U.S. Navy Salvage Report
TWA Flight 800

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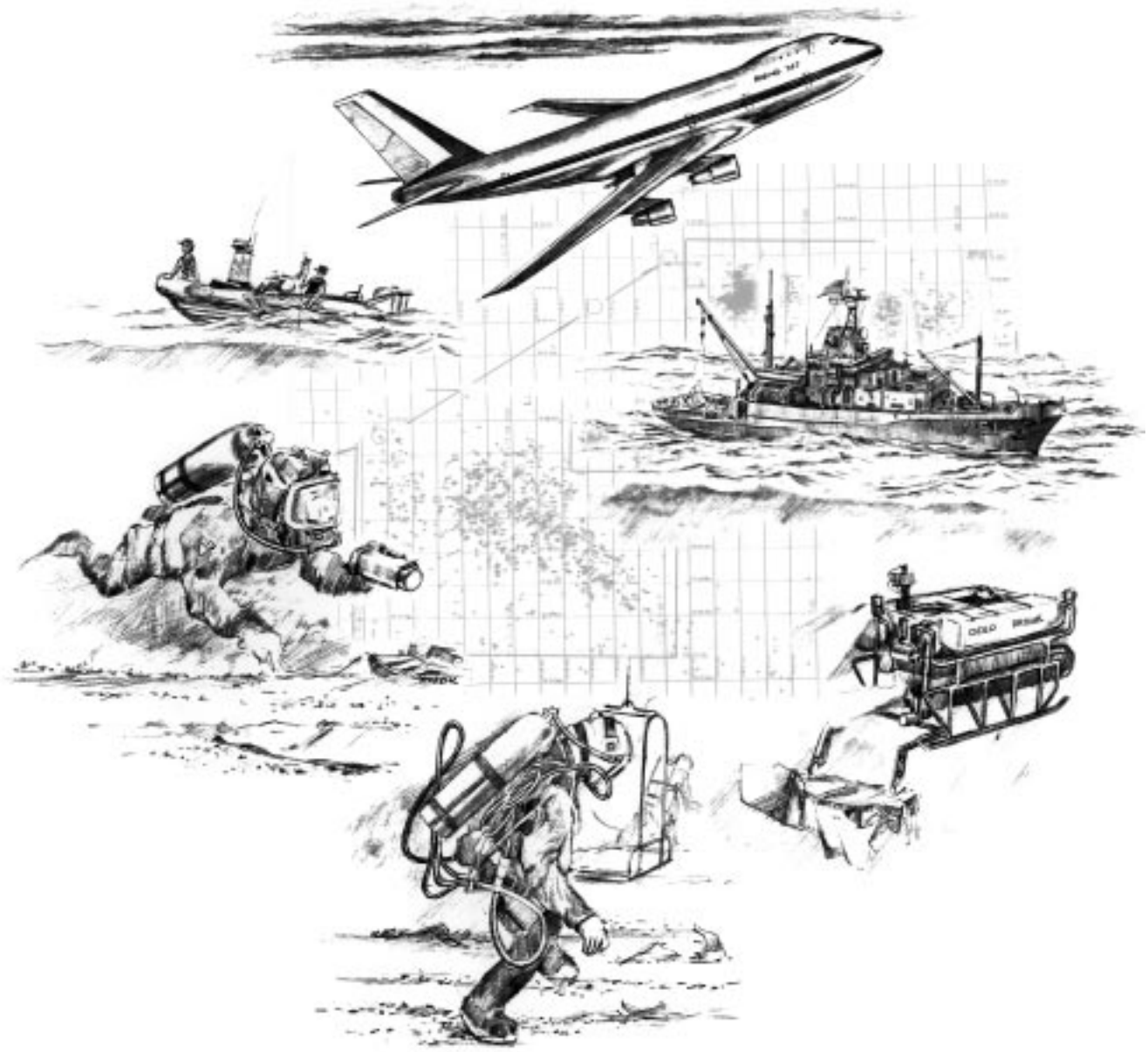
U.S. NAVY SALVAGE REPORT
TWA FLIGHT 800



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Foreword

This report on the salvage of the victims and wreckage of TWA Flight 800 documents the techniques and procedures that were used in this difficult operation. The report is intended to serve two purposes. First, it documents the actual conduct of the operation. Secondly, and more importantly, the report provides lessons learned so that if confronted with an event of this nature in the future, the salvage team will have a ready reference to draw upon.

The multi-agency task force that worked elbow-to-elbow every day for the first four months was comprised of dedicated and selfless individuals. They worked under exceedingly difficult conditions never complaining. Their only goal was the recovery of every victim and all of the aircraft. That all 230 victims and over 98 percent of the aircraft were recovered is testimony to their dedication and professionalism.

A special note of thanks is in order to all the many volunteers from agencies such as the American Red Cross and the gracious people of Long Island. They provided great support during the long and difficult hours. It is unfortunate that it takes a tragedy of this magnitude to truly appreciate the kindness in others. The capacity for volunteerism and neighbor helping neighbor was never better demonstrated than in the aftermath of this terrible tragedy.

A special note on the divers is also in order. These brave men and women risked great peril diving into the middle of a torn and twisted aircraft with razor-sharp metal and over 300 miles of electrical cable. To these were given the daunting task of recovering the 125 victims not recovered from the surface of the ocean. They worked day after day descending to the depths to recover the victims and aircraft wreckage. Their singleness of purpose and steadfast devotion to duty are truly praiseworthy.

It is sincerely hoped that we are never faced with another tragedy like TWA 800. But if another tragedy should occur, the lessons learned from the TWA 800 Salvage Operation should assist those who follow in our wake.

Captain R. S. McCord, USN
Supervisor of Salvage and Diving
Director of Ocean Engineering

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Introduction and Background

Chapter 1

Introduction and Background

1.1 Introduction

Soon after 8:31 on the evening of 17 July 1996, Trans World Airways Flight 800, a Boeing 747-131 bound for Paris, crashed into the Atlantic Ocean some 10 miles southeast of East Moriches, Long Island (see Figure 1-1). Throughout the night and the following day, rescuers searched for survivors. None were found. It was later established that all 230 people on board Flight 800 died. This report describes the U.S. Navy's participation in the multi-agency effort to recover the remains of the victims of the incident and the aircraft wreckage to help investigators determine the cause of the crash. The history of this effort is, first and foremost, the story of a salvage operation carried out under unusual and often trying conditions. It thus offers many insights into the techniques of open-ocean diving and marine salvage. The story is not complete, however, without a thorough examination of the way that Navy officials dealt with challenges such as interagency cooperation and public relations.

1.2 Tasking

Primary responsibility for discovering the cause of the crash of Flight 800 lay with the National Transportation Safety Board (NTSB), an independent Federal agency charged by Congress with investigating every civil aviation accident in the United States. Because of the possibility that the crash was the work of terrorists, the Federal Bureau of Investigation (FBI) was responsible for determining whether criminal activity was involved. In the hours immediately following the crash, these two agencies formed a joint task force to begin the investigation. Navy involvement in the investigation began on the morning of 18

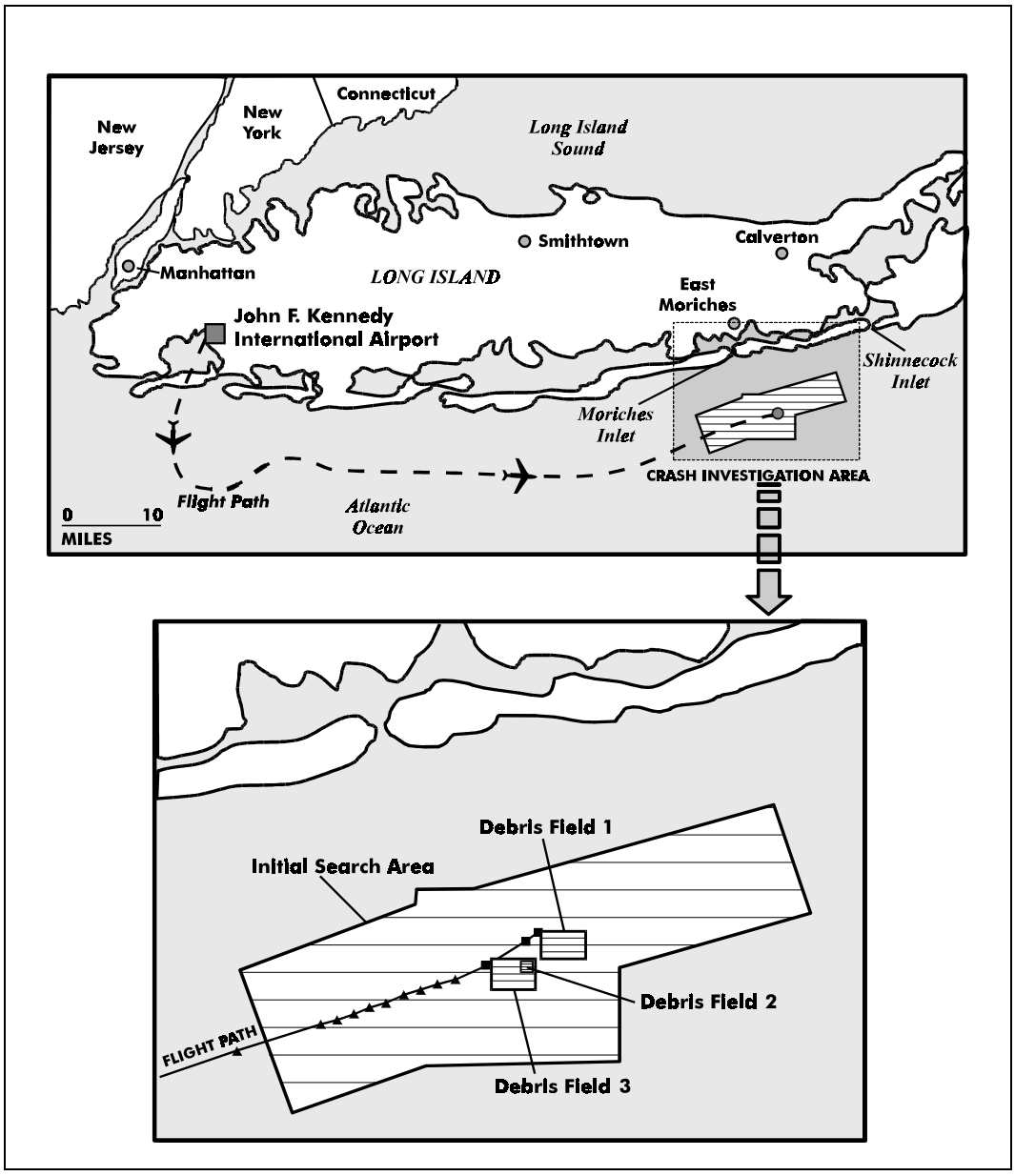

Figure 1-1. Operations Area. After taking off from JFK International, the Boeing 747-131 turned to fly northeast along the Long Island coastline. Radar received the final transponder signal as the airplane passed 10 miles southeast of East Moriches at an altitude of 13,700 feet. Radar continued to detect objects in the air after the transponder stopped working. Based on this radar information and the location of floating debris, investigators began the search for wreckage and eventually identified three debris fields.

July, when Captain Ray Scott McCord, the Supervisor of Salvage and Diving (SUPSALV) at Naval Sea Systems Command (NAVSEA) called the NTSB and informally offered the assistance of his organization. This set in motion an exchange of telephone calls and faxes between the Chief of Naval Operations (CNO) and the NTSB that, by late afternoon on 18 July, resulted in a Naval message from the CNO formally tasking SUPSALV to assist in the NTSB investigation (see Appendix A for tasking messages and other official correspondence).

While this exchange of information was taking place and in anticipation of formal tasking, SUPSALV and Mr. Tom Salmon, head of the Salvage Operations Division (SEA 00C2) departed Arlington, VA for Long Island, NY. They arrived at East Moriches on the afternoon of 18 July and met with NTSB officials. Additional exchanges of information took place between staff members of the CNO, SUPSALV, and the Commander-in-Chief, U.S. Atlantic Fleet (CINCLANTFLT).

At first, the NTSB requirement was for Navy help in mapping the debris field and in finding the downed aircraft's flight data and cockpit voice recorders. To accomplish this mission, the Navy created a small team from readily available assets. Through its undersea search and operations contractor, Oceaneering International, Inc., SUPSALV contracted for the services of a commercial vessel (M/V PIROUETTE) and loaded it with Navy-owned equipment, including a towed pinger locator (TPL), a side-scan sonar (SSS) system, and a mini-remotely operated vehicle (ROV). Because the airplane had crashed into relatively shallow water (120 feet), SUPSALV also requested the services of Navy divers. Explosive Ordnance Disposal (EOD) and mobile diving units of the Atlantic Fleet provided 13 divers, support personnel, and the means of establishing a small command and control center and Fly Away Dive Locker (FADL) dive station at Coast Guard Station Group Moriches, where the search and salvage command post was established (see Figure 1-2).

Figure 1-2. U.S. Coast Guard Station Moriches. Due to its proximity to the crash, the Coast Guard Station at East Moriches, NY, became the hub of the search and recovery operation. Here the Navy established its command and control center and facilities for data analysis, public affairs, and communications. Wreckage was transferred to shore at the Shinnecock Coast Guard Station.

1.3 Extension of the Navy Mission

Within days it became apparent to SUPSALV that significant Navy assistance would be needed in the far more extensive and complicated tasks of recovering victims and wreckage.

On 21 July, in anticipation of a formal change in the mission, SUPSALV requested the assignment of a Navy salvage ship and advised CNO, NAVSEA, and CINCLANTFLT that additional assets would be needed. CINCLANTFLT directed USS GRASP (ARS 51) to assist the operation and further recommended the formation of Task Group 40.50, with a Navy Flag Officer as Officer in Tactical Command (OTC). Before leaving her homeport in Little Creek, VA, GRASP was outfitted with a SUPSALV mini-ROV (MR-1). CINCLANTFLT subse-

quently assigned USS OAK HILL (LSD 51), a dock landing ship, to serve as the Afloat Command Post. By the time Navy diving operations commenced on 21 July, the recovery of victims had become the first priority, even though the flight data recorders had yet to be found.

When the flight data recorders were recovered on 23 July, the recovery of victims and identification of debris had been underway for three days. Even though no formal tasking had been received, the Navy effort had evolved into a three-phase operation. These phases, which overlapped considerably, were:

- Phase 1: Debris Search, Location, and Identification
- Phase 2: Victim Recovery
- Phase 3: Wreckage Recovery

Phase 1, the use of side-scan sonar and laser line scanning systems to identify places where victims and wreckage might be located, lasted until 13 October 1996. Phases 2 and 3, the use of divers, ROVs, salvage vessels, and scallop trawlers to recover victims and wreckage, lasted through 18 May 1997.

By 27 July, two major debris fields had been defined (see Figure 1-3). SUPSALV then requested a second salvage ship and CINCLANTFLT directed USS GRAPPLE (ARS 53) to join the effort. Before getting underway, GRAPPLE was equipped with Deep Drone, SUPSALV's 7200-foot depth rated salvage ROV. With mini-ROVs already operating from PIROUETTE and GRASP, Deep Drone brought the number of operating ROVs on site to three. A fourth ROV, MR-3, served as a spare and was located ashore at USCG Station Moriches.

The use of divers and ROVs to search for victims worked well, leading to the recovery of all the victims not recovered on the surface during the Coast Guard's search for survivors in the immediate aftermath of the crash. Divers and ROVs working with salvage vessels were also successful at recovering more than 95 percent of the aircraft.

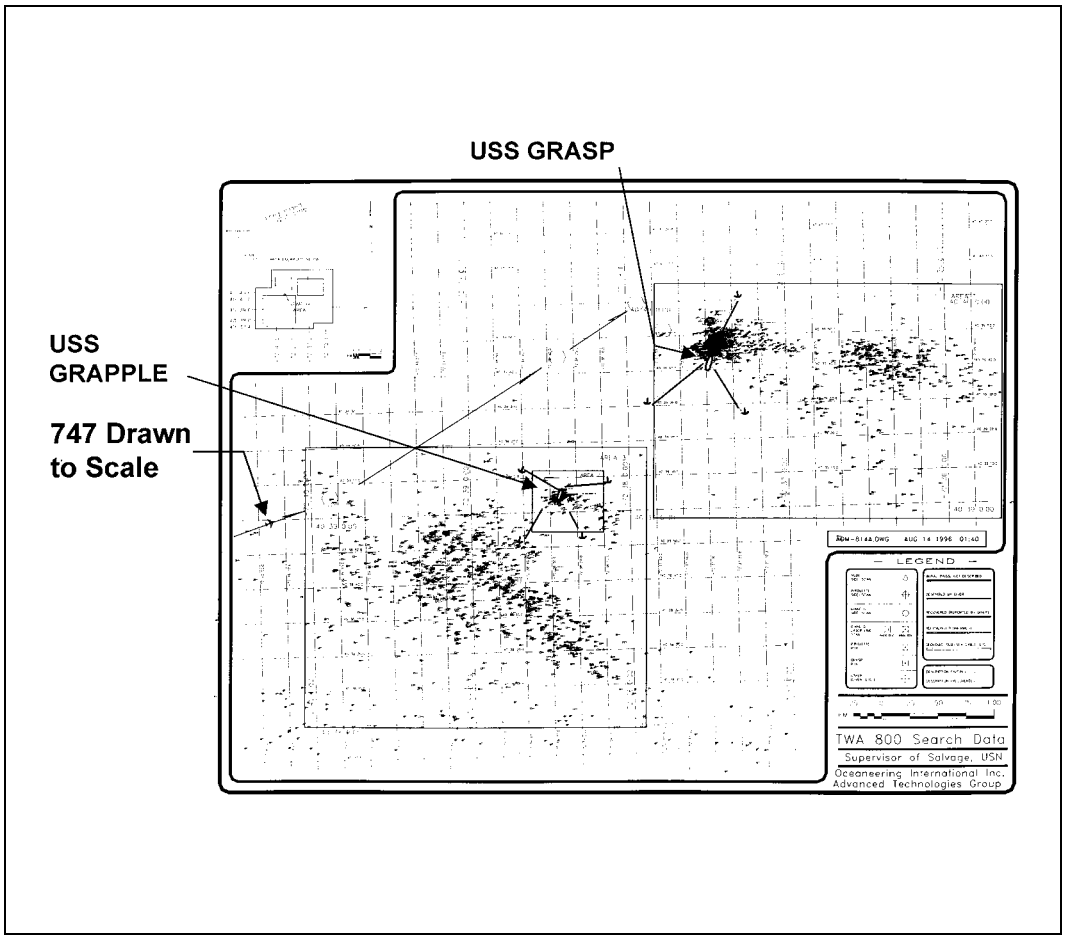

Figure 1-3. Wreckage Location. USS GRASP was moored over Debris Field 1, which contained the bulk of the airplane (from the wings aft). USS GRAPPLE was moored over Debris Field 2, which contained the cockpit and first class section. Debris Field 3 contained scattered debris.

While recovering significant portions of the aircraft, the use of divers and ROVs to recover every last piece of wreckage proved difficult. Shifting sands on the ocean floor, tides, and heavy weather caused many of the smaller pieces of wreckage to become imbedded in the ocean floor before divers could get to them. SUPSALV considered a number of options for recovering this portion of the wreckage, including continued use of divers and ROVs, suction dredging and lift excavation. After examining the costs and benefits of each method, SUPSALV recommended and the NTSB authorized the use of commercial scallop trawlers

to scrape the sea bed. This effort began on 4 November 1996 and continued until 30 April 1997.

1.4 Scope of the Navy Mission

For more than nine months, the Navy led a search and recovery effort of unusual complexity and extent. The Navy-led team located and recovered all 125 victims who had not been recovered in the immediate aftermath of the crash. The Navy-led team also identified over five thousand "targets" — specific sites where wreckage was likely to be found — and recovered millions of pieces of debris. Divers, most of whom were Navy divers and all of whom were working as part of the Navy-led team, made 677 surface-supplied dives and 3,667 SCUBA dives for a total bottom time of 1,773 hours. ROVs made 376 dives, for a total operating time of 2,679 hours. Four Navy vessels, one research vessel, nine commercial ships, and dozens of support craft participated. See Figure 1-4 for a summary of the operation's statistics and Figure 1-5 for a list of major assets deployed.

1.5 Overview of the Operation

While planning for the Flight 800 search and recovery operation was based on the concept of three phases, the activities associated with the operation fell naturally into three distinct time periods. From 18 July until the end of August there was a period of intense activity aimed at recovering victims and those pieces of the aircraft (such as flight recorders and engines) seen as critical to the investigation. From the beginning of September through the first week of November, there was a sustained effort to recover as much of the aircraft as possible using divers and ROVs. From 4 November until 30 April 1997, the operation consisted mostly of the use of commercial trawlers to scrape debris from the seabed.

1.5.1 The Period of Intense Activity

Because of the need to recover victims as quickly as possible and the desire of investigators to rapidly recover those pieces of wreckage most likely to

Surface-supplied dives:	677	ROVs used:	4
Surface supplied hours:	856	ROV dives:	376
		ROV hours:	2,679
Scuba dives:	3,667		
Scuba hours:	917	Vessels	
		Navy:	4
Total dives:	4,344	NOAA:	1
Total diving hours:	1,773	Contract:	9
Navy divers:	225 +		
Civilian divers:	150 +		

Figure 1-4. Summary of Statistics. The Flight 800 operation was one of the largest diver-assisted salvage operations ever conducted.

provide important clues, the first period of the search and recovery operation was marked by feverish activity. Humanitarian concerns mandated that victims be found, identified, and returned to their loved ones with the absolute minimum of delay. The tendency of shifting sands, heavy seas, corrosion, and sea growth to alter physical evidence made it desirable to get important pieces of the aircraft out of the water as soon as possible. Even so, activities were conducted in a systematic manner, with due attention being paid to considerations of safety, economy, and efficiency.

Search Vessels

- M/V PIROUETTE
- R/V RUDE
- M/V DIANE G
- M/V MARION C II
- M/V ABLE J
- M/V ATLANTIC SURVEYOR

Salvage Vessels

- USS GRASP (ARS 51)
- USS GRAPPLE (ARS 53)

Flag/Support Vessels

- USS OAK HILL (LSD 51)
- USS TRENTON (LPD 14)

Trawling Vessels

- F/V CHRISTIAN & ALEXA
- F/V TRADITION
- F/V KATHY ANN
- F/V ALPHA OMEGA II
- F/V NORDIC PRIDE

Cable Vessels

- ATT/V GLOBAL MARINER
- ATT/V DEBRA LEE
- ATT/V ENTERPRISE

Support Craft

- Side Loading Warping Tug
- LCM(8) landing craft (two)
- LCM(8) JENNIFER LYNN (commercial)

Search Systems

- Shallow Water Intermediate Search System (SWISS)
- Towed Pinger Locator (TPL)
- Laser Line Scanning System

Remotely Operated Vehicles

- Mini-ROV 1
- Mini-ROV 2
- Mini-ROV 3
- Deep Drone

Figure 1-5. Major Assets Deployed. The Flight 800 operation was a true test of the U.S. Navy's current search and salvage capabilities. Two of the Navy's four SAFEGUARD-class salvage vessels and four of SUPSALV's ROVs were deployed. SUPSALV also took full advantage of commercial assets acquired through its standing undersea search and operations contract with Oceaneering International, Inc. The salvage operation was augmented by two Navy amphibious vessels, which served as flag ships and provided logistical support. See Appendix B for more information on each major asset.

Because of this emphasis on time, operations were initiated before formal taskings were received and while planning was still underway. Units, from a variety of Navy commands and other organizations, were put to work as soon as they arrived. Divers, ships crews, and shore personnel worked long hours, with a minimum of rest and no breaks save those imposed by bad weather.

The first organization to respond to the disaster was the U.S. Coast Guard, which began an extensive effort to locate survivors within minutes of the crash. Other ships in the area, including R/V RUDE, an oceanographic vessel belonging to NOAA, took part in this rescue attempt. Additional civilian and

commercial craft volunteered their services for a few days. When it became clear that there were no survivors, these ships began to recover victims and pieces of wreckage that were floating on the surface.

SUPSALV involvement in the search and recovery effort began on 18 July 1996, the day after the crash. Prior to leaving his Arlington, Virginia office for Long Island, SUPSALV called for those assets that he believed he would need for the immediate task of locating the flight recorders. Of these, the contractor vessel PIROUETTE, based out of Point Pleasant, New Jersey, arrived on scene on the evening of 19 July. The Navy divers and diver support personnel, all from stations on the East coast of the United States, were on scene by the end of the day on 20 July. While waiting for these units to arrive, SUPSALV arranged for NOAA vessel RUDE to use its side-scan sonar to begin looking for areas where the flight recorders might be found. Starting on 20 July, PIROUETTE used both its towed pinger locator (TPL) and SSS to join in the search for the flight recorders. On 27 July, DIANE G, a research vessel belonging to Scientific Applications International Corporation, arrived on scene and began to employ its laser line scanner (LLS) and SSS to help identify underwater objects.

Diving operations to recover victims and debris began on 18 July, when divers from local police departments arrived at the scene of the disaster. The pace of diving operations picked up rapidly on 21 July, when the first Navy divers began to work. Within a week, a total of 120 divers (81 Navy) were involved in the operation. By the 6 August, the number of divers had risen to 188 (149 Navy) and, two days later, began to slowly decline. In August, the average number of divers available on any given day was 153. In September, this number dropped to 121. On 2 November 1996, the day that diving operations were secured, 86 divers (56 Navy) were present for duty. See Figure 1-6 for a time line of the operation.

