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High-Tech Tools and Hard, Hard Work At FOB Rhino

By Tom Sawyer

Long before the first U.S. soldiers hit the ground in Afghanistan, military construction specialists began studying, analyzing, calculating and planning for the support the troops would need. Military engineers are using the information technology tools of the 21st Century—geospatial data mining, digital collaboration, remote sensing and imaging and satellite communications—together with intelligence in the classic traditions of the cold war to take on an enemy whose tactics range from driving bomb-laden camels toward their foes to crashing hijacked airliners into the towers of lower Manhattan.

MOON DUST **Huge planes trashed Rhino's dirt strip nightly. Seabees kept it open.** *(Photo courtesy of US Navy/Master Chief Photographer's Mate Terry Cosgrove)*

It is a story that may never be fully told, but from a series of interviews with military and construction officials, it is possible to sketch how the work is being done. A good starting point is the night of Oct. 19, 2001, 39 days after Sept. 11, as the first assaults by U.S. ground troops in Afghanistan started to unfold.

A MYSTERIOUS OBJECTIVE. On one stage helicopters swooped out of the moonless night to raid a Taliban headquarters in Kandahar, their troops snatching documents, data and prisoners and whisking them away. At another stage, 200 U.S. Army paratroopers, most from the 3rd Ranger Battalion of the 75th Ranger Regiment of Ft. Benning, Ga., along with a few "specialists" from the Army and Air Force, raided a strange fortified compound on a dry lakebed about 80 miles to the southwest.

Preceded by fire from supporting aircraft, the rangers jumped from four C-130 transports, parachuted down and burst into the walled compound's buildings. About 30 defenders fleeing from outlying buildings or rushing toward the compound were killed. The Rangers spent a few hours on the ground and then flew out in the same four transports that dropped them. Somehow, the pilots of those 155,000-lb aircraft knew by then that the outpost's 6,840-ft-long dirt runway was not only safe to land on, but that it also had room for them to turn and taxi and get away again.

Planning for Operation Rhino, as the raid was named, included numerous engineering issues, not the least of which was evaluating the unexplored airstrip. It was not only the return route for the raiders, it was also to serve as a staging point in case the simultaneous raid going on farther north ran into trouble and needed support.

Although it wasn't specified in the mission plan, that same brief visit also helped set the stage for the next act at Rhino on Nov. 25, when elements of the 15th Marine Expeditionary Unit, based at Camp Pendleton, Calif., began swarming in with more than 1,000 troops and an endless chain of aircraft to set up a forward operations base. Engineering support came from a detail of about two dozen Seabees from the Naval Mobile Construction Batallion-133, based in Gulfport, Miss., whose primary task was to improve and maintain the crucial runway.

Such commitments require good site condition information. But the brief night raid of Oct. 19, which began to wrap up when troops signaled the transport planes that the field was safe for landing, was the only "boots on-the-ground" time planners had. The rest of the analysis was made by studying satellite imagery, research and old-fashioned intelligence gathering.

One of the raid planners and participants, Maj. Robert Whalen, regimental intelligence officer with the 75th, describes the target as a "frontier outpost," surrounded by an 8-ft wall with 30-ft-high towers on each corner. And it was new construction.

"It was a self-contained compound attached to a 6,000-ft runway right in the middle of Afghanistan; an oasis of civilization in the middle of nowhere," he says. "Once we received a tip about it we got new satellite pictures and saw construction tents outside in September and October, and then they disappeared."

Whalen says raid planners—as do the rest of the military—rely on satellite imagery and other remote sensing data collected by the National Imaging and Mapping Agency, a secure federal clearinghouse for strategic satellite imagery and geospatial data under the Dept. of Defense and the Central Intelligence Agency. The raid planners used NIMA images to document the layout, calculate the wall height and estimate the number of people using the compound by looking for the latrines. Then they obtained "hand-held" photographs of the unfinished buildings that allowed the regimental engineer and master breecher to study the construction and estimate the sizes of charges that would be needed to blow openings into the walls.

But when the soldiers jumped from their planes on Oct. 19 there was still much they did not know.

"We had to make all sorts of guesses about what was at Rhino," Whalen says. "After we were there we knew the ground was very difficult to dig down any distance at all. It seemed very hard-packed to us. Rangers hurt themselves, two with broken legs and ankles." The high altitude of the compound, at 3,285 ft, also meant the soldiers, weighing 250 to 300 lb with their gear, came down fast. "To us it seemed very, very hard, but I bet to the C-130 pilots it probably seemed alarmingly porous," Whalen says. One thing the Rangers did not bring with them was their own engineer. "We wanted as many shooters as possible," Whalen says.

