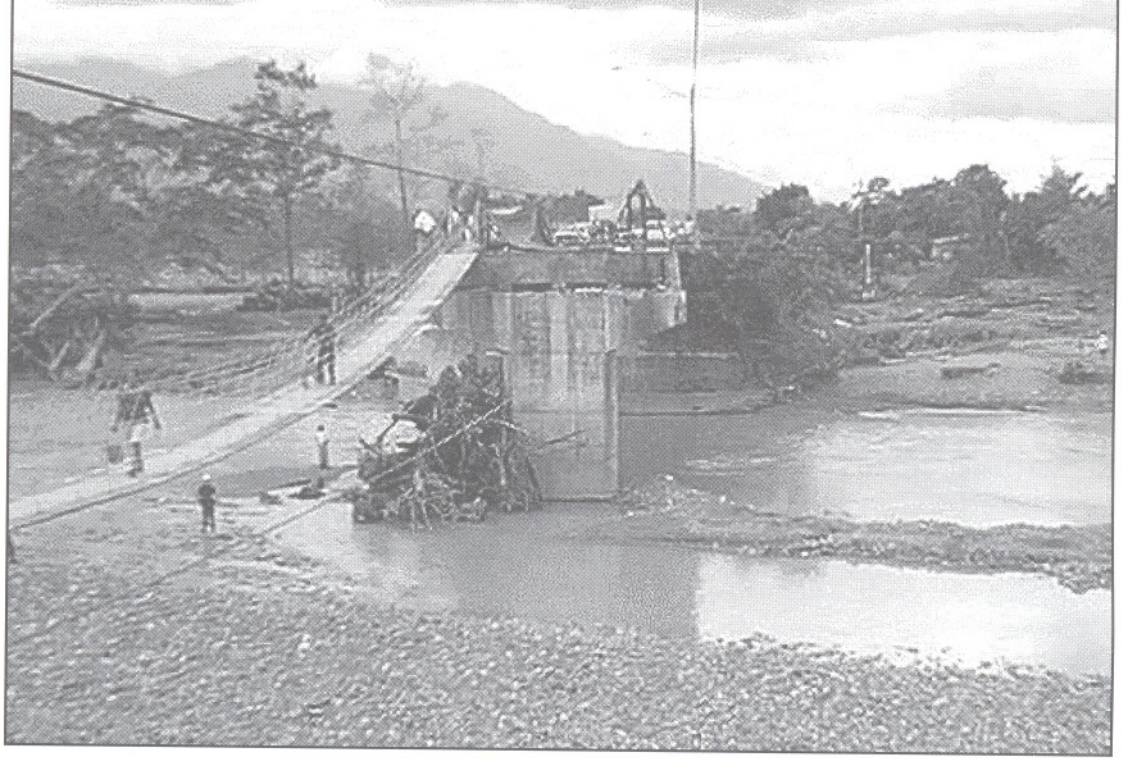


Joint Engineers in Disaster Relief: Hurricane Mitch Slams Central America

By Lieutenant Colonel Robert W. Nicholson

The damage and destruction that Hurricane Mitch wrought on Central America was of biblical proportions. The hurricane—called a 200-year-plus storm because it was the most devastating one to hit Central America in recorded history—was a category five event. Unlike most hurricanes, it did not render a swift, powerful blow to a contained area but spent a week meandering across the isthmus dumping huge amounts of rain. Very few infrastructures are engineered to withstand this type of event, much less those of underdeveloped countries in Central America. The grim figures below show the metrics of the disaster, but they cannot begin to describe the tragedy and trauma exacted.

This article is the story of the soldiers, sailors, airmen, and marines of Joint Task Force-Bravo (JTF-B), who participated in Operation Fuerte Apoyo (Strong Support). Together they survived the ravages of the hurricane firsthand and then exerted Herculean effort to save human lives and mitigate suffering. It is a story about a team, thrown together, that displayed the brotherhood of the Americas working together in a time of tragedy. Even though most of Central America was affected by the storm, the small country of Honduras—about the size of Tennessee and located in the center of the region—withstood the majority of the wrath of Hurricane Mitch. Therefore this article focuses on relief efforts in Honduras.

