HANDBOOK

No. 09-33 May 09

Tactics, Techniques, and Procedures

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Foreword

Route clearance (RC) is a critical mission for U.S. Army units. Throughout Iraq and Afghanistan, units must clear roads of obstacles, primarily improvised explosive devices (IEDs), to allow freedom of movement for friendly forces and the local populace. Although engineer units shoulder much of the burden for this task, RC is a mission that all units should understand and be able to execute with available resources.

This handbook supplement, authored by the 766th Explosive Hazards Coordination Cell (EHCC) during Operation Enduring Freedom (OEF) 08-09, is a guide for RC operations in Afghanistan. For ten months, the EHCC's mobile observation team observed Task Force Workhorse, the 201st Engineer Battalion, Kentucky National Guard, while it cleared the roads of Afghanistan. During this time, the IED threat increased greatly, and insurgent actions evolved to a much more sophisticated level. The EHCC chose to consolidate critical information in order to help future OEF deploying units, specifically RC-focused units, to develop training plans and prepare for their missions in Afghanistan. This Afghanistan Route Clearance Supplement describes the latest tactics the insurgents use and the actions the platoon-level route clearance packages take to mitigate these tactics. Afghanistan is much different from Iraq in both terrain and threat. This supplement presents effective ways for units to employ the latest RC vehicles and other support equipment in Afghanistan.

The enemy continues to evolve rapidly in Afghanistan. The U.S. military continues to field new technology in an effort to defeat IEDs. Each unit that uses this handbook should provide updates and comments to the Center for Army Lessons Learned for the benefit of future U.S. forces.

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Afghanistan Route Clearance Supplement

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Introduction

Route clearance (RC) operations for Operation Enduring Freedom in Afghanistan are much different from RC operations for Operation Iraqi Freedom in terms of the terrain, seasonal weather, level of infrastructure, volume of insurgent threats, sources of improvised explosive device (IED) components, and motivation for IED emplacement. The purpose of this supplement is to focus on RC in Afghanistan.

Overview of Afghanistan

Afghanistan is composed of 34 provinces and is operationally divided into five regional commands: Regional Command Capital, Regional Command East, Regional Command North, Regional Command South, and Regional Command West. Regional Command Capital is completely surrounded by Regional Command East but is independent of the Regional Command East command. Regional Command Capital is composed of Kabul Province alone. The provinces in Regional Command East are Paktika, Paktya, Khwost (P2K); Ghazni, Wardak, Logar; Nangarhar, Nuristan, Konar, Laghman (N2KL); Bamyan; Parwan; Kapisa; and Panjshir. The provinces in Regional Command North are Faryab, Jawzjan, Sari Pul, Balkh, Samangan, Kunduz, Baghlan, Takhar, and Badakhshan. The provinces in Regional Command South are Nimroz, Helmand, Day Kundi, Oruzgan, and Zabul. The provinces in Regional Command West are Badghis, Herat, Ghowr, and Farah.

Figure I-1. Afghanistan provinces

U.S. forces are focused primarily on Regional Command East. Regional Command East is further divided into five areas of operations (AOs). The five AOs for Regional Command East

are Currahee in the southeast, Duke in the northeast, Warrior in the north-northwest, Ghazni in the west, and Spartan in the center. The provinces in AO Currahee are Paktika, Paktya, and Khwost (P2K). The provinces in AO Duke are Nangarhar, Nuristan, Konar, and Laghman (N2KL). The provinces in AO Warrior are Bamyan, Parwan, Kapisa, and Panjshir. AO Ghazni is composed of the Ghazni Province alone. The provinces in AO Spartan are Wardak and Logar.

Figure I-2. Afghanistan by regional command

Some AOs are further subdivided into minor AOs; however, the minor AOs do not necessarily correspond to the provincial boundaries. AO Currahee is composed of Team (TM) Paktya, TM Khowst, TM Eagle, and TM White Eagle. AO Duke is composed of AO Raptor, AO Pacesetter, AO King, AO Rock, and AO Saber. AO Warrior, AO Ghazni, and AO Spartan are not broken down into minor AOs.