While the Rangers secured the perimeter and searched the compound's buildings, specialists from the Air Force, reportedly from the 23rd Special Tactics Squadron of the Special Operations Command based at Hurlburt Field, near Ft. Walton Beach, Fla., walked the runway in the dark. Alert for mines, they tested the runway with a soil penetrometer, a long rod with a cone-shaped end and a sliding weight. It registers soil resistance when the weight is dropped, allowing bearing characteristics to be evaluated.

The 23rd's members are trained in unconventional infiltration tactics, including scuba and free-fall parachuting. The unit includes a specialty group called combat controllers whose capabilities include surveying and assessing assault zones, and establishing and controlling landing and drop zones "in the most austere and inhospitable regions of the world," according to the unit's mission statement. In addition to inspecting and evaluating runways, the special tactics teams bring in kits that include battery-powered runway lights to guide in pilots.

A public affairs spokesman for the Air Force Special Operations Command declined to discuss Operation Rhino, in part because combat controllers were still in the field. "Combat Control has very few people but they have been working with all those units," he says. The C-130 aircraft used in the raid "can just about land anywhere," he added. "It's unbelievable."

"The most important intelligence we brought back was really the condition of that runway," says Whalen. "That was something we could not tell until we were actually on the ground and sampled it. We brought along specialists who walked up and down the runway to take readings and measurements.

"By the time we left we were absolutely certain it would support C-130s and cautiously optimistic that it would support C-17s. It was more time-consuming to figure out whether it could support a bigger aircraft like a C-17, and this was a raid. Our goal was to destroy the Taliban presence, destroy weapons, gather intelligence and get out. And do it within one cycle of darkness."

In the weeks following the raid intelligence officers monitored the site closely, looking for evidence of fresh mine laying activity "particularly on the runways, in case the Americans came back," Whalen says. On Nov. 25 they did.

EXPLODING CAMELS. Lt. Cmdr. Len Cooke, who led Naval Mobile Construction Battalion-133 to help set up Forward Operating Base Rhino, as it was now named, says the Seabees were tasked with finding water, controlling blinding clouds of dust and keeping the unpaved runway functioning through about 800 nighttime landings over the course of the next five weeks. "It was a dry lakebed runway that was designed for Cessnas and Piper Cubs, and they were landing C-17s," Cooke says.

The other challenge, of course, was the threat of enemy raids, which included the possibility of bomb-packed camels being driven into the lines and detonated by remote control—a strategy Afghan fighters had used against the Russians.

"In the month I spent at Rhino we would have a security alert sometimes twice a night, sometimes four times a night, and then sometimes nothing for four or five nights," Cooke says. Each time they passed the alert the Seabees grabbed their weapons and went to their defensive stations. "We're fighting engineers," Cooke says. "I've been in the uniform for 19 years and I have never been around a group of people where morale was higher and conditions worse."

At least one camel was unfortunate enough to enter the perimeter by running between two fighting holes one night. It was met with a barrage of fire but no trace of the beast was found in the morning.

During the month the base was in use, heavy transport aircraft, including the 585,000-lb Globemaster C-17s, arrived nightly. Their landing gear gouged huge gashes into the unpaved surface. Cooke says the big planes left ruts 18 in. deep and their wash blasted oceans of soil into the air. "This kind of soil and terrain is pretty common in that part of the world, but when it is hit by an aircraft it is more like moon dust and talcum powder than sand," Cooke says. "When a plane lands it pulverizes what little hardpan is on the land. It's more like fireplace ash."

Helicopter pilots throughout the theater of operations are plagued by blinding brown-outs as they return, resulting in hard landings and broken landing gear. Some crashes resulted in injuries and fatalities. At Rhino, the Seabees improved helicopter landing pads using scrap metal and clay. Maintaining the helicopters was complicated by their stations close to the dust-choked runway, a position needed to keep the security perimeter tight.

KEEP 'EM FLYING **Every morning the "pulverized" face of Rhino's runway was scraped away.** *(Photo courtesy of US Navy/Photographer's Mate First Class Greg Messier)*

Cooke says the Seabees did a lot of seat-of-the-pants engineering but as soon as they established satellite communications over SIPRNET, an Internet protocol router network for classified communications, and NIPRNET, an unclassified channel,they started long-range collaboration. “We were looking for assistance for engineering—drilling a well, stabilizing the dirt runway, controlling the dust,” says Cooke. “We were sending images back and forth over the SIPRNET nonstop, along with urgent requests for parts.

“We had so little equipment there we had to have critical priority on parts,” he says. If a grader broke down and runway maintenance fell behind it could have interrupted the airlift and compromised the mission. “The mechanics stayed out there with the operators. Sometimes right on the runway we had to do maintenance to keep them running,” Cooke says.

