



## **The Space Shuttle Columbia Recovery Mission Toledo Bend, Texas**

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When the Space Shuttle Columbia broke up on re-entry February 1, 2003 an investigation began of tremendous proportions. We, the American people, needed answers and of course we wanted them now. The investigation started almost immediately. Investigators poured through the video footage of the re-entry, the digital data and the debris from the break-up.

The recovery operation, which was divided into separate water and land operations, involved thousands of people and about 19 different agencies at the Federal, State and Local levels. Initially the Federal Emergency Management Administration was in control of the entire recovery operation.

The Dive Teams that were involved in the water recovery were the Texas Department of Public Safety Dive Team, the Houston Police Department Dive Team (supplemented with members of the Galveston County Dive Team), the Environmental Protection Agency Dive Team, the Federal Bureau of Investigation Dive Team, and our Team, the Galveston Police Department Marine/Dive Team.

As far as dive gear all Teams were diving dry suits, AGA's on S.C.U.B.A. The Texas Department of Public Safety Team and the Environmental Protection Agency Team dove dry suits, Superlites and surface supplied air. All Divers were tended from the surface. Our Team as well as the Houston Team used the O.T.S. Buddy Phone® for communications. When the Navy arrived they dove wet suits and AGA's (of course they had a military designation for the AGA).

The water operation search concentrated on the Shuttle flight path that crossed Toledo Bend Reservoir, Texas, as documented on radar. The reservoir lays on the Texas Louisiana border and covers approximately 180,000 acres. The widest point is approximately 20 miles. Depths range to 120 feet. Toledo Bend was formed in 1967 by damming the Sabine River. The engineers calculated that it would take ten years to flood the reservoir, so the residents were told that they had ample time to move out. The timber rights were sold and the timber was to be harvested over this ten-year period. Well guess what, the engineers missed the flood date by nine years and nine months! That's right, it flooded in three months. So the houses, roads, bridges, logging equipment and such were left in place. As Captain Jim Wilkins, Navy Supervisor of Salvage, so accurately put it "We're diving in a Flooded National Forrest".

**Trees/ stumps Toledo Bend**



The flight path was scanned with several different sonars. Of course this was an ongoing process due the area that needed to be covered, roughly two nautical miles each side of the flight path. The scans, which were digitally recorded, were turned over to the NASA personnel who reviewed the data during the night. Any items that appeared to be possible targets (shuttle debris, unknown manmade objects or just unknown objects) were assigned to the Dive Teams to check out. Each morning at the briefing the Teams were given a Target Packet, which contained the Latitude/Longitude of the target and a very brief description. The descriptions were brief with a basic description like "2mx1m rectangular object". Also, any "eye witness" sightings were investigated. There were several people who came forward who were on the lake when the debris fell. One problem was that the fallen debris was small enough to blend in with the timber on the bottom and basically become invisible to the sonar. Of course there was the story of the Volkswagen size piece that fell into the lake. That area was scanned and dove with negative results.

With Target packets and G.P.S. in hand the Teams would go to the G.P.S. coordinates of their target and drop a buoy and dive their assigned targets.

This created the first problem. Some of the coordinates were taken with G.P.S. receivers that calculated the differential some were not. So sometimes you were right on the money sometimes you were not. Some teams lost a lot of time searching for targets because of this oversight. Once the problem was identified it was corrected and caused no more problems.



Once on target, the Diver would descend the buoy line and conduct about a 30-foot circular search pattern around the buoy weight. With the bottom being a forest the common search patterns were pretty much useless. If you were lucky and had a target in a "clearing" you could use a pivot board or sweep pattern, but most of the time the bottom was just not conducive to normal search patterns. Did I mention visibility, yeah right! On a good day 1 to 2 feet, normally 0 or less!

Sgt. Art Oates, Commander of the Houston Police Department Dive Team, made arrangements for Kongsberg Simrad Mesotech to send down a sector scanning sonar to assist in the search. The sector scanning sonar, for those of you who are not familiar with it, scans 360-degree area out to about 100 meters. The beauty of this type of sonar is that is it real-time and scans from a stationary point. The benefit is that we could go to the target site, drop the scanning sonar and locate the target then, through the Diver communications, direct the Diver to the target. This reduced the search time per target dramatically. Also, the scanning sonar

identified other targets that the Diver would also check. Mark Atherton, of Kongsberg Simrad Mesotech, did an outstanding job of getting us up to speed on the operation of the sector scan.

About the second week of the recovery operation, personnel from the U.S. Navy Mobile Dive Salvage Unit-2 (MDSU-2) and Supervisor of Salvage moved in and took charge of the water recovery effort. I have to admit rumors among the Dive Teams involved were running rampant; basically we could pack our gear because the Navy would not need us.