In AO Currahee, the minor AO boundaries generally align with the provinces; however, there are a few exceptions. TM Paktya contains only Paktya Province. TM Khowst contains only Khowst Province. TM Eagle contains the east half of Paktika Province, while TM White Eagle contains the west half of Paktika Province.

In AO Duke, the minor AO boundaries generally do not align with the provinces; however, there are a few exceptions. AO Raptor contains Nangarhar Province. AO Pacesetter contains Laghman Province. AO King contains the westernmost third of Nuristan Province; AO Rock contains the middle third of Nuristan Province and the westernmost three-quarters of Konar Province. AO Saber contains the easternmost third of Nuristan Province and the easternmost quarter of Konar Province.

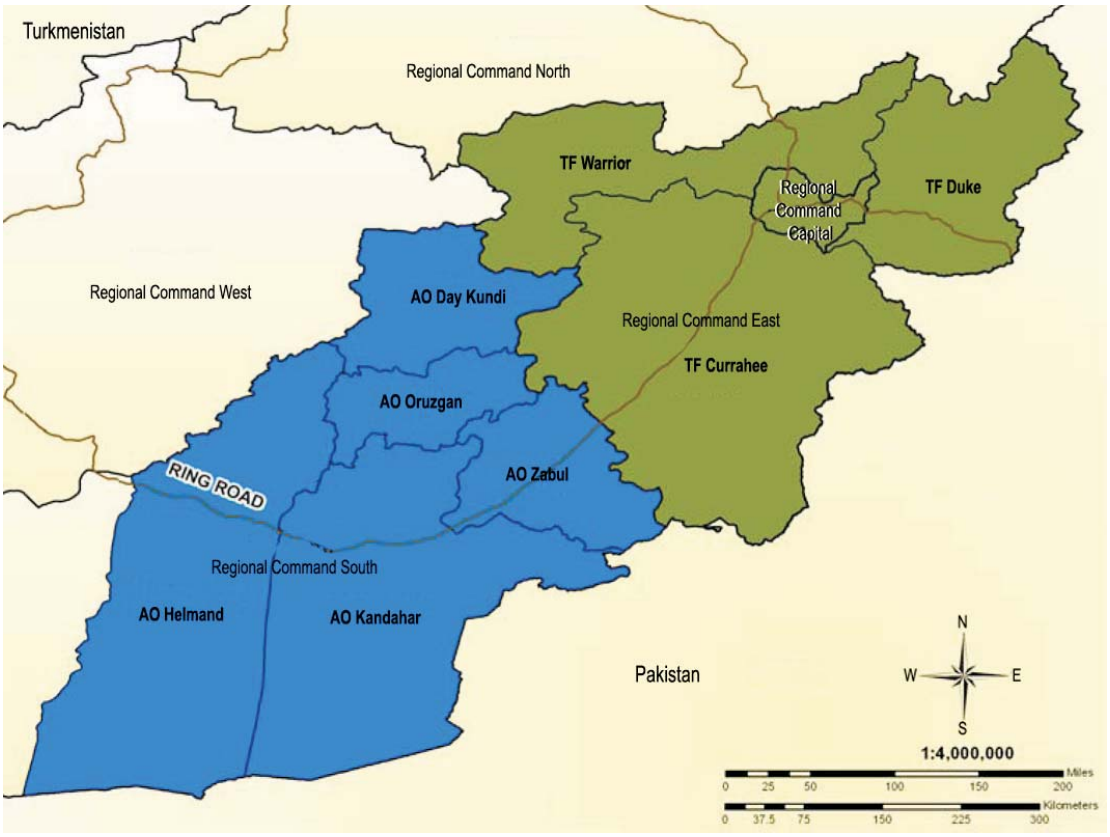

Figure I-3. Afghanistan by AOs

Terrain and Weather

In Afghanistan, the terrain varies drastically from one area to the next. The country is divided into three major geographic zones: the northern steppe, the southern desert plateau, and the spine of the Hindu Kush mountain range. The northern steppe runs across the northern border from Badghis in Regional Command West to Takhar in Regional Command North. The southern desert plateau runs across the western and southern border from Herat in Regional Command West to Kandahar in Regional Command South. The Hindu Kush mountain range and its offshoots run generally from northeast to southwest and cover the rest of the country. Figures I-4a, I-4b, I-4c, and I-4d all show Regional Command East.