Hurricane Mitch Statistics	
Persons killed and/or missing	More than 10,000
Persons displaced	Nearly 3,000,000
Bridges destroyed	More than 300
Roads damaged	More than 1,000 kilometers
Estimated damage	$10 billion

Joint Task Force-Bravo

The Coronel Enrique Soto Cano Air Base, located approximately 75 kilometers north of the capital city of Tegucigalpa in the Department of Comayagua, is home to the Honduran Air Force Academy and JTF-B. Assigned to the U.S. Southern Command (USSOUTHCOM), JTF-B was organized in 1983 to assist in the national policy of deterring Nicaraguan aggression in Central America and to provide command and control over U.S. military units deployed to the joint

operations area. Over time, the organization and the mission have changed. Under the revised 1996 Operations Order Central Champs, JTF-B now conducts and supports the USSOUTHCOM commander's directed joint, combined, and interagency operations in the joint operations area to enhance regional cooperative security. Inclusive in this mission as the commander's strategic "gateway" to Central America (Belize, Guatemala, El Salvador, Nicaragua, Costa Rica, and Honduras) are these specific tasks:

- Maintain a C5-capable airfield.
- Conduct humanitarian assistance and disaster relief exercises (medical readiness training and engineering).
- Support Joint Chiefs of Staff joint/combined exercise training.
- Act as executive agent for humanitarian demining as well as counternarcotic operations.

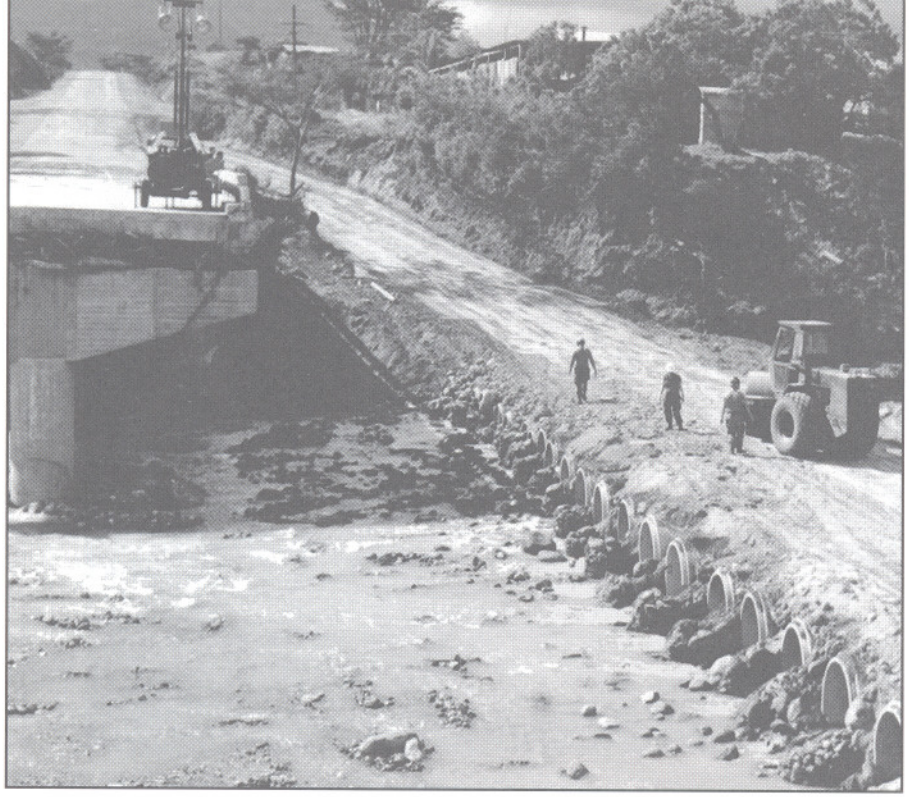
When installations close and the United States' presence in Panama is removed (by 31 December 1999), JTF-B will be the only forward-deployed force in Central and South America. The organizational structure is the result of a downsizing operation to an eventual zero presence in Honduras, but it halted at 499 personnel in 1996. The resulting organization is "a mile wide and a foot deep."

