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U. S. NAVY SALVAGE REPORT
OPERATIONS DESERT SHIELD/DESERT STORM
VOLUME 1

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FOREWORD

This report reviews the salvage events of Operations DESERT SHIELD and DESERT STORM, reflects on the Navy's current salvage force preparedness, and presents a strategy and agenda for meeting similar challenges in the future. The salvage experience in the Arabian Gulf reaffirms that an effective salvage force is a fundamental requirement for naval warfare. If the Gulf War salvage experience can be summed up, it is that salvage must be integrated into mobilization planning and execution. Salvage must be included in the deliberate planning for timely crisis response, limited regional conflict, and major wartime engagements.

Though potentially significant, the Gulf air threat proved minimal. After the commencement of DESERT STORM, both air action and surface opposition were virtually nil against Allied Naval forces. There was no submarine threat, and no amphibious landing was undertaken. Mines were the dominant threat. Although Arabian Gulf naval operations took place in a relatively benign environment, major naval casualties were sustained. Any significant naval action would have overwhelmed available salvage resources. Salvage assets available were barely adequate and arrived in-theater "just in time". A potentially disastrous situation was reduced by positioning ESSM equipment and commercial salvage tugs in-theater and by finally deploying a single Navy salvage ship to the Gulf.

In the future, comprehensive planning will ensure that adequate force levels, plans, and logistics considerations are addressed "up front". As the crisis develops, resources can begin moving by priority and plans can be executed. Force commanders can concentrate on the tactical situation instead of having to develop plans from scratch and deal with logistics priorities.

USS BEAUFORT set a new standard for salvage excellence that epitomizes the passage in *MUD, MUSCLES, AND MIRACLES*, "At sea there is no substitute for properly designed and equipped salvage ships". BEAUFORT played a vital role in combat casualty assistance to TRIPOLI and PRINCETON. BEAUFORT also played a pivotal role in search and recovery operations for aircraft and Tomahawk missiles. The SMIT commercial salvage vessels brought experience and additional capabilities that, along with special firefighting equipment, proved to be major factors in the salvage successes of DESERT SHIELD and DESERT STORM. The recent SALVAGE 2010 Study Report on Salvage Ship Force Level Requirements concludes that a strong Navy core of salvage ships, augmented with commercial salvage vessels will provide the most responsible, capable, and cost-effective composition for our future salvage force.

The major challenges ahead are to work with planners to increase awareness of salvage mission responsibilities and capabilities and to aggressively promote integration of salvage considerations into Navy and joint operational planning.

Captain R.P. Fiske, USN
Director of Ocean Engineering
Supervisor of Salvage and Diving

EXECUTIVE SUMMARY

This report recounts combat and noncombat salvage actions that occurred during Operations DESERT SHIELD and DESERT STORM. The U.S. Naval Force component of U.S. Naval Forces Central Command operated in a high optempo environment involving over 400 vessels maneuvering in restricted waters, often in harm's way. Missions included: offensive air strikes, maritime patrol and interdiction, amphibious assault, and strategic sealift. Although there were remarkably few incidents that resulted in serious ship casualties, this report documents the full spectrum of wartime demands for salvage response. Included are:

- Combat casualties to in-theater naval forces – USS TRIPOLI and USS PRINCETON mine strikes.
- Marine accidents to sealift forces – USNS HIGGINS grounding.
- Harbor clearance and wreck removal – Ash Shuaybah, Al Shuwaikh, Al Ahmadi, and Ras Al Qualayah harbors.
- Search and recovery – SH-60B Helicopter, Tomahawk Land-Attack Missiles (TLMS) and AC-130.

This report discusses the planned deployment of Mobile Diving and Salvage Unit (MDSU) teams which were standing by in Hawaii, but never moved in-theater. These teams have been specially trained in offship firefighting and salvage.

The report also identifies the need for further work in the areas of communications and command organization. There is a need for fleet awareness of the Navy's salvage mission, as well as the need for a larger integration of salvage into fleet and joint operations planning.

Gulf salvage assets in-theater are compared with the composition of the Navy's "salvage system" of the future—an integrated salvage force consisting of Navy and commercial salvage assets. Working together, they would be augmented by Emergency Ship Salvage Material (ESSM), commercial, offship firefighting equipment, satellite communications, and automated information systems technology.

Financial assistance provided by the Government of The Netherlands through the U.S. Supervisor of Salvage and Diving (SUPSALV) Western Pacific salvage contract was a key factor in the timely mobilization of the salvage assets in the Gulf. The Dutch funding of the SMIT-TAK salvage tug SMIT NEW YORK was crucial to SUPSALV's establishing a salvage presence in the Arabian Gulf in early January 1991 and maintaining it beyond the cessation of hostilities.

In order to expedite emergency salvage and towing services, SUPSALV recommended to USCINCCENT that a salvage office be established in Sharjah, U.A.E. It was recommended that a senior salvage engineer in that office coordinate salvage support through the SMIT-TAK contract. In an issue paper, dated 9 October 1990, SUPSALV apprised the prospective COMUSNAVCENTCOM of the potential need for combatant, non-combatant, and strategic sealift force salvage services during Operation DESERT SHIELD. The issue paper also recommended organic and contract assets needed to meet the anticipated salvage demands. With persistence, which included a December visit of a SUPSALV representative to Commander, Naval Logistics Support Force, approval was obtained to establish an ESSM base in the U.A.E., and to engage the contract services of SMIT NEW YORK. NAVCENT's request that one U.S. Seventh Fleet salvage ship be deployed to the Arabian Gulf fell short of SUPSALV's recommendations for two Navy salvage ships along with flyaway teams and equipment.

Salvage was not included in the deliberate planning process for Operation DESERT SHIELD/DESERT STORM. Had advance planning been in place, the late ad hoc drafting of the Salvage Concept of Operations would have been avoided. Moreover, Navy salvage ships and MDSUs augmented with commercial assets would have been deployed sooner.

Documented Operations DESERT SHIELD/DESERT STORM salvage events are drawn from recorded personal interviews with the principle salvage participants, ship logs, equipment lists, and written correspondence in the form of naval messages, letters, issue papers, and memoranda. The salvage lessons learned from Operation DESERT SHIELD/DESERT STORM fall into the general categories of Personnel; Command, Control and Communications (C^3); Planning; and Operations. The lessons learned and recommendations presented reflect collective concerns of professionals involved in ship survivability and salvage.

The major recommendation is that the Navy salvage community leaders, SUPSALV, senior Fleet salvage operators, and salvage engineers promote salvage as a Fleet operational imperative and ensure that salvage requirements and assets are incorporated into operational planning.

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CHAPTER 1

BACKGROUND

1-1 INTRODUCTION

This report documents the major salvage, diving, and towing events of Operations DESERT SHIELD and DESERT STORM. This report was drawn from recorded events documented by ship logs, message traffic, letters, memoranda, and related reports covering the period 2 August 1990 through 1 June 1991. Personal interviews, with key personnel involved both in-theater and at CONUS headquarters activities, provided an invaluable source of information. Individuals interviewed have long professional involvement in worldwide ship salvage and diving operations and management. The interviews clarify events, provide professional opinions, and articulate lessons learned.

During Operations DESERT SHIELD and DESERT STORM, the naval component of the U.S. Central Command forces rapidly increased from the few ships that were present in the Arabian Gulf on 2 August 1990, when Iraq invaded Kuwait, to a force of more than 115 ships. Figures 1-1A and 1-1B on Pages 1-2 and 1-3 give a general description of the broader Area of Operations (AOR) that encompassed the Red Sea, Arabian Sea, the Gulf of Oman, and the Arabian Gulf. U.S. naval forces included six aircraft carriers, 34 amphibious ships, dozens of combatants, combat logistics force ships, auxiliaries, and several attack submarines. Additionally, over 460 sealift voyages, originating from 28 ports worldwide, delivered over 10 million tons of war material cargo to the Arabian Gulf. U.S. naval and strategic sealift forces were exposed to a high-risk threat of combat and non-combat casualty situations that included the threat of missile attacks, mine strikes, sabotage, shore battery gunfire, collisions, groundings, and marine breakdowns- possibly in a Chemical, Biological, and Radioactive (CBR) environment. There were precious few salvage ships in this armada; yet lethal weapon threats to surface ships clearly existed, threats capable of inflicting damage requiring salvage, offship fire-fighting, emergency towing, and battle damage repair support for stricken combatants, sealift forces and amphibious operations in the Arabian Gulf. Table 1-1 shows the consequences of various weapon hits, capable of inflicting damage through a combination of effects, including:

- Flooding through hull ruptures or damaged piping.
- Loss of weapons or weapon control.
- Loss of maneuverability.
- Structural and fire damage.
- Loss of services.
- Secondary (internal) explosions.

Table 1-1. Threats and Consequences.

THREAT	BLAST	FRAG/ DEBRIS	FIRE	SHOCK	FLOOD-ING	WHIP-PING	PENE-TRATION
Air-Delivered ASCM	P	P	S	S	S	N	P
Bombs/Projectiles	P	P	S	P	P	N	P
U/W-Delivered Torpedoes	P	S	S	P	P	P	N
Mines	P	S	S	P	P	P	N

P = Primary S = Secondary N = Negligible/None

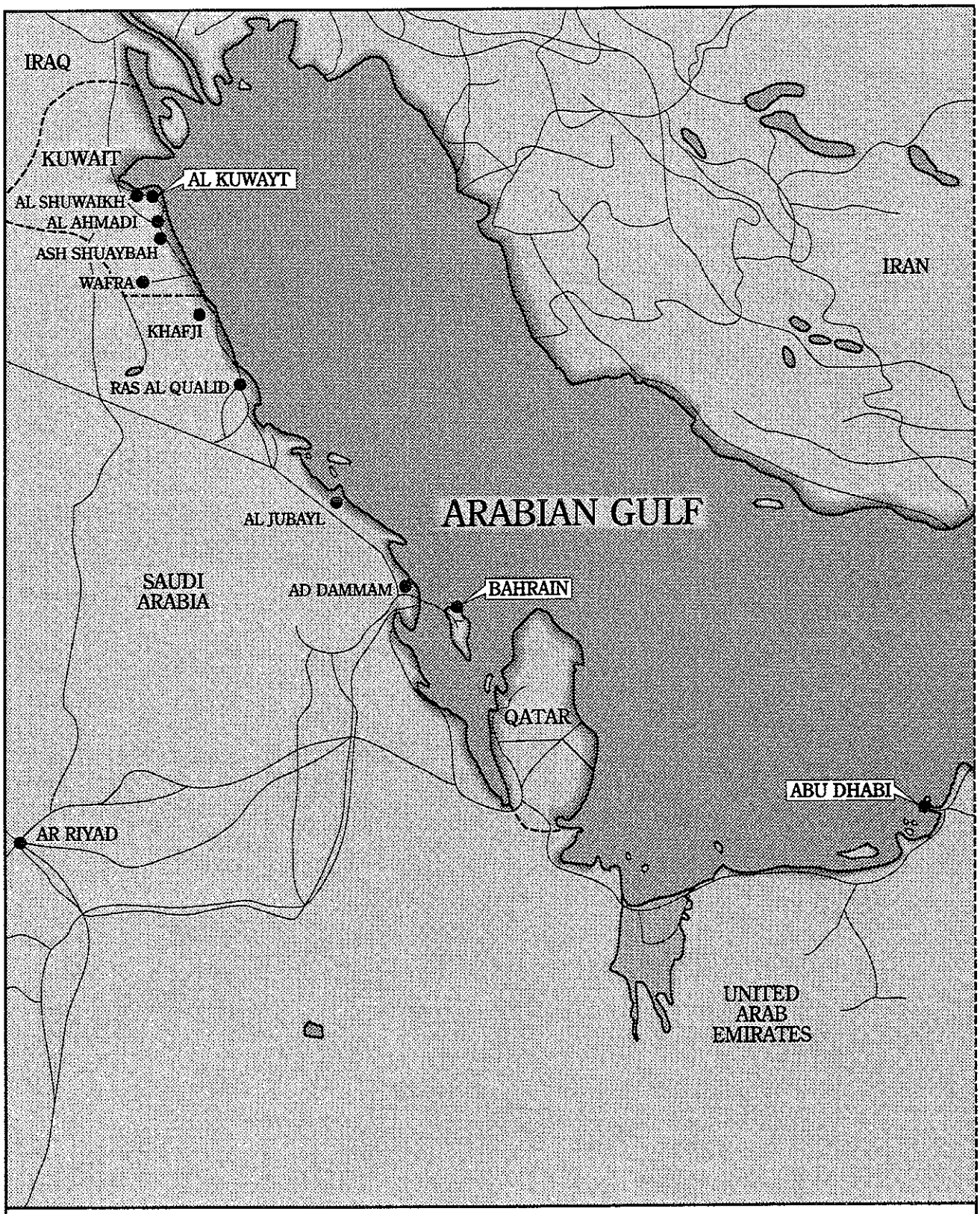


Figure 1-1A. Arabian Gulf.

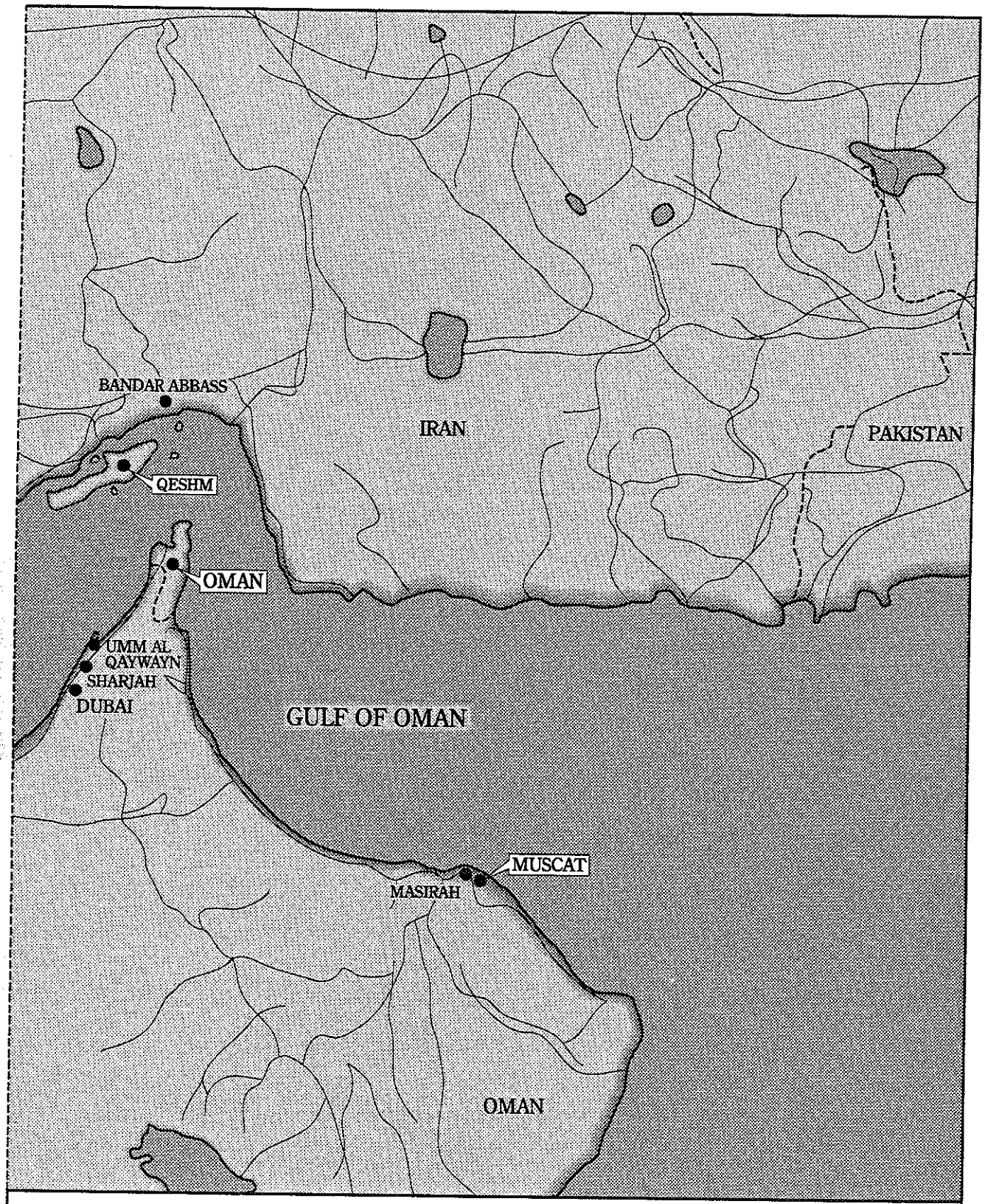


Figure 1-1B. Arabian Gulf.

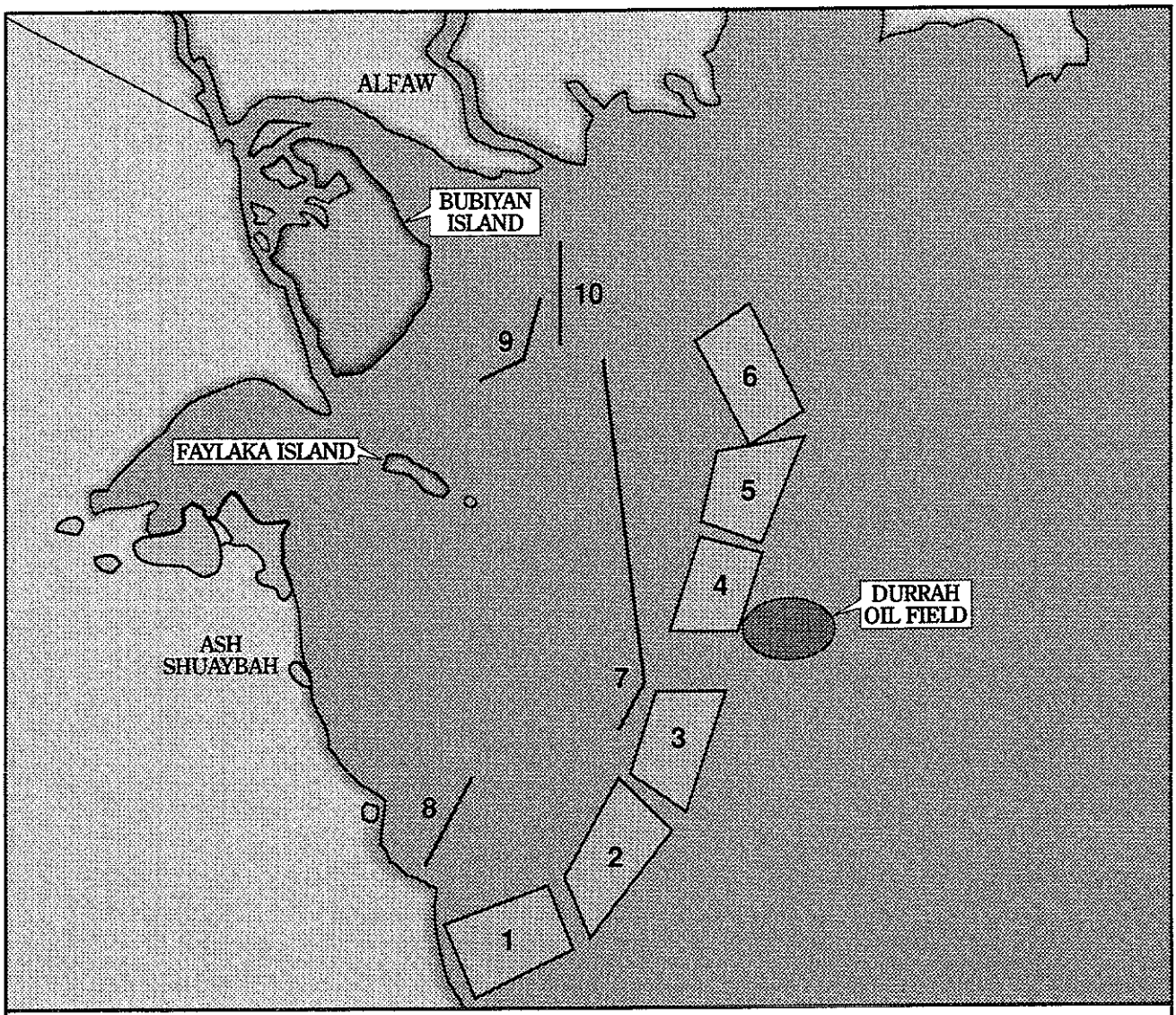


Figure 1-2. Minefield Layout.

1-2 DEMAND FOR SALVAGE

In the Arabian Gulf War, the risk associated with combat and logistics operations rose sharply, and with it the potential demand for salvage services. Those demands included:

- Combat casualties to in-theater naval forces.
- Combat casualties and marine accidents to sealift forces.
- Harbor clearance and wreck removal.
- Search and recovery.
- Environmental management.

1-2.1 Combat Casualties to in-theater Naval Forces. During the latter part of Operation DESERT SHIELD and the first days of Operation DESERT STORM, the principal enemy threat was the Badger/Mirage air strikes delivering SILKWORM and EXOCET missiles. When the Iraqis chose not to launch a major air strike, mine strikes became the principal threat to the naval component of the coalition forces. An estimated three thousand moored contact and bottom-influence mines were laid. Mines could have seriously disrupted the waterborne logistics flow of ammunition and other war materials.

On February 18, 1991, USS TRIPOLI (LPH 10) and USS PRINCETON (CG 59) detonated mines in the Arabian Gulf off Kuwait. Both ships received damage from blast, shock, flooding, and whipping. TRIPOLI was holed and experienced flooding and structural damage. PRINCETON received major structural damage with minor internal flooding and damage to propulsion and steering systems. In both instances, the salvage response was immediate, involving Navy salvage officers, a Navy salvage ship, and two commercial salvage tugs. USS BEAUFORT (ATS 2) proceeded directly to the area, sending a salvage officer and master diver ahead by helicopter. Ship Repair Unit, Detachment (SRUDET) Bahrain dispatched CDR Bert Marsh, a salvage engineer, as the OIC of a combination Repair Party/Battle Damage Assessment Team (BDAT) from USS JASON (AR 8). Once the stricken vessels were towed out of the minefield areas, M/V SMIT NEW YORK and M/V GALA, under contract to SUPSALV, assisted with escort and towing of the damaged ships to the nearest repair facilities. These were classic salvage actions in which organic and contracted commercial salvage assets provided an effective and successful response to combat casualties.

Had the planned amphibious assault taken place, realistic salvage priority would have included assault craft stranded or sunk by mine strikes or shore gunfire. As early as October, it became apparent that no salvage organization was in place. As late as 15 January 1991, salvage readiness in support of an amphibious assault was in question. When the assault began and forces were in the Amphibious Operating Area (AOA), salvage forces under a group or unit commander would enter the AOA to support the operations. The two ships available, USS BEAUFORT and SMIT NEW YORK, would be overwhelmed by salvage demands during a full- scale assault. Insufficient salvage and towing assets were available in the Gulf to tow damaged ships south to Dubai or to other locations for battle damage repair or to perform salvage tasks other than AOA support.

USS NICHOLAS (FFG 47) experienced a near miss from a missile. Had the missile hit the ship, NICHOLAS would have experienced the primary effects of blast, fragmentation, debris, and penetration, and the secondary effects of fire, shock and flooding. As in the case of USS STARK (FFG 31), emergency salvage assistance involving offship firefighting and towing could have been critical to the survival of the ship.

1-2.2 Marine Accidents. Every type of marine accident shown in Table 1-2 occurred during DESERT SHIELD and DESERT STORM. During mobilization and war, the risk of marine accidents increases from a peacetime level for a number of reasons. Ship population density and fleet optempo, particularly in-theater and in the theater-contiguous region, are much higher. Over 200 coalition force naval vessels operated in the Gulf region. Whereas the Military Sealift Command (MSC) fleet normally contains 135 ships in peacetime, by February 1991, there were 333 ships owned or chartered by MSC operating around the world. Of these, 237 were directly supporting DESERT STORM. As of mid-March 1991, these ships had made 459 voyages, transporting and offloading 3.5 million tons of dry cargo and 6.0 million tons of liquid cargo at Arabian Gulf ports. Sealift traffic during the first six months of DESERT SHIELD/DESERT STORM was equivalent to six years of peacetime activity.

Table 1-2. Causes for Salvage Action

CAUSES	PROBABLE SALVAGE ACTIONS					
	FIREFIGHTING	ADVANCED DAMAGE CONTROL	FLOODING CONTROL	DEBEACHING	TOWING	EMERGENCY TRANSFERS
Marine Accidents						
Internal Fire	•		•		(•)	(•)
Collision	•	•	•	•	(•)	•
Stranding				•	(•)	
Breakdown		•			•	

• Primary Action

(•) Secondary Action resulting from a Primary Action

On 2 January, USNS ANDREW J. HIGGINS (T-AO 190) went hard aground on an uncharted "pinnacle" in the Gulf of Oman just south of Masirah. At the time of grounding, the ship was directly supporting the Amphibious Force. When this occurred, there was no Navy salvage response capability in the Gulf region except M/V SMIT NEW YORK, which was not scheduled to go on hire until three days later. SMIT NEW YORK went on hire that day and proceeded directly to the grounding location from Al Fujayrah, U.A.E. The U.S. Seventh Fleet salvage officer flew in from Subic Bay, R.P., arriving on 4 January, two days after the grounding.

USS VIRGINIA (CGN 38) was involved in a collision with a fishing vessel south of Souda Bay, Crete, while enroute to the Arabian Gulf, also, USS KANSAS CITY (AOR 3) and USS HARRY W. HILL (DD 986) collided during an underway replenishment evolution. Fortunately, the collisions were not serious enough to require salvage and towing assistance.

Internal fires and breakdowns occurred, not all of which required salvage or towing services. These included an engine room fire and breakdown of USNS CAPE EDMONT (T-AKR 5069) and breakdowns of USNS CURTISS (T-AVB 4), USNS CAPE BON (T-AK 5059) USNS CAPE CHARLES (T-AK 5038) and USNS SANTA ANA (T-AK 5022). An engine room fire aboard the foreign-flagged M/V MERCS HORANA resulted in a major conflagration requiring assistance from five naval vessels from three coalition countries.

1-2.3 Harbor Clearance, Harbor Salvage, and Wreck Removal. In all wars, strategic or tactical situations require specific ports and sites to fulfill military objectives. In the case of Operation DESERT STORM, the port of Ash Shuaybah was a planned military objective to be used as a major logistics resupply port for U.S. Army, Marine Corps, and coalition ground forces moving north toward Kuwait City and the Iraqi boarder. A beach amphibious assault was planned in an area just north of Ash Shuaybah. Once ashore, half of the assault forces would head south to seize and hold the port, while half turned north to defend against enemy forces to the north and west. Harbor clearance, harbor salvage, and wreck removal of Ash Shuaybah harbor were considered time-critical to permit disembarkation of heavy-wheeled and tracked vehicles and ammunition aboard the Maritime Prepositioning Ships (MPS), other Prepositioning Force vessels, Roll On/Roll Off (RO/RO) ships, and follow-on through-the-port logistics support.

After cancellation of the amphibious assault, the port of Ash Shuaybah was no longer a military objective. However, for economic and humanitarian reasons, Navy salvage officers teamed with a U.S. Army Diving Detachment to conduct harbor clearance and wreck removal operations for the government of Kuwait. For the same reasons, a plan was developed to restore the port of Al Shuwaikh, Kuwait.

1-2.4 Search and Recovery. The most noteworthy search and recovery projects involved USS BEAUFORT and included:

- Location of a downed Air Force C-130 and recovery of its black box recorder.
- Search and recovery of an SH-60B helicopter.
- Search and recovery of three Tomahawk Land Attack Missiles (TLAMs).

1-2.5 Environmental Management. An estimated 45 million barrels of crude oil were intentionally dumped by Iraq into the waters off the coast of Kuwait; it was the largest oil spill in the world. While the Supervisor of Salvage is the Navy's agency responsible for open-sea oil cleanup, the Arabian Gulf cleanup was not considered a U.S. Government responsibility. Had the Navy become involved, the oil skimmers and support equipment maintained at the ESSM sites in CONUS and Hawaii could have been mobilized in support of DESERT SHIELD and DESERT STORM.

1-3 PLANNED SALVAGE ORGANIZATION AND ASSETS

The *Surface Ship Survivability Manual*, NWP 62-1 (Rev C), published in December 1989, recognizes that survivability enhancement and damage minimization are principal missions of fleet ship salvage forces. Chapter 9 of the manual addresses coordination and control of salvage assets under a Force Salvage Commander (FSC) and salvage and equipment assets. These include fleet salvage ships, battle group-embarked Salvage Assistance Response Teams (SARTs), Mobile Diving and Salvage Unit (MDSU) teams, Navy platforms of opportunity and commercial salvage tugs. Had salvage been incorporated into fleet and joint Concept of Operations (CONOP) and Operation Plans (OPLAN), the salvage force organization envisioned in NWP 62-1 would have been in place.

Because of the U.S. Naval Forces Central Command's salvage doctrine at the start of Operation DESERT STORM, provisions for salvage and towing support to naval forces in the Middle East were not addressed in the CONOPS and OPLANS. The rash of higher-priorities relegated salvage to a rather low consideration.

1-3.1 SUPSALV Efforts to Position Salvage Assets In-Theater. After sending salvage recommendations via naval message in September 1990, the Supervisor of Salvage and Diving formally voiced concern for the lack of Navy salvage protection for Naval Forces supporting Operation DESERT SHIELD to VADM Stanley Arthur, just prior to his relieving VADM Henry H. Mauz as Commander, U.S. Seventh Fleet and Commander, U.S. Naval Forces Central Command. At the time, there were no U.S. Navy salvage assets, either afloat or shore-based, readily available to support DESERT SHIELD. USNS CURTISS was cited as an illustrative example of the concern for lack of a salvage response. CURTISS experienced an engine room fire that caused the ship to go dead-in-the-water in the Gulf of Oman. The only response — a telephonic exchange involving MSC, SUPSALV, SMIT-TAK in Singapore, and the SMIT-TAK representative in Sharjah, U.A.E. — failed to produce a timely salvage assistance response. Fortunately, the casualty was restored in the interim. As assessed by SUPSALV, the Navy's salvage assistance response posture was marginal at best. As was the case during the USS STARK and USS SAMUEL B. ROBERTS incidents, only commercial salvage and towing assets were available. For major combat casualties, commercial salvage assets alone would be inadequate.

They could not be expected to enter known minefields or areas where a CBR or hostile fire threat existed. Specific recommendations in October were:

1. Forward-deploy two ARS 50/ATS 1 Class salvage ships to the Arabian Gulf for the duration of DESERT SHIELD.

2. Establish a SUPSALV field office in Sharjah, U.A.E., for the duration, with authority to contract for time-critical salvage services.

3. Stage Emergency Ship Salvage Material (ESSM) on the Arabian Peninsula to support flyaway salvage missions by deployed MDSU personnel.

In late November 1990, a SUPSALV staff representative met with SMIT International to coordinate and accommodate approximately $1.0M being provided by the Dutch government through the Ministry of Foreign Affairs towards the SUPSALV WESTPAC Zone contract with SMIT. Due to this contribution, the Dutch government provided a substantial portion of the contracted salvage forces used during the conflict.

In December, a SUPSALV representative traveled to Bahrain to meet with RADM Robert Sutton, Commander Naval Logistics Support Force, and NAVCENTCOM staff to lay the groundwork for bringing the 16,000 BHP salvage tug M/V SMIT NEW YORK on hire in the Gulf and establishing a Navy ESSM equipment base in Sharjah. Efforts were successful in establishing a SMIT-TAK office and ESSM base of operations in Sharjah and in bringing SMIT NEW YORK on hire on 2 January 1991, followed by M/V SMIT MADURA on 18 January.

1-3.2 Fleet Salvage Force Efforts To Position Assets In-Theater. In early September, the commanders of both Combat Support Squadrons (COMSUPRONs) Five and Eight and salvage officers on both U.S Pacific and U.S. Atlantic Fleet staffs pressed the issue of deploying salvage ships to the Arabian Gulf, as well as deploying a MDSU detachment to Bahrain for rapid salvage response to hostile actions. This issue was resolved in November. when USS BEAUFORT (ATS 2) was tasked to deploy from Sasebo, Japan to the Arabian Gulf in January 1991. By the end of January, COMUSNAVCENT's salvage force consisted of one Navy ATS, two SMIT salvage tugs, and an ESSM base in Sharjah. Additional commercial vessels were available locally through the SMIT contract, but the availability of crews was a function of hostility conditions and, therefore, problematic.

1-4 SELECTION OF SALVAGE OPERATIONS BASE, SHARJAH, U.A.E.

The logic behind siting the ESSM base in Sharjah, instead of in more northern Bahrain, was based on several factors:

- SMIT had an existing joint venture agreement with Rockwater International, who had offices and warehouse facilities in Sharjah. Rockwater had an effective organization in place and an established working relationship with the local authorities and logistics infrastructure.

- Accessibility to the warehouse facility and the waterfront was less complicated than in Bahrain where there was a higher tempo of activity; a denser population of Naval logistics personnel, material, and equipment; and more stringent security.

- Responsive direct airlift to and from the "Mirage" military airfield just outside Sharjah, which was the delivery point for the 325 tons of ESSM equipment that arrived aboard sixteen C-141 flights in mid-January.

- Sharjah offered a broad range of port facilities including ample pier and wharf berthing, drydock facilities, and some of the largest shipyards and ports in the Gulf.

- Reliable availability of required salvage consumables and a ready labor supply.

- Strategic location in the event that the Straits of Hormuz were blocked.

1-5 INITIAL SUPSALV/DUTCH GOVERNMENT DISCUSSIONS

In the early phase of Operation DESERT SHIELD, SUPSALV inquired about SMIT's capability to provide shoreside salvage support in the Arabian Gulf and associated equipment rates. Discussions in the fall of 1990 between SUPSALV and the SMIT U.S. representative led directly to the financial involvement of the Government of The Netherlands in supporting Operation DESERT SHIELD. SMIT International worked closely with The Netherlands Ministry of Foreign Affairs, Atlantic Co-Operation and Security Affairs Department and Naval Sea Systems Command (SEA 00C) to formalize the Government of The Netherlands' offer of assistance by financing SMIT salvage tug services. The enthusiastic support of individuals such as Mr. Ronald Mollinger of the Atlantic Co-Operation and Security Affairs Department, was crucial to the timely agreement.

The European Division, J5, the Joint Staff and the European Policy Division, Office of the Secretary of Defense concurred with the Naval Seas Systems Command initiative to accept salvage services offered by the Government of The Netherlands at no cost to the United States Government in support of U.S. and allied shipping in Operation DESERT SHIELD. This action was viewed as supporting military requirements but also, as an excellent example of supporting U.S. Government policy in increasing the commitments and contributions of allied nations to the Arabian Gulf effort.

1-6 CONCEPT OF OPERATIONS (CONOPS)

Normally, the CONOPS is a precursor to developing the OPLAN, including the Time-Phased Force and Deployment Data (TPFDD) (see Chapter 3), as part of a deliberate planning process. As the crisis situation and threat changes, CONOPS are changed and/or updated, OPLAN and TPFDD are updated and validated, and OPTASKS developed and executed. In the case of salvage, CONOPS was not developed until late January 1991. This partially explains why USCINCCENT, COMUSNAVCENT OPLANS did not include salvage requirements.

The draft CONOPS developed by the salvage officers assigned to SRUDET Bahrain/CTG 151.12 for combat diving and salvage support of Operations DESERT SHIELD and DESERT STORM is included as Appendix A.

CHAPTER 2

WESTPAC SALVAGE POSTURE

2-1 INTRODUCTION

This chapter provides background information tracing the Dutch government's offer of financial assistance to SUPSALV in Operations DESERT SHIELD and DESERT STORM, as well as the effect of the funding on SUPSALV's ability to establish rapid salvage representation in the Gulf. A brief description of SMIT International puts SUPSALV's WESTPAC Zone salvage contractor into an international commercial marine context and outlines the company's experience in Arabian Gulf salvage, towage, and vessel management. SMIT's familiarity with port protocol and logistic support infrastructure in Sharjah facilitated establishment of the SUPSALV shore support facility.

2-2 SUPSALV INITIAL ORGANIZATION

2-2.1 WESTPAC Zone Salvage Contract. Since 1989 SUPSALV has divided the globe into three areas for salvage coverage—Atlantic, Pacific, and Western Pacific (WESTPAC) zones. SMIT International is the WESTPAC zone salvage contractor. The contractor is responsible for salvage, salvage-related tasks and emergency towing services in the geographic area that includes the Northern Arabian Gulf operational area.

2-3 FUNDING

Of the $4.74 million spent on salvage support of Operations DESERT SHIELD and DESERT STORM, the SMIT-TAK salvage contract accounts for approximately $4.03 million, or 85 percent of the total cost. The funding assistance received from the Government of The Netherlands was provided through a no cost to the U.S. Government Delivery Order under the SMIT-TAK contract and paid directly to SMIT. The Government of The Netherlands paid approximately 46 percent of the SMIT-TAK salvage contract costs.

The remaining 54 percent, or $2.17 million, of the SMIT-TAK salvage contract costs were provided under a separate Delivery Order from NAVSEA 00C (SUPSALV). Navy funding was obligated or committed either at specific OPNAV (OP-37) direction or from FY-91 Emergency Salvage mission funding levels.

In February 1991, NAVSEA (00C) estimated that $4.0 million per month was required to maintain what was then currently projected salvage capability levels. The salvage organization in place at that time was considered capable of accomplishing 2-3 simultaneous operations. One large operation, such as salvage support for an amphibious assault, could require all in-theater salvage assets.

Appendix G provides a cost breakdown for all salvage services furnished in support of DESERT SHIELD/DESERT STORM.

2-4 U.S. MARITIME ADMINISTRATION VESSEL INSURANCE

War risks to merchant ships are not generally covered by standard commercial hull and cargo policies. Ship owners must obtain additional insurance to cover those risks. Commercial war risk insurance is usually written on an annual and geographical basis; the premium depends on the perceived level of risk in the areas where the ship intends to sail. Underwriters charge an Additional Premium (AP) for areas of particularly high risk. Before August 1990, the **annual** premium for merchant ships in the Middle East was equal to the value of the ship multiplied by 0.0005 (1/20th of one percent, or $10,000 for a $20,000,000 vessel). There was no AP for most of the Arabian Gulf; but, there was a small AP for the Shatt Al Arab area, due to debris from the Iran/Iraq war and the residual risk that the conflict might resume.

During Operation DESERT SHIELD an AP was imposed in the Arabian Gulf at a premium equal to 25 percent of the ship's value **per week** (an annual rate of 1,300 percent, or **26,000 times** the pre-war rate for the area).

The Merchant Marine Act of 1936 authorizes the Maritime Administration (MARAD) to write war-risk insurance for U.S. or foreign-flag ships operated in the national interest of the United States. Insurance under the statute is written only when commercial war-risk insurance is unavailable or available only at prohibitively high rates. The Government does not charge a premium to the shipowner or operator for war-risk insurance issued under the Act. It is a noncash transaction until a loss occurs, and then the Government pays the loss if it is covered under the terms of the policy. The policies are modeled after commercial policies, so that the coverage is generally congruent with what the ship had carried before the war risk arose.

Acting under an Agreement of Indemnity dated 17 August 1990, between the Navy and the Department of Transportation, SEA 00C obtained war risk insurance from MARAD to cover the following nine vessels operated by its contractor or subcontractors:

- GALA.
- STELLA.
- MR. SMALL 1.
- SUBTEC 1.
- SMIT NEW YORK.
- SMIT MADURA.
- BIG ORANGE VII.
- SALVANA.
- SALVALOUR.

Although MR. SMALL 1, SALVANA, and SALVALOUR were never placed on-hire, they were insured as a contingency measure. No loss occurred to any of the insured vessels during Operations DESERT SHIELD or DESERT STORM. The Military Sealift Command used the same method for obtaining MARAD insurance for ships under its contracts.

2-5 NETHERLANDS MINISTRY OF FOREIGN AFFAIRS

In November 1990, The Netherlands Ministry of Foreign Affairs informally suggested to SUPSALV through SMIT that the Government of The Netherlands underwrite the cost of salvage services by one SMIT tug for approximately 45 days in support of Operation DESERT SHIELD/DESERT STORM. The offer progressed through appropriate military channels and the U.S. State Department and received favorable responses.

On 13 December, the Chief of the European Division of the Joint Chiefs sent a memo to the Naval Sea Systems Command regarding the prospective bi-lateral agreement. An excerpt follows:

> *"European Division, J5, The Joint Staff and the European Policy Division, Office of the Secretary of Defense concur with the Naval Sea Systems Command initiative to accept salvage services offered by the Government of The Netherlands (GON) at no cost to the USG in support of U.S. and allied shipping in Operation DESERT SHIELD.*
>
> *This action not only supports military requirements but is an excellent example of supporting USG policy in increasing commitments and contributions of allied nations to the Arabian Gulf effort."*

Confirmation of the Government of The Netherlands' approved funding of a Dutch salvage vessel to be provided to the United States in support of Operation DESERT SHIELD was received 19 December 1990. On 7 February 1991, SUPSALV received notification that the Government of The Netherlands would fund an additional salvage vessel under the same arrangement.

2-6 SMIT INTERNATIONAL ASSETS AND EXPERTISE

SMIT International, the parent company of SMIT-TAK, is an industry leader in the marine towing, salvage and ocean engineering field. Under the SUPSALV contract, SMIT-TAK provides rapid-response salvage services, supported by specialized personnel and equipment, which are vital to successful resolution of ship casualty situations. This is true for both the military and commercial sectors of the global salvage and towage market, and it proved to be true during the Gulf War.

2-6.1 SMIT Presence and Experience in the Arabian Gulf. In the 1980s, SMIT opened an office in Sharjah for support of the Arabian Gulf offshore industry. Later, the office staff later played an instrumental logistics/management role in the Iran/Iraq war coordinating emergency salvage, towing, and offship firefighting services to casualties from the war. This prior involvement in the region significantly enhanced SMIT's ability to support Navy salvage and towing requirements.

2-6.2 Firefighting Experience. SMIT's joint venture, Rotterdam International Safety Centre (RISC) Holding B.V., specializes in firefighting and emergency services, including training and supply of personnel. Its Rotterdam school has achieved a worldwide reputation for teaching state-of-the-art firefighting techniques. With the cooperation of the Royal Netherlands Navy, a total of 8.5 tons of RISC heavy-duty firefighting equipment was flown from Rotterdam to Sharjah for installation aboard the SMIT MADURA and SMIT NEW YORK. A breakdown of the equipment sent to Sharjah is included as Appendix F. A RISC fire engineer and pump specialist accompanied the equipment and oversaw daily training in its use aboard ship. Once the gear was installed, the SMIT MADURA became one of the most versatile firefighting platforms in Operation DESERT SHIELD/DESERT STORM.

2-6.3 Evaluation of Local Charter Vessels. Early on, SMIT was tasked to conduct an informal market survey of the material condition of readiness, crew availability, and day rates for potential subcontract vessels-of-opportunity to work in concert with the USN salvage ship USS BEAUFORT (ATS 2), SMIT NEW YORK, and SMIT MADURA. Of the seven vessel charter firms contacted, four were based in the U.A.E., two in the U.S. and one in Hong Kong. With the exception of IMI and IMS, all of the following companies operated a mixture of supply and anchor handling/tug/supply boats:

- Swire Pacific (Hong Kong-based) – 6 boats, 2,000-4,000 BHP, $2,000-5,000/day.
- Zapata (U.S.-based) – 15 boats, 2,000-6,000 BHP, $2,500-6,000/day.
- Tidex (U.S.-based) – 8 boats, 2,400-5,000 BHP, $2,400-5,000/day.
- International Marine Services (IMS) (U.A.E.-based) – Oceangoing tug IMSALV LION, 6,600 BHP, $40,000/day [considered by SUPSALV and SMIT as a last-resort charter option].
- Intermarine Inc (IMI) (U.S.-based) – 12 supply boats, 2250-3600 BHP, $2,000/day.

In addition to material condition of readiness, horsepower rating, and day rate, a major factor in charter vessel selection was the willingness to venture into a war zone or near-war-zone environment. IMI was the only company to commit to such operations as a SMIT subcontractor. Between 5 and 19 February, SMIT hired three IMI vessels in support of Operation DESERT SHIELD/DESERT STORM—BIG ORANGE VII, GALA, and STELLA.

When the need for a heavy-lift sheerleg capability would be required for Shuwaikh harbor clearance, a U.S. contractor, J. Ray McDermott, offered a suitable crane at a day rate of $160,000. SMIT was prepared to defray operating costs for up to 60 days (at $12,500/day) if SUPSALV would fund the cost of round-trip towage of a SMIT sheerleg from Singapore. Over the projected five-week length of the harbor clearance task, this arrangement would have made the SMIT price to the Navy $1 million, as opposed to McDermott's $5.6 million. In the end, day rates became a moot point since the Kuwaiti government elected not to request the assistance of the U.S. Navy for Shuwaikh harbor clearance.

CHAPTER 3

MOBILIZATION

3-1 INTRODUCTION

Efforts to mobilize a salvage force in support of Operation DESERT SHIELD began in August 1990. At the time, there were no U.S. Navy salvage assets, either afloat or shore-based, readily available to support DESERT SHIELD. SUPSALV identified the need for a responsive salvage force consisting of Navy salvage ships and flyaway MDSU teams, supported by Emergency Ship Salvage Material (ESSM) assets staged in-theater. Through the WESTPAC salvage contract with SMIT-TAK, SUPSALV could establish a full-time Navy office to coordinate, advise, and execute any ship salvage actions or contingencies.

COMUSNAVCENT had no response plan or provisions for emergency salvage and towing other than a last-minute effort to hire a commercial salvage tug through the SUPSALV contract. Nevertheless, salvage force mobilization progressed through persistence on the part of NAVSEA 00C and the respective Fleet salvage officers. Concurrently, NAVSEA tasked SMIT-TAK to provide the salvage tug SMIT NEW YORK for a minimum period of 45 days to perform emergency towing, salvage, and firefighting services in support of DESERT SHIELD.

On 28 November, COMUSNAVCENT acknowledged that although commercial salvage assets were available in the Arabian Gulf, organic assets were needed. CINCPACFLT was tasked to provide an ARS/ATS or T-ATF with MDSU. CINCLANTFLT was tasked to be prepared to deploy or surge a salvage ship from the Mediterranean to the Red Sea. The PACFLT salvage ship mission was to:

- Render offship firefighting with installed monitors.
- Embark personnel with special training in fire rescue and assistance.
- Provide extensive salvage equipment including pumps, generators, welding equipment, and other salvage gear.
- Make emergency structural repairs, as well as support damage control and towing preparations.
- Augment the AR/AD underwater inspection and ship husbandry capability.