Figure I-4a

Figure I-4b

Figure I-4c

Figure I-4d

The provinces that contain the northern steppe include Badghis, the northern half of Faryab, Jawzjan, the northern half of Sari Pul, the northern two-thirds of Balkh, Konduz, and the northeast quarter of Takhar. The provinces that contain the southern desert plateau include the

western half of Herat, the western two-thirds of Farah, Nimroz, the southern three-quarters of Helmand, and the southwestern three-quarters of Kandahar. The provinces that contain the Hindu Kush mountain range and its offshoots include Badakhshan, Takhar, Baghlan, Samangan, Balkh, Sari Pul, Faryab, Herat, Ghowr, Farah, Helmand, Day Kundi, Oruzgan, Kandahar, Zabul, Paktika, Paktya, Khowst, Ghazni, Wardak, Logar, Bamyan, Parwan, Kapisa, Panjshir, Nuristan, Laghman, Konar, Nangarhar, and Kabul.

Some areas are extremely mountainous, and the so-called roads are nothing more than narrow goat trails, which offer insurgent forces excellent cover and concealment from approaching maneuver forces. There are many ideal spots for ambush near to the roads, and several IED events in these areas have coordinated small arms fire incorporated into the attacks. In other areas of the country, the terrain is wide open desert and without many hiding spots near the roads. The methods of attack in these areas are drastically different.

Fighting Season

The weather in Afghanistan plays a major role in the way units conduct operations. The seasonal nature of the mountainous regions lends itself to a "survival season" and a "fighting season." The survival season is primarily the winter months. Harsh winters offer extremely cold temperatures and large snow accumulations. In many areas, the snowfall makes the roads completely impassible and shuts off ground maneuvers completely in some parts of the country. The fighting season begins with the spring thaw and allows for movement in areas that were previously impassible due to the harsh winter conditions. This fighting season usually ramps up from the early spring to the beginning of summer. The summer weather can also be harsh. Hot, dusty, dry conditions will often limit the movement of forces not properly protected from the heat. In the fall, when the extreme heat has passed, IED activity sparks up again; however, it is usually not as intense as the spring fighting. Most people are focusing on preparing for the coming winter months and not on fighting.