The Hurricane

On 22 October 1998, the JTF-B commander alerted Situation Assessment Team-Alpha (SAT-A) to travel to the Pacific coast of Costa Rico to survey flood damage caused by heavy rains. Meanwhile, base weather personnel began watching Tropical Storm Mitch in the Caribbean off the northern coast of Honduras. National Weather Service predictions showed the storm increasing in strength and its path heading straight for Belize. Because the majority of Belize is at or near sea level, the JTF-B commander became concerned that a storm of this size would cause catastrophic damage. He put the team on hold and redirected its attention to Belize. The determination was made not to send the team's helicopters to Belize until after the storm had passed to avoid damage to the helicopters and the potential of the team becoming stranded.

As the hurricane began to develop and damage the northern coast of Honduras, the commander directed that a second situation assessment team (SAT–B) be formed to move north and perform surveys. The team left for the coast on 28 October. They made it as far as La Mesa International Airfield near San Pedro Sula, Honduras' second largest city, before the hurricane forced them to stop. The team was trapped in San Pedro Sula as the hurricane passed south of them and damaged roads, cutting them off from Soto Cano Air Base. Meanwhile the National Weather Service continued to predict the hurricane track into Belize. As the storm traveled across Honduras, it dumped as much as 84 inches of rain in five days.

Assessments continued throughout the first weeks after the storm, conducted mainly from UH-60 Black Hawk helicopters because floodwaters had not receded and roads were generally impassable. After the search-and-rescue effort trailed off, the JTF-B commander dedicated one helicopter daily to the engineers to conduct assessments and reconnaissance. This was critical to rapidly gain a picture of the overall situation; it greatly assisted in early determination for critical areas for engineer response.



Seabees from NMCB 7 finish a culvert/gabion crossing over the Rio Hombre at Rio Hondo.

Rehabilitation

After Soto Cano was out of danger and there was some idea of the extent of the damage to the country's infrastructure, the JTF-B's Directorate of Engineering began to coordinate with the Honduran government and SOUTHCOM for the U.S. forces' response. Tegucigalpa, located on the convergence of three major rivers, was hit particularly hard by the hurricane. Its downtown area was wiped out, and most government office buildings were flooded and lost all facilities, automation, and equipment. This situation, along with the death of the mayor in a helicopter crash, left the government in disarray. The JTF-B commander issued planning guidance and directed the JTF engineers to develop a methodology and concept to rehabilitate the country. The JTF-B commander's planning guidance for engineer operations was clear and simple: *Conduct initial rehabilitation of critical lines of communication and critical infrastructure nodes to conduct humanitarian assistance efforts and provide an initial assessment of critical municipal and national infrastructure.*