At first, SCUBA divers operated from a shore-based dive station, using small craft such as Boston Whalers and Rigid Hull Inflatable Boats (RHIBs) to get to their dive locations. When they arrived on station, the salvage ships USS GRASP and USS GRAPPLE provided stations for surface-supplied divers as well

FLIGHT 800 SALVAGE OPERATIONS TIME LINE OF EVENTS

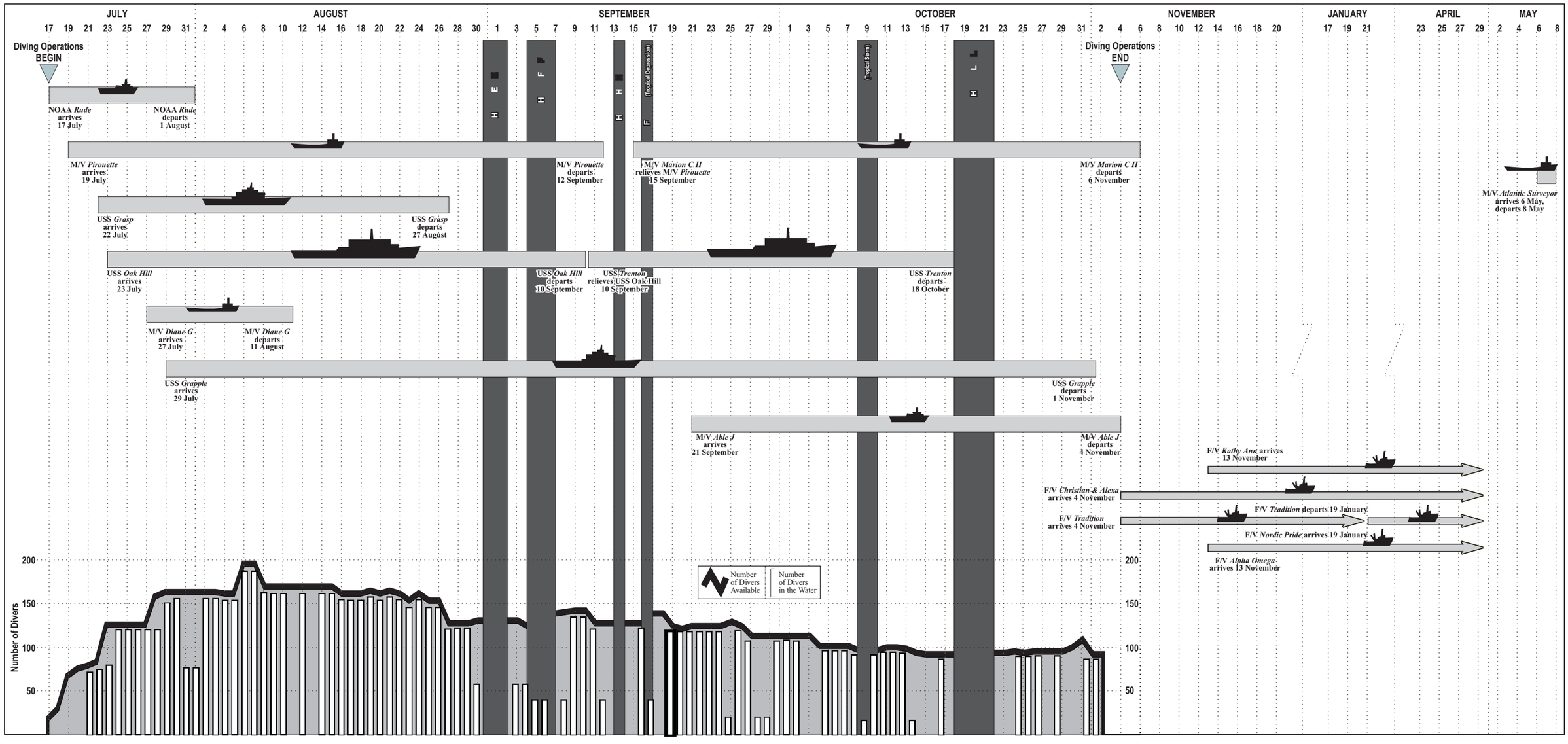

Figure 1-6. Time Line of Events.

as platforms for ROV operations and a means of lifting large pieces of debris from the water. Additional berthing and messing for divers operating from GRASP and GRAPPLE were provided by USS OAK HILL and her replacement, USS TRENTON (LPD 14).

During the period of intense activity, the first priority for diving operations was the recovery of victims. This psychologically difficult task occupied the bulk of divers' attention through the end of July, limiting the recovery of wreckage to those pieces likely to restrict access to victims and those items (such as the flight recorders, engines, and the cockpit) of particular interest to the investigation. By the first week of August, 194 of the 230 victims had been recovered and identified and some dive teams began recovering debris in areas not likely to contain victims. By the end of August, a total of 211 victims had been recovered and identified. In the next ten months, all 19 remaining victims were identified through DNA testing.

1.5.2 The Period of Sustained Effort

Two events marked the end of the period of intense activity and the beginning of the period of sustained effort. The first was the departure, on 27 August, of the GRASP and the 25 divers that she carried. The second was the occurrence of heavy weather, much of it the result of Atlantic hurricanes, that made diving operations impossible on more than half of the days in September. See Figure 1-7.

A reduction in the tempo of operations helped to combat diver fatigue. The imperative of recovering victims and items of particular concern to the investigation had led some divers to dive as many as 21 consecutive days. At first, it was thought that a high level of activity was best for the divers in terms of their physical and mental well-being. As time went by, however, this grueling schedule became a concern to Navy leaders on the scene. Throughout the operation divers were continually evaluated for signs of physical and mental fatigue, full advantage was taken of bad weather to provide divers with a chance to rest, and psychiatrists, chaplains, and counselors were on hand to help divers deal with

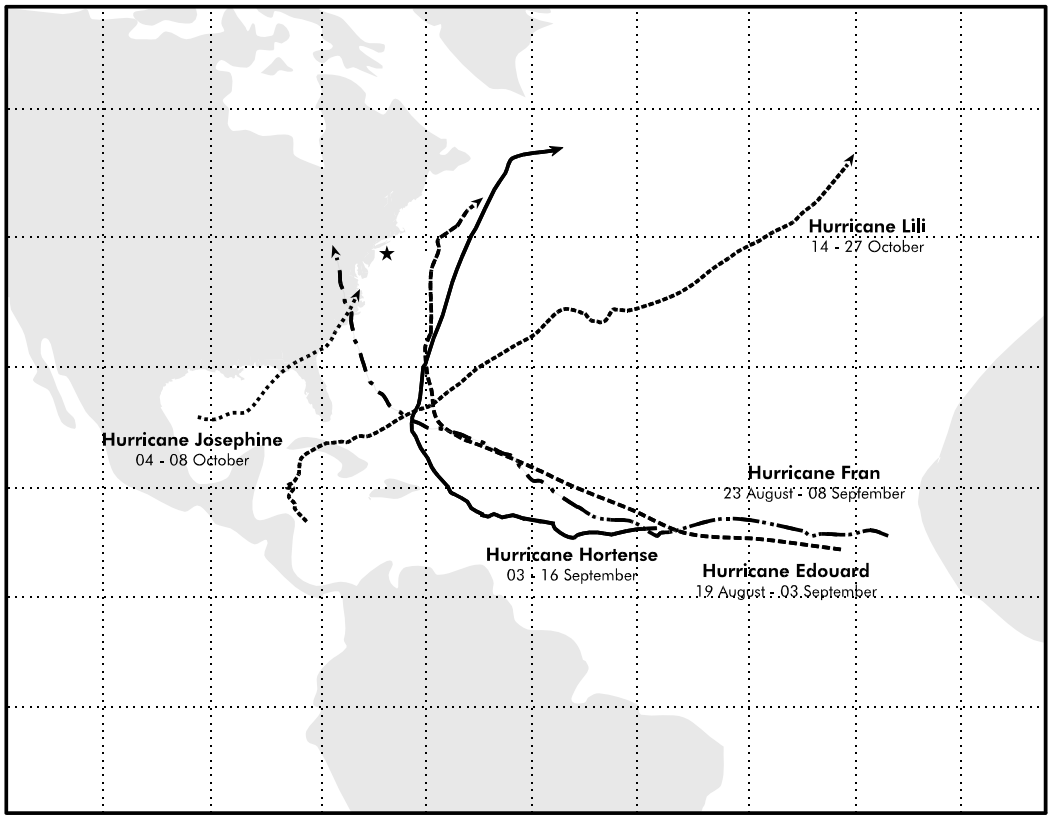

Figure 1-7. Major Storm Systems Affecting Operation. With the onset of autumn, severe weather became an increasingly significant operational factor. The first hurricane to arrive, Hurricane Edouard, ultimately caused the most damage. On August 31, Edouard forced the GRASP, OAK HILL, and PIROUETTE to evacuate to Staten Island. High swells caused significant shifting of sand and debris, requiring all debris fields to be remapped.

psychological stress. Despite these measures, the only real cure for diver fatigue was a stable work schedule that gave divers sufficient time off to fully recover from the rigors of their duties.

A secondary factor was the particular needs of the various ships involved in the operation. PIROUETTE, for example, having been designed for coastal operations of limited duration, lacked the endurance associated with vessels of the "blue water" Navy. She was thus obliged to return to port every two or three weeks in order to take on supplies. GRASP had just completed a long deploy-

ment when mobilized for the search and recovery operation. Both ship and crew were overdue for a return to their home port.

Despite these hardships, the period of sustained effort was characterized by the steady and thorough exploitation of debris fields. Side-scan sonar was used to expand existing debris fields, make more detailed searches of existing debris fields, and explore areas that might contain debris. Divers and ROVs were used to systematically remove all of the debris from one debris field before moving on to the next.

The last use of side-scan sonar to locate debris took place on 13 October. All diving operations were secured at 1200 on 2 November.

1.5.3 Trawling Operations

Despite the success of the mapping, diving, and ROV operations in recovering debris located on the sea bed, bad weather and the passage of time had caused many of the smaller pieces of debris to become imbedded in the sand on the ocean floor. After studying a number of options, including the development of a rake attachment for ROVs, the use of a suction dredge, lift excavation, and the continued employment of divers, SUPSALV determined that the best way to recover the remaining victims and debris was to use commercial trawlers to literally scrape up the layer of sand. This effort began on 4 November 1996 and lasted until 30 April 1997.

An ROV was used to make a final inspection of the crash area. The ROV made 85 dives, locating only one small piece of additional wreckage. ROV operations were secured at 1300 on 18 May, thus ending the Navy's at sea salvage operation.

1.6 Operational Factors

The Flight 800 search and recovery operation was complicated by a number of unusual factors. The most important of these were:

- The large scope and long duration of the operation.
- The difficulty of the diving conditions.
- The large number of organizations, public and private, civil and military, involved in the investigation.
- Intense media interest, compounded by widespread speculation as to the cause of the crash.
- The need to treat every piece of wreckage as criminal evidence.
- The recovery of a large number of victims.

1.7 Purpose and Organization of the Report

This report discusses the Flight 800 search and recovery operation from a number of perspectives. Its purpose is to record the accomplishments of those who made the operation a success and to help prepare others for the challenges of the future.

In many respects, every search and recovery operation is unique. Though it is impossible to identify them ahead of time, there are, nonetheless, many aspects of this operation that are likely to recur in the future. For this reason, the remainder of this report consists of chapters that deal with specific challenges that were encountered. Chapter 2 records the way that the Navy dealt with the problems of command and organization, specifically the demands of working with many independent agencies. Chapter 3 concerns public affairs and media relations. Chapter 4 is about planning and management. Chapter 5 discusses diving and salvage aspects of the operation. Chapter 6 provides a summary of lessons learned and Chapter 7 offers brief conclusions.

Chapter 2

Command and Organization

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Command and Organization

2.1 Organizations Involved

The most striking feature of the investigation into the causes of the crash of Flight 800 was the large number of organizations involved. Besides the U.S. Navy, these included regulatory, investigative, service, law enforcement, and emergency management agencies of the Federal government, New York State, and Suffolk County as well as private corporations, labor unions and the news media. As these organizations were independent of each other, had different organizational cultures, and, in many cases, had very little experience in working with each other, it was necessary to tailor a simple, powerful, and mutually acceptable framework for effective cooperation.

2.1.1 Conduct of the Investigation as a Whole

From the beginning, the lead agency for the Flight 800 crash investigation was the National Transportation Safety Board (NTSB). Charged by Congress with investigating every civil aviation accident in the United States, the NTSB is an independent agency whose chairman is appointed by the President of the United States and confirmed by Congress. NTSB Vice Chairman Robert Francis coordinated the efforts of the multi-agency operation in Long Island and Mr. Al Dickinson was the senior NTSB Investigator-in-Charge of the investigation.

Because of the possibility that the crash was the work of terrorists or other criminals, the Federal Bureau of Investigation (FBI) was responsible for conducting a criminal investigation that ran parallel to the safety investigation of the NTSB. The FBI put Assistant Director James K. Kallstrom, head of the New York office, in charge of the criminal investigation.

In the hours immediately following the crash, the NTSB and the FBI formed a joint task force to conduct the investigation. While this arrangement did not preclude Navy officials from having to deal with both of the lead agencies on the investigation, it did spare the Navy from the conflicts and confusion that might result from having to support two separate approaches to the investigation.

2.1.2 Other Investigatory Agencies

Because the accident took place in an area under the jurisdiction of New York State and New York's Suffolk County, state and local officials became involved in the investigation. The Suffolk County Medical Examiner played the most direct role, taking responsibility for the handling of victims and leading a team of pathologists which examined the victims for clues to the cause of the crash. Other state and local agencies, including the State Police, local police, the New York Army National Guard, and the New York Naval Militia, played supporting roles. National Guard trucks, for example, moved debris from the piers where it had been unloaded at the USCG Station Shinnecock to the hangar at Calverton, Long Island where the aircraft was being reassembled. Local police provided security for the many temporary facilities set up by investigators in Smithtown, Calverton, and other Long Island towns as well as local transportation by sedan and helicopter.

Because many of the crash victims were French citizens, the French government sent officials to observe and provided experts to assist investigators. The possibility that mechanical or structural problems may have caused the destruction of the aircraft led to the involvement of representatives from the private companies and labor unions involved in manufacturing the aircraft and its components.

As a rule, Navy officials had little direct contact with representatives of most of the organizations involved in the investigation. The primary relationship, governed by a pre-existing memorandum of understanding, was with the NTSB. The most important secondary relationships were with the Coast Guard

and FBI. Other federal agencies involved in the investigation, such as the Bureau of Alcohol Tobacco and Firearms (BATF) and the Federal Aviation Administration (FAA), reported directly to the NTSB or the FBI. In addition to simplifying matters and allowing the Navy to focus on the search and recovery effort, this degree of separation shielded the Navy from the controversies in which some of these agencies became involved.

2.1.3 Maritime Organizations

The Navy was not the only maritime organization involved in the investigation. The Coast Guard was the first maritime organization to respond to the crash and directed the search and rescue operation in the immediate aftermath. The Coast Guard also made its shore facilities available for use by other organizations. As the investigation progressed, the Coast Guard transported passengers and cargo from ship-to-shore and kept the search and recovery areas clear of vessels that were not part of the investigation. The National Oceanic and Atmospheric Administration (NOAA) made available NOAA Ship RUDE, which played an important role in identifying the debris fields in the first two weeks of the operation. Marine salvage companies provided the rest of the ships which located and mapped debris fields. Fishing companies provided the trawlers used late in the recovery operation to scrape debris off of the ocean floor.

The Navy worked directly with the Coast Guard, NOAA, and the private companies providing ships. The relationship between the Navy and the Coast Guard was that of separate services, each of which had a clearly defined function and its own chain of command. The lack of formal relationships between lower echelons of both services, however, did not prevent the achievement of a high degree of cooperation. The relationship between the Navy and NOAA was at first informal, based on a verbal agreement between SUPSALV and the captain of RUDE. Though NOAA eventually formally tasked RUDE and the shore-based NOAA command center to assist the Navy, the relationship was based on willing cooperation, with good communications in both directions. As a result, RUDE

and the NOAA command center operated as if they were under the formal operational control of Navy officer in charge of the search and recovery effort.

Commercial salvage and fishing vessels operated under contract to SUPSALV. The salvage vessels that were mobilized began work under the provisions of a pre-existing contract with Oceaneering International, Inc. As the search and recovery effort settled into a routine and the level of effort required became more predictable, additional contracts for the services of salvage and fishing vessels were negotiated and executed by Oceaneering International, Inc. for SUPSALV.

2.1.4 Diving Organizations

Throughout the first three phases of the search and recovery effort, Navy divers worked side by side with divers from the New York State Police, the New York City Police Department, the Suffolk County Police Department, and the FBI. At any given time, these non-Navy divers accounted for somewhere between 20 percent and 35 percent of the total number of divers on hand and were fully integrated into the Navy's diving operations.

While not subject to military discipline, non-Navy divers were effectively under the operational control of the Navy's Mobile Dive Team Coordinator for the duration of the operation. The Mobile Dive Team Coordinator determined which non-Navy divers were qualified to dive, assigned them to specific targets and locations, and monitored their work. This degree of control was made possible, not only by the good will of the non-Navy divers taking part, but also by the fact that all concerned respected the professionalism and experience of the Navy leaders on scene. Even with these advantages, considerable diplomacy was sometimes needed to gracefully decline the help of enthusiastic divers who lacked the background necessary for dealing with the particular challenges of this open ocean recovery operation with the associated physical and psychological difficulties.

2.2 Navy Organization

For the first four days of the search and recovery operation, SUPSALV was the senior Navy officer present and the de facto officer in charge of all Navy efforts in support of the investigation. However, with the expansion of the Navy's mission, the high profile of the case, and the number of ships and units involved, the Navy organization grew accordingly.

The actual composition of the U.S. Navy Salvage command structure varied considerably from normal Navy operations. The organization consisted of the four U.S. Naval vessels, one NOAA vessel, four contract vessels, numerous mobile units, reserve units and the command and control staff. Originally, the Commander in Chief, Atlantic Fleet (CINCLANTFLT), through Commander, Naval Surface Forces Atlantic (COMNAVSURFLANT), stood up CTG 40.50 under the command of RADM Edward K. Kristensen. CTG 40.50 was operated out of the U.S. Coast Guard Station, East Moriches, Long Island in order to better coordinate with other agencies. Under RADM Kristensen, SUPSALV coordinated both the naval forces and the contract support. The command and control staff consisted of personnel from COMLOGGRU TWO, COMEODGRU TWO, and SUPSALV.

Due to the increased magnitude of the operation, the Joint Chiefs of Staff assigned control of the operation to U.S. Atlantic Command (USACOM) on 28 July 1996. USACOM redesignated Task Group 40.50 as Joint Task Force 40.50 (JTF 40.50).

In addition to reporting to the Navy chain of command, RADM Kristensen worked closely with Vice Chairmen Francis of the NTSB and Assistant Director Kallstrom of the FBI. As the lead government agency for the investigation, NTSB had overall responsibility of the operation, with the FBI in charge of the criminal investigation and JTG 40.50 in charge of the salvage and recovery operations.

2.3 Formal Agreements

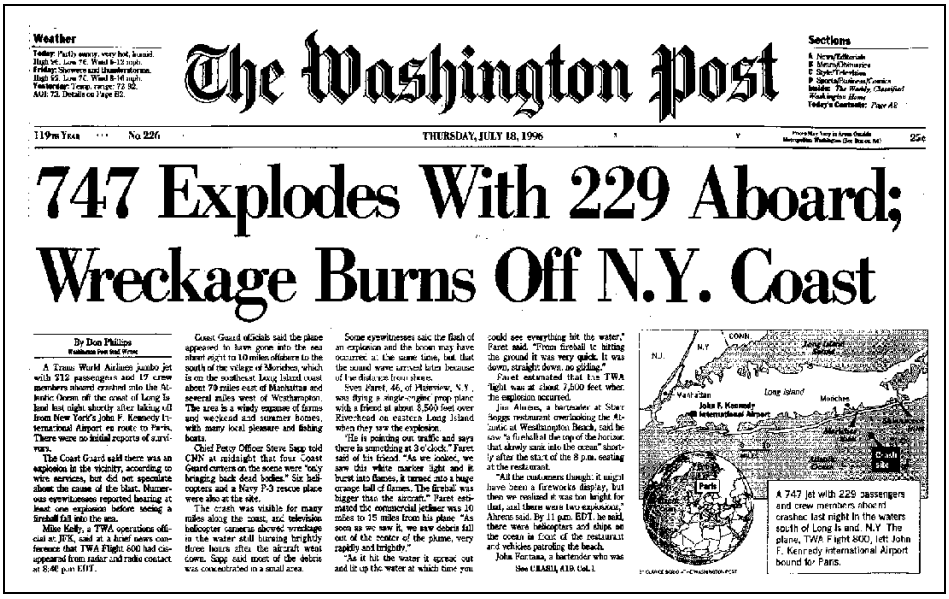
Navy support of the NTSB investigation was governed by a pre-existing memorandum of agreement that established procedures for cooperation between the two organizations. The two key provisions of this agreement were the designation of SUPSALV as the NTSB's single point of contact for all underwater search and salvage assistance coming from the Department of Defense and a promise to reimburse the Navy for contractor and other out-of-pocket expenses associated with the support of an NTSB investigation.

The memorandum of agreement greatly reduced the time necessary for SUPSALV to organize Navy resources for the search and recovery effort. Freed from the need to negotiate with the NTSB at a time when that organization had its hands full and certain that out-of-pocket expenses would be reimbursed, SUPSALV was able to focus on other aspects of the operation.

In accordance with the memorandum of agreement, SUPSALV received periodic letters of commitment from the NTSB. These letters committed specific amounts of money to cover the costs of Navy support to the NTSB investigation.

Chapter 3

Public Affairs



Weather

Today: Partly sunny, very hot, humid. High 96. Low 74. Wind 8-12 mph.
Friday: Showers and thunderstorms. High 93. Low 72. Wind 8-16 mph.
Yesterday: Temp. range: 72-92. AQI: 72. Details on Page B2.

The Washington Post

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Today's Contents: Page A2

119TH YEAR ... No. 229 THURSDAY, JULY 18, 1996 25¢

747 Explodes With 229 Aboard; Wreckage Burns Off N.Y. Coast

By Don Phillips
Washington Post Staff Writer

A Trans World Airlines jumbo jet with 212 passengers and 17 crew members aboard crashed into the Atlantic Ocean off the coast of Long Island last night shortly after taking off from New York's John F. Kennedy International Airport en route to Paris. There were no initial reports of survivors.

The Coast Guard said there was an explosion in the vicinity, according to wire services, but did not speculate about the cause of the blast. Numerous eyewitnesses reported hearing at least one explosion before seeing a fireball fall into the sea.

Mike Kelly, a TWA operations official at JFK, said at a hotel news conference that TWA Flight 800 had disappeared from radar and radio contact at 8:40 p.m. EDT.

Coast Guard officials said the plane appeared to have gone into the sea about eight to 10 miles offshore to the south of the village of Moriches, which is on the southeast Long Island coast about 70 miles east of Manhattan and several miles west of Westhampton. The area is a windy expanse of farms and weekend and summer homes, with many local pleasure and fishing boats.

Chief Petty Officer Steve Sapp told CNN at midnight that four Coast Guard cutters on the scene were "only bringing back dead bodies." Six helicopters and a Navy P-3 rescue plane were also at the site.

The crash was visible for many miles along the coast, and television helicopter cameras showed wreckage in the water still burning brightly three hours after the aircraft went down. Sapp said most of the debris was concentrated in a small area.

Some eyewitnesses said the flash of an explosion and the boom may have occurred at the same time, but that the sound were arrived later because of the distance from planes.

Sven Paret, 46, of Plainview, N.Y., was flying a single-engine prop plane with a friend at about 8,500 feet over Riverhead on eastern Long Island when they saw the explosion.

"He is pointing out traffic and says there is something at 3 o'clock," Paret said of his friend. "As we looked, we saw this white narrow light and it burst into flames. It turned into a huge orange ball of flames. The fireball was bigger than the aircraft." Paret estimated the commercial jetliner was 10 miles to 15 miles from his plane "As soon as we saw it, we saw debris fall out of the center of the plane, very rapidly and brightly."

"As it hit the water it spread out and lit up the water at which time you could see everything hit the water," Paret said. "From fireball to hitting the ground it was very quick. It was down, straight down, no gliding."

Paret estimated that the TWA light was at about 7,500 feet when the explosion occurred.

Jim Ahrens, a bartender at Starr Boggs restaurant overlooking the Atlantic at Westhampton Beach, said he saw "a fireball at the top of the horizon that slowly sank into the ocean" shortly after the start of the 8 p.m. seating at the restaurant.

"All the customers though: it might have been a fireworks display, but then we realized it was too bright for that, and there was two explosions," Ahrens said. By 11 p.m. EDT, he said, there were helicopters and ships on the ocean in front of the restaurant and vehicles patrolling the beach.

John Fontana, a bartender who was

See CRASH, A19, Col. 1

A 747 jet with 229 passengers and crew members aboard crashed last night in the waters south of Long Is and, N.Y. The plane, TWA Flight 800, left John F. Kennedy International Airport bound for Paris.

Chapter 3

Public Affairs

3.1 The Public Affairs Challenge

Public interest in the crash of Flight 800, the investigation into the cause of the crash, and the search and recovery effort that supported the investigation, was considerable. During the first two weeks of the investigation, researchers conducting an ongoing study of the news-watching habits of 75,000 adults found that 69 percent of that population sample were closely following news reports related to the disaster. This made the Flight 800 story the major news story of the year and the fourth most closely watched news story since 1986.

To cover this story, hundreds of print, television, and radio journalists traveled to Long Island, setting up shop just outside the Coast Guard Station at East Moriches or the hotel in Smithtown where the NTSB had established its headquarters. This proliferation of journalists provided the Navy with an excellent opportunity to inform the public about its work and capabilities. At the same time, the fact that so many journalists were looking for unique and interesting stories created the danger that unsophisticated and uncoordinated response would endanger the smooth relations between agencies that were so important to the success of the operation.

As important as relations with the press might be, the Navy public affairs challenge was not limited to dealings with the world of journalism. The relatives of those killed in the crash, many of whom had traveled to Long Island and were staying in the hope of being able to take home the remains of their loved ones, formed a small but important group. Elected officials, including members of

Congress, the governor of the State of New York and the mayor of the City of New York, formed a third group whose questions had to be answered.

Because of the intensity and extent of these three forms of public interest in the search and recovery effort, Navy leaders were required to consider the public affairs implications of every statement that they made and nearly every action that they took. The creation of a Navy Command Information Bureau (CIB) for the search and recovery effort was of great help in this task. The work of public affairs specialists, however, did not relieve other members of the Navy team of the need to be aware of the effect that otherwise innocent words or actions might have on victims' families, on the other organizations involved in the investigation, and on the public perception of the Navy.

3.1.1 Victims' Relatives

Suffering from the shock of unexpected tragedy and the intense stress of having to come to terms with the loss of someone dear to them, relatives of those who had died in the crash were very eager for any news about the crash, the investigation, and the search and recovery effort. As a rule, these people took comfort from knowing that competent professionals were hard at work recovering the remains of their loved ones. At the same time, any rumors, conflicting stories, or isolated bits of news that victims' relatives became aware of were likely to cause a highly emotional reaction, whether it be false hope, the mixture of grief and relief that comes from certain knowledge, or anger directed against those in authority. For this reason, it was important to provide victims' families with a single authoritative source of information about the investigation and, in particular, the effort to recover victims.

At the very beginning of the search and recovery effort, providing information to victims' relatives was done on an *ad hoc* basis. As early as 20 July, just two days after he had arrived on Long Island, SUPSALV, with the concurrence of the NTSB, conducted a series of three separate briefings for victims' relatives and public officials. The purpose of these briefings was to inform victims' relatives of the broad outlines of the search and recovery plan and to reassure them that

victim recovery was at the top of SUPSALV's list of priorities. The message was simple, authoritative, consistent with what the NTSB and FBI had been saying, and contained as much information about the process of searching for victims as SUPSALV was able to provide.

On 24 July, SUPSALV took part in another briefing for victims' relatives. With SUPSALV on the podium were senior representatives of the NTSB, the FBI, and the Suffolk County Medical Examiner. On 26 July, NTSB officially took over the role of dealing with victims' families. This placed a very delicate task in the hands of a single agency and reduced the risk that victims' relatives might be given contradictory information. About the same time, the FBI became responsible for maintaining the official record of victims found and victims identified. This assignment of responsibility prevented the confusion that might result from several tallies being kept.

3.1.2 The Press

The challenge of dealing with print, television, and radio journalists was, in many respects, similar to that of providing information to victims' families. The requirement for a single, authoritative, consistent story that was as complete as possible remained the same. The chief difference was the form in which this story was told. While victims' relatives required information only for their own personal use, journalists required information they could pass on to their readers, viewers, or listeners. This might take the form of press releases, still or moving pictures, a press briefing, making an informed person available for interview, or allowing a journalist to observe operations.