One of the Seabees’ first tasks was to dig a 6-ft-deep test pit by the runway, digitally photograph the wall and transmit the image back to supporting engineers in Bahrain and Hawaii for geotechnical advice. The Seabees also needed water badly, and asked for help in finding it.

Supporting engineers accessed NIMA’s data, studied the remote imagery and geology of the area and came back and told the Seabees where to drill. But there was a catch. In order to tap groundwater, supporting engineers told them they would probably have to drill to 600 ft to meet their needs. After considering the probable length of the mission, the time it would take to drill and the logistics of flying in equipment and enough 10-in. casing and 4-in. draw tube for the job, Cooke says the Seabees decided that flying in “bulkwater” made more sense. “We decided to try and squeak by without it,” Cooke says.

Water was needed for dust control and runway repair. Cooke says the top 3 ft of lakebed was like clayless moon dust. Below that, however, there was some clay. “So between landings we dug borrow pits off the side of the runway to find that clay...took whatever bulkwater we had and created improved dirt patches on the runway,” Cooke says.

At dawn each day they started repairs by scraping away the previous night’s rutted surface. Then, they would pick the worst spot and rebuild it by laying down a 3- or 4-in. layer of clay, wetting it, rolling it, and repeating the process over and over again. They could improve 400 ft to 600 ft each day this way, and the patch would last four or five nights before it was trashed again. It helped, but it was a stop-gap method and not a solution. With more than 6,000 ft of runway, the Seabees were not exactly gaining.

After time, the entire runway began sinking to the point where a front-end loader had to follow the graders to pick up the spoil and throw it over the growing berm along the side. The airstrip also began taking on a concave profile from the wheels tracking down the center, a circumstance that required additional periodic grading to restore flatness.

The machines worked the runway from sunup to sundown and between landings at night. “Whoever landed first each night got a pretty good ride. Everybody else had to pay the price,” Cooke says.

At the same time, supporting engineers in Hawaii were tracking down a dust control product called Envirotac II that had been tried on Marine maneuvers in Arizona a few years earlier. Justin Vermillion, vice president of Environmental Products and Applications Inc., Envirotac’s Wildomar, Calif., manufacturer, says he began to get a series of phone calls and urgent requests for test samples.

The product is a syrupy “goo” that is mixed with water and applied as a top dressing to harden loose soil, he says. Vermillion’s sample was quickly approved, and by Dec. 12 he had filled two 5,500-gal bulk trucks with the product and driven to a waiting C-17 at March Air Force Base in Riverside, Calif. Lacking the plastic containers needed for air-shipping the product, Vermillion says they picked up 206 used Pepsi drums from a feed store’s horse trough inventory on the way to the airport and packaged the hardening agent on the runway as Marines loaded the plane.

“Everything was from the hip, we didn’t get PO numbers or anything,” he says. “I didn’t know it was going to Camp Rhino until afterward.”

When it arrived, Vermillion says he got a telephone call from a Seabee engineer at Rhino. Cooke says they called because the kind of application they had in mind wasn’t exactly covered in the product literature. “We were looking for a little insanity check,” Cooke says.

Vermillion says he also learned the Marines took to calling his product “Rhino Snot.” That was all it took to give the product, which already had some other nicknames, a new moniker. The name stuck and so did the runway.

Cooke says advanced digital communications and imagery were key to quickly and accurately assessing physical problems and prescribing the solutions. “Without the ability to communicate from that remote location accurately about our requirements, we would not have been able to do the mission as easily or as successfully. A picture was worth 1,000 words. It would have been very difficult for us without that digital communication

Live From Afghanistan: Linking Experts to the Field by Satellite

The U.S. Army Corps of Engineers is providing support to combat engineers in the field via "TeleEngineering Operation Communications" kits that provide live video-conferencing and data links to subject matter experts back home.

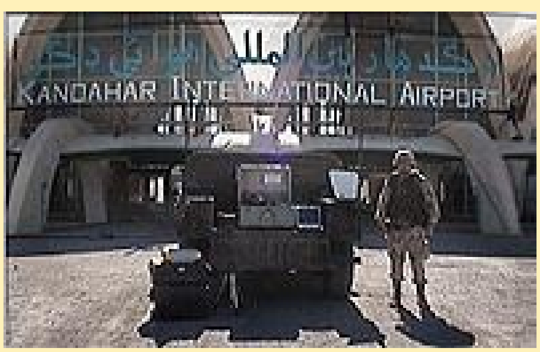
The kits, developed at the U.S. Army Engineer Research and Development Center in Vicksburg, Miss., come in two versions. One is used to install an office network at a base; the other for satellite communications from the field. They are being used heavily by military engineers repairing bomb-damaged runways and neglected infrastructure facilities, such as water and electrical systems, bridges, tunnels and roadways.