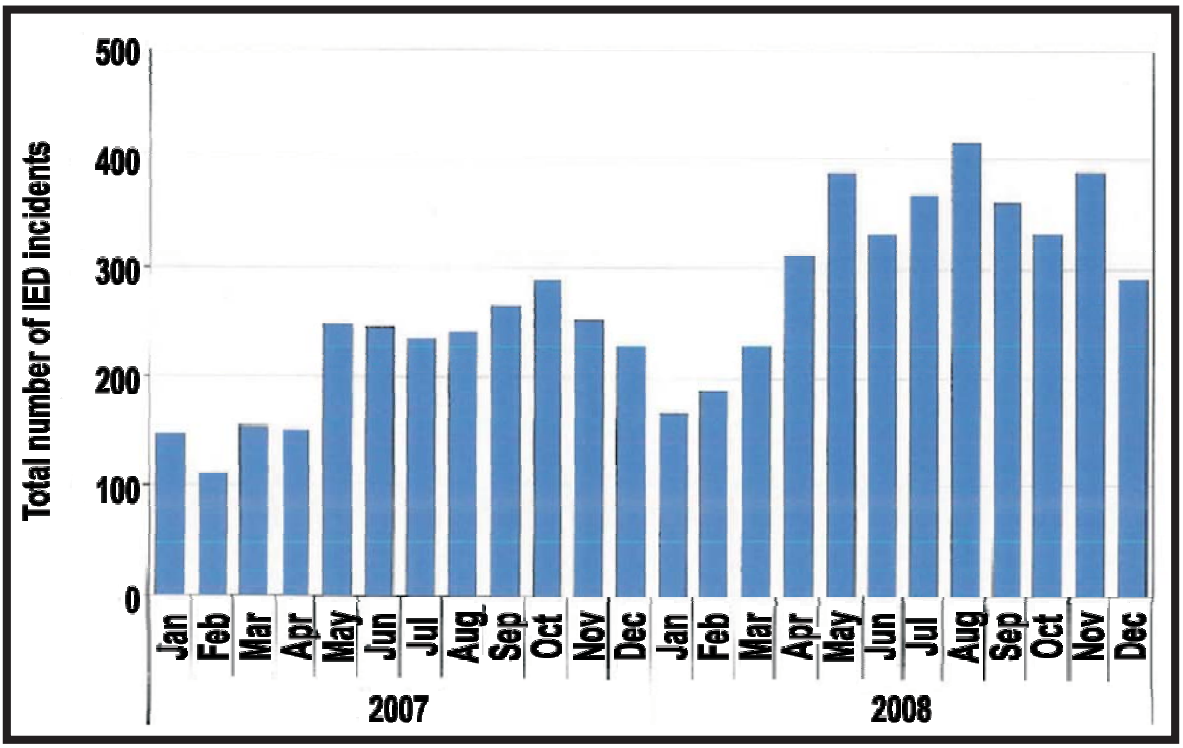

Figure I-5. Number of hazards by month

Infrastructure

Infrastructure or, more to the point, a lack of infrastructure is a major issue in Afghanistan. The vast majority of the roads in Afghanistan are unimproved and not well defined. Often the location of the road changes from season to season and from year to year. Flooding, washouts, rockslides, lack of infrastructure, discovery of a better/safer/faster/more direct path, and many other factors all contribute to the ever-changing network of trails and paths used for vehicular traffic. In some areas, drivers use dry riverbeds as primary roads during the dry season. These wide open "roads" can quickly become raging rivers during the spring thaw. In some areas, the roads are paved; however, many years of damage from tracked vehicles and explosions from previous wars have greatly degraded their serviceability. These paved roads are often limited to the main ring road and a few off shoots from that road.

The sources of IED components in Afghanistan are drastically different from those in Iraq. In Afghanistan, there are fewer components for making IEDs. A cache in Afghanistan usually does not meet the minimum requirements of a cache in Iraq. The enemy uses homemade explosives in IEDs in Afghanistan, which bring additional complications to the RC mission. Additionally, there are many existing minefields that are mistaken for IEDs. RC units should deal with these areas as minefields rather than IEDs. Sometimes the enemy transplants mines from the minefields to a roadway. In these situations, it is difficult to determine if the area is a part of a larger minefield and should be dealt with as such, or if the area is more like an IED and should be dealt with accordingly.

The motivations for using IEDs in Iraq and Afghanistan are similar in some areas and different in others. In the lowlands, which are primarily in the south and west, the enemy uses IEDs as an initiator for an attack and then again when targeting first responders or reactionary forces. In the highlands, which are primarily in the north and east, the enemy uses IEDs to shape an attack and limit mobility.

Culture, People, and Religion

Culture

Afghan culture is a rich mix influenced by different ethnicities and languages. It is extremely difficult to generalize about an entire population; however, Afghans are typically friendly and hospitable. Their lives have been rife with conflict, and they can be stern. The Afghan's belief that Allah controls all matters greatly influences his perceptions. This belief helps Afghans tolerate extreme physical hardship.

Approximately 44 percent of Afghans are Pashtun, about half of whom are of the Durrani tribal group and the other half of the Ghilzai group. Tajiks are the second largest ethnic group with 25 percent of the population, followed by Hazaras at 10 percent and Uzbeks at 8 percent. Other smaller groups, including Turkmen, Qizilbash, Kazakhs, Aimaq, Wakhis, Nuristanis, Baluchis, Kyrgyz, Sikhs, Hindus, and Jews, constitute the remaining 13 percent of the total population.