3-2 SHARJAH BASE OPERATIONS

The Sharjah base operations office was the nerve center of SUPSALV salvage vessel operations and logistics support in Operations DESERT SHIELD and DESERT STORM. From here, the SMIT representative coordinated a complex web of vessel, equipment, and logistic support requirements and capabilities. Co-location of the SMIT/SUPSALV administrative offices with the ESSM warehouse and equipment issue function enabled managers to stay abreast of shoreside capability to support afloat salvage operations.

3-3 ESSM EQUIPMENT

In only six days, 11-16 January 1991, SUPSALV's ESSM contractor mobilized 325 tons of ship salvage, firefighting, and spill response equipment from its base in Williamsburg, Va., to Sharjah, U.A.E. A total of sixteen C-141 MAC flights transported the gear from Norfolk Naval Air Station. Hazardous Materials (HAZMAT) went on the first planeload. For reasons of aircraft configuration and fuel economy, the maximum payload per C-141 was 22.5 tons. Individual loads were structured so that all components of a given system (e.g., firefighting or beach gear) arrived on the same plane. All but one flight arrived in Sharjah without incident. That flight was delayed in Riyadh on the day the war began, due to possible need for the aircraft to expedite medical supplies to the war zone. Coordination with U.A.E. Government civilian and military officials for customs clearance proved difficult. Through its local experience, SMIT-TAK provided essential assistance in obtaining these clearances.

3-4 TRANSPORTATION

With the exception of ship assets, all movement of Navy and commercial salvage and diving equipment and personnel into the Gulf Theater was accomplished by airlift. Once in-theater, equipment was moved by truck or by vessel. Personnel moved in and around the area by military and commercial aircraft, land vehicles, and vessels.

3-4.1 Equipment. The major equipment movements were:

- FADS II Diving System by MAC aircraft from Hawaii to Bahrain.
- 325 tons of ESSM equipment by sixteen C-141 MAC aircraft from Naval Air Station, Norfolk to Sharjah, U.A.E.
- SMIT offship firefighting equipment by commercial air from Rotterdam to Sharjah.
- Eastport International and Oceaneering International search and recovery equipment by MAC flight from CONUS to Bahrain.

Once in-theater, equipment moved by land vehicle from airfields to waterfront facilities where it was temporarily stored in staging areas, warehouses or directly loaded aboard vessels. The portion of ESSM equipment remaining in the AOR was transported from Sharjah, U.A.E. to Bahrain aboard M/V GALA for warehousing in Bahrain.

All U.S. Army 7TH Transportation Group port operations equipment and Diving Detachment equipment was transported to and from the Gulf AOR by sealift aboard M/V AMERICAN CORMORANT (T-AKF 2062), a heavylift float on/float-off (FLO/FLO) vessel and aboard two Logistic Support Vessels (LSV - ARMY). AMERICAN CORMORANT, a PREPO Squadron Two ship prepositioned in Diego Garcia, offloaded all prepositioned craft and equipment and proceeded to CONUS for a full load of Army port clearance and diving equipment (see Fig. 4-5, p. 4-8). The LSVs transported the bulk of diving support equipment.

Except for the portion of ESSM equipment returned to CONUS by SEA-LAND commercial carrier and equipment remaining in the Gulf region, all Navy and contractor equipment returned by airlift. (See Chapter 6, Demobilization.)

3-4.2 Personnel. Military, government civilian, and contract personnel traveled by both military and commercial air to and from the Gulf area of responsibility (AOR). Once in-theater, military and commercial air, surface, and ground transportation were used for local travel. Navy salvors depended on the transportation available in-theater, while Underwater Construction Team (UCT) detachments, Explosive Ordnance Disposal (EOD) units, and U.S. Army Port Operations Group Diving Detachments operating in the AOR had land vehicles integral to deployable equipment packages. Had MDSU teams and equipment been sent to the Gulf, they would have deployed as rapid-response, lightweight, flyaway teams that relied on the local transportation infrastructure and ESSM for support.

3-4.3 Time-phased Force and Deployment Data. Time-Phased Force and Deployment Data (TPFDD) is both part and product of the joint operation planning process used by a commander to determine the best method of deploying forces, equipment, and material to accomplish assigned tasks and to direct the action necessary for completing his mission. It is the computer-generated portion of a joint OPLAN that contains time-phased force data, non-unit-related cargo and personnel data, and movement data for execution of that OPLAN. Information includes in-place units, prioritized arrival of units deployed to support the OPLAN, routing of forces to be deployed, movement data associated with deploying forces, estimates of non-unit-related cargo, and personnel movements to be conducted concurrently with the deployment of forces, and estimates of transportation requirements.

The plan development phase of the deliberate planning process produces huge amounts of information regarding the forces, the equipment and material support to those forces, and the time-phased movement of personnel and material to the area of operations. Planners need ADP computer support that is provided by the Worldwide Military Command and Control System (WWMCCS) Standard ADP System to manage all the information. Planners are those headquarters, commands and agencies involved in the training preparation, movement, reception, employment, support, and sustainment of military forces assigned or committed to a theater of operations. Using specialized application programs of the Joint Operation Planning System (JOPS) ADP, planners create a TPFDD computer file by entering data supplied by sources throughout the Joint Deployment Community.

As early as mid-August, MDSU-1 encountered delays in scheduling the Flyaway Diving System (FADS) II and six-man operating team for EOD Unit support Bahrain, on a dedicated military aircraft. In time of surge or mobilization, forces and equipment identified in Operation Plans (OPLANS) time-phase deploy according to the TPFDD. Since deployment of salvage forces and equipment such as MDSU teams, their non-unit equipment, and all ESSM equipment is not adequately addressed in most Navy and joint OPLANS, it was not entered in the TPFDD. Because ESSM and FADS were not in the TPFDD file, they were treated as unplanned transportation requirements that had to queue until entered into the TPFDD. Salvage, for the most part, was not considered in the Navy's deliberate planning process that resulted in Middle East Force/Arabian Gulf OPLANS. In early December, CINCPACFLT informed NAVSEA 00C and all other concerned activities that once the ESSM requirement was identified, the equipment, origin, destination, and required delivery date must be entered into the DESERT SHIELD TPFDD for TRANSCOM to arrange transportation. This was not accomplished until early January.

3-5 COMMUNICATIONS

As shown in Table 3-1, the following communications were available to salvage vessel operators and shoreside support managers during Operations DESERT SHIELD/ DESERT STORM:

- INMARSAT (Voice/FAX; SUPSALV provided).
- HF/SSB (Voice/FAX).
- VHF.
- Bridge-to-Bridge.
- Land Lines.
- Telex Over Radio (TOR).

Table 3-1. SUPSALV Desert Storm Communications Matrix.

PLATFORM/ FACILITY	HF-SSB		VHF	INMARSAT		TELEX OVER RADIO	LAND LINES	BRIDGE-TO-BRIDGE	OTHER
	VOICE	FAX		VOICE	FAX				
SRUDET BAHRAIN	X[1]	X		X	X		X	X	
SHARJAH BASE OPS	X		X	X		X	X		
USS BEAUFORT	X	X	X	X	X		X[2]	X	X[3]
SMIT NEW YORK	X	X	X	X	X	X	X	X	
SMIT MADURA			X			X	X	X	
GALA			X				X	X	
STELLA			X				X	X	
BIG ORANGE VII			X				X	X	
SUBTEC I			X				X	X	

NOTE:

[1] There was a dedicated salvage primary and secondary frequency on the HF-SSB for which SRUDET BAHRAIN was designated Net Control.

[2] All vessels had land line telephones whenever in port.

[3] USS BEAUFORT was the only salvage asset with a complete suite of communications enabling worldwide voice and message communications, both secure and non-secure, and the ability to communicate with every Navy ship and commercial salvage tug in the Arabian Gulf.

Land lines provided direct communication between the Sharjah office and its tasking source, SRUDET Bahrain, located approximately 250 miles to the northwest. Although not every office or vessel had access to every option, aggregate communications capabilities were sufficient to meet combat salvage requirements.

Whenever SMIT vessels were operating, Sharjah Base maintained a 24-hour radio watch, manned by a SMIT professional radio officer experienced in salvage operations. Although contract vessels had only non-secure communications, USS BEAUFORT possessed standard secure U.S. Navy communications capability. BEAUFORT's manning level enabled a 24-hour radio watch.

The two INMARSAT SATCOM transceivers, originally placed aboard SMIT NEW YORK and USS BEAUFORT, were later transferred to other vessels. The SMIT NEW YORK unit was transferred to USS TRIPOLI on 18 February when the latter was escorted by BEAUFORT from the Kuwait minefield to Bahrain. The other unit was transferred from BEAUFORT to USNS SIOUX (T-ATF 171) on 1 June, when she relieved BEAUFORT.

3-6 MILITARY SALVAGE PERSONNEL

Navy salvors who actually participated in salvage operations during DESERT SHIELD AND DESERT STORM were far fewer than envisioned by SUPSALV and the two Combat Support Squadron Commanders. What was hoped to be a salvage force mobilization involving at least two Navy salvage ships, a 50-man MDSU detachment, commercial salvage tugs, and an ESSM base, resulted in a force of only one ATS augmented by two SMIT-TAK salvage tugs and several local-hire vessels, one enlisted and six officer salvors, and a U.S. Army port operations/diving detachment.

In the September-October timeframe, SUPSALV recommended sending a Reserve Captain salvage engineer from NAVSEA DET 1006 to serve as a NAVSEA Salvage Coordinator in Sharjah, responsible for managing the ESSM equipment and the commercial salvage contract with SMIT-TAK. It was not until December that

CAPT Steve Delaplane, USN (1140), a seasoned fleet salvage operator, was selected in lieu of a reserve O-6. He arrived 1 January under temporary-duty orders to COMUSNAVSUPFOR. Concurrently, SUPSALV sent three engineering officers to round out the team and provide NAVSEA 00C representation:

- CDR Bert Marsh, USN (1440), an experienced salvage engineer well versed in the Program of Ship Salvage Engineering (POSSE), arrived in-theater on 3 January and immediately assisted in the salvage of USNS HIGGINS. He remained in-theater until 5 March.

- LCDR Dave Balk, CEC, USN (5100), an underwater construction engineer, with knowledge and experience in ship husbandry, arrived on 8 January and remained in-theater until 18 April.

- LCDR Steve Barton, USNR (1445), a reserve salvage engineer activated from NAVSEA DET 1006 with experience using POSSE, arrived 29 Feb and relieved CDR Marsh.

There were early discussions of deploying two MDSU detachments—one active detachment from MDSU-1 and one reserve MDSU to either backfill MDSU-1 in Hawaii when the active team deployed or deploy as an integrated active/reserve detachment. In January, MDSU-1 was prepared to deploy a 50-man Detachment, trained and equipped to conduct offship firefighting, aboard two SMIT salvage tugs and three other commercial vessels. When it became clear that the MDSU detachment would not deploy, the decision was made to send CDR Jim Evans, USN (1140), Commanding Officer MDSU-1, to assist and relieve CAPT Delaplane as the senior salvage officer assigned to SRUDET BAHRAIN/CTG 151.12. The only other Navy salvors sent to the Arabian Gulf were CDR Jim Cosper, USN (1140), Commanding Officer MDSU-2, and MMCM (MDV) George McLaughlin, MDSU-1.

A diving team assigned to the U.S. Army 7TH Transportation Group Diving Detachment banded together with Navy salvage officers and master diver to form a pseudo-MDSU team that performed harbor clearance and wreck removal operations.

3-7 CONTRACTORS

3-7.1 GPC, Inc. Global Phillips Cartner (now known as GPC, Inc.), an Alexandria, Virginia-based company, holds the NAVSEA contract to maintain, warehouse, mobilize, and operate ESSM equipment as directed by SUPSALV. GPC operates large central warehousing operations in Stockton, Cal., and Williamsburg, Va., and a smaller facility in Hawaii. Equipment is prepositioned at unmanned storage facilities at the following locations:

- Livorno, Italy.

- Singapore.

- Aberdeen, Scotland.

ESSM equipment falls into the broad categories of firefighting, pollution response and ship salvage materials. For redundancy, GPC stocks most equipment at both Stockton and Williamsburg; however, Stockton tends to specialize in marine pollution response gear, while Williamsburg stores more ship salvage equipment such as beach gear.

During Operations DESERT SHIELD/DESERT STORM, GPC worked under NAVSEA Contract No. N0002489-1, Delivery Order No. 33, to set up the ESSM base in Sharjah, U.A.E. GPC personnel:

- Mobilized 325 tons of firefighting and ship salvage equipment from Williamsburg, VA, to Sharjah, over a period of six days.

- Coordinated warehousing, maintenance and loadout of salvage and firefighting equipment on the chartered SUPSALV salvage vessel BIG ORANGE VII.

- Segregated salvage equipment to be left in Bahrain, loaded the gear aboard GALA, and demobilized the remainder of the original ESSM shipment to CONUS via SEA LAND commercial carrier.

3-7.2 SMIT and Subcontractors. SMIT International has been SUPSALV's Western Pacific (WESTPAC) contractor since 1986. Services that SMIT provided for Operations DESERT SHIELD/DESERT STORM were covered by NAVSEA Contract No. N0002490D4349. Under Delivery Order 002, funded by the Dutch Government's contribution to the war effort, SMIT provided a company representative in Sharjah and the salvage tug SMIT NEW YORK, and hired an 8,000-ft^2 warehouse/office space. Under Delivery Order 003, SMIT provided the salvage tug SMIT MADURA.

3-7.2.1 InterMarine, Inc. As a SMIT subcontractor InterMarine, Inc. (IMI), Houston, TX, through its Sharjah office, provided the services of three offshore supply vessels—GALA, STELLA and BIG ORANGE VII—between February and April 1991.

3-7.2.2 SUBTEC Offshore Support Ltd. As a SMIT subcontractor, SUBTEC Offshore Support Ltd., Nicosia, Cyprus, provided the accommodation barge SUBTEC I, on standby in Sharjah, from 10 February through 4 April 1991.

3-7.3 Oceaneering International, Inc. Oceaneering International, Inc., Steadfast Division, has been the SUPSALV contractor for deep ocean search since 1983. Following the conclusion of Operations DESERT SHIELD/DESERT STORM, Oceaneering personnel spent two weeks aboard USS BEAUFORT for search and recovery of a USN SH-60B Light Airborne Multi-Purpose (LAMPS) ASW helicopter and multiple Tomahawk Land Attack Missiles (TLAMs). The work was performed under NAVSEA Contract No. N0002490D4183. Delivery Order No. 0012 specified providing assistance to SUPSALV in operations for search and recovery of classified objects, while D.O. 0013 required mobilizing SUPSALV's hand-held pinger-locator, a differential global positioning system (DGPS) system, and a side-scan sonar to support aircraft recovery operations.

3-7.4 Eastport International, Inc. Eastport International, Inc., based in Upper Marlboro, Md., has been SUPSALV's worldwide deep ocean operations contractor for over 15 years. In Operations DESERT SHIELD/ DESERT STORM, Eastport International, Inc., worked under NAVSEA Contract No. N002490D4090, Delivery Orders No. 0024 and 0025. The former delivery order required Eastport to operate and maintain the SUPSALV mini-ROV to support aircraft recovery operations, while the latter covered classified aspects of underwater object recovery.

CHAPTER 4

U.S. NAVAL FORCE ORGANIZATION

4-1 INTRODUCTION

The U.S. Naval Force level and organizational structure was dynamic; it expanded, changed and reorganized as the situation and strategy of DESERT SHIELD/DESERT STORM unfolded. Key event dates were:

- DESERT SHIELD:
  - PHASE ONE 2 August (C Day) – 17 November 1990.
  - PHASE TWO 18 November 1990 – 15 January 1991.
- DESERT STORM:
  - PHASE ONE 16 January (D Day) – 23 February 1991.
  - PHASE TWO 24 February (G Day) – 28 February 1991 (cease fire).
  - PHASE THREE 29 February – 1 June 1991 (post cease fire period).

Prior to Operation DESERT SHIELD mobilization in August 1990, U.S. naval forces in the AOR consisted of seven ships assigned to Commander, Middle East Force (CMEF) and the six ships in the USS INDEPENDENCE (CV 62) Carrier Battle Group. The principal commands who would comprise and support the naval component of the U.S. Central Command forces were globally dispersed:

- Commander, U.S. Naval Forces Central Command (Rear) (COMUSNAVCENTCOM), RADM Robert Sutton, located at Pearl Harbor, Hawaii.
- Commander, Seventh Fleet (COMSEVENTHFLT), VADM Henry H. Mauz, Jr., embarked in USS BLUE RIDGE (LCC 19), homeported in Yokosuka, Japan.
- Commander Sixth Fleet (COMSIXTHFLT), VADM James D. Williams, embarked in USS BELKNAP (CG 26) homeported in Naples, Italy.
- Commander, Joint Task Force Middle East (CJTFME) and Commander, Middle East Force,(CMEF), RADM William M. Fogarty, embarked on USS LA SALLE (AGF 3), homeported in Bahrain.
- Commander, Task Force Sixty-Three (CTF 63), CAPT B. Nelson, located in Naples, Italy.

Concurrent with the movement of Commander, U.S. Central Command from McDill AFB in Florida to Riyadh, Saudi Arabia, Commander USNAVCENTCOM, RADM Sutton and his staff shifted from Hawaii to Bahrain. Upon arrival of COMSEVENTHFLT/USS BLUE RIDGE in the Arabian Sea, VADM Mauz relieved RADM Sutton as COMUSNAVCENTCOM and the U.S. Navy numerical Battle Task Force (CTF 150) organization shown in Figure 4-1 was established. RADM Sutton was designated Commander, Naval Logistics Support Force (COMNAVLOGSUPFOR), operating out of Bahrain.

During mobilization for Operation DESERT SHIELD, the CTF 150 organization changed, expanding dynamically as carrier battle groups arrived and special units in-chopped. Figure 4-2 depicts the command organization that went into effect around 1 January 1991 that comprised the maximum-strength naval force in place during the last days of DESERT SHIELD and throughout DESERT STORM.

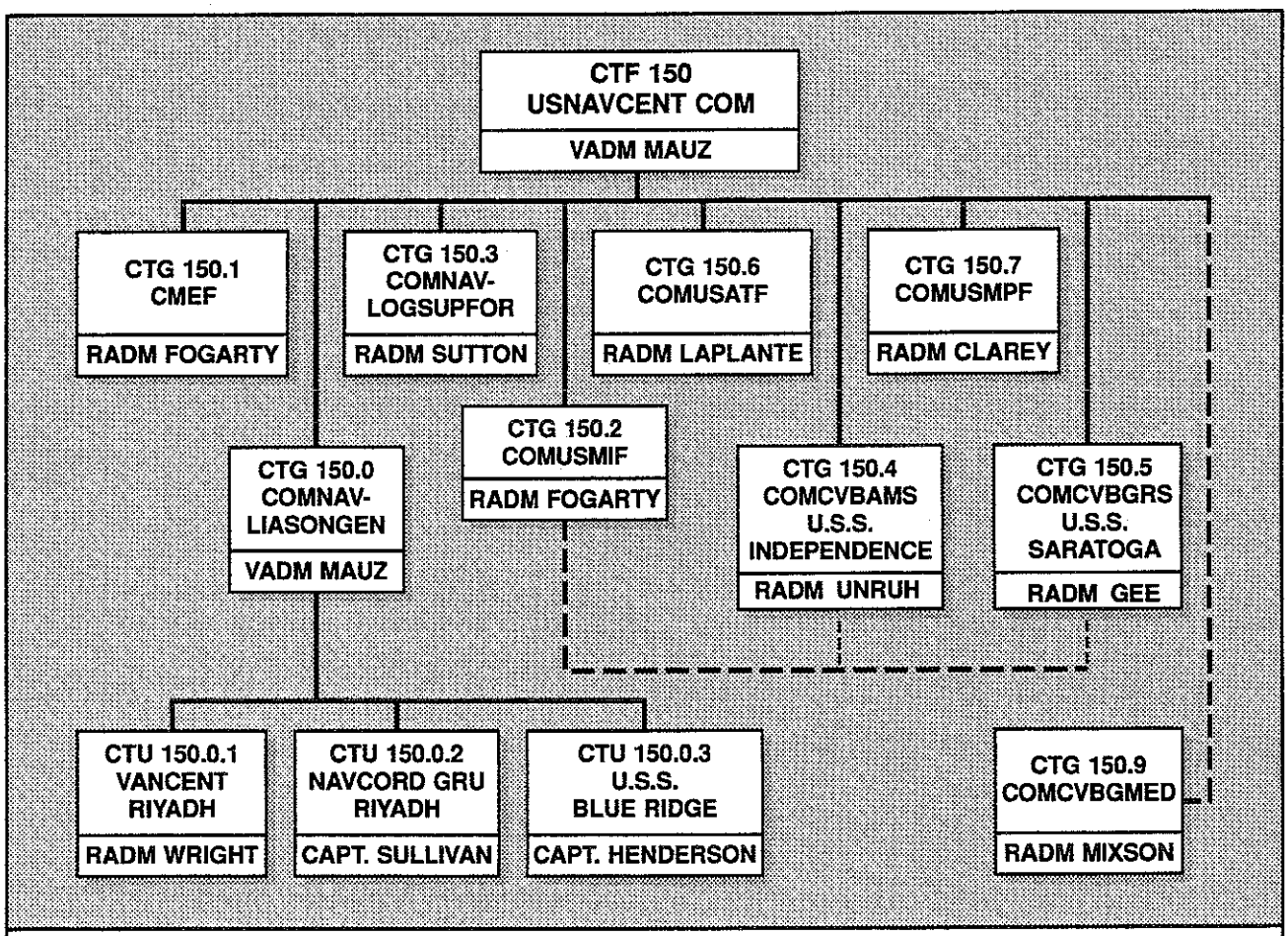


Figure 4-1. U.S. Naval Force Organization on September 1990.

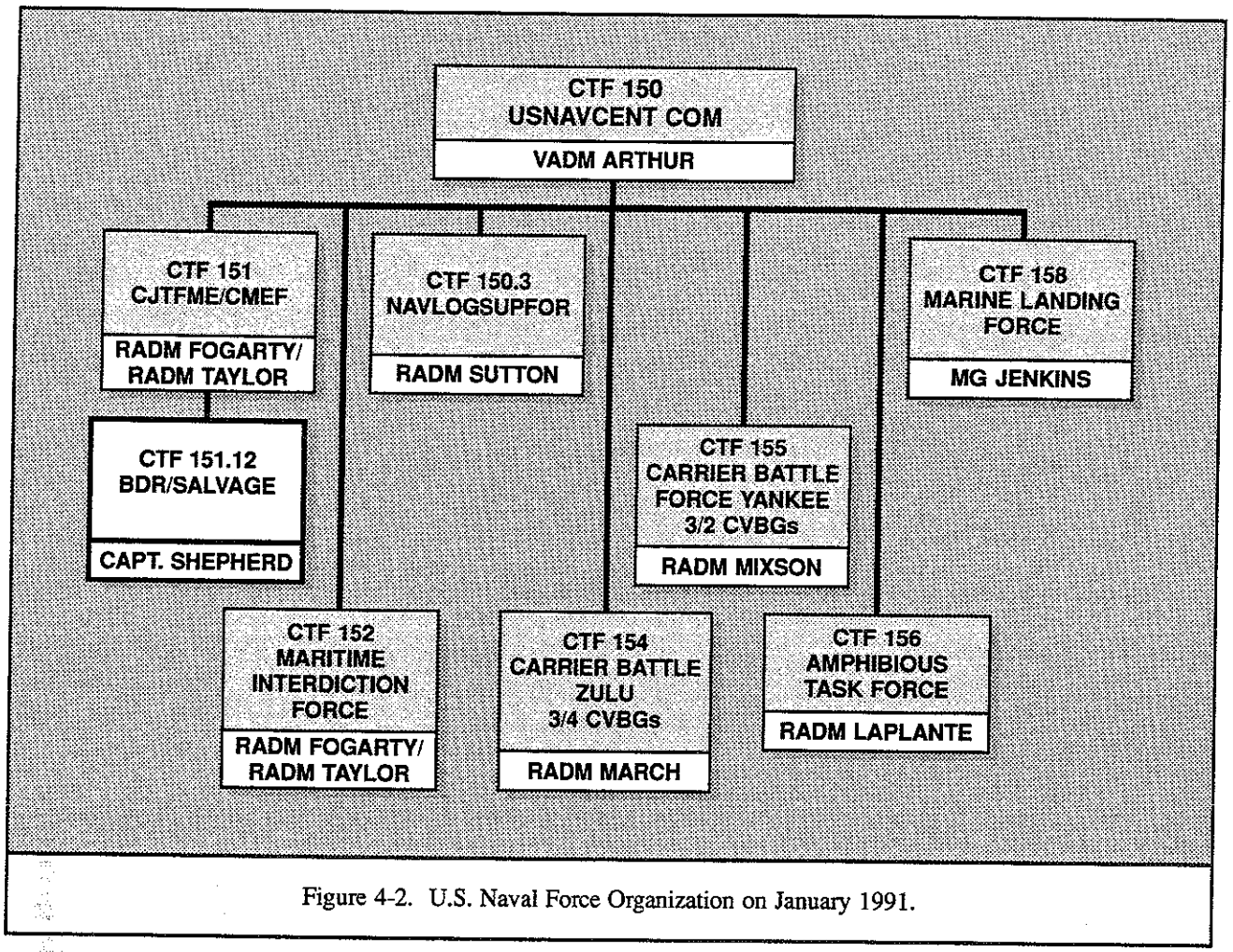


Figure 4-2. U.S. Naval Force Organization on January 1991.

4-2 NAVAL FORCES CENTRAL COMMAND COMPOSITION

The following briefly describes the various Commander Task Force components under COMUSNAVCENT-CTF 150:

- CTF 150 – VADMs Mauz and Arthur remained embarked in USS BLUE RIDGE throughout the entire period of conflict, maintaining close contact with CINCCENT in Riyadh through telecommunications and frequent personal visits.

- CTF 151 – Under the command of RADM Fogarty (CJTFME/CMEF) until relieved by RADM R.A.C. Taylor in early February 1991, CTF 151 was responsible for a variety of surface force support functions, including gunfire support. Mission tasking for salvage, battle damage repair and ship maintenance eventually came under CTF 151.

- CTG 152 – RADM Fogarty's other hat as Commander, Maritime Interdiction Force.

- CTG 150.3 – COMNAVLOGSUPFOR, under RADM Sutton, with responsibility for shore-based logistics support and port security. RADM Sutton originally had responsibility for salvage.

- CTF 154 – Carrier Battle Force ZULU consisting of as many as four Carrier Battle Groups stationed in the North Arabian Sea, Gulf of Oman and Arabian Gulf under the command of RADM Larry R. Marsh.

- CTF 155 – Carrier Battle Force YANKEE, consisting of three Carrier Battle Groups stationed in the Red Sea under the command of RADM Riley D. Mixson. Reduced to two CVBGs when USS AMERICA (CV 66) shifted to the Arabian Gulf.

- CTF 156 – Amphibious Task Force under the command of RADM John B. LaPlante, Commander Amphibious Group TWO; included CTG 156.2, Commander Amphibious Group Three, RADM Stephen S. Clarey.

- CTF 158 – Marine Landing Force under the command of MG H. Jenkins, Commanding General 4TH Marine Expeditionary Brigade (MEB); included CTG 158.2, CG 5TH MEB.

4-3 SALVAGE UNDER THE CJTFME/CMEF (CTF 151) ORGANIZATION

Initial discussions concerning the positioning of salvage assets in the Arabian Gulf involved the staffs of SUPSALV and CTF 63. With the support and cooperation of the CTF 63 Salvage Officer, a SUPVALV representative met with RADM Sutton (CTF 153) to discuss establishing an ESSM base in the Gulf area and providing commercial salvage tug and offship firefighting assets for Fleet support. CTF 63 maintained a four-person Ship Repair Unit detachment in Bahrain (SRUDET Bahrain) that, with the rapid build-up of fleet units and quantum increase in strategic sealift traffic in the Arabian Gulf area, was greatly expanded. At the time, it was logical and convenient to organize salvage under the Officer-in Charge, SRUDET Bahrain due to the functional relationship of salvage and ship damage repair resulting from both combat and non-combat casualties. However, as naval forces grew and Operation DESERT STORM began, organizational changes occurred to align battle damage repair and salvage response more closely to operational events. SRUDET Bahrain, while remaining a Sixth Fleet unit, was closely aligned with CTF 151. In February, the Fleet Salvage Commander (FSC) was formally designated CTG 151.12. CTF 151 included the following:

- CTG 151.1 USS La SALLE (AGF 3).

- CTG 151.2 USS WISCONSIN (BB 64).

- CTG 151.3 COMDESRON 35.

- CTG 151.4 Mine Countermeasure Ships - one MCM and three MSOs.

- CTG 151.5 USS JASON (AR 8), USS CAPE COD (AD 43).

- CTG 151.6 AEW Coordinator – Air Wing Det.

- CTG 151.7 USS BUNKER HILL (CG 52).

- CTG 151.8 SIGENT and Intelligence Warfare.

- CTG 151.9 Harbor Defense – MIUW, EOD Mobile Unit.

- CTG 151.10 Not Used.

- CTG 151.11 COMDESRON 22 – Amphibious Advance Force.

- CTG 151.12 Fleet Salvage Officer, USS JASON (AR 8) and USS BEAUFORT (ATS 2).

Unit designations within the CTF 151 organization changed as the tactical situation changed. USS BEAUFORT, for example, was assigned under CTG 151.11, 151.12 and 151.5 at different times over a 5-month period depending on the tactical commander responsible for the particular OPTASK assigned.

4-3.1 CTG 151.12 Organization. In December 1990, SRUDET Bahrain expanded from a four-man detachment with an O-4 Officer-in-Charge to an O-6 OIC and over 100 additional military and enlisted and civilian ship surveyors and technical representatives assigned. CAPT Patrick Shepherd, USN (1110), COMDESRON SIX, was hand-picked for the position, based on his major fleet staff, tender command and operational fleet maintenance experience. He arrived on 6 January 1991, reporting to Admiral Sutton (CTF 153) for temporary command of SRUDET Bahrain. Later, SRUDET Bahrain was included under CTF 151 and reorganized as shown in Figure 4-3.

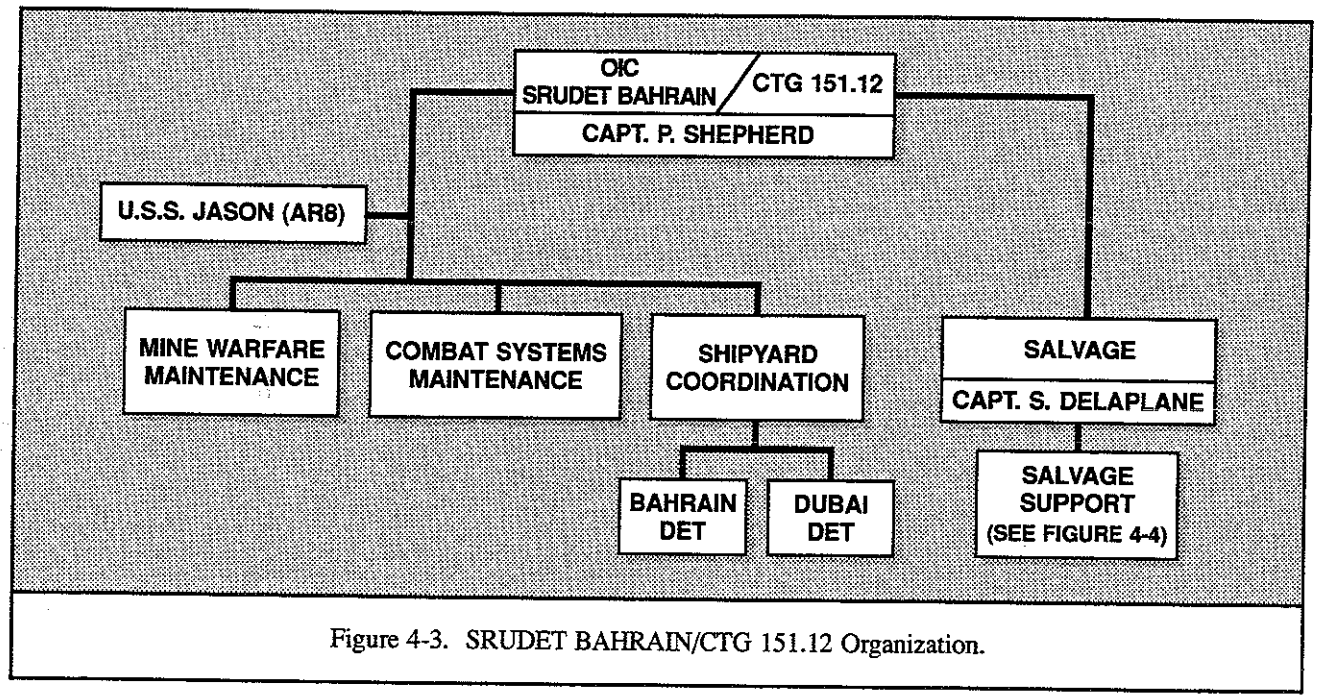


Figure 4-3. SRUDET BAHRAIN/CTG 151.12 Organization.

4-3.2 Salvage Organization. CTG 151.12 functioned as the Force Salvage Coordinator (FSC) in the absence of an FSC assigned directly to either CTF 151 or CTF 150 afloat staffs. As the senior salvage officer in-theater, CAPT Steve Delaplane arrived in Bahrain on 11 January under orders to report to RADM Sutton for duty involving salvage and diving. He eventually reported to OIC SRUDET Bahrain as the senior salvage advisor. Figure 4-4 identifies all salvage assets in-theater.

The SRUDET BAHRAIN Salvage detachment consisted of six officers and one master diver:

NAME	PARENT ORGANIZATION
CAPT Steve Delaplane (1140)	CINCLANTFLT
CDR Bert Marsh (1440)	NAVSEA 00C
CDR Jim Evans (1140)	CO, MDSU-1
CDR Jim Cosper (1140)	CO, MDSU-2
LCDR Dave Balk (5100)	NAVSEA 00C
LCDR Steve Barton, USNR (1445)	NAVSEA 00C (NAVSEA RESERVE DET 1006)
MMCM(MDV) George McLaughlin	MDSU-2

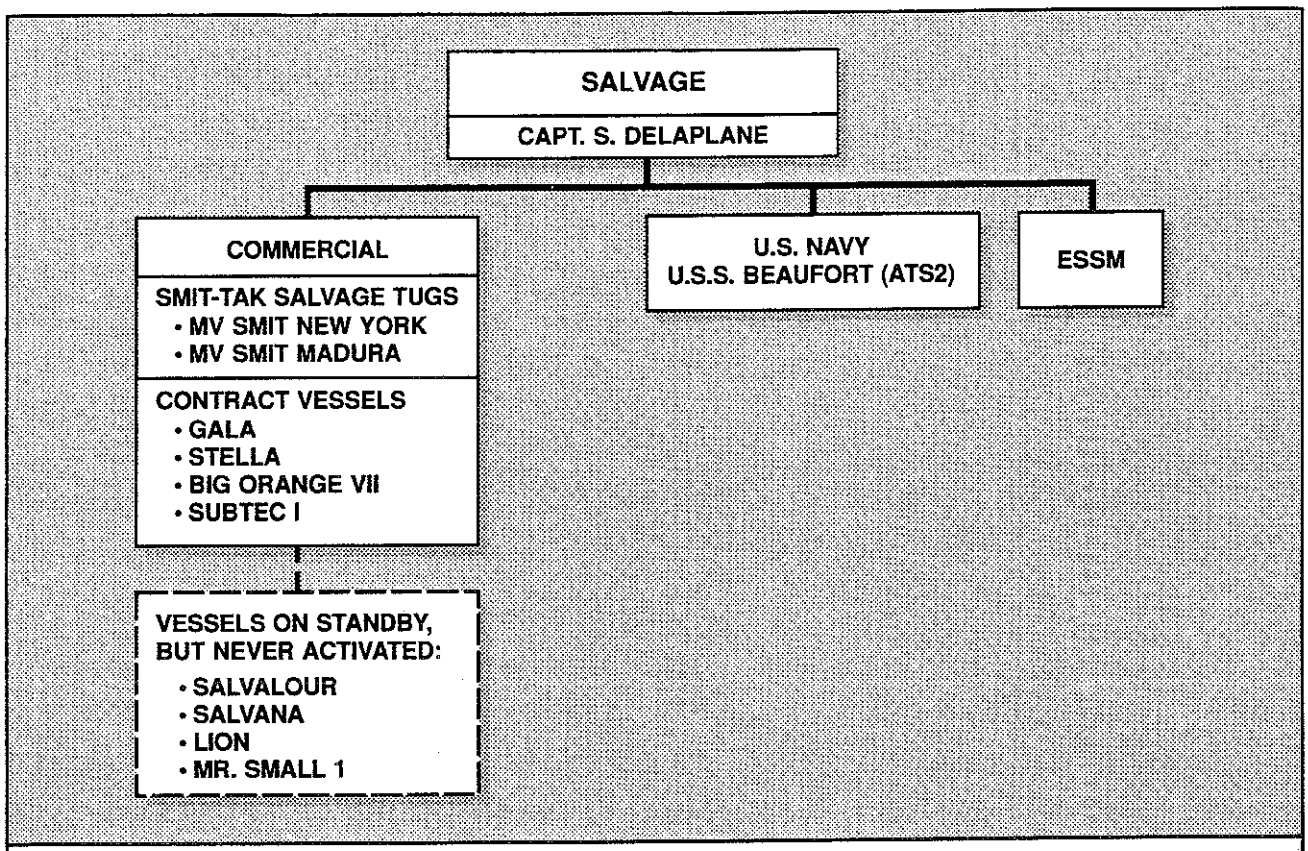


Figure 4-4. Salvage Organization.

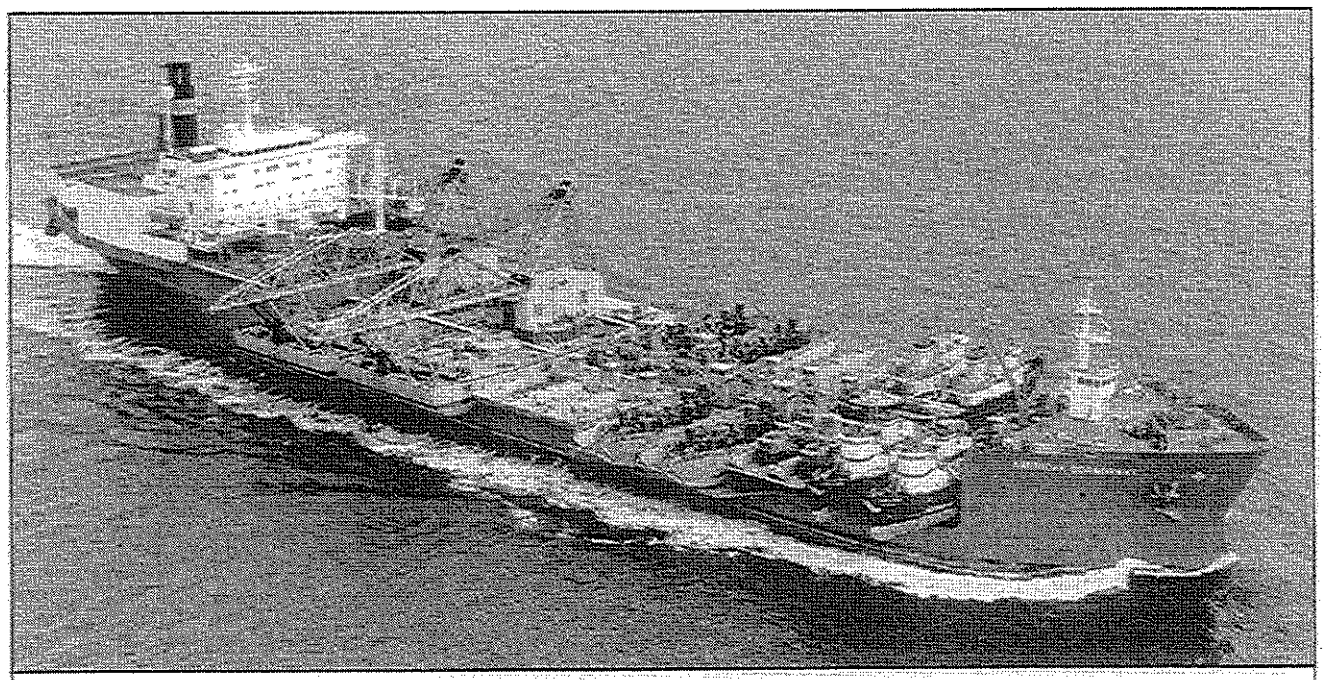


Figure 4-5. USNS CORMORANT.

4-4 U.S. ARMY DIVING DETACHMENT

The Army divers who worked with the CTG 151.12 salvage officers in Al Shuaybah, were one of three detachments belonging to the U.S. Army Diving Detachment (Provisional), 7TH Transportation Group, Fort Eustis, VA. All three detachments, each consisting of two 17-man lightweight diving teams and a 12-man Command and Control unit, were deployed to the Arabian Gulf port of Al Dammam. Their mission was to establish bases of operations in Dammam and Al Jubayl and perform ship husbandry on Army and MSC ships. Further, they where to conduct port security sweeps and port contingency operations as required.

The detachments were put on semi-alert in early August. Shown in Figure 4-5, the 7TH Transportation Group's heavy port support equipment aboard USNS AMERICAN CORMORANT (T-AKF 2062) was discharged in Dammam in mid-August. Later AMERICAN CORMORANT made a second voyage from Norfolk, carrying 7TH Trans Group afloat assets, consisting of two 1600 series LCUs, one of which was outfitted as a diving support vessel and four 2000 series LCUs. In late August, two Army LSVs, fully loaded 7TH Trans Group equipment including most of the Dive Detachment equipment, deployed from CONUS and arrived in Dammam in early September. The divers did not deploy until four months later with an advance party arriving 14 January 1991 and the balance in February.

The merging of the Navy salvage officers and master diver with the Army diving detachment was mutually beneficial. Army divers and their equipment fulfilled the harbor clearance function of the absent MDSU-1 team. The Navy salvage officers became harbor clearance advisors to the Army Diving Detachment, enabling them to perform salvage work in Al Shuaybah harbor—their most significant port operation in the Arabian Gulf. It is an operation that would not have been possible without Navy salvage and EOD assistance. The Army Diving Detachment began to redeploy to CONUS in early May, with the last group scheduled to depart in September 1991.

CHAPTER 5

OPERATIONAL SUPPORT

5-1 INTRODUCTION

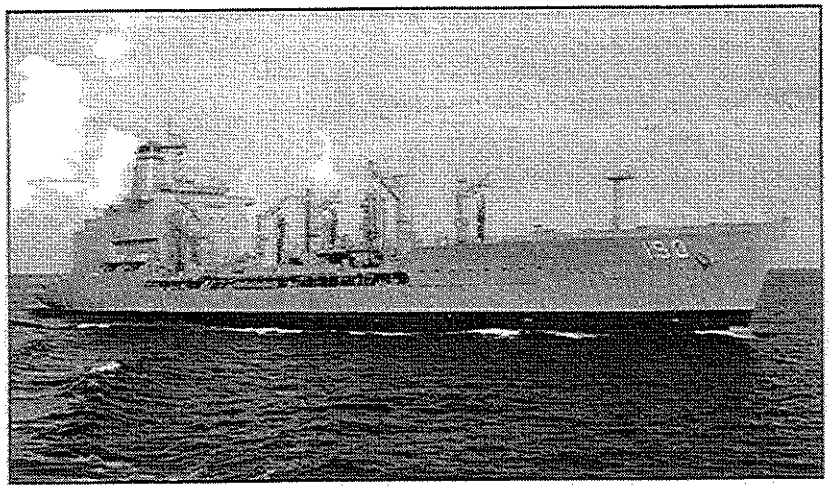
This chapter describes major salvage operations during and immediately following Operation DESERT SHIELD/DESERT STORM. The initial situation, salvage actions taken and ultimate resolution of the casualty situation are described for each operation. In the order of occurrence, the salvage events included:

- USNS ANDREW J. HIGGINS (T-AO 190) Grounding.
- USS TRIPOLI (LPH 10) Mine Strike.
- USS PRINCETON (CG 59) Mine Strike.
- SH-60B Helicopter Recovery.
- Tomahawk Land Attack Missile (TLAM) Search and Recovery.
- Harbor Clearance and Wreck Removal.

Other ship casualties occurred that elicited initial salvage alerts and—in some cases—brief responses. An example was USS BEAUFORT's damage assessment of USS KANSAS CITY (AOR 3) following a collision with USS H.W. HILL (DD 1086) that resulted in a holed fuel tank on KANSAS CITY.

Another ship casualty worthy of mention is the M/V MERCS HORANA, which suffered a major fire and breakdown in the central Arabian Gulf. While no Navy or commercial salvage assets were involved, the incident illustrates a situation where a SART (Salvage Assistance Response Team), composed of a MDSU detachment, would have been more timely and effective. Because there was no in-theater SART, five naval vessels were tied up fighting the ship's fire for two days and were effectively lost as fleet assets. A flyaway SART team and a platform of opportunity would have been more effective.

5-2 USNS ANDREW J. HIGGINS (T-AO 190) GROUNDING



5-2.1 Background. USNS ANDREW J. HIGGINS (T-AO 190) is liquid cargo carrier of the USNS HENRY J. KAISER (T-AO 187) Class, built by Avondale Shipyards and commissioned in 1987. Its principal characteristics are as follows:

- Length 677.5 feet.
- Beam 97.5 feet.
- Draft 35 feet.
- Displacement 40,700 tons (full load).
- Cargo capacity 180,000 bbls.

The basic design configuration is shown in Figure 5-1. Cargo and ballast tank capacities are shown in Figure 5-2. Ship's complement is 95, and the ship carries a 20-man Navy detachment.

At 0810 local time on 1 January 1991, USNS ANDREW J. HIGGINS went aground at 20°-06.5'N, 058°-30.5'E, in the North Arabian Sea. The ship was operating with the Amphibious Task Force, CTF 156, in an area off the coast of Masirah, Oman. At the time of the grounding, HIGGINS was proceeding to one of the two designated anchorages at 7 knots under conditions of unrestricted visibility and calm surface with 6-foot ground swells. Recently updated charts indicated a depth of 24 meters in the area. HIGGINS was following in the wake of a destroyer that had just passed over the grounding site; an unchartered reef pinnacle measured approximately 300 × 120 feet, the highest point of which protruded up, resulting in a depth of 20 feet below the MLT.