3.1.2.1 Regular Briefings

One of the more important means of dealing with journalists was the regularly scheduled press briefing that the Navy conducted jointly with the NTSB and FBI. During the first three weeks of the operation, the briefings took place once or twice a day and the Navy representative was Rear Admiral Kristensen. Other members of the Navy team also participated. Soon after the recovery of

the flight data recorders, for example, the two divers who had brought those important pieces of evidence to the surface appeared at a press briefing to answer reporters' questions.

After 9 August, as media interest became less intense and the investigation became more routine, the scheduled briefings were reduced to once a day. On 4 October, media interest in the search and recovery operation had declined to a point where the regularly scheduled briefings were eliminated entirely and done only on an "as needed" basis.

Though the FBI and Navy played a large role in these briefings, it had been established early on in the investigation that the NTSB would be the sole source of information on the progress of the investigation. This policy was maintained throughout the course of the investigation. Nonetheless, the participation of senior FBI and Navy representatives at briefings and their speaking on matters within their areas of competence, made these organizations' contributions clear to all present.

3.1.2.2 Other Services for Journalists

In the immediate aftermath of the crash, as it became more evident that Navy participation in the search and recovery effort would be extensive, a number of Navy officers saw an opportunity to better tell the Navy story. To that end, a number of journalists were invited to embark upon the USS OAK HILL (LSD 51) for the short trip from its home base of Little Creek, Virginia, to the waters off of East Moriches. This short excursion provided journalists with a chance to get a taste of life aboard ship. When OAK HILL arrived off Long Island on 24 July, the journalists were transported by helicopter to the Coast Guard Station at East Moriches where they joined the other reporters already there.

An FBI directive banned journalists from entering the security zone that the Coast Guard had set up around the area where the aircraft had crashed. As this restriction did not apply to Navy public affairs specialists, the work of

recording and publicizing the accomplishment of Navy personnel involved in the search and recovery operation became a Navy responsibility.

Though press releases were often made available, the bulk of the Navy's work in telling its own story consisted of taking pictures, both still and moving, of the work that civilian journalists were not permitted to observe. These pictures enabled television networks, local television stations and various publications to illustrate the many stories they were running on the Flight 800 investigation. Navy imagery became so popular that it was used to illustrate news stories that had little to do with the Navy's participation in the search and recovery effort

3.2 Organization for Public Affairs

On 22 July, Captain Gordon Peterson of NAVSEA Public Affairs Office, arrived at East Moriches to set up a Command Information Bureau (CIB) to handle all public relations work, including liaison with Coast Guard and NTSB public affairs officers, in support of the Navy search and recovery effort. During the period of intense activity, the CIB grew rapidly. By the end of July it consisted of 11 public affairs specialists (five officers and six enlisted personnel). As public interest in the search and recovery operation declined, the CIB began to shrink. By 31 August, public interest declined to a point where the functions of the CIB could be carried by a single Navy public affairs officer. It was important from the outset to include the senior Navy public affairs officer in planning and progress meetings. This ensured that public affairs personnel understood all facets of the operation.

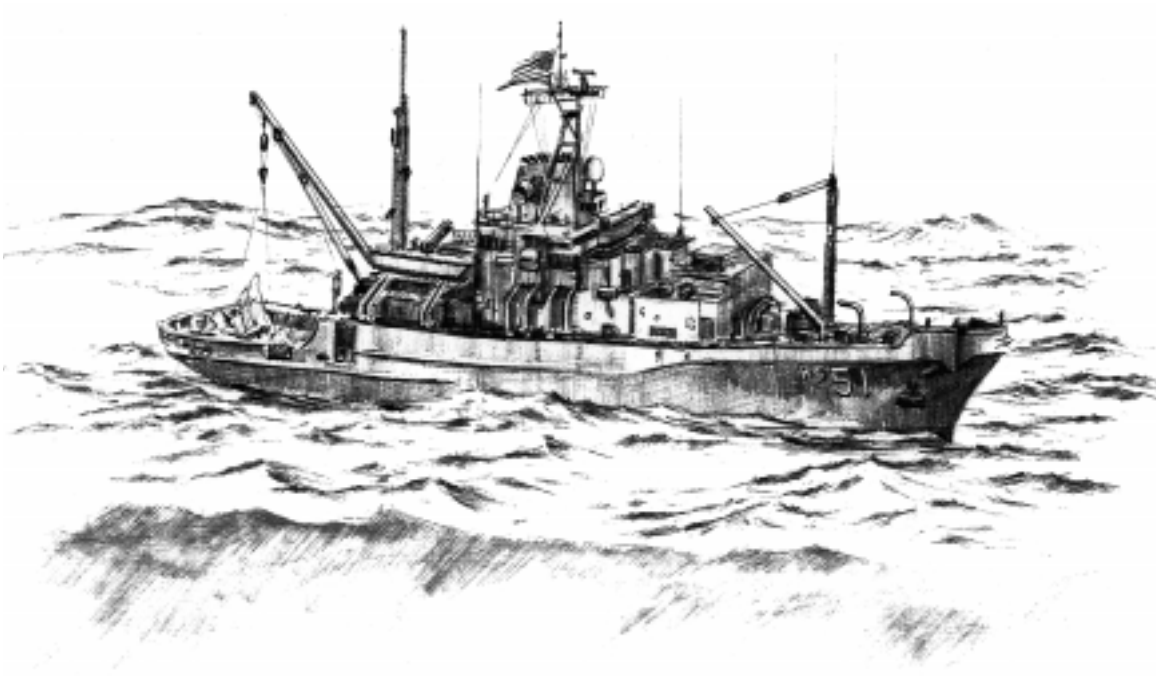
3.3 Speculation

From the earliest days of the investigation, the mysterious nature of the crash of Flight 800 led to widespread speculation about the cause of the disaster. Much of the public interest in the search and recovery effort revolved around the relationship between pieces of wreckage that had been found and various theories about the cause of the crash.

Because of the tendency to jump to conclusions and because any hint of bias might taint the criminal investigation, it was important that the Navy maintain an air of complete neutrality. While Navy people had to have a good understanding of the progress of the investigation they were supporting, questions relating to the meaning of items recovered from the sea were routinely passed on to the FBI and NTSB. The exception to this rule was the statements made by Rear Admiral Kristensen to debunk the theory that Flight 800 had been shot down by a missile from a U.S. Navy warship.

Chapter 4

Planning and Management



Chapter 4

Planning and Management

Planning and management are two functions that cannot long be separated from one another. Their elements are so intertwined that major changes in one invariably lead to the need for changes in the other. Because of the way that the mission evolved, the scale of operations, and the large number of organizations involved, effectively dealing with the dynamic interrelationship between planning and management was a major factor in the success of the Flight 800 search and recovery operation.

4.1 Planning

The initial planning for Navy support of the NTSB investigation was based on the assumption that the initial tasks would be the recovery of the downed aircraft's flight recorders and the mapping of the debris field. When SUPSALV realized that the Navy was the only organization that could effectively manage the recovery of victims located below the surface, his planning assumptions changed radically. A second shift occurred when, early in the investigation, the NTSB and FBI decided to recover all the wreckage that they could and use it to reconstruct portions of the aircraft. This greatly affected the scale of the Navy's operation and, in particular, the time it would take to finish the job. The final change took place when it became clear that diving operations had reached a point of diminishing returns and that the remainder of the debris would have to be recovered by trawling.

4.1.1 Concept of Operations

Despite the changes in planning assumptions, the basic concept of operations remained the same. Ships provided with underwater sensors such as side-

scan sonar (SSS) would identify and map debris fields. A combination of divers and ROVs would then use these maps to prioritize and locate items of interest on the sea bed and develop recovery plans.

As the mission evolved, this basic concept was refined. As one debris field was being cleared, the ships with SSS and other sensors would be searching for and mapping others. Each group of divers was assigned a set of targets to prosecute, allowing the divers to become intimately familiar with those targets. This basic approach was retained until diving and ROV operations gave way to trawling. Figure 4-1 illustrates recovery techniques used during the diving and ROV phase.

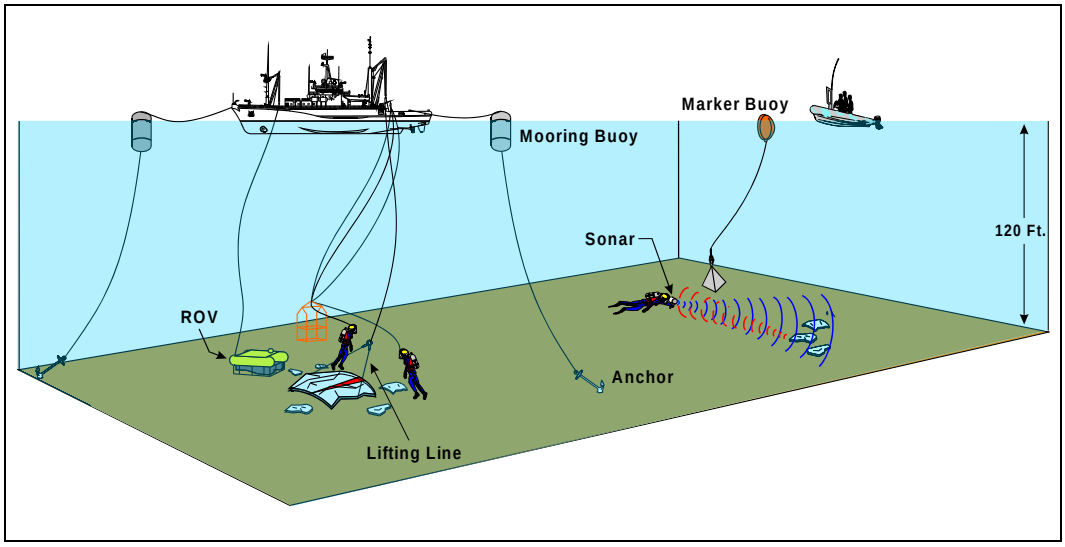


Figure 4-1. Recovery Techniques. The ARS ships (GRASP and GRAPPLE) were moored over large concentrations of debris. ROVs were used to locate and inspect wreckage, allowing surface-supplied divers to review the work site prior to descent. Once underwater, divers rigged large pieces of wreckage for lifting and put smaller pieces into baskets. Scattered debris was recovered by mobile scuba dive teams. They used GPS equipment to position themselves over individual targets and AN/PQS 2A handheld sonar to locate the wreckage.

4.1.2 Choice of Means

At the very beginning of the search and recovery operation, when the focus was on the recovery of the flight recorders of the downed 747, SUPSALV limited his request for assets to those vessels and units that could be made avail-

able within a day or two. Some of these—such as the mobile dive teams, their support detachments, and M/V PIROUETTE—were available because of deliberate preparations that had been made. In the case of diver and diver support units, this was a matter of maintaining units at a high state of readiness. In the case of Pirouette, availability was a function of a pre-existing contract between SUPSALV and Oceaneering International, Inc. Other key elements of the team that was assembled on-site during the first few days of the operation—particularly NOAAS RUDE—just happened to be close by at the time of the crash.

As the parameters of the search and recovery operation became better known, the use of rapid reaction units and the diverting of assets that happened to be on or near the scene was replaced by a slower, more methodical process of choosing which ships and units were needed.

4.1.2.1 Choice of Ships

All of the commercial support ships hired to assist in the operation were subcontracted by Oceaneering International, Inc. under the SUPSALV Undersea Search and Operations contract. M/V PIROUETTE was the first ship hired, due to her proximity to the site and her ability to host the specialized search systems being utilized. Oceaneering installed the Navy's Shallow Water Intermediate Search System (SWISS), MR-2, and TPL and provided personnel to support operations around the clock.

Apart from brief port visits during bad weather and for purposes of resupply, PIROUETTE stayed on station from 19 July until 12 September, when her anchor cable broke in heavy weather. In anticipation of severe weather, PIROUETTE was replaced by M/V MARION C II, a larger vessel with better seakeeping characteristics. During the latter part of the search phase of the operation, NTSB hired another survey vessel, M/V ABLE J, to verify that everything possible was being done to locate and recover wreckage.

The NOAA Ship RUDE, which made a valuable contribution to the effort to locate debris fields during the first two weeks of the operation, was more a

matter of seizing an opportunity than planning. An oceanographic vessel operated by the National Atmospheric and Oceanic Administration (NOAA), RUDE assisted in the initial search for survivors. RUDE was equipped with a side-scan sonar system comparable to the Navy system and assisted Pirouette in the initial search effort. Rude remained on station until 1 August.

To increase the search effectiveness for small objects, SUPSALV directed Oceaneering International, Inc. to provide a laser line scan (LLS) system. Oceaneering subcontracted with Science Applications International Corporation (SAIC) to mobilize its LLS system. The LLS installed aboard DIANE G produced underwater images that were more detailed than those provided by side-scan sonar (see Figure 4-2 and Figure 4-3). The particular forte of LLS was the location of objects made of non-solid material, particularly upholstery, luggage, and victims. DIANE G was on station from 27 July to 11 August. Figure 4-4 shows the areas searched by the five survey vessels that participated in the operation.

As the mission evolved, SUPSALV requested other assets. USS GRASP (ARS 51), one of the two salvage ships in the Atlantic Fleet, had just returned to its home port of Little Creek, VA after a five-month deployment. GRASP provided a fully capable dive platform, a diver life support system, an organic team of twenty divers, and two booms capable of lifting submerged objects. Prior to leaving Little Creek, 29 additional divers reported aboard. GRASP was later joined (29 July) and eventually relieved (27 August) by her sister ship, USS GRAPPLE (ARS 53), a ship with nearly identical capabilities. CINCLANTFLT also assigned USS OAK HILL (LSD 51) to support the operation. Designed for amphibious operations, OAK HILL provided a number of important capabilities:

- **Command Post/Communications**. Although the Admiral's command post was established ashore for closer contact with other agencies, the ship served as the flag ship for JTF 40.50 and provided valuable communications and support facilities. OAK HILL provided secure ship-to-shore and ship-to-ship links, allowing Navy personnel to discuss sensitive issues without risk of disclosure. The same links kept JTF 40.50 in contact with higher authorities.

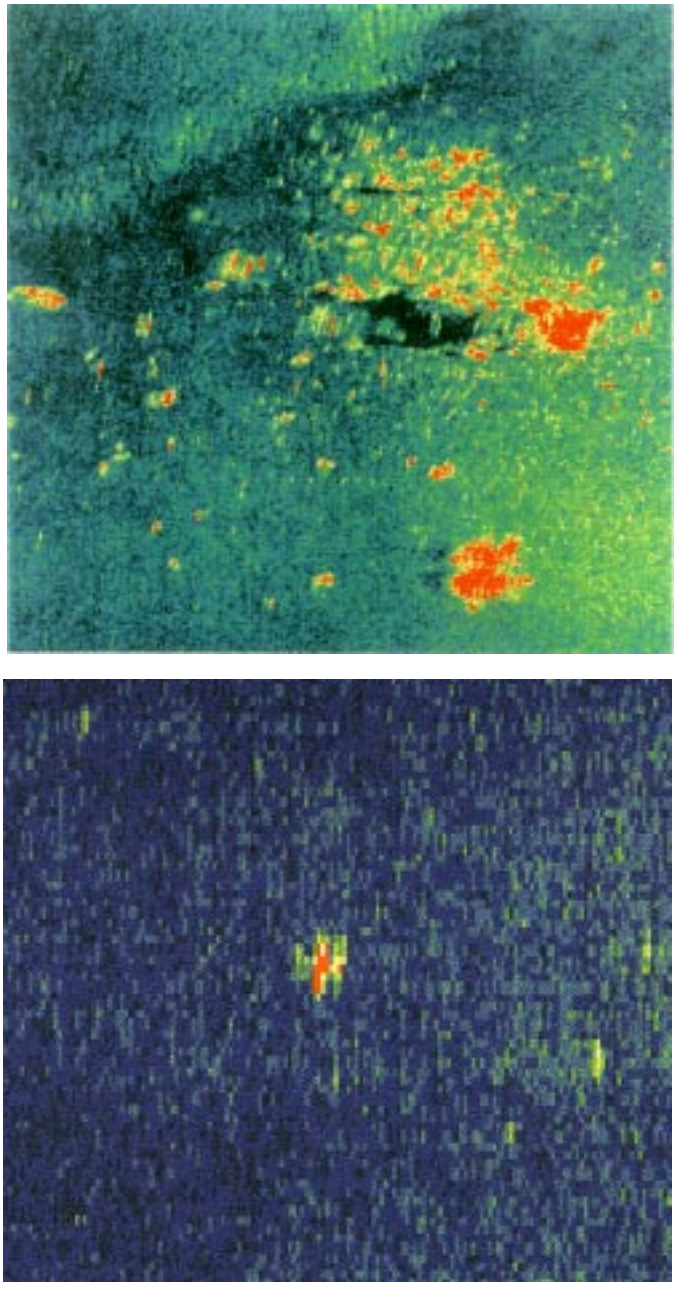
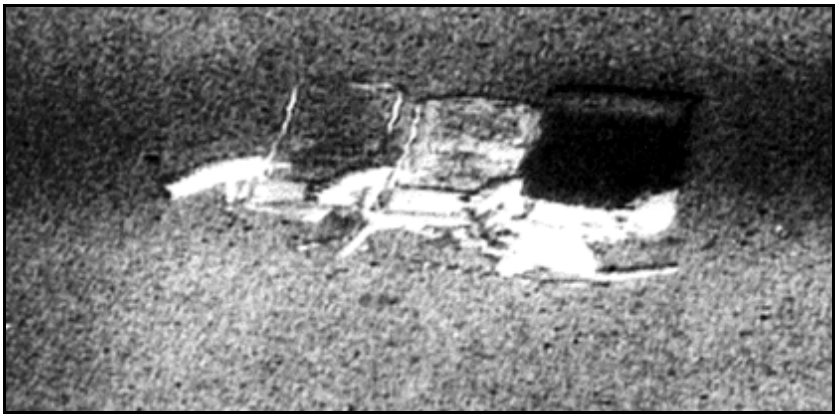
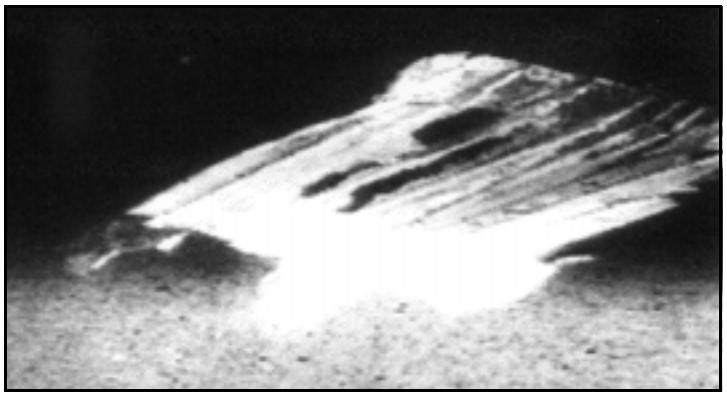


Figure 4-2. Sample Sonar Images. Side scan sonar operations produced images such as the two shown above. Sonar technicians evaluated these images, captured precise location information, and assigned target numbers to each. This data was used to prioritize targets and generate target assignment lists for divers and ROVs. Some 5,000 targets were eventually prosecuted.





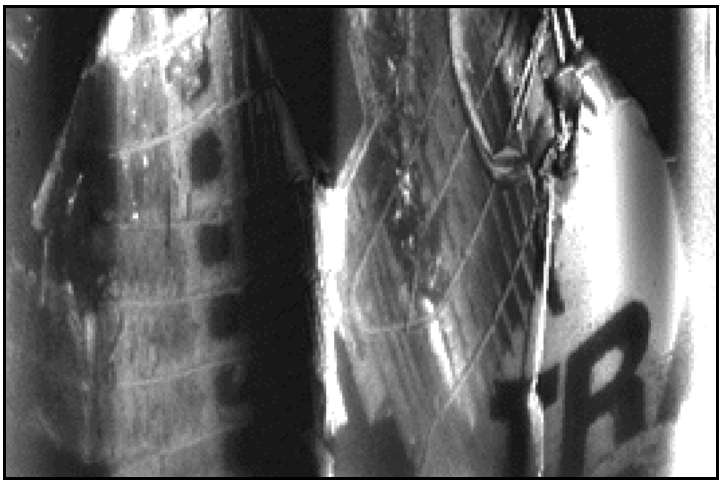


Figure 4-3. Sample Laser Line Images. Laser line scanning was used in the early weeks of the operation to locate victims and identify wreckage. The three images above demonstrate the high resolution that can be acquired with laser line scanning. The top image is a row of three airplane seats. The second image is a piece of sheet metal. The third image is a twisted piece of the airplane's fuselage; the letters "TRA" (from "TRANS WORLD") are visible in the lower right-hand corner. The limitation of the LLS is its narrow field of view.

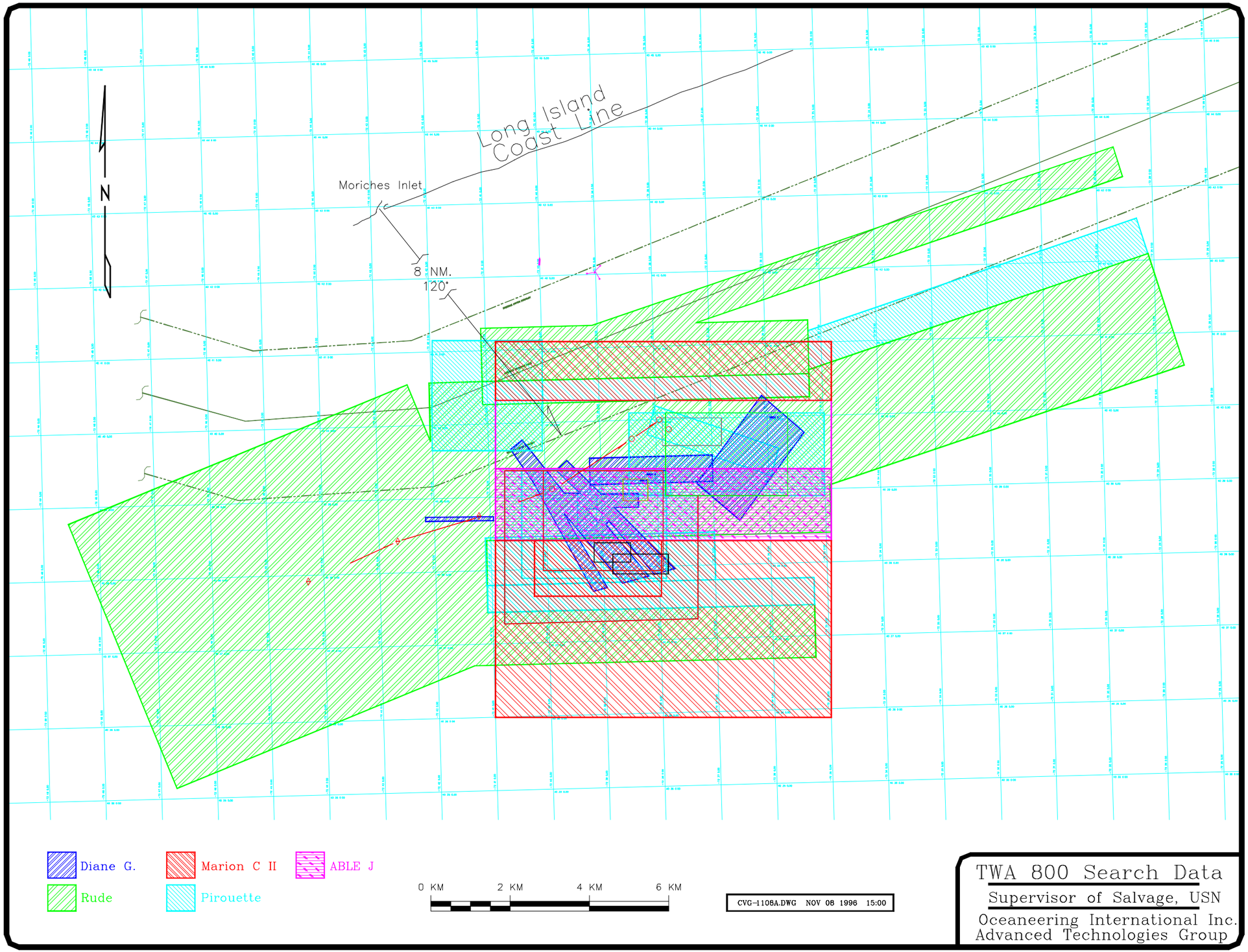


Figure 4-4.
Survey Ship Coverage.

- **Berthing, Dining, and Medical Facilities**. The facilities aboard OAK HILL made possible 24-hour diving operations from GRASP and GRAPPLE. Not only did this ease pressure on the limited accommodation spaces in the salvage ships, it provided a useful change of environment for the divers. While operations on the two salvage ships continued around the clock, the berthing spaces on the amphibious ships were relatively quiet, allowing the divers to relax.

- **Helicopter Support**. The helicopter landing deck on the OAK HILL permitted the use of CH-46 Sea Knight helicopters from Cargo Helicopter Squadron Eight (HC-8) to move divers, crew members, VIPs, and journalists from ship-to-shore. Helicopters were also used to transport some wreckage directly to the hanger in Calverton where the 747 was being reassembled.

- **Small Support Craft**. Three small craft arrived at the site in OAK HILL's well deck and operated from the ship. Two LCM-8 landing craft ("Mike 8 boats") from Assault Craft Unit 2 carried wreckage ashore. A Side Load Warping Tug (SLWT) from Amphibious Construction Battalion 2 supplemented the lifting capabilities of the salvage ships.

- **Cargo Capacity**. OAK HILL's considerable cargo capacity greatly reduced the need for the vessels involved in the operation to return to port and her Supply Department provided access to the Navy supply system.

- **Medical/Dental Facility**. OAK HILL had doctors, dentists, and fully outfitted facilities to deal with injuries sustained during the operation, including a fractured clavicle and emergency dental assistance to Vice Chairman Francis.

On 10 September, OAK HILL was relieved by another amphibious ship, USS TRENTON (LPD 14) along with two CH-46 Sea Knight helicopters and

crew from Cargo Helicopter Squadron Six (HC-6). TRENTON provided the same basic capabilities as OAK HILL.

The choice of ships for the trawling was based on the need to ensure that virtually all small debris potentially buried in silt and mud during adverse weather conditions would be recovered. As shown in Figures 4-5 through 4-7, the selection of scallop trawlers, which use mechanical rakes to penetrate several inches into the seabed, proved to be very effective. The five trawlers that were used for the operation were able to operate under adverse conditions that would have precluded ROVs or divers from working.