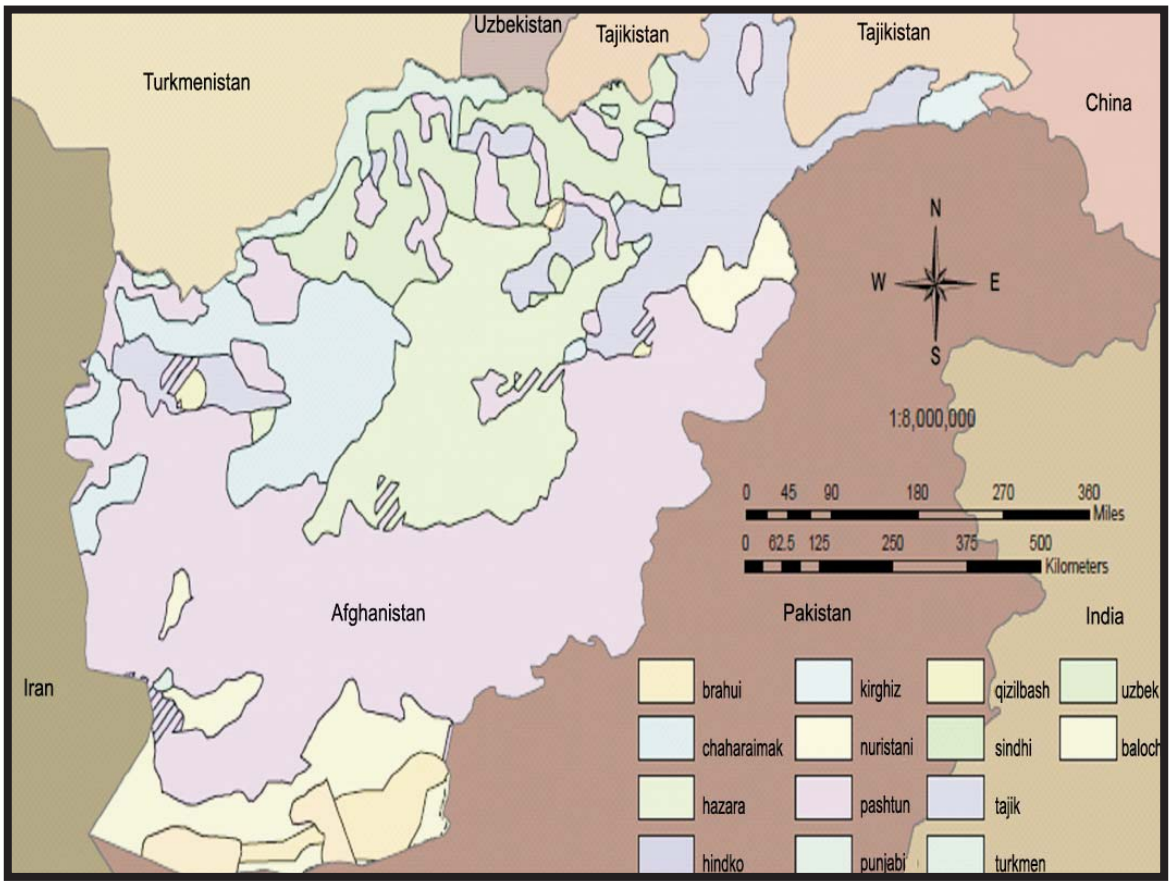

Figure 1-6

People

The Afghans' primary loyalty is to their families, kin groups, clans, or tribes; they express their identities through these groups. Their moral attitudes are often strict and inflexible, and they stress honor and individual responsibility to fulfill expected roles. Personal disputes are not resolved easily because of the need to protect one's honor. Personal behavior affects family honor, so Afghans consider it essential to live according to these rigid rules. Piety and stoicism are admired traits.

Afghan society is mostly rural. The rural populations are mostly concentrated along the rivers. Villages in Afghanistan encircle larger towns that act as commercial, communication, and administrative centers. The most heavily populated and urban part of the country is between the cities of Kabul and Charikar. Other population concentrations can be found east of Kabul near Jalalabad, in the Heart oasis and the valley of the Harirud River in the northwest, and in the Valley of Kunduz River in the northeast. Most urban settlements have grown along the ring road that runs from Kabul southwest to Kandahar, then northwest to Herat, northeast to Mazar-e Sharif, and southeast to Kabul. Cities have formed where major routes intersect.