5-2.2 Salvage Response Actions. Upon notification of the grounding on 2 January, SUPSALV immediately tasked M/V SMIT NEW YORK to get underway from Fujayrah, U.A.E., for an ETA of 1600 on 3 January.

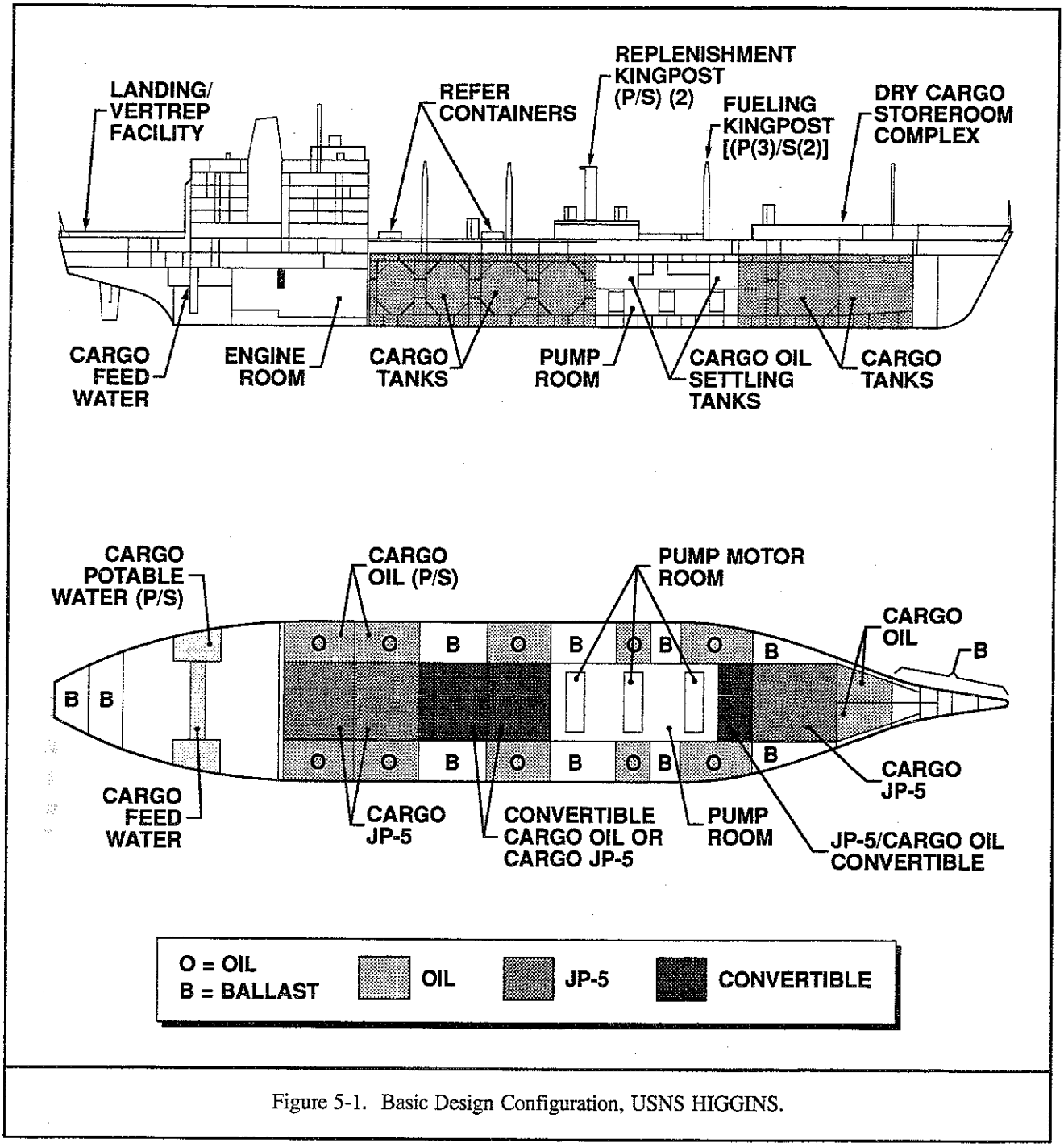


Figure 5-1. Basic Design Configuration, USNS HIGGINS.

CARGO TANK SUMMARY

TANK	FRAME	CAPACITIES	
		100% GALLONS	98% GALLONS
DFM Cargo Tk No. 1 (P/S)	22-26	2*(266930.56)	2*(261591.94)
JP-5 Cargo Tk No. 2 (Ctr)	26-31	89243931	874590.13
DFM/JP-5 Cargo Tk No. 3 (Ctr)	31-33	33320625	326542.13
DFM Cargo Tk No. 3 (P/S)	31-35	2*(74750.31)	2*(269255.31)
DFM Cargo Tk No. 5 (P/S)	37-39	2*(178147.13)	2*(174584.19)
DFM/JP-5 Cargo Tk No. 7 (P/CTR)	43-47	66641913	653090.31
DFM Cargo Tk No. 7 (P/S)	43-47	2*(377010.44)	2*(369470.19)
DFN/JP-5 Cargo Tk No. 8 (Ctr)	47-51	666419.13	653090.31
JP-5 Cargo Tk No. 9 (Ctr)	51-55	666419.13	653090.31
DFM Cargo Tk No. 9 (P/S)	51-55	2*(373849.44)	2*(366372.44)
JP-5 Cargo Tk No. 10 (Ctr)	55-59	566456.63	555127.13
DFM Cargo Tk No. 10 (P/S)	55-60	2*(355460.19)	2*(348350.98)
JP-5 Settling TK	33-37	167887.25	164529.44
DFM Settling Tk	40-43	203627.13	199554.56
JP-5 Contaminated Tk	36-40	37554.77	3680365
DFM Contaminated Tk	37-40	42386.23	41538.48
Lube Oil Tk	59-60	25000.00	24500.00
TOTALS		7920111.1	7761706.55

BALLAST TANK SUMMARY

TANK	FRAME	CAPACITIES (100%)	
		GALLONS	LONG TON S.W.
Forepeak Ballast Tank	C-18	82177.08	313.8
S.W. Ball Deep Tank N0. 1	18-22	261474.75	998.6
S.W. Ball Tk No. 2 (P/S)	28-31	2*(137526.06)	2*(525.2)
S.W. Ball Tk No. 4 (P/S)	35-37	2*(166834.00)	2*(637.2)
S.W. Ball Tk No. 6 (P/S)	39-43	2*(371822.31)	2*(1420.1)
S.W. Ball Tk No. 8 (P/S)	47-51	2*(377459.19)	2*(1441.6)
Aft Ballast Tank	110-119	59595.92	227.6
Aft Peak Ballast Tank	119-152	307520.88	1174.5
Pump Room D.B. Ballast Tk	33-39	101131.75	386.2
TOTALS		2919183.48	11148.9

Figure 5-2. USNS HIGGINS Cargo and Ballast Tank Locations and Capacities.

Since HIGGINS was a PACFLT asset and since no Salvage Officer or Salvage Engineer was present in the Gulf Theater, assistance was requested from Commander Naval Surface Group Westpac (CTF 73). CTF 73 responded by sending the SEVENTHFLT Salvage Officer (CTG 73.6.8), LCDR T. Murphy, and a small team consisting of the SRF Subic Diving Officer and divers, with an ETA of early 4 January at the Masirah Air Head in Oman.

The MSC Area Commander arranged for USNS COURIER (T-AK 5019) to proceed to the scene and stand by for a lightering evolution.

Commanding Officer USS IWO JIMA (LPH 2) was assigned as On-Scene Commander until CTG 73.6.8 arrived on scene. Other than pressurizing the suspected damaged tanks to 3 PSI, to maintain ship stability, the decision was made not to take salvage action until LCDR Murphy approved.

At midnight on 3 January, HIGGINS reported that it was hard aground at frames 47-55, resting on a reef mound. Current ship's cargo load was 29,921 BBLS of F-76 and 29,793 BBLS of F-44. At the same time, the On-Scene Commander reported an estimated spill of 80,000 gals.

5-2.3 Initial Damage Assessment. An initial underwater inspection was made by SEAL Team divers aboard USS TRENTON (LPD 14) and EOD divers aboard USNS KILAUEA (T-AE 26). LT Thornton, a SEAL attached to the Beachmaster Group, was the acting on-scene salvage officer and prepared the reef sketch in Figure 5-3. Initial damage assessment reported was a ruptured hull, port side near frame 50, resulting in an initial spill of 2,200 gallons of DFM and JP-5 fuel. Upon further inspection and tank measurements, the following holed damage was assessed:

- Cargo Tanks:
  - 1 Port.
  - 3 Port/Center/Stbd.
  - 5 Port, 5 Stbd.
  - 7 Port/Center/Stbd.
  - 8 Center.
  - 9 Port.
- Ballast Tanks:
  - 2 Stbd.
  - 4 Port.
  - 6 Port, 6 Stbd.
  - 8 Port.

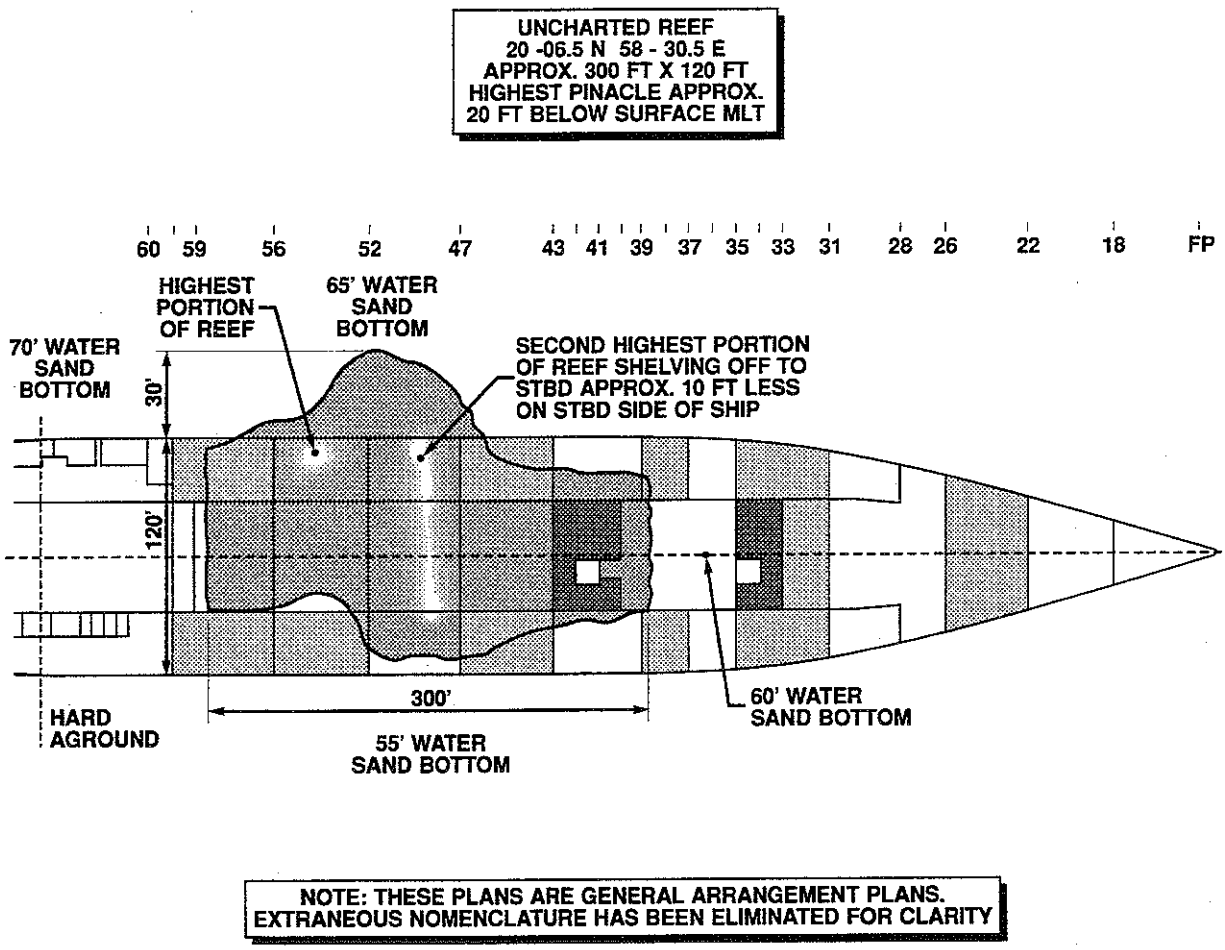


Figure 5-3. Initial Damage Assessment Reef Sketch Prepared by LT Thornton.

5-2.4 Salvage Operation Chronology. The actual salvage operation that began late on the third day after HIGGINS went aground started with LCDR Murphy's arrival on-scene and shift of OPCON to CTU 73.6.8. Events occurred in the following chronological sequence:

DATE	TIME (local)	EVENT
5 JAN 1991	1841	M/V COURIER began defueling the following six tanks:

TANK NO.	LOCATION
DFM Sett Tank	3-40-0
9 Stbd	5-51-2
10 Port	5-55-2
10 Stbd	5-51-1
JP-5 Sett Tk	3-33-0
10 Center	5-55-0

During the defueling, SMIT NEW YORK held COURIER in optimal position to maintain station throughout the evolution.

	2355	Completed fuel offload. HIGGINS was reported lively and making way under own power with SMIT NEW YORK escorting and monitoring oil seepage astern.
7 JAN 1991	1550	HIGGINS proceeding at 4 kts SOA due to environmental conditions and concerns with SMIT NEW YORK following at 10 miles astern to monitor the size and dispersion/evaporation of the trailing oil streak. Intentions are to lighter in Fujairah or Muscat.
10 JAN 1991	0648	COMSC concurs with rapid and safe removal of the remaining contaminated liquid cargo and expeditious arrival at the repair facility in Dubai considering the good weather opportunity and critical operational concerns in-theater.
11 JAN 1991	0800	HIGGINS arrives at a predetermined MODLOC, 50 nautical miles from any land for defueling all remaining cargo in preparation for entering drydock in Dubai. CTU 73.6.8 requests high-capacity submersible pumps for top stripping tanks and three Yokohama-type fenders for defueling to M/V GEORGIOS. Estimated time of 48 hrs (ETC 13 JAN at 1800) to offload 64,627 BBLS DFM and 10,407 BBLS JP-5.
	1645	Commenced pumping fuel from HIGGINS' tanks to M/V GEORGIOS with the planned defueling of 12 tanks in the following sequence down to a 4-inch level using submersible pumps: 1 Port, 2 Stbd, 3 Port, 3 Center, 3 Stbd, 2 Center, 4 Port, 4 Stbd, 5 Port, 5 Stbd, 6 Port, and 6 Stbd.
13 JAN 1991	0542	Contaminated cargo offload completed. The extent of damage to the ballast tanks (2 Stbd, 4 Port, 6 Port, 8 Port, and 8 Stbd) was unknown since these tanks were pressurized to 3 PSI to maintain stability, and had not been previously gaged. Suspected damage of longitudinal or transverse bulkheads or both.
		Ready to UNREP the uncontaminated cargo of JP-5, DFM, and lube oil to USNS WALTER S. DIEHL (T-AO 193).
	2000	UNREP with W.S. DIEHL completed; underway for Dubai at 6-8 kts.

DATE	TIME (local)	EVENT
15 JAN 1991	1430	M/V SMIT NEW YORK detached. A.J. HIGGINS arrived Dubai, U.A.E., and entered the drydock.
16 JAN 1991		A.J. HIGGINS secure in drydock. The extent of hull and structural damage was greater than the initial underwater survey estimate. There was minor internal tank cargo piping damage. Figure 5-4 depicts the holes, gashes, and stove-in areas of the hull plating based on initial drydock inspection. Drydock and repair costs were $2.7 million.
4 MAR 1991		A.J. HIGGINS out of drydock.
7 MAR 1991		A.J. HIGGINS completed sea trials and returned to full readiness.

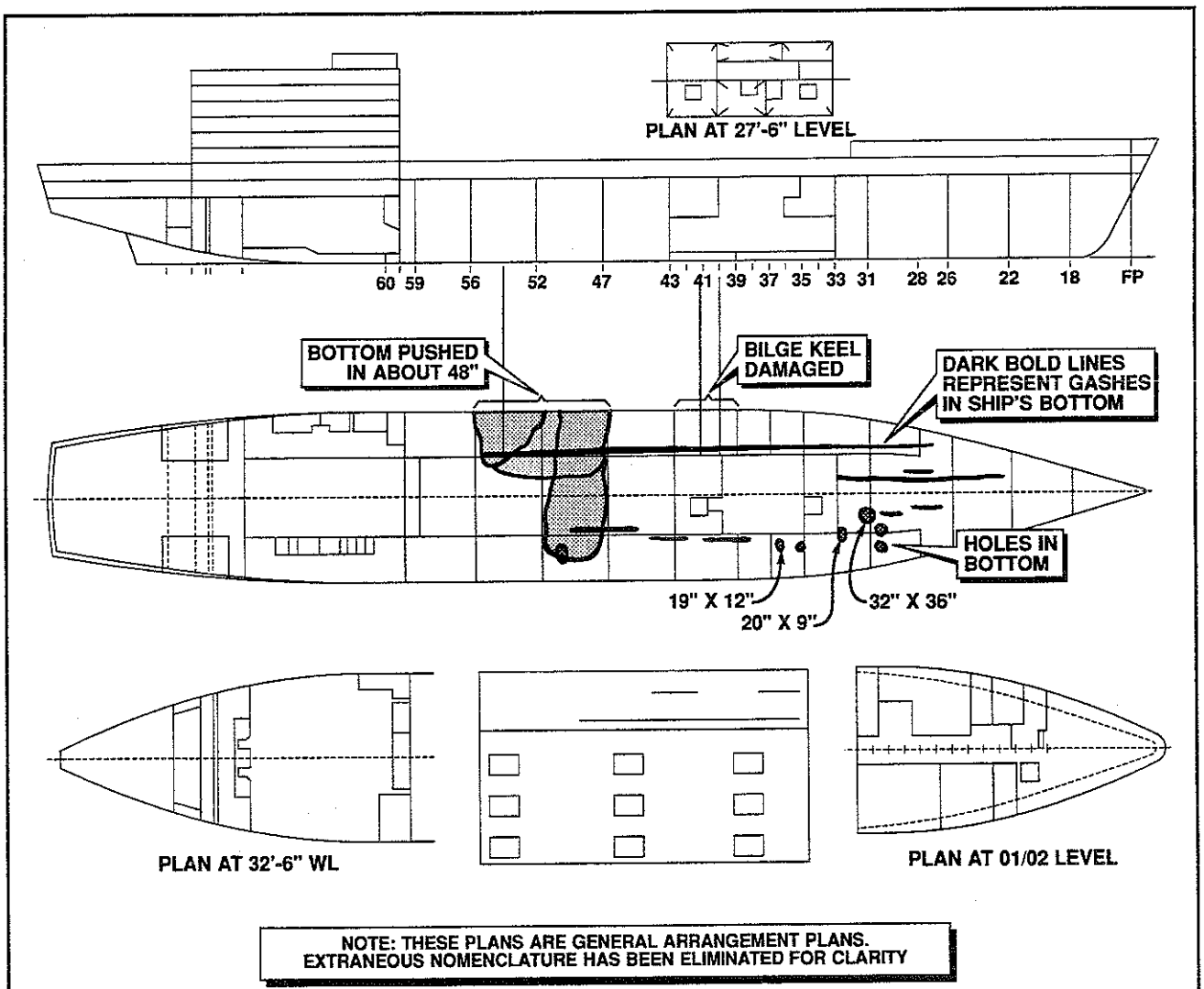
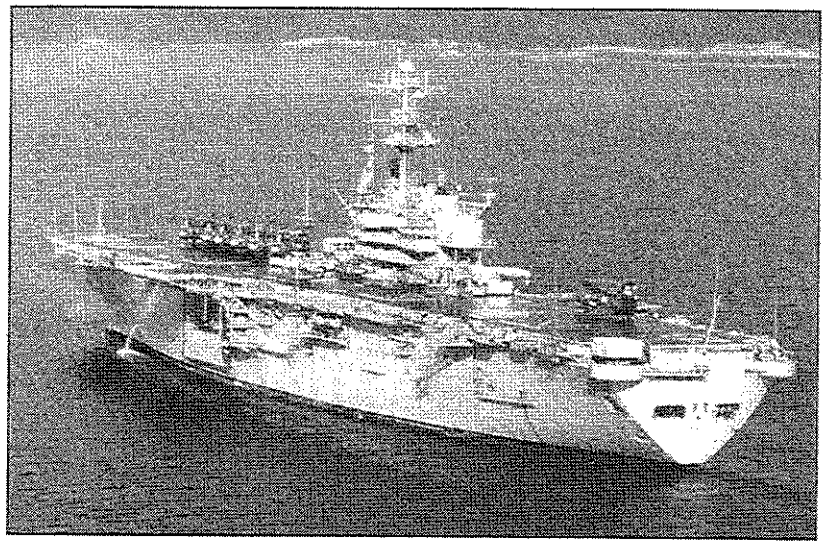


Figure 5-4. Initial Damage Assessment.

5-3 USS TRIPOLI (LPH 10) MINE STRIKE



5-3.1 Background. USS TRIPOLI is an IWO JIMA Class amphibious assault ship, built by Ingalls Shipbuilding and commissioned in 1966. Its principal characteristics are as follows:

- Length 602 feet.
- Beam 104 feet.
- Draft 31 feet.
- Displacement 11,000 tons (light), 18,825 tons (full load).

Ship's complement is 686, including 48 officers. The vessel can transport 1746 amphibious assault troops.

On 18 February at approximately 0550 local time, TRIPOLI struck a floating contact mine on the starboard bow while conducting mine-hunting operations off Kuwait.

5-3.2 Salvage Response Actions. CAPT Shepherd, OIC SRUDETBAHRAIN/CTG 151.12, directed CDR Marsh, acting as OIC of a 12-member Battle Damage Assessment Team from USS JASON in Bahrain, to proceed by fastest possible means to the casualty site, some 250 miles to the northwest. Transportation by CH-53 helicopter was arranged through LOGSUPFOR (CTG 150.3). Drawn from the JASON's standing Rescue and Assistance team, the BDAT brought the Program of Ship Savage Engineering (POSSE), the software program developed by SUPSALV; several P-250 pumps; the "Jaws of Life;" and some blowers to TRIPOLI. CDR Marsh and the BDAT departed JASON at 0930 and arrived aboard TRIPOLI at 1115.

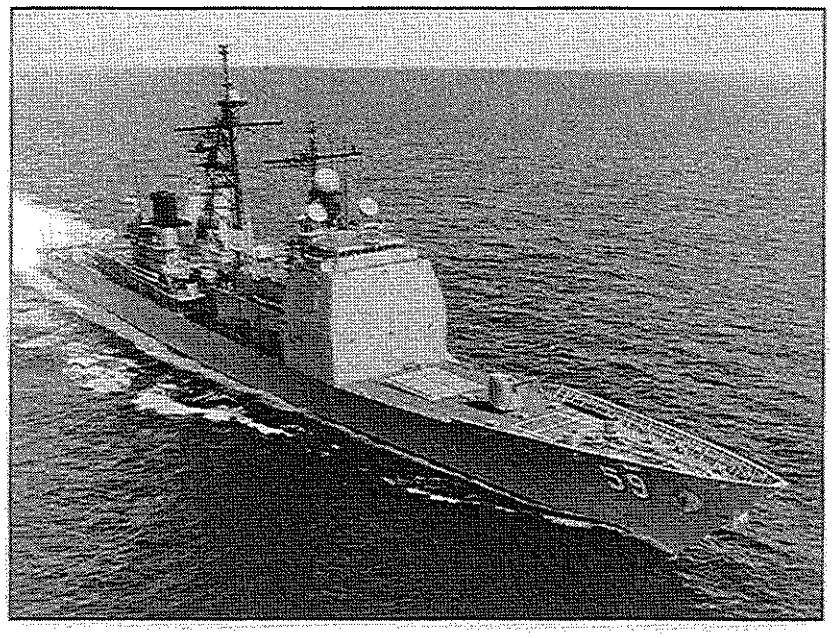
5-3.3 Initial Damage Assessment. When CDR Marsh arrived on board TRIPOLI, the vessel had exceeded its design forward water level, but an aft trim tank could correct trim. Transverse stability could be controlled by moving the vessel's helicopters around on deck. The vessel's damaged stability was adequate, and CDR Marsh estimated 6-8 feet of GM. The mine explosion impact area was in the vicinity of FR 18. Flooding extended aft to FR 31, and included JP-5 fuel tanks. EOD divers reported a hole in the vessel's starboard side measuring approximately 16 × 25 feet.

5-3.4 Resolution. CDR Marsh advised the TRIPOLI's Commanding Officer that a major problem would occur if the vessel sustained another mine hit; i.e., bulkhead 31 might carry away, and that the vessel should leave immediately for repairs in Bahrain. USS BEAUFORT escorted TRIPOLI out of the minefield area. TRIPOLI remained on station until her mission was completed, LCDR Balk had surveyed the mine damage, and emergency repairs were made to enable safe transit under own ship's power. SMIT NEW YORK escorted her to the Arab Shipbuilding and Repair Yard (ASRY), Bahrain, for drydocking and repair.

5-3.5 Salvage Operation Chronology. All times local.

DATE	TIME (local)	EVENT
18 FEB 1991	0503	TRIPOLI hits floating mine off Kuwait coast. USS BEAUFORT (ATS 2) responds immediately by proceeding to TRIPOLI's location, flying an advance two-man survey team ahead by helo.
	0708	USS BEAUFORT arrives on site, standing by to render assistance. Upon hearing of a second mine strike on USS PRINCETON (CG 59), BEAUFORT departs to render assistance to the more heavily damaged ship.
	0930	Salvage Engineer, departs tender JASON with Battle Damage Assessment Team via SH-53 helicopter, enroute TRIPOLI.
	1115	Salvage team arrives aboard TRIPOLI, begins assessment of mine damage.
	1245	Salvage engineer advises Commanding Officer of TRIPOLI that the safest course was to proceed immediately to Bahrain for repairs. Following the debrief, CDR Marsh /departs for USS PRINCETON, which had hit two mines within two hours after TRIPOLI's hit. CO of PRINCETON requested engineering assistance to determine structural integrity and stability of his vessel.
21 FEB	0200	Salvage ship, USS BEAUFORT rendezvous with TRIPOLI, anchoring 1,000 yards off. Rigged TRIPOLI for towing stern first.
22-23 FEB		BEAUFORT's salvage divers and TRIPOLI's EOD technicians performed hull survey and video of TRIPOLI hull damage. Using Kerie Cable to burn holes to stop longitudinal stress cracks around the hull from propagating. Ship's crew shored the deck with welded I-beams.
23 FEB	1800	TRIPOLI departed south at 5 kts under own power but rigged for tow under BEAUFORT escort with USS AVENGER (MCM 1) leading the way out and mine hunting.
24 FEB	2200	BEAUFORT passes TRIPOLI escort and emergency tow duties to SMIT NEW YORK at 27° 30' North.
26 FEB		TRIPOLI arrives ASRY.
15 MAR		TRIPOLI resumes Operation DESERT STORM duties following repairs.

5-4 USS PRINCETON (CG 59) MINE STRIKE



5-4.1 Background. USS PRINCETON is a TICONDEROGA Class AEGIS guided-missile cruiser, built by Ingalls Shipbuilding and commissioned in 1989. Its principal characteristics are as follows:

- Length 567 feet.
- Beam 55 feet.
- Draft 31 feet (full load).
- Displacement 7,015 tons (light), 9466 tons (full load).

Ship's complement is 358, including 24 officers. The vessel has accommodations for 409.

On 18 February at approximately 0718 local time, PRINCETON was conducting routine operations off Kuwait when it detonated two bottom-influence mines simultaneously.

5-4.2 Salvage Response Actions. CDR Marsh contacted CO, PRINCETON by radio, offering assistance ranging from a salvage engineer to a rescue/assistance team and BDAT. The Commanding Officer of PRINCETON replied that only a salvage engineer's structural integrity assessment and advice was needed since the vessel's damage had been contained by ship's force. The salvage engineer was transferred from USS TRIPOLI to PRINCETON by LAMPS helicopter, arriving less than 10 minutes after liftoff. USS BEAUFORT had to transit approximately 10 miles through a mine field, escorted by USS ADROIT (MSO 509) before reaching PRINCETON at approximately 1219.

5-4.3 Initial Damage Assessment. CDR Marsh consolidated the ship's damage control reports, the diving survey results from the salvage divers on BEAUFORT, and the results of his own inspection to bound the salvage problem. He was able to ascertain the following damage:

- Superstructure split at the quarterdeck on both sides, from 01 to 03 levels; separation 5" to 6" in places.
- Relatively little damage on main deck underneath the damaged superstructure. Longitudinales in fairly good condition.
- Minor buckling @ FR 220.
- Major buckling @ FR 380.
- FR 472 – worst damage, sideshell damaged to waterline and main deck. The second platform deck totally buckled.
- Flooding minor – controlled by eductors.
- Port rudder jammed – could not be jacked over by emergency method. (It finally was freed by combination of jig and come-along.) Stbd shaft ok.

Utilizing the *POSSE* program loaded in a laptop computer, the salvage engineer was able to calculate the loss of hull girder strength caused by the whipping forces on the ship. From this he established an accurate picture of the still water bending stress as a result of lost hull strength, particularly the high levels of stress in the stern area. His analysis provided real-time, on-site structural integrity assessment.

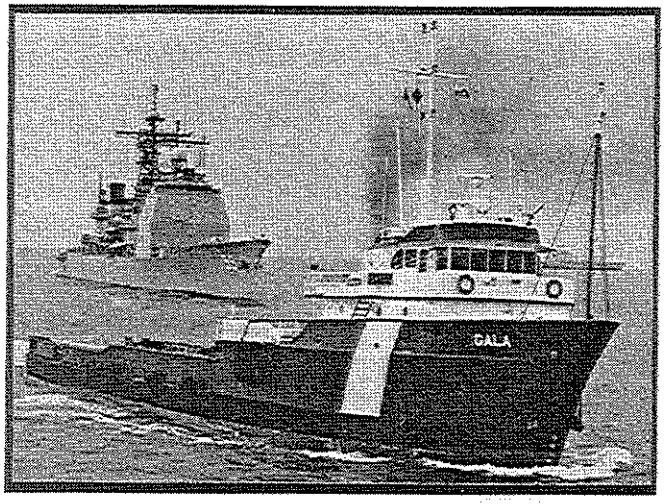
A detailed assessment of USS PRINCETON's loss of structural integrity is provided in Appendix B.

5-4.4 Resolution. The Commanding Officer of PRINCETON asked for advice on being towed or using ship's power to move out of the area. The salvage engineer advised that it was essential that no vibration of the stern area be transmitted from the screws. Ultimately, a tow was also preferable due to the questionable integrity of the ship's damaged rudder. PRINCETON was taken in tow by the USS BEAUFORT at approximately 1600 local time, with the USS ADROIT (MSO 509) leading the way out of the minefield.

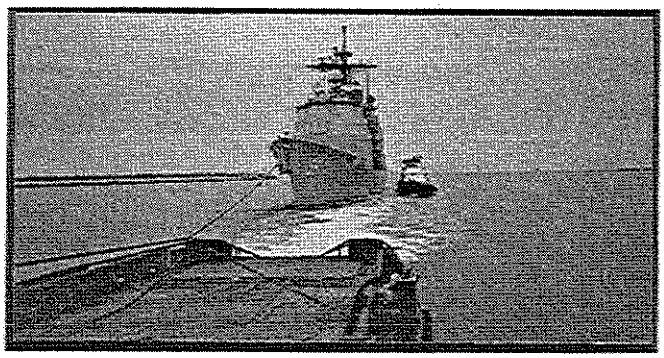
At 1745 on February 19 the SMIT-TAK salvage vessel SMIT NEW YORK relieved BEAUFORT and took PRINCETON in tow, destination Dubai. It appeared likely that the vessel would break up if it encountered any heavy weather enroute. As weather along PRINCETON's intended track deteriorated, its destination was changed to Bahrain at 0650 on February 20. At 0305 on February 21, the SMIT NEW YORK passed PRINCETON to harbor tugs for docking in Bahrain.

5-4.5 Salvage Operation Chronology.

DATE	TIME (local)	EVENT
18 FEB 1991	0718	PRINCETON detonates bottom-influence mine off Kuwait coast.
	1300	CDR Bert Marsh USN arrives aboard USS PRINCETON. After making an initial damage assessment, he uses POSSE computer software to analyze PRINCETON's structural strength and stability.
	1600	USS BEAUFORT takes PRINCETON in tow, headed for Dubai.
19 FEB	1745	TUG SMIT NEW YORK relieves BEAUFORT as towing vessel.
20 FEB	0650	Based on deteriorating weather conditions and the danger of breaking up in a storm, PRINCETON's destination changed from Dubai to Bahrain.
21 FEB	0305	SMIT NEW YORK passes PRINCETON to Bahrain harbor tugs for docking.
	0600	PRINCETON arrives in Bahrain for temporary repair work.
26 FEB	0900	Departed Bahrain under tow by M/V GALA for Jebal Ali to offload ammunition and other materials.
28 FEB	0800	Arrived Jebal Ali.
07 MAR		Departed Jebal Ali under tow by M/V GALA and arrived at Dubai Drydock Co. for repair. USS PRINCETON underwent repairs and returned to service early April.

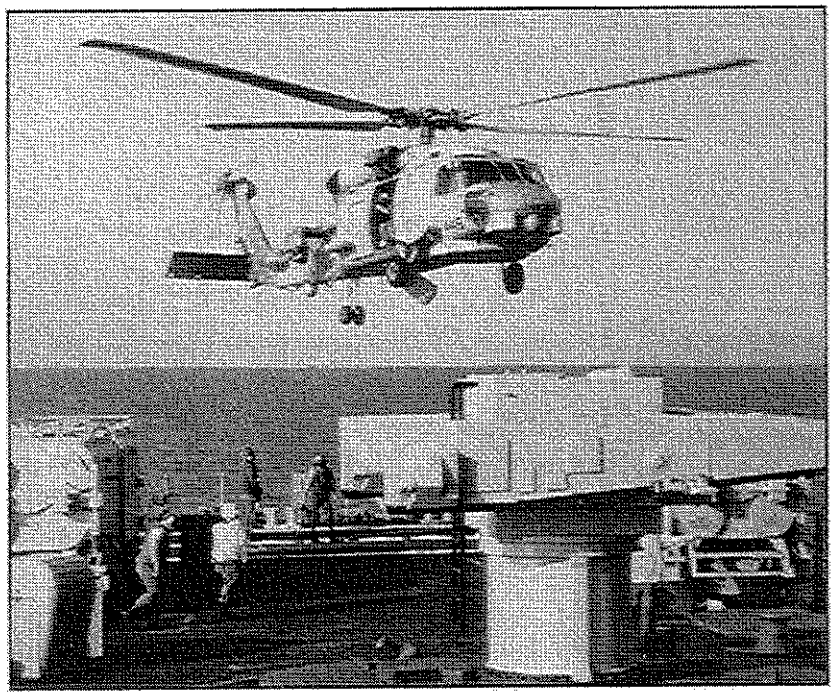


USS PRINCETON (CG 59)
In Tow After Mine Hit.



USS PRINCETON (CG 59)
Entering Port for Repairs.

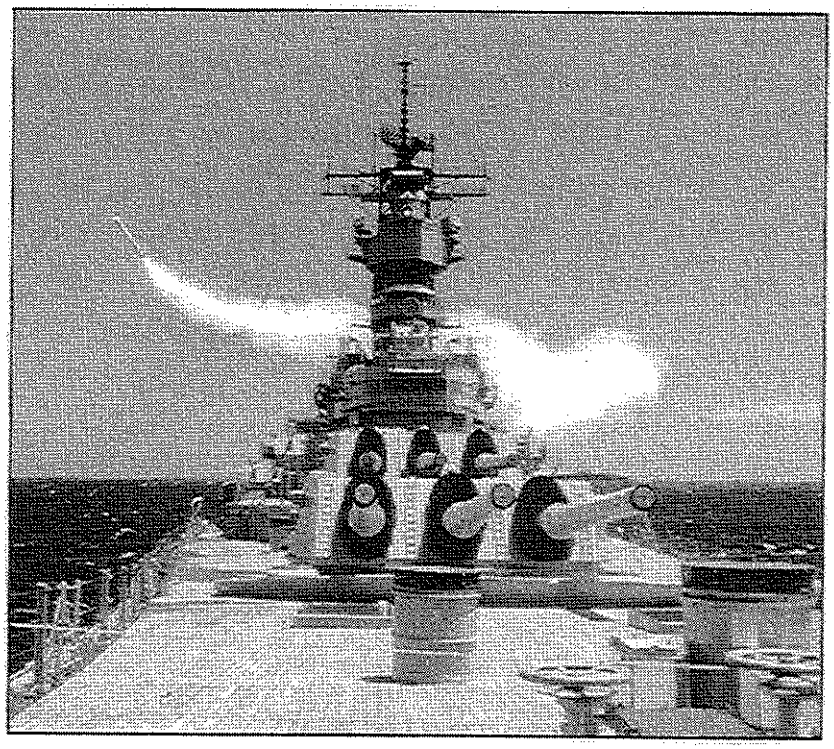
5-5 SH-60B HELICOPTER RECOVERY



The Sikorski SH-60B Seahawk is a LAMPS III helicopter operated off destroyer and frigate class escorts for medium range ASW.

On 18 March USS BEAUFORT, with SUPSALV representatives aboard, recovered a U.S. Navy SH-60B helicopter from the bottom of the Arabian Gulf. Location of the helicopter was facilitated by information supplied by a crewmember and by the helicopter's water activated acoustic beacon. BEAUFORT navigated to a point within 200 yards of the helicopter's entry location. An EOD diver equipped with a hand-held pinger locator device found the helicopter almost immediately. BEAUFORT rigged a two-point moor, and divers secured an eight-inch lifting hawser around the rotor. BEAUFORT's boom raised the aircraft. This straightforward operation was expeditiously executed. Total elapsed time was 11 hours, from the salvage ship's arrival on station to securing the helicopter on deck—an unusually speedy aircraft recovery operation. This demonstrates the effectiveness of an experienced and well-trained salvage crew.

5-6 TOMAHAWK LAND ATTACK MISSILE (TLAM) SEARCH AND RECOVERY



SUPSALV's ordnance recovery efforts continued after the war ended in late February. From 23 March through 7 April SUPSALV and contractor personnel aboard USS BEAUFORT conducted search and recovery missions in the Arabian Gulf to salvage several Tomahawk Land Attack Missiles (TLAM) for failure analysis. Located in four separate geographic positions in the NAG, the missiles had been launched by three USN combatants: cruiser USS MOBILE BAY (CG-53), and destroyers USS PAUL F. FOSTER (DD 964) and USS FIFE (DD 991). The missiles had failed in the early stages of flight.

At 200-225 feet, water depths in the operating area were beyond practical diver search depths, so a SUPSALV Remotely Operated Vehicle (ROV) was used for bottom reconnaissance and location of TLAM fragments which were initially located with side-scan sonar. The ROV's virtually unlimited endurance made it an ideal choice for extended submerged operations. Once a debris field had been mapped, divers rigged and recovered TLAM fragments of interest. Some TLAMs were more than 50-percent intact.

The TLAM recoveries highlighted the range of expertise that SUPSALV can bring to bear on a salvage or search-and-recovery mission. In addition to furnishing internal technical, management and operations experience, SUPSALV can access contractor expertise in undersea search, survey and recovery technology as needed.

5-7 HARBOR CLEARANCE AND WRECK REMOVAL

The salvage CONOPS treated port clearance operations as a high priority salvage evolution closely linked to the planned amphibious assault. Harbor clearance and port restoration were anticipated in support of coalition force landings and occupation of port facilities. A port such as Ash Shuaybah, (see Figure 5-5) located just south of the planned beach assault area was considered critical to the logistics resupply of Marine Corps and Army ground forces as they advanced into Kuwait and as far north as southern Iraq. Had the amphibious landing occurred or had the actual ground assault not been as successfully prosecuted, a time critical clearance operation would have been required. The available salvage clearance assets included:

- USS BEAUFORT.
- SMIT NEW YORK or SMIT MADURA.
- ESSM equipment deck loaded on BIG ORANGE VII.

- SUBTECH ONE, a yard salvage repair tender, to serve as a mother craft with berthing for 70, shops, 150-ton crane, salvage air system and an uncertified chamber.

- BIG ORANGE VII, an offshore supply boat, for staging ESSM gear, a portable chamber and a light-lift crane, etc.

- SALVANA and SALVALOUR, two local tugs to be used for rigging, towing, etc.

- IMSALV LION, a 8000 SHP tug, considered a last resort asset due to the $40K per day cost.

- Heavy-lift craft – only local asset was a McDermott 600-ton Ringer crane barge (at 150K/day) or an 1100-ton SMIT sheerleg from Singapore (at $12.5K/day). The estimated total cost for mobilization/demobilization and 45 days of clearance was $700K.

The decision on hiring a heavy-lift craft was delayed until mid February. It became apparent that Ash Shuaybah was not going to be a critical port, consequently, the high cost of harbor clearance for humanitarian and economic reasons could not be justified.

The 20- to 25-man MDSU team required for clearance operations was not available in-theater.

The brevity of the ground fighting and cease-fire took harbor clearance and wreck removal out of the tactical arena and into the humanitarian and economical arena. Immediately after the cease-fire, the Kuwaiti ports of Mina Ash Shuaybah, Ras' Al' Qualid, and Al Shuwaikh were surveyed. Of the three ports, Al Shuwaikh was by far the most heavily damaged and obstructed. Ash Shuaybah and Ras' Al' Qualid were only lightly damaged but Ash Shuaybah had a Soviet-made OSA-II fast attack missile boat sunk with two live missiles aboard in launchers. To render the harbor safe, the missiles had to be disarmed and removed; a joint effort involving Navy EOD.

CTG 151.12 salvors, and a U.S. Army Diving Detachment. The Navy had a harbor clearance CONOPS and real requirements in hand, but lacked the MDSU detachment and equipment. The Army Diving Detachment team had the people and equipment but no active task assignments. Consequently, the Army divers worked with CDR Jim Evans and LCDR Dave Balk during harbor clearance of the port of Al Shuwaikh. Additionally, three detachments were deployed to establish operating bases in Al Dammam and Al Jubayl to perform ship husbandry, port security sweeps and port restoration contingency operations. The Army divers and crane crews were exceptionally cooperative.

Wholesale harbor clearance operations were not conducted after the war. Several factors contributed to this decision including:

- Using Navy resources on post war projects considered economic and humanitarian projects.

- Perceived impropriety of the U.S. Navy competing with commercial salvage companies that were capable and willing to perform the clearance.

- Political expedient to demobilize existing contracted and military assets.

Nevertheless, some harbor clearance work did take place. Captioned photographs are provided at the back of this chapter.

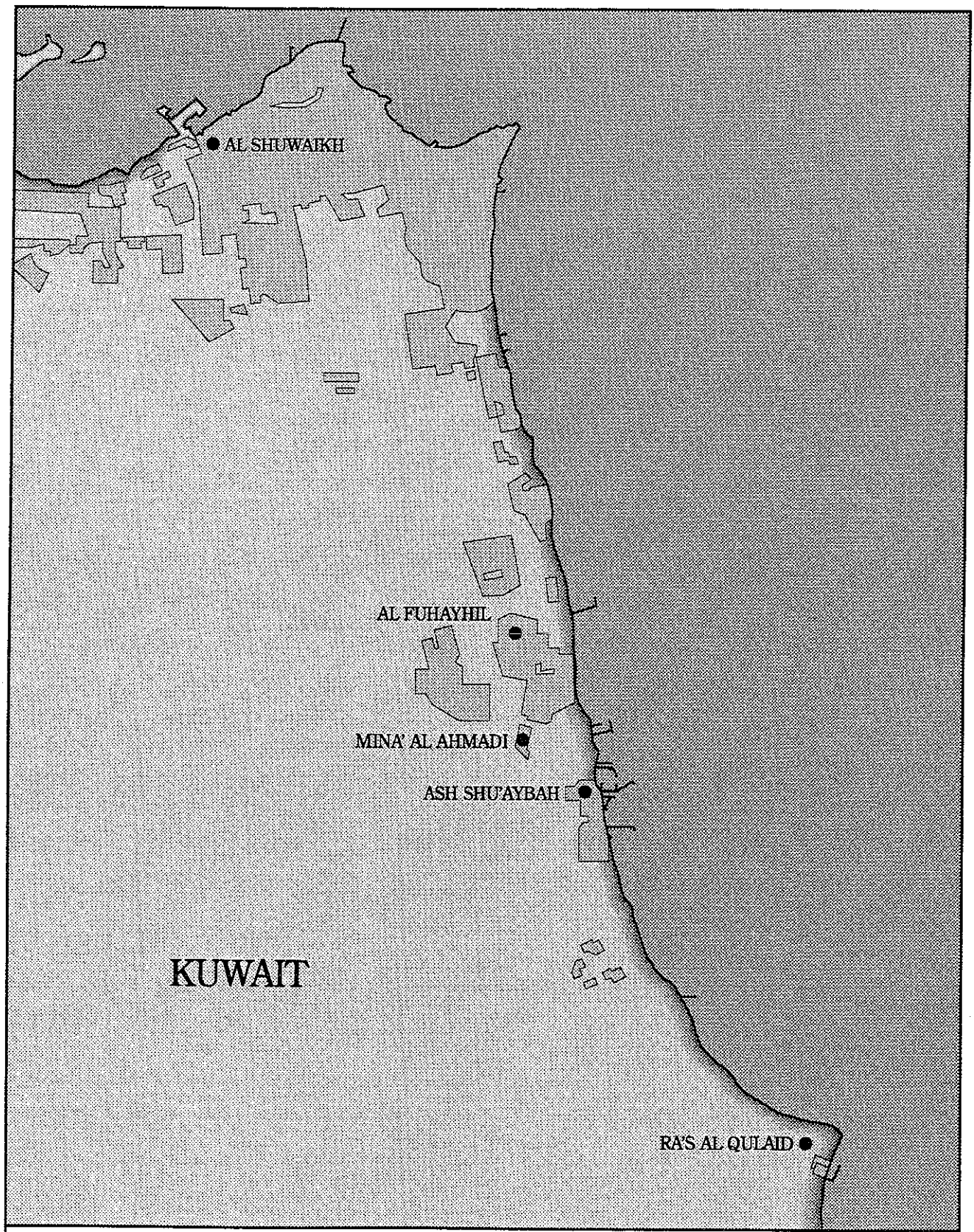


Figure 5-5. Kuwait Region of Arabian Gulf.