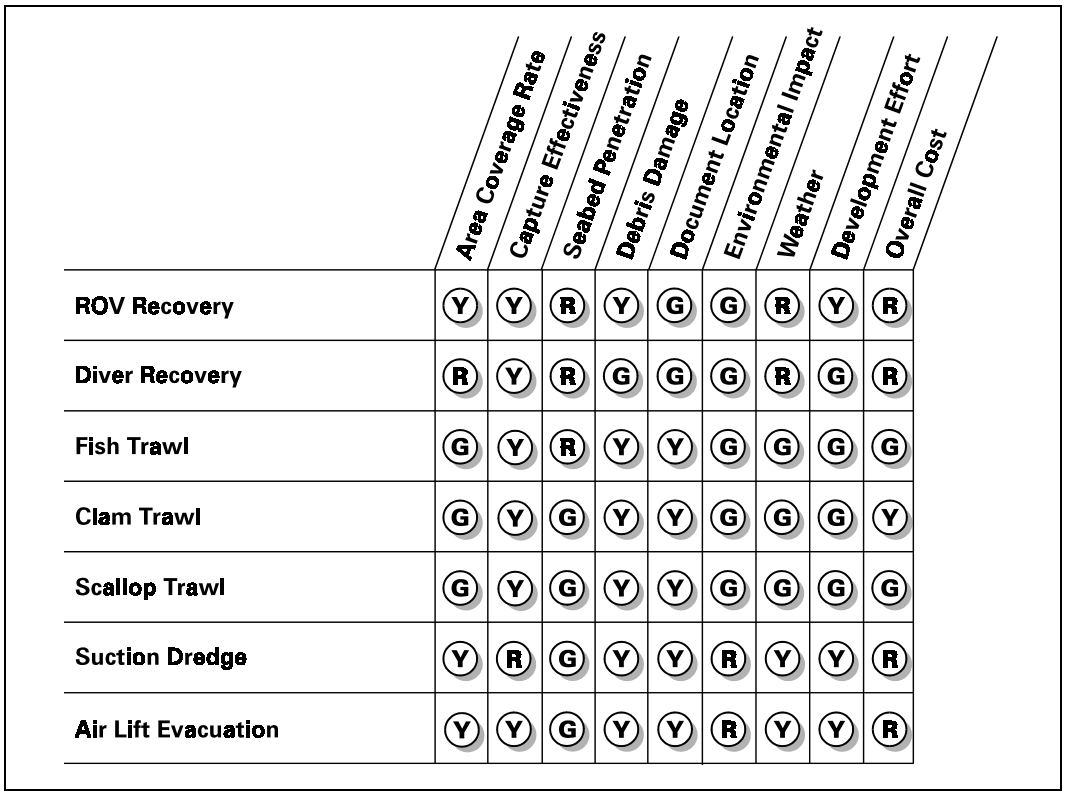


Figure 4-5. Comparison of Recovery Methods. At the request of NTSB, SUPSALV conducted a cost/benefit analysis of various recovery options, including the continuation of diving/ROV operations. Trawling offered good area coverage rates, low susceptibility to rough weather, and acceptable environmental impact levels. On the chart above, "G" stands for green (cost <$5M), "Y" stand for yellow ($5-$15M), and "R" stands for red (>$15M).

	FISH	CLAM	SCALLOP
Sweep Width (Ft.)	150	10	30
Recovery Rate (Sq.Ft./Hr.)	1,822,00	121,500	291,648
Debris Capture Effectiveness	Fair	Good	Good
Seabed Penetration	1 inch	6-12 inches	6-12 inches
Damage to Debris	Possible	Possible	Possible
Duration (Days)	26	152	64
Vessels	4	6	6
Costs ($M)	$1.6	$12.5	$4.9
Estimates Based on 25 Sq. NM Area			

Figure 4-6. Comparison of Trawling Methods. All of the trawling methods examined had similar and acceptable performance in terms of environmental impact, weather susceptibility, and development effort. Key factors in the area coverage rate were sweep width, reset duration (how long the trawl could be towed before emptying), reset period (time required to clean trawl), and trawling speed. Scallop trawling offered the best combination of benefits.

AVERAGE COVERAGE OPTIONS			
Area (Sq. NM)	2.5	5	25
Vessels (No.)	3	4	6
Duration (Days)	20	26	64
Cost ($M)	$1.1	$1.6	$4.9

Figure 4-7. Comparison of Scallop Trawler Options. After recommending the scallop trawling method, SUPSALV mobilized one vessel to validate the concept. After a successful trial run, SUPSALV decided to use four scallop trawlers for the duration of the operation. The trawling phase lasted from 4 November 1996 to 31 April 97.

4.1.2.2 Selection of Units

On 19 July, when the Navy's work in support of the NTSB investigation was still limited to locating the flight data recorders, SUPSALV requested the following assets:

- Explosive Ordnance Disposal Mobile Unit Two Detachment (Earle, New Jersey): 4 persons with a 24-foot workboat.

- Mine Counter Measures (MCM) Detachment (Charleston, S.C.): 7 persons with Mk 16 Mixed Gas UBA, Fly Away Dive Locker (FADL).

- Mobile Diving and Salvage Unit Two (Little Creek, VA): 4 persons with Transportable Recompression Chamber System (TRCS).

- Explosive Ordnance Disposal Mobile Unit Two (Little Creek, VA): 2 persons with Rigid Hull Inflatable Boat (RHIB) and SCUBA equipment.

- Explosive Ordnance Disposal Group Two (Little Creek, VA): 2 communications specialists with command and control equipment.

Provided by units of Explosive Ordnance Disposal Group Two (EODGRU TWO), the Explosive Ordnance Disposal unit of the Atlantic Fleet, these teams were already on the East Coast of the United States when assigned to the search and recovery effort and were able to drive from their home stations to Long Island in one day or less.

As the mission expanded to include recovery of victims and the debris from the entire aircraft, it became necessary to greatly increase the number of divers. By 6 August, 188 divers were involved in the search and recovery effort. After 7 August, this number gradually diminished until the last full day of diving operations (1 November 1996) when 86 divers were on hand. At most times, 30 to 39 of these divers were from the New York State, New York City, or Suffolk County Police Departments or the FBI. The rest were from the Navy.

Navy divers involved in the Flight 800 search and recovery effort came from nearly every type of diving organization in the Navy. While most divers came from EOD units, Navy salvage ships, or the Mobile Diving and Salvage Unit (MDSU), other Navy organizations were also represented. Divers from the submarine tenders USS EMORY S. LAND and USS L.Y. SPEAR, the Special

Warfare community, the Navy Experimental Dive Unit (NEDU), the Navy Diving and Salvage Training Center (NDSTC), the Navy Medical Research Institute (NMRI), the Navy Submarine Medical Research Laboratory (NSMRL), Shore Intermediate Maintenance Activity (SIMA) Norfolk, Combat Logistics Group Two (COMLOGGRU 2), the and Naval Sea Systems Command (NAVSEA) participated.

4.1.3 Database Management

Before dive operations began, side-scan sonar generated a target list with thousands of individual targets, each of which might include many separate pieces of wreckage. Each item on the target list had to be searched for victims and identified for later recovery.

4.1.3.1 Target Database

Even with the large number of divers working on the search and recovery operation, SUPSALV could not afford to dispatch divers at random. It needed a system that would record each target as it was discovered and help the diving coordinators match targets with the available assets. Although the Navy had worked with similar target lists before, previous search and recovery operations had involved only small numbers of divers and many fewer targets. The scope of this search and recovery operation demanded an automated solution.

In response, SUPSALV and Oceaneering International, Inc. developed the initial target database before diving operations began, literally overnight. This rapid implementation was possible because SUPSALV personnel were able to clearly describe how the system should work and Oceaneering had the organic computers and programming skills to translate that description into an operational system. Information from the search systems was input directly into the database in computerized form, minimizing the possibility of error. In addition to target location and size, the database recorded the source of the information, the date, description, and other comments. The software also handled the conversion from the Universal Transverse Mercator (UTM) navigational system

used by some of the search vessels to the Navy standard degrees/minutes/seconds (DMS) system.

With the database in place, SUPSALV was able to produce detailed information packages for the dive teams on a daily basis. Based on target information from the database, planners matched dive teams with targets depending on their skills and techniques. For example, most of the police dive teams dove only in pairs, so SUPSALV often assigned these teams to larger targets where two divers could work effectively. SUPSALV also concentrated diving efforts on targets where divers were most likely to find victims. Each team received a number of target locations and other information, including side-scan sonar, laser line scan, and ROV imagery, which allowed them to plan their recovery efforts. See Figure 4-8 for an example of a Diver Target Assignment List.

After each dive, divers filled out target questionnaires on which they recorded their observations and comments on each target (see Figure 4-9). This information was then added to the target database overnight and used to plan the next day's dives. This information would later be used as input to the tags database.

4.1.3.2 Tags Database

The search and recovery effort soon expanded to include recovery of all wreckage, rather than identifying and recovering particular pieces. As debris began to arrive at the Calverton hangar, SUPSALV representatives working with the NTSB saw the need for a system that could track wreckage throughout the recovery process.

The key to the debris tracking system was the use of color-coded metal tags which were attached to wreckage as it came to the surface. Each of the three primary search areas was assigned its own color; additional colors were used to tag floating debris depending on where it was brought ashore. Figure 4-10 shows the tagging instructions that were developed for this operation. SUPSALV also numbered the tags sequentially. Different recovery units received different

BOAT	TARGET No.	LAT	LONG	COMMENT
EOD-1	LLS-1	40-39:09.49	072-38:31.92	
	536	40-39:06.77	072-38:31.47	
	16659.9P	40-39:09.51	072-38:41.02	
	DIG-42	40-38:57.40	072-39:10.60	
	DIG-275	40-38:57.08	072-39:13.55	
	DIG-226	40-38:57.60	072-39:11.40	
	DIG-204	40-38:57.12	072-39:15.72	
EOD-2	12636.5P	40-39:06.63	072-38:24.89	
	12598.3S	40-39:06.41	072-38:25.26	
	521	40-39:06.45	072-38:23.55	
	522	40-39:06.64	072-38:22.00	
	527	40-39:06.51	072-38:18.88	
	526	40-39:05.21	072-38:20.20	
EOD-3	PIR-79	40-39-43.86	072-37-18.00	Engine Pylon
	PIR-80	40-39:43.99	072-37:19.76	No.1 Inbd Strut
	PIR-82	40-39:46.76	072-37:26.86	Mid-spar
	2038.7S	40-39:43.66	072-37:22.17	Engine
EOD-4	12594.2P	40-39:03.69	072-38:16.64	
	537	40-39:03.01	072-38:16.93	Adjacent to above tgt
	549	40-39:03.88	072-38:18.78	
	DIG-9	40-39:02.00	072-38:19.00	
	12898.0P	40-39:01.55	072-38:16.93	
	12613.1P	40-39:01.27	072-38:17.26	Adjacent to above tgt
	12614.3P	40-39:01.45	072-38:19.57	
	12614.9P	40-39:01.80	072-38:21.03	
	12615.2P	40-39:01.26	072-38:21.54	
EOD-5	PIR-84	40-39:47.27	072-37:27.78	Engine Pylon Door
	PIR-85	40-39:47.54	072-37:27.61	Mid-spar Fitting
	PIR-42	40-39:52.08	072-37:18.66	Engine
	2038.8S	40-39:44.47	072-37:22.18	Wing Section
	PIR-9	40-39:49.04	072-37:13.76	Fuselage Section
NYSP	LLS-376	40-38:21.45	072-38:26.09	
	LLS-311	40-38:16.53	072-38:12.68	
	LLS-263	40-38:17.94	072-38:18.42	
	LLS-337	40-38:24.03	072-38:16.17	
	LLS-347	40-38:21.02	072-38:22.57	
	LLS-242	40-38:21.94	072-38:23.37	
NYPD	LLS-336	40-38:28.55	072-38:22.39	
	LLS-236	40-38-31:84	072-38:24.90	
	LLS-283	40-38:33.74	072-38:42.75	
	LLS-201	40-38:34.09	072-38:37.28	
SCPD	LLS-308	40-38:45.30	072-38:58.10	
	LLS-245	40-38:45.65	072-38:55.12	
Bonus	DIG-13	40-38:54.50	072-39:36.70	
Bonus	DIG-121	40-38:52.26	072-39:42.24	
Bonus	DIG-132	40-38:47.10	072-39:40.50	
Bonus	DIG-319	40-38:45.27	072-39:43.91	
Bonus	DIG-134	40-38:44.88	072-39:52.15	
Bonus	DIG-85	40-38:54.54	072-39:39.48	

Figure 4-8. Sample Diver Target Assignment List. For every day of scuba operations, the Mobile Dive Team Coordinator compiled an assignment list such as the one shown above. Many factors had to be considered when prioritizing targets, including location, size of the targets, dive team equipment, and dive team skill levels. The target number indicates the source of the data (e.g., "PIR" stands for PIROUETTE, "LLS" for laser line scan, "DIG" for DIANE G's side-scan sonar contacts).

DIVER TARGET QUESTIONNAIRE

TARGET NUMBER: LLS-52 LAT: 40°38 38.5 N LONG: 072 39 08.77
DIVE BOAT: EOD-3 ORGANIZATION: USN
DIVER NAME: DEXTER
DEPTH: 118 LS: 0942 RS: 0959 DATE: 02AUG96

TARGET DESCRIPTION

Target Type: METAL
(Metal Structure/Wiring/Piping/Mechanical Components)

Length: 18' Height: 4' Width: 10'

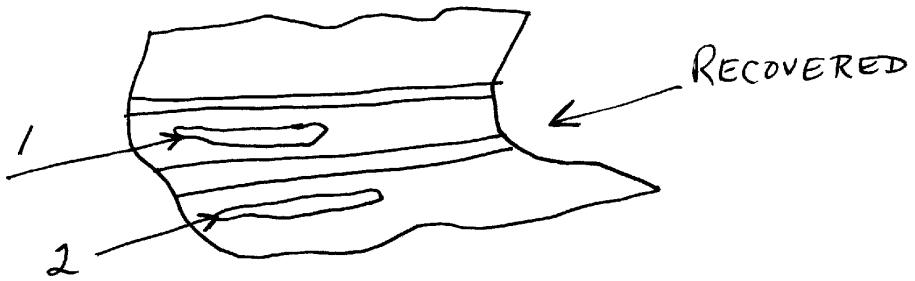
Identifying Numbers: —
(Part Numbers/Wire Numbers/Seat Row/Other Reference Numbers)

Condition: BENT
(Fire Damage/Darkened Areas/Soot/Insulation Missing/Bent)

Documentation: DIVER VISUAL / VIDEO
(Diver Visual/Diver Video/ROV Video/ROV Photo/Recovered Components/Electrical Wire Sample)

Describe Target: METAL AIRCRAFT BODY
2 HOLES RIPPED FROM INSIDE OUT

Sketch Target:



Notes:

- Stay clear of oxygen bottles, round fire extinguisher bottles, springs, landing gear struts, sharp edges, door evacuation slides.
- Closely monitor bottom time and air supply.
- Remain within no-decompression dive limits.
- Alert SUPSALV Command Center when diving is secured for the day.
- Debrief SUPSALV Command Center/NTSB/FBI upon return to port.
- Safety is Paramount!

Figure 4-9. Sample Diver Target Questionnaire.

ranges of tags and additional codes indicated whether the item was recovered before or after September 5, when the debris fields were re-surveyed and re-plotted due to Hurricane Edouard.

Large pieces were tagged separately, smaller pieces were placed in bags and each bag was tagged. The tag numbers were then recorded on standard wreckage log sheets (see Figure 4-11). From these sheets, tag and target information was entered into the database.

As the tagging system came into use, SUPSALV and Oceaneering decided to translate the original QuattroPro database into Microsoft Access, which had more powerful search and query capabilities.

The tag database allowed the operators to manipulate the data in various ways. It also allowed them to send this data directly to AutoCAD, a commercial drafting application, which Oceaneering used to generate maps, known as plots, for divers and investigators (see Figure 4-12). They could determine where a particular piece had been recovered or identify what tag numbers had been found at a given location. Using the target descriptions, they could make plots of where particular kinds of debris were found. Ultimately, they were even able to connect the location of debris on the seafloor with its position on a model of the aircraft (see Figure 4-13). Because of the flexibility inherent in the computerized database, it was able to evolve from a relatively simple resource management system to a powerful investigative tool. For more information on the operation's database management system, refer to Appendix C and the NTSB's "Data Management Report," 17 Nov 1997.

4.2 Management

The best plan in the world is of little use unless it is properly executed. This is the primary role of management. In the case of the Flight 800 search and recovery effort, two significant management challenges were the establishment of effective daily routines and maintaining good internal and external communications.

TAGGING INSTRUCTIONS

TAG **AS MANY ITEMS AS POSSIBLE** WHEN LIFTED FROM WATER.
ESPECIALLY IMPORTANT IS AIRCRAFT STRUCTURE AND SPECIFIC PARTS LIKE PUMPS AND CONTROLLERS.

TAG NUMBERS ARE SEQUENTIAL. RECORD THIS NUMBER **ON WRECKAGE TRACKING LOGS WITH OTHER INFORMATION. ENSURE INFO MATCHES** THAT BEING RECORDED BY NTSB AND FBI REPS.

TAGS ARE COLOR CODED FOR EASE IN IDENTIFYING WRECKAGE LOCATION AS FOLLOWS:

GREEN: DEBRIS FIELD 1 - NE
YELLOW: DEBRIS FIELD 2 - CENTER
RED: DEBRIS FIELD 3 - SW

IF YOU PICK UP DEBRIS FROM TWO DIFFERENT LOCATIONS, ENSURE THAT DEBRIS IS SEGREGATED. DO NOT MIX DEBRIS FROM DIFFERENT LOCATIONS. IT IS VITAL THAT DEBRIS IS SEGREGATED. DO NOT MIX DIFFERENT TAG COLORS WHEN LOADED ONTO THE MIKE BOAT.

MULTIPLE PIECES MAY HAVE THE SAME DIVER TARGET NUMBER. THIS IS OK. EACH PIECE WILL HAVE A UNIQUE TAG **NUMBER**.

IF DEBRIS BREAKS APART ONCE ONBOARD, TAG EACH PIECE WITH SEQUENTIAL NUMBERS.

IF BASKET WITH SMALL PIECES COMES ABOARD, TAG LARGE PIECES AND BAG SMALLER PIECES AND TAG BAG.

WRECKAGE SHEETS WILL BE COLLECTED EACH MORNING. ENSURE A COPY IS AVAILABLE FOR PICKUP.

Figure 4-10. Tagging Instructions.

WRECKAGE LOG SHEET

DATE_____ **TIME** _____

TAG NUMBER _____

DIVE TARGET NUMBER _____

WRECKAGE DESCRIPTION _____

_____

_____

LATITUDE 40 - _____ **N**

LONGITUDE 72- _____ **W OF PICK LOCATION**

Figure 4-11. Wreckage Log Sheet.

4.2.1 Daily Routines

During the first three phases of the search and recovery effort, the heart of the daily routine was the Progress Meeting held each evening at the East Moriches Coast Guard Station. Usually scheduled for 1900, the progress meeting provided SUPSALV and JTF 40.50 a chance to review the significant events of the day just ended and make a plan for the day to come. Common topics included what had been recovered by divers, what had been discovered by side-scan sonar and other sensors, predictions of weather and sea-state, medical concerns, relations with the press, and NTSB requirements. At the end of the progress meeting, the daily situation report (SITREP) from JTF 40.50 was reviewed and released (see Appendix D).

Later in the evening, usually about 2300, a representative of SUPSALV would meet with the shore-based technicians who would process the sonar and

laser line data collected that day. The purpose of this meeting was to review the mapping work that would be done that night and make sure that adequate preparations would be made for the next morning's dive operations.

At 0730 each morning, the Dive Team Coordinator would brief the dive supervisor and one assistant from each mobile dive team. This briefing provided an overview of the day's diving objectives and assign dive teams to specific targets. Dive team supervisors were provided with the most recent side-scan sonar images, laser line scan images, and/or plots of the areas where they would be working. Supervisors were also given the opportunity to share observations and lessons learned with leaders of other dive teams.

The daily routine of the Navy elements was closely integrated with the daily routines of the other major organizations involved in the larger investigation. Each morning the Coast Guard hosted a logistics meeting for all agencies located aboard the Coast Guard Station at East Moriches. Major topics included telephone lines, power requirements, and hazardous material handling procedures. Each afternoon, the NTSB held a progress meeting at the Calverton hangar where SUPSALV briefed the investigation team on operational progress and each investigation team leader updated his group's efforts.

4.2.2 Communications

The communications suite used by those involved in the search and recovery operation included both civilian and military elements. Military secure-voice VHF and UHF radios were used to communicate with Navy ships, commercial VHF radios and cellular phones were used to communicate with small craft and commercial ships, and commercial land lines were established in the Command Center. In addition, a military communications field unit was set up and maintained by Navy EOD communications personnel. In sharp contrast to secure military communications, cellular telephone conversations were easily intercepted by unauthorized parties. This made it difficult to communicate openly while traveling about the area. INMARSAT, a commercial marine satel-

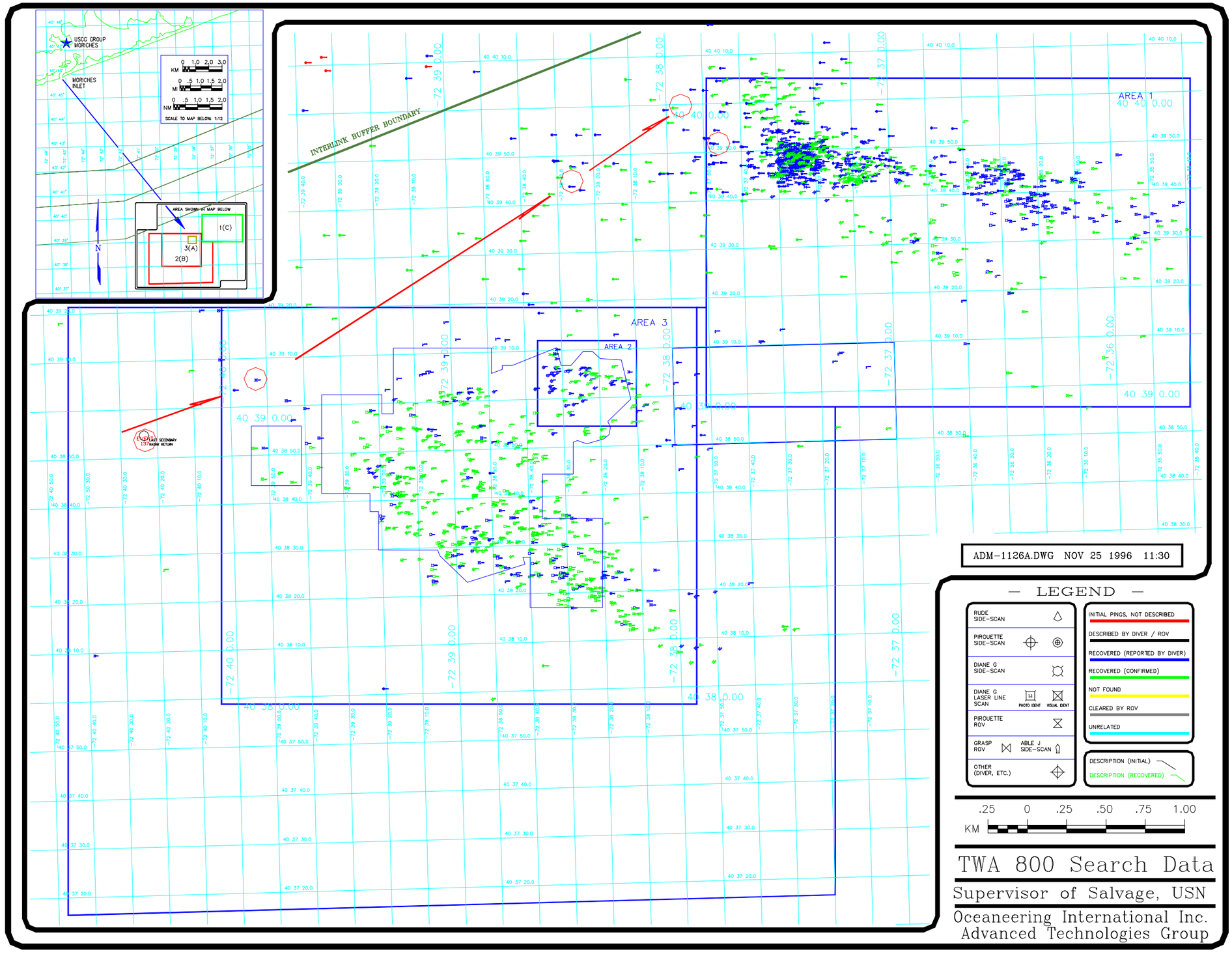


Figure 4-12.
Sample Database Plot.

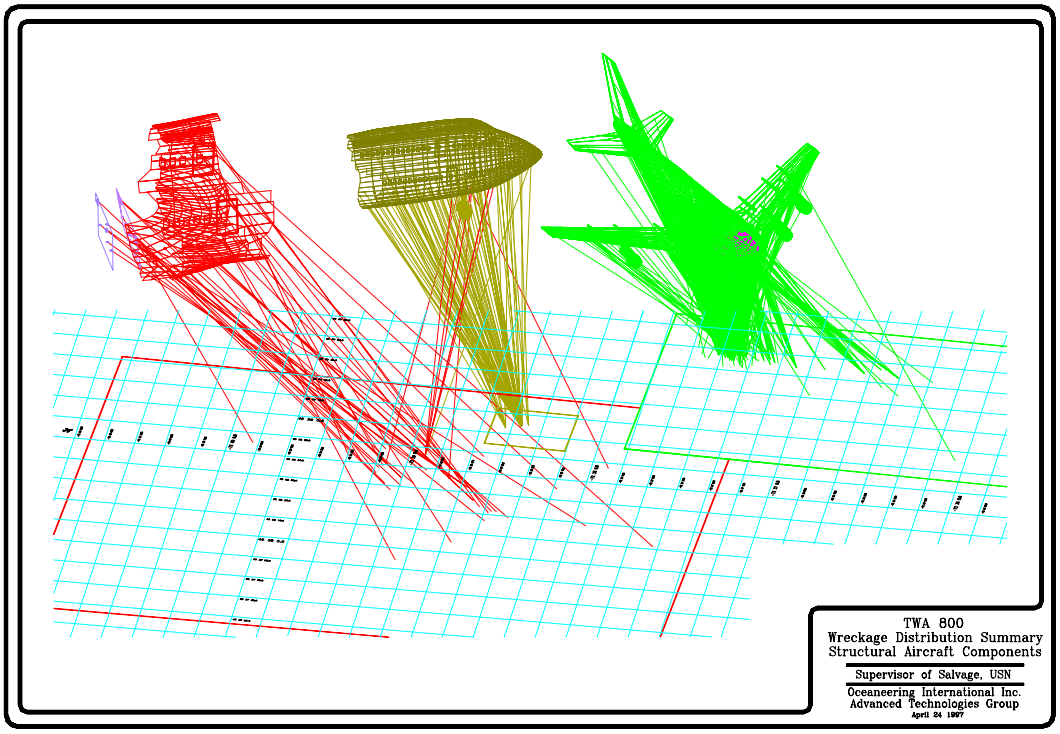


Figure 4-13. Wreckage Distribution Diagram.

lite phone system, was somewhat more secure and proved to be very valuable but expensive to use.