Thirty-two languages and dialects are spoken in Afghanistan. Dari (a form of Persian) is spoken widely and has several dialects. It is similar to the Farsi spoken in Iran and Tajik spoken in Tajikistan. Pashtu has two major variants and many dialects.

Religion

Afghanistan is an Islamic society; 84 percent of the population follows the Sunni tradition, 15 percent of the population follows the Shi'a tradition, and 1 percent of the population follows other traditions. However, Islam has not been a unifying force that has overcome ethnic differences. Local religious leaders are often not well educated. The level of religious observation varies, but most Afghans profess a strong adherence to the Islamic faith.

Chapter 1

Tools of the Trade (Route Clearance Equipment)

The Route Clearance Package Team (size and equipment)

The main platforms units currently use in theater are the interim vehicle-mounted mine detector (IVMMD) or Husky/Meerkat, the mine-protected clearance vehicle (MPCV) or Buffalo, and the medium mine-protected vehicle (MMPV) or RG-31. Each unique vehicle has a primary mission as a part of the route clearance package (RCP).

IVMMD (Meerkat/Husky)

Units use the Husky for detection. The original system is composed of two elements: a Meerkat and a Husky with mine-detonation trailers (MDTs). However, the in-theater configuration of this system is slightly different. Most RCPs have two Huskies, no Meerkats, and no MDTs. Huskies carry one Soldier and offer blast protection from antitank (AT) blast mines. They have proven effective in searching for IEDs and AT mines. At low tire pressure, they can overpass an AT mine without activating it. They are blast protected to 15 pounds (lb) TNT equivalent and offer ballistic protection to 7.62 x 51-millimeter (mm) ball ammunition projectiles. The detection array consists of induction coils that detect magnetic fields beneath the vehicle. Soldiers have walked away unharmed from frequent IED hits.

Figure 1-1. Husky

MPCV (Buffalo)

Units use the Buffalo for investigation of possible IEDs. The Buffalo is equipped with a hydraulic arm and camera for IED search and investigation. The vehicle weighs 23 tons and stands 12.5 feet (ft) high and 28.5 ft long. The hydraulic boom arm has attachments for scraping and digging. Buffalos are blast protected to 30 lb of TNT equivalent under the centerline of the

vehicle and 45 lb under any tire. Additionally, it offers ballistic protection to 7.62 x 51-mm ball ammunition. Most Buffalos in theater have shoulder-fired antitank (RPG) rocket protection in the form of a cage, which prevents the RPG rocket from functioning properly in the event of a direct hit. To date, Buffalos have taken hundreds of hits with few fatalities. They have contributed to neutralizing thousands of IEDs. Buffalos can carry up to six Soldiers; however units configure most Buffaloes to carry five and take the sixth seat out to make room for additional equipment.

Figure 1-2. Buffalo

MMPV (RG-31)

Units use the RG-31 for security. The RG-31 is the primary weapons platform for the RCP and can carry up to eight Soldiers; however, most RG-31s in theater are configured to carry six.

Figure 1-3. RG-31 MK 5

The vehicle offers blast protection from AT mines under any wheel or the centerline. This diesel-powered 4 x 4-vehicle offers better protection against mine blasts than the M1114 and M1151 up-armored high mobility multipurpose wheeled vehicle (HMMWV). It is blast protected to 15 lbs TNT equivalent front, rear, and centerline. Additionally, it offers ballistic protection to 7.62-mm ball ammunition. Units use the RG-31 extensively for command and control of route and area clearance missions, force protection, and very important person transport. The vehicle minimizes inherent risks to personnel during countermine/counter-IED missions. Units can add a hydraulic arm, similar to the one on the Buffalo, to the RG-31; however, personnel should not

use the arm as the primary mode of interrogation because it lacks strength and is unable to interrogate as deep as the Buffalo. Currently, the most common variant of the RG-31 is the RG-31Mk5E, also referred to as the mine resistant ambush protected (MRAP) vehicle. Though this is not the only MRAP vehicle in existence, it is the primary engineer MRAP platform in use.