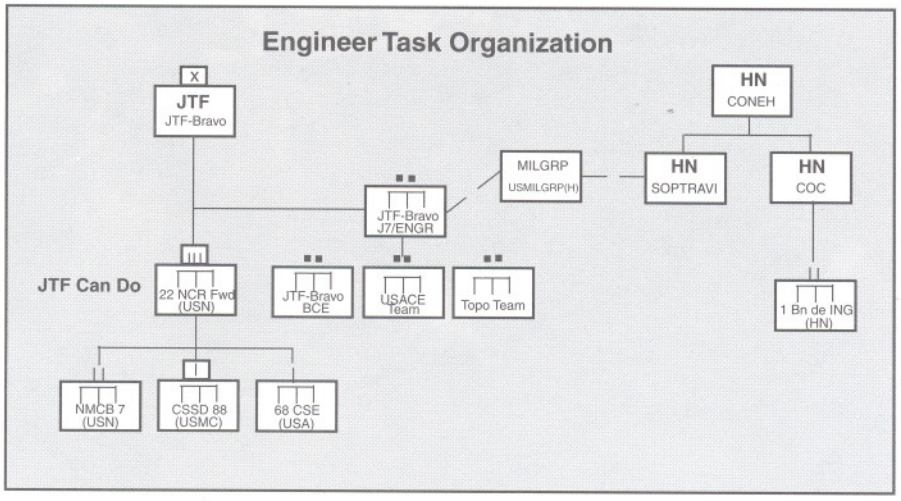
The concept of rehabilitation was to link the northern and southern ports with the capital along Centro Americano Carretera 5 (CA-5) to form the backbone of a relief supply route. Then branch roads linking the departmental capitals with the backbone route would be repaired. This plan was initially briefed to the commander of the Honduran Armed Forces and the Secretaria de Obras Publicas y Transporte (Secretary of Public Works and Transportation—or SECOPT). The plan was well received but not for the reasons on which it was predicated. The plan was based on connecting the national capitals with departmental capitals—or along political lines. It just so happened that this plan also supported the economic necessity and lines of communication for getting agricultural harvests (primarily coffee and fruit) to international markets. This event began a direct relationship between the SECOPT and the JTF-B engineers.

During the immediate aftermath of the hurricane, the Honduran government went through several reorganizations to maximize their limited resources and streamline command and control. SECOPT was reorganized and became the Secretaria de Obras Publicas, Transporte y Vivienda (Secretary of Public Works, Transportation, and Housing—or SOPTRAVI). JTF-B engineers coordinated through the Military Group–Honduras to meet with SOPTRAVI at its temporary office in a parking garage at the Tocontin Airport in Tegucigalpa. A complex process began to prioritize and assign projects based on the resources available and the capabilities of the various countries that volunteered to help. JTF-B engineers spent many hours negotiating with SOPTRAVI on where to employ U.S. engineers, the specific projects, and standards of construction.

While coordinating with SOPTRAVI, SOUTHCOM was also preparing an engineer force package to support engineer operations in the four countries affected by the hurricane: Honduras, Nicaragua, Guatemala, and El Salvador. Based on the assessment already forwarded to SOUTHCOM from the joint operations area and the approved concept of operations, SOUTHCOM engineers devised a package that consisted of an engineer command and control headquarters, vertical and horizontal construction capabilities, and a bridging unit for each country. U.S. Atlantic Command was tasked to provide the units and further tasked the service components. The following units were selected to fill the requirements for Honduras:

- 22nd Naval Construction Regiment (FWD) as the overall engineer task force headquarters.
- Naval Mobile Construction Battalion 7 (NMCB 7) and the U.S. Army 68th Engineer Company (Combat Support Equipment [CSE)] as the vertical and horizontal construction capabilities.
- U.S. Marine Corps Combat Service Support Detachment 68 (CSSD 68) as the bridging asset.

The figure to the right shows the initial engineer task organization and line of coordination.



Engineer Projects

The final list of projects for JTF- B engineers includes four low-water crossings, five bridges, 135 kilometers of road work, and the repair of municipal utilities. The first priority was to link the coffee-producing regions west of Tegucigalpa to the capital and on to the ports. Two culvert crossing sites were constructed by NMCB 7 at Rio Hondo and Talanga. Not only was it important to reconnect this road for relief operations, it was also a major economic line of communication for the coffee harvest, which was ready for market. If the roads could not be opened, it would further compound the effects of the hurricane on the Honduran economy. Rio Hondo is where Honduran Route 15 (HN-15) crosses Rio del Hombre. This highway connects areas north, northwest, and west of the capital to the rest of the country. South of Talanga at a pueblo named San Juan de Flores, was a secondary route connecting Carratera 6 (CA-6) with HN-15 between Ojo de Agua and Talanga. This route helped relieve traffic off CA-6 while the bridge at Ojo de Agua was being shipped and installed. Constructed by NMCB 7, it consisted of a culvert crossing along the Rio Grande de Choluteca.