4.3 Finance

The search and recovery operation following the loss of Flight 800 was one of the most extensive, and hence expensive, operations of its type ever conducted. Out-of-pocket costs for the Navy for the salvage operation were approximately $13.4 million. From the start of Navy participation on 18 July 1996 until the dissolution of JTF 40.50 on 2 November 1996, some $2.7 million was spent to cover the costs — particularly the cost of fuel and expendables for ships and craft — that the Atlantic Fleet incurred in supporting the search and recovery operations. During the same period, SUPSALV obligated approximately $5 million. Much of this went to pay for the commercial ships, crews, and services provided by contractors. From 4 November through 30 April 1997, the

trawling operation to retrieve the remaining debris cost SUPSALV an additional $5.5 million. In May of 1997, a week of using ROVs to spot-check the results of the trawling operation cost another $200,000. All costs were reimbursed by the NTSB.

The actual cost to the Navy of supporting the search and recovery operation was, in fact, far higher than the figures indicate. Neither salaries for service members nor cost of maintaining ships, equipment, and shore facilities were factored in. Furthermore, these figures did not include costs for the hangar facilities. For comparison, SUPSALV conducted a study that indicated the operation would have cost in excess of $45 million if conducted solely by commercial contractors.

4.3.1 Process

While few people would have anticipated an undertaking on the scale of the Flight 800 search and recovery operation, the pre-existing mechanism for using NTSB funds to cover SUPSALV's and the Navy's extraordinary expenses worked well. Established by the same Memorandum of Understanding (MOU) that governed other aspects of the relationship between the NTSB and SUPSALV, the mechanism was based on the use of Letters of Commitment. Issued by the NTSB to SUPSALV on an as-needed basis, Letters of Commitment authorized SUPSALV to spend a specific number of NTSB dollars in support of the operation and promised to reimburse the Navy at a later date. The first Letter of Commitment associated with the Flight 800 search and recovery operation, issued on 18 July 1996, committed $164,000 of NTSB funds to the mapping of the debris fields and the recovery of the flight data recorders. As the operation evolved, subsequent Letters of Commitment provided substantially larger amounts.

Throughout the operation, the Deputy Supervisor of Salvage maintained regular contact with the Comptroller of the NTSB. Weekly updates kept the NTSB Comptroller apprised of the rate at which funds were being expended in support of the search and recovery operation. As additional funds were needed,

the NTSB Comptroller provided Letters of Commitment with very little delay and a minimum of formality

4.3.2 Appropriations

The Flight 800 search and recovery operation began in the fourth quarter of Fiscal Year 1996, with no money having been appropriated for the specific purpose of funding operations of this sort. The NTSB, an organization responsible for investigating all aviation accidents as well as significant mishaps involving other forms of transportation, lacked the funds to immediately reimburse the Navy's costs. Because of this, there was a significant delay between the time that the Navy had to make an expenditure in support of the Flight 800 search and recovery operation and the time that it was reimbursed by the NTSB. While waiting for this reimbursement Naval Sea Systems Command (NAVSEA) and the Atlantic Fleet had to take money from other programs. In Fiscal Year 1996, the Navy had obligated approximately $5.5 million but had only been reimbursed $164,000.

Congress passed a supplementary appropriation for Fiscal Year 1997, specifically targeting funds to the Flight 800 search and recovery operation. Unfortunately, the language of the appropriation inadvertently prevented the Navy from applying these funds to reimburse expenditures incurred in Fiscal Year 1996. This led both the Navy and the NTSB to support legislation that would specifically authorize the use of funds from the Fiscal Year 1997 supplemental appropriation to pay for costs incurred in Fiscal Year 1996. In July 1997, the Navy Fleet and SUPSALV were fully reimbursed for costs associated with the Flight 800 search and recovery operation.

4.3.3 Contracts

While the amphibious and salvage vessels of the Atlantic Fleet, as well as Navy divers and shore personnel, proved indispensable to the search and recovery operation, many services were provided by SUPSALV's prime contractor for undersea operations, Oceaneering International, Inc. During the evolution of

the Flight 800 search and recovery operation, this delivery-order support contract proved to be an extraordinarily flexible instrument. As a modest effort to map the debris fields and recover flight data recorders grew into a massive enterprise that lasted ten months, the delivery-order support contract was used to provide sonar mapping, laser imaging, precise navigation, database development and management, logistics support, support ships and craft, project management, operator technicians, engineering support, specialized equipment and a host of other services.

Chapter 5

Diving and Recovery Operations

Chapter 5

Diving and Recovery Operations

The recovery operation encompassed three basic activities: recovering victims and debris from the sea floor, transporting debris from the salvage ships and craft to the shore, and transporting the debris to the hangar at Calverton.

5.1 Victim and Debris Recovery

Nearly all of the victims and the vast majority of the debris recovered during the search and recovery operation were taken out of the water by divers using either SCUBA or surface-supplied diving systems. SCUBA divers were generally based on shore and worked out of small boats. The surface-supplied divers worked off of one of the two Navy salvage vessels, GRASP and GRAPPLE.

To support surface-supplied diving, the salvage ship would moor directly over the debris field to be explored. The salvage ship would remain moored in position until all debris had been recovered from the site. To avoid disturbing debris, side-scan sonar and ROVs were used to locate clear drop points for the anchors.

5.1.1 Recovery Techniques

Victims were brought to the surface in a variety of ways. Some were placed in body bags or covered salvage baskets. These were then lifted to the surface by one of the salvage ships. Other victims were brought to the surface by the divers themselves or on the dive stage used by the surface-supplied divers. The victims were then immediately transferred to a law enforcement boat for transport to shore.

Small items of debris were placed in bags that the divers could bring up themselves or in salvage baskets that were lifted by the SLWT or a salvage ship. To keep very small pieces from falling out, these baskets were sometimes lined with sheets of plastic.

Larger items, which were lifted directly by GRASP, GRAPPLE, and the SLWT, presented their own particular set of problems (see Figure 5-1 and Figure 5-2). The limited visibility coupled with the catastrophic damage to the airframe made it difficult to judge the center of gravity for a balanced lift. The jagged edges were a hazard to the divers and quickly abraded lifting straps. Because of the quantity and size of the debris, the ships' decks quickly fouled, in some cases forcing diving operations to be suspended until debris could be taken ashore by LCM-8.

A few very large pieces, including the 80-foot long starboard wing section, had to be cut because they would not fit in the LCM-8s for the move ashore nor in the trucks to move to the hangar. This required both approval from the FBI and the NTSB and some innovation by the salvors. Conventional saws proved inadequate. After allaying concerns about the neatness of the cut, the salvors used Kerrie Cable, a pyrotechnic material normally used for underwater cutting, to cut these pieces to fit the available transport craft.

5.1.2 Diving Operations and Coordination

Making the best use of the many divers involved in the search and recovery effort was a challenge to the management and leadership skills of the Navy leaders in charge both on scene and at the units providing divers. Divers from more than a dozen Navy commands participated in the operation. Because these units all had other operational tasking and training requirements to meet, there was a constant turnover of personnel supporting the Flight 800 operation. In spite of this, the highly qualified divers all proved to be very effective in performing their mission.

Figure 5-1. Starboard Wing Section. Large, jagged pieces of wreckage were difficult to rig, lift, and transport. Pictured above is an 80-foot section of the starboard wing aboard the USS GRASP.

Figure 5-2. Tail Section. The Side Loading Warping Tug worked with the Mobile Dive Teams to recover large pieces of wreckage, such as this tail section.

Explosive Ordnance Disposal Group Two (EODGRU-2) provided the majority of the Navy divers participating in the operation. In addition to the EOD Mobile Team SCUBA divers, EODGRU-2 tasked Mobile Diving and Salvage Unit Two (MDSU-2) to provide surface-supplied divers to augment the divers in GRASP and GRAPPLE. Concurrent with the Flight 800 operation, EODGRU-2 was tasked with other priority missions, including conducting explosives searches in support of the Secret Service. With the Presidential campaign and the Olympic Games in Atlanta underway, the Flight 800 operation was a major obligation, and EODGRU-2 was forced to reassign dive teams frequently. This might have proved to be a problem, but the unit was very proactive in its planning, notifying JTF 40.50 of these moves, and sending replacement teams whenever they were required.

When more divers were required, the Navy's informal "master diver network" also took a hand. While normally there is only one master diver on a job, this operation was so big that as many as eight master divers were working at the same time. This concentration of experience meant that the master divers on site knew almost all the other master divers in the Navy. They were able to "call around" and determine what units had divers available. Official tasking from CINCLANTFLT followed these informal discussions.

Special attention was required to make the best use of divers from organizations other than the Navy. These divers received their daily target assignments from the Navy dive coordinators but remained officially outside the Navy's control.

Having been trained to perform a limited number of tasks in relatively shallow water, divers from police and fire departments generally lacked the breadth of skill and experience normally associated with Navy divers. Navy leaders evaluated each dive team to ascertain its ability to carry out this difficult work. For the most part, the evaluation process contributed to the creation of teams of enthusiastic and hard-working divers who were given tasks appropriate to their capabilities. As the operation progressed, the non-Navy divers' skill levels

improved significantly. These divers did an outstanding job working side-by-side with the Navy divers.

5.1.3 Dive Safety Issues

Because most of the objects to be recovered were in water that was about 120 feet deep, great care had to be taken to prevent diver injuries due to decompression. Recompression chambers were an absolute necessity. Chambers on board GRASP and GRAPPLE were used to treat emergency cases and to conduct surface decompression dives. On shore, the Transportable Recompression Chamber System (TRCS) was available for the emergency treatment of mobile scuba divers. Detailed planning was necessary to make the best use of limited bottom time and recompression chamber availability.

These precautions paid off. There were very few dive-related injuries and all of the divers involved recovered completely. Indeed, the most serious injuries sustained were broken bones suffered in moving between small craft and the larger ships in high sea states.

Initially, there was a higher than usual number of treatments among the surface-supplied divers. Although not large in absolute terms, this was considered unacceptable and SUPSALV decided to reduce the allowable bottom time at 120 feet from 90 minutes to 60 minutes. Although the cause of these incidents was not clear, SUPSALV opted for a conservative approach and the problem was resolved. No similar problem was encountered for the mobile team divers, who were making no-decompression dives with only 15 minutes on the bottom.

Although the Navy had no formal authority over the civilian dive teams, it took steps to ensure their safety. After a small number of treatments for decompression sickness, Navy Master Divers observed the civilian dive teams in action and made some informal recommendations.

5.1.4 Diving and Recovery Supplies

For the most part, JTF 40.50 was able to acquire diving and salvage material through the normal Navy supply channels. In a few cases, however, the system was unable to keep up with the demand. In these cases, SUPSALV acquired supplies locally through its contract with Oceaneering International, Inc.

The salvage ships' organic supply of strapping and other lifting materials, used for bringing debris to the surface, was stretched by the magnitude of the operation and the need to leave debris rigged for lifting throughout its the transit to Calverton. Also, much of the debris was sharp and jagged, which abraded the straps and shortened their life-span significantly. To ensure that adequate supplies were available, Oceaneering International, Inc. provided rigging from several sources in Long Island.

Another critical item was oxygen. The surface-supplied divers operating from GRASP and GRAPPLE needed medical grade oxygen for surface decompression. Again, Oceaneering International, Inc. provided oxygen from commercial suppliers on Long Island.

5.1.5 ROV Operations

To complement the divers, SUPSALV provided four Remotely Operated Vehicles (ROVs), small submersibles controlled remotely by operators on the surface. The ROVs operated from several ships during the course of the operation. Mini-ROV 1 and the larger Deep Drone worked from GRASP and GRAPPLE respectively, supporting the shipboard divers. Mini-ROV 2 worked from M/V PIROUETTE, and later M/V MARION C., supporting the mobile SCUBA divers. Mini-ROV 3 was kept ashore as a ready spare. All four ROVS are Navy owned and operated by Oceaneering International, Inc. as part of its support contract with SUPSALV. (See Appendix B for detailed technical characteristics of the ROVs.)

The ROVs served primarily as reconnaissance tools, locating and identifying debris for the divers. Their onboard sonars had much longer range than the hand-held PQS-2A used by the divers. This allowed ROVs to pinpoint targets detected by side-scan sonar. Once an ROV located a piece of wreckage, operators used onboard video and still cameras to identify it and document its condition. These records gave investigators valuable information about the condition and position of wreckage before it was disturbed by the recovery process.

The ROVs' video cameras allowed divers to plan their recovery operations and make the most of their limited bottom time. Diving Officers and Master Divers used the video to examine larger pieces of debris and plan a rigging strategy before anyone actually dove on the target.

Unlike a diver, who could stay underwater for only a limited period of time, an ROV could stay underwater and work around the clock. ROVs could continue to locate and survey targets during the night or periods of bad weather. Divers could then begin work as soon as diving resumed. With an ROV in position, divers could simply follow its umbilical cable down, saving time that would otherwise be spent searching for the target.

The ROVs also carried out some limited recovery tasks. The two Mini-ROVs, with their very simple manipulators, could only retrieve small objects. Deep Drone, however, could grip larger objects and do some rigging tasks with its two sophisticated manipulator arms.

5.2 Ship-to-Shore Transportation

In most cases, victims were transferred from the dive boats and salvage ships to a Suffolk County Police Department (SCPD) boat. The SCPD then transported victims to the Suffolk County Medical Examiner. In the later stages of the operation, a few victims were transported ashore by Navy CH-46 Sea Knight helicopters.

The ship-to-shore transfer of debris was more problematic. Some items, particularly small or important pieces, were carried by CH-46 Sea Knight helicopters operating from the OAK HILL or TRENTON. Most material, however, went ashore on the two LCM-8s (see Figure 5-3).

Figure 5-3. LCM-8 Support Craft. LCM-8s, also known as "Mike boats," proved invaluable for shuttling debris and trash to shore and stores to ships.

The decks of the salvage ships proved to be the major choke point in the operation. The "mike boats" were not always able to keep up with the rate of recovery. In part this was due to the length of the trip — approximately 18 nautical miles from the debris fields to the Shinnecock Coast Guard Station. Given the LCMs' top speed of about ten knots, this translated to a minimum four-hour round trip plus time for unloading. Necessary precautions to preserve the evidentiary value of the debris also caused delays.

5.2.1 FBI Evidence Handling Requirements

The transfer process was complicated by FBI and NTSB requirements. Understandably, they required that particular procedures be followed to preserve the evidentiary value of each piece. FBI agents and NTSB representatives were stationed aboard each ship and had to be present whenever debris was moved. As material was brought to the surface it was tagged by the FBI agent. (The tagging system is discussed in more detail in Section 4.1.3, "The Target Database.") Wreckage from different debris fields could not be mixed in the same trip, which

sometimes resulted in an LCM making a run with only a single salvage basket. The LCMs had to be swept after each trip for any debris that might have fallen out of the baskets and might interfere with or contaminate materials in future trips. While these measures were necessary to preserve the chain-of-custody that would have been necessary in a criminal prosecution, they introduced a significant level of complication in an already difficult operation.

5.3 Movement of Debris to Calverton

Once material arrived at Shinnecock, the New York Army National Guard used a mobile crane to transfer it from the LCMs to heavy trucks. Most of this activity fell to the Army National Guard and local police forces although Navy and New York Naval Militia personnel assisted at various points. Although only one crane was in operation at a time, a second crane was brought in to be immediately available as a spare. The National Guard provided 12 tractors and ten trailers to transport debris to Calverton.

Figure 5-4. Reconstruction of Wreckage at Calverton Hangar. As part of its investigation, the NTSB used recovered wreckage to reconstruct portions of the aircraft. This photo shows a section of the fuselage, with passengers seats in the foreground.

5.4 Trawling Operations

As conventional diving and ROV efforts became less productive, the NTSB and FBI asked the Navy to come up with an alternative method to retrieve the final pieces of the aircraft. This presented a new challenge for SUPSALV, since most aircraft salvage operations require only retrieval of those items of particular interest to the investigators, not the entire aircraft.

After considering several methods (refer to Figure 4-5), SUPSALV eventually recommended trawling. The techniques used by local scallop trawlers to collect shellfish were equally suited to recovering small pieces of debris buried in the mud. Through Oceaneering International, Inc., SUPSALV hired five ships, of which four were working at any given time. (See Appendix B for descriptions of the trawlers). Trawling began on 4 November. The ships typically spent 21 days at a time on-station with 7 days off for rest and resupply. Foul weather and mechanical failures imposed additional breaks in the operation, which lasted almost six months.

Trawling was a painstaking activity. The trawl lines were typically several miles long and had to be carefully laid out to cover the entire area in an orderly fashion, criss-crossing the debris fields (see Figure 5-5). The ships worked along the lines at 2-3 knots towing a 15-foot-wide net on each side of the ship. Successive sweeps were made to cover the gap between the two nets, and each area was swept until no new material was recovered. To ensure accurate coverage, SUPSALV provided the trawlers with highly accurate differential GPS receivers of the same type used by the divers. These units, operated by Oceaneering personnel, allowed the trawlers to stay within five meters (16 feet) of their designated course.

As each line was completed, the nets were brought aboard and emptied (see Figure 5-6). Natural materials were discarded, but FBI personnel on the ships took custody of all man-made objects. These were bagged and tagged using the tagging system developed earlier and were subject to the same evidence handling rules used throughout the recovery operation. Small craft (either a

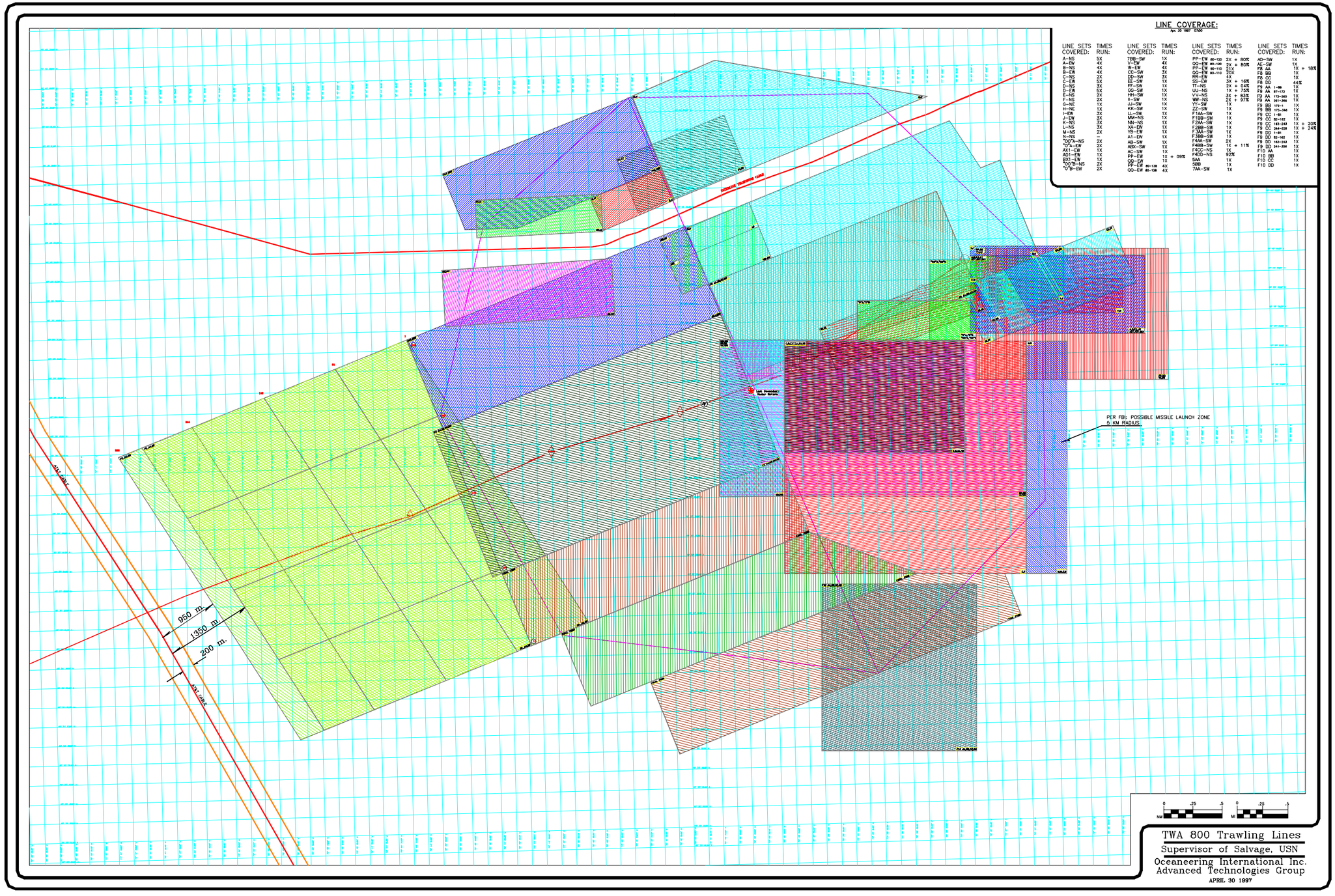


Figure 5-5
rawling Coverage

5-11/5-12 blank

Figure 5-6. Trawling Operations. Top photo shows one of the 15-foot nets used for trawling. Bottom photo shows some of the small pieces of debris recovered from the ocean floor.

commercial LCM-8 or a SUPSALV rigid-hulled inflatable) took the material ashore, where NTSB personnel sorted the aircraft debris from other objects.

One patricular challenge to overcome was the presence of a submerged trans-Atlantic telephone cable in the area to be trawled. This was handled by stationing AT&T vessels above the cable to keep the trawling vessels from coming closer than 200 yards. Then an AT&T ROV was used to inspect the area 200 yards on either side of the cable.

SUPSALV ceased trawling on 28 April as successive sweeps turned up no further debris. Overall, the trawling operation recovered about 1,000 pieces of aircraft debris, amounting to one or two percent of the aircraft. Of these pieces, the NTSB considered about 100 "useful"; the others were either too small to identify or were from parts of the aircraft in which the investigators had little interest.

5.5 ROV Follow-Up Survey

To ensure that the trawling had retrieved everything of interest, the NTSB asked SUPSALV to conduct a "quality assurance" survey of the debris fields. Beginning 9 May, Mini-ROV 2, operating from the chartered survey vessel M/V ATLANTIC SURVEYOR, searched 85 sites for additional wreckage (see Figure 5-7). Utilizing the MR-2's high-resolution sonar and video camera, a 100-meter circle was searched at each site. Only one small scrap of debris was found.

Based on the results of the survey, the NTSB concluded that additional search and recovery activities were unnecessary. On 18 May, SUPSALV, with the concurrence of the FBI and NTSB, terminated the Flight 800 search and recovery operation.

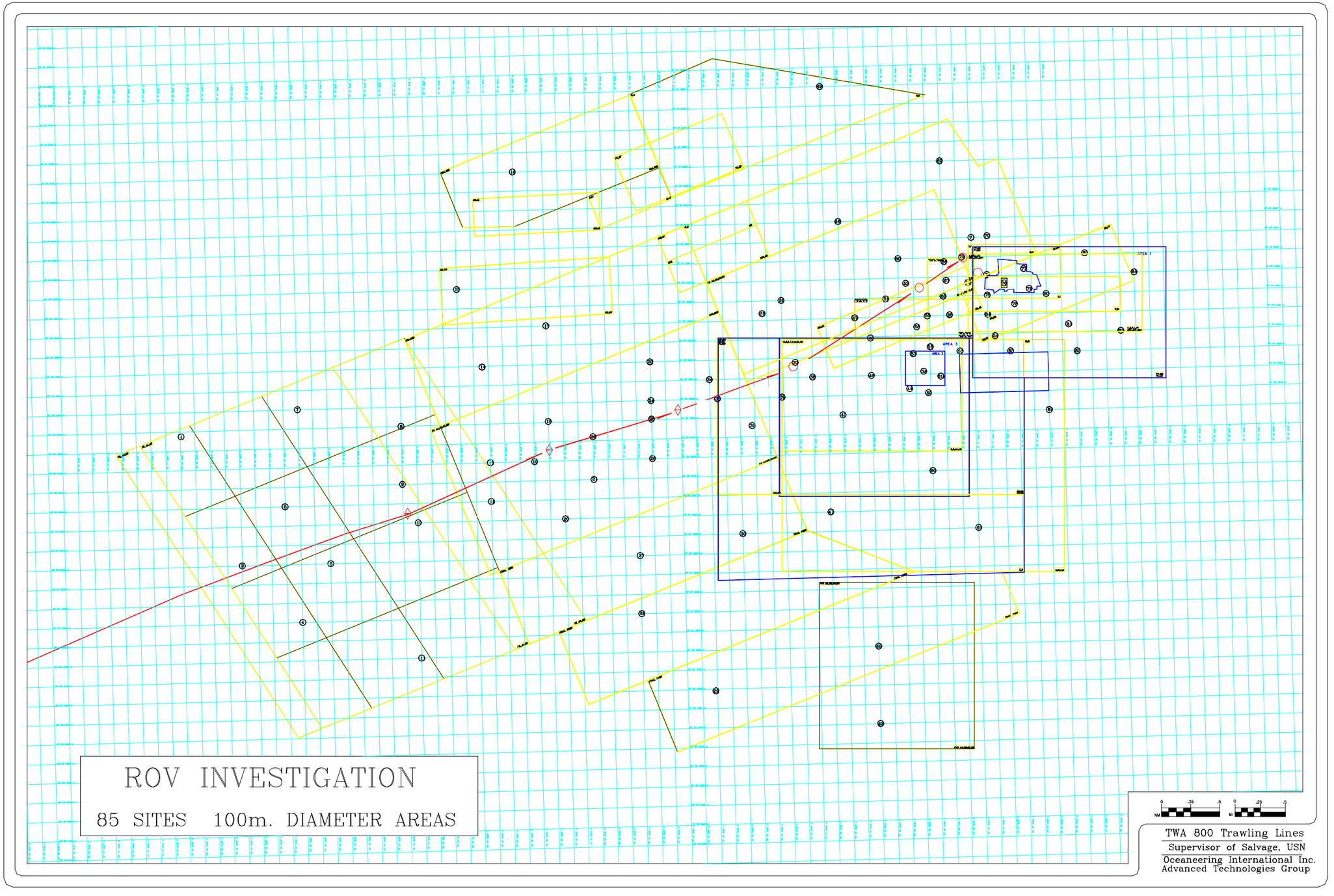
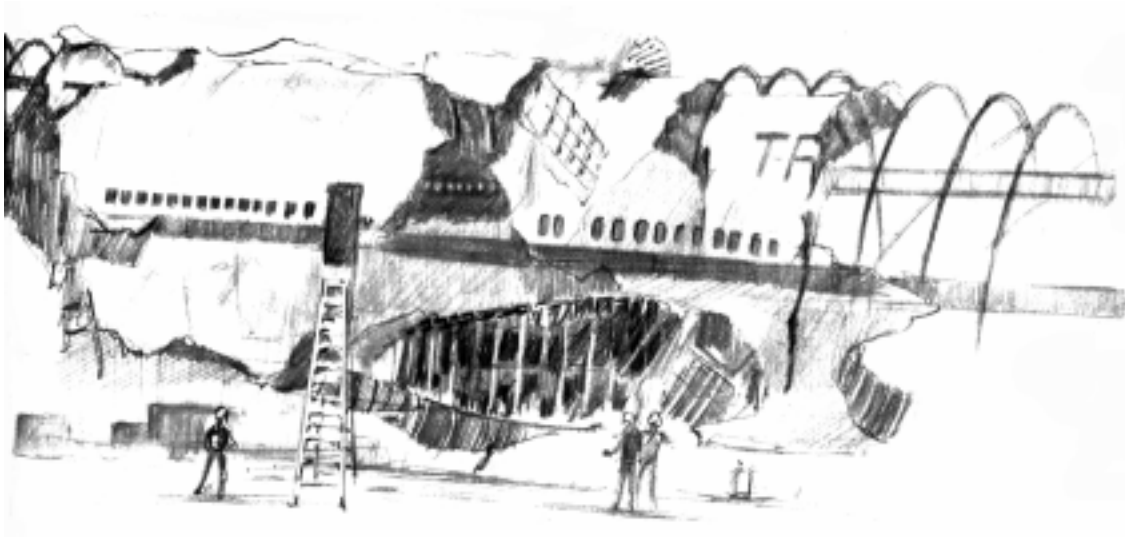


Figure 5-7.
ROV Inspection Sites.