5-7.1 Al Ahmadi Pier. CDR Jim Evans was designated OTC for moving two supertankers clear of north Al Ahmadi pier. Towing bridles were rigged on both vessels using equipment from M/V SMIT NEW YORK and SMIT MADURA. On the following day, the empty tankers were moved to designated, mine-swept anchorages.

5-7.2 Ash Shuaybah Harbor. In response to the request by the Kuwait government, CTG 151.12 was tasked to salvage a Soviet-made OSA-II fast attack missile boat (Figure 5-6) that had been damaged during an air strike on Ash Shuaybah harbor and sank. Two STYX missiles with 1100-pound warheads remained in their launchers aboard the heavily damaged 200 ton vessel. Apparently, the missile in the third launcher detonated during the attack on the OSA-II.

The Army's 140-ton pier crane and 100-ton derrick could not lift the boat free of the surface intact. After an EOD team rendered the warhead and rocket motors safe, the loaded launchers were cut free. Using oxy-arc Broco rods, Army divers worked to remove the missiles and launchers. On the third attempt to cut through an electrical cable, the rocket booster ignited, launching the missile through the launcher outer door for a distance of 20 feet.

The rocket motor separated from the guidance and control section. Fortunately, no injuries resulted. Both cranes were used to bring the OSA to the surface and remaining missile launchers were removed with an acetylene torch. Using a third crane, the one remaining missile was removed from the launcher and loaded on a truck for disposal.

The only other sunken obstructions in Ash Shuaybah were two pilot boats and a pontoon in the barge harbor area. Other vessels in the main harbor area were damaged but not sunk including a burned out Panamanian freighter, a Kuwaiti self-propelled barge, and two Iraqi tugs. CDR Jim Cosper, USN (1140), Commanding Officer MDSU-2, Master Diver McLaughlin from MDSU-2 and two enlisted men assigned to CTG 151.12 pumped the craft and moved them away from the berths the Kuwaiti government wanted cleared.

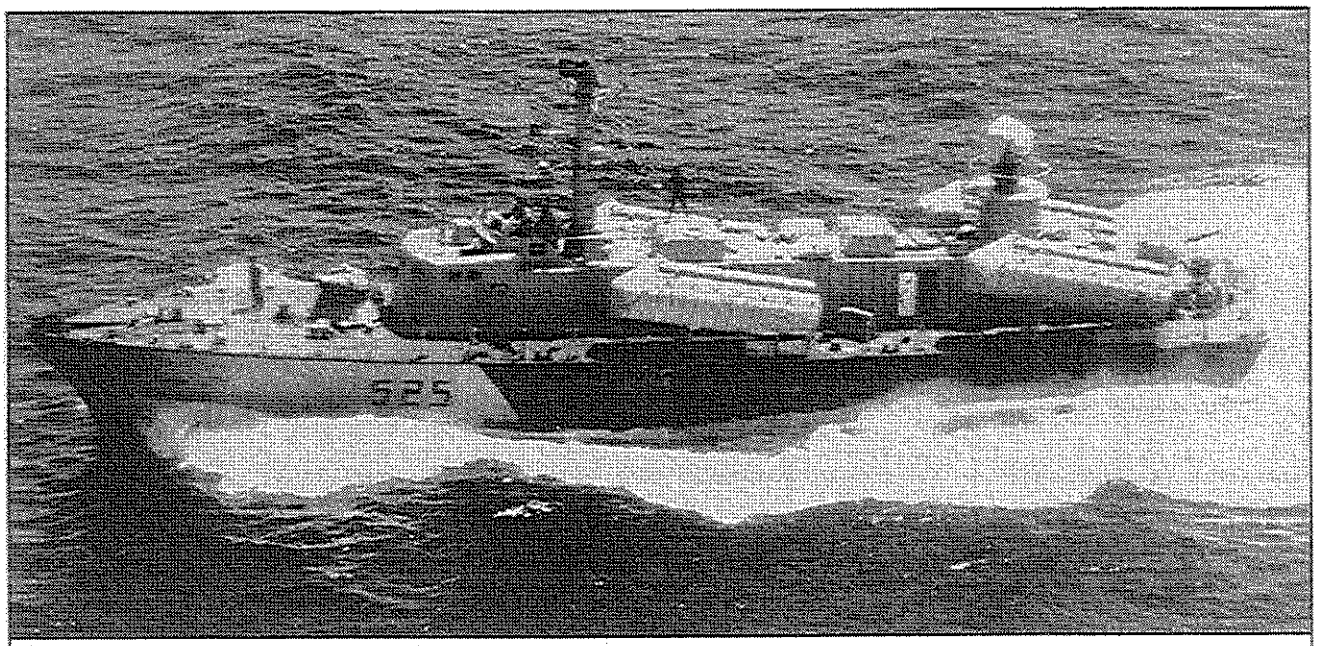


Figure 5-6. OSA-II Missle Boat.

5-7.3 Al Shuwaikh Harbor (Figure 5-7). After completing a thorough survey of the port of Al Shuwaikh in Kuwait City (see CONOPS, Appendix A), a meeting was held with CAPT Nabari, a senior Kuwaiti naval officer who was Port Director of all Kuwaiti ports, a representative of the U.S. Army Corps of Engineers, CAPT Shepherd (CTG 151.12), and CDR Evans. CAPT Nabari was presented a proposal for using Navy MDSU personnel and USS BEAUFORT to clear the harbor if the Kuwait government would hire the necessary heavy-lift equipment. The Navy would benefit from the operational experience, and Kuwait would have a cleared harbor. CAPT Nabari indicated that only the deep-water berth required clearing, and that he planned to hire a Kuwaiti company to do the rest. The deep water berth was obstructed by two pier cranes that the Iraqis had toppled into the water.

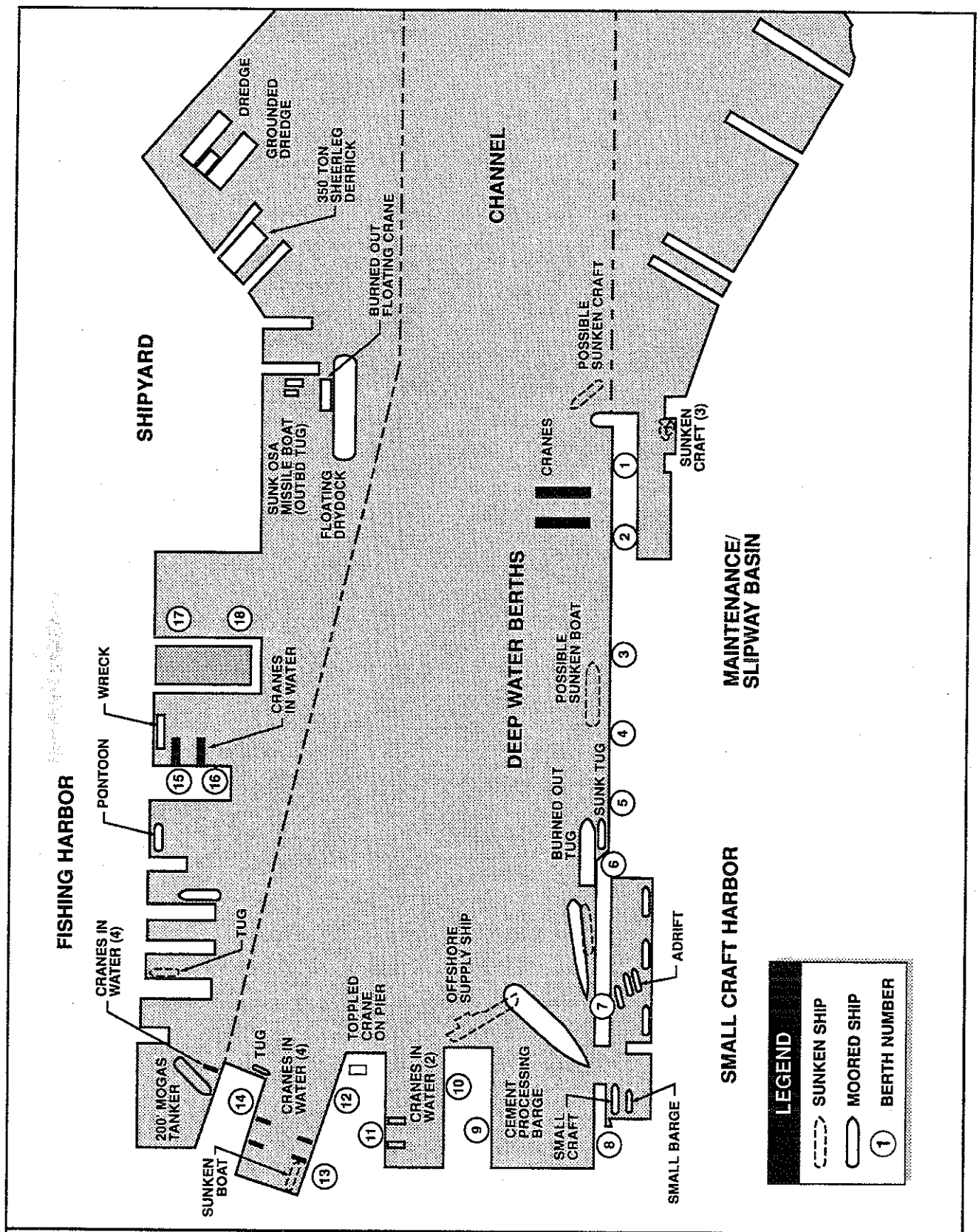


Figure 5-7. Ash Shawaikh Harbor.

The other significant salvage tasks were:

- One sunken and one burned-out tug.
- A cement processing barge holed in the starboard bow.
- One French Commando Bospara boat sunken under the cement processing barge.
- One sunken OSA-I with three STYX missiles and no apparent structural damage.

5-7.4 Ras Al Qulayah. The Kuwait Naval Base was located in the harbor of Ras Al Qulayah. A seven-man salvage team, including LCDR Balk and six Army divers, was sent south to Ras Al Qulayah to pump and patch a self-propelled YW to prevent it from sinking. There were numerous sunken small craft that a floating crane could have easily picked up.

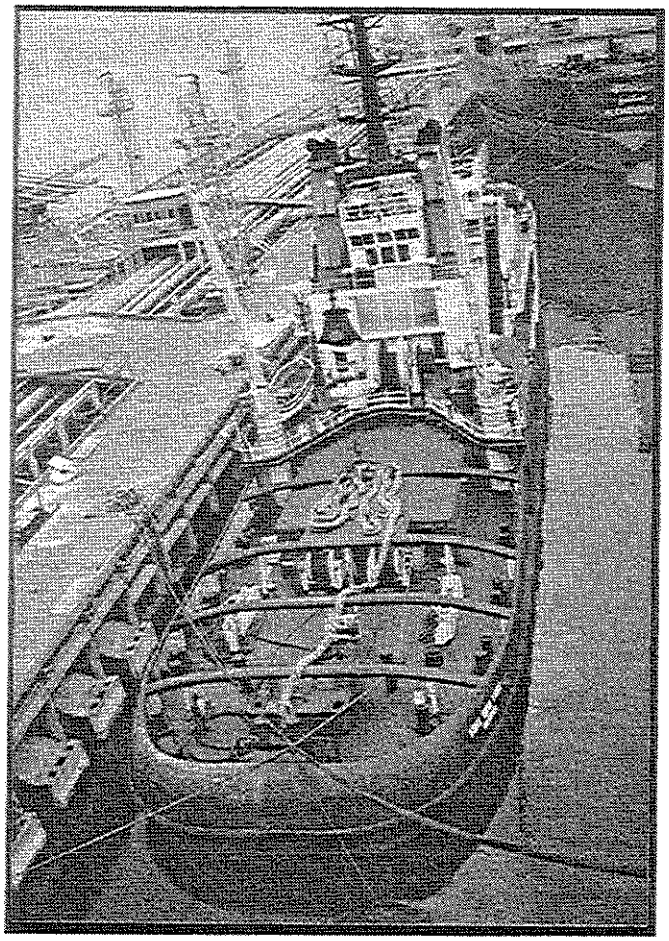
5-8 OFFSHIP FIREFIGHTING; M/V MERCS HORANA

On 29 March, M/V MERCS HORANA, a foreign registered merchant vessel suffered an engine room casualty resulting in a major conflagration. At the time of the casualty, the ship was in the central Arabian Gulf area in the vicinity of allied ships. USS FRANCIS HAMMOND (FF 1067), HMS BRILLIANT (F 90) and SPS VICTORIA (F 82) all responded by providing offship firefighting and repair party assistance with USS SHASTA (AE 33) and USS NIAGARA FALLS (AFS 3) providing logistic support to the firefighters. USS BEAUFORT (ATS 2) was in port Bahrain in a TAV period with USS CAPE COD. M/V SMIT NEW YORK was in Ash Shuaybah, Kuwait standing by to provide assistance in raising the OSA-II missile boat. M/V SMIT MADURA went off-hire early on 29 March and was enroute from Sharjah, U.A.E. to Singapore.

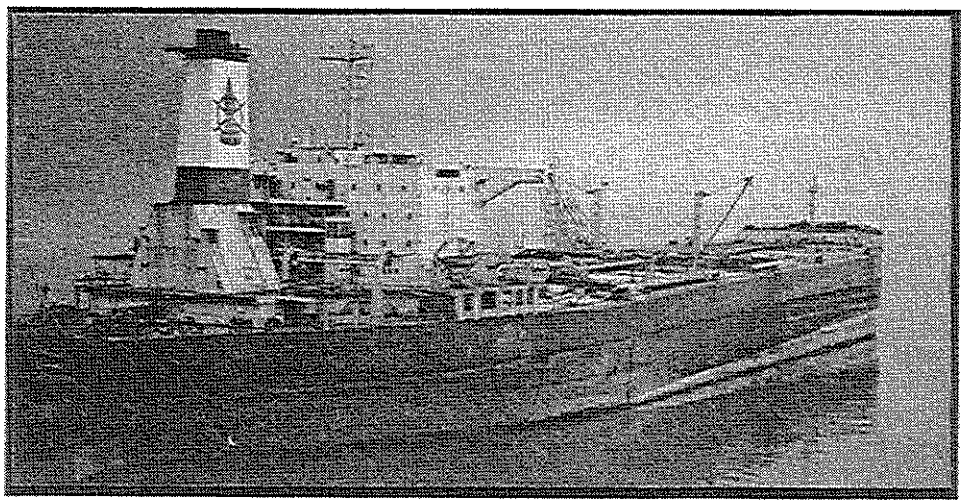
HMS BRILLIANT fought the blaze along the starboard side while SPS VICTORIA applied firefighting water from the port side. USS HAMMOND's assistance included:

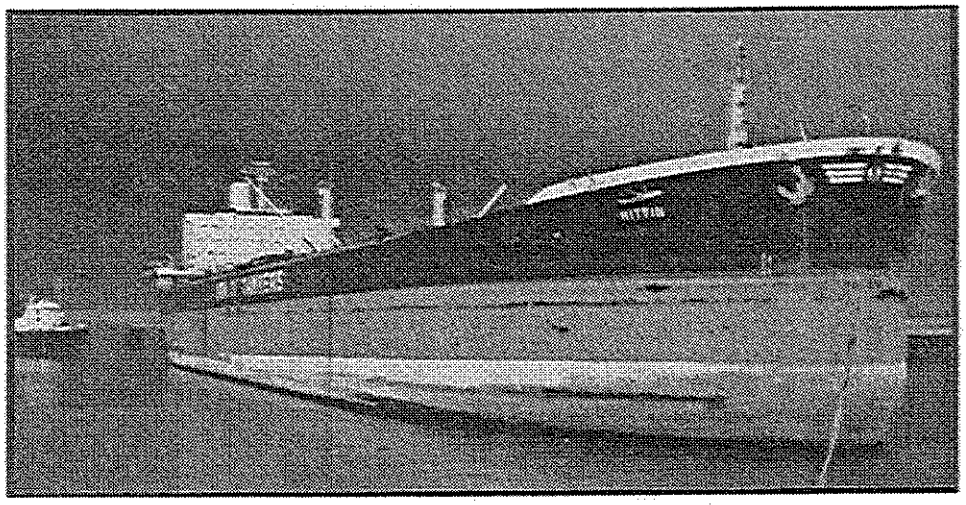
- Designated On-Scene Commander.
- Transferred by boat a firefighting team with 20 five-gallon AFFF cans and assorted firefighting equipment to HMS BRILLIANT.
- Provided a second firefighting team and assistance consisting of two P-250 pumps, 15 OBAs and 60 OBA canisters.
- Received VERTREPed firefighting supplies from USS SHASTA consisting of 12 OBAs, 50 OBA canisters, 14 cans of AFFF, 1½-inch hoses, nozzles, and cutting tools staged in two triwalls.
- Firefighting teams extinguished the fire, cut dewatering accesses, and assisted in dewatering with P-250s and peri-jet eductors. HMS BRILLIANT provided electrical power from alongside for electrical submersible pumps and firemain.

The fire reflashed once and was quickly extinguished by HAMMOND firefighting teams and BRILLIANT's offship firefighting team. After approximately 24 hours of fighting fires, HMS BRILLIANT took MERCS HORANA in tow.

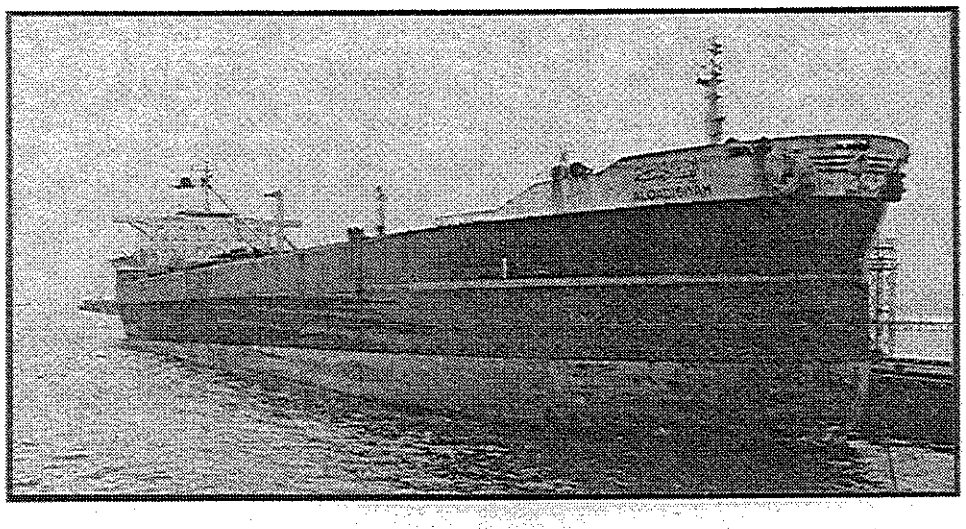


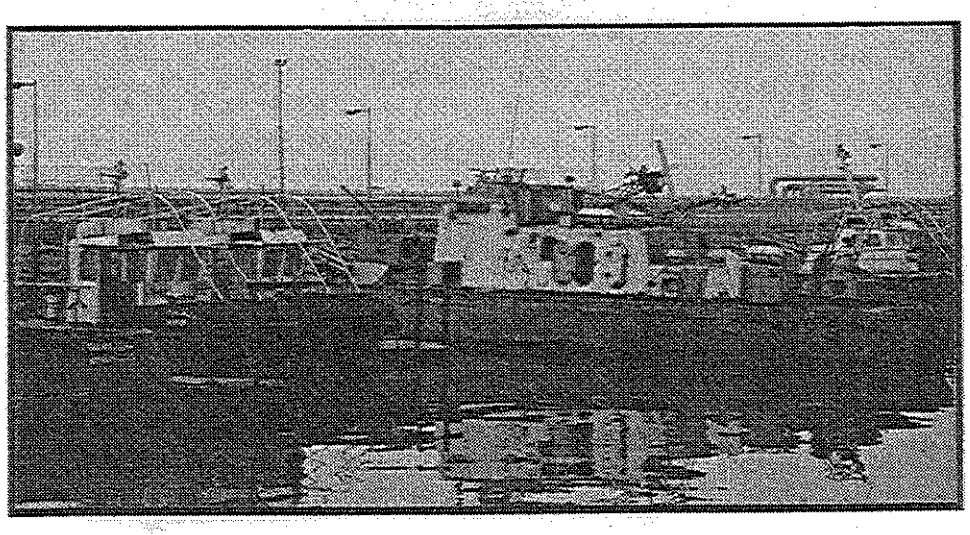
SMIT NEW YORK
Preparing Iraqi Supertanker
AL QUADISYAH for Tow.
(left and below)





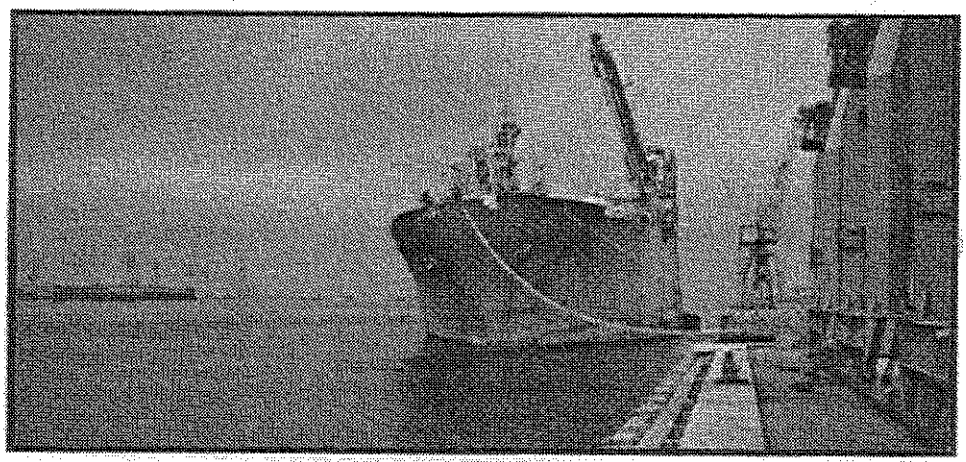
Iraqi Supertankers HITTIN and AL QUADISIYAH Being Moved by SMIT NEW YORK and SMIT MADURA from Al Ahmadi Pier to Safe Anchorage.
(left and below)



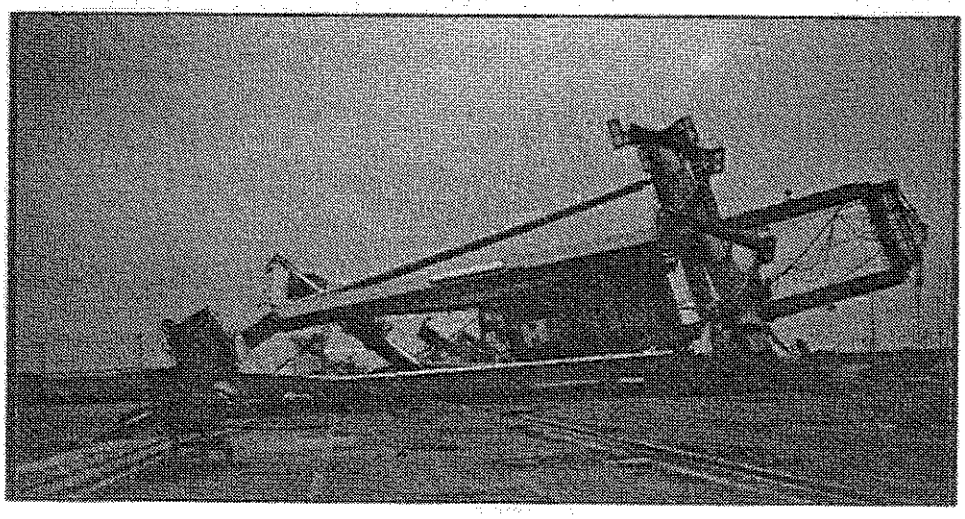


Small Craft in Ras Al Qulayah Harbor.

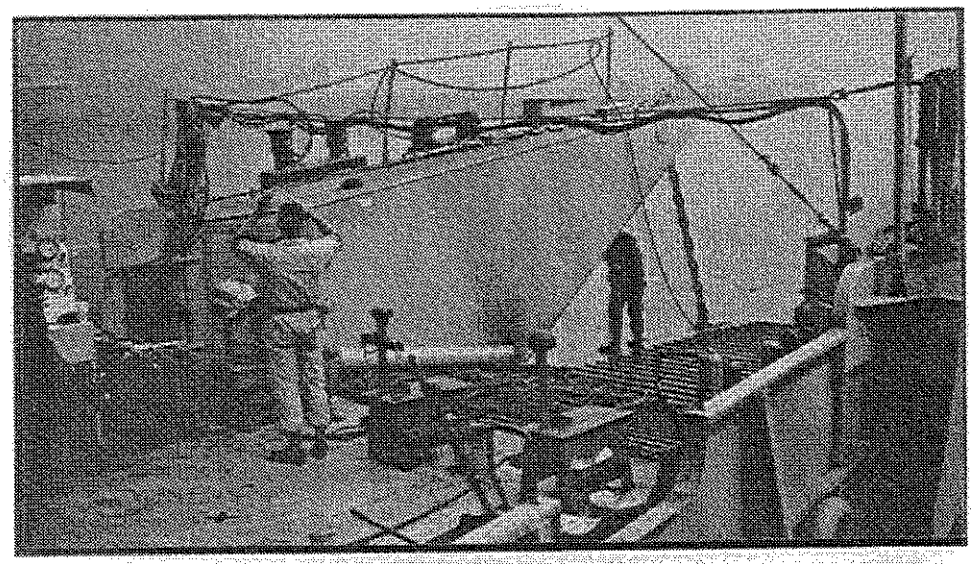
Small Craft in Ras Al Qulayah Harbor.



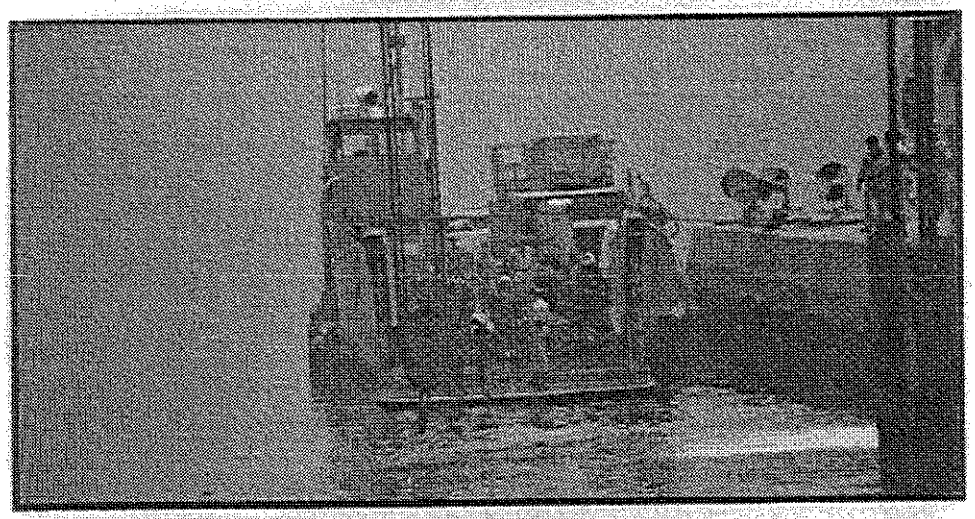
Grain Processor Listing in Al Shuwaikh Harbor.

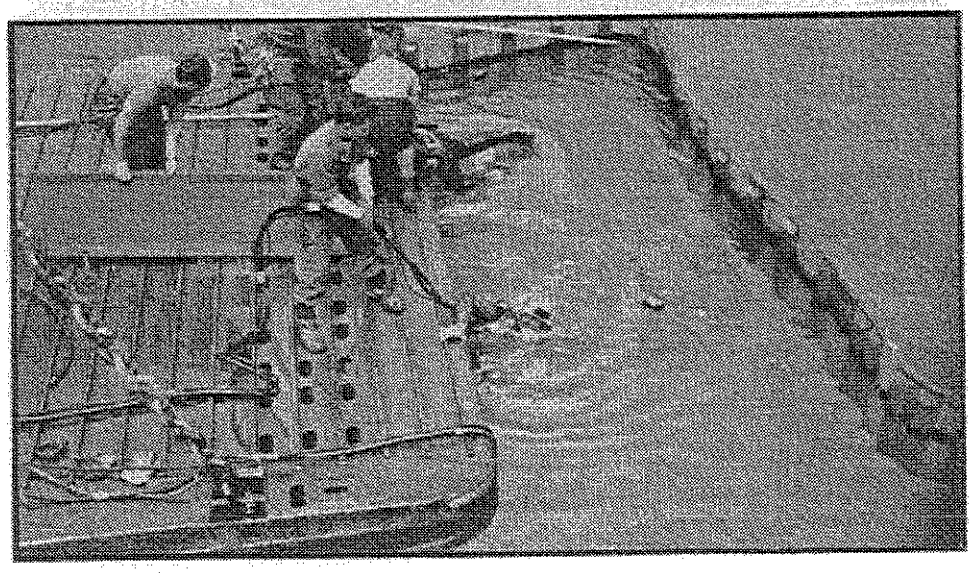


Toppled Pier Crane - Al Shuwaikh Harbor.

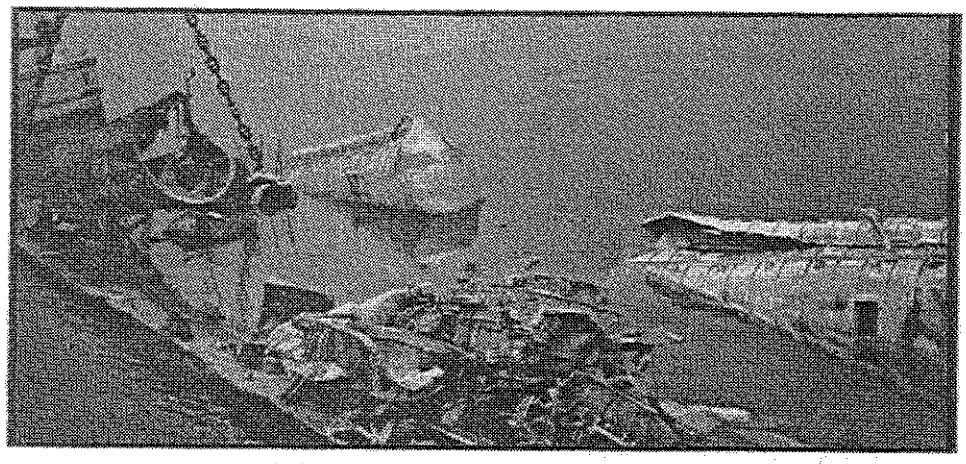


Army Diving Boat on
OSA II Project in
Ash Shuaybah Harbor.
(left and below)

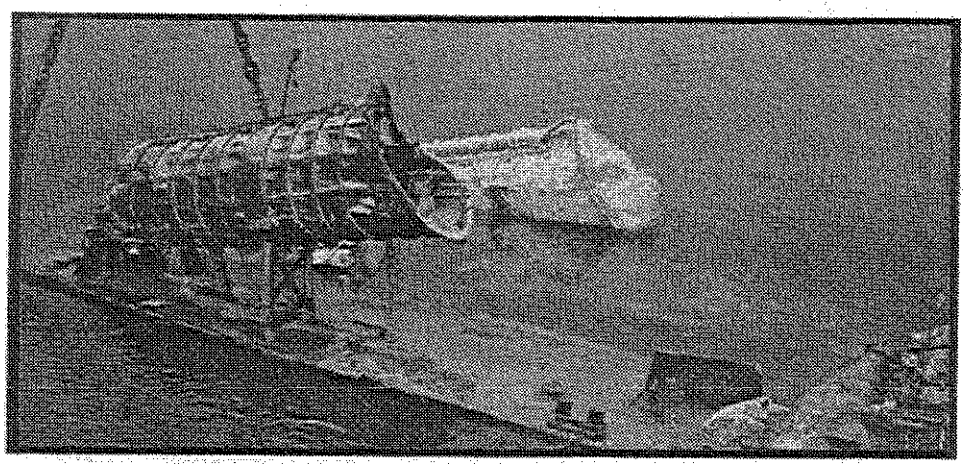




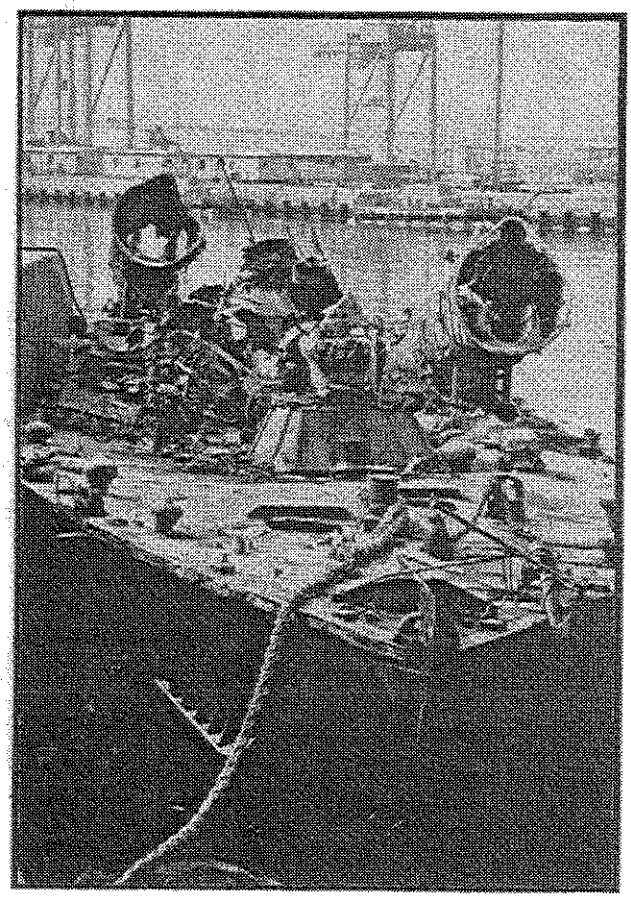
Army Diver on OSA II in
Ash Shuaybah Harbor
Dive Boat.

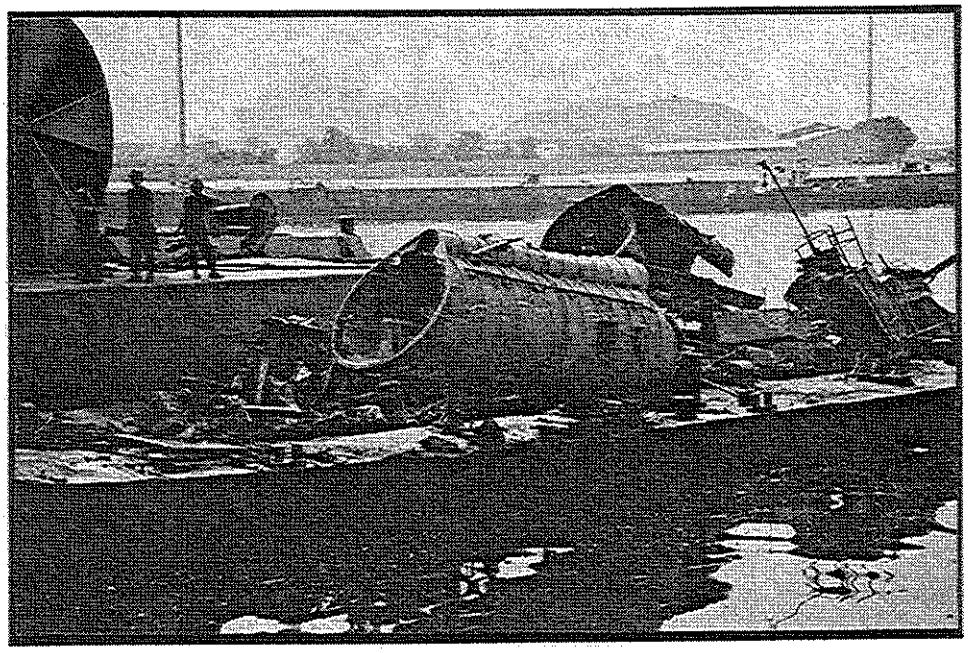


OSA II Wreck
Ash Shuaybah Harbor.

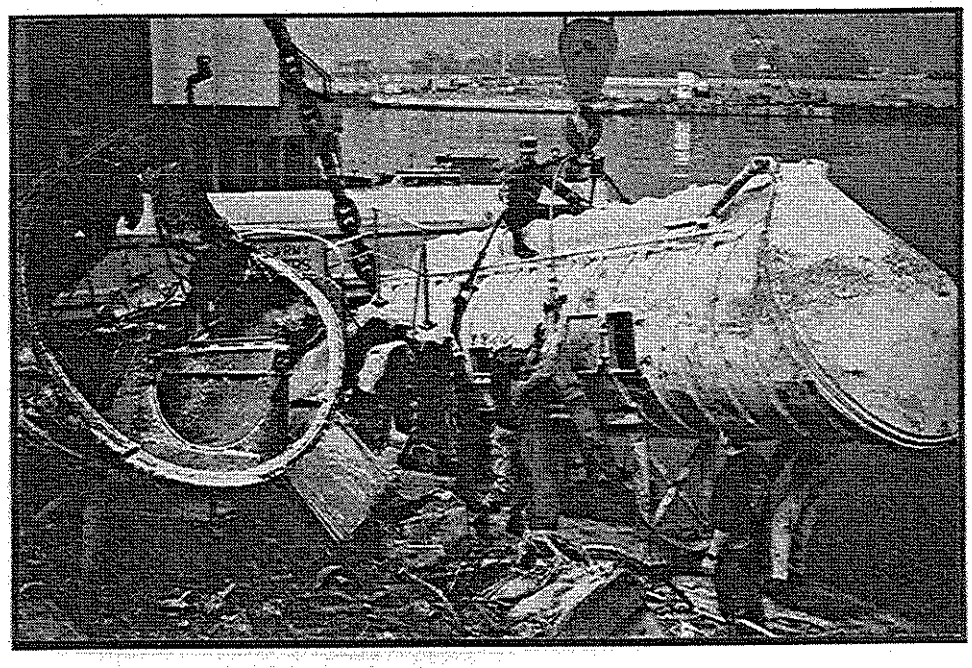


OSA II Missle Boat
Recovery - Ash Shuaybah
Harbor.
(left and below)

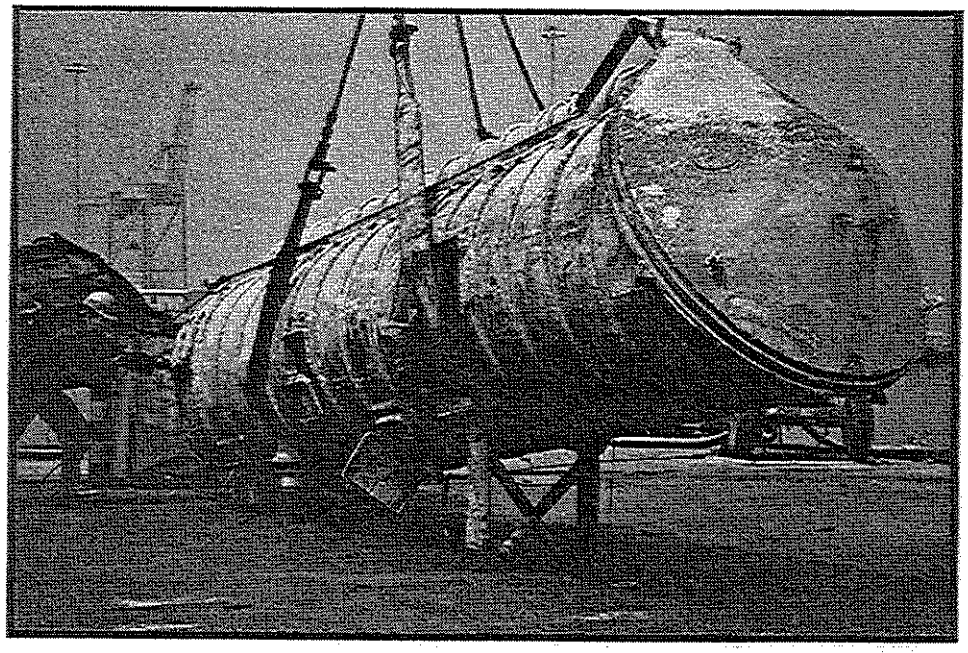




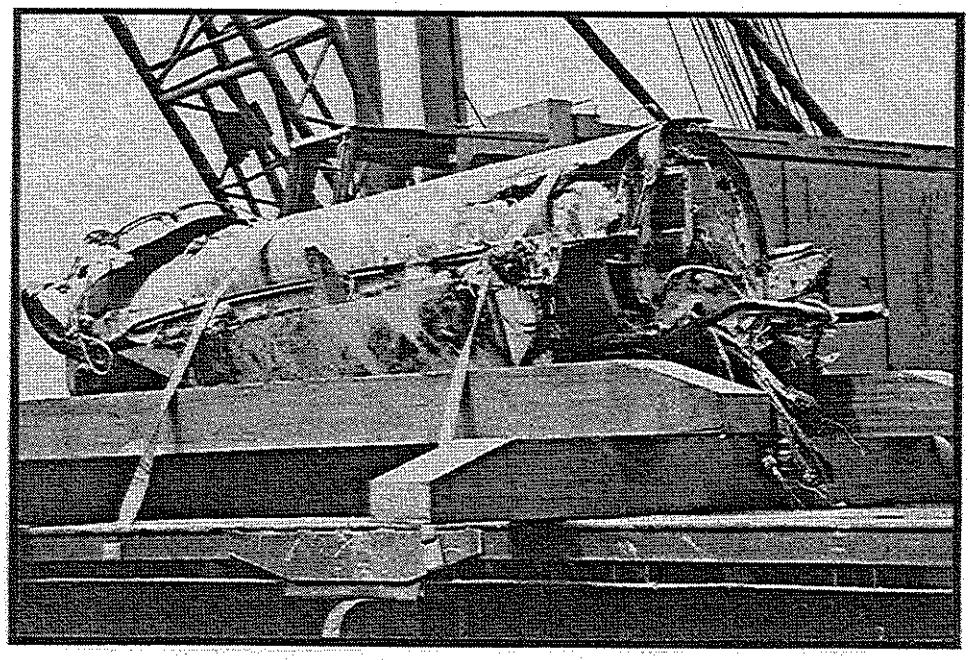
OSA II Recovery/Salvage Operations.



Removal of Styx Missile in Launcher from OSA II Fast Attack Missile Boat.



Styx Missile Launcher with Missile Removed from OSA II for Disposal. (left and below)



CHAPTER 6

DEMOBILIZATION

6-1 ESSM

On 11 April 1991, over 110 tons of equipment was loaded aboard M/V GALA in Sharjah and transferred to a warehouse storage facility in Bahrain leased by SUPSALV for one year. The remainder of the 325 tons of equipment was shipped back to the ESSM warehouse, Williamsburg, VA, in 14 sea vans and flatracks aboard a commercial carrier.

6-2 SMIT FIREFIGHTING EQUIPMENT

On completion of Operation DESERT SHIELD/DESERT STORM, the 8.5 tons of heavy-duty firefighting equipment provided by the SMIT subsidiary, Rotterdam International Safety Centre (RISC), was sent by air freight from Sharjah back to Rotterdam via commercial aircraft. As had been the case for the inbound shipment, the Royal Netherlands Navy blocked the aircraft space at their government rates.

6-3 USS BEAUFORT (ATS 1)

USS BEAUFORT remained in-theater through the end of May 1991, when USS SIOUX (T-ATF 171) with a MDSU detachment arrived in the Arabian Gulf. USS BEAUFORT out-chopped and returned to homeport, Sasebo, Japan.

CHAPTER 7

CONCLUSIONS

7-1 INTRODUCTION

This chapter presents broad conclusions, supported by lessons learned. Given are recommendations for improving Navy salvage force response in the future. The personal interviews (see Appendix C) were a major source of recommendations and lessons learned, which have been grouped into categories of Planning; Command, Control and Communications (C^3); Personnel and Training; and, Operations and Safety.

7-2 CONCLUSIONS

The combat and noncombat salvage and towing demands of Operations DESERT SHIELD/DESERT STORM are indicative of what the Navy can expect in future low intensity regional conflict and limited war situations when regional support and global cooperation involving coalition forces exist. The combination of U.S. Navy and commercial salvage assets is a proven prescription for future salvage concepts of operation. SUPSALV salvage ship contracting is particularly effective for quick-response operations. MSC is best suited to the contracting lead for long-term towing and support vessels that are beyond the U.S. Navy organic capability and to assist in obtaining the necessary war-risk insurance coverage from the Maritime Administration for U.S. or foreign-flag salvage and towing vessels that are operated in the national interests of the Unites States.

The front-line of salvage should always be organic assets; USS and USNS salvage and ocean towing ships. While commercial salvage vessels and specialized equipments were expected to play an augmenting role in the composition of the future salvage force of the U.S. Navy, it was not anticipated nor desired that commercial assets be the predominant salvage force presence in the Arabian Gulf, although this proved to be the case. Several factors lead to the requirement for a combat salvage capability:

- A U.S. salvage ship can be assimilated into a BG or amphibious task force.
- Communications with the commercial elements of the assembled salvage force were greatly inferior to those with the fleet element, USS BEAUFORT.
- Salvage operations in minefields required optimum communications with minehunters.
- USS BEAUFORT simultaneously sent SART teams to two separate casualties
- Commercial salvage ships refused to enter minefields and areas where chemical attacks were probable.

Once USS BEAUFORT (ATS 2) arrived at the end of January and SRUDET Bahrain was designated CTG 151.12 in early February, the salvage force present in the Gulf became a known entity and salvage demands were handled effectively. The force level proved to very capable of handling one casualty at a time. Case-in-point was USS BEAUFORT dividing her time in the mine fields between TRIPOLI and PRINCETON, and the use of commercial vessels SMIT NEW YORK, SMIT MADURA and GALA as pass-to tugs for towing or escorting damaged ships to repair facilities. However, the combined Navy-commercial salvage force lacked the depth to deal with two major concurrent salvage operations as presented in the draft CONOPS prepared by CTG 151.12. Deployment of a MDSU detachment and a second organic salvage ship would have provided a concurrent, multiple salvage response capability.

The highly visible manner in which peacetime salvage funding and accountability was applied to mobilization and wartime operations was a contentious issue with the operating Fleet. This should be avoided in the future.