Other Route Clearance Package Vehicles

M984 heavy expanded mobility tactical truck wrecker

Units use the M984 heavy expanded mobility tactical truck (HEMTT) wrecker for recovery. The M984 is an 8 x 8 HEMTT equipped with a heavy-duty crane and winch. It provides heavy wheeled recovery and crane recover/tow/maintenance lift assistance to 10-ton and lighter tactical wheeled vehicles. Its lift-and-tow system can recover disabled vehicles in two to three minutes. The HEMTT wrecker weighs 49 tons and is 7.8 ft tall and 32.8 ft long. The materiel-handling crane has a capacity of 5 tons at 12 ft or 12 tons with boom extension retracted and resting on boom support tubes. The winch has a 30-ton capacity. The HEMTT can pull a Buffalo but cannot lift it. Occasionally, a unit will use the HEMTT to lift and recover a Buffalo, but it is not recommended and will stress the vehicle beyond its design parameters, which may result in long-term damage to the wrecker. The on-scene commander should make the decision to lift a Buffalo with the M984 HEMTT wrecker and take into consideration all the repercussions of pushing the equipment to its limits. The M984 HEMTT wrecker can pull, tow, or lift the Husky and RG-31.

Figure 1-4. M984 HEMTT wrecker

M916 with M870 trailer

Units use the M916 with M870 trailer for recovery. The M916 light equipment transporter is a 20-ton 6 x 6 tractor used primarily to tow compatible semi-trailers. Units primarily use the M870 40-ton “lowboy” semi-trailer to transport engineer construction equipment in the local, line haul, and maintenance evacuation missions in primary, secondary, and off-road conditions. It has an on-board winch capable of pulling engineer construction equipment onto the trailer. The M916 shares engine, transmission, and other components with other M915-series trucks.

Figure 1-5. M916 with M870

Add-On Equipment

The Department of Defense (DOD) is fielding several "add on" pieces of equipment in theater. Most of this equipment adds capabilities to vehicles, allows them to serve in more than one role, and provides redundant capabilities to detection and investigation assets.

Figure 1-6. RG-31 MK with mine roller

Units can add the Self-Protection Adaptive Roller Kit (SPARK) to an RG-31 or M1114/M1151 up-armored HMMWV. The front roller consists of two roller banks on the left and right side of the vehicle that provide contact with the ground, which causes IEDs to detonate on the roller. When IEDs detonate on the roller, the blast is forced down and out, as opposed to underneath the vehicle. Eighty percent of the battle-damaged rollers are repaired and returned to the warfighter within hours. DOD is currently fielding a SPARK variant specifically for OEF.

Figure 1-7a. Mine roller

Figure 1-7b. Mine roller

The Vehicle Optical Sensor System is a visual detection asset. The gyro-stabilized camera offers multiple modes and produces images in both day and night, thermal, and high-zoom magnification. This camera enhances the visual detection abilities of the route clearance operation and allows for on-the-move detection with the capability to provide video feed. The video feeds allow the operator to pass critical information to decision makers or special units such as explosive ordnance disposal. Units typically mount these systems on the RG-31 platform.

Figure 1-8. RG-31 with gyro cam

Chapter 2

Route Clearance Formations

Basic Formation Principles

All route clearance packages (RCPs) use variants of the same basic RCP convoy formation. Each variation used by the convoy commander is an adaptation based on the type of route (improved versus unimproved), quality of the road surface, history of improvised explosive device (IED) emplacement, and visual indicators present on the route. The order of march may change throughout the mission based on visual indicators, current intelligence, and changes in conditions along the route itself.

The basic components of RCP convoy formations are detection, interrogation, explosive ordnance disposal (EOD), and command and control (C2) and security. The detection element, whether Huskies or mine rollers, leads the convoy. Interrogation and EOD fall in behind the detection element but stay in that order. Security vehicles should spread out within the convoy to ensure complete security coverage of the convoy. Convoy leaders should give specific attention to vehicles without crew-served weapons, such as: the Husky, Buffalo, M916, light equipment transporter, and heavy expanded mobility tactical truck.