Chapter 6

Lessons Learned



Chapter 6

Lessons Learned

This chapter discusses lessons learned from the Flight 800 operation that may have implications for future search and recovery operations.

6.1 Public Affairs

In an operation of this magnitude, the role of public affairs cannot be overemphasized. Timely and accurate reporting to the news media is essential. A lack of information often leads to speculation that requires extensive attention to rectify.

The creation of a Navy Command Information Bureau did much to relieve the salvage team of public affairs responsibilities. Nevertheless, a great deal of time and effort was spent in the first few weeks of the operation educating the media about Navy diving and salvage capabilities. While some of the information conveyed was unique to the operation, much of it was not. The media had to be educated, for example, on the differences between and limitations of scuba divers and surface-supplied divers. The public also had to learn that locating and surveying underwater debris is a methodical process that ultimately saves time and makes divers more efficient. Until the public grasped this concept, the Navy had to fight the perception that it was not doing all that it could to recover victims.

Educating the media should not consume any more time than necessary. In this case, the window of opportunity for getting the Navy's story out to the public was regulated by the NTSB. In anticipation of future media attention, SUPSALV should consider developing a Press Kit containing appropriate background information. Such a kit could include fact sheets on how a typical search

and salvage operation is conducted, how various search and salvage systems work, and the advantages and limitations of each system with respect to weather and water depth. The kit should also explain decompression, the advantages and limitations of different diving systems, and what Navy divers do in their day-to-day jobs. The current SUPSALV brochure could be used as a starting point for this project.

The CINCLANTFLT Combat Camera Group was assigned to the operation to record events, using both video and still photography. The Combat Camera Group contained divers who recorded videos of the divers working on the bottom and the conditions under which they worked.

6.2 Logistics

Large-scale operations such as this generally require a substantial shore-based logistics organization. This organization handles issues such as debris offloading and transfer, disposal of trash from ships, safe haven for ships during storms, and re-provisioning and refueling (a major consideration in the Flight 800 operation). It also arranges for small purchases such as supplies, clothing for divers, repair of small boats, and repair and maintenance of equipment. All of these tasks were handled successfully during the Flight 800 operation, but on an *ad hoc* basis. The goal is to have logistics systems in place from the very beginning.

The amphibious ships and the COMLOGGRU TWO Det Earle Supply Officer were assigned to coordinate logistics support. The drawback of this arrangement was that both parties were geographically isolated from the day-to-day command operations center. Because of this, neither could adequately manage the multitude of logistics issues that arose. In future large-scale operations, a logistics support organization should be included in the command center.

With regard to on-site contracting and subcontracting, pre-established contracts gave SUPSALV a great deal of flexibility.

Additionally, a large concern was the disposal of trash generated by three Navy ships with over 500 personnel. This became a particularly difficult assignment due to the limited infrastructure present along the coast of Long Island.

When setting up shore-based operations in the future, shore-based personnel need to work with local agencies to ensure that all applicable permits, such as use of portable fuel tanks, generators, and compressors, are acquired.

6.3 Amphibious Ships

The amphibious ships assigned to this operation were very beneficial in providing berthing and messing, communications, machine shops, office spaces, cargo holds, helicopter landing decks, boats, and dental and medical facilities. In future large-scale operations, support ships of this nature should be considered.

6.4 Transportation and Berthing

At its height, the Flight 800 operation involved hundreds of Navy personnel working at various locations on Long Island and on contractor vessels, salvage ships, amphibious ships, and dive boats. The efficient transportation of personnel, equipment, and debris from one location to another was a constant logistical challenge. Arrangements had to be made for ship-to-ship, ship-to-shore, and shore-to-shore transportation, as well as for a multitude of transportation requirements ashore.

Dedicated support craft, in the form of RHIB boats and Coast Guard craft, were extremely useful for logistics runs. Future operations should include provisions for dedicated support craft appropriate to anticipated sea states. LCM-8s proved invaluable for shuttling debris ashore. Support craft should be included in initial planning for future operations.

For land transportation, a dedicated driver and vehicle for transportation should be considered. During this operation there was a continual requirement for shuttling personnel to and from the airport, picking up supplies, and so forth.

The magnitude of the operation required the Navy to seek on-shore berthing for some personnel. Depending on the locations, this could be difficult and should be considered in initial operational planning.

6.5 Staffing

In addition to the command management staff, military personnel and/or contractors should be assigned to assist in administrative, watch standing, communications, and logistics support duties.

6.6 Planning and Management

6.6.1 Plan of the Day (POD)

A Plan of the Day (POD) needs to be developed each night and promulgated to all operating forces and other concerned parties. A planning meeting each morning should update the POD to allow planners to take full advantage of current information from the forces at sea and ensure close coordination among all assets.

6.6.2 Standardization of Forms and Records

From the very beginning of an operation, forms such as logs, reports, and PODs should be standardized (see Appendix D for examples). A daily log, detailing accomplishments to date, should be established from Day One.

6.6.3 Financial Management/Cost Tracking

Costs must also be monitored from the onset of an operation. Cost estimates should be reconciled with actual costs weekly to ensure adequate cost control

6.6.4 Cellular Telephones and Pagers

Cellular telephones and pagers proved to be invaluable communications tools, with the caution that they are not secure and subject to monitoring. The use of pagers was extremely beneficial in maintaining contact with key personnel.

The use of cellular phones and pagers should be considered for large-scale operations.

Cellular phones provided to ships for crew members to make personal calls provided a morale booster. This service, which was donated by AT&T, was in constant use and much appreciated. In future large-scale operations, this service should be solicited as a morale booster.

6.6.5 Database Management

The use of a computer database to monitor search and recovery data is required for large-scale operations. A database was developed using commercial off-the-shelf software. It is now available for all future operations.

6.7 Operations

6.7.1 Crew Rest

For long-term operations it is important to plan for crew rest and relaxation. Logistics support needs to be taken into consideration for this.

6.7.2 Non-Navy Divers

By evaluating the capabilities and experience of civilian law enforcement and emergency response dive teams, the Navy was able to safely incorporate these divers into the diving organization. In accordance with Navy diving policy, the non-Navy trained divers formed their own dive teams and utilized their own equipment and boats. These teams were tasked by the Navy Mobile Team Leader.

6.7.3 Navy Divers

Superior training, both in Navy dive schools and on the job, enabled Navy divers with diverse backgrounds (i.e., EOD, Salvage, SPECWAR) to integrate into a highly effective salvage team. Initial cross-training between various

specialists and integrating divers into a single team is required to achieve the highest efficiencies.

Nevertheless, this operation demonstrated that EOD and SPECWAR groups have personnel, and equipment, and procedures that can be used successfully in salvage operations. Hand-held sonar devices, for example, were extremely helpful in locating debris for the scuba divers.

Due to the length of this operation, the weather changed and many of the Navy divers were unprepared for the change of weather. All dive commands should ensure that their divers are properly outfitted.

6.7.4 Laser Line Scanner

The Flight 800 operation represented the most extensive use to date of laser line scanner (LLS) technology in a Navy salvage operation. Providing higher resolution than side scan sonar (SSS), LLS was good at identifying objects made of non-metallic materials. This was used when trying to locate victims that were apart from wreckage and when prioritizing where to dive first. Significant drawbacks to the LLS were its very limited field of view and high operating cost.

6.8 Incident Management

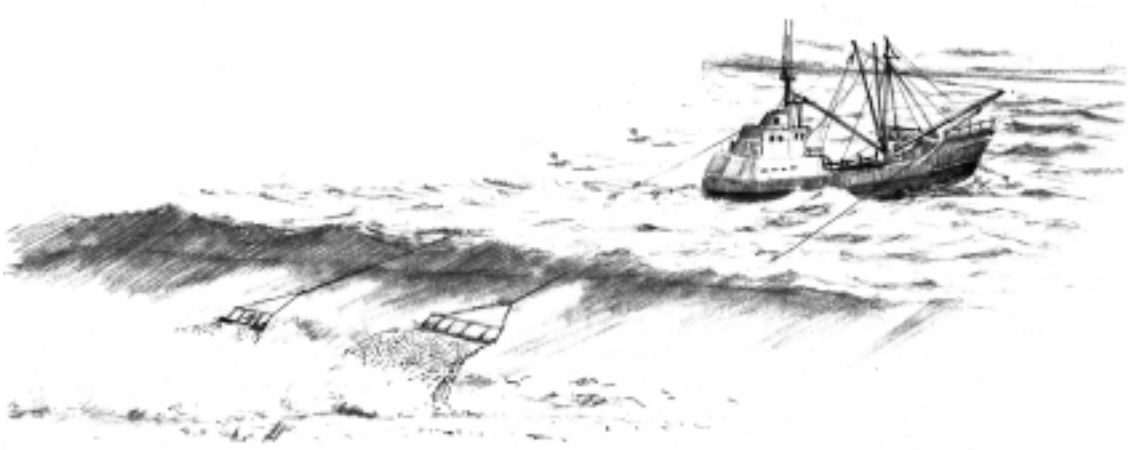
In anticipation of future large-scale operations, an Incident Command System (ICS) management organization should be used. This organization includes (but is not limited to) Logistics, Operations, Planning, Finance, and Facilities. The person in charge of each area then assembles a staff to carry out those functions. Adjunct to this organization are the command staff, public affairs office, and so forth.

6.9 Planning Guide

A planning guide for large-scale operations to assist in initial planning and staffing should be developed.

Chapter 7

Conclusion



Chapter 7

Conclusion

The story of the Flight 800 search and recovery effort bears testimony to both the value of careful preparation and the virtue of creative improvisation. Some of the assets that proved useful in the operation, such as the salvage ships GRASP and GRAPPLE, were used for their intended purposes. Other things that contributed to success had been designed with little or no thought to salvage operations. Hand-held sonar devices designed to locate underwater mines were useful in locating aircraft wreckage. The amphibious ships OAK HILL and TRENTON, designed to carry Marines into battle, became command platforms and diver support vessels.

The written agreements that SUPSALV had with the NTSB and Oceaneering International, Inc., functioned exactly as they had been intended to function. The informal relationships between SUPSALV and other organizations, such as the National Oceanic and Atmospheric Association (NOAA) and civilian diving units, were formed in the course of the operation. In one set of cases, cooperation was based on formal arrangements that had been in place for years. In the other, less than a few hours were needed to form effective working relationships.

There is no way of knowing what the future holds for the Navy salvage forces. In some respects at least, the next challenge will resemble the Flight 800 search and recovery effort. Other aspects of the next major salvage operation will be completely new. Some of the techniques used in the waters off Long Island will prove useful again. Others will have to be discarded or modified. What these will be, however, will not be known until that operation is well under way.

Appendix A

Correspondence

Figure A-1. Initial Tasker Message.

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                              UUUUUUUUUUUUUUUUUUUUUUUUUUUUUU
                              U-UNCLASSIFIED--UNCLASSIFIED-U
                              UUUUUUUUUUUUUUUUUUUUUUUUUUUUUU

OTTUZYUW RUENAAA4482 2010438-UUUU--RULSSEA.
ZNR UUUUU
RUCBFAC T COMEODGRU TWO
RULYEPA T COMLOGGRU TWO
0 182019Z JUL 96 ZYB PSN 561841M25
FM CNO WASHINGTON DC//N3/N5//
TO RULSSEA/COMNAVSEASYSCOM WASHINGTON DC//OOC/OOD//
RUCBCLF/CINCLANTFLT NORFOLK VA//N3/N33/N332//
INFO RUCBTFA/COMNAVSURFLANT NORFOLK VA//N3/N32//
RULYEPA/COMLOGGRU TWO
RUCBFAC/COMEODGRU TWO
BT
UNCLAS //N04740//
MSGID/GENADMIN/CNO/N312P//
SUBJ/TWA FLIGHT 800//
REF/A/FAX/NTSB/18JULY96/-/PASEP//
REF/B/DOC/MEMORANDUM OF UNDERSTANDING//
REF/C/TEL/1SJUL96//
REF/D/TEL/18JUL96//
NARR/REF A REQUESTS NAVY ASSISTANCE IN THE SALVAGE OF TWA FLT 800. REF B IS A
MOU BETWEEN U.S. NAVY SUPERVISOR OF SALVAGE AND NATIONAL TRANSPORTATION SAFETY
BOARD (NTSB). REF C IS A TELCON BETWEEN NAVSEA//OOC// (MR TOM SALMON) AND OPNAV
(LCDR SULLIVAN) DISCUSSING NTSB REQUEST FOR SEARCH/SALVAGE ASSISTANCE. REF D IS
A TELCON BETWEEN CINCLANTFLT (LT TISSANDZER) AND OPNAV (LCDR SULLIVAN)
DISCUSSING SAME SUBJECT.//
POC/PATRICK SULLIVAN/LCDR/N312P/PNT 4D600/TEL:(703)697-5641/TEL:DSN 227-5641//
RMKS/1. THIS MESSAGE FORMALIZES TASKINGS ASSOCIATED WITH A NTSB REQUEST OF 18
JUL 96 (REF A) FOR NAVY SEARCH AND SALVAGE ASSISTANCE ICW THE CRASH OF TWA FLT
800.
2. FOR COMNAVSEASYSCOM: PURSUANT TO REFERENCE C AND IAW REFERENCE B, TAKE THE
NTSB REQUEST FORAC. DIRLAUTH, KEEPING ALCON INFORMED OF PLANS AND EXECUTION
STATUS.
3. FOR CINCLANTFLT: PURSUANT TO REFERENCE D, BE PREPARED TO PROVIDE FLEET
SUPPORT SERVICES AS COORDINATED WITH COMNAVSEASYSCOM.
4. FOR ALCON: OPERATION WILL BE CONDUCTED TO TWO PHASES: PHASE I INVOLVES
SEARCH AND LOCATION OF FLIGHT DATA AND VOICE RECORDERS; PHASE II INVOLVES
RECOVERY OF RECORDERS AND, POSSIBLY, OTHER AIRCRAFT COMPONENTS AS SPECIFIED BY
NTSB. INITIAL LIASION WITH NAVSEA//OOC// INDICATES PHASE I WILL BE ACCOMPLISHED
BY NAVSEA-CONTRACTED ASSETS. EXTENT OF NAVY FLEET SUPPORT WHICH MAY BE REQUIRED
DURING PHASE II WILL BE DRIVEN BY PHASE I FINDINGS AND FOLLOW-ON NTSB REQUEST.
REQUEST CAPTURE DIRECT COSTS ASSOCIATED WITH THIS OPERATION FOR
PAGE 03 RUENAAA4482 UNCLAS
SUBSEQUENT REIBURSEMENT BY NTSB.//
BT
#4482
```

Figure A-2. Report of Assignment of the OTC 40.50.

```
********** U N C L A S S I F I E D ************

OTTZYUW RUCBSGG4754 2040111-UUUU--RUCBTFA.
ZNR UUUUU
O 0111Z JUL 96 ZYB PSN 138923L26
FM CINCLANTFLT NORFOLK VA//NO1//
TO RUENAAA/CNO WASHINGTON DC//N3/
INFO RULSSEA/COMNAVSEASYSCOM WASHINGTON DC//00//
RUCBTFA/COMNAVSURFLANT NORFOLK VA//N3/N32//
RUCBKMC/CO14SUBLANT NORFOLK VA
RHNVSSA/COMNAVAIRLANT NORFOLK VA
RUCBCM/CINCUSACOM NORFOLK VA
RULYPA/RULYSDD/COMLOGGRU TWO
RULYVA/COMSECONDFLT
BT
UNCLAS //NO3000//
MSGID/GENADMIN/CINCLANT.FLT/22/JUL//
SUBJ:TWA FLIGHT 800 SALVAGE OPRATIONS//
REF/A/GENADMIN/COMNAVSEASYSCOM/230001ZJUL96//
REF/B/GENADMIN/CNO WASHINGTON DC/230002JU96//
REF A IS COMNAVSEASYSCOM REQUEST FOR ADDITIONAL NAVY SUPPORT IN
TWA FLIGHT 800 SALVAGE OPERATIONS.//
REF B IS CNO TASKING MESSAGE FOR ADDITIONAL SUPPORT IN TWA
FLIGHT 800 SALVAGE OPERATIONS.//
POC/G. WEDDING/CAPT/CLF N3/-/TEL:COMM 803-322-5397/TEL:DSN 836-5397//
RMKS/1. IAW REF A, AND AS DIRECTED BY REF B, RADX EDWARD KRISTENSEN,
COMLOGRU TWO WILL ACT AS OTC FOR NAVY SUPPORT TO NTSB FOR SALVAGE
OPERATIONS OF TWA FLIGHT 800 AND WILL BE ON SCENE 23JUL96.
2. THE USS OAKHILL (LSD-51) WILL SERVE AS AFLOAT COMMAND POST.  USS
OAKHILL WILL BE UNDERWAY MIDDAY, TUESDAY, 23JUL96.
3. CLF IS READY TO PROVIDE ADDITIONAL ASSETS AND SUPPORT AS TASKED.//
```

Figure A-3. Tasker for Joint Task Force 40.50.

```
********* U N C L A S S I F I E D ***********

OTTUZYUW RUCBSGG7030 208l500-UUUU--RUC5TFA.
ZNR UUUUU
O P 26150OZ JUL 96 ZYB PSNCINCLANTFLT NORFOLK VA//N3//
TO RUCBTFA/COMNAVSURFLANT NORFOLK VA//N3//
RHNVSSA/COMUAVAIRLANT NORFOLK VA//N3//
RULYEPA/CTG ZERO FOUR ZERO PT FIVE ZERO
INFO RUENAAA/CNO WASBINGTON DC11N31N511
RUCBACM/CINCUSACOM NORFOLK VA//J3//
RULYVKA/COMPHIBGRU TWO
RULYEPA/RHBAOA1K/C0ML0GGRU TWO
RUCBFAC/COMEODGRU TWO
RHBAOAK/USS OAK HILL
RHBAADQ/USS, GRASP
RHNVHHH/USS GRAPPLE
BT
UNCLAS
OPER/TWA FLT 800 CRASH INVESTIGATION//
MSGID/ORDER/CINCLANTFLT//
REF/A/RMG/CINCUSACOM/252309ZJUL96//
REF/B/RMG/DIRMIILSPT/251931ZJUL96/-/NOTAL//
NARR/REF A IS THE CINCUSACOM EXECUTE ORDER FOR DOD SUPPORT OF
PAGE 02 RUCBSGG7030 UNCLAS
TWA FLT 800.  REF B IS THE DIRMILSPT EXECUTE ORDER FOR DOD\SUPPORT OF TWA FLT
800 CRASH INVESTIGATION.//
ORDTYP/EXORD/CINCUSACOM//
TIMEZONE/Z//
NARR/THIS IS AN EXECUTE ORDER. THE SECRETARY OF DEFENSE
HAS DESIGNATED THE SECRETARY OF THE ARMY, AS THE DOD EXECUTIVE
AGENT TO DIRECT THE EXECUTION OF SUPPORT TO THE LEAD FEDERAL
AGENCY (LFA) IN THE INVESTIGATION OF TWA FLIGHT 800 CRASH, UNDER
MILITARY SUPPORT TO CIVIL AUTHORITY.//
GENTEXT/SITUATION/
1.  SITUATION/
1.A. IAW REFS A AND B, USN SUPPORT TO THE NTSB (LFA) HAS NOW
BEEN PLACED UNDER MILITARY SUPPORT TO CIVIL AUTHORITY (MSCA) AS
A SERVICE RESPONSE, AND TERMED A DISASTER RELIEF TASK FORCE (DRTF).
THE LFA WILL CONTINUE TO COORDINATE THE ACTIONS OF ALL FEDERAL
AGENCIES INVOLVED IN THE INVESTIGATION OF THE CRASH OF TWA
FLIGHT 800.
1.B. THE FEDERAL BUREAU OF INVESTIGATION IS ALSO INVESTIGATING
THIS EVENT AND COULD POSSIBLY BECOME THE LFA.
GENTEXT/MISSION/
PAGE 03 RUCBSGG7030 UNCLAS
2  MISSION.  USN CONTINUES TO SUPPORT THE NTSB IN CONDUCTING THE
INVESTIGATION OF THE CRASH OF TWA FLIGHT 800.//
GENTEXT/EXECUTION/
3.  CONCEPT OF OPERATIONS. CTG 40.50 AS THE COMMANDER OF THE DRTF
WILL CONTINUE TO SUPPORT THE LFA.
4.  TASKING ASSIGNMENTS
4.A.  CTG 040.50
4.A.1  BPT ASSUME OPCON OF ALL DOD FORCES THAT MAY DEPLOY ISO OF
```

RECOVERY OPERATION AND CONTINUE TO PROVIDE SUPPORT OF LFA CRASH
INVESTIGATION.
4.A.2. NOTIFY CINCLANTFLT OF ANY ADDITIONAL FORCE REQUIREMENTS
NECESSARY TO CONDUCT SUPPORT MISSION.
5. COORDINATING INSTRUCTIONS
5.A. SUPPORT OF LFA IS ONGOING, THIS EXORD EFFECTIVE UPON RECEIPT.
5.B. ANTICIPATED LENGTH OF OPERATION IS 30 DAYS OR LESS.
5.C. DIRLAUTH ALCON. KEEP CINCLANTFLT INFORMED.//
GENTEXT/ADMIN AND LOG/
6. TRANSPORTATION
6.A. AIRLIFT PRIORITY IS IBI FOR DEPLOYMENT, 3A1 FOR REDEPLOYMENT AS
PER REF A.
PAGE 04 RUCBSGG7030 UNCLAS
7. SUPPORT PROVIDED TO THE LEA (CURRENTLY NTSB) IS ELIGIBLE FOR
REIMBURSEMENT UNDER PROVISIONS OF THE ECONOMY ACT. CAPTURE ALL COSTS
ASSOCIATED WITH SUPPORT BEING PROVIDED.
8. REPORTING INSTRUCTIONS. CTG 040.50: IN ADDITION TO THE CURRENT
DAILY SITREP ADDEES, ADD "CINCUSACOM NORFOLK VA//J3//" AND INFO
"DIRMLSPT DCSOPS WASHINGTON DC" IAW REPORTING GUIDELINES, PARA 8 OF
REF A.
BT
#7030

Figure A-4. Final SITREP.

```
2435                UUUUUUUUUUUUUUUUUUUUUUUUUUUUU
    FINEX!!!!!      U-UNCLASSIFIED--UNCLASSIFIED-U
                    UUUUUUUUUUUUUUUUUUUUUUUUUUUUU

