Refuge mapmaker aids columbia shuttle recovery effort

by Mark Laker

Soon after the Columbia space shuttle disaster in February, I received an email at work requesting people with computer GIS (Geographic Information System) experience to assist in the shuttle debris recovery effort. The message was brief, requesting interested persons to state in a few sentences their experience and availability.

Space exploration has always inspired me and captured the best of my imagination. I'm proud of NASA's remarkable accomplishments, and I couldn't ignore this call for assistance in such a tragic situation. I sent off my papers and expected a quick reply. After a week passed with no response, I started packing to travel to Minnesota to pick up the new family hunting dog "Buster" from my uncle's farm. I was almost out the door when a fax came with orders to leave immediately for Houston, Texas; end of instructions. I repacked my bags, grabbed a laptop computer, and jumped on a plane to Houston.

From Houston I was to proceed to the Interagency Coordination Center in Lufkin, 100 miles northeast of Houston. On the trip to Lufkin were two wildland firefighters with the U.S. Forest Service from Colorado and Oregon. Contrary to my traveling companions, this road trip represented the most I would see of the Texas countryside during my stay. I could have used the exercise, but I would be searching the countryside and helping the recovery effort with my laptop computer, not with my hiking boots.

Although the Federal Emergency Management Agency (FEMA) is directing the recovery, most of personnel came from various state and federal agencies across the country. The search crews are primarily wildland firefighters from the Forest Service, National Park Service, Bureau of Land Management, Bureau of Indian Affairs, U.S. Fish and Wildlife Service, as well as state forestry agencies. Although trained for firefighting, these crews are sometimes mobilized for disasters and have responded well to the demands of the shuttle recovery effort. In addition to being physically fit and comfortable in the woods, these firefighters come complete with tents, showers, toilets, and an organized command structure.

The Coordination Center is located at the Bank of America building, a large three story building which was mostly empty prior to the disaster. After making it through security and getting all the necessary security passes, I was off to the "GIS" shop. "The what?" asked the security guard. "The GIS shop," I said again. "Do they make maps?" the officer asked. "Bingo, that's the place."

Though maps are easily the most identifiable product of a GIS shop, its capabilities far exceed simple computerized mapmaking. The word "Geographic" is the key in a Geographic Information System. This means that the GIS data are physically associated with points on the ground, by means of spatial coordinates such as longitude and latitude.

For example, I could take my notebook with locations of fishing spots for halibut and trout I have collected with my handheld GPS unit, and make a trout map or a halibut map. I could label the locations with little halibut or trout icons, and when I click on a particular icon, a menu pops up giving water depth, previous catch information, and anything else that I care to have associated with that particular point on the map.

When I walked into "The Map Room" at the Coordination Center, my jaw must have dropped. I was looking at probably the largest GIS operation in the country. The historic scale of this recovery was starting to sink in. There were about 30 people arranged around several folding tables running the length of the room. I lost count of laptops and desktop computers packed on the tables.

Bundles of yellow network cables dropped down through ceiling openings, tying all of the electronic brains together. All along one wall were printers and plotters. A plotter is basically a huge printer, which is fed paper from a three- to five-foot wide role. We had 10 plotters! And of course the walls were covered with maps. After locating an empty three-foot desk space, I set up shop next to a couple other new guys, Kevin and Jacob, two consummate practical jokers who also happened to work for the U.S. Fish and Wildlife Service.

All set up and ready to flex my GIS muscles, I was anxious to start some productive work, as well as find out what other folks were doing. The highest prior-

ity for the GIS shop was to assist the ground search crews. It was obvious in the early days of the search that a search grid was needed to efficiently manage the recovery effort. In any large-scale search, you have to keep track of where you've been and where you need to go. To capture the primary search area, we created a GIS grid 130 miles wide and 280 miles long, stretching across half of Texas and Louisiana. On an average day we produced approximately 1,000 maps using this grid. During peak hours, printer and plotter time was coveted and coordinated by frequent announcements throughout the room.

Currently, there are 141 twenty-person search crews on the ground. Several maps are prepared daily for each search crew. Each map includes a color-infrared aerial photograph as a background. Structures (building, roads), forests, and general terrain are some of the easily recognizable features or landmarks visible on the background. Several additional "layers" of information are added to complete the map, including the search grid, labeled roads, lakes, streams, latitude and longitude marks, and dots representing previously found debris.

By studying the maps, the crews can plan how many people will be needed to search an area and what hazards exist. For example, a thick, brushy forest covers a large portion of the search area. If that's not trouble enough, a good number of the plant species offer nice big sharp thorns. Picture devil's club with 3-inch thorns! Finding pieces of the shuttle in such terrain is literally like looking for a needle in a "needle-stack."

With a search area potentially 280 miles long, any method that allows you to narrow your search is pure gold. The original search area was based on the shuttle's predicted flight path. As more shuttle pieces were found, GIS analysts were able to determine that the actual debris path was different than predicted. With this information, we altered the search area to increase the likelihood of finding more debris. Using radar data and ballistic coefficient models, our analysts created maps predicting where the larger pieces might have fallen.

To date more than 10,000 people from across the nation have participated in the recovery effort, over two hundred being from Alaska. Over 1.7 million acres have been searched and approximately 42,000 confirmed shuttle items have been recovered and their locations recorded in the GIS. These fragments represent about 26% of the shuttle's landing weight. I also think it's important to not lose sight of the human tragedy of this disaster. Respect and sensitivity for the lost crewmembers, and their loved ones, has been evident throughout the recovery effort. I listened to several stories about kindhearted locals who offered support to the effort, sometimes at significant personal expense. I consider it an honor to have participated in the shuttle recovery, and hope that my small piece of the endeavor will contribute to safer space exploration in the future.

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