The third crossing was an ACROW bridge installed by CSSD 68 and the Honduran Primer Batallon de Ingenieria on CA-6 over the Rio Grande de Choluteca, which connected the coffee-growing region to the west of the capital. It was of major economic importance to get surviving crops to market.

The next priority was to reconnect the north coast highway from Puerto Castilla to Puerto Cortes. CA-13 runs along the northern coast of Honduras and connects an important fruit-growing region with the ports. Fruit exports are a major source of foreign income for Honduras. Three major cuts along this route were at Rio Bonito, Rio Perla, and Rio Congrejal. Unseasonable rains in December and January seriously hampered construction at these sites. In several instances, ongoing work was washed away by high, rapid currents. Rio Congrejal, which was constructed by NMCB 7, and Rio Perla, which was constructed by the 68th Engineer Company (CSE), were culvert crossings. Rio Bonito was a culvert causeway built by the 68th, but the CSSD 68 and Honduran engineers installed its 50-meter bridge.

Several important and difficult projects assigned throughout Honduras focused on commercial routes but were too difficult for the Honduran government to accomplish with its assets. The engineers of JTF-B assessed the projects and erected two bridges at Tegucigalpa and Ilama, repaired 35 kilometers of road in and around Morazan, and opened the port at Puerto Castilla.

In downtown Tegucigalpa, few bridges span the Rio Grande de Choluteca, which splits the city. The Molina Bridge was lost during the hurricane. A 50-meter, two-lane panel bridge originally was prescribed for the site, but it was not possible to locate four suitable points on which to rest a simple span bridge. Ultimately, CSSD 68 installed a 74-meter, two-lane, Class-40, triple-double ACROW bridge on footers specially designed to accept the weight of the bridge on existing structures.

The Ilama Bridge crosses the Rio Ulua and links the northern and southern parts of the country east of Lago de Yahoa. The only other route requires a five-hour detour. The available panel bridging could only span 74 meters in a single span, and the river current and limitations of the military engineers prohibited construction of an intermediate support. Therefore, the U.S. Army Corps of Engineers (USACE) located a suitable site upriver to construct a causeway and prepare a site for the bridge. A hydrologist and a civil engineer from USACE designed and supervised the 68th Engineer Company (CSE) in constructing the causeway and abutments and the CSSD 68 in constructing the bridge.

The road from Morazan to Yoro connects the Upper Valle de Aguan with the Valle de Sula (two important agricultural regions). Meandering up a narrow valley, a 7-kilometer section of the road was almost completely wiped out by raging currents. NMCB 7 and 68th Engineer Company (CSE) worked with local contractors at several sites along the road to make it passable to commercial traffic. These patches and crossings were very expedient and were not expected to last through the next rainy season. NMCB 7 also worked in and around Morazan on local mountain roads to clear mudslides and re-establish drainage. Despite their remote

Soldiers from the 68th CSE Company emplace a culvert at the village of Morazan.

location and the devastation of that region, the local people were always willing to help the Seabees and Army engineers in the area.

The main port facility for international shipment of fruit produced in the Valle de Aguan is Puerto Castilla. The port was heavily hit by high winds and sea surges. Two vessels were sunk on the docks: a Honduran Navy PT boat and a fishing trawler. These ships reduced the already limited dock capacity by half and made it necessary to load fruit shipments over the docks by hand. The reduced dock capability significantly decreased the throughput of commercial products and inhibited deployment of National Guard engineers en route to the area. U.S. Army divers from the 544th Engineer Team (Dive) of TF-10 (10th Transportation Battalion) worked for several weeks to salvage the vessels. They cut the PT boat into pieces and raised each piece separately with cranes. Using the same method, they raised the trawler in one piece, towed it to open water, and sank it. (See article on page 9.)