PATUZYUW RUEOMCA0286 1392030-UUUU--RULSSEA.
ZNR UUUUU
ZUI RULSSEA1273 1391500
P 190636Z MAY 97  ZYB PSN 401099M23
FM COMNAVSEASYSCOM WASHINGTON DC//00C//
TO RUENAAA/CNO WASHINGTON DC//N3/N8/N86/N87/N88//
INFO RUCBACM/CINCUSACOM NORFOLK VA//J3//
RUCBCLF/CINCLANTFLT NORFOLK VA//N01/N3/N5//
RUEKJCS/JOINT STAFF WASHINGTON DC//NMCC/J3WHEM//
RULSJGA/COMDT COGARD WASHINGTON DC//OPC//
RUCBTFA/COMNAVSURFLANT NORFOLK VA//N00/N3/N32/N4//
RUENAAA/CHINFO WASHINGTON DC//JJJ//
RUENAAA/OLA WASHINGTON DC//00//
RUEGABA/CCGDONE BOSTON MA//CC//
RULYEPA/COMLOGGRU TWO
RUEGABF/COMCOGARDGRU MORICHES NY
RUCBFAC/COMEODGRU TWO
RUCBFDF/MOBDIVSALU TWO
RHNVGGT/USS GRASP
RHBAQSJ/USS GRAPPLE
RUCBFAR/EODMU TWO
RHFJFOX/EODMU SIX
RHNVHHC/EODMU TEN
RHFJFOV/EODMU TWELVE
RUCTMGG/NAVXDIVINGU PANAMA CITY FL//JJJ//
RUCTMGE/NAVDIVESALVTRACEN PANAMA CITY FL//JJJ//
RULSSEA/COMNAVSEASYSCOM WASHINGTON DC//00C/91/00// BT
UNCLAS  //N04740//
MSGID/GENADMIN/NAVSEA 00C//
SUBJ/TWA FLT 800 SALVAGE SITREP 19 MAY 97//
POC/RICHARD ASHER/CIV/SEA 00CB/-/TEL:703-607-2753/TEL:DSN 327-2753//
RMKS/1.  FOL IS UPDATE OF SALVAGE OPS AS OF 0800Q 19 MAY 97:
A.  ASSETS:  M/V ATLANTIC SURVEYOR.
B.  STATUS:  M/V ATLANTIC SURVEYOR COMPLETED ROV VIDEO INSPECTION OF ALL 85
SITES.  AS AGREED TO WITH NTSB/FBI, TERMINATED ALL OFF SHORE OPERATIONS 1300,
18 MAY.  VESSEL DEPARTED AREA FOR POINT PLEASANT NJ TO DEMOBILIZE EQUIPMENT.
C.  INTENTIONS:  DEMOBILZE SUPSALV COMMAND CENTER AND ALL REMAINING EQUIPMENT
AT THE US COAST GUARD STATION EAST MORICHES NY TODAY.
D.  THIS COMPLETES THE NAVY'S AT SEA SALVAGE OPERATION FOR TWA FLT 800 WHICH
HAS BEEN ONGOING SINCE THE CRASH LAST JUL 17.  4344 MANNED DIVES WITH A BOTTOM
TIME OF 1773 HOURS AND 2691 HOURS OF ROV BOTTOM TIME WERE EXPENDED IN THIS
OPERATION.  ADDITIONALLY 4 SCALLOP TRAWLERS DRAGGED THE BOTTOM FROM 4 NOV 96 TO
30 APR 97.  A FINAL QUALITY ASSURANCE CHECK USING A ROV CONDUCTED 85 DIVES IN
THE CRASH AREA, LOCATING ONLY ONE SMALL PIECE OF WRECKAGE, WHICH WAS RECOVERED.
E.  LAST SITREP THIS OP.
2.  PERSONNEL:  SUPSALV REP REMAINS SUPERVISING DEMOBILIZATION. 3.  PUBLIC
AFFAIRS:  NTR.//
BT
#0286 NNNN
```

Figure A-5. Bravo Zulu from CINCUSACOM

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                    uuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuu
                    U     U N C L A S S I F I E D      U
                    uuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuu

PTTUZYUW RUEOMCB6129 3081433-UUUU--RULYEPA.
ZNR UUUUU ZUI RUCBACM1946 3081412
P 031412Z NOV 96 PSN 72201ON12
FM CINCUSACOM NORFOLK VA//00//
TO RUCBCLF/CINCLANTFLT NORFOLK VA//N3/N31/N32/N33/N41/N446/
     N62//
RULYEPA/CTG FOUR ZERO PT FIVE ZERO
INFO RUEKJCS/JOINT STAFF WASHINGTON DC//J2/J3/J3-JOD/J33-WHEM/
     J4/J5//
RUEKJCS/SECDEF WASHINGTON DC
RUENAAA/CNO WASHINGTON DC//N511/N312//
RUEADWD/DIRMILSPT DCSOPS WASHINGTON DC//DAMO-ODS//
RULSJGA/COMDT COGARD WASHINGTON DC//DAMO-ODS//
RULSSEA/COMNAVSEASYSCOM WASHINGTON DC
RUCOCGR/COMLANTAREA COGARD PORTSMOUTH VA
RUCBACM/CINCUSACOM NORFOLK VA//CDO//
BT
UNCLAS
QQQQ
QQQQ
OPER/TWA FLT 800 RECOVERY/CINCUSACOM//
MSGID/GENADMIN/CINCUSACOM//
SUBJ/BRAVO ZULU FOR TWA FLIGHT 800 RECOVERY OPS//
RMKS/1.  I PERSONALLY COMMEND AND CONGRATULATE EACH INDIVIDUAL WHO SUCCEEDED
UNDER SUCH TRYING CIRCUMSTANCES IN SUPPORTING THE TWA FLIGHT 800 RECOVERY
OPERATIONS.  YOUR EFFORTS WERE INSTRUMENTAL IN EASING THE PAIN OF THE FAMILIES,
LOVED ONES AND FRIENDS, AIDING THEM IN FINDING A SENSE OF CLOSURE TO THIS
TERRIBLE TRAGEDY. ADDITIONALLY, YOUR DEDICATION AND SKILL PROVIDED THE MEANS BY
WHICH SO MUCH OF THE DOWNED AIRCRAFT COULD BE RECOVERED FROM THE OCEAN FLOOR TO
FACILITATE THE INVESTIGATION INTO THE CAUSE OF THE CRASH.
2. YOU CAN BE JUSTIFIABLY PROUD OF YOUR PERFORMANCE IN A DIFFICULT, OFTEN
DISAGREEABLE AND DANGEROUS OPERATION.  IN THIS HIGH PROFILE EVENT, THE NATION
SAW THE BEST OF HOW ITS ARMED FORCES AND DOD CIVILIANS RESPOND TO THE CALL WHEN
A DISASTER STRIKES.
3. MY SINCERE APPRECIATION FOR A JOB WELL DONE.
J.J. SHEEHAN.
BT
#6129
NNNN
DLVR:COMLOGGRU TWO(001) ... HOST(O)
DLVR:CTG 40.50(0) ... TENANTACT(l)
RTD:000-000/COPIES:

                                  1 OF 2

                    uuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuu
                    U     U N C L A S S I F I E D      U
                    uuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuu
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Figure A-6. Bravo Zulu from SECNAV

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                    uuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuu
                   U     U N C L A S S I F I E D       U
                    uuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuu

RTTUZYUW RULYEPA3752 3112020-UUUU--RULYSUU.
ZNR UUUUU
R 07202OZ NOV 96
FM COMLOGGRU TWO
INFO COMNAVSEASYCOM WASH//OO/OOC//
COMNAVSPECWARCOM CORONADO CA//00//
COMPHIBGRU TWO
COMEODGRU TWO
COMNAVSPECWARGRU TWO
R 06221OZ NOV 96
FM SECNAV WASHINGTON DC//SN//
TO LOGGRU TWO
INFO CNO WASHINGTON DC//NOO//
CINCLANTFLT NORFOLK VA//00//
COMNAVSURFLANT NORFOLK VA//NOO//
BT
UNCLAS 11N0000011
MSGID/GENADMIN/SECNAV WASHINGTON DC//
SUBJ/BRAVO ZULU//
RMKS/1.  TO REAR ADMIRAL KRISTENSEN AND THE MAGNIFICENT MEN AND WOMEN OF
LOGISTICS GROUP TWO, CONGRATULATIONS ON A JOB WELL DONE. OVER MORE THAN FOUR
MONTHS OF GRUELING DUTY, THE LOGGRU TWO TEAM SERVED AT THE CENTER OF AN HEROIC
EFFORT TO UNCOVER THE CAUSES OF THE TWA FLIGHT 800 TRAGEDY.  THE MISSION HAS
BEEN AN UNQUALIFIED SUCCESS: YOUR SELFLESS PROFESSIONALISM PROVIDED A CRITICAL
SOURCE OF HOPE AND COMFORT FOR FAMILIES AND LOVED ONES OF THE FLIGHT 800
VICTIMS.  ADDITIONALLY, YOUR DEDICATED DIVING, SALVAGE, AND SUPPORT OPERATIONS
MAY YET PROVIDE THE CLUES TO PREVENT A TERRIBLE TRAGEDY SUCH AS THIS FROM
OCCURRING AGAIN.
2. THE SUPERB TEAM PERFORMANCE OF LOGGRU TWO IS IN KEEPING WITH THE HIGHEST
NAVY TRADITIONS OF HONOR, COURAGE, AND COMMITMENT. ON BEHALF OF THE DEPARTMENT
OF THE NAVY AND A GRATEFUL NATION, THANK YOU FOR YOUR UNTIRING EFFORTS.  I AM
EXTREMELY PROUD TO SERVE AS YOUR SECRETARY.
3. RELEASED BY THE HONORABLE JOHN H. DALTON, SECRETARY OF THE
NAVY.//
BT
#3752
NNNN

                                  1 OF 2

                    uuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuu
                   U    U N C L A S S I F I E D       U
                    uuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuu
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Figure A-7. Letter from President Clinton.

THE WHITE HOUSE

WASHINGTON

August 6, 1996
CAPT Raymond S. McCord, USN
Supervisor of Salvage and Diving
U.S. Navy Salvage Operations
2631 Jefferson Davis Highway
Arlington, Virginia 22242-5160

Dear Captain McCord:

I am deeply grateful for the tremendous dedication that you and your staff have put into the recovery effort following the crash of TWA flight 800.

The care with which you have approached this difficult job has gone a long way to reassure the families and friends of the victims -- and all Americans -- that everything is being done to recover those who were lost and to discover the cause of this tragedy. On behalf of a grateful nation, I thank you -- and the men and women working with you -- for all that you have done to help the healing process.

Sincerely,

Figure A-8. Letter from CNO.

CHIEF OF NAVAL OPERATIONS

26 August 1996

Dear Rear Admiral Kristensen,

I recently received a letter from Ms. Paula Helfrich from Hilo, Hawaii expressing her appreciation for the great job that our Navy Salvage Divers have done in the recovery of the TWA wreckage. A copy of her letter is enclosed.

I would like to extend again my personal Bravo Zulu to each of our men and women working at the site. Through their professionalism and hard work they have demonstrated that our Navy truly cares about our nation and its citizens.

Best wishes for a job exceptionally well done.

Sincerely,
JAY L. JOHNSON
Admiral, U.S. Navy

Rear Admiral Edward K. Kristensen, USN
Commander, Combat Logistics Group TWO
9730 Maury Avenue
Norfolk, VA 23511-3093
Enclosure

Figure A-8. Letter from CNO (Enclosure).

August 6, 1996

Admiral Jay Johnson, USN
Chief of Naval Operations,
The Pentagon, Washington DC 20350

Dear Admiral Johnson:

As I watched the closing ceremonies of the 100th Olympic Games, I reflected on true heroism and unflinching spirit. The Olympics have given us two weeks of spectacle, sports and showmanship.

The true real-life unsung heroes, however, are the men and women of the Coast Guard, Navy Salvage Divers, and their civilian counterparts who have labored in unspeakable conditions off Long Island Sound during this same time period. Their "gold" has been the retrieval of the tragic wreckage of TWA Flight 800.

There are no medals, national anthems, public applause or parades for them. Yet they make me prouder to be an American than any Olympiad ever could.

Yours sincerely,

Paula Z. Helfrich
575 Alawaena, Hilo, HI 96720

Figure A-9. Letter from the Families of TWA Flight 800.

The Families of
TWA Flight 800
Assoc., Inc.

P.O. Box 1061 Clifton Park, NY 12065 518.371.3927

October 23, 1996
The President of the United States
The White House
Washington, D.C.

Dear Mr. President,

On July 17, Paris bound TWA Flight 800, with 230 souls aboard, burst into a cataclysmic fireball and fell into the sea. The remains scattered across the ocean's surface, burned, and sank beneath the waves.

Within hours the families began arriving, hoping for survivors, but, in the end, waiting in grief on the Long Island shore for the return of the lost.

Then came the divers. Strong men, courageous men, compassionate men. They came to risk their lives to relieve the suffering of people they didn't even know. That night they plunged into burning seas, but no survivors were found. The task became more grim and dangerous as they began to recover the dead. Undeterred by the numbing cold and near blindness of the ocean depths, these iron men continued to dive day after day around the clock. Undaunted by personal risk, and untiring, they continued for weeks to bring back from the ocean floor those loved ones lost. Almost everyone. And still they continue, combing the depths to find the answer we all seek.

These divers have done an outstanding, selfless and heroic job. By their courageous acts they have honored all of us who must stand and wait on life's shoreline.

The Families of the Victims of TWA Flight 800 recognize that these men are heroes. So do people all over the world. We realize we owe a debt we can never repay, but feel they should be honored for their extraordinary actions. We are requesting, Mr. President, that you formally recognize them also. We ask that you bring them to our nation's capitol, award them a medal for their valor and courage, and allow all Americans an opportunity to publicly thank them.

We realize your time is valuable, but what could be of more value than thanking and honoring those who have performed such a national service for us all. Thank you for your consideration and your anticipated reply.

Sincerely,

Aurelie and Walter Becker,
John and Eleanor Seaman,
Directors
The Families of TWA Flight 800

Appendix B

Mobilized Assets

USS GRASP (ARS 51)

Description:	Rescue and Salvage Ship
Owner:	U.S. Navy
Features:	Heavy lift capabilities Ample deck area Diver life support system, including recompression chamber
SUPSALV systems:	Mini-ROV 1 (see page B-18)
Primary assignment:	Recovery of victims and heavy debris from bulk of aircraft (Debris Field 1)
Period on site:	22 July to 27 August 1996
Length:	255 feet
Beam:	51 feet
Displacement:	2880 tons fully loaded
Complement:	101 (6 officers, 95 enlisted)
Diving Systems:	MK 21 Deep Sea Air, Air SCUBA
Cargo Handling Capacity:	Aft boom 80,000 lbs. Forward boom 15,000 lbs.

USS GRAPPLE (ARS 53)

Description:	Rescue and Salvage Ship
Owner:	U.S. Navy
Features:	Heavy lift capabilities Ample deck area Diver life support system, including recompression chamber
SUPSALV systems:	Deep Drone 7200 (see page B-20)
Primary assignment:	Recovery of victims and heavy debris from the first class section and cockpit of the aircraft (Debris Field 2)
Period on site:	29 July to 1 November 1996
Length:	255 feet
Beam:	51 feet
Displacement:	2880 tons fully loaded
Complement:	101 (6 officers, 95 enlisted)
Diving Systems:	MK 21 Deep Sea Air, Air SCUBA
Cargo Handling Capacity:	Aft boom 80,000 lbs. Forward boom 15,000 lbs.

USS OAK HILL (LSD 51)

Description:	Dock Landing Ship
Owner:	U.S. Navy
Features:	Docking well for LCM-8 landing craft (see page B-14) and Side Loading Warping Tug (see page B-13) Landing area for CH-46 Helicopter (see page B-15) Berthing for divers
Primary assignment:	Afloat Command Post
Period on site:	23 July to 10 September 1996
Length:	609 feet
Beam:	84 feet
Displacement:	16,708 tons fully loaded
Complement:	419 (22 officers, 397 enlisted)

USS TRENTON (LPD 14)

Description:	Amphibious Transport Dock
Owner:	U.S. Navy
Features:	Docking well for LCM-8 landing craft (see page B-14) and Side Loading Warping Tug (see page B-13) Hangar and landing area for CH-46 Helicopter (see page B-15) Berthing for divers
Primary assignment:	Afloat Command Post (relieved USS OAK HILL)
Period on site:	10 September to 18 October 1996
Length:	570 feet
Beam:	84 feet
Displacement:	Approximately 17,000 tons fully loaded
Complement:	420 (24 officers, 396 enlisted)

NOAA R/V RUDE

Description:	Survey Ship
Owner:	National Oceanic and Atmospheric Administration (NOAA)
Features:	100kHz side-scan sonar (EG&G 260/272 system by EdgeTech) SEABAT 9001Bottom Profiling Sonar Isis Sonar Acquisition System (Triton Technology)
Primary assignment:	Debris mapping
Period on site:	17 July to 1 August 1996
Length:	90 feet
Beam:	22 feet
Displacement:	220 tons
Complement:	11 (4 officers, 7 crew)

M/V PIROUETTE

Description:	Search Vessel
Owner:	Divemasters Inc. of Toms River, NJ (chartered by Oceaneering International, Inc. for the U.S. Navy)
SUPSALV systems:	Shallow Water Intermediate Search System (SWISS) (see page B-16) Towed Pinger Locator system (see page B-17) Mini-ROV 2 (see page B-19) Isis Sonar Acquisition System (Triton Technology)
Primary assignment:	Debris mapping
Period on site:	19 July to 12 September 1996

M/V DIANE G

Description:	Search Vessel
Owner:	Science Applications International Corporation (SAIC) (under contract to Oceaneering International, Inc. for the U.S. Navy)
Installed systems:	SM 2000 Laser line scanning (see page B-21) Side-scan sonar
Primary assignment:	Debris mapping and identification
Period on site:	27 July to 11 August 1996

M/V MARION C II

Description:	Search Vessel
Owner:	Caldwell's Diving Company of Toms River, NJ (chartered by Oceaneering International, Inc. for the U.S. Navy)
Features:	Large unobstructed steel deck area (112 feet by 32 feet)
SUPSALV systems:	Shallow Water Intermediate Search System (SWISS) (see page B-16) Mini-ROV 2 (see page B-19) Deep Drone 7200 (see page B-20) Isis Sonar Acquisition System (Triton Technology)
Primary assignment:	Debris mapping (replaced M/V PIROUETTE)
Period on site:	15 September to 6 November 1996
Length:	195 feet
Beam:	42 feet
Complement:	21

F/V CHRISTIAN & ALEXA

F/V TRADITION

FISHING VESSELS

F/V CHRISTIAN & ALEXA
F/V TRADITION
F/V KATHY ANN
F/V ALPHA OMEGA II
F/V NORDIC PRIDE

Description: Commercial Fishing Vessels

Primary assignment: Debris recovery (trawling)

Period on site:

F/V CHRISTIAN & ALEXA:
4 November 1996 to 30 April 1997

F/V TRADITION:
4 November 1996 to 19 January 1997

F/V KATHY ANN:
13 November 1996 to 30 April 1997

F/V ALPHA OMEGA II
13 November 1996 to 30 April 1997

F/V NORDIC PRIDE:
19 January to 30 April 1997

M/V ATLANTIC SURVEYOR

Description:	Search Vessel
Owner:	Divemasters Inc. of Toms River, NJ (chartered by Oceaneering International, Inc. for the U.S. Navy)
SUPSALV systems:	Mini-ROV 2 (see page B-19)
Primary assignment:	Final quality assurance check in trawl area
Period on site:	6 to 8 May 1997
Length:	110 feet
Beam:	26 feet
Complement:	16

Side Loading Warping Tug (SLWT)

Description:	Warping Tug
Owner:	U.S. Navy
Features:	A-frame winch with lifting capacity of 12 tons
Primary assignment(s):	Recovery of debris rigged by Mobile Dive Teams; surface-supplied dive platform
Period on site:	23 July to 18 October 1996
Length:	84 feet
Beam:	21¼ feet
Displacement:	110 tons
Complement:	8 (enlisted)

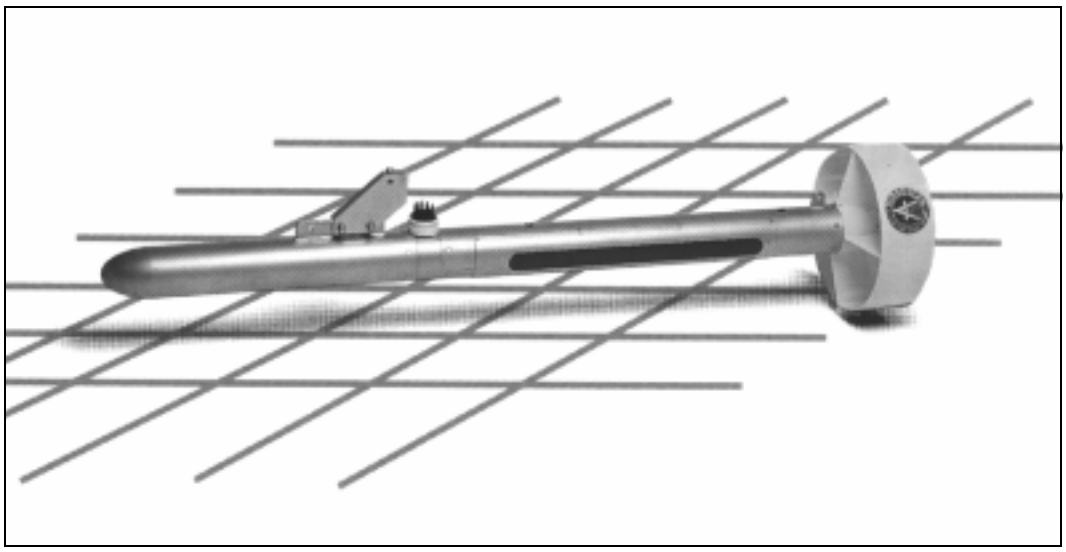
LCM-8

Description:	Mechanized Landing Craft
Owner:	U.S. Navy
Features:	Capacity to carry 58 tons of cargo
Primary assignment:	Logistics (transportation of debris and trash to shore, stores to ships)
Period on site:	23 July to 2 November 1996*
Length:	73½ feet
Beam:	21¼ feet
Displacement:	34 tons light, 121 tons full load
Complement:	5 (enlisted)

* Contracted commercial LCM-8 JENNIFER LYNN was used during the trawling phase to transport debris recovered to shore

CH-46 "Sea Knight" Helicopter

Description:	Cargo Helicopter
Owner:	U.S. Navy
Primary assignment:	Transportation of debris, personnel, and stores
Period on site:	23 July to 2 November 1996
Fuselage Length:	46 feet, 8 inches
Height:	16 feet, 8 inches
Weight:	15,198 pounds empty, 24,300 pounds maximum takeoff
Crew:	3 (1 pilot, 1 copilot, 1 crewman)

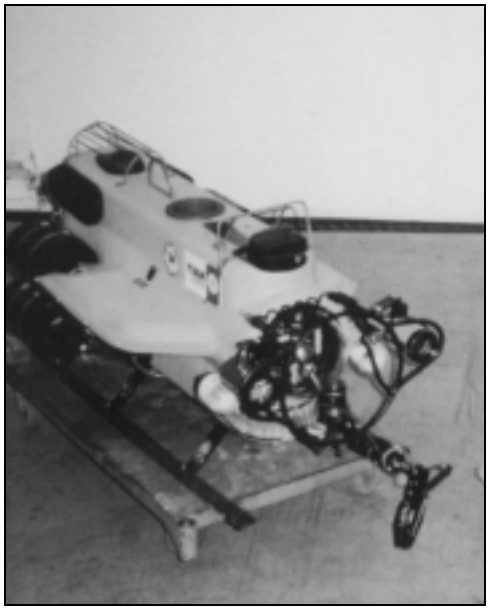


SUPSALV Shallow Water Intermediate Search System (SWISS)

Description:	Towed side-scan sonar system
Owner:	U.S. Navy
Features:	Dual frequencies (100 kHz for primary searching; 500 kHz for higher resolution)
Primary assignment:	Debris mapping and identification, working from M/V PIROUETTE (see page B-8) and M/V MARION C II (see page B-10)
Period on site:	19 July to 6 November 1996
Length:	57 inches
Weight:	60 pounds (in air)
Diameter:	3.5 inches
Depth Rating:	7,000 feet (based on cable length)

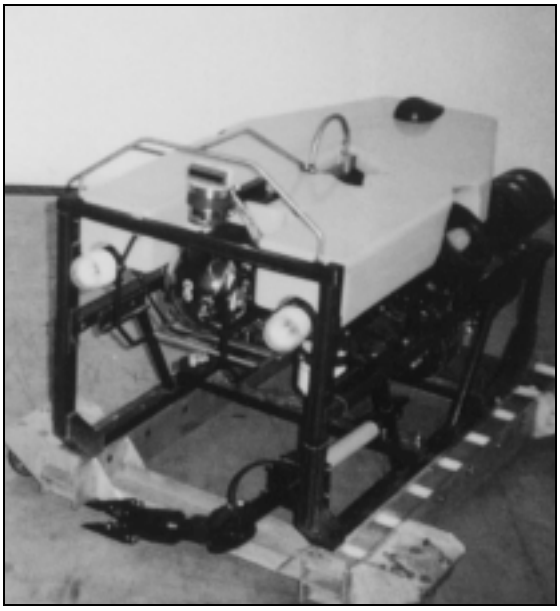
SUPSALV Towed Pinger Locator System

Description:	Towed Pinger Locator (TPL) System
Owner:	U.S. Navy
Features:	Highly sensitive underwater microphones
Primary assignment:	Detection of aircraft flight recorders, working from M/V PIROUETTE (see page B-8)
Period on site:	20 July to 14 September 1996
Length:	72 inches
Weight:	500 pounds
Diameter:	12 inches
Depth Rating:	20,000 feet



SUPSALV Mini-ROV 1

Description:	Miniature Remotely Operated Vehicle (Standard Vehicle)
Owner:	U.S. Navy
Features:	High resolution target-locating sonar, 35mm and television cameras, two-function manipulator
Primary assignment(s):	Locating victims, identification of debris, and underwater still and video photography, working from the USS GRASP (see page B-3)
Period on site:	23 July to 27 August 1996
Length:	4 feet 8 inches
Width:	2 feet 3 inches
Height:	2 feet 1 inches
Weight:	200 pounds
Payload:	22 pounds
Depth Rating:	1,000 feet

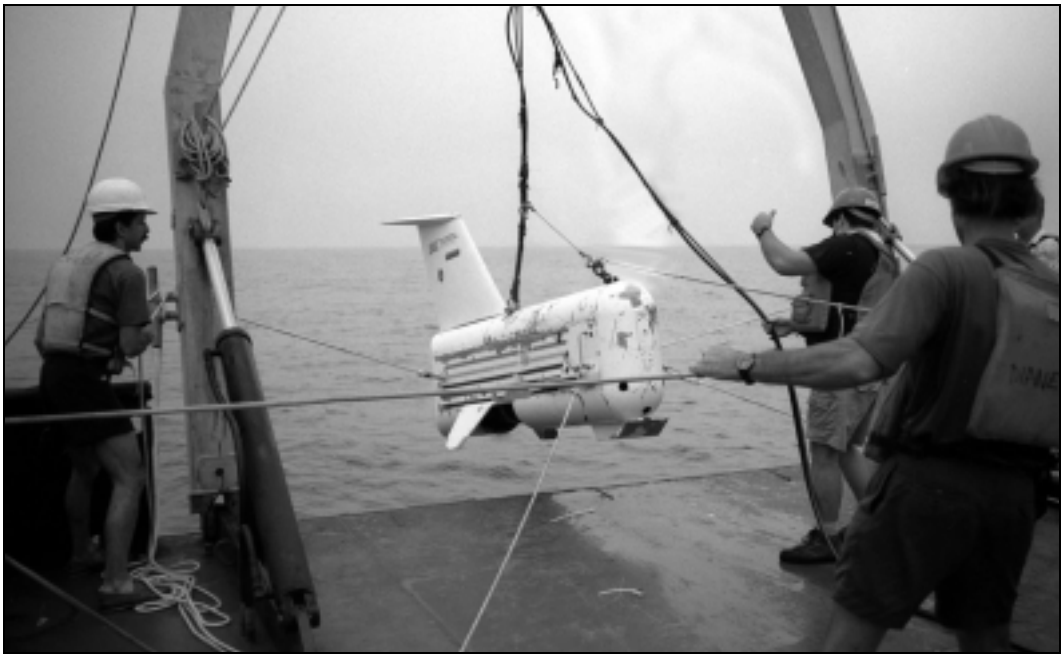


SUPSALV Mini-ROV 2

Description:	Miniature Remotely Operated Vehicle (Open Frame Vehicle)
Owner:	U.S. Navy
Features:	High resolution target-locating sonar, 35mm and television cameras, three-function manipulator
Primary assignment:	Locating victims, identification of debris, and underwater still and video photography, working from M/V PIROUETTE (see page B-8), M/V MARION C II (see page B-10), and M/V ATLANTIC SURVEYOR (see page B-12)
Period on site:	19 July to 6 November 1996, returned 6 to 18 May 1997
Length:	4 feet 2 inches
Width:	2 feet 4 inches
Height:	2 feet 4 inches
Weight:	325 pounds
Payload:	90 pounds
Depth Rating:	1,000 feet

SUPSALV Deep Drone 7200

Description:	Remotely Operated Vehicle
Owner:	U.S. Navy
Features:	Target-locating sonar, color and black-and-white television cameras, 35mm camera, two 7-function manipulators
Primary assignment:	Location of victims, identification of debris, recovery of debris, and underwater still and video photography, working from the USS GRAPPLE (see page B-4) and M/V MARION C II (see page B-10).
Period on site:	29 July to 6 November 1996
Length:	9 feet 3 inches
Width:	4 feet 7 inches
Height:	6 feet 2 inches
Weight:	3,500 pounds
Lift Capacity:	3,200 pounds (via vehicle)
Depth Rating:	7,200 feet



Laser Line Scan System

Description:	SM 2000 Laser Line Scan System
Owner:	Science Applications International Corp. (SAIC) (under contract to Oceaneering International, Inc. for the U.S. Navy)
Features:	High resolution imagery, detection of non-metal objects
Primary assignment:	Debris identification and location of victims, working from M/V DIANE G (see page B-9)
Period on site:	27 July to 11 August 1996
Length:	108 inches
Weight:	1200 pounds
Width:	24 inches
Depth Rating:	2000 meters

Appendix C

Tagging Information

Appendix C

Tagging Information

C.1 History

When TWA Flight 800 crashed off East Moriches, Long Island on 17 July 1996, NAVSEA Supervisor of Salvage (SUPSALV) was asked to assist in the location and recovery of wreckage to aid the investigating federal agencies. Personnel from SUPSALV mobilized to the scene and commenced an extensive search for wreckage. After the first few days of the search, it became clear that extensive wreckage would be recovered. A comprehensive system to track the wreckage, from the ocean floor into the hangar where the reconstruction would eventually take place, was required to ensure an effective means to use the wreckage location on the ocean floor as an important tool in the investigation.

SUPSALV representatives, working closely with NTSB representatives at East Moriches and at the hangar, organized a consensus to initiate a tagging procedure. It was agreed that the procedure must be comprehensive; that is, that the database used on the water must be the same database used in the hangar. The tag system database components developed over a period of several days and weeks, but the primary tool in this database was the tags which were hung on the wreckage when the pieces were brought to the surface.

During the first week of the recovery effort, a system of tagging was developed to ensure at least the major pieces of wreckage recovered were tagged with a location of recovery. The debris field had been divided into distinct areas, and the tags would identify these areas. Recovery personnel realized that if the wreckage was not tagged on-site, serious complications could arise if there was no way of determining that particular piece's location on the ocean floor.

This appendix describes the basic fundamentals of the tagging system and how the system integrated with the target location sheets developed by divers. It also discusses problems associated with the system and steps taken to resolve those problems. Each tag was a 2½-inch by 3½-inch metal tag. The tags were generally attached to the wreckage using a cable tie or similar piece of line. The tag system was refined and improved throughout the operation. This appendix covers the period of recovery when divers were responsible for the bulk of the recovered debris.

C.2 Tag Colors

The debris field was split into three distinct areas prior to the commencement of wreckage recovery from the ocean floor. It was important to be able to segregate the material brought up from the individual debris fields. Therefore, a different color was assigned to each area (red, yellow and green). Green tags were assigned to Debris Field 1 (the northeast field); yellow tags were assigned to Debris Field 2 (the center field); and red tags were assigned to Debris Field 3 (the southwest field). Through the course of the recovery operation, other tag colors were assigned to handle other cases. White tags were given to the FBI to use for floating debris that was brought to Moriches. Blue tags were used for floating debris brought to Shinnecock.

C.3 Tag Numbers

Each tag was numbered with an alphanumeric unique identification number. Initially, red tags were assigned numbers beginning with “A”, A001 for example. Yellow tags had a “B” prefix, green tags had a “C” prefix, white tags a “D” prefix, and blue tags an “E” prefix. All tags were numbered by SUPSALV command center staff and the tags were checked once for QA purposes.

Following a hurricane which passed close by the operating area in August, there was concern that the debris may have shifted due to ocean floor currents or wave action. To allow for this possibility, the red, yellow, and green tags were assigned a different letter prefix to allow segregation of pre- and post-hurricane

wreckage recovery. These prefixes were “X” for red, “Y” for yellow; and “Z” for green.

C.4 Tagging Assignments

When the search operation commenced, each piece of wreckage identified by remote operated vehicle, laser line scan, side scan sonar, or diver inspection, had a target identification number assigned to it. This was entered into a database from which target lists were developed for priority targets of interest. When recovery began, divers were assigned targets on a daily basis from this master target list. Whenever a diver dove on a particular target, the diver would fill out a “Diver Target Questionnaire,” (see Figure 4-9) which solicited information on the target.

When the recovery effort commenced, these diver questionnaires became closely linked with the tagging process. The divers would dive on a target assigned in the morning operations brief. Based on the target description described in the database from the original diver questionnaire, the diver would know whether or not he/she was on the correct target. When that piece of wreckage was recovered, it was tagged by personnel onboard the recovery vessel. It was tagged with a colored tag. A corresponding “Wreckage Log Sheet” (see Figure 4-11), was created on that tag number describing latitude and longitude recovered, brief description, and other pertinent data. These log sheets were collected every evening and entered into a wreckage recovery database.

A senior person aboard each recovery vessel was assigned responsibility for tagging recovered wreckage. The GRASP, GRAPPLE, and SLWT (side loading warping tug) were the primary recovery vessels used. If other vessels were engaged in recovery operations they were issued tags on a case by case basis. Instructions were provided in writing (see Figure 4-10) to each person assigned this responsibility. It was that person's responsibility to ensure tagging was properly conducted on his/her platform. This process was QA’ed by SUPSALV command center staff several times per day. Corrections and adjustments to procedures were made as conditions and situations warranted but, in all cases,

were made only after discussing with appropriate personnel at the command center.

C.5 Tag Database

The information collected on the wreckage logs were inputted into a database on a nightly basis. Originally the target database was an Excel spreadsheet. The tag database started out as a similar Excel spreadsheet. During the second week of August it became apparent that the two databases, to be truly useful, needed to be merged into a single database. The decision was made to merge the two databases into a single Access database, controlled by personnel in the hangar.

The targets were entered into the database from their collection sources via several routes, depending on the way in which the data was generated. When the database management was moved into the Calverton hangar for easier access by NTSB and FBI investigators, a protocol was developed to enter the data properly into the system. There were two systems to collect data in the field. The first was target generated from sonar data which was transferred electronically via disks. The second was the tag and target sheets, which were filled out when a piece of wreckage was recovered from the water and tagged with a unique number or when divers collected data following a dive on a specific target. This data was transferred from the written sheets into the database by data entry personnel. The data was entered on a daily basis, as soon as the logs were delivered by personnel responsible for collecting the logs. Accuracy of the data was checked by NTSB representatives using the data as well as SUPSALV representatives who routinely reviewed the overall database as it developed.

Once in the database, the data was used in a variety of ways by NTSB and FBI investigators. As the investigation proceeded, suggestions for ways in which to manipulate and use the data were developed under joint supervision by NTSB and FBI personnel. Output from the database was sent to various mapping processes. Maps and printouts were used by SUPSALV in recovery operations, FBI received routine written and disc copies of the database, and NTSB used the

data to assist their investigation. NTSB outputs included 3D distribution drawings to connect debris position to a model of aircraft, seat distribution (2D and 3D), and mapping by debris type (engine, fuselage, interior, etc.).

During the trawling phase, the mapping of the trawl locations and main data handling was conducted in Moriches. The transfer into the main database was done in Calverton. The same customers used the trawling data: SUPSALV for operational data, and NTSB and FBI for investigative purposes.

C.6 Interaction Between Target Database and Tag Database

The interaction between the target and tags database early on was extensive. The two databases were closely tied. The tying factor between the two was the target number. This number was used with increasing regularity to track down information on a piece of wreckage. Because of this need to access information from the databases and the increasingly complex nature of the data, the databases were merged. This proved to be a tremendous benefit as it allowed investigators to manipulate the data in countless ways that would have been impossible in the original spreadsheet format.

C.7 System Problems

The tag system, developed over the course of several days, was an excellent system designed to meet the changing requirements of wreckage recovery and to allow as flexible a system as possible given the number of personnel and agencies involved. Despite the integrity of the system, there were areas in which problems developed. These problems are discussed below.

C.7.1 Duplicative/Missing tag numbers

The tags were numbered by hand in lots of three to four hundred at a time. These tags were usually QA'ed to ensure duplicative tags (same number twice) or missed numbers did not occur. However, there is a possibility that this could have occurred. Generally a missed number was not a problem, except when trying to track down all tags. Duplicative tags were generally resolved by adding

an “a” after one of the numbers and later a separate number was assigned in the hangar.

C.7.2 Mismatched tag color to known/suspected recovery locations

Each recovery platform generally recovered wreckage in one debris field at a time. This made it easy to use a single tag color at any given time onboard a recovery vessel. However, early in the recovery process, an LCM-8 was used to collect all debris and deliver it to Shinnecock Coast Guard Station for truck transport to the hangar. It was realized that during this transfer, debris could get commingled and an erroneous conclusion that a piece of wreckage may have come from the wrong debris field was possible. For that reason, there was a concerted effort to segregate the debris. Later LCM-8 boat trips kept wreckage segregated to keep any untagged wreckage with tagged wreckage from the same debris field. Information on tagged items was recorded on Wreckage Log Sheets and was not affected by any co-mingling of debris.

C.7.3 Hangar tagging

Additionally, items were tagged by hangar personnel when a piece of wreckage arrived in the hangar without a tag. This process was generally only done with some implicit knowledge of where the piece originated (it was with a group of wreckage with all green tags, for example). It is possible that a piece could have been misidentified to the wrong location.

In the first few days of the tag system, investigators in the hangar were briefed on the system. They wanted to ensure everything was tagged appropriately. Since not all items were tagged (mainly just the large pieces were individually tagged and smaller pieces were tagged by placing in cargo nets and tagging the cargo net) it was initially felt that the items that were not tagged could be tagged as they came off the trucks at the hangar. This was attempted for two nights with SUPSALV personnel present as the trucks arrived. This was soon seen as an uncontrollable situation as there were too many personnel involved in offloading and the debris was rapidly desegregated. This practice was stopped

after two days. It was decided the place to fix the problem was at the recovery end onboard the vessels.

Later, a separate series of tag numbers was dedicated for use by hangar staff to identify pieces of interest. These procedures are fully documented in the NTSB's "Data Management Report," 17 Nov 1997.

C.7.4 Tags

The alphanumeric designation on each tag was made by magic marker. It was later discovered that due to stacking of the tags, the ink smeared making some numbers difficult to read. This problem was overcome by using a different type of marker.

C.7.5 Different database by FBI

The FBI used a lot numbering system to identify recovered items. Unfortunately, this system did not take recovery position into account. Attempts to use the FBI lot numbers to determine recovery positions for untagged items met with limited success because there was no control over debris field segregation between the time the recovered items arrived in the hangar and the assignment of lot numbers.

C.8 Conclusion

The tag system which developed over the course of the first few days of the recovery proved to be an invaluable source of information to investigators. All investigators using this system should understand, however, that the system did have some weaknesses. In general, the information is reliable as evidenced by the backup of target database information. On rare occasion, however, a piece of wreckage, through improper marking or lost data, may have been improperly tagged. Unfortunately, this is the nature of a large database and recovery system devised while in use and administered by many people from diverse agencies. Given these constraints it performed well beyond anyone's expectations.

Appendix D

Standard Forms and Records

Figure D-1. Sample Plan of the Day (POD).

DAILY OPERATIONAL ASSIGNMENTS
13 AUG 1996

USS GRASP
Continue ROV/Dive recovery operations in debris area I.

USS GRAPPLE
Conduct ROV survey in debris area III. SCUBA teams will support DEEP DRONE as needed.

M/V PIROUETTE
ROV on targets assigned. Depart salvage site for reprovision in Manasquann, NJ.

USS OAK HILL
Continue support operations in present location. Helo and boat support as required. Launch support platforms weather permitting.

EOD/CIV DIVE DREAM TEAM
Recover debris/HR in debris area I, II and III utilizing SLWT and GRAPPLE 35’ workboat to lift debris.

MDSU II CHAMBER TEAM
Standby to conduct chambers operations.

Figure D-2. Sample Daily Logs.