DEPLOYABLE KIT HAS PC, VIDEO CONFERENCING GEAR. *(Photo courtesy of Wayne Fryer, USAERDC)*

"If you've got a pavement problem it makes it real easy to describe, especially if you have something for scale," says Lt. Col. Michael Picard, senior operations officer for military operations at the Corps' Southwest Division headquarters in Dallas, the campaign's engineering-support provider.

"The reason we are using these kits isn't because they are 'gee-whiz,' it's because we want to bring great amounts of engineering expertise forward to help that guy on the ground support the maneuvering commander," he says.

The deployable kits have been steadily improved and made smaller ever since their first use 3 $^{1}/_{2}$ years ago in the Balkans. The 67-lb packages house a Polycom ViewStation for video-conferencing, a Panasonic Toughbook ruggedized notebook pc, an external hand-held camera, a connection for an M-4 satellite terminal and a sophisticated encryption device that lets it communicate outside of military channels over commercial satellite links. They can be powered by 110v or 220v ac power, or from a vehicle battery.



CORPS LIAISON KIT WITH KANDAHAR KIT. *(Photo courtesy of 2nd Lt. Phillip Valenti, Charlie Company, 326 Engineering Battalion, 101st Airborne Div. US Army)*

The kits have been reliable, Picard says, and have enabled the Corps to make its "absolutely huge engineering resources" available to combat engineers without having to send specialty experts forward. "We have been able to move stuff back and forth, and it doesn't burden the military communications either," he says. "We are a ghost in the background. We come packaged with our own communications."

There are three of the units in theater now, one at headquarters in Kuwait and one in Kandahar. The third has been lent to the 10th Mountain Division from Ft. Drum, N.Y., which is involved in a huge rehabilitation project at an old Soviet base at Karsi Khanabad, Uzbekistan.

"I'm absolutely amazed some wirehead hasn't already invented this thing, and that it was left up to the [Corps of] Engineers to say, 'we need this capability. Let's build it and field it,'" Picard says.

Strategic Data And Image Service Feeds Mission Planners

The National Imaging and Mapping Agency was formed in 1996 from eight defense-related imaging, mapping and analysis agencies. A name-change, to National Geospatial Intelligence Agency, is being considered.

The tempo at NIMA has soared since Sept. 11. Says one staff specialist who asked not to be identified: “If we’re going after terrorists worldwide...wouldn’t you expect a quantum increase in the workload, across the board in every federal/ defense-related entity imaginable?”

The data NIMA is delivering for operations in Afghanistan includes a new set of radar topographic measurements made from the Space Shuttle a year ago. They capture elevations on the entire globe from 56° north latitude to 56° south latitude, with data points every 30 meters that are up to two-and-a-half times more accurate than the incomplete aerial photo-based data available before. Sample U.S. images are at *www.jpl.nasa.gov/srtm.*

The points can be displayed as exquisite photo-like images. But the real magic is not in their ethereal beauty but in the fact that they are representations drawn from 12.9 million points in every 60-mile square, to which site-specific intelligence can be referenced. It is a map on which a global geospatial database can be framed. At its best, such a database means that anything that can be located in three dimensions and registered there can be prompted to interface with software, or reveal everything on file about it, simply by pointing and clicking with a mouse.

Commands within the Air Force have been developing geospatial systems for bases since 1995, after a rape incident in Okinawa led to an agreement to reduce Kadena Air Base there to half its size. The challenge was to compress the base and “not lose the mission,” says Brig. Gen. Patrick Burns, who was deputy civil engineer at the Pacific Air Forces headquarters in Hawaii at the time and is now head civil engineer for the Air Combat Command at Langley AFB, Hampton Va. By creating a spatial database of Kadena, planners were able to manipulate alternatives before the compression began and automate management once it was done.

Their system, called GeoBase, is built around industry standards and commercial software to encourage broader application. An offshoot is GeoReach, an expeditionary version that begins with collected images of a foreign site being assessed for rapid base deployment. NIMA has data and images of 12,000 airfields around the world that can provide starting points for planners.

Decision-quality data is linked to the image. Burns says the process can remotely develop 70% to 80% of the information needed to execute a “beddown” in 45 days—a deployment that might mean a tent city for up to 5,000 people and runways capable of handling fighter jets and transports. The missing information is filled in by fast-moving reconnaissance teams with wearable computers, digital cameras, testing tools and GPS equipment.

GeoReach got its first field test two months before Sept. 11 in a covert Drug Enforcement Administration deployment of three C-130s in South America. The Air Force says it is being used extensively in Operation Enduring Freedom now.

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