Lessons Learned

The lessons learned from this joint engineering operation were innumerable and many were not captured. Junior leaders—who faced and overcame difficulties in leadership, logistics, and engineering—learned most from this operation. Some of the major lessons learned at the joint level follow.

Engineer Command and Control

In an operation requiring significant engineer effort, the engineer command and control headquarters must be able to control all engineers in theater, design construction projects, perform construction management and quality assurance, and manage construction materials. The JTF-B Directorate of Engineering expected the 22nd Naval Construction Regiment (FWD) to be like a U.S. Army engineer construction group and command all engineers and their support elements and manage all construction in the joint operations area. Plans were made accordingly, and difficult projects were selected all through the Valle de Sula, western departments of Honduras, and the north coast. However, the 22nd only expected to build a 1,000-man base camp and perform repairs in and around Soto Cano. The unit selected the NMCB 7 headquarters as its "forward" command element and provided some augmentation. This arrangement overtaxed the 22nd's capability to command and control widely dispersed engineer missions. In particular, Seabees lack sufficient organic long-range communications to cover platoon-sized elements dispersed over a wide area. They are accustomed to receiving a mission then task organizing and cross attaching troops between companies to tailor a package for the mission.

Before deploying, the NMCB 7 and the air detachment commanders asked for specific missions and a definite engineer end state. JTF-B could not provide the 22nd with the information they needed because the situation was unclear at that time: assessments were incomplete, the Directorate of Engineering was still working with SOPTRAVI to define the U.S. role, and there were no designs for projects. Therefore the entire NMCB was deployed.

Because JTF-B expected to put the U.S. Marine Corps bridge company under the 22nd Naval Construction Regiment (FWD) for command, control, and support, they anticipated a unit of 80-90 marines. However, the SOUTHCOM operations order told units to plan to be self-sufficient when they arrived. Therefore the Marine Corps put together a package consisting of the bridge company; a reverse osmosis water-purification unit; and transportation, maintenance, communications, and other service support personnel. A total of 240 marines from the 2nd Landing Support Battalion at Camp Lejune became the Combat Service Support Detachment 68.

The Marine Corps' decision was fortuitous because the Seabees were recalled in mid-January and the CSSD 68 element was needed to command and control the remaining engineers—the Marine Corps Bridge Company and the 68th Engineer Company (CSE). Because it was a service support unit, CSSD 68 had no staff engineer section. The unit was augmented with an engineer major and captain from the JTF-B staff and a design team from USACE. The design team included a hydrologist,

a structural engineer, a civil engineer, and a site manager.

Class IV Management

Engineers must be able to requisition, manage, transport, and handle their Class IV bills of materials, which are essential to joint engineer mission accomplishment. Without positive control, many missions would have failed, not been completed on time, or not started at all. During this deployment, engineers were in total control of ordering, acquisition, transportation, handling, and accounting for Class IV supplies. The Seabees' Class IV was shipped directly from their unit in Gulfport, Mississippi, to Soto Cano. All other Class IV was procured through purchase requests and contracts prepared by engineers. The Seabees and marines either used organic assets to line-haul the materials or contracted the line-haul from a local vendor. Either way the engineers had positive control over the bills of materials.

Naval Facilities (NAVFAC) and USACE Roles

These engineers played a critical role in providing assessments, designs, and project management and were key to the success of this operation. USACE responded early to requests for assessments but redeployed when the assessments were completed. Later, NAVFAC engineers, who augmented the 22nd Naval Construction Regiment (FWD), completed initial designs for expedient crossings and performed several assessments of public facilities. They delivered expeditionary designs based on minimal data. Their job was made difficult because little or no valid hydrologic data was available. When the NAVFAC engineers redeployed with the Seabees in mid-January, a design team was needed to assist in redesigning structures that had failed due to unseasonably heavy rains. A second USACE team that had the right skills was assigned and took ownership of the projects.