Until salvage is fully integrated into the Navy's deliberate planning process for crisis response and wartime mobilization, salvage will largely remain an unplanned, ill-defined function of logistics. Salvage will continue to sway precariously between the after-the-fact critique descriptions of "just in time" or "too little, too late". The major fleet command staffs have a difficult time recognizing the necessity of a "firehouse function" such as salvage since recognition of salvage is acceptance of the realization that ships will get hit in war and that salvage is an important aspect of ship survivability. It is incumbent upon the Special Operations (1140) and Salvage Engineering (1440) communities to jointly and aggressively educate fleet planners and decision makers on the mission of salvage, requiring 1140/1440 representation on the major fleet staffs.

Had an amphibious assault taken place, the salvage ships present would have been overwhelmed by the demand for removing damaged craft from assault lanes, providing emergency damage control/offship firefighting assistance, and towing casualties to the nearest repair ship or shore repair facility. The potential for multiple mine and shore battery casualties existed. Similarly, the planned beach assault included the demand for timely tactical harbor clearance and wreck removal. The harbor clearance and wreck removal actually performed by Navy salvage officers and the Army port operations and diving detachment was an after-the-fact safety and humanitarian gesture.

An embarked Salvage Assistance Response Team (SART) aboard USS BEAUFORT, SMIT NEW YORK, or USS SHASTA could have responded to the fire casualty aboard M/V MERCS HORANA and substantially reduced firefighting time, damage extent and the direct firefighting involvement of three naval combatants.

7-3 LESSONS LEARNED

7-3.1 Planning

7-3.1.1 Area of Concern. Salvage, offship firefighting and emergency towing support for stricken combatants, sealift forces, and proposed amphibious operations were not addressed in planning guidance and operation orders.

a. **Discussion/Observation:** CONOPS and OPLANS for the initial deployment of naval forces did not adequately address ARS/ATS/T-ATF ships for combat salvage, offship firefighting, and emergency towing. ESSM, FADS and other MDSU support equipment requirements were not initially entered in the TPFDD; required a last minute, extraordinary effort to prioritize in-theater transport. One organic salvage ship and the services of several commercial vessels acquired through NAVSEA 00C's long-term salvage contract, arrived just in time to assist in USNS HIGGINS grounding and to deal with USS TRIPOLI and USS PRINCETON mine strikes. Furthermore, the high concentration of port facilities and vessels available in the Gulf masked the shortage of towing and salvage assets. Other third-world threats will require longer tows to shelter/repair facilities.

b. **Lessons Learned:** There must be deliberate planning to ensure the presence and integration of salvage assets in the naval force composition as operational contributors to the Fleet combat effort. If salvage guidance had been written into standing orders, appropriate salvage force levels would have deployed in-theater automatically, with no need for extraordinary effort and distracting intervention at the Battle Force Commander level.

While commercial assets can be effectively used to meet many peacetime Navy salvage requirements, it is risky to assume their availability in wartime. There were no financial incentives for commercial salvors like those encountered during the tanker war. There is commercial crew and owner reluctance and no interest in working in mine, missile or CBR hazard areas. Organic and long-term contract commercial salvors provide the only reliable source of trained emergency salvage, offship firefighting, and emergency towing capability.

c. **Recommendations:**

(1) Integrate salvage into CONOPS, OPLANS/TPFDD, and OPORDS.

(2) Detail salvage officers or establish permanent 1140 billets on major fleet staffs (follow the EOD lead), starting with OPNAV (OP-06), SECONDFLT and THIRDFLT Plans, Policy and Operations. Evaluate utilization of reserves in these positions.

(3) Mobilize fleet salvage ships when combatant are mobilized.

(4) Transfer the contracting lead for large-scale towing and salvage support operations that are beyond USN organic capability to MSC with NAVSEA 00C providing technical/COTR assistance and formalize with a memorandum of understanding.

7-3.1.2 Area of Concern. Harbor clearance, harbor salvage and wreck removal were included in the salvage CONOPS prepared by CTG 151.12 as follow-on to the planned beach amphibious assault operation under operation control of CTF 156. The harbor at Ash Shuaybah could have been a critical logistics port for USMC and USA ground forces. However, those who would have been involved were not aware of the capabilities and limitations of others.

Due to differences in Army and Navy approved diving equipment and the Navy's diving system certification program, which is not followed by the Army, cross utilization of assets is not possible under current regulations.

a. **Discussion/Observation:** Harbor clearance can involve the coordinated effort of HCUs/MDSUs, EOD, UCT, U.S. Army Transportation Corps, and U.S. Army Corps of Engineers personnel and assets. As the CONOP for harbor clearance and wreck removal was being developed, little consideration was given to the interaction and planned use of Navy salvage, EOD, UCT and Army divers and port operators. Navy salvage operators were unaware of the Army's prepositioned assets aboard M/V AMERICAN CORMORANT and the deployed port operation and diving equipment of the 7TH Trans Group. The unplanned working relationship between Navy salvage officers and the Army 7TH Transportation Group Diving Detachment for a clearance operation in Shuaybah masked the real need for a dedicated MDSU detachment in-theater. Navy EOD were available for ordnance clearance. Navy UCT departed before harbor clearance operations started.

b. **Lessons Learned:** Harbor Clearance requires joint service planning, coordination, training, and exercises. Awareness and availability of other service assets can reduce redundancy of equipment and logistics costs. Joint use of diving equipment should not be limited by service policy.

c. **Recommendations:**

(1) Develop joint CONOPS/OPLANS for harbor clearance, harbor salvage, wreck removal, and port restoration involving Navy salvage/EOD/UCT and Army diving/port operation personnel and assets.

(2) At least one senior salvage officer from a COMSUPPRON and one salvage engineer from a FLTCINC staff participate in joint exercises.

(3) Identify the requirements for and availability of heavy-lift capability, e.g., ringer crane/sheerleg through commercial lease/prepositioning.

(4) Establish 1140 billets or ADDU responsibility to key joint service staffs. Improve liaison among service commands, e.g., COMSUPPRONs, UCTs, and 7TH TRANS GROUP.

(5) Incorporate joint salvage operations planning into the Naval Diving and Salvage Training Center (NDSTC) curriculum. Army diving officers, as well as Navy salvage officers, are trained at NDSTC.

(6) Evaluate the assignment of 1145 reserve officers to key Army staffs.

7-3.1.3 Area of Concern: Material Support for Salvage and Firefighting

a. **Discussion/Observation:** Emergency Ship Salvage Material (ESSM) is stored in seven locations worldwide. The 14 Reserve MDSUs have diving equipment and small salvage equipment stored at the principal ESSM sites. The two active MDSUs have boats (LCM-8s and LWT-1), support craft (YRST) that are surface heavy-lift craft transportable and Flyaway Diving System (FADS), and an assortment of smaller salvage pumps, compressors, etc. Support for a major salvage operation (e.g., grounding, major conflagration, or harbor clearance) will require a large number of pumps, generators, compressors, support craft, and pulling gear. A temporary ESSM base was established in Sharjah, U.A.E., and stocked with ESSM equipment air shipped from the east coast ESSM base. A FADS with six operators was set up in Bahrain to support EOD operations.

b. **Lessons Learned:** The temporary ESSM base provided a valuable, flexible stockpile of equipment readily available in-theater to support major salvage operations. The FADS provided diving treatment support to all diving operations in the area.

c. **Recommendation:**

As part of the task of incorporating salvage into CONOPS and OPLANS, identify the planned deployment of ESSM and MDSU equipment for inclusion into the Time-Phased Force and Deployment Data (TPFDD) file and update as required.

7-3.2 Command, Control and Communications (C^3)

7-3.2.1 Area of Concern. An effective salvage force with a Force Salvage Coordinator assigned to an operational command staff afloat.

a. **Discussion/Observation:** The concept of salvage described in the Surface Ship Survivability Manual, NWP 62-1 (Rev C), identifies an afloat Force Salvage Commander (FSC) who advises the Battle Force Commander regarding salvage, offship firefighting, emergency battle damage repair, towing, etc. In Operations DESERT SHIELD/STORM, COMUSNAVCENT assigned management responsibility for maintenance, including tender resupply, SRU representation, technical assistance and diving and salvage operations to CTF 63 and CTF 73. This resulted in SRUDET Bahrain being tasked with salvage. The NAVCENT staff contact for salvage was the Chief of Staff for Logistics (Code N4), an O-6 Supply Officer. The closest thing to an afloat FSC was Commanding Officer, USS BEAUFORT who was proactive and quick to respond and advise operational commanders on all casualty response and salvage matters.

b. **Lessons Learned:** The FSC should have been be assigned directly to the senior staff (i.e. USNAVCENTCOM/CTF 150 or COMIDEASTFOR/CTF 151 staffs). The FSC must be cognizant of planned naval operations, and changes thereto, in order to plan for and prioritize fleet salvage demands. Salvage, as an element of ship survivability, is associated with battle damage repair. However, salvage is not a maintenance function.

c. **Recommendations:**

(1) As part of integrating salvage into Fleet CONOPS and OPLANS, identify the position and role of the FSC within the Battle Force Command structure.

(2) Develop a staff organizational concept for a Special Operations cell with the requisite expertise for EOD, MCM, and Salvage and Diving. The Diving and Salvage should include both operational salvage (1140) and salvage engineering (1440) expertise. Qualified Reserve officers in this capacity should be used.

7-3.2.2 Area of Concern. Ship survivability following major structural damage.

a. **Discussion/Observation:** The USS PRINCETON mine strike caused significant hull damage due to whipping. The Commanding Officer's primary concern was an immediate and accurate assessment of his ship's structural integrity, hull strength and stability.

b. **Lessons Learned:** The rapid, on-scene assessment provided by a salvage engineer equipped with a portable computer and *POSSE* (Program for Ship Salvage Engineering) was the correct and very best response possible. A Battle Damage Assessment Team (BDAT) stood by with additional assistance.

c. **Recommendations:**

(1) Fully implement the Salvage Assistance Response Team (SART) and BDAT team concepts presented in the Surface Ship Survivability Manual (NWP 62-1 (Rev C) and Navy Ship Salvage Manual.

(2) Train active and Reserve officers in the use of the *POSSE* program.

7-3.2.3 Area of Concern. Dedicated communications linking salvage force components to one another and to fleet unit customers were lacking.

a. **Discussion/Observation:** None of the six modes of communications used were common to all salvage force elements (SRUDET Bahrain/CTG 151.12 headquarters, USS BEAUFORT, SMIT office in Sharjah, SMIT NEW YORK, SMIT MADURA, and SMIT contracted local vessels). USS BEAUFORT was the only salvage asset with a complete suite of communications enabling worldwide voice and message communications, both secure and unsecured and the ability to communicate with every Navy ship and commercial salvage vessel in the Arabian Gulf. The primary salvage lines of communication of commercial telephone and INMARSAT, while providing communication in and around the Gulf and direct to Washington, placed salvage outside the theater military C^3.

b. **Lessons Learned:** Salvage communications must be integrated into the Battle Force Commander's C^3 infrastructure and fully addressed in CONOPS/OPORDS. If commercial salvage vessels and base operations are involved, military communications require that Navy liaison/detachment personnel be assigned. Salvage must have secure communications capability.

c. **Recommendations:**

(1) Designate a fleet common salvage frequency in CONOPS/OPLANS. This should include communications with Army port operations and diving detachments.

(2) Provide a commercial salvage frequency to be monitored by naval vessels or provide shipboard radios to commercial vessels.

(3) Provide MDSUs with portable SATCOM communications packages capable of in-the-clear and secure voice (STU III or equivalent) communications for use by detachments/teams embarked on commercial salvage vessels and other salvage platforms.

(4) All commercial salvage vessels contract should have a Navy liaison, preferably a salvage officer with portable communications and a CTE/CTU designation.

7-3.3 Personnel and Training

7-3.3.1 Area of Concern. Trained manpower support for ship salvage.

a. **Discussion/Observation:** MDSU teams are trained to assist at remote sites in ship salvage, emergency damage control, firefighting, damage assessment, etc.

b. **Lessons Learned:** The major combat and noncombat casualties involving USS TRIPOLI, USS PRINCETON and USNS HIGGINS did not develop into major salvage operations although the potential was there. Had PRINCETON suffered major flooding or fire, and the planned amphibious assault executed, major salvage efforts would have been involved. One ATS would have proven inadequate.

c. **Recommendations:**

(1) Deploy at least one MDSU combat salvage team with SART capability in-theater and mobilize two back-up teams for standby at home bases. Reserve MDSUs should be involved to augment or back fill active teams. MDSU teams will use ESSM equipment from the temporary ESSM pool and be capable of operating as detachments aboard T-ATFs, commercial salvage vessels, ARS/ATS augments, vessels of opportunity, or as SARTs placed aboard stricken ships.

7-3.3.2 Area of Concern. Too few Navy Engineering Duty Officers trained as Salvage Engineers (1440) are available to ensure that a salvage engineer will be deployed with a naval battle force, ready to respond to casualties requiring rapid assessment of ship hull structural integrity and stability.

a. **Discussion/Observation:** USS PRINCETON and USS TRIPOLI illustrate the value of having a salvage engineer readily available to respond to a casualty. There is a sharp contrast between putting a salvage engineer with POSSE aboard USS PRINCETON within a few hours of the mine hits and the three days it took the U.S. Seventh Fleet salvage engineer to arrive at the USNS HIGGINS grounding site. Timely response could mean the difference between saving or losing a ship.

b. **Lessons Learned:** The salvage engineer's rapid response and assistance is conducting structural integrity and stability assessment to support sound decisions early on can make a ship CO's decisions more effective and may mean the difference between the survival or loss of a ship. He is the coordinator and liaison between the SART team and BDAT team members.

c. **Recommendation:**

(1) During fleet operations where there is a high probability for salvage response (e.g.- amphibious assault, operations in a high mine threat environment), the Battle Group/Fleet staff should be augmented with an experienced ED salvage engineer to advise the Battle Force Commander on salvage engineering matters, coordinate Battle Damage Assessment Teams (BDATs) and provide immediate response to casualties.

(2) Consider "pocket orders" for qualified active/Reserve ED salvors to report to COMNAVSEA (SUPSALV) for further transfer (FFT) to theater/incident.

7-3.3.3 Area of Concern. Training and requirements for performing the various Underwater Ship Husbandry (UWSH) tasks such as hull repair and maintenance, patching, sonar dome repair, submarine tile work, defouling, etc., are not uniform among tender, repair ship and shore-based IMA dive lockers.

a. **Discussion/Observation:** As many as six AR/AD/AS ships participated in DESERT SHIELD/STORM, each with its own standards for qualifications and requirements to accomplish their UWSH missions.

b. **Lessons Learned:** A method of establishing requirements for performing various UWSH functions is needed. Quality control and standard procedures in addition to diver proficiency are required.

c. **Recommendations:**

(1) Establish a qualification and certification program for IMA dive lockers to ensure proper standards of training, procedures and work quality.

(2) Emphasize UWSH at the Naval Diving and Salvage Training Center, Panama City, FL, with NAVSEA 00C technical assistance and oversight. Provide specific training in UWSH tasks as part of the standard school curriculum or by separate course with formalized Personnel Qualification Standards (PQS).

(3) Qualify/certify NRMDSU individuals in UWSH to provide appropriate augmentation to in-theater IMAs and further make them available to the FSC.

7-3.4 Operations and Safety

7-3.4.1 Area of Concern. Oil Spill potential and the requirement to selectively clean or protect specific areas.

a. **Discussion/Observation:** No contingency capability was established to provide spill cleanup or protection of amphibious operations areas or desalinization plants.

b. **Lessons Learned:** In a war zone, where deliberate oil spills can be used tactically, or when there exists a high risk of massive spills in harbor and coastal waters from combat casualties or in-port sabotage acts, contingency plans should be developed. Anti-pollution capability should be provided prior to a pollution incident.

c. **Recommendations:** Develop contingency plans for specific targets/missions and deploy oil spill cleanup equipment to accomplish these assignments. Review existing oil pollution doctrine and evaluate tactical implications and actions with specific considerations to resource base.

7-3.4.2 Area of Concern. Diving Safety.

a. **Discussion/Observation:** A major EOD, or harbor clearance operation will require the use of recompression chambers. Currently, portable systems are not environmentally protected from high ambient temperatures (100 - 120 degrees Fahrenheit) to prevent overheating a diver undergoing recompression.

b. **Lessons Learned:** Commercial portable recompression chambers are encased in air conditioned milvans or trailers for operating in regions with high temperature climates such as the Arabian Gulf.

c. **Recommendation:** Identify the number of cooled recompression chambers required for contingencies and design, develop and procure the required number of containers for existing portable units.

7-3.4.3 Area of Concern. Diving Safety.

a. **Discussion/Observation:** Navy diving officers used Army diving equipment to inspect the condition of underwater wrecks and damaged vessels during harbor clearance surveys and operations in ports of Kuwait. Some of the Army diving equipment is not approved for Navy use. U.S. Army divers are trained in the proper use and maintenance of diving systems and equipment by the Navy. However, the Army does not currently have a diving system certification program.

b. **Lessons Learned:** With proper planning, it is probable that Army and Navy divers will be involved in joint operations and that situations will occur when one service will require the use of the other's diving equipment and portable diving systems.

c. **Recommendations:**

(1) Establish a Joint Service Dive System Certification Program with NAVSEA 00C as the designated Single Manager.

(2) Identify DOD approved diving systems and equipment for joint service use.

7-3.4.4 Area of Concern. Organic underwater photography capability.

a. **Discussion/Observation:** Diving and salvage efforts involve an initial survey dive to identify the scope of effort and possible solutions. At best, this requires experienced divers, still photographs of the initial conditions and post dive explanation and discussion of the situation. Due to the unique nature of combat sustained damage, the time critical nature of initial survey data, and the data evaluation process, a diver operated video camera with topside monitor would streamline and improve the process.

b. **Lessons Learned:** Underwater video and still photography capability improves diving and salvage response.

c. **Recommendations:** Provide Navy salvage ships and MDSUs with underwater photography systems with video and still photographic equipment, including wide-angle and illumination equipment. Photographics systems should be integrated with a generic ROV platform which would expand its utilization.

7-3.4.5 Area of Concern. Boats for diving operations.

a. **Discussion/Observations:** The 35-foot workboats aboard ATS 1 Class ships are poorly suited for inspection dives in rough weather. They are difficult to launch, maneuver and recover and require a large number of support personnel. The present complement of small rubber, Zodiac-type boats prove too small and unstable for dive operations, especially in rough weather.

b. **Lessons Learned:** Without a larger 12-man rubber boat, BEAUFORT diving operations in rough weather had to be postponed for safe boating reasons until weather improved and lower sea states prevailed.

c. **Recommendations:** Outfit Navy salvage ships with large 12-man rubber or ribbed boats to better support diving operations in rough weather

7-3.4.6 Area of Concern. BEAUFORT underwater cutting and welding.

a. **Discussion/observations:** Underwater cutting and welding required extensive material support in terms of welding machines, batteries, oxygen, welding rod, and especially KERIE cable for cutting. Material was hard to come by in-theater.

The extensive hull damage would have required a large amount of KERIE cutting cable, oxygen and welding rod. Hull damage to USS TRIPOLI required KERIE cable hull cutting to stop the spread of longitudinal cracks beyond flooding boundaries. The supply of KERIE cable was depleted.

b. **Lessons Learned:** Deploying salvage ships and MDSU teams should be well prepared to conduct emergency underwater cutting and welding operations.

c. **Recommendations:** Equip deploying salvage ships and MDSU teams with sufficient underwater equipment and supplies with rapid resupply capability. This necessitates 800 feet of KERIE Cable, supporting oxygen and plenty of cutting rod. Evaluate the inclusion of certain specialty salvage consumables in the ESSM system.

7-3.4.7 Area of Concern. BEAUFORT diving communications.

a. **Discussion/Observations:** Shallow water diving operations, especially from small boats cannot utilize existing communication systems. Present communications are installed in surface supplied diving systems, available only when diving off the ship or other larger platform. Diving in SCUBA without diver communications out of a small boat on the KANSAS CITY and TRIPOLI projects did not afford the necessary communications for safe, efficient and productive diving. The MK21 Lightweight Diving System has communications via the norman 300-foot umbilical with the option of a backpack mounted SCUBA-type air bottle.

b. **Lessons Learned:** Boat-launched shallow water inspection dives require diver-topside communications as much as deeper, surface-supplied diving tasks.

c. **Recommendations:** Diving activities having only conventional surface-supplied diving rigs should adapt two umbilicals, one for each of two divers, to a 50-foot length of strength-communications cable for use in boat-launched dives, using the MK21 SSDS or MK20 LWDS with SCUBA bottle for air source.

APPENDIX A

CONCEPTS OF OPERATIONS (CONOPS)

Two Concepts of Operations were developed for Operation DESERT STORM by CTG 151.12 and are included in this appendix as:

- A-1 – Concept of Operations: Combat Diving and Salvage Support of Operation DESERT SHIELD/ DESERT STORM
- A-2 – Proposed CONOPS for Salvage Clearance in Support of the Recovery of the Harbor of Ash Shuwaykh, Kuwait

A-1 CONCEPT OF OPERATIONS: COMBAT DIVING AND SALVAGE SUPPORT OF OPERATION DESERT SHIELD/DESERT STORM (DRAFT)

PURPOSE: To establish a Combat Diving and Salvage Group in the region to support the Force Commander.

I DEFINITIONS

Combat diving and salvage forces provide the following mission support:

- **Ship Survivability.**
  - Enhance/augment the survivability of ships and minimize personnel casualties with rapid and specialized assistance to vessels damaged as a result of hostile action or marine casualty; including fires, flooding and structural damage.
  - Conduct emergency underwater repair and other repairs necessary to the ship's survival.
  - Conduct/support damage assessment and interface with ship repair resources.
  - Recover weapons, cargo, fuel, and other valuable materials from damaged ships.
  - Deliver damaged ships to a safe haven as directed by the Force Commander.
- **Marine Salvage** – Debeaching, raising/refloating and clearance of naval and commercial shipping including vessels of foreign registry when in the interests of the United States.
- **Harbor and Channel Clearance** – Clear ships, wrecks and other obstructions in harbors, rivers and waterways as required in support of combat operations.
- **Locate and Recover Objects** – Locate and recover objects from ocean floors at any depth through organic force and/or contracted resources.
- **Commercial Salvage Support** – Enter into contracts with U.S. and available foreign salvage contractors as necessary to support anticipated combat operations.
- **Provide Technical and Operational Assistance in Environmental Protection** – Assist on the prevention and cleanup of oil, hazardous materials and other marine pollutants.

II LEVEL OF THREAT ASSESSMENT

The following threats exist in the AOR that require Combat Diving and Salvage support forces:

- **Mining** – Damage of shipping incident to deliberate mining and stray mines adrift.
- **Air Strikes/Missile/Gun Fire Damage.**
- **Collisions, Groundings and Other Marine Casualties** – Damage as a result of the intensity of operations and the number of naval and commercial vessels in the AOR.
- **Terrorist or Deliberate Sinking of Shipping** – Deliberate actions to block canals, port facilities and channels.

III FORCE STRUCTURE AND CAPABILITY

The following describes the capability of each vessel once augmented with equipment and personnel:

- **Base of Logistics Support** - Sharjah, U.A.E.
  - Contractor Augmentation.
    - Office, warehouse and shop spaces.
    - One Contract Representative.
  - USN Augmentation.
    - One Group Commander.
    - One Chief of Staff Officer (0-5/1140 Salvage Officer.
    - One Salvage Engineer (1440).
- **USN Salvage Ship** – ATS/ARS (60-ton bollard pull) to provide:
  - Command and Control.
  - Towing, Firefighting, Salvage lifting, equipment and material, and Diving (surface supplied air and HeO_2).
- **SMIT-TAK Salvage Tug** (170-ton bollard pull) to provide:
  - Towing, Salvage, Firefighting, and Diving (SCUBA).
  - Contractor Augmentation.
    - One portable FI-FI unit.
    - Two Salvage personnel.
  - USN Augmentation
    - One Salvage/Navy Liaison Officer.
    - One 10-man Offship Firefighting/Battle Damage Repair/Diving(SCUBA) Team with Team Leader.

- **SMIT-TAK Firefighting Tug** (40-ton bollard pull) to provide:
  - Firefighting, Towing, Salvage, and Diving (SCUBA).
  - Contractor Augmentation.
    - Three portable FI/FI units.
    - Two portable FI/FI Attack modules.
    - Two portable Breathing Apparatus modules.
    - Two firefighting personnel.
    - Two salvage crew.
  - USN Augmentation.
    - One Salvage/Navy Liaison Officer.
    - One 10-man Offship Firefighting/Battle Damage Repair/Diving(SCUBA) Team with Team Leader.
- **Commercial Tug – SEMCO SALVALOUR** (70 ton bollard pull) to provide:
  - Towing and Diving (SCUBA).
  - USN Augmentation.
    - One Salvage/Navy Liaison Officer.
    - One 6-man Battle Damage Repair/Diving (SCUBA) Team with Team Leader.
- **Off Shore Supply Vessel** to provide:
  - Salvage Material Support and Diving (SCUBA).
  - Harbor Clearance Equipment and Diving Support Platform.
  - USN Augmentation.
    - One Salvage/Navy Liaison Officer.
    - One 6-man Battle Damage Repair/Diving(SCUBA) Team with Team Leader.

- **Emergency Ship Salvage Material (ESSM)** to provide:
  - Equipment augment for Organic Forces to Support Extended Operations.
  - Equipment includes:
    - 26 Pumps (10", 6", 3", 4" Electric submersible).
    - 4 125 CFM air compressors and hose.
    - 8 1,600 ft pulling ground legs and anchors.
    - 5 Hydraulic power units.
    - 8 Four-fold ground leg puller purchases.
    - 4 Portable salvage welders.
    - 4 Welding kits.
    - 4 Underwater cutting kits.
    - 3 Portable 8-ton winches.
    - 8 5 KW generators.
    - 6 30 KW generators.
    - 2 Portable lighting towers.
    - 1 Reverse Osmosis Water Purification Kit.
    - 1 Command van.
    - 1 Shop van.
    - 1 Rigging van.
- **Harbor Clearance Unit** – This is a rapid - "rip it up and clear it out" - capability of limited lift (500-600 ton) capacity. It is intended to afford a capability to rapidly clear obstructed piers and channels to facilitate immediate logistic throughput.

  It is also a basic capacity that can be augmented by contracted heavy lift (2000 tons or greater) assets for major clearance of longer duration.

  The harbor clearance effort will require a detailed survey in order to assess the capability viz-a-viz the operational and logistic support requirements. It is entirely possible that the clearance effort will exceed the initial time allocated by the planners for this effort. The clearance of a large commercial tanker could require weeks; in this case, alternatives must be considered.

- Contractor Augmentation:
  - One 500-600 ton crane barge.
  - Three working/pulling barges with cranes.
  - Two 2000 HP anchor handling tugs.
- USN Augmentation:
  - One ARS-50 Class salvage vessel.
  - One Salvage Officer.
  - 25-man diving and salvage team.

IV EXECUTION

Once contract arrangements are completed and the units are fully augmented and have arrived in the AOR, the following employment scenarios can be supported:

- **Emergent Response.** Employment of one or more units in response to emergent requests for towing, battle damage or marine casualty assistance.
- **Amphibious Operations Support.** The full scope of combat diving and salvage support can be anticipated in support of planned amphibious operations. Four designated units can be employed as a task element of an ATF in support of these requirements.
- **Surface Force Operations.** One or more units can be employed in support of Surface Action Group (SAG) or Carrier Battle Group (CVBG) operations.
- **Harbor Clearance and Port Restoration.** Salvage units can be anticipated in support of allied landings and occupation of port facilities. The Navy salvage vessel, a 25-man diving and salvage team and the contracted harbor clearance unit can be employed as a task element in support of this mission.
- **Recovery of Personnel and Objects/Material.** Search and recovery of personnel and objects of significant interest can be expected in the AOR as a result of operations; e.g., downed aircraft, high valued ordnance and equipment, and material lost overboard. A single unit can be employed when augmented with contracted search and recovery assets; e.g., remotely operated vehicles, side scan sonar, etc. Ordnance recovery would require an Explosive Ordnance Disposal (EOD) team.

V STATUS OF FORCE READINESS/CAPABILITY

A. Salvage Tug M/V SMIT NEW YORK.

- Location: Sharjah, U.A.E.
- Status: RFS in 4 hrs with readiness condition:
  - Towing – C1.
  - Salvage Equipment – C2 (materials).
  - Personnel – C4.
  - Firefighting – C3; offship water/foam monitor capability only. No FI/FI personnel embarked.
  - Diving – C4; no equipment or personnel aboard.
- Personnel: Civilian Tug Master, Salvage Master and 17-man crew. No USN personnel.
- Remarks: Cannot support operations in a CBR environment.

B. Firefighting Tug M/V SMIT MADURA.

- Location: Enroute to Arabian Gulf from Singapore; 3628 miles with 11 days transit time, weather dependent.

C. SEMCO Tug M/V SALVALOUR.

- Location: Local.
- Status: Awaiting confirmation of contract funds.

D. SEMCO Tug M/V SALVANA.

- Location: Local.
- Status: Awaiting confirmation of contract funds.

E. Offshore Supply Vessel.

- Location: Local.
- Status: Awaiting confirmation of contract funds.

F. Harbor Clearance Unit Vessels.

- Location: Work barges are local and lift barge available in one week.
- Status: Awaiting confirmation of contract funds.

G. ESSM Equipment.

- Location: Staged in Sharjah, U.A.E.
- Status: C1.

H. U.S. Navy Salvage Vessel.

- Location: Enroute from WESTPAC with ETA late January.

VI REQUIREMENTS

A. NAVSEA WESTPAC Zone Contract. Require the necessary funding to hire required vessels and contractor augmentation personnel and material.

B. USN Personnel Augmentation. Require the following personnel from MDSU-1 (Pearl Harbor, HI) and MDSU-2 (Norfolk, VA) to form up two salvage and diving detachments:

- **Detachment One** – For contractor vessel augmentation to support salvage operations.
  - One senior Salvage Officer (1140) from MDSU-1.
  - 38 Battle Damage Repair/Diving & Salvage team personnel from MDSU-1 specialized in offship firefighting and ideally suited to augment contract vessels for firefighting/ship survivability and diving.
  - Five Salvage/Navy liaison officers (experienced O-3/O-4) from Combat Support Squadron available assets.
- **Detachment Two** – To support port clearance operations.
  - One senior Salvage Officer (1140) from MDSU-2.
  - 25 Diving and Salvage team personnel from MDSU-2.

C. **USN Equipment Augmentation.**

- Teams bring personnel diving equipment.
- Five SCUBA Diving sets each consisting of:
  - 6 SCUBA air compressors.
  - 20 SCUBA tanks and miscellaneous items.
- Two Flyaway Diving Systems (FADS I without chamber) and associated surface-supplied diving equipment.
- Underwater cutting and welding equipment (KERI cable).

D. USN Salvage Vessel Augmentation. USS GRASP (ARS 51), ready for deployment from Norfolk VA, provides:

- Command and Control.
- 250-ton salvage lift capability.
- 40-ton boom.
- 270-ton retraction/pulling capability.
- Two 35-foot work boats.
- Bow thruster for dynamic positioning for deep recovery operations using ROV.
- Surplus berthing for 20-man MDSU augment.

This is a force multiplier that will permit **CONCURRENT** salvage evolutions in the AOR.

VII COMMENTARY/JUSTIFICATION

A. This salvage force can be stood up incrementally as the contractor and USN augmentation come on-line.

- Once NAVSEA funding is confirmed, contract platforms can be put on-hire. This will afford the surface units to stand up a basic towing activity.

- The MDSU personnel augment is needed to achieve any measure of ship survivability/firefighting/port clearance capability.

B. Considering the nature of the operations and the environment, the availability of civilian contract assets are insufficient to support operations in the AOR and are limited in the following aspects:

- Command and Control, CBR operations, logistic support interface and on-station endurance.

- There can be no absolute assurance that contracted operators will hazard their vessels and crews to the extent required by the operations.

- Funding for these assets expires mid-February. Contract continuation will cost $4 million per month.

C. These contract asset considerations may seriously jeopardize operational support and, in any event, will limit employment to one tasking at a time.

D. The requested augmentation of one ARS-50 Class vessel (USS GRASP) will provide an inherently more capable asset, whose support in all operations will be assured and will give the force structure the added dimension to conduct **CONCURRENT OPERATIONS**.

- USS GRASP is deployable on short notice.

- An ARS-50 Class vessel can be used for recovery operations enroute the AOR and in-theater as addressed in USNAVCENT MSG 202259Z JAN 91.

A-2 PROPOSED CONOPS FOR SALVAGE CLEARANCE IN SUPPORT OF THE RECOVERY OF THE HARBOR OF ASH SHUWAIKH, KUWAIT

REF/A/OPGEN DAILY/CTF 151/ 121505Z MAR 91//
REF/B/COMBAT SITREP/CTF 151/080528ZMAR91//
REF/C/SYS.RRM/CTG 151.6/ 121903Z MAR 91//
REF/D/SYS.RRM/CTF 151.12/260905Z FEB 91

RMKS/1. GENERAL: THIS CONOPS PROVIDES A REPORT ON THE APPARENT CONDITIONS OF PIERS AND SUNKEN SHIPPING IN THE HARBOR OF ASH SHUWAIKH, C REF. A. SALVAGE METHODOLOGIES, CAPABILITIES, COSTS/TIME REQUIREMENTS AND ALTERNATIVES ARE DISCUSSED. AN ASSESSMENT, SCOPE OF MISSION, ALTERNATIVES AND RECOMMENDATIONS FOR THE CONDUCT OF THE OPERATIONS ARE PRESENTED.

2. FORCES.

2A. ENEMY. PRIMARY THREAT TO U-S AND ALLIED NAVAL UNITS AND ASSOCIATED HARBOR/PORT FACILITIES COMES FROM PASSIVE THREATS INCLUDING IMPLACED LAND MINES, SEA MINES, BEACH MINES, IMPROVISED EXPLOSIVE DEVICES, UNEXPLODED ORDNANCE AND CHEMICAL AND TOXIC HAZARDS. THREAT FROM AIR, SEA AND LAND BASED HOSTILE FORCES IS CONSIDERED MINIMAL. THE THREAT OF ATTACK FROM LAND OR SEA BASED TERRORISTS OR ATTACK INCIDENT TO CIVIL UNREST IS POSSIBLE.

2B. FRIENDLY. U-S AND ALLIED FORCES.

3. SITUATION/ASSESSMENT. THE FOLLOWING REFLECTS THE DAMAGE TO PIER/FACILITIES AND SHIP SALVAGE/CLEARANCE RELEVANT TO RESTORING PORT OPERATIONS IN ASH SHUWAIKH AND IS BASED ON A COMPILATION OF ASSESSMENTS CONDUCTED BY CTG 151.6/151.12 PERSONNEL DURING THE PERIOD 2 - 18 MAR. 91. NO DIVING OPERATIONS OR UNDERWATER ASSESSMENTS WERE CONDUCTED. ALL OBSERVATIONS MADE FROM THE SHORE. THE AREAS DESCRIBED ARE REFLECTED ON DMA CHART 62433 - HARBOR OF AL KUWAIT.

3A. SLIPWAY/MAINTENANCE BASIN. TWO SUNKEN TUGS AND ONE BURNED OUT TUG. SEVERAL OTHER VESSELS DAMAGED, BUT AFLOAT.

3B. DEEP WATER BERTH/BASIN. THE FACE OF THE PIER IS EXTENSIVELY DAMAGED BY FIRE. TIMBERS BETWEEN CONCRETE PILINGS AND PIER FACING ARE BURNED OUT ALONG BERTHS 1 THROUGH 6 LEAVING THE PILINGS UNSUPPORTED AND POSING AN UNDERWATER HAZARD TO SHIPS MOORING IN THESE BERTHS. THE STRUCTURE OF THE OVERHEAD CONVEYOR SYSTEM HAS BEEN BUCKLED BY FIRE, RENDERING IT UNUSABLE AND POSING A DANGER TO PERSONNEL ON THE PIER IF IT SHOULD COLLAPSE. BULK CARGO CRANES ARE TOPPLED AND COMPLETELY SUBMERGED IN BERTHS 1 AND 2. THERE IS ONE POSSIBLE SUNKEN CRAFT IN BERTH 3. THERE IS ONE SUNKEN AND ONE BURNED TUG IN BERTH 6 AND ONE SUNKEN CRAFT/TUG IN BERTH 7. ADDITIONALLY, THE SHIP "HILAL CEMENT" IS MOORED AT BERTH 6. SHE IS A CRANE BARGE/FRONT END OF A TANKER, ESTIMATED IN EXCESS OF 20,000 DWT. ALTHOUGH ORIGINALLY THOUGHT TO BE RESTING ON THE BOTTOM, THIS 560 FT LONG SHIP RETAINS SOME BUOYANCY. THE STERN IS STILL MOORED AS BEFORE, BUT THE BOW HAS ROTATED 180 DEGREES, OUT INTO THE INNER BASIN, AND BACK ALONGSIDE THE PIER. SHE HAS BEEN PROPERLY MOORED. SHE IS DOWN BY THE BOW AND LISTING TO STARBOARD APPROX. 15 DEGREES. FURTHERMORE, IT HAS BEEN LEARNED THAT THE HILAL CEMENT WAS IN THE PROCESS OF BEING CONVERTED TO A GRAIN PROCESSING SHIP PRIOR TO THE INVASION 2 AUG. 1990. THIS AFFECTS THE SALVAGE PLANNING IN THAT REMOVING GRAIN CAN BE MORE READILY ACCOMPLISHED THAN REMOVING CONCRETE. NO BOARDING OF THE SHIP BY USN PERSONNEL HAS BEEN POSSIBLE TO DATE: FRENCH MILITARY HAVE BOARDED AND SECURED THE BOW.

3C. SMALL CRAFT HARBOR. TWO TO FOUR SMALL CRAFT SUNK. DAMAGE TO PIERS IS MINIMAL.

3D. PASSENGER SHIP TERMINAL (BERTH 8). NO APPARENT DAMAGE.

3E. CONTAINER TERMINAL (BERTHS 9 THROUGH 14). NO APPARENT DAMAGE TO PIERS. AN OFF SHORE SUPPLY VESSEL (APPROX. 180 FT LONG AND 800 TO 1000 TONS DISPLACEMENT) IS SUNK ON ITS STARBOARD SIDE BETWEEN BERTHS 9 AND 10 AND FOULS THE APPROACH TO BERTH 9. POSSIBLE SUNKEN TUG OR PILOT BOAT BETWEEN BERTHS 13 AND 14. FOUR CONTAINER CRANES ARE TOPPLED AND PARTIALLY SUBMERGED AT BERTHS 10, 12, 13, AND 14. TWO ADDITIONAL CRANES HAVE BEEN STRUCTURALLY CRIPPLED BY ABORTIVE ATTEMPTS AT EXPLOSIVE DESTRUCTION. THEY POSE A SERIOUS HAZARD TO PIER AND WATERBORNE ACTIVITIES.

3F. FISHING HARBOR. FINGER PIERS SHOW NO APPARENT DAMAGE. CRANE TOPPLED AND IN THE WATER AT BERTH FH1. ONE TUG SUNK ALONGSIDE THE WESTERN FINGER PIER.

3G. LIVESTOCK AND REFRIGERATED CARGO PIERS. PIERS AT BERTHS 15 AND 16 ARE EXTENSIVELY FIRE-DAMAGED. ONE CRANE TOPPLED AND IN THE WATER AT BERTH 17.

3H. SHIP BUILDING AND REPAIR YARD. MINIMAL DAMAGE APPARENT TO PIERS AND FLOATING DRY DOCK. DREDGE AT NORTHERN JETTY APPEARS TO BE BUOYANT BUT GROUNDED ALONG ONE SIDE.

3J. AIDS TO NAVIGATION. CHANNEL MARKERS APPEAR TO BE UNDAMAGED AND IN POSITION.

3I. THE WATER IN THE INNER HARBOR BASIN AND BERTHS WAS ALMOST ENTIRELY FREE OF OIL. OPERATIONAL IMPACT SHOULD BE MINIMAL.

4. ASSESSMENT.

4A. IVO THE EXTENSIVE PIER DAMAGE REPORTED PARA 3, THERE ARE LIMITED OPTIONS TO READILY RESTORE PORT OPERATIONS WITHOUT SIGNIFICANT FACILITIES RECONSTRUCTION. IT APPEARS HOWEVER, THAT THE CONDITION OF THE CONTAINER HANDLING PIERS (BERTHS 8 THROUGH 14) COULD SUPPORT SOME CARGO THROUGHPUT FOR HUMANITARIAN AND COMMERCIAL SHIPPING IN THE NEAR-TERM. MOBILE PIER CRANES COULD BE USED FOR CARGO ON/OFF LOAD UNTIL DAMAGED PORT CONTAINER CRANES ARE REPLACED OR REPAIRED.

4B. INTENTIONS REPORTED REF. B, LIMITS THE EXTENT OF SALVAGE OPERATIONS TO THE "MINIMUM WORK" REQUIRED TO OPEN THE PORT. ACCORDINGLY, THE SCOPE OF SALVAGE OPERATIONS SHOULD BE FOCUSED ON OPENING THE CONTAINER BERTHS. THE SCOPE OF THIS MISSION WOULD INCLUDE THE REMOVAL OF SIX CRANES, THE RAISING/REMOVAL OF THREE KNOWN SUNKEN VESSELS IN THE MAIN CHANNEL (POSSIBLY MORE) AND THE PATCHING AND DEWATERING OF THE VESSEL CALLED THE "HILAL CEMENT." THIS LATTER PROJECT IS NECESSARY TO PRECLUDE IT FROM SINKING, TURNING OVER AND BLOCKING THE MAIN TURNING BASIN. UPON COMPLETION OF THIS MISSION, CLEARANCE OF THE HARBOR ENTRANCE, THE INNER BASIN AND BERTHS 6 THROUGH 14 WOULD HAVE BEEN ACCOMPLISHED.

5. ASSUMPTIONS.

5A. TASKING, AUTHORITY AND FUNDING TO CONDUCT THE OPERATION. THE ORIGINAL SCOPE OF TASKING FOR PORT RECOVERY WAS FOR ASSESSMENT OF SPECIFIED PORTS. THIS SCOPE HAS EXPANDED SIGNIFICANTLY AND HAS RAISED CONCERNS REGARDING THE REQUIREMENT OF USN INVOLVEMENT, TASKING AND THE FUNDING TO SUPPORT OPERATIONS; REF. C REFERS. REGARDLESS OF WHICH OPTION INVOLVING USN FORCES IS ADOPTED, THE TASKING MUST BE SPECIFIED AND RESOURCE COMMITMENT ASSURED.

5B. SCALED DOWN SHORE SIDE LOGISTIC AND SECURITY SUPPORT WOULD BE PROVIDED TO SUPPORT SALVAGE OPERATIONS AS A CONTINUATION OF THE ARCENT/301 ST AREA SUPPORT GROUP OR ALTERNATIVE INFRASTRUCTURE SUPPORTING THE EOD HARBOR AND CHANNEL CLEARANCE OPERATIONS. THE SUBTEC 1, CURRENTLY ON THREE MONTH CHARTER UNTIL 10 MAY 1991, WOULD BE USED FOR BERTHING AND MESSING OF MDSU PERSONNEL, AS WELL AS A WORK/CRANE (150 TON) BARGE TO SUPPORT OPERATIONS.

5C. THE OFF SHORE SUPPORT BARGE, SUBTEC 1, IS PRESENTLY UNDER USN CHARTER THROUGH 10 MAY 91 AND WOULD BE BROUGHT IN TO ASH SHUWAIKH HARBOR ONCE CLEARED ACCESS IS ASSURED. THE DAILY RATE IN SHARJA IS $7300/DAY; A REVISED DAILY RATE IS BEING NEGOTIATED NOW THAT THE WAR ZONE CHARTER RATES HAVE BEEN SUSPENDED.

5C1. THIS VESSEL AFFORDS BERTHING AND ACCOMMODATIONS FOR 70 PERSONNEL, HAS A VERTREP CAPABILITY, CRANE, STORAGE FOR ALL ESSM AND DIVING EQUIPMENT, A COMMERCIAL RECOMPRESSION CHAMBER WHICH CAN BE USED IN EMERGENCIES, WORK SHOP AND OFFICE SPACE, SALVAGE AIR SYSTEM AND HF/VHF COMMUNICATIONS. THE NAVSEA INMARSAT WOULD BE INSTALLED ONBOARD TO SUPPORT OPERATIONS.

5D. USS BEAUFORT WILL BE NOT BE AVAILABLE TO SUPPORT SUBJECT OPERATIONS FOR THE NEXT 4 WEEKS DUE TO CURRENT HELO AND TLAM RECOVERY/DEMOLITION OPERATIONS. HER SUBSEQUENT AVAILABILITY MAY BE IMPACTED BY PLANNED REDEPLOYMENT O/A 13 MAY 1991. REQUEST FOR CONTACT RELIEF MUST SPECIFY THAT AN ARS-50/ARS-38/ATS-1 CLASS SALVAGE VESSEL MUST BE DESIGNATED TO RELIEVE BEAUFORT; AN ATF (CURRENTLY DEPLOYED IN THE MED) WILL NOT PROVIDE THE NECESSARY ORGANIC CAPABILITY TO SUPPORT PORT CLEARANCE OPERATIONS.

5E. DEPLOYMENT OF 32 USN DIVING AND SALVAGE PERSONNEL (4 OFFICERS AND 28 ENLISTED) FROM MOBILE DIVING AND SALVAGE UNITS (MDSU) ONE AND TWO WILL BE REQUIRED TO SUPPORT OPS AND PROVIDE CTF 151 STAFF REPRESENTATION.

5E1. ASIDE FROM USS BEAUFORT, THERE ARE ONLY TWO USN DIVING AND SALVAGE PERSONNEL AVAILABLE IN THEATER TO SUPPORT SUBJ OPS.

5E3. REF D REQUESTED A WAIVER FROM CNO/NAVSEA (OP23/00C) FOR NAVY PERSONNEL TO DIVE US ARMY DIVING EQUIPMENT. ALTHOUGH REF D ASSUMED CONCURRENCE IN THE WAIVER REQUESTED, OWING TO THE FACT THAT ARMY AND NAVY DIVERS TRAIN AT THE SAME NAVY FACILITY AND THE EQUIPMENT ARE ALMOST IDENTICAL, NO FORMAL RESPONSE HAS BEEN RECEIVED; INFORMAL PHONCON HAS INDICATED THAT APPROVAL WILL NOT BE FORTHCOMING. THIS WILL PRECLUDE NAVY PERSONNEL, IN CHARGE OF OPERATIONS, FROM DIVING POSING AND UNTENABLE RESTRICTION IN THE SCOPE OF THE PROPOSED OPERATIONS.