Nothing could have been further from the truth! Captain Chris Murray, Commander of MDSU-2 and Captain Jim Wilkins Supervisor of Salvage, made it clear from the beginning that they needed the assistance of the local Teams to conduct this operation. Not that MDSU-2 was not up to the task. MDSU-2 conducted the recovery of TWA Flight 800; they recovered portions of the Civil War ship Monitor as well as the Challenger Shuttle. Suffice to say these guys knew what they were doing and had earned their name "Experts in Salvage".

The Navy really had the experience and organizational skills to pull this operation together. They set up a Command Post at a large local Marina. From there the entire water search was coordinated. The side scan sonar images were brought there at the end of the day. The images were turned over to the "Voodoo Lounge" where the image specialists and N.A.S.A. personnel analyzed them and determined which were worthy of assigning to a Dive Team for further investigation. As the Teams found their targets we made notes on the target packet as to what the target actually was. The Voodoo Lounge took this feedback and used it to modify their filters. This reduced the number of obvious false targets.

At the Command Post the Navy had a Re-Compression chamber that was staffed anytime there was diving operation in progress. There were Navy D.M.T.'s and National Forestry E.M.T.'s there at all times. The Navy jammed our tanks daily. We would drop them off at the end of the day and pick them up the next morning after the morning briefing. I also should mention here that there were over 3000 (yes three thousand) dives made and not one diving accident!

Communications were also an initial problem. F.E.M.A. brought in the National Forestry Service who solved the Communications problems. They supplied radios, repeaters and Dispatchers. There are very few places on the lake that you could not communicate directly with the Command Post and you were always able to communicate with the other Dive Teams, Security and Buoy Boats. If a "dead spot"



**This is Sgt. Tim Galvan, on board our boat. Sgt. Galvan is our Marine Sgt. Each morning the Boat operator would prepare the boat for the day's missions. This would include entering the G. P. S. Coordinates of each target into our G.P.S.**

was identified, the National Forestry Service set a repeater to solve the problem. They did an outstanding job.

Each morning there was a briefing and target assignments session. During the briefing we discussed weather expectations (which for the first several weeks was the same, cold and wet!), and receive our Target packets. The Navy did their best to assign the targets located in protected areas during inclement weather or high winds.

There were times the winds were clocked at 50 M.P.H.! When the weather improved we moved to the open areas of the lake. As is the norm for weather in Texas (if you don't like the weather just wait a few minutes and it will change!) there would be several changes in one day. To accommodate this we were given Target packets for each change in the weather conditions.

Emergency procedures were also discussed. The Command Post was accessible by water so if your dive area was in the area of the Command Post you could transport injured personnel to the waiting D.M.T.'s via your Dive Boat. If you were too far from the Command Post there were designated boat ramps where an emergency vehicle would meet you and transport the injured personnel to the Command Post.



**GPD divers preparing to dive.  
Officer John Courtney (Center),  
Officer Pete Contenta (right)  
Officer Ronny Phillips (Left)**

Of course all of this was coordinated by radio. Should there be a dive related accident the Command Post would notify all Dive Boats and ALL diving operations would stop immediately. This was necessary because the chamber would hold only one diver.

To make locating the Targets easier we were assigned an Environmental Protection Agency person with a Trimble G.P.S. to locate the targets and buoy them. These people were assigned a separate boat and boat operator. This speeded up the process tremendously as they were able to stay several targets ahead of the Dive Teams. Each Team

was also assigned a security boat, usually a Texas or Louisiana Game Warden. Their assignment was to keep the Media, "Looky Lews" and fishermen at a safe distance. Later in the operation the Coast Guard supplied some security boats. The Media was renting any boat they could to get the "prize photo". For the most part the media understood the concept of Diver's in the water and kept at safe distance, but from time to time, especially in the early part of the operation, they would venture too close for comfort.

At each briefing Capt Murry and/or Capt Wilkins asked if anyone had any ideas on improving the operation. If someone suggested one, it was tried. If it worked it was

added if not at least we tried and tested the suggestions. One idea that was brought up during the briefing was the addition of the SONAR "Picture" of the Target to the target information in the packet. That way the Diver had an idea what he was feeling for. We tried it, it helped, and from that point on the SONAR "picture" was in the packets. We also had Team Leader meetings at least once a week to discuss ways to improve the operation. Capt Wilkins and Capt. Murray wanted feedback from the Teams daily, anything to improve the search or make the operation safer.

The E.P.A, guys were incredible with the Tremble G.P.S. Most of the time they dropped the buoy directly on the Target. The farthest they missed, as far I know, was less than six feet!