Working With the Host Nation

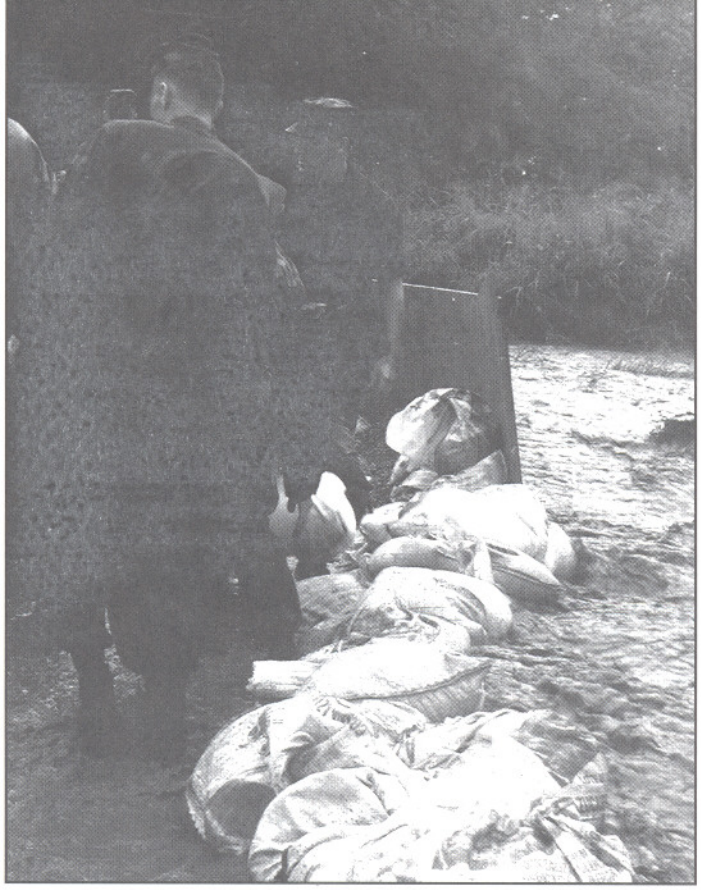
No two nations are the same. Even in Central America, *each country has its own customs, culture, history, and sensitivities.* To be successful with any of them, *country leaders must feel that they own the plan—because in reality they do.* The best JTF-B's Directorate of Engineering could do was articulate the capabilities of U.S. forces and recommend how they could best be used. There were many players in the relief effort: nongovernmental organizations, private volunteer organizations, and civilian and military personnel. *It is useful to know the big picture to determine where U.S. forces fit best. In disaster situations, especially where the government has been directly affected, it is important to be patient as they recover from the disaster. It is important to make clear what U.S. forces are willing and able to do and make sure they deliver. Always take minutes of meetings and record agreements, then translate them and provide the host nation government a copy. This confirms expectations and avoids misunderstandings.* In many cases, the Hondurans thought the U.S. temporary fixes would be permanent fixes. It was necessary to send written notification through the U.S. Embassy to the Honduran government to reiterate the expediency of the repairs and warn that they might not last through the rainy season.

The country's military groups and the civil-military operations office (JTF-B J5) played an invaluable role in coordinating engineer operations with the Honduran government, the local populace, and civilian contractors. All coordination with Honduras and other Central American countries was done through the military groups. They acted as an intermediary and helped convey the JTF-B story to the host nation and vice versa. They, along with the civil-military operations, coordinated with the Honduran military to provide security and engineers. Civil-military operations teams were assigned to every forward operating base and helped garner local support and labor for projects. The teams dealt directly with the local SOPTRAVI contractors on site to synchronize and support each project.