5E4. MDSU PERSONNEL REQUESTED WILL PROVIDE TWO DETACHMENTS OF 14-15 PERSONNEL EACH TO SUPPORT DIVING AND SALVAGE TASKINGS. THE NUMBERS OF PERSONNEL ARE DRIVEN BY THE MINIMUM NUMBER OF PERSONNEL REQUIRED TO MAN A SURFACE SUPPLIED DIVING OPERATION - 13. THEY WOULD DEPLOY WITH ONLY THEIR ORGANIC SURFACE SUPPLIED/SCUBA DIVING EQUIPMENT; NO SALVAGE MACHINERY WOULD BE DEPLOYED AS IT ALREADY IS IN THE ESSM INVENTORY PRESENTLY STAGED IN SHARJAH, U.A.E.

5E5. THE MDSU PERSONNEL HAVE BEEN ON STANDBY TO DEPLOY ISO OF DESERT SHIELD/STORM CONTINGENCIES.

5F. WHILE SOME SALVAGE WORK CAN BE DONE CONCURRENTLY WITH EOD CLEARANCE OPERATIONS, SALVAGE DIVING AND BOAT OPERATIONS WILL BE RESTRICTED. EXCEPT FOR SOME PRELIMINARY DIVING SURVEYS OF THE CRANES AND SUNKEN SHIPS WHICH CAN BE DONE FROM THE SHORE, SALVAGE OPERATIONS CANNOT BEGIN UNTIL COMPLETION OF THE EOD CLEARANCE MISSION.

5G. THE AVAILABILITY OF CONTRACT ASSETS TO SUPPORT SALVAGE OPERATIONS WILL BE IMPACTED BY THE POST-HOSTILITY RESURGENCE OF COMMERCIAL OFFSHORE ACTIVITY. SUBJECT TO AVAILABILITY, IT MAY REQUIRE THREE TO FOUR WEEKS TO MOBILIZE COMMERCIAL ASSETS ON SCENE.

5H. IVO OF THE DAMAGE INFLICTED TO PIERS AND FACILITIES AS WELL AS THE OBSERVABLE CONDITIONS SOME OF THE SHIPPING, IT SHOULD BE ASSUMED THAT THE SUNKEN SHIPPING IS BADLY DAMAGED. THIS, AS WELL AS THE DEPTH OF THE WATER, LIMITS THE REMOVAL OPTIONS TO RESTORE BUOYANCY/LIFT AND DICTATES THE NEED FOR A HEAVY LIFT CAPABILITY. THIS ASSUMPTION IS JUSTIFIED HISTORICALLY, IN SIMILAR OPERATIONAL CIRCUMSTANCES, IN TERMS OF EXPEDIENCE, SAFETY AND MINIMIZATION OF THE OVERALL COSTS OF THE OPERATIONS.

5I. MORE OBSTRUCTIONS OR SUNKEN SHIPPING MAY BE DISCOVERED ONCE EOD/MCM SURVEY AND CLEARANCE OPERATIONS BEGIN.

6. SALVAGE METHODOLOGIES, CAPABILITIES AND COST/TIME ESTIMATES.

6A. THE FOLLOWING IS PROVIDED TO ENHANCE UNDERSTANDING OF THE OPERATIONAL PLANNING, CONTINGENCIES AND EXECUTION. THE COSTS WHICH ARE REPORTED ARE BASED ON RECENT CONTRACTUAL EXPERIENCE FOR WAR ZONE OPERATIONS. ALTHOUGH THE WAR ZONE HAS BEEN REDUCED, THE AREAS IN WHICH WE WOULD BE OPERATING WOULD MOST PROBABLY STILL BE QUOTED FOR WAR ZONE RATES. THE COSTS AND TIME ESTIMATES PRESENTED HEREIN ARE REASONABLE AND BASED UPON RECENT OFF-SHORE MARKET DATA AND EXTENSIVE OPERATIONAL EXPERIENCE. THEY ARE NONETHELESS ESTIMATES AND SHOULD NOT BE CONSIDERED ABSOLUTE.

6B. RAISING VESSELS WHICH ARE TOTALLY SUBMERGED CAN BE ACCOMPLISHED BY ONE OR A COMBINATION OF TWO METHODS. THE FIRST METHOD ENDEAVORS TO GAIN BUOYANCY (LIFT) BY DEWATERING SELECTED COMPARTMENTS BY PUMPING OR INJECTING COMPRESSED AIR. THIS METHOD REQUIRES THAT THE AIR/WATER TIGHT INTEGRITY OF COMPARTMENT BE ACHIEVED THROUGH UNDERWATER REPAIRS. THIS PROCESS IS GENERALLY A LONG PROCESS, SUBJECT TO SETBACKS AND HAS THE POTENTIAL TO IMPOSE MORE DAMAGE FROM OVER-PRESSURIZATION AND IS NOT THE METHOD OF CHOICE FOR BADLY DAMAGED SHIPS. LIFTING THE VESSEL WITH A CRANE/DERRICK OF SUITABLE CAPACITY AFFORDS A DEGREE OF CERTAINTY IN TIME PLANNING, RISK MANAGEMENT AND FLEXIBILITY IN THE DISPOSAL/REMOVAL OPTIONS. EXAMPLES OF THIS TYPE OF SALVAGE ARE DOCUMENTED IN THE BOOK "MUD, MUSCLE AND MIRACLES BY CAPT C.A. BARTHOLOMEW: THE SALVAGE OF THE COAST GUARD CUTTERS "CUYAHOGA" AND "BLACKTHORN" ARE PERTINENT EXAMPLES REPORTED THEREIN.

6C. USS BEAUFORT - IS THE MOST CAPABLE CLASS OF SALVAGE SHIP IN THE US NAVY, AFFORDING AN OPTIMAL MIX OF DIVING AND SALVAGE CAPABILITY, COMMAND AND CONTROL AND OPERATIONAL SUPPORT. THE DIVING CAPABILITY INCLUDES SCUBA AND SURFACE SUPPLIED (AIR - 190 FSW LIMIT AND HELIUM/OXYGEN - 300 FSW LIMIT). SHE CARRIES AN INVENTORY OF EMERGENCY SHIP SALVAGE MATERIAL (ESSM) EQUIPMENT AS WELL AS DEMOLITIONS. WITH SPECIFIC REGARD TO LIFTING, SHE POSSESSES A 10 TON CRANE FORWARD FOR CARGO HANDLING AND A 20 TON CRANE AFT FOR MINOR SALVAGE (AIRCRAFT) LIFTING. SHE ALSO HAS THE CAPABILITY TO MAKE TIDAL/DYNAMIC LIFTS OF 120 TONS (NOMINAL) OVER THE BOW ROLLERS. THIS CAPABILITY ONLY CLEARS OBJECTS OFF OF THE BOTTOM BUT NOT CLEAR OF THE WATER. IN A HARBOR CLEARANCE ROLE SHE CAN PROVIDE FABRICATION/REPAIR SUPPORT, DIVING SUPPORT AND SOME AUGMENTATION OF CONTRACT ASSETS AND CAN CONDUCT SOME SALVAGE LIFTING WITHIN THE LIMITS OF HER CAPABILITIES AND DEPENDING ON THE CONDITION OF THE SUNKEN VESSEL.

6C1. AS A COMPARISON, AN ATF (FLEET TUG) HAS ONLY AN 8-10 TON CARGO BOOM. IT IS NOT DESIGNED FOR SALVAGE LIFTING. SHE HAS NO OTHER LIFTING CAPABILITY AND IS OTHERWISE LIMITED IN HER DIVING AND SALVAGE CAPABILITY. AN ARS-38 CLASS SHIP HAS A 10 TON CARGO BOOM AFT AND A 20 TON CARGO BOOM FORWARD; A COMPLETE SURFACE SUPPLIED AIR DIVING CAPABILITY, RECOMPRESSION CHAMBER AND AN INVENTORY SALVAGE MATERIALS ONBOARD. SHE ALSO POSSESSES THE SAME TIDAL/DYNAMIC LIFT OVER THE BOW ROLLERS AS AN ATS. THE ARS-50 CLASS SALVAGE SHIP HAS A FORTY TON CARGO AND SALVAGE BOOM AFT AND IS ELSEWISE ALMOST AN EQUAL CAPABILITY REPLACEMENT FOR THE ATS/BEAUFORT. ONLY AN ATS HAS A MIXED GAS (HELIUM-OXYGEN) DIVING CAPABILITY FOR DIVING OPERATIONS BETWEEN 190-300 FSW.

6D. A HEAVY LIFT BARGE CAN BE RIGGED AS A SHEER LEG DERRICK OR A LARGE RING MOUNTED (VICE CRAWLER) CRANE. HEAVY LIFT REFERS TO A CAPACITY IN EXCESS OF 500 TONS BUT MORE GENERALLY IN THE 1000 TO 2000 TON RANGE. SOME ARE SELF-PROPELLED FOR MOVEMENT AROUND HARBORS; OTHERS REQUIRE TOWING VESSELS FOR TRANSIT AND HARBOR MOVEMENT. LIFTING IS USUALLY DONE USING SUITABLY SIZED CHAIN BRIDLES. THIS IS A PREFERRED METHOD BECAUSE IT HAS THE HIGHEST DEGREE OF OPERATIONAL CERTAINTY AND SAFETY. WOVEN-WIRE LIFTING SLINGS OR BANDS CAN ALSO BE USED FOR SPECIAL LIFTS. REEVING THE CHAINS OR LIFTING SLINGS UNDER A SUNKEN VESSEL IS DONE BY POSITIONING A SMALLER "MESSENGER" WIRE UNDER THE VESSEL WHICH IS THEN TAKEN TO POWER OR A CRANE HOOK TO PULL THE HEAVIER LIFTING BRIDLE INTO PLACE. MESSENGER WIRES CAN SOMETIMES BE "SWEPT" INTO POSITION; OTHER CIRCUMSTANCES MAY REQUIRE THAT A DIVER USING A WASHOUT NOZZLE AND FIRE HOSE, TUNNEL UNDER THE VESSEL TO BRING MESSENGER INTO POSITION. THIS LATTER PROCEDURE IS A MORE COMPLEX AND TIME CONSUMING OPERATION.

6E. THE DAILY CHARTER COST OF HEAVY LIFT CRANES CAN VARY CONSIDERABLY. IN THE RECENT PAST, A 600 TON CRANE BARGE WAS QUOTED AT $1000,000 PER DAY; WHILE A 1000 TON SHEER LEG DERRICK WAS QUOTED AT $12,500 PER DAY. A CHARTER TUG WAS REQUIRED FOR BOTH AT $3000 PER DAY. THE COST OF TRANSIT DAYS IN MOBILIZATION/DEMOBILIZATION - "PORTAL TO PORTAL" - MUST GENERALLY BE FACTORED INTO DETERMINING OVERALL COST. THERE ARE FREQUENTLY OPPORTUNITIES TO SAVE ON MOB/DEMOB COSTS WHICH CAN BE EXPLOITED ON A CASE BY CASE BASIS.

6E1. SUCH AN OPPORTUNITY EXISTS IN THAT THE DUTCH GOVERNMENT HAS EXPRESSED A WILLINGNESS TO FUND OR DEFRAY THE MOB/DEMOB AND PERHAPS THE OPERATING COSTS OF A DUTCH COMMERCIAL SALVAGE LIFTING DERRICK. THIS WOULD REQUIRE EXPLOITATION BY CTF '51/USNAVCENT/USCINCENT REPRESENTATION TO THE EMBASSY/STATE DEPARTMENT. NAVSEASYSCOM CURRENTLY HAS A WORLD WIDE SALVAGE CONTRACTUAL AGREEMENT WITH SMIT-TAK INTL FOR THIS REGION. NAVSEA CAN PROVIDE CONTRACT MANAGEMENT SUPPORT FOR HARBOR CLEARANCE OPERATIONS; AS THEY HAVE DONE FOR CONTRACT SALVAGE SUPPORT TO DATE.

6E2. MR JIM BLADH, NAVSEA (CODE 00C), HAS BEEN WORKING WITH THE DUTCH GOVT. AND HAS FACILITATED THE CONTRIBUTION OF OVER $2 MILLION TO THE DESERT SHIELD/STORM SALVAGE FUNDING. NAVSEA ASSISTANCE IN THIS REGARD COULD BE FORMALLY REQUESTED THROUGH CINCENT.

6E3. LCDR COOK, CMEF REP. TO THE US EMBASSY, HAS INDICATED THAT REPRESENTATION FOR KUWAITI FUNDING TO SUPPORT THE ASH SHUWAIKH SALVAGE CLEARANCE CAN BE MADE THROUGH THE EMBASSY AND KUWAITI MINISTER OF COMMUNICATIONS.

6F. WORKING/CRANE. A WORKING CRANE BARGE IS A FUNDAMENTAL ELEMENT IN HARBOR CLEARANCE OPERATIONS, ESPECIALLY IN CONJUNCTION A HEAVY LIFT CRANE/DERRICK, IN THAT IT AFFORDS A STABLE WORKING PLATFORM FROM WHICH TO CONDUCT SURVEY, PRE-RIGGING OF HEAVY LIFTING CHAINS/WIRES, OPERATING MACHINERY AND A MEANS OF REMOVING SALVAGED SHIPPING AND OBJECTS ONCE LIFTED. THE SUBTEC 1 FULFILLS THIS REQUIREMENT. IF THE SUBTEC IS NOT RETAINED ON CHARTER, THEN A BARGE AND CRANE CAN BE CONTRACTED FOR ABOUT $3000 PER DAY.

6G. OFF SHORE SUPPLY VESSEL. THIS WILL BE REQUIRED TO TRANSPORT ESSM AND DIVING EQUIPMENT TO THE SITE, OPERATE AS A SEPARATE DIVING SUPPORT PLATFORM TO PERMIT CONCURRENCY IN PROGRESSING THE CLEARANCE AND LIFTING OPERATIONS, AND PROVIDE ACCOMMODATIONS FOR SOME OF THE MDSU PERSONNEL IF THE SUBTEC 1 IS NOT RETAINED. IT ALSO CAN BE USED AS A TUG TO MOVE BARGES AROUND THE HARBOR. CURRENT CONTRACT RATES ARE APPROX. $4000 PER DAY.

6H. EMERGENCY SHIP SALVAGE MATERIAL (ESSM). NAVSEASYSCOM (CODE 00C), OFFICE OF THE SUPERVISOR OF SALVAGE MAINTAINS AN EXTENSIVE INVENTORY OF SALVAGE SUPPORT MATERIAL FOR WORLD WIDE DEPLOYMENT . THIS EQUIPMENT INCLUDES PUMPS, SALVAGE AND DIVING AIR COMPRESSORS, WELDERS, GENERATORS, HYDRAULIC POWER UNITS AND DEVICES, WIRES AND ANCHORS. THERE IS PRESENTLY A BROAD SELECTION OF EQUIPMENT WAREHOUSED IN SHARJAH, UAE. IT HAS BEEN PREPOSITIONED TO SUPPORT SHIP BATTLE DAMAGE REPAIR AND HARBOR CLEARANCE CONTINGENCIES IN THE NAVCENT AOR. SOME EQUIPMENT HAS BEEN REDEPLOYED, HOWEVER A SELECTION TO SUPPORT PORT SALVAGE CLEARANCE HAS BEEN RETAINED AND WILL BE LOADED IN THE SUBTEC 1.

6I. UNDERWATER CUTTING. DIVERS CAN GENERALLY ACCOMPLISH UNDERWATER CUTTING OF STRUCTURAL STEEL BY MEANS OF EXPLOSIVES, OXY-ARC ELECTRIC CUTTING OR THERMITE CUTTING MATERIALS (KERI CABLE). WHILE THE EXPLOSIVES ARE QUICK, THEY ARE RESTRICTED IN THEIR APPLICATIONS WHERE SYMPATHETIC DAMAGE MAY RESULT. OXY-ARC IS VERY TIME INTENSIVE AND MODERATELY EXPENSIVE. THERMITE CUTTING IS FASTER THAN OXY-ARC BUT IS SIGNIFICANTLY MORE EXPENSIVE. KERI CABLE COSTS ABOUT $80 PER FOOT AND IT CAN REQUIRE AS MUCH AS 100 FEET OF MATERIAL TO CUT A MODERATE SIZED STRUCTURAL BEAM (SUCH AS A CRANE LEG). CUTTING WRECKS OR STRUCTURAL MEMBERS CAN ALSO BE DONE USING A CHAIN BRIDLE RIGGED BETWEEN THE TWO MAIN HOOKS OF A HEAVY LIFT DERRICK. BY SEQUENTIALLY HEAVING AROUND ON ONE HOOK AND SLACKING THE OTHER, THIS SAWING ACTION CAN MAKE EXPEDIENT WORK OF SHIP CUTTING PROJECTS.

6J. ASSUMING NO DELAYS DUE TO WEATHER, EXPECTED SETBACKS AND CONFLICT WITH OTHER OPERATIONS, TIME ESTIMATES FOR WRECK AND CRANE REMOVAL CAN VARY SIGNIFICANTLY BY THE TECHNIQUE EMPLOYED, THE SIZE AND CONDITION OF THE OBJECTIVE AND THE CAPABILITY OF THE ASSET EMPLOYED. THE FOLLOWING ARE PROVIDED TO ENHANCE THE CONCEPTUAL UNDERSTANDING AND APPRECIATION OF ALCON REGARDING THE TASKS DISCUSSED AND THE OPTIONS PUT FORTH IN PARA 8; THEY SHOULD NOT BE VIEWED AS ABSOLUTE. ONLY WHEN SURVEYS ARE CONDUCTED AND SPECIFIC PLANS ARE FORMULATED CAN TIME REQUIREMENTS CAN BE REASONABLY ESTIMATED.

6J1. THE REMOVAL OF A CRANE. WITH A HEAVY LIFT ASSET, A CRANE CAN BE RIGGED AND LIFTED CLEAR OF THE WATER AND PLACED ON THE PIER IN ONE TO TWO DAYS. UNDERWATER CUTTING IS MINIMAL; ONLY TO FREE THE LIFT OF DANGLING ENCUMBRANCES. USING SAY, A 20 TON CRANE WOULD REQUIRE SECTIONING THE WRECKED CRANE INTO MULTIPLE SECTIONS WITHIN THE WEIGHT AND REACH LIMITATION OF THE LIFTING CRANE. THE CUTTING OF EACH SECTION COULD REQUIRE AS MUCH AS THREE DAYS. THE WEIGHT OF THE MAIN BODY OF THE CRANE EXCEEDS 20 TONS; OWING TO THE STRUCTURAL COMPLEXITY OF THIS CONSTRUCTION, SECTIONING THE MAIN BODY COULD EASILY REQUIRE AS MUCH AS FIVE DAYS. IN SUMMARY, A HEAVY LIFT ASSET REDUCES THE TIME REQUIREMENT BY A FACTOR OF FIVE TO SEVEN, IS THE MOST COST EFFECTIVE OPTION AND IS THE SAFEST OPERATION IN THAT IT LIMITS CUTTING OPERATIONS.

6J2. THE REMOVAL OF A SUNKEN SHIP. CONCEPTUAL COMPARISON OF THIS OPERATION IS EXTREMELY DIFFICULT BECAUSE THERE ARE SO MANY VAGARIES WHICH CAN BEFALL A PLAN WHICH REQUIRES THE RESTORATION OF SOME DEGREE OF BUOYANT LIFT TO SUCCEED. USING A HEAVY LIFT ASSET WHOSE LIFT CAPACITY EXCEEDS THE DISPLACEMENT OF SUNKEN IS STRAIGHT-FORWARD. FIRST THE SLINGS MUST BE POSITIONED UNDER THE SHIP AND THEN THE SHIP MUST BE LIFTED. THE LARGEST SUCH PROJECT IN ASH SHUWAIKH HARBOR APPEARS TO BE THE OFF SHORE SUPPLY BOAT AT THE ENTRANCE TO PIER 9. USING A HEAVY LIFT DERRICK, THIS SHIP COULD BE RAISED AND REMOVED IN A 3 TO 7 DAY TIMEFRAME. USING A LIFT ASSET WHICH CAN ONLY PARTIALLY LIFT ONE END OF THE SHIP TO THE SURFACE AND REQUIRING THE REMAINDER OF THE BUOYANCY TO BE ACHIEVED BY DEWATERING COMPARTMENTS COULD RUN SEVERAL WEEKS, IF SUCCESSFUL AT ALL.

6K. OFFICE OF THE SUPERVISOR OF SALVAGE, COMNAVSEASYSCOM (00C) CAN PROVIDE LOGISTIC, TECHNICAL/ENGINEERING AND CONTRACTUAL MANAGEMENT SUPPORT THROUGH ORGANIC AND WORLD WIDE CONTRACT RESOURCES. INQUIRES AND SOLICITATION FOR FUNDING FROM OTHER THAN DOD/USN CAN ALSO BE FACILITATED THROUGH THIS OFFICE.

7. MISSION. TO CONDUCT SHIP SALVAGE AND HARBOR CLEARANCE OPERATIONS TO REOPEN THE CONTAINER TERMINAL AT PORT ASH SHUWAIKH, KUWAIT IN SUPPORT OF USNAVCENT/CTF 151 PORT RECOVERY.

8. COMMAND AND CONTROL/REPORTS. TO BE DETERMINED. IF A NAVY TASK GROUP IS COMMITTED TO THIS OPERATION, PROPOSE THAT A SEPARATE OPTASK/ORGANIZATION BE ESTABLISHED UNDER 151.6.

9. EXECUTION. PHASES OF CLEARANCE OPERATIONS ARE PRESENTED. ALTERNATIVES FOR THE CONDUCT OF THE OPERATIONS ARE DISCUSSED. THERE ARE MANY CONSIDERATIONS WHICH IMPACT THE SELECTION OF THE BEST ALTERNATIVE. THE ALTERNATIVES DISCUSSED ONLY FOCUSES ON THE ASPECTS OF TIME, COST EXPEDIENCE, SAFETY AND BENEFIT TO THE OPERATIONAL EXPERIENCE OF THE US NAVY SALVAGE FORCES.

9A. THERE ARE THREE PHASES FOR THE OPERATIONS PROPOSED:

- THE PATCHING AND DEWATERING OF THE "HILAL CEMENT";
- THE REMOVAL OF THE CRANES WHICH ARE IN THE WATER;
- AND THE REMOVAL OF THE THREE KNOWN, TWO POSSIBLE AND ANY OTHER SUNKEN VESSELS, DISCOVERED DURING THE EOD CLEARANCE SURVEYS, WHICH BLOCK ACCESS TO THE CONTAINER TERMINAL BERTHS.

THERE ARE CONCURRENCIES AND EFFICIENCIES WHICH CAN BE REALIZED IN PROGRESSING THESE PHASES, DEPENDING UPON THE COA ADOPTED.

9B. ALTERNATIVE ONE: NO USN INVOLVEMENT. NO COST, NO BENEFIT. LEAVE THE SALVAGE AND PORT CLEARANCE TO A COMMERCIAL CONTRACTORS.

9C. ALTERNATIVE TWO: USN PARTICIPATION LIMITED TO IN-THEATER ASSETS.

- USS BEAUFORT IS THE ONLY IN-THEATER ASSET. HER AVAILABILITY WILL BE DELAYED APPROX. 4 WEEKS UNTIL COMPLETION OF HER CURRENT TASKING; REDEPLOYMENT PLANS MAY HAVE TO BE MODIFIED TO PERMIT HER PARTICIPATION IF A RELIEF IS NOT REQUESTED AND IN THEATER.

- USS BEAUFORT IS A VERY CAPABLE SHIP AND HAS DEMONSTRATED SUPERB PROFESSIONALISM IN HER DIFFICULT TASKINGS ISO OF DESERT STORM. CLEARLY, HOWEVER, THE SCOPE OF THE MISSION IS BEYOND THE INHERENT CAPABILITY OF THE SHIP TO EXPEDIENTLY PROSECUTE; THE SUPERIOR PERFORMANCE OF THE OFFICERS AND CREW, NOTWITHSTANDING.

- DEPENDING UPON THE NATURE OF THE OPERATIONAL ORGANIZATION WHICH EVOLVES TO PERFORM THIS MISSION AND THE ABILITY OF THE TIME LINE TO ACCOMMODATE, USS BEAUFORT COULD READILY SUPPORT THE OPERATIONS IN VARIETY OF WAYS. THIS WOULD BE OF DIRECT PROFESSIONAL BENEFIT TO THE CREW, US NAVY REPRESENTATION AND THE COST WOULD BE LIMITED TO REPLACEMENT OF MATERIALS EXPENDED.

SCOPE OF OPERATIONS THIS ALTERNATIVE:

- PATCHING/DEWATERING OF THE "HILAL CEMENT"
- REMOVAL OF SIX CRANES

ESTIMATED TIME OF OPERATIONS: 6 - 9 WEEKS.

CONTRACT VESSELS IN SUPPORT OF THIS ALTERNATIVE: NONE.

ESTIMATED COST OF THIS ALTERNATIVE:

- CONSUMABLES AND EQUIPAGE REPLACEMENT FOR USS BEAUFORT.

WORK REASONABLY BEYOND THE SCOPE OF THIS ALTERNATIVE:

- RAISING THE SUNKEN VESSELS IN THE MAIN HARBOR. SOME OF THE SMALL CRAFT IN THE SMALL CRAFT BASIN MAY BE SALVAGED IF THE CONDITION OF THE HULL PERMITS.

9D. ALTERNATIVE THREE: USS BEAUFORT/RELIEF AUGMENTED BY MOBILE DIVING AND SALVAGE UNIT DETACHMENT FROM CONUS. THIS WOULD ENHANCE THE CONCURRENCY OF BEAUFORT'S PARTICIPATORY CAPABILITY AND COULD AFFORD SOME EXPANDED DIVING CAPABILITY TO CONDUCT DIVING OPERATIONS AWAY FROM THE SHIP. THE BENEFITS WOULD EXPAND TO INCLUDE THE MDSU PARTICIPANTS AND THE COSTS WOULD INCREASE TO REFLECT THE MOB/DEMOB AND REPLACEMENT OF MATERIALS CONSUMED BY SALVAGE REPRESENTATION.

SCOPE OF OPERATIONS THIS ALTERNATIVE:

- PATCHING/DEWATERING OF THE "HILAL CEMENT"
- REMOVAL OF SIX CRANES

ESTIMATED TIME OF OPERATIONS: 4 - 6 WEEKS

CONTRACT VESSELS IN SUPPORT OF THIS ALTERNATIVE:

- SUBTEC 1 AND TUG FOR TRANSIT AND MOVEMENT AROUND HARBOR.

ESTIMATED COST OF THIS ALTERNATIVE:

- $672,000

WORK REASONABLY BEYOND THE SCOPE OF THIS ALTERNATIVE:

- RAISING THE OFF SHORE SUPPLY VESSEL SUNK AT BERTH NINE AND ANY OTHER VESSELS IN EXCESS OF 150 TON DISPLACEMENT.

9E. ALTERNATIVE FOUR: USS BEAUFORT/RELIEF AUGMENTED BY A MDSU DET AND COMMERCIAL CONTRACT ASSETS. THERE ARE VARYING DEGREES OF CONTRACT ASSET SUPPORT WHICH WOULD ENHANCE USS BEAUFORT/MDSU/CTF 151 ABILITY TO PARTICIPATE/CONTROL THE OPERATIONS.

- SUPPORTING THE ACCOMPLISHMENT AND CONTROL OF THE FULL SCOPE OF THE MISSION WOULD REQUIRE THE FOLLOWING: THE DEPLOYMENT OF A 32 MAN MDSU DET; CONTRACTING FOR A HEAVY LIFT CRANE/DERRICK AND TUG, A WORKING CRANE BARGE AND AN OFF SHORE SUPPLY VESSEL.

- IT IS ESTIMATED THAT THE KNOWN SCOPE OF THE MISSION COULD BE ACCOMPLISHED IN THREE TO FIVE WEEKS. THE ESTIMATED CONTRACT ASSET COST FOR THIS OPERATIONS AND TIMEFRAME WOULD BE ON THE ORDER OF $1.5 TO $2 MILLION DOLLARS. THIS A REASONABLE ESTIMATE. AN EXACT ESTIMATE IS NOT POSSIBLE AT THIS TIME.

- WITHOUT SPECIFIC TASKING, THIS IS BEYOND THE SCOPE OF CURRENT USN/DOD FINANCIAL RESOURCES AND FINANCIAL SUPPORT WOULD HAVE TO BE SECURED FROM OUTSIDE SOURCES. NONETHELESS, THE EXPERIENCE GAINED BY NAVY SALVAGE FORCES WOULD BENEFIT THE NAVAL SERVICE FOR YEARS TO COME. AS WITH IN VIETNAM AND THE SUEZ CANAL CLEARANCE OPERATIONS, THE PARTICIPANTS IN SALVAGE OPERATIONS INCIDENT TO THOSE HOSTILITIES WERE THE TEACHERS AND CADRE OF EXPERTISE FOR THE PAST FIFTEEN YEARS. THIS MISSION HAS THE SAME POTENTIAL BENEFIT.

SCOPE OF OPERATIONS THIS ALTERNATIVE:

- PATCHING/DEWATERING OF THE "HILAL CEMENT"
- REMOVAL OF SIX CRANES
- RAISING THE SUNKEN VESSELSESTIMATED TIME OF OPERATIONS: 3 - 5 WEEKS.

CONTRACT VESSELS IN SUPPORT OF THIS ALTERNATIVE:

- HEAVY LIFT DERRICK - SMIT CYCLONE / TUG FOR TRANSITS
- SUBTEC 1 - CRANE BARGE/ACCOMMODATIONS
- BIG ORANGE 7: OFF SHORE SUPPLY VESSEL/TUG DIVING VESSEL

ESTIMATED COST OF THIS ALTERNATIVE:

- $1.5 - 2.0 MILLION

WORK REASONABLY BEYOND THE SCOPE OF THIS ALTERNATIVE: NONE.

10. RECOMMENDATIONS.

10A. SEEK ALTERNATIVES FOR THE FUNDING TO SUPPORT ALTERNATIVE FOUR. THERE ARE OPPORTUNITIES FOR JOINT-VENTURE OPERATIONS WITH THE DUTCH GOVERNMENT AND POTENTIALLY WITH THE GOVERNMENT OF KUWAIT.

10B. FAILING THAT, ALTERNATIVES THREE, THEN TWO SHOULD BE PURSUED. PARTICIPATION, HOWEVER SLIGHT, IS BETTER THAN NOTHING AT ALL!

11. REQUEST CONCURRENCE AND GUIDANCE AS TO COA. IF THE SUBTEC 1 ASSET WILL NOT BE REQUIRED TO SUPPORT THE SCOPE OF USN INVOLVEMENT IN THIS MISSION, INTEND TO NEGOTIATE TERMINATION OF THE CONTRACT.

APPENDIX B

COMBAT SALVAGE ASSESSMENT OF USS PRINCETON (CG 59)

On February 18, 1991, the USS PRINCETON (CG 59) detonated two submerged mines, while on station in support of Operation DESERT STORM in the North Arabian Gulf. The structural damage required immediate on site assessment due to its severity and its location in the hull girder of the vessel.

A salvage engineer stationed in Bahrain, at the Ship Repair Unit Detachment, was flown out to the PRINCETON after an initial salvage assessment of the condition of the USS TRIPOLI (LPH 10), who had also struck a contact mine. Utilizing the Program of Ship Salvage Engineering (*POSSE*) (Figure B-1 for capabilities), the engineer was able to accurately calculate the reduction in hull girder strength suffered by the PRINCETON and recommend the necessary course of action for both temporary and voyage repairs to the ship. This paper reviews the *POSSE* program methodology and its specific application in a real time combat damage assessment.

Director of Ocean Engineering

Program of Ship Salvage Engineering (POSSE)

- **Rapid Response Analysis -**
  Uses a Previous Coast Guard Developed Parametric Set of Equations to Estimate Stability and Strength of Standard Vessels. Uses Information Taken From Lloyds Register:
  - Length Between Perpendiculars
  - Design Speed
  - Depth
  - Beam
- **Detailed Analysis -**
  Uses a Modified Commercial Ship Design Program, with a Data Disc of Ship Offsets, Weight Distribution and Load, by Class, to Calculate Stability and Stress in Flooded and Grounded Conditions

Figure B-1. Program of Ship Salvage Engineering (POSSE).

B-1 INTRODUCTION

At 0716 on the 18th of February 1991, the USS PRINCETON (CG 59) detonated two mines almost simultaneously, while she was underway in the Northern Arabian Gulf, in support of Operation DESERT STORM. This battle damage was suffered due to Iraqi mining of the Arabian Gulf off of Kuwait, and followed closely behind a contact mine strike on the starboard bow of the USS TRIPOLI (LHA 10) at 0550 on 18 February. Immediate, on site assessment of the PRINCETON'S structural integrity was required to provide the Commanding Officer and the Task Force Commander with the means to determine what course of action to take, and the extent of repairs required to the PRINCETON. Arriving on scene by helicopter, a salvage engineer was able to assimilate the ship's own damage control reports, the diving survey results from the salvage divers on the USS BEAUFORT (ATS 2) and the results of his personal inspection. The engineer was able to gauge the loss of section modulus inflicted on the hull due to whipping of the hull girder. From this, the engineer was able to establish an accurate picture of the still water bending stress imposed by the reduced section modulus, particularly the high level of stress in the stern area, thus providing a real time, on-site structural integrity assessment.

B-2 BACKGROUND

During the build-up of forces in support of DESERT STORM, the Supervisor of Salvage, at the Naval Sea Systems Command Washington, D.C., deployed a salvage engineer versed in the recently developed salvage program, *POSSE*. The salvage engineer worked for the Commander

Service Force Sixth Fleet, Ship Repair Unit Detachment in Bahrain and was designated as the Officer in Charge for a combined rescue and assistance and damage assessment team. When the TRIPOLI and PRINCETON suffered mine damage, the team was first dispatched via helicopter to the TRIPOLI to assess her condition relative to a reported 16 foot by 20 foot hole, produced by a contact mine strike below the waterline centered at frame 18. From the Damage Control Assistant and Chief Engineer's reports, and an initial underwater survey performed by the EOD on board TRIPOLI, the ship was flooded to her third deck from frame 10 to frame 31, including the flammable stowage locker, emergency diesel room, ballast, and overflow tanks. The flooding had trimmed her by the bow, but counterflooding aft could have been used if required to correct the trim. Additionally, she was able to control her list by movement of aircraft on the flight deck. She had in excess of four feet of positive metacentric height with the flooding limited to spaces directly open to the sea. Based on TRIPOLI's stable condition and relatively small loss of section modulus, with no reported damage to the keel, the salvage engineer debriefed the Commanding Officer and prepared to board the PRINCETON.

B-3 TRIAGE/INITIAL ASSESSMENT

CAPT Paul Rinn, former Commanding Officer of USS SAMUEL B.ROBERTS, emphasized the importance of providing casualty-specific salvage assistance after a mine strike. From CAPT Rinn's recommendation, the triage decision process was clear:

Direct communications with the CO of PRINCETON was paramount. The ability to advise the CO of the Battle Damage Assessment Teams (BDAT) capabilities, specifically rescue and assistance, detailed damage and repair assessment, and the salvage engineer's ability to evaluate the ship's structural integrity. The CO of PRINCETON opted immediately for the salvage engineer's ability to evaluate the ships structural integrity. A quick flight by LAMPS III helicopter flight to the PRINCETON, placed the salvage engineer on deck approximately four hours after the mine strike.

The initial survey indicated that the Commanding Officer, CAPT Edward B. Hontz, and his crew had controlled the damage. Through their damage control efforts, they had limited damage from several factors, including whipping, minor breeches in the hull, and broken chill water piping. In fact, their quick reaction in shutting down power to the number three electrical switchboard had prevented an electrical fire; more over, their ingenuity was demonstrated by restoring control of the damaged port rudder control mechanism.

The first mine had exploded directly beneath the stern of the PRINCETON, while a second detonated 300 yards off the starboard bow. The most obvious damage was caused by whipping of the hull girder, splitting the superstructure from the quarterdeck to the 0-3 level and across the 0-3 level (Figures B-2, B-3, and B-4. However, this damage was determined to be of minor concern based on a survey of the main deck, sheer strake, and supporting grillage, combined with the results of an underwater hull survey conducted by divers from the USS BEAUFORT (ATS 2). The BEAUFORT's dive team, lead by their executive officer and master diver, provided specific data on the underwater hull condition, essential to evaluating structural integrity.

The detailed survey limited concern over the area below the worst superstructure damage. However, damage suffered at frames 380 and 472 was much more significant. By crawling the bilges, inspecting longitudinal stiffeners below the maindeck and first platform, and combining these inspections with the divers' reports, it became obvious that the area of greatest concern was the frame 472 which was cracking at the main deck. Figures B-5 through B-8 show the sequence of cracking or buckling of the deck from starboard to port. These coincide with a step down in the hull from three decks to two decks, which was a significant structural failure.

A simplified estimate for the section modulus of the PRINCETON at frame 472 was developed from:

1 – Scaled distances taken from arrangement drawings.

2 – Section drawings from station 15.

3 – A listing of inertials and distances to the neutral axis for the deck and keel of this class of cruiser.

4 – Hand measurements of thickness.

Results of the estimation process are shown in Figure B-9. This is a smoothed version of the original, done after offsets of the hull were available.

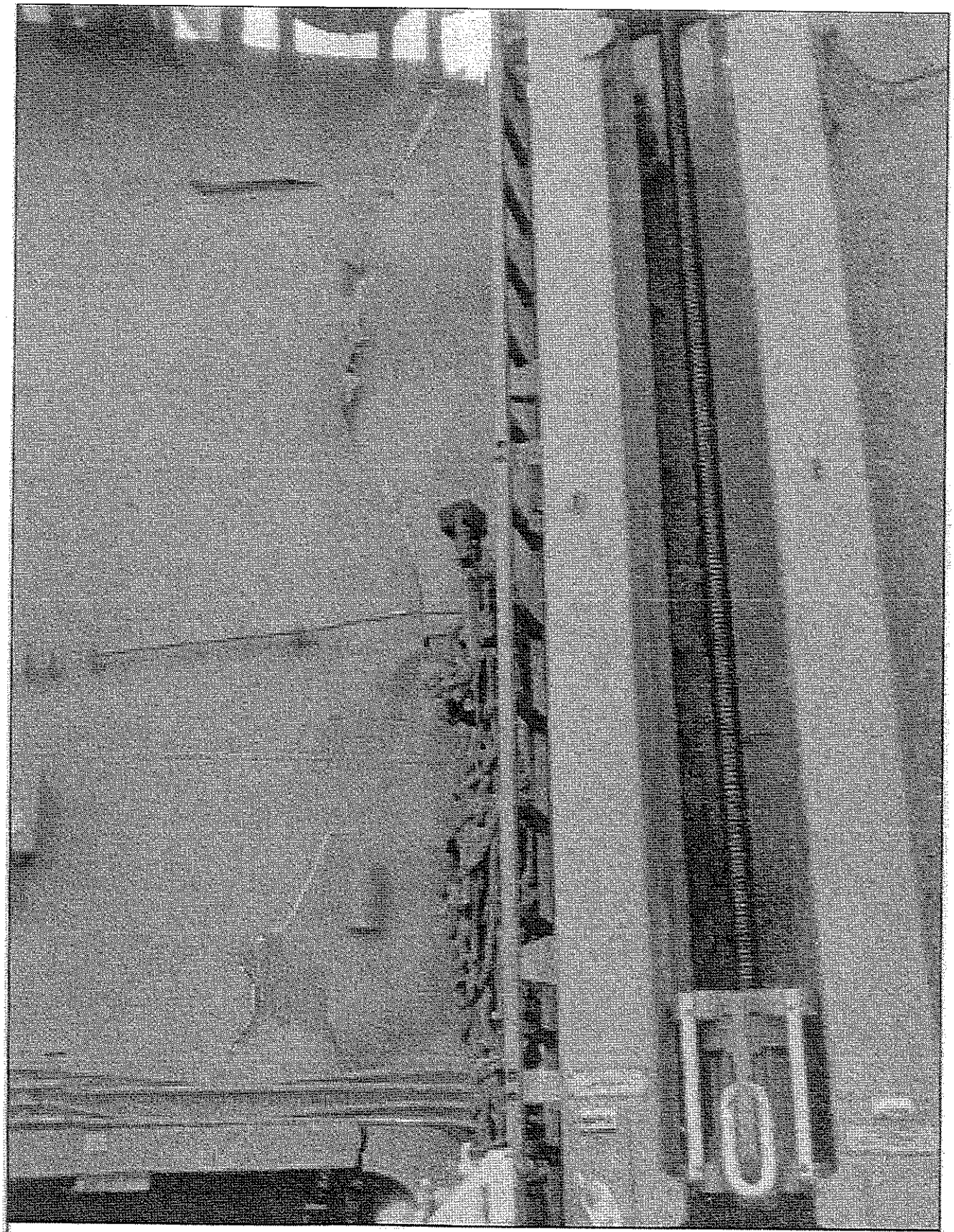


Figure B-2. Vertical Stress Cracks in the Superstructure from 01 Level 03 Level Vicinity of Frame 472.

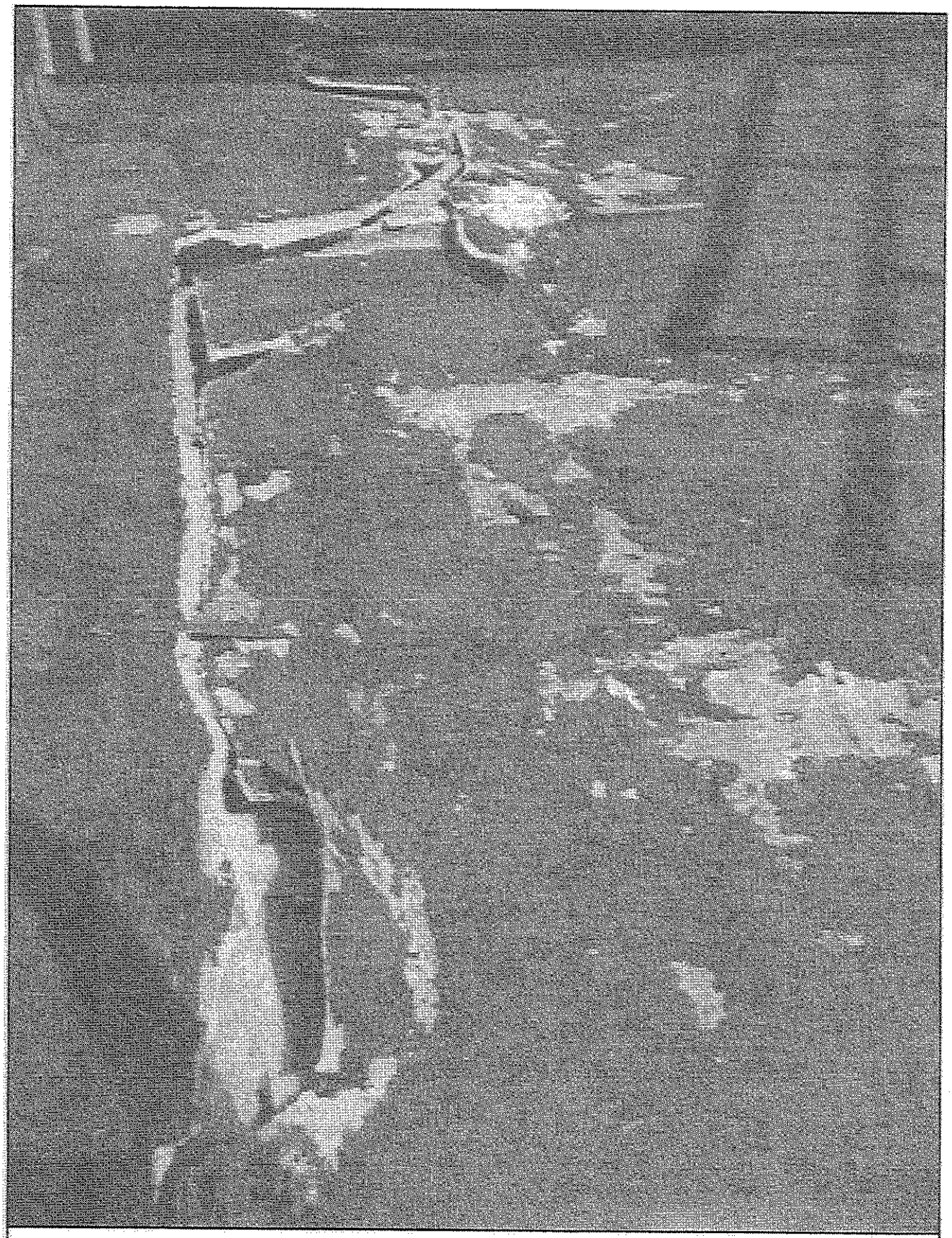


Figure B-3. Transverse Stress Cracks in the 03 Level Deck.