The security boats also did an outstanding job. This is an inland lake so there was no common communications with boaters. We posted signs at all of the public boat ramps, bait shops and any store that sold fishing supplies, informing boaters of the operation and to steer clear of the Dive or Sonar boats. A picture of the Recreational Dive Flag was also posted. There were also announcements on the local radio/television stations. The security Boats had to make contact with each boater that appeared to be getting too close and turn them around. Most boaters were very cooperative.

Once on scene we would anchor next to the first buoy. We dove what has become pretty much the standard for PSD Teams; primary Diver, safety Diver and a 90% Diver and all Divers were tethered. Our Boat Driver and 90%er acted as the Tenders. Also we were always within sight of another Dive Team so that if there was an emergency we could get a complete Team as back up within minutes. We also had an 80CF tank set up and ready to go should the Primary Diver require additional air while working through the problem. The Primary Diver would descend the buoy line to the buoy weight, which were usually bricks. The Diver would attach a search line to the buoy weights and conduct a circular search pattern out to 30 feet. Of course this was if the bottom terrain would allow such a search. If not the Diver would search the area as thoroughly as he could. With the addition of the sonar image to the target packet the Diver was able to recognize by feel when he had the Target. We still searched the area as best we could to sure. We made notes as to what the SONAR image really was on the target packet. This was turned in to the Command Post at the end of the day.

**Buoy marking target.  
The yellow line is the Diver's  
Tender line**



Once that target was cleared we advised the Buoy Boat (E.P.A.) and they pulled the buoy and moved to the next target. That continued until we cleared all of our targets or burnt our Divers because of Bottom time or RNT because of depth.

Divers also had to search around brush piles, trees, logjams, trout lines, nets, fishing lines and all kinds of snag goodies, this also wore the

Divers down. If the Target was manmade and could be brought to the surface without too much difficulty we removed it. We had a regular Rogues Gallery of stuff brought up by the Teams. Larger items we left on the bottom.

Some of the items the Teams located were fish traps, a Dodge truck, a crane, bass boat, bridges (yes bridges) out board motors, farm equipment, fences and more.

There have been a lot of discussions about Teams working together. This operation proved that the concept would work. Each Team was allowed to dive by their own S.O.P/S.O.G. The Team Leader had the ultimate decision if a dive was within the capabilities of his Team. Any dive that was not made for these reasons was reassigned to a Team with the capabilities.

We were able to use technology that we would never have had access to otherwise.. From Satellite imagery, sonars and side scan, sector scan, un-tethered and hand held, to different types of photography. It was a once of a lifetime experience.

Of the three thousand dives made at Toledo Bend only two pieces of the Space Shuttle Columbia were recovered from the water: One, a forward brake assembly, recovered by the F.B.I. Team and a piece of insulation from a cargo bay door recovered by our Team. The insulation was not a sonar target our Diver found it.

I think we did everything humanly possible to search for and recover the debris. As the search operation progressed Capt. Wilkins contacted the Scripps Institute, Woods Hole Institute, Naval Office of Research, and N.O.A.A. for further logistical support and assistance. They all sent their best and brightest and agreed that we were doing all that was technologically and humanly possible.

We learned that pieces of debris smaller than two feet with a low profile off of the bottom blend into the bottom clutter. Something else we learned was that different Teams with different procedures can work together on large operations. The Navy did an outstanding job of coordinating the operation and leaving control of the dive to the individual Team. The camaraderie among the Teams was great and helped to keep morale high

The residents of the area, namely Fairmount and Hemphill were fantastic. They opened their home and their hearts to us. When the operation first began the Water Operations Command Post was set up in the Fairmount Volunteer Fire Department. The residents made sure we had everything we needed. They brought home cooked

**The sonars used during this operation read like a list of the who's who of sonars:**

**Reson** 8125 Multibeam Sonar (455kHz),

**Reson** 8101 Multibeam Sonar (240kHz),

**Klein** 3000 side Scan Sonar (100/500kHz),

**EdgeTech** MPX FM Multipulse Side Scan (400kHz)

**Marine Sonic** Side scan sonars- 10deg down look @ 600kHz, 10deg down look @ 900kHz, 5deg down look @ 600kHz, 5deg down look at 1200Khz (REMUS), and the Single beam echo sounder 24/240 kHz that had been configured as a side looker.

meals, equipment; anything they had that we needed we got. One of the problems was sleeping accommodations. They were few and far between close to the water operations. Anyone that had an extra room offered it to us. The house we stayed in was the weekend home of family that lived in Louisiana. They "gave" us their house for the entire duration of the operation. The house sat right on the water with private boat dock and all. We tried to pay for our accommodations but they refused to take money. Like everyone else in the area they said they were just doing their part. If you ever get in the area of Fairmount and Hemphill, Texas be sure to thank the residence for the kindness they showed us. It helped to motivate us and it felt good to know that good old fashion Patriotism and the American Sprit is alive and well in East Texas!