Panel Bridging

In this disaster, the Bailey bridge seemed to be a panacea for all bridging problems. The JTF-B engineer section was inundated with questions about this bridge from all sectors—government, civilian, military, foreign, and U.S. When word was put out that the Bailey bridge manual was available on the U.S. Army Engineer Center's home page, everyone became an instant Bailey bridge expert. There was a general misunderstanding of the capabilities and limitations of the bridge and exactly what it could do. Another misunderstanding was that commercially available panel bridges are of the same quality, the parts are interchangeable, and a single-single (single-width, single-story) bridge will fit any gap. In fact, each brand of bridging is different, and bridges must be specially designed for each gap. The Honduran government estimated that they had 700 meters of gap to bridge, so they ordered 700 meters of single-single panel bridging. However, river channel conditions made it impractical to build intermediate supports, so multistory, multiwidth bridges were designed. The original 700 meters of bridging was only enough to construct three bridges, and then only after ordering additional parts.

In the initial planning immediately after the hurricane, SOUTHCOM engineers researched the availability of Bailey bridging from war stocks. They found that most of the bridges were in poor condition and not ready for shipment. Thus, all the bridges emplaced by U.S. forces were commercially purchased panel bridges. Although their concept was similar to the Bailey bridge, marine engineers required a technical representative from the manufacturer to assist in the installation. In all instances, the panel bridges were placed adjacent to or as a detour away from the damaged bridge site. This allowed traffic to continue so the host



Soldiers and airmen construct a flood levee on Rio Conquigue.

nation could reconstruct permanent bridges. *The recommended solution is to keep a list of commercially available panel bridge points of contact, then custom order bridges to fit each site.*

Topographic Support

Early in the operation, the Directorate of Engineering determined a need for topographic surveys and terrain analyses. The topography of the country had altered due to significant land slides and river course changes. New topographic data was needed to determine the extent of the changes, to correct existing maps, and to determine watershed changes for hydrologic design.

When JTF-B was initially asked for their augmentation requirements, the Directorate of Engineering asked for a topographic survey detachment and a terrain analysis team. After several iterations of military occupational skills and grade changes, the commander of the 30th Engineer Battalion (Topographic) (Army) was consulted. Once he heard the requirements, he recommended and deployed a composite team of surveyors and terrain analysts. The surveyors surveyed bridge and crossing sites and river channels for JTF-B and assisted USACE and U.S. Geological Survey teams in surveying serious landslides. The surveyors also trained Hondurans to use newly acquired state-of-the-art topographic survey equipment.

The terrain analysts did not fare as well. An analysis of imagery before and after Hurricane Mitch could show areas of damage and changes in topography and watersheds. Even though U.S. Army Space Command offered to get the most recent post-Mitch data, baud rates and a disrupted postal system prevented getting the data to the terrain team. They did, however, produce several useful products for both JTF-B and the Honduran government. A landslide in the heart of the capital blocked the Rio de Choluteca and backed water into the city. The resulting topographic survey and terrain analysis allowed geotechnical experts to determine the extent of the slide, predict further slippage, and design remedial solutions. *The lesson learned is to keep data on the joint operations area as current as possible because the means to get new data may not be available or timely.*

Lastly, in dealing with civilians and other governmental agencies, the use of military grids is not widely accepted outside tactical units. However, when geolocating sites, using latitude and longitude was universally understood.

Real-World Training

This episode in Honduras was tragic to the people, the economy, and the country. But it provided an excellent training ground for all service engineers. No amount of training can prepare a unit, organization, or country for a disaster of the magnitude of Hurricane Mitch. Every unit that participated increased their training readiness. Young leaders were placed in remote locations and were required to act on their own with minimal guidance. Faced with issues of force protection, caring for their troops, and constantly dealing with local officials and contractors, they gained real-world experience rarely available at combat training centers. The engineering problems that the officers and NCOs encountered could not be taught in the classroom. Each problem required a unique solution, and in all cases decisions were made on the spot.

All parties involved made mistakes, but the service engineers demonstrated an incredible amount of ingenuity, flexibility, and teamwork. Jointness at the individual level was never an issue. Soldiers, sailors, airmen, and marines all saw the destruction of the countries and worked together to ensure that projects were completed.

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