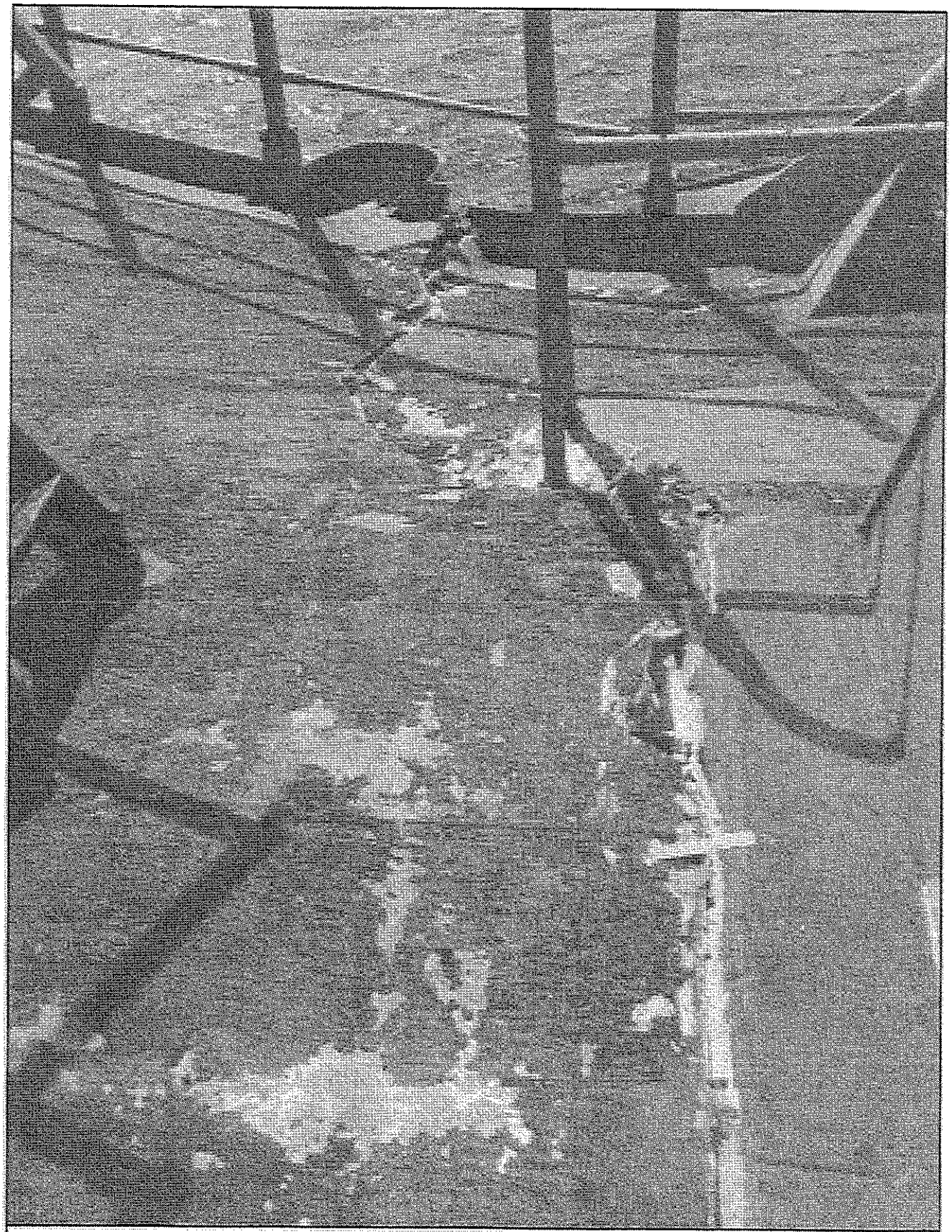


Figure B-4. Stress Crack in 03 Level Deck Surface.

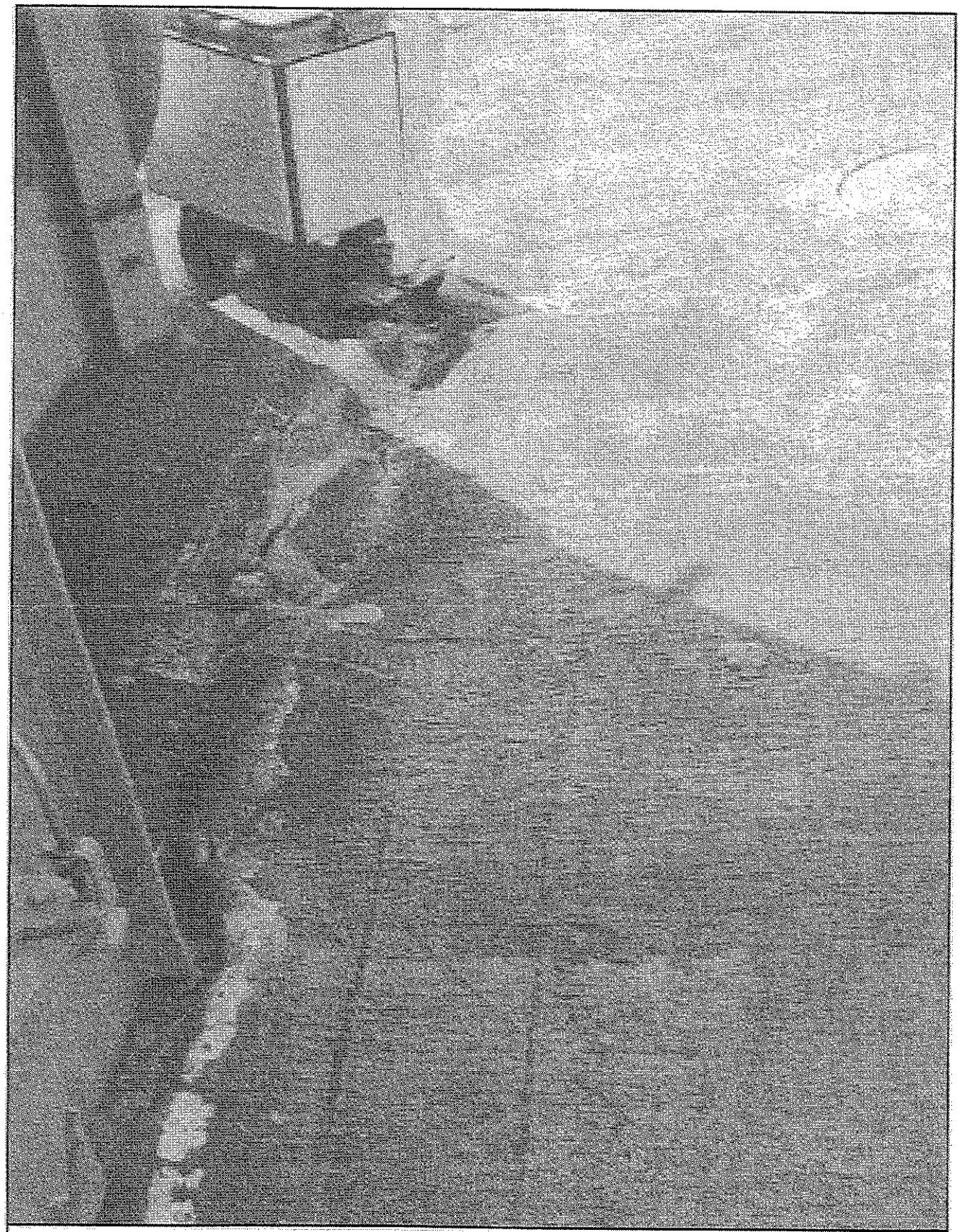


Figure B-5. Crack in Main Deck in Vicinity of Pyrotechnics Locker.

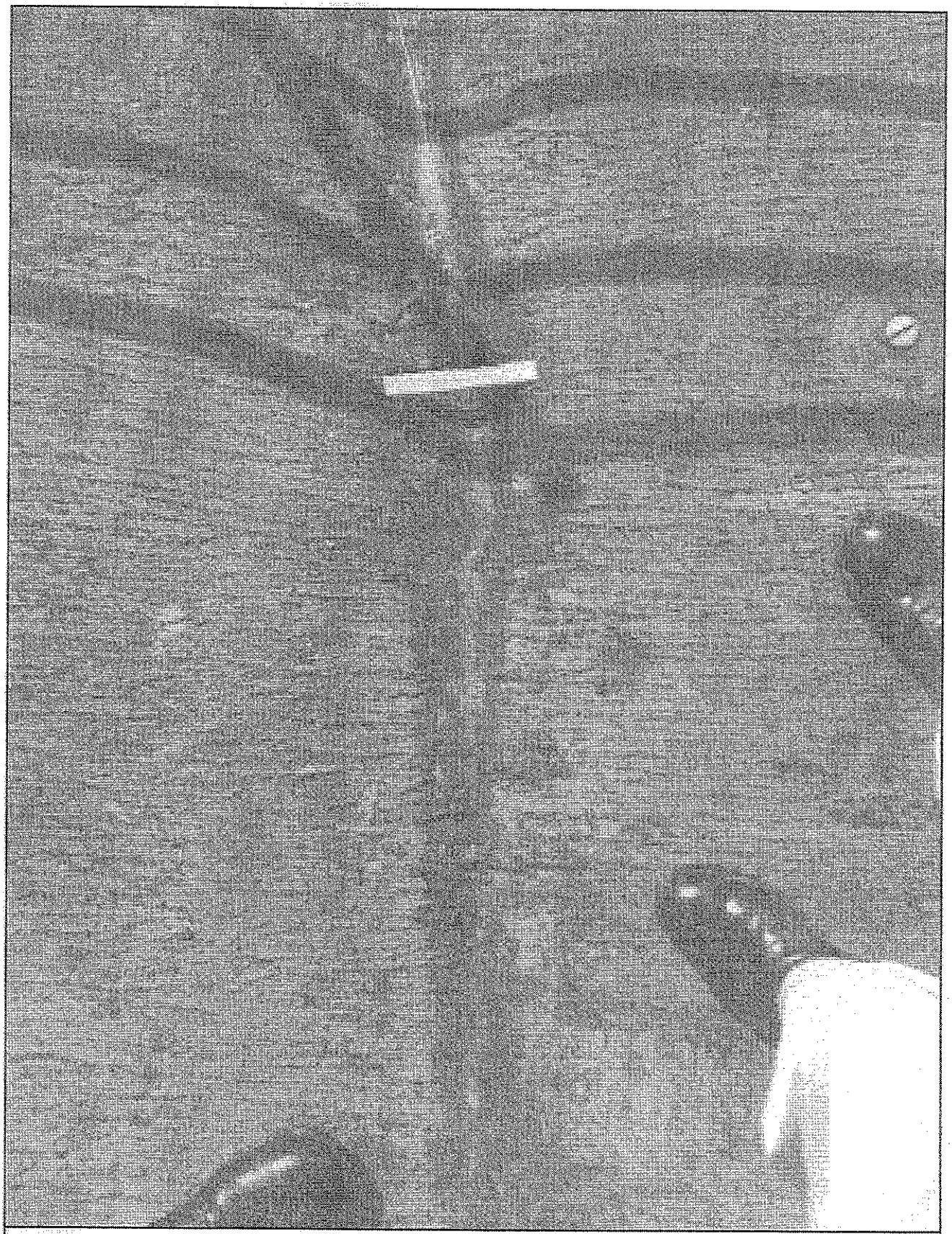


Figure B-6. Cracking in HY80 Steel Main Deck, Vicinity of Frame 472.

Figure B-7. Stress Crack in Main Deck, Vicinity of Frame 472; STBD Side, Running Athwartships to Port.

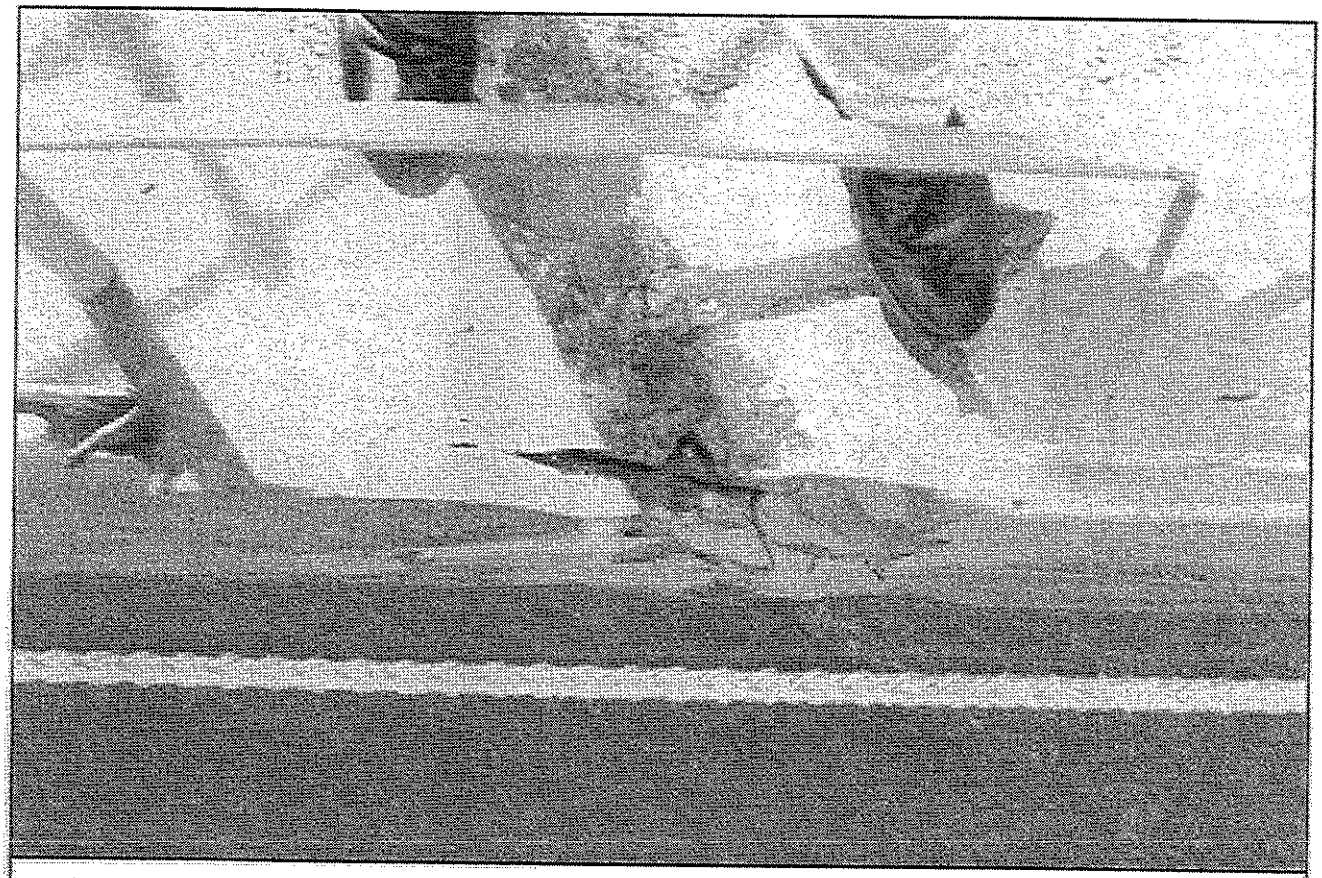
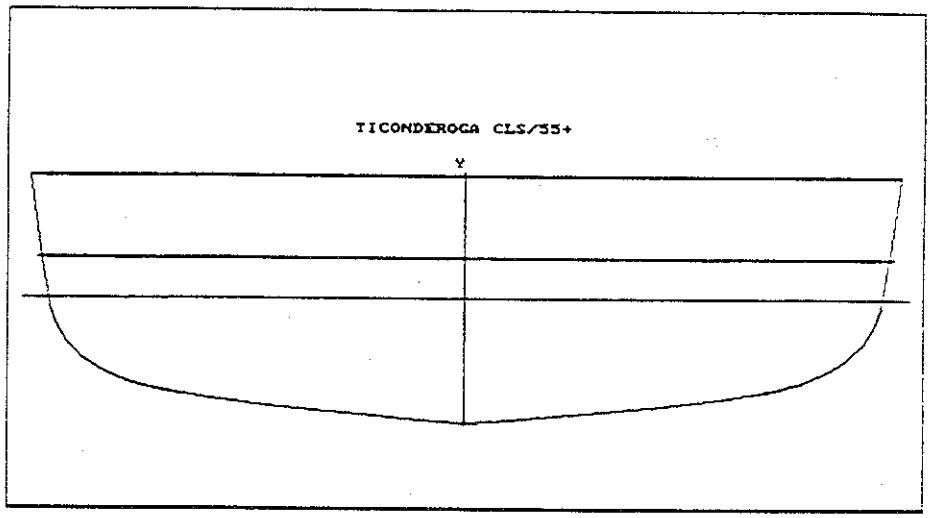


Figure B-8. Portside Shear Strake Crack Wide Open, Frame 472.

CG 47 -- TICONDEROGA CLS/55+ OOC POSSE-SCMD VA2
Rev. - 3/2/91

SECTION MODULUS
TICONDEROGA CLS/55+



Total Section Properties

About Horizontal Neutral Axis

Area:	1034.8 in2	Ixx:	63302.1 in2ft2		
Section Modulus - Upper Flange:		6005.1 in2ft	Y upper:	10.54 ft	
Section Modulus - Lower Flange:		5996.7 in2ft	Y lower:	10.56 ft	
Shear Area y:		274.6 in2			

(computed at calculated extreme fibers)

About Vertical Neutral Axis

Area:	1034.8 in2	Iyy:	258476.1 in2ft2		
Section Modulus - Left Flange:		10498.1 in2ft	X left:	24.62 ft	
Section Modulus - Right Flange:		10498.2 in2ft	X right:	24.62 ft	
Shear Area x:		871.2 in2			

(computed at calculated extreme fibers)

Figure B-9. Section Modulus at FR 472.

Using the undamaged simplified section and marking off those portions of the hull shown to be damaged by visual inspection, a model of the damage was created. The damage included:

1 – Maindeck cracked or buckled across the entire beam.

2 – Sheer strake cracked or buckled.

3 – All longitudinales under the main deck tripped.

4 – First platform deck cracked or buckled across most of the beam.

5 – All longitudinales under the first platform deck tripped across the beam.

Additionally, the side shell was buckled from the deck down to the cathodic protection system anode. The estimated damaged section properties at frame 472 are included as Figure B-10 (again, the figure shown was recreated after the fact when additional information was available). These results for section modulus were entered into *POSSE*, which has full load bending moments in still water for numerous classes of U.S. Navy ships available.

B-4 RESULTS

The results of this analysis for still water, full load weight distribution and damage section modulus are shown in Figure B-11. This figure is a reproduction of the graphical evidence used on board PRINCETON to debrief the CO on the structural integrity of his ship. As shown, an estimated 59.55 ksi (thousands of pounds per square inch) of tensile stress was present in the hull, which was over 70 percent of the yield stress for the hull material.

B-5 CONCLUSION

Based on the estimated stress in the hull in a still water condition, the Commanding Officer and salvage engineer developed a course of action, which was to:

1 – Extract PRINCETON from the minefield.

2 – Tow PRINCETON south based on weather and predicted sea state.

3 – Transit to Dubai, where she could be drydocked (her sill depth requirement controlled the location).

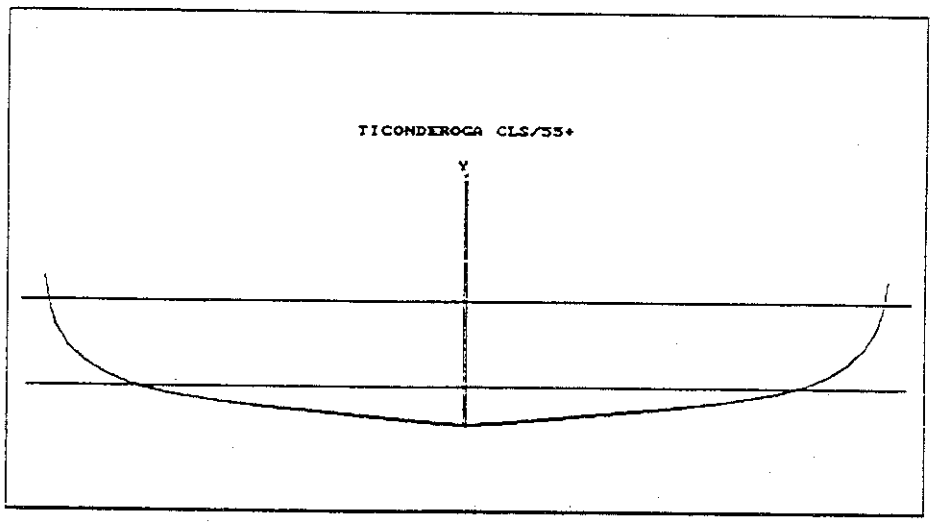
4 – Ensure a special blocking arrangement would support the weakened stern.

5 – While drydocked, conduct structural repairs to restore the lost section modulus, prior to open ocean transit.

Late during the second day of towing, the sea state increased causing the salvage engineer to recommend and the Commanding Officer to direct PRINCETON to Bahrain, where temporary repairs were conducted (Figure B-12). The on site structural integrity assessment was verified first, through independent calculations conducted by the structural codes at the Naval Sea Systems Command (via message to the PRINCETON enroute) and secondly through inspections on arrival in Bahrain.

CG 47 -- TICONDEROGA CLS/55+ OOC POSSE-SCMD VA2
Rev. - 3/2/91

SECTION MODULUS
TICONDEROGA CLS/55+



Total Section Properties

About Horizontal Neutral Axis

Area:	507.9 in2	Ixx:	5031.1 in2ft2		
Section Modulus - Upper Flange:			282.7 in2ft	Y upper:	17.80 ft
Section Modulus - Lower Flange:			1523.8 in2ft	Y lower:	3.30 ft
Shear Area y:			200.8 in2		

(computed at calculated extreme fibers)

About Vertical Neutral Axis

Area:	507.9 in2	Iyy:	124874.7 in2ft2		
Section Modulus - Left Flange:			5107.6 in2ft	X left:	24.45 ft
Section Modulus - Right Flange:			5036.6 in2ft	X right:	24.79 ft
Shear Area x:			413.9 in2		

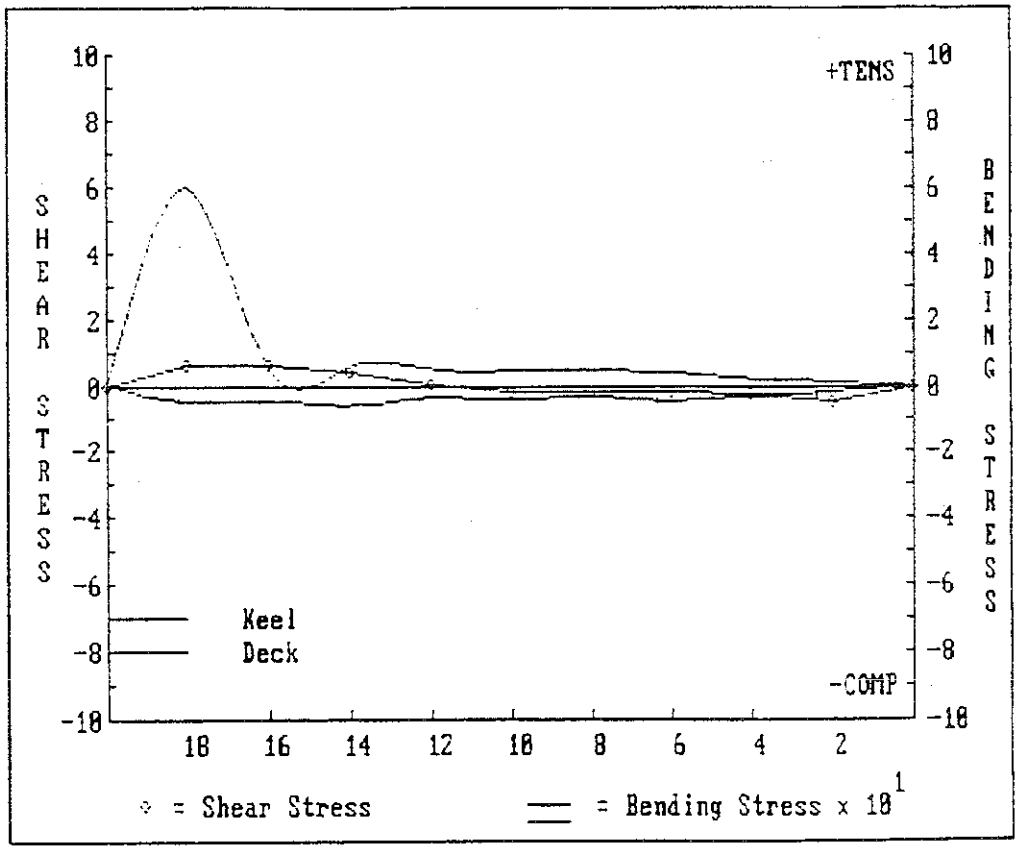
(computed at calculated extreme fibers)

Figure B-10. Estimated Damage Section Properties at FR 472.

CG47 -- USS PRINCETON (MINE on 2/18/911 DDC POSSE-RAPID V42
02-18-1991

SHEAR FORCE & BENDING STRESS SUMMARY

Initial Condition



STA. No.	LOCATION ft-FP	SHEAR FORCES SHEAR LTons	SHEAR STRESS ksi	BENDING MOMENTS MOMENT ft-LTons	DK STRESS ksi	KL STRESS ksi
AP	529.00A	0	0.00	0	0.00	0.00
18	476.10A	-240	0.59	6646H	59.55	4.80
16	423.20A	-404	0.59	25689H	6.39	4.35
14	370.30A	-309	0.38	44934H	5.39	5.77
12	317.40A	-19	0.02	52738H	5.07	3.57
10	264.50A	202	-0.20	47864H	4.39	4.03
8	211.60A	155	-0.16	39814H	4.44	3.23
6	158.70A	130	-0.19	31728H	3.94	4.37
4	105.80A	168	-0.24	21537H	2.27	3.17
2	52.90A	250	-0.44	10158H	1.32	1.91
FP	0.00	0	-0.00	27S	-0.00	-0.01

Maximum Shear Stress at Sta. 18: -0.59 ksi
Maximum Deck Bending Stress at Sta. 18: 59.55 ksi
Maximum Keel Bending Stress at Sta. 14: -5.77 ksi

Figure B-11. Shear Force and Bending Stress Summary.

Figure B-12. Deck-welded I-Beam Strengtheners.

APPENDIX C

INTERVIEWS

Included in this appendix are the following:

- Sample interview letter.
- Sample letter returning draft writeups for comment.
- List of interviewees.

Transcripts of the personal interviews conducted in conjunction with this report are bound separately in *Volume II, Salvage Interview Report.*

SAMPLE INTERVIEW LETTER

CDR Bert Marsh, USN
Naval Sea Systems Command
ATTN: CODE SEA-00C2
Washington, DC 20362-5101

Dear CDR Marsh:

Jamestown Marine Services has been tasked to assist in writing a comprehensive report documenting the total U.S. salvage involvement in OPERATION DESERT SHIELD and DESERT STORM.

The importance of this report cannot be overstated. It will not only chronicle the key salvage events of the Arabian Gulf War, identify lessons learned, and document well founded recommendations but will serve to reinforce the Navy's "total salvage system" concept for the future. This timely report, also, will complement the recently completed Supervisor of Salvage study on Navy Force Level Requirements for Salvage Ships sponsored by CNO (OP-37). The concept of salvage system resources directed by the Force Salvage Commander (FSC) will be examined, including U.S. Navy and contractor ships, as well as personnel and equipment assets from Supervisor of Salvage Operations, Mobile Diving and Salvage Units, and Emergency Ship Salvage Material (ESSM) system. The report will document salvage and towing demands and the salvage logistics support infrastructure.

This salvage report will attempt to capture the personal experiences, observations, and thoughts of individuals, such as yourself, who are considered the key players in ship survivability and salvage events that occurred. You can best identify the problems and opportunities encountered regarding the deployment and involvement of salvage forces during OPERATION DESERT SHIELD and DESERT STORM. We would like to meet with you personally during the next month, at your convenience, for an interview discussion. If your present deployment makes a personal visit impractical, we will attempt a phone interview.

Accordingly, please review the attached read-ahead material. Attachment 1 is the proposed report outline. It will to give you an idea of the scope and breadth of the intended final report. We would appreciate any comments you might provide regarding the outline. Attachment 2 is a sample of the type of questions we would like you to address in the course of an interview. We will follow-up this letter with a phone call to confirm an interview time convenient to your schedule. The interview should last about one hour.

The success of this Salvage Report will impact directly upon the future role of Navy salvage as we enter the 21st Century. Your participation and input will be melded with others in the operational community to assure an effective future maritime posture supportive of our national defense objectives.

Thank you in advance for your participation in this important effort.

Sincerely,

Bruce Banks
President
Jamestown Marine Services, Inc.

ATTACHMENT 1
PROPOSED OUTLINE

Foreword
Executive Summary

BACKGROUND
- Initial DESERT SHIELD Organization
- Survey and selection of the Salvage Base of Operations
- Initial contacts and SUPSALV recommendations

MOBILIZATION
- Sharjah, Base Ops (Airports, shipyards, etc.)
- ESSM equipment
- Transportation
- Military personnel
- Contractor personnel

SUPSALV WEST PAC CONTRACT
- SUPSALV initial organization
- USN funding
- Netherlands, Ministry of Foreign Affairs
- SMIT-TAK involvement for initial funding
- SMIT-TAK organization, assets, and expertise
  - Tanker War
  - FiFi experience

U.S. NAVY BATTLE FORCE ORGANIZATION
- SRU Det Bahrain
  - Concept of Operations (CONOPS)
    - Bluewater Salvage/Towing/Firefighting
    - Amphibious Ops Support
    - Harbor Clearance
    - TLAM recovery
- Floating assets
- Salvage organization/SUPSALV Rep or organization

OPERATIONAL SUPPORT
- USNS HIGGINS
- USNS CURTIS
- USS PRINCETON (CG 59)
- USS TRIPOLI (LPH 10)
- M/V SANTA ADELA
- SH-60B Helicopter recovery
- Towing support

IRAQIAN PRIMARY THREAT
- Mines/missiles

CONCLUSIONS
- Lessons learned
- Recommendations

APPENDIXES
- Pertinent message traffic
- Salvage assets
- Key personnel
- USN funding
  - Expenditures
- Dutch government funding
  - Expenditures

ATTACHMENT 2
SAMPLE INTERVIEW QUESTIONS

The following questions are intended as a point of departure to stimulate further discussion and to assist you in preparing for the interview session:

1. In what capacity, and to what extent, were you involved with salvage forces deployment and operations during OPERATION DESERT SHIELD and DESERT STORM? Did the purpose or agenda for your involvement change over time?

2. In your opinion, what were the two or three major problems encountered with regard to the deployment of salvage forces and equipment in the Mid-East region of conflict?

3. In your opinion, what were the best two or three features of our salvage force presence in the Gulf?

4. Was the Navy prepared with a concept of operations or plan for dealing with:

   - Firefighting contingencies?
   - Vessel towing?
   - Battle damage assessment?
   - Emergency ship repairs?

5. How would you characterize the salvage organizational infrastructure and interface with CENTCOM? Logistics Support Force? COMMIDEASTFOR? SIXTHFLT?

6. Was the presence of ESSM equipment adequate? If not, what type, quantity, deployment, and positioning of ESSM gear would you recommend?

7. How effective was the active Navy and contractor salvage interface in providing a "salvage system" presence?

8. In your opinion, would the Navy be well served by a continuing, long-term presence in the Gulf region? What composition? What organizational infrastructure?

9. Was there a role for MDSU/RMDSU personnel? If yes, how many?

10. If the Salvage Assistance Response Team (SART) concept were fully up and running, how would you have deploy the SART in the Gulf War?

11. What could have been done to improve salvage presence afloat and ashore?

12. What should the Navy's salvage role be, if any, in the post-war reconstruction?

13. If you were "king", what two or three changes would you implement that, in retrospect, would have made the Navy salvage forces more effective in support of OPERATION DESERT SHIELD and DESERT STORM?

SAMPLE RETURN LETTER

CDR Bert Marsh, USN
Naval Sea Systems Command
ATTN: CODE SEA-00C2
Washington, DC 20362-5101

Dear CDR Marsh:

It was a pleasure to interview you in support of the OPERATION DESERT SHIELD/STORM Salvage Report. The attached draft writeup is provided for your review. We have attempted to capture the salient features of your expressed views and ideas regarding salvage based on your experience and observations as SUPSALVREP to SRUDETBAHRAIN.

Please note that this is a draft version of the interview record. We would appreciate any comments or markups you might wish to make to expand, clarify, add to, or delete from the draft writeup. Space is provided after each paragraph for hand-written comments. After your review, please mail a copy of the marked-up draft to:

Jamestown Marine Services, Inc.
101 North Columbus Street, Suite 411
Alexandria, VA 22314

Once we have received your marked up copy, a final interview record will be prepared. Your interview, along with those of other interviewees, will provide much of the information that will comprise the OPERATION DESERT SHIELD/STORM Salvage Report.

Thank you for your interview. Should you have any questions or comments you wish to discuss by phone please contact me at (703) 360-0995 or 836-8741.

Sincerely,

John W. Allen
Project Coordinator

DESERT SHIELD/STORM INTERVIEW MATRIX

NAME	ADDRESS	PHONE
Asher, Richard	Naval Sea Systems Command ATTN: Code SEA-002 Washington, DC 20362-5101	(703) 607-2753
Balk, David, LCDR, CEC, USN	Naval Sea Systems Command ATTN: Code SEA-00C2 Washington, DC 20362-5101	(703) 607-2761
Bladh, Jim	Naval Sea Systems Command ATTN: Code SEA-00C2 Washington, DC 20362-5101	(703) 607-2758
Cooper, Keith	Naval Sea Systems Command ATTN: Code SEA-00C2 Washington, DC 20362-5101	(703) 607-2758
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ESSM/ Totten, Jerry	ESSM Base c/o GPC Box JK Williamsburg, VA 23187	(804) 887-7402
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APPENDIX D

CHRONOLOGIES

D-1 SMIT CHRONOLOGY

Table D-1 shows the utilization periods of SMIT vessels. This information is followed by a chronology of the major events involving these vessels.

D-2 USS BEAUFORT CHRONOLOGY

A chronology of the major events involving USS BEAUFORT is included as part of this appendix.

D-3 ESSM CHRONOLOGY

A chronology of the major events involving the ESSM is included as part of this appendix.

Table D-1. SMIT Vessel Utilization Periods.

VESSEL	DATE ON-HIRE	DATE OFF-HIRE
SMIT NEW YORK	3 JAN 1991	5 APR 1991
SMIT MADURA	18 JAN 1991	29 MAR 1991
GALA	19 FEB 1991	4 MAR 1991
	19 FEB 1991	15 APR 1991
STELLA	19 FEB 1991	2 MAR 1991
BIG ORANGE VII	05 FEB 1991	14 MAR 1991
SUBTEC 1	10 FEB 1991	4 APR 1991

SMIT LOG CHRONOLOGY

DATE	TIME	EVENT
2 JAN 1991		**SMIT NEW YORK on hire, DELIVERY ORDER 0002. SMIT NEW YORK Master Mr. C. Pronk.**
	1845	SMIT NEW YORK commences transit Fujairah to Masirah to assist USNS HIGGINS (22 hrs.)
4 JAN 1991	1605	SMIT NEW YORK anchors near HIGGINS.
5 JAN 1991	2345	HIGGINS refloated by own means. SMIT NEW YORK commences escort duty for HIGGINS, Masirah to Dubai @ 3-5 kts SOA.
8 JAN 1991		Received orders to stay minimum of 65 mi. offshore; not allowed to enter Gulf area.
10 JAN 1991		Max. liability of D.O. 0002 adjusted from $900,000 to $882,872.28.
14 JAN 1991	1640	Released from escort duty to proceed from HIGGINS, @ pos. 26-26N, 56-08E to assist USNS CAPE CHARLES, pos. 26-28N, 52-17E. CC reports engine problem.
15 JAN 1991	0600-0925	Vain search for CAPE CHARLES.
	0925	Received message from USS CLEAR RIDGE that CAPE CHARLES proceeding under own power.
	2300	SMIT NEW YORK arrived Sharjah, standing by in Port Khalid for instructions.
		SMIT GM Roger Elliott (RE) arranges labor to transport ESSM gear from Sharjah Airport to Rockwater storage warehouse.
		USN commenced using Rockwater warehouse facility, Sharjah.
18 JAN 1991	**2130**	**SMIT MADURA ON-HIRE, DELIVERY ORDER 0003. SMIT MADURA departed Singapore.** ETA Sharjah 1 Feb. CREW: 12 ship's company, 2 salvage crew.
23 JAN 1991		SMIT MADURA ETA Sharjah 31 Jan @ 1200.
27 JAN 1991		SMIT MADURA ETA Sharjah now 31 Jan. @ 2200 (change due to current).
29 JAN 1991		2 INMARSAT SATCOM units purchased. 1 installed aboard SMIT NEW YORK, IAW USN instructions. (Cost recorded in cost schedule for 30 Jan.)

DATE	TIME	EVENT
1 FEB 1991	0000	SMIT MADURA entering Sharjah.
	0055	SMIT MADURA Alongside SMIT NEW YORK.
		SMIT MADURA: 4 additional salvage crew (total salvage crew now 6), 1 radio/comm officer arrived Sharjah airport from Singapore.
2 FEB 1991		8.5 tons FIFI equipment arrived Sharjah airport from Rotterdam aboard commercial air freight, booked at Royal Netherlands Navy rates.
3 FEB 1991		FIFI equipment (pumps, monitors) loaded, rigged aboard SMIT MADURA.
4 FEB 1991		FIFI equipment tested on SMIT MADURA.
		An estimated $25,000 is scheduled for the final DESERT STORM report.
5 FEB 1991	**0800**	**IMI tug BIG ORANGE VII on-hire at standby rate, in port Sharjah.**
7 FEB 1991		IMI Sharjah to install a 15-ton Rough Terrain Gallion crane on SMIT MADURA at lease cost of $450/day, per fax to RE from G. Nicholson, IMI Sharjah Middle East Manager.
		SMIT MADURA loads 5 tons foam.
9 FEB 1991		SMIT MADURA loads 16 tons foam.
		SMIT NEW YORK loads 4 tons foam.
10 FEB 1991		**Accommodation Barge SUBTEC 1 on-hire @ day rate of $5000 outside the "War Zone." Day rate of $1250 for berthing/messing/laundry for max. of 60 personnel. Standing by in Sharjah Creek.**
14-15 FEB 1991		SMIT NEW YORK, SMIT MADURA carry out FIFI/towing exercises, man-overboard drill.

DATE	TIME	EVENT
18 FEB 1991	0915	SMIT NEW YORK, SMIT MADURA placed on standby for USN ops, Bahrain area.
	0930-1200	SMIT NEW YORK loading out ESSM gear: — 2 x 125 cfm compressor — 3 x 30 KW generators — 3 x 4 Sub pumps — Various spares.
	1310	SMIT MADURA underway for Northern Gulf area for USN ops. (@ 1400 instructed to proceed to Bahrain). 15 PERSONS ON BOARD: — 12 marine crew — 2 Rotterdam RISC FIFI specialists — 1 USN liaison officer.
18 FEB 1991	1315	SMIT NEW YORK underway for Northern Gulf, to rendezvous with USS BEAUFORT (ATS 2), presently towing mine-damaged USS PRINCETON (CG 59) 23 PERSONS ON BOARD: — 17 marine crew — 5 SMIT crew — 1 USN liaison officer.
19 FEB 1991	1315	SMIT MADURA alongside Mina Salman Port, Bahrain, standing by for further instructions.
	1600	SMIT NEW YORK arrived at PRINCETON/BEAUFORT location
	1745	SMIT NEW YORK connected to PRINCETON. Commenced towing toward Dubai @ 6 kts, PRINCETON running stbd propeller. Allowable bollard pull is 23 tons. M/V BIG ORANGE VII loads out ESSM gear in Sharjah. **M/V STELLA, GALA on-hire, standing by in Sharjah.**
20 FEB 1991	0650	SMIT NEW YORK towing destination changed from Dubai to Bahrain.
	0800	**BIG ORANGE VII placed on full-charter.** BIG ORANGE VII fully loaded with ESSM gear, leased Clark crane and standing by in Sharjah.

DATE	TIME	EVENT
21 FEB 1991	0305	SMIT NEW YORK disconnected towing bridle from PRINCETON, passed the vessel to Bahrain harbor tugs.
	0840	SMIT NEW YORK moored at Mina Salman Port, Bahrain.
	1000	BIG ORANGE VII and M/V GALA leave Sharjah for Bahrain.
23 FEB 1991	1545	SMIT NEW YORK departed Bahrain for rendezvous to relieve BEAUFORT as escort for USS TRIPOLI (LPH-10) to Al Jubayl.
	2345	SMIT NEW YORK arrived at rendezvous position.
24 FEB 1991	2220	SMIT NEW YORK commenced escorting USS TRIPOLI
25 FEB 1991	1625	SMIT NEW YORK released from escort duty by TRIPOLI.
26 FEB 1991	0910	M/V GALA commences towing USS PRINCETON from Bahrain to Jebal Ali.
		SMIT NEW YORK released from standby duties by TRIPOLI.
26 FEB 1991	0940	SMIT NEW YORK enroute Bahrain.
	1745	SMIT NEW YORK arrives Bahrain.
28 FEB 1991	1245	GALA lets go USS PRINCETON in Jebal Ali.
1 MAR 1991	0930	BIG ORANGE VII departs Bahrain for Al Dammam.
	1440	Arrives Al Dammam.
2 MAR 1991	**0800**	**STELLA off-hire.**
	1400	GALA departs Sharjah port for Jebal Ali.
	1600	BIG ORANGE VII departs Dammam enroute northern Gulf.
	1800	GALA arrives Jebal Ali, standing by.
3 MAR 1991		GALA standing by in Jebal Ali port.
	2040	BIG ORANGE VII arrived northern Gulf, waiting to offload cargo.

DATE	TIME	EVENT
4 MAR 1991	**2000**	**GALA off-hire.**
		DELIVERY ORDER 0002 IS CLOSED AS OF TODAY. COSTS OF SMIT NEW YORK, SMIT MADURA HAVE BEEN TRANSFERRED TO DELIVERY ORDER 0003 EFFECTIVE 5 MAR 91 (DAY ONE).
		BIG ORANGE VII at anchor in northern Gulf location, waiting to transfer cargo.
7 MAR 1991	0900	SMIT MADURA departs Bahrain for Al Dammam to load fuel.
	1700	Arrive Al Dammam.
		SMIT MADURA anchored Dammam Port, awaiting further instructions from MSC Office
9 MAR 1991	1130	SMIT MADURA departed Al Dammam for Bahrain.
	1730	SMIT MADURA moored in Port Khalid, Sharjah.
10 MAR 1991		SMIT MADURA at Sharjah Port discharging all FIFI equipment.
	1750	SMIT MADURA departed Sharjah for Bahrain.
11 MAR 1991	1845	Moored in Mina Salman Port, Bahrain.
	1950	BIG ORANGE VII arrived Bahrain.
12 MAR 1991	1550	BIG ORANGE VII departed Bahrain for Sharjah.
13 MAR 1991	1800	BIG ORANGE VII arrived Sharjah Port, waiting to discharge ESSM gear.
14 MAR 1991	**1400**	**BIG ORANGE VII off-hire.**
15 MAR 1991	1100	SMIT NEW YORK departed Bahrain for Ash Shuaybah, Kuwait
	1200	SMIT MADURA departed Bahrain, enroute Ash Shuaybah.
		Crew compensation for hazardous operations commenced today as both SMIT NEW YORK and SMIT MADURA passed 27-30N, officially entering the "War Zone."
16 MAR 1991		Both SMIT NEW YORK, SMIT MADURA receive minehunter escort for passage through minefields enroute Mina Ash Shuaybah Port, Kuwait.

DATE	TIME	EVENT
17 MAR 1991	1330	SMIT NEW YORK, SMIT MADURA moored alongside pier in Shuaybah, and investigate Iraqi tankers, ALQADISIYAH and HITTIN, to be towed from pier they are obstructing north pier, Mina Al Ahmadi.
18 MAR 1991		SMIT NEW YORK, SMIT MADURA waiting for area surrounding north pier, Al Amahdi, to be cleared of mines.
22 MAR 1991		SMIT NEW YORK, SMIT MADURA shifted HITTIN from Al Ahmadi pier to an anchorage.
23 MAR 1991		SMIT NEW YORK, SMIT MADURA towed ALQADISIYAH from Al Ahmadi pier to an anchorage.
25 MAR 1991		SMIT MADURA departs Ash Shuaybah for Sharjah.
29 MAR 1991		**SMIT MADURA off-hire; departed Sharjah for Singapore.**
30 MAR 1991		SMIT NEW YORK standing by if needed to assist in raising of Iraqi OSA-II missile boat in Shuaybah. First lift attempt failed due to breaking chain of lift bridle.
1 APR 1991		OSA missile boat salvaged; SMIT NEW YORK took salvage gear back aboard.
2 APR 1991	0945	Departed for Sharjah. Must pick up escort enroute.
3 APR 1991	1645	SMIT NEW YORK passed latitude 21-30N.
4 APR 1991	**2400**	**Accommodation Barge SUBTEC 1 off-hire.**
5 APR 1991	**1230**	**SMIT NEW YORK off-hire, later placed on -hire to Kuwait Oil Tanker Company.**
11 APR 1991	**0800**	**GALA on-hire at Sharjah.** Commenced loading ESSM gear for transfer to Bahrain.
15 APR 1991		GALA completes transfer of ESSM gear, returns to Sharjah Port, goes off-hire.

USS BEAUFORT CHRONOLOGY

DATE	TIME	EVENT
29 JAN		Chopped to CMEF, condition III steaming.
30 JAN		Transited straits of Hormuz, "Confrontation" with Iranian Auxiliary "Duroo" near straits entrance.
31 JAN-9 FEB		Moored Abu Dhabi in threatcon Delta.
10 FEB		Underway to join Amphibious Advance Group.
13 FEB		Underway collision damage assessment of USS KANSAS CITY (hole in one fuel tank) in heavy seas at anchor. Joined Amphibious Advance Force (approximately 40 coalition ships) headed north.
15 FEB		On station Northern Arabian Gulf awaiting action with other auxiliaries in Dora Oilfield "holding box."
16-17 FEB		On station. Came alongside British ship RFA DILIGENCE and made up fittings for US/British firemain. Discussed salvage/options/coordination.
18 FEB		At 0503C overheard TRIPOLI mine strike reports on voice circuits. Proceeded directly to TRIPOLI. Helo'd salvage officer and MDV ahead. Laid off TRIPOLI at 0708, having overheard PRINCETON's mine strike report, proceeded to her location. Within first few minutes after departure spotted moored mine below water and 6 feet off port bow. Maneuvered away and marked/reported mine. AVENGER reported on bridge to bridge we had entered a mine line that she (Avenger) held on sonar. Backed out and then came ahead through mineline on instructions from AVENGER on bridge to bridge radio. Fell in behind ADROIT for 10 miles (approximately), transit to PRINCETON. Maneuvering for scores of mine like contacts made trip last until 1219C. At 2000 yards from PRINCETON sent dive team in by rubber boat to get started (Master Diver and Salvage Officer had been helo'd to PRINCETON from TRIPOLI). Dive team's boat ran directly over another moored mine and marked it with a smoke float so ship could avoid. Did underwater damage assessment of PRINCETON and took her in tow just beforedusk. Maneuvered her behind Adroit making abrupt turns, some over 90 degrees, to avoid mine like contacts until out of the minefields at about dawn. NOTE: Timely tow was significant in that if weather had been bad Princeton would have probably lost her stern section. South East winter storms were coming every few days and we wanted to get her out and beat the next storm. As it was she had to be taken to Bahrain vice Dubai when heavy weather hit on the way south.