```
                              Saturday, 5 October 1996
                             CUMULATIVE OPERATING DAYS:
                                        80
                        Operating days by platform and mission:

USS GRASP 36  USS GRAPPLE 69  M/V PIROUETTE 57   M/V MARION C 21   MOBILE TEAMS
Dive ops  32  Dive Ops    56  Side scan     23   Side scan    18   On Scene 78
MR-1      32  Deep Drone  51  MR-2          30   MR-2          0   Diving   52

USS OAK HILL 49    USS TRENTON 26      DIANE G 15     NOAAS RUDE 15

                         LCM-8 loads 54      CH-46 loads 34
SIGNIFICANT EVENTS:
- GRAPPLE anchored north of Area I to allow for side scan operations.  GRAPPLE divers
augmenting Mobile Dive Teams.
- MARION C Continued SSS operations.  To date completed total of 38 lines on 37.5
Meter range scale on 20 Meter lines.
- ABLE J Continued SSS operations.
- Mobile dive teams commenced dive operations.
```

```
                              Sunday, 6 October 1996
                             CUMULATIVE OPERATING DAYS:
                                        81
                        Operating days by platform and mission:

USS GRASP 36  USS GRAPPLE  70   M/V PIROUETTE 57   M/V MARION C 22  MOBILE TEAMS
Dive ops  32  Dive Ops     57   Side scan     23   Side scan    19  On Scene  79
MR- 1     32  Deep Drone   52   MR-2          30   MR-2          0  Diving    53

USS OAK HILL 49    USS TRENTON 27      DIANE G 15     NOAAS RUDE 15

                       LCM-8 loads 54      CH-46 loads 35
SIGNIFICANT EVENTS:
- GRAPPLE anchored north of Area I to allow for side scan operations.  GRAPPLE divers
augmenting Mobile Dive Teams.  At 2000 GRAPPLE layed two point moor over a multiple
target area and DEEP DRONE commenced operations.
- MARION C Continued SSS operations.  Shifted to 50 Khz system at 0900 and completed
three lines, running line #60 twice.  Shifted to 100/500Khz system at 2000 and
continued operations.  To date completed total of 45 lines on 37.5 Meter range scale
on 20 Meter lines.
- ABLE J Continued SSS operations.
- Mobile dive teams continued dive operations.
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Figure D-3. Sample SITREP from Diving Phase.

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                        U-UNCLASSIFIED--UNCLASSIFIED-U
                        UUUUUUUUUUUUUUUUUUUUUUUUUUUUUU
OTTUZYUW RULYSGG8241 2200345-UUUU--RULSSEA.
ZNR UUUUU R
HDLPOM T HELSUPPRON TWO DET ONE
RHDLPSK T HELSUPPRON FOUR/HELSUPPRON FOUR DET FOUR
RHDLPSK T HELSUPPRON FOUR DET THREE/HELSUPPRON FOUR DET TWO
RHRAACO T HELSUPPRON SIX DET SEVEN
RHRAAOH T HELSUPPRON EIGHT DET FOUR
RUCBFAT T PHIBCB TWO
RUCBFAU T ACU FOUR
RUCBFBU T BMU TWO
RUCBFDI T CONNAVBEACHGRU TWO
RUFRHOV T HELSUPPRON EIGHT DET SIX
RUFTNKH T HELSUPPRON TWO DET TWO
RUFTNKP T HELSUPPRON FOUR DET ONE
RULSABR T FLECONPRON SIX UAV DET INDIA
RULSABR T FLECOMPRON SIX DET PATUXENT RIVER MD
RULSABR T FLECONPRON SIX UAV DET GOLF
0 070045Z AUG 96 PSN 651733M25
FM CTG ZERO FOUR ZERO PT FIVE ZERO
TO RUCBACM/CINCUSACOM NORFOLK VA//J3//
RUCBCLF/CINCLANTFLT NORFOLK VA//N01/N3/N5// INFO
RUEKJCS/JOINT STAFF WASHINGTON DC//NMCC//
RUENAAA/CNO WASHINGTON DC//N3/N5/N8/N86/N87/N88//
RULSJGA/COMDT COGARD WASHINGTON DC//OPC//
RULSSEA/COMNAVSEASYSCOM WASHINGTON DC//00/91/OOD/OOC//
RUCBTFA/COMNAVSURFLANT NORFOLK VA//NOO/N3/N32/N4//
RHNVSSA/COMNAVAIRLANT NORFOLK VA//N3/N5//
RUCBKMC/COMSUBLANT NORFOLK VA//N3/N5/I
RUENAAA/CHINFO WASHINGTON DC//JJJ//
RUENAAA/OLA WASHINGTON DC//00//
RUEGABA/CCGDONE BOSTON MA//CC//
RULYEPA/RHBAOAK/COMLOGGRU TWO
RULYVKA/COMPHIBGRU TWO HELTACWINGLANT
RULSAAV/NAVMEDRSCHINSTITUTE BETHESDA MD//JJJ//
RUENNED/BUMED WASHINGTON DC//272//
NAVBEACHGRU TWO
PAGE 02 RULYSGG8241 UNCLAS
RUCBFAP/ACU TWO
RUDJAMC/WPNSTA EARLE COLTS NECK NJ//A/B/20//
RUEGABF/COMCOGARDGRU MORICHES NY R
UCBFAC/COMEODGRU TWO RUCBFDF/MOBDIVSALU TWO
RUCOQAR/HELSUPPRON EIGHT
RHBAOAK/USS OAK HILL
RHBAADQ/USS GRASP
RHBAQSJ/USS GRAPPLE
RHBAOAK/HELSUPPRON EIGHT DET THREE
RUCBFAR/EODMU TWO
RHFJFOX/EODMU SIX
RHNVHHC/EODMU TEN
RHFJFOV/EODMU TWELVE
```

RHBCHNC/USCGC HARRIET LANE
RHWZFUA/NOAAMOA NORFOLK VA//JJJ//
RHWIFUA/NOAAMOP SEATTLE WA//JJJ//
RUCOCGA/NOAAS RUDE
RUEADWD/DIRMZLSPT DCSOPS WASHINGTON DC//JJJ//
BT
PAGE 03 RULYSGG8241 UNCLAS
UNCLAS //N04740// MSGID/GENADMIN/CTG 040.50//
SUBJ/TNA FLT 800 SALVAGE SITREP 06 AUG 96//
RMKS/1. FOL IS UPDATE OF SEARCH OPS AS OF 2130Q 06 AUG:
A. ASSETS:
- USS OAK HILL
- USS GRASP
- USS GRAPPLE
- MV PIROUETTE
- RV DIANE G
- EOD/MDSU/NMRI PERS AND EQUIP
B. STATUS:
- COMNAVSEA, OTC, AND SUPSALV VISITED GRAPPLE TO VIEW THE RECOVERY OPERATION.
- OAK HILL CONTINUES TO PROVIDE BERTHING AND ACCOMODATIONS FOR OFF DUTY DIVERS. SLWT CONTINUED TO WORK WITH SCUBA TEAMS TO RECOVER DEBRIS IN AREA 3 DEBRIS FIELD.
-USS GRASP CONDUCTED FIVE SURFACE SUPPLIED AND ONE SCUBA DIVE. CONDUCTED EIGHTEEN HRS ROV OPS. RECOVERED NUMEROUS MISCELLANEOUS AIRCRAFT DEBRIS.
PAGE 04
RULYSGG8241 UNCLAS
- USS GRAPPLE CONDUCTED THREE SURFACE SUPPLIED DIVES. RECOVERED OVERHEAD SECTION OF COCKPIT WITH WINDOWS INTACT AND NUMEROUS SMALL DEBRIS IN VICINITY OF COCKPIT.
- EOD/NYPD/SCPD MOBILE DIVE TEAMS CONDUCTED 42 DIVES UTILIZING 56 DIVERS. TEAMS RECOVERED VARIOUS SMALL DEBRIS.
- PIROUETTE IDENTIFIED AND ASSISTED SCUBA TEAMS IN RECOVERING TWO SEATS AND OTHER SMALL DEBRIS. HAVE VISUALLY IDENTIFIED SIX AREAS WITH DEBRIS.
- R/V DIANE G CONTINUED LASER LINE SCAN SURVEY SE OF AREA 1 FOR DEBRIS.
- NOAA SHIP RUDE RELEASED FROM DUTY. WILL BE RECALLED IF REQUIRED.
- NUMBER VICTIMS RECOVERED: 195
- NUMBER VICTIMS IDENTIFIED: 192
C. INTENTIONS:
OAK HILL CONTINUE LOGISTIC AND TRANSPORTATION SUPPORT.
- GRASP CONTINUE SEARCH AND RECOVERY OPS.
- GRAPPLE CONTINUE SEARCH AND RECOVERY OPS.
- EOD/NYPD/SCPD DIVERS CONTINUE SEARCH AND RECOVERY DIVES.
- PIROUETTE TO CONTINUE SEARCH AND SUPPORT FOR DIVE TEAMS.
- DIANE G TO CONTINUE LASER LINE SCAN.
PAGE 05 RULYSGG8241 UNCLAS
2. A. PERSONNEL ASSIGNED:

	OFFICER	ENLISTED	CIVILIAN	CONTRACTORS
CLG2	4			
NAVSEA OOC	10		4	39
USS OAK HILL	27	342	5	
USS GRASP	08	74	9	
USS GRAPPLE	08	86	2	
PUBLIC AFFAIRS	6	5		
R/V DIANE	1	1	13	
NOAA SHIP RUDE		NOAA ANALYSTS RELEASED. TO BE RECALLED IF REQUIRED		
M/V PIROUETTE			10	

```
EOD               8           28
MDSU              1           25
NMRI              1            8
 B. TOTAL NUMBER DIVERS ON SCENE: 188
CLG2/NAVSEA: 10
GRASP/TAD: 39
GRAPPLE/TAD: 32
EOD: 33
PAGE 06 RULYSGG8241 UNCLAS
MDSU 2: 26
NY STATE POLICE: 15
NY CITY POLICE: 17
SUFFOLK CITY POLICE: 7
3. PUBLIC AFFAIRS. NAVY CIB CONTINUES TO RESPOND TO REQUESTS FROM NEWS MEDIA
FOR INFORMATION ABOUT NAVY OPERATIONS. PH1 HURD AND JO2 MANNING EMBARKED ON M/V
DIANE G. TO DOCUMENT LASER LINE SCAN OPS. PH1 MCKETHER AND J02 PARKER EMBARKED
ON OAK HILL TO DEVELOP HOMETOWN FEATURES. NYT REPORTED TODAY THAT COMPUTER
USERS HAVE BEEN TURNING IN RECORD NUMBERS TO THE WORLD WIDE WEB FOR UP-TO-DATE
INFORMATION ON TWA FLIGHT 800 CRASH. THE ARTICLE SPECIFICALLY MENTIONS NAVY'S
PA LIBRARY HOMEPAGE.
A. VIDEO. RELEASED FOOTAGE OF LASER LINE SCANNER OPERATIONS ON M/V DIANE G,
WRECKAGE ABOARD GRAPPLE AND UNDERWATER DIVER OPERATIONS TO ABC POOL. CONTINUE
TO SHOOT FOOTAGE WITHIN COAST GUARD COMPOUND AND SHINNECOCK FOR OFFICIAL
DOCUMENTATION.
B. STILL. STILL PHOTOGRAPHY OF UNDERWATER DIVE OPERATIONS AND WRECKAGE RECOVERY
RELEASED BY NTSB TO UPI. PH2 SIDNEY AND PHAN WITHROW SHOT STILLS AND STATIC
VIDEO OF WRECKAGE AT GRUMMAN HANGAR IN CALVERTON, NY. NEGATIVES AND TAPE
PROVIDED TO FBI AND NTSB FOR P
AGE 07 RULYSGG8241 UNCLAS
APPROVAL PRIOR TO RELEASE. ANTICIPATE RELEASE TO POOL TOMORROW.
C. MEDIA OPS. NTSB CONDUCTED AFTERNOON BRIEFING AT 1615. NAVY DIVER (CDR
SCHOHLLEY) CONDUCTED Q AND A WITHIN THE BRIEFING SESSION.
4. NAVSEA OOC CONCURS.//
BT 88241
NNNN 00
(1) ....INFO FOR COMNAVSEASYSCOM
    91(1) 00D(1) 00C(1) 01K(1) PMS312(1) PMS377(1) 00A(1)
    01P(1) 3D9MED(1) 03G(1) 03N(1) 03Y(1) 04I2M(1) 071(1)
    072(1) 07A(1) 91Z(1) 92(1) 92Q(1) PMS373(1) PMS395(1)
```

Figure D-4. Sample SITREP from Trawling Phase.

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                        UUUUUUUUUUUUUUUUUUUUUUUUUUUUUU
                        U-UNCLASSIFIED--UNCLASSIFIED-U
                        UUUUUUUUUUUUUUUUUUUUUUUUUUUUUU

PATUZYUW RUEDMCB5708 0701329-UUUU--RULSSEA.
ZNR UUUUU
ZUI RULSSEA0847 0691500
P 100635Z MAR 97 ZYB PSN 875269M37
FM COMNAVSEASYSCOM WASHINGTON DC//00C//
TO RUENAAA/CNO WASHINGTON DC//N3/N8/N86/N87/N88//
INFO RUCBACM/CINCUSACOM NORFOLK VA//J3//
RUCBCLF/CINCLANTFLT NORFOLK VA//N01/N3/N5//
RUEKJCS/JOINT STAFF WASHINGTON DC//NMCC/J3WHEM//
RULSJGA/COMDT COGARD WASHINGTON DC//OPC//
RUCBTFA/COMNAVSURFLANT NORFOLK VA//N00/N3/N32/N4//
RUENAAA/CHINFO WASHINGTON DC//JJJ//
RUENAAA/OLA WASHINGTON DC//00//
RUEGABA/CCGDONE BOSTON MA//CC//
RULYEPA/COMLOGGRU TWO
RUEGABF/COMCOGARDGRU MORICHES NY
RUCBFAC/COMEODGRU TWO
RUCBFDF/MOBDIVSALU TWO
RHNVGGT/USS GRASP
RHNVHHH/USS GRAPPLE
RUCBFAR/EODMU TWO
RHFJFOX/EODMU SIX
RHNVHHC/EODMU TEN
RHFJFOV/EODMU TWELVE
RUCTMGG/NAVXDIVINGU PANAMA CITY FL//JJJ//
RUCTMGE/NAVDIVESALVTRACEN PANAMA CITY FL//JJJ//
RULSSEA/COMNAVSEASYSCOM WASHINGTON DC//00C/91/00// BT
UNCLAS //N04740//
MSGID/GENADMIN/NAVSEA 00C//
SUBJ/TWA FLT 800 SALVAGE SITREP 10 MAR 97//
POC/RICHARD ASHER/CIV/SEA 00CB/-/TEL:703-607-2753/TEL:DSN 327-2753//
RMKS/1.  FOL IS UPDATE OF SALVAGE OPS AS OF 0800Q 10 MAR 97:
A.  ASSETS:
- F/V NORDIC PRIDE
- F/V CHRISTIAN/ALEXA
- F/V ALPHA/OMEGA II
- F/V KATHY ANN
B.  STATUS:  ALL TRAWLERS IN ROUTE TO GREENPORT TO XFER AGENTS AND OFFLOAD
DEBRIS DUE TO WX CONDITIONS.
- F/V NORDIC PRIDE IN ROUTE TO GREENPORT. - F/V ALPHA/OMEGA IN ROUTE TO
GREENPORT.
- F/V CHRISTIAN AND ALEXA IN ROUTE TO GREENPORT. - F/V KATHY ANN IN ROUTE TO
GREENPORT.
C.  INTENTIONS:  RESUME TRAWLING OPS AS SOON AS XFER IS COMPLETE. .  PERSONNEL:
SUPSALV REP REMAINS ON SITE SUPERVISING SALV OPS. 3.  PUBLIC AFFAIRS:  NTR.//
BT
#5708
NNNN
```

Figure D-5. Sample CTF SITREP.

THURSDAY 08 AUG 1996 PM BRIEF

FBI reports number victims recovered: 195 as of 1400 08 Aug.

USS GRASP conducted 3 SSDS dives. ROV in the water for 4 hours. Recovered numerous small debris. Waiting to off-load half of wing/fuselage. Recovered partial H/R. Continue to search for and recover H/R and debris using ROV and dive operations.

USS GRAPPLE conducted 3 SSDS dives utilizing ROV for 8 hours. Recovered numerous small debris. Continue to search for and recover H/R and debris using ROV and dive operations.

R/V DIANE G conducted sonar/laser survey in area NW of Area 3 several small targets indicated.

M/V PIROUETTE conducting side scan operations south of area 3 and have logged numerous targets. Continue to side scan area for targets.

EOD and NYPD conducting dives in areas 1 and 3 debris fields. Will continue dive and recovery operations.

USS OAK HILL deployed SLWT to area 3 to support EOD/NYPD diver recovery. LCM-8 boats conducting runs to Shinnecock to off-load debris. Continue to support debris runs to Shinnecock.