DATE	TIME	EVENT
19 FEB	1600	Turned Princeton over to tug SMIT NEW YORK and headed north again.
20 FEB		Joined auxiliary group in Dura Field holding box. Hit by severe storm and ordered to proceed to TRIPOLI as heavy seas caused her flooding boundaries to pant and failure was possible. Helo'd 1st Lieutenant in TRIPOLI.
21 FEB	0200	Anchored 1000 yards from Tripoli, seas abating. Tripoli rigged to be towed stern first.
22-23 FEB		Seas down. Performed hull survey and video of TRIPOLI hull damage. Cracks promulgating aft from hole towards flooding boundary in danger of growing as metal works in seaway (moving visibly). Used Kerie Cable to burn two stop crack holes. Left at 1800, 23 February escorting TRIPOLI south at 5 knots, (her own power) rigged to take her in tow stern first if necessary. Avenger leading out, mine hunting.
24 FEB		Turned over TRIPOLI escort/emergency tow duties to tug SMIT NEW YORK at 27 degrees 30 minutes north and headed back to Northern Gulf at 2200.
25 FEB		Enroute north conducted small boat transfer/limited reprovision with USS KALAMAZOO at 0315C. Anchored east of Sirus oil field in northern gulf at 1615C in company with numerous other ships. Awaiting tasking.
26 FEB-1 MAR		Anchored as above.
2 MAR		Transited south for reprovisioning at dusk.
3 MAR		Vertrep 17 pallets from USS NIAGARA FALLS and alongside refuel 40,000 gallons from USNS PASSUMPSIC. Recovered "Rubber Duck" decoy in casing dropped during vertrep of USS VALLEY FORGE. Upon completion headed north and came to anchor.
4 MAR		Transited swept channel to "BBFSA" area off Kuwait and anchored near USS LASALLE and USS New ORLEANS. Visited CMEF staff on New ORLEANS.
5 MAR		Heavy Southeast storm. Needed both anchors.
6 MAR		Anchored as above.
7 MAR		Helo'd Master Diver and one diver with 3 inch pump to assist in minor salvage work ashore at Ash Shuaibah, Kuwait.
8 MAR		Master Diver and diver return.
9 MAR		Helo'd dive team to USS CARON to inspect suspected leaking CPP. At 1630C led the civilian tug SCORPIO with self-propelled mine sweeping boat down swept channel to port of Ash Shuaibah. Anchored out (1800 yards off) at 1900.

DATE	TIME	EVENT
10 MAR	0630	Went to Ash Shuaibah by boat to conduct liaison with salvage forces and deliver some line needed by them. 0900 weighed anchor and lead civilian tug BIG ORANGE VII out swept channel. Proceeded to flight recorder box recovery of downed C-130 off Khafji.
11 MAR		Anchored about 4 miles off the beach north of Khafji. Closest we could get. Boat sent in with divers to find C-130 marked by Air Force helo. Found C-130 and picked up Air Force liaison officer but could not dive after 1600 due to heavy weather (surf) in area (8 FSW).
12 MAR		Weather abated. Recovered the C-130 flight recorder box from the debris field. Discovered floating mine and destroyed with embarked (for C-130 tasking) EOD using ships salvage demolitions. 1600 commenced transit to Bahrain.
14 MAR	1400	Pier side Bahrain. Loaded side scan/ROV for helo and ordnance recovery operations.
17 MAR		Underway for SH-60 helo recovery.
18 MAR		On site 0700. Located pinger with receiver by boat. Laid 2 point moor and hooked up to helo in 90 FSW with scuba divers. Helo on deck in one piece at 1900. Unbolted center section of towbow and removed to get it on in one piece. Left for Bahrain to offload.
20 MAR		Offloaded SH-60 with ships crane in Bahrain.
22 MAR		Underway 1630C for TLAM recovery operations.
22 MAR-7 APR		Successful TLAM recovery operations. Laid 17 precision 2 point moors and recovered 3 missiles in heavy current in 180 - 230 FSW. Side scan/ROV essential to success as was acoustic positioning system. We returned to port for the system after being unable to track ROV relative to ship in heavy currents. One item required deep air diving and two required mixed gas diving.
8-10 APR		Off-load in port Bahrain.
11 APR		Underway for Dubai on short (1 day) notice to deliver LM 2500 change out kit to USS PRINCETON who had lost one main engine during testing.
12 APR		Delivered LM 2500 engine and vans at Dry Dock basin. Proceeded to port visit at Mina Rashid, Dubai.
13-17 APR		In port Dubai.
18 APR		Enroute Bahrain.
19 APR		Reprovision Bahrain.
20 APR		Enroute Kuwait City for port opening ceremony.

DATE	TIME	EVENT
21 APR		Transited swept channel. Planning meeting on board USS KIDD for ceremony.
22 APR		Participated in Kuwait City ceremony in company with numerous multi-national ships (via swept channels).
23 APR		Transit to Bahrain (via swept channel when north).
24 APR		In port Bahrain for TAV with USS CAPE COD.
1-31 MAY		Various operations, logistics services, etc.
1 JUN		Underway for transit back to Sasebo, Japan.
2 JUN		Outchop COMIDEASTFOR.

ESSM CHRONOLOGY

DATE	EVENT
29 NOV 1990	SUPSALV made initial inquiries regarding ESSM contractors level of support for preparing equipment for shipment to the Gulf and assistance in establishing a temporary base in Sharjah, U.A.E.
27 DEC	ESSM equipment identified, staged, and ready for shipment from Cheatam Annex, Virginia.
29 DEC	USNAVCENTCOM approved temporary ESSM base in Sharjah, U.A.E.
11-12 JAN 1991	Loaded and trucked 23 loads of ESSM equipment from Cheatam Annex to NAS NORFOLK.
11-18 JAN	Loaded ESSM equipment aboard 16 MAC C-141 aircraft with destination, Sharjah, U.A.E.
15-27 JAN	GPC Sharjah personnel inventoried, warehoused, and initiated preventive maintenance for ESSM.
4 FEB	Fully loaded 100 tons of ESSM equipment loaded aboard M/V BIG ORANGE VII for PRINCETON and TRIPOLI contingencies. Placed ESSM pumps aboard SMIT NEW YORK for damage control use.
4 APR	GPC contracted for a 12-month lease of commercial warehouse space in Bahrain for temporary ESSM pool equipment.
	Loaded 211 tons of ESSM equipment aboard commercial cargo vessels for return to Cheatam Annex facility.
1 JUL	Notification received that ESSM shipment arrived Norfolk, Virginia. As of 10 July, ESSM had not been delivered to Cheatam Annex.

APPENDIX E

SALVAGE VESSEL SPECIFICATIONS

CATEGORY	SMIT NEW YORK (1977)	SMIT MADURA (1973)	STELLA (1972)
OWNER	SMIT Rotterdam	SMIT Rotterdam	InterMarine Inc. (IMI) Houston
LOA (ft)	211	179	176
Beam (ft)	47	40	38
Draft (ft)	19	16	12
HP	16,000	4000	4800
Displacement (T)	3758	1792	198
CATEGORY	**BIG ORANGE VII (1975)**	**GALA (1971)**	**SUBTEC I (1977)**
OWNER	Intermarine Inc. (IMI) Houston	Intermarine Inc. (IMI) Houston	SUBTEC Offshore Support Ltd. Nicosia, Cyprus
LOA (ft)	175	176	230
BEAM (ft)	38	38	60
Draft (ft)	13	14	14
HP	2250	4800	---
Displacement (T)	195	198	2214

APPENDIX F

EQUIPMENT

F-1 ESSM EQUIPMENT — ORIGINAL LOADOUT

Table F-1 is a list of SUPSALV equipment mobilized from Williamsburg, Va., to Sharjah, U.A.E., in support of Operations DESERT SHIELD/DESERT STORM.

F-2 ESSM EQUIPMENT ON BOARD BIG ORANGE VII

Table F-2 is a list of ESSM equipment transferred from the SUPSALV warehouse in Sharjah to the chartered salvage support vessel BIG ORANGE VII.

F-3 ESSM EQUIPMENT RETAINED IN-THEATER (BAHRAIN)

Table F-3 is a list of ESSM equipment transferred April 12 from the SUPSALV warehouse in Sharjah to a leased warehouse in Bahrain.

F-4 SMIT FIREFIGHTING EQUIPMENT

F-4.1 Introduction. When the decision was made to deploy SMIT MADURA from Singapore to the Arabian Gulf as a specially outfitted offship firefighting salvage tug, a substantial amount of fire and safety control equipment was sent from Rotterdam to Sharjah by air. The firefighting (FiFi) equipment, its capabilities and the training given by the SMIT RISC Fire and Safety personnel are discussed below.

F-4.2 FiFi Equipment. The SMIT FiFi equipment sent by the RISC Fire and Safety Division of the Operations Department was a combination of standard response equipment that included the following items:

Item	Quantity
FiFi-pump sets; 650 m^3/hr with two monitors	4
First Attach container	2
Breathing Apparatus (BA) container	2
Hose container	2
Breathing-air compressor	1
Plastic foam container, 2500 l	1

Tables F-4 through F-9 provide the exact item inventories for each container.

F-4.3 FiFi Capabilities. By storing the FiFi equipment on the two SMIT tugs, SMIT NEW YORK became a salvage tug with tactical and logistical FiFi potential and SMIT MADURA became a fully equipped FiFi vessel. Both were equipped with flouroprotein foam; SMIT NEW YORK with 8.5 tons and SMIT MADURA with 20 tons. Tables F-10 and F-11 provide FiFi equipment lists for each vessel. Two SMIT Fire and Safety specialists and instructors accompanied the equipment.

F-4.4 FiFi Training Exercises. Equipment training was given to the crews of both vessels by qualified firefighting and safety instructors. Basic training was given to all crew members and special firefighting team. Foam training was provided to the firefighting teams. Special offshore firefighting exercises between SMIT NEW YORK and SMIT MADURA were held to test the capability of each working independently and jointly.

F-5 EASTPORT INTERNATIONAL, INC.

As components of the company's standard flyaway search and recovery module, the following equipment was airlifted via MAC flight from CONUS to the Arabian Gulf in support of SUPSALV search and recovery operations following the conclusion of Operations DESERT SHIELD/DESERT STORM:

- Benthos Super Sea Rover™ remotely operated vehicle.
- Operator console.
- Power supply.
- 1000-foot, 0.5" electromechanical cable.

F-6 OCEANEERING INTERNATIONAL, INC.

The following equipment was airlifted via MAC flight from CONUS to the Arabian Gulf in support of SUPSALV search and recovery operations following the conclusion of Operations DESERT SHIELD/DESERT STORM:

- Klein 100 kHz Dual Side Scan Sonar System.
  - 100 kHz towfish.
  - 1000 ft. double-armored tow cable.
  - Klein Model 595 Graphic Sonar Recorder.
- Electrohydraulic winch.
- Triton Technology Q-MIPS™ computer-enhanced sonar imaging system.
- NEC Powermate Portable Plus computer.
- Diconix Inkjet Model 150 portable dot matrix printer.
- Trimble Differential Global Positioning System (GPS) receiver..

Table F-1. ESSM Equipment Original Loadout.

DESCRIPTION	PART NO.	QUANTITY	TOTAL WEIGHT	DESCRIPTION	PART NO.	QUANTITY	TOTAL WEIGHT
25 Air Compressor	AC0310	4	10,600 lbs	Pump, 4" Electric Submersible	PU0240	5	7,800 lbs
Basket #1	BG0100	8	10,528 lbs	Reel, Submersible Salvage Hose Assembly	RC0600	5	2,080 lbs
Basket #2		8	40,272 lbs	Kit, Underwater cutting	KT0558	4	2,000 lbs
Anchor, Stato		8	49,600 lbs	Welder, 400A, Diesel	WL0470	4	13,000 lbs
Wire Rope Reel 5/8"		8	7,104 lbs	Kit, Welding	KT0472	4	1,200 lbs
Wire Rope Reel 1 5/8" x 300'		8	18,560 lbs	Winch, 8T Diesel	WN0010	3	21,240 lbs
Wire Rope Reel 1 5/8" x 600'		8	58,720 lbs	Reverse Osmosis Water Purification Unit	WP0903	2	15,000 lbs
Wire Rope Reel 1 1/4" x 4-100'		16	33,280 lbs	Van, Rigging	VA0010	1	13,220 lbs
Basket #1	BG0200	4	6,368 lbs	Van, Shop	VA0508	1	11,400 lbs
Basket #1	BG0300	8	10,992 lbs	Van, Command	VA0727	1	7,500 lbs
Wire Rope Reel 1 5/8"x 300'	WR0150	4	9,280 lbs	Spare parts for AC0310	AC0311	4	72 lbs
Wire Rope Reel 1 5/8" x 600'	WR0151	10	36,700 lbs	Spare parts for GE0410	GE0411	6	120 lbs
Chain, 2 1/4" x 90'	CH0040	4	20,136 lbs	Spare parts for LT0430	LT0431	2	24 lbs
Fire Fighting Kit	FF0544	2	1,908 lbs	Spare parts for PW0045	PW0046	5	66 lbs
Generator, 5 KW	GE0404	8	7,680 lbs	Spare parts for PU0201	PU0202	8	288 lbs
Generator 30 KW, Diesel	GE0410	6	22,200 lbs	Spare parts for PU0210	PU0211	7	364 lbs
Light Tower	LT0440	2	2,090 lbs	Spare parts for PU0220	PU0221	4	224 lbs
MOD-6 Power Unit	PW0045	5	20,410 lbs	Spare parts for PU0230	PU0231	2	56 lbs
Hyd. Cable Puller	HC0012	8	44,000 lbs	Spare parts for WL0470	WL0471	4	56 lbs
Hyd. Hose Assembly Reel	HC0003	16	11,680 lbs	Spare parts for WN0010	WN0011	3	42 lbs
Hyd. Cable Puller Spare Parts	HC0013	8	3,424 lbs	Ancillary set for PU0201	PU0203	8	6,240 lbs
Hyd. Cable Puller Bridle Assembly	HC0047	8	5,306 lbs	Ancillary set for PU0210	PU0212	9	11,340 lbs
Hyd. Cable Puller Control Panel	HC0049	8	3,120 lbs	Ancillary set for PU0224	PU0224	4	5,120 lbs
50T Hyd. Cable Puller Load Cell	HC0052	8	1,632 lbs	Tension Meter, Hyd.	TE0051	8	2,096 lbs
Pump, 3" Diesel	PU0201	8	5,360 lbs	Gauges for Tension Meter	TE0052	16	832 lbs
Pump, 6" Diesel	PU0210	7	16,520 lbs	Spare parts for Tension Meter	TE0053	4	2 lbs
Pump, 10" Diesel	PU0220	4	12,800 lbs	Manifold Basket for 10" Pump	MISC	4	2,860 lbs
Pump, Jetting 3 Cyl.	PU0230	2	8,800 lbs	Van, Spare parts (Gulf)	VA2213	1	10,000 lbs (estimated)

Table F-2. ESSM Gear On-board BIG ORANGE VII.

DESCRIPTION	PART NO.	QUANTITY
Pump, 3"	PU0201	4
Spare Parts Kit, 3" pump	P0202	4
Hose Kits, 3"	Set# 317, 312, 316, 322	4
Submersible, 4" Elec.		2
Pump, 6"	PU0210	2
Spare Parts Kit, 6" pump	P0211	2
Generator, 30 KW	GE0410	2
Spare Parts, 30 W Generator	P0411	2
Hose Kits	SN 601, 644	2
Hydraulic Power Unit, Mod 6	PW0045	2
Spare Parts, Mod 6 Hyd. Power Unit	2089	2
DC Welder, 400 Amp	WL0470	2
Welding Kit	WL0472	2
Spare Parts Kit, 400 Amp DC welder	P0470	2
Under Water Cutting Kit	KT0558-01	2
Tuflex Slings Type	E-5150	4
Poly Pro Line, 3/4"		1
Poly Pro Line, 1"		1
Poly Pro Line, 1/2"		1
Manila Line, 1/2"		1
Hand Held Radios w/Charges		4
Generator, 5KW	GE0404	4
Jetting Pump, 500 GPM	PU0230	1
Jetting Pump, Aux. Equip. Box	P0272	1
Spare Parts Kit, Jetting Pump	P0231	1
Fire Fighting Kit w/submersible pump	FF0544	1
Air Comp., 125 CFM	AC0310	2
Jerry Cans		2
Spare Parts Kit, AC0310	P0311	2
Light Tower	LT0430	1
Spare Parts Kit, Light Tower	P0431	1
Sub. Pump Hyd. Kits w/ 6 containers	No. 206, 207	2
Tripods		2
Hose Reels (Hydraulic)		4
Wire Rope Reel, 1 5/8" x 300	WR0150	2
Wire Rope Reel, 5/8" x 1200	WR0141	2
Wire Rope Reel, 1 5/8" x 100 x 4	WR0151	4
Wire Rope Reel, 1 5/8" x 600	WR0151	4
Cable Pullers, 1 5/8" Hyd.	HC0012	2
Brid. Cable Puller		2
Hydraulic Control Stands	HC0049	2
Spare Parts Kit	SP0013	2
Hydraulic Hose Reels	HC0003	4
Shackles	SS1082	2
Hydraulic Tensioner, 50T	TE0051	2
Gauge, Hydraulic Tensioner		4
Load Cell Boxes	HC0052	2
Spare Part Kit, Tensioner	TE0053	1
Beach Gear, Consisting of 6 containers	CO0020	8
Stato Anchors	AN2006	2
Jerry Can, 5 Gals of 22190 oil		1
Jerry Can, 5 Gals of Type "F" oil		1
Technical Manuals of Equipment Supplied		12

Table F-3. ESSM Gear Left in Bahrain.		
DESCRIPTION	PART NO.	QUANTITY
Air Compressor, 125 CFM		4
Salvage Air Hose		2
Beach Gear Legs		2
Beach Gear Wire Rope, 1 5/8" x 300'		2
Beach Gear Wire Rope, 1 5/8" x 600'		4
Beach Gear Wire Rope, 5/8" x 1200'		2
Crown Wire, 1 1/4" x 100'		4
Di-Lok Chain, 2 1/4"		4
Anchor		2
Beach Gear Purchase, 5/8" Tackle		2
Beach Gear Puller Tackle		4
Generator, 5 KW Diesel		2
Generator, 30 KW Diesel		3
Light Tower with 5 KW Diesel Generator		2
Lighting Kit (120 V)		1
Power Unit, Hydraulic, Mod. 6		2
Hydraulic Hose Reel		4
Pullers		3
Control Panel		2
Tensioner, 50 Ton		4
Load Cell, 50 Ton		4
Bridle Assembly		1
Shackles, 2 1/2" (Box)		1
Spare Parts		2
Pump, Diesel, 3"		2
Hose Kit, 3"		6
Pump, Diesel, 6"		2
Hose Kit, 6"		2
Pump, Jetting, 2 1/2"		1
Kit, Jetting Pump		1
Pump, Sub. 4" Electric		3
Welder, Diesel, 400 Amp.		2
Under Water Cutting Kit		2
Welding Kit		2
Winch, 8 Ton, Diesel		2
Shop Van		1
Spare Parts/Misc. Van		1

Table F-4. BA - Container "A".			
ARTICLE	NUMBER	ARTICLE	NUMBER
Oxygen Kit	1	Hearing Protection	2
Helmets, Black	8	First Aid Kit (includes first aid book)	1
Firefighting Suits	8	Flashlight	4
Rubber Boots	8	Batteries, spare	20
Breathing Apparatus (positive pressure)	8	Beamguns, sealed	2
Facemask in box	8	Batteries, spare	5
Spare Air Bottles - 300 bar, 6 ltr	8	Gloves, poly-safe	10
O-rings for BA (sets)	20	Drum Lube Oil (60 ltr)	2
Spare part set - FiFi Unit (2)	1	Elec Start Device (includes cable), spare	1

Table F-5. First Attack Container "A".			
ARTICLE	NUMBER	ARTICLE	NUMBER
Fire Hoses, 3" 30 mtrs	10	Foam-branchpipe, 400 ltr/min lomex	3
Fire Hoses, 2" 30 mtrs	5	Inductor, 400 ltr/min	3
3-way Siamese	2	Inductor, 800 ltr/min	3
Acron Monitor	2	Foam Suction Hose	3
Mistjets Stak Construction	2	Reducing Coupling, 2-1/2" to 3"	1
Unifire	2	Reducing Coupling, 2 to 3"	1
Branchpipe, 1.m.3p	1	Reducing Coupling, 2" to 2-1/2"	1
Nozzle, 38mm	2	International Shore Connection	1
Hose Strap	10	BA-set Positive Pressure	5
Hose Repair Kit	5	Face Piece in Box	5
Coupling Wrench	2	Spare BA-bottle, 300 bar/6 ltr	5
Fire Axe	2	Foam-branchpipe, 400 ltr/min NF	1
Safety Line, 30 mtr	3	Alco Monitor	2
Foam-branchpipe, 800 ltr/min	3		

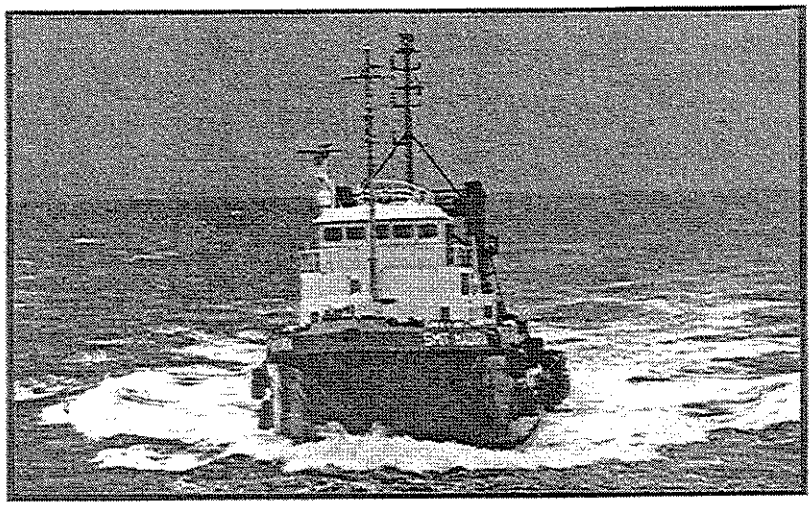
Table F-6. Hose Container "A".			
ARTICLE	NUMBER	ARTICLE	NUMBER
Fire Hoses, 3" 30 mtr	46	Reducing Coupling, 2-1/2" to 3"	1
Fire Hoses, 2" 30 mtr	9	Reducing Coupling, 2" to 2-1/2"	1
Dividing Breeches	5	Storz-coupling, 2-1/2" to 3" Hose Pillar	2
Acron Monitor	2	International Shore Connection	1
Mistjets Stak Construction	2	Saddle Beam, 75mm	10
Branchpipe, 1.m.3p	2	Saddle Beam, 100 mm	5
Reducing Nozzle to Alco Thread	2	Wrench for Alco Coupling	1
Hose Strap	20	CSWL	2
Hose Repair Kit	20	Safety Line, 30 mtr	2
Coupling Wrench, 4" to 6"	4	Rubberring, 2-1/2" Storz	1
Coupling Wrench, 2" to 3"	10	Rubberring, 4" Storz	6

Table F-7. BA - Container "B".			
ARTICLE	NUMBER	ARTICLE	NUMBER
Oxygen Kit	1	Flashlight	4
Helmets, Black	8	Batteries, spare	20
Firefighting Suits	8	Beamguns, sealed	2
Rubber Boots	8	Batteries, spare	5
Breathing Apparatus (positive pressure)	8	Gloves, poly-safe	10
Facemask in box	8	Foam Injection Pump	1
Spare Air Bottles - 300 bar, 6 ltr	8	Spare part set - FiFi Unit (2)	1
O-rings for BA (sets)	20	Alco Monitor	4
Hearing Protection	2	Light Foam Generator	1
First Aid Kit (includes first aid book)	1		

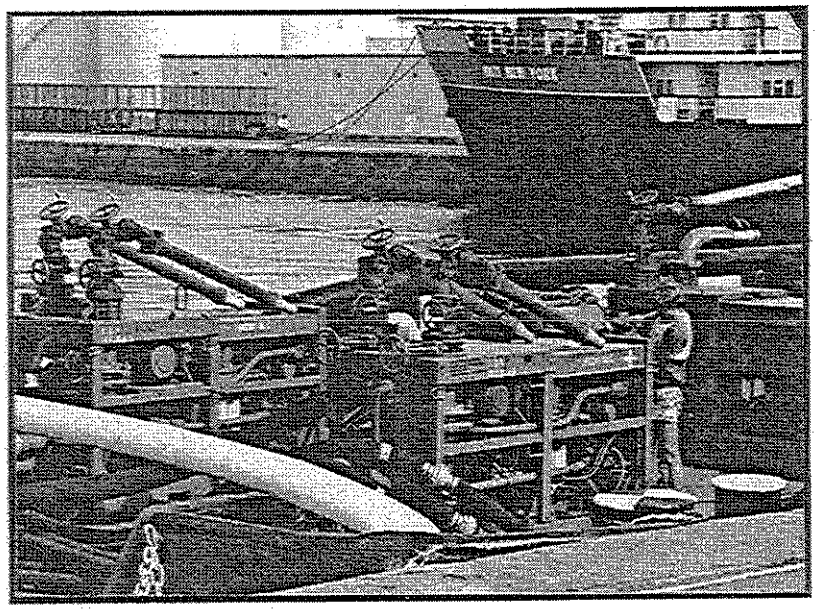
Table F-8. First Attack Container "B".	
ARTICLE	NUMBER
Fire Hoses, 3" 30 mtrs	10
Fire Hoses, 2" 30 mtrs	5
3-way Siamese	2
Acron Monitor	2
Mistjets Stak Construction	2
Unifire	2
Branchpipe, 1.m.3p	1
Nozzle, 38mm	2
Hose Strap	10
Hose Repair Kit	5
Coupling Wrench	2
Fire Axe	2
Safety Line, 30 mtr	2
Foam-branchpipe, 800 ltr/min	3
Foam-branchpipe, 400 ltr/min lomex	3
Inductor, 400 ltr/min	3
Inductor, 800 ltr/min	3
Foam Suction Hose	5
Reducing Coupling, 2-1/2" to 3"	1
Reducing Coupling, 2 to 3"	1
Reducing Coupling, 2" to 2-1/2"	1
International Shore Connection	1
BA-set Positive Pressure	5
Face Piece in Box	5
Spare BA-bottle, 300 bar/6 ltr	5
Foam-branchpipe, 400 ltr/min NF	1
Alco Branchpipe	6
Alco Monitor, 2500 ltr/min	1
Alco Foam-branchpipe, 2400 ltr/min	2
Foam-branchpipe, 5000 ltr/min	2
Suction Strainers	18
Manifold	2

Table F-9. Inventory List SMIT NEW YORK.
1 - FiFi Pump Set, includes 2 monitors and manifold with 4 outlets
BA - Container "B"
Hose Container "B"
First Attack Container "B"
2.5 tons Fluoroprotein Foam, 3 percent in drums stored on deck
6 tons Fluoroprotein Foam in Tank
FiFi/Foam System own vessel, 450 m^3/h
NOTE: The SMIT NEW YORK had to be equipped with a logistical/tactical potential of FiFi equipment. Therefore, some of the inventory of the three "B" containers was changed to the "A" containers onboard the SMIT MADURA.

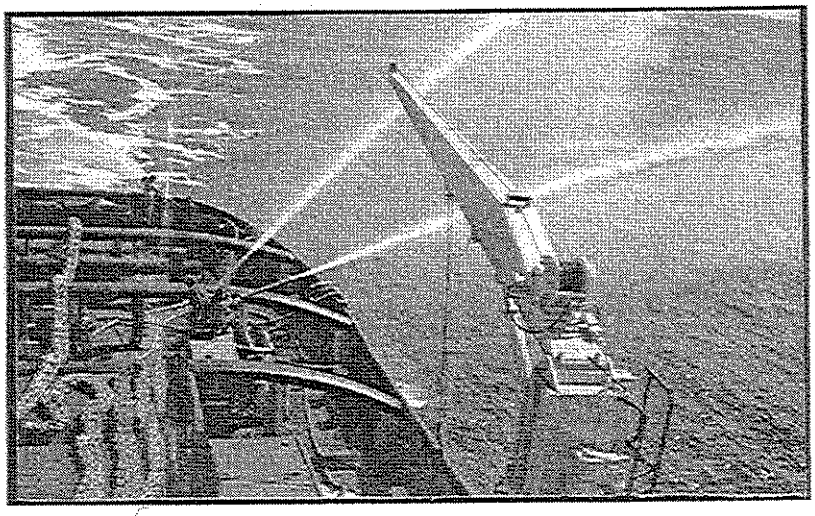
Table F-10. Inventory List SMIT MADURA.
1 Fire Engineer and 1 Pump Specialist
2 FiFi Pump Sets with 2 Monitors
1 FiFi Pump Set with 1 Foam Monitor and 1 Manifold with 4 Outlets
1 - 2500 ltr/min Monitor fixed on platform, approx. 12 mtr above sea level
Sprinkler System against chemicals and possible fire radiated heat
1 - Foam Tank of 2500 ltr with integrated foam monitor of 2400 ltr/min
1 - BA Compressor 200/300 Bar
1 - Crane "Cherry Picker" to place FiFi equipment onboard possible casualty
BA Container "A"
Hose Container "A"
First Attack Container "A"
17.5 tons of Fluoroprotein Foam - 3 percent, stored in drums
2.5 tons of Fluoroprotein Foam - 6 percent, stored in drums
NOTE: Additional equipment from the "B" Containers were store in the "A" Container.



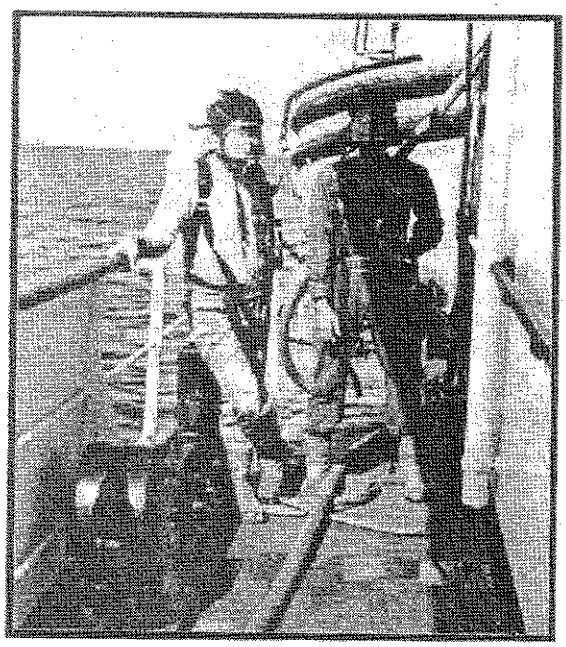
M/V SMIT MADURA at Sharjah U.A.E.



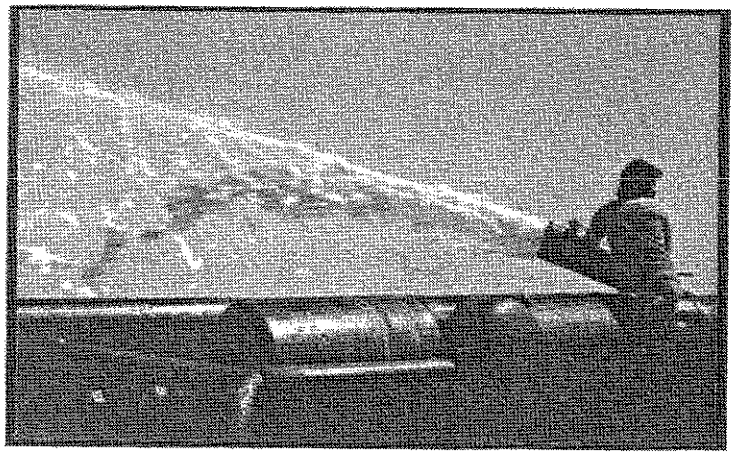
FiFi Equipment on SMIT MADURA.



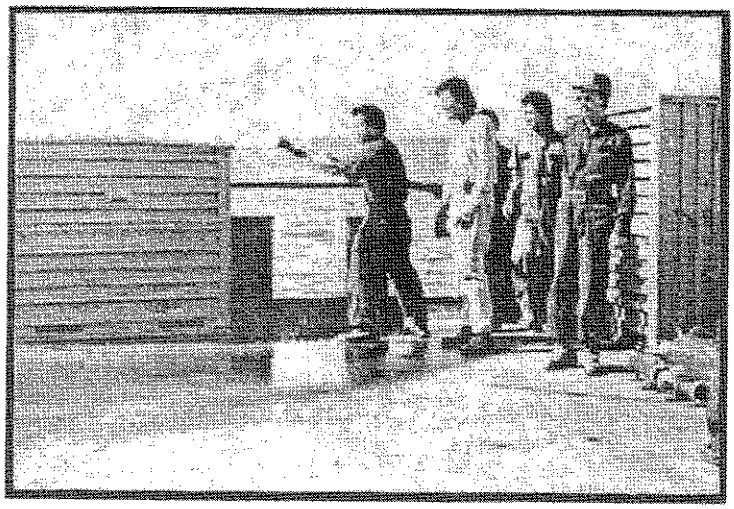
Portable Firefighting Monitors.



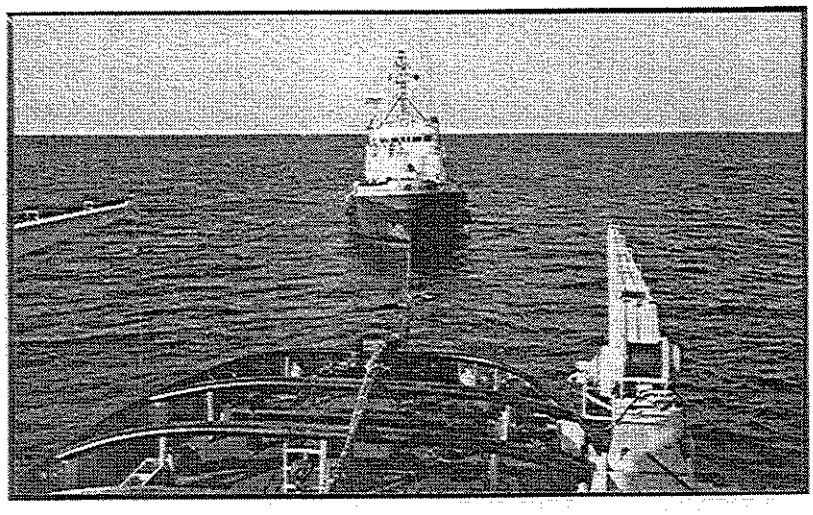
SMIT NEW YORK Crew Wearing Breathing Apparatus (BA).



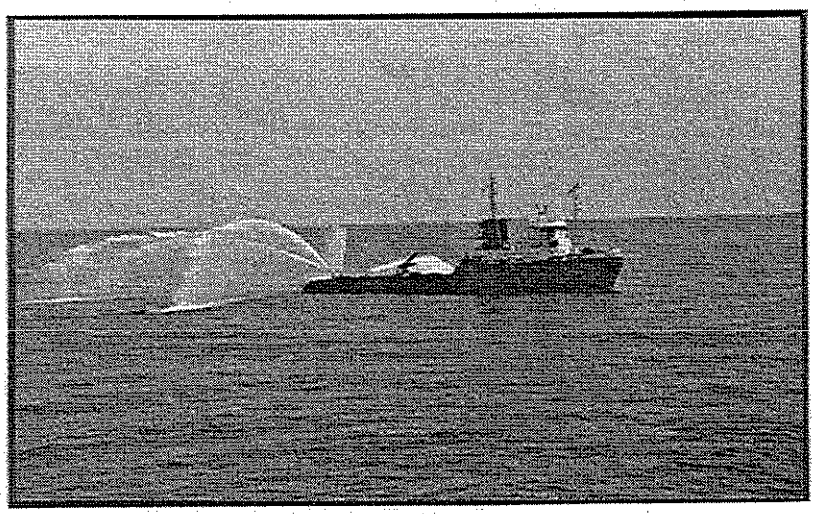
Foam Delivery Drill.



Hose Handling Training Aboard SMIT NEW YORK.



Towing Exercise - SMIT NEW YORK
Towing SMIT MADURA.



Firefighting Training Aboard
SMIT NEW YORK - Water Curtain.

APPENDIX G

OPERATION COST SUMMARY FOR OPERATION DESERT SHIELD/DESERT STORM

In identifying a cost summary of NAVSEA 00C sponsored salvage support of Operations DESERT SHIELD/DESERT STORM, all salvage-related costs during the period of 15 DEC 1990 through 30 JUN 1991 were considered. This period, beginning with Mr. Jim Bladh's visit to Sharjah, U.A.E. and Bahrain and ending with USS BEAUFORT's departure from the Gulf AOR, is broken into five phases marked by key events in order to provide a timeline financial expenditure summary. The phases are:

PHASE	DATES	EVENTS
I	15 DEC 90 - 01 JAN 91	SUPSALV Rep in Saudi Arabia for Fleet liaison to establish SUPSALV representation and ESSM base in Sharjah, U.A.E.
II	02 JAN 91 - 17 JAN 91	USNS HIGGINS aground, M/V SMIT NEW YORK on hire; SUPSALV reps arrive in GULF; ESSM Equipment shipped and arrives Sharjah; Air War begins
III	18 JAN 91 - 01 MAR 91	M/V MADURA on hire; ESSM Base set up; USS BEAUFORT chops to CTF 151; USS TRIPOLI AND USS PRINCETON mine strikes; Ground War begins and ends
IV	02 MAR 91 - 08 APR 91	Oceaneering/Eastport mobilize and demobilize for TLAM search and recovery project; SMIT NEW YORK and SMIT MADURA off hire; ESSM Base shifts to Bahrain
V	09 APR 91 - 01 JUN 91	General demobilization; USS BEAUFORT out chops

The SUPSALV Headquarters costs in coordinating and selecting the ESSM base location, and establishing a SUPSALV presence within SRUDET BAHRAIN/CTG 151.12 include the following:

COST ACCOUNT	AMOUNT
N0002491TO05086	$ 6,000.00
N0002491TO06860	$10,274.78
	$16,274.78

The following contractors participated in the salvage support effort:

CONTRACTOR	CONTRACT No.	D/O No.
SMIT INTERNATIONAL	N0002490D4349	0002, 0003
GLOBAL PHILLIPS CARTNER	N0002489D4013	0033
EASTPORT INTERNATIONAL, Inc.	N0002490D4090	0024, 0025
OCEANEERING INTERNATIONAL, Inc. Steadfast Division	N0002490D4183	0012, 0013
ROH, Inc.	N0002490C4142	N/A

Table G-1 provides a total cost summary of scheduled and unscheduled costs in the categories of:

- Personnel – Labor and per diem costs.
- Equipment – Vessels and major equipment.
- Transportation – Equipment and personnel.
- Services – Local warehouse and labor support, priority parts express, communications, customs support.
- Material/Misc. – All other costs not included in above such as utilities, spare parts, consumables, fuel & lubricants, reports, war risk insurance, SATCOM, etc.

Table G-1. Contractor Headquarters Costs.

CATEGORIES	COSTS					TOTAL
	I	II	III	IV	V	
	15 DEC - 01 JAN	02 JAN - 17 JAN	18 JAN - 01 MAR	02 MAR - 08 APR	09 APR - 01 JUN	
1. PERSONNEL	36,642.07	31,120.71	260,380.70	309,623.24	52,359.96	$690,126.68
2. EQUIPMENT	0.00	200,638.00	1,466,744.01	1,399,539.69	87,996.55	$3,154,918.25
3. TRANSPORTATION	0.00	1,631.85	151,324.62	84,635.56	45,058.16	$282,650.19
4. SERVICES	0.00	0.00	12,639.91	11,999.22	7,026.98	$31,666.19
5. MATERIAL/MISC	20,220.88	67,788.20	210,787.53	177,060.10	85,391.90	$561,248.61
TOTAL	$56,862.95	301,178.76	$2,101,876.77	$1,982,857.81	$277,833.55	$4,720,609.84

Tables G-2 through G-8 shows cost summaries percontractor for the above categories.

Table G-2. SMIT International Costs (Delivery Order 0002).

CATEGORIES	COSTS					TOTAL
	I	II	III	IV	V	
	15 DEC - 01 JAN	02 JAN - 17 JAN	18 JAN - 01 MAR	02 MAR - 08 APR	09 APR - 01 JUN	
1. PERSONNEL	0.00	15,000.00	191,900.00	7,200.00	0.00	$214,100.00
2. EQUIPMENT	0.00	200,638.00	1,073,639.62	62,424.00	0.00	$1,336,701.62
3. TRANSPORTATION	0.00	0.00	60,175.24	0.00	0.00	$60,175.24
4. SERVICES	0.00	0.00.	0.00	0.00	0.00	$0.00
5. MATERIAL	0.00	45,024.17	132,638.42	70,291.41	0.00	$247,954.00
TOTAL	$0.00	$665,662.17	$1,458,354.28	$139,915.41	$0.00	$1,858,930.86

Table G-3. SMIT international Costs (Delivery Order 0003).

CATEGORIES	COSTS					TOTAL
	I	II	III	IV	V	
	15 DEC - 01 JAN	02 JAN - 17 JAN	18 JAN - 01 MAR	02 MAR - 08 APR	09 APR - 01 JUN	
1. PERSONNEL	0.00	585.68	6,296.79	135,115.49	2,749.53	$144,747.49
2. EQUIPMENT	0.00	0.00	393,104.39	1,268,346.00	62,596.55	$1,724,046.94
3. TRANSPORTATION	0.00	621.24	72,922.05	58,683.15	1,960.62	$134,187.06
4. SERVICES	0.00	0.00	0.00	0.00	0.00	$0.00
5. MATERIAL/MISC	0.00	8,229.03	46,849.49	93,750.62	18,188.19	$167,017.33
TOTAL	$0.00	$9,435.95	$519,172.72	$1,555,895.26	$85,494.89	$2,169,998.82

Table G-4. Global Phillips Cartner Costs (Delivery Order 0033).

CATEGORIES	COSTS ($000 DOLLARS)					TOTAL
	I	II	III	IV	V	
	15 DEC - 01 JAN	02 JAN - 17 JAN	18 JAN - 01 MAR	02 MAR - 08 APR	09 APR - 01 JUN	
1. PERSONNEL	36,642.07	31,120.71	260,380.70	309,623.24	52,359.96	$690,126.68
2. EQUIPMENT	0.00	200,638.00	1,466,744.01	1,399,539.69	87,996.55	$3,154,918.25
3. TRANSPORTATION	0.00	1,631.85	151,324.62	84,635.56	45,058.16	$282,650.19
4. SERVICES	0.00	0.00	12,639.91	11,999.22	7,026.98	$31,666.19
5. MATERIAL/MISC	20,220.88	67,788.20	210,787.53	177,060.10	85,391.90	$561,248.61
TOTAL	$56,862.95	$301,178.76	$2,101,876.77	$1,982,857.81	$277,833.55	$4,720,609.84

Table G-5. Eastport International, Inc. Costs Delivery Order 0024).

CATEGORIES	COSTS ($000 DOLLARS)					TOTAL
	I	II	III	IV	V	
	15 DEC - 01 JAN	02 JAN - 17 JAN	18 JAN - 01 MAR	02 MAR - 08 APR	09 APR - 01 JUN	
1. PERSONNEL	0.00	0.00	0.00	5,769.69	0.00	$5,769.69
2. EQUIPMENT	0.00	0.00	0.00	5,769.69	0.00	$5,769.69
3. TRANSPORTATION	0.00	0.00	0.00	0.00	0.00	$0.00
4. SERVICES	0.00	0.00	0.00	0.00	0.00	$0.00
5. MATERIAL/MISC	0.00	0.00	0.00	3,723.58	0.00	$3,723.58
TOTAL	$0.00	$0.00	$0.00	$15,262.96	$0.00	$15,262.96

Table G-6. Eastport International, Inc. Costs (Delivery Order 0025).

CATEGORIES	COSTS					TOTAL
	I	II	III	IV	V	
	15 DEC - 01 JAN	02 JAN - 17 JAN	18 JAN - 01 MAR	02 MAR - 08 APR	09 APR - 01 JUN	
1. PERSONNEL	0.00	0.00	0.00	20,422.00	2,419.48 2,338.00	$25,179.48
2. EQUIPMENT	0.00	0.00	0.00	0.00	0.00	$0.00
3. TRANSPORTATION	0.00	0.00	0.00	3,475.50	16,437.67	$19,913.17
4. SERVICES	0.00	0.00	0.00	6,619.32 2,163.29	4,590.77	$13,373.38
5. MATERIAL/MISC	0.00	0.00	0.00	0.00	0.00	$0.00
TOTAL	$0.00	$0.00	$0.00	$32,680.11	$25,785.92	$58,466.03

Table G-7. Oceaneering International, Inc. Costs (Deliver Order 0012).						
CATEGORIES	COSTS ($000 DOLLARS)					TOTAL
	I	II	III	IV	V	
	15 DEC - 01 JAN	02 JAN - 17 JAN	18 JAN - 01 MAR	02 MAR - 08 APR	09 APR - 01 JUN	
1. PERSONNEL	0.00	0.00	0.00	71,600.00	9,300.00	$80,900.00
2. EQUIPMENT	0.00	0.00	0.00	48,800.00	25,400.00	$74,200.00
3. TRANSPORTATION	0.00	0.00	0.00	7,600.00	21,3000.00	$28,900.00
4. SERVICES	0.00	0.00	0.00	0.00	0.00	$0.00
5. MATERIAL/MISC	0.00	0.00	0.00	6,100.00	200.00	$6,300.00
TOTAL	$0.00	$0.00	$0.00	$134,100.00	$56,200.00	$190,300.00

Table G-8. Oceaneering International, Inc. Costs (Deliver Order 0013).						
CATEGORIES	COSTS ($000 DOLLARS)					TOTAL
	I	II	III	IV	V	
	15 DEC - 01 JAN	02 JAN - 17 JAN	18 JAN - 01 MAR	02 MAR - 08 APR	09 APR - 01 JUN	
1. PERSONNEL	0.00	0.00	0.00	33,900.00	0.00	$33,900.00
2. EQUIPMENT	0.00	0.00	0.00	14,200.00	0.00	$14,200.00
3. TRANSPORTATION	0.00	0.00	0.00	13,700.00	0.00	$13,700.00
4. SERVICES	0.00	0.00	0.00	0.00	0.00	$0.00
5. MATERIAL/MISC	0.00	0.00	0.00	1500.00	0.00	$1,500.00
TOTAL	$0.00	$0.00	$0.00	$63,300.00	$0.00	$63,300.00