The order of march should never be dictated too rigidly or specifically by unit standing operating procedure. The order of march should remain fluid and open to the interpretations and intuitions of the RCP commander.

Detection

The detection element consists of Huskies and mine rollers that can be interchanged based on the route type as well as mission time constraints. Huskies have better visibility, a high blast survivability rate, and metal detection capabilities. When an RCP uses two Huskies in tandem, the vehicles should clear side and center overlapping lanes. The side cleared should vary between missions to prevent setting a predictable pattern. One theory is to clear only the left side since the enemy expects allied forces to drive on the right. This, however, sets another predictable pattern that the enemy can easily exploit.

Mine rollers can be placed in the lead on paved roads as well as when speed is a priority consideration off-road. RCPs have also used mine rollers to quickly proof choke points to allow gun trucks to maneuver during ambushes when thorough interrogation of choke points is impractical or dangerous.

Interrogation

Interrogation vehicles are the Buffalo and the RG-31 with an interrogation arm. The difference in capability between the two is significant. The Buffalo has a much stronger arm, but it has no way to defend itself with crew-served weapons. The RG-31 has a turret-mounted crew-served weapon; however, its arm is much weaker and is nearly unusable when trying to interrogate in the rocky or hard-packed soil common in many areas of operation.

If the RCP uses the RG-31 for interrogation, the gunner in the turret should lower himself inside the vehicle to protect against a possible detonation.

The RCP should use the Buffalo as the primary interrogation vehicle. Its placement in the convoy is dictated by route width and the level of protection it will require from other vehicles

within the formation. If a route is too narrow, when the detection element encounters a possible IED, the Buffalo may be unable to maneuver into position for interrogation.

Command and control and security

Convoys generally use the mine resistant ambush protected (MRAP) vehicle (RG-31 MK 5) or the legacy RG-31 vehicles (MK 1 and MK 3) for security needs on the ground. Much like in any other convoy, the C2 element is embedded with the security element and centered in the order of march. Generally speaking, there is a lead gun truck and rear security, and the rest of the available gun trucks are dispersed evenly throughout the convoy to provide optimum coverage of unprotected vehicles.

As long as the convoy holds to the principles listed above, one formation works as well as any other. Each RCP mission operates on a different route with a different purpose, different time constraints, and various limiting factors.

Formation Examples

Paved roads

Figure 2-1. Paved roads formation

While RCPs can use Huskies on paved roads, they normally do not because of the large amount of trash, debris, and buried infrastructure objects that produce continuous metal signatures to the Huskies. Mine rollers will usually take the lead on paved roads, because they still offer some protection against victim-operated (pressure plate or tripwire) IEDs.

Unimproved roads

Figure 2-2. Unpaved roads formation

Huskies will almost always lead the way on an unpaved road. The MRAP mine roller will drop back to allow the Huskies to find IEDs but will stay in front of the rest of the convoy to give one added layer of protection for the vehicles that follow. On more than one occasion, IEDs with a simple pressure plate have detonated on the fifth or sixth vehicle, even though every vehicle in front of them ran over the pressure plate as well. Most times this occurs because the pressure plate does not function properly because rocks or debris prevent the contacts from closing the circuit.

Restricted terrain

Recovery operations become extremely difficult in rough terrain and often result in hasty solutions for recovery until the RCP can move to an area where there is sufficient room to

execute full-recovery operations. Depending on the most prevalent threat in that area, the unit may modify the platoon column formation so the vehicle in the front has the most effective capability for combating the specific threat. In many areas where terrain restricts movement, it also limits visibility, which increases the danger of ambush. In these situations, it is best to coordinate for close combat attack helicopters and/or close air support to provide reconnaissance from the air and to add superior firepower in the event of ambush.

Unrestricted terrain

In unrestricted terrain, maneuverability becomes a key asset for the RCP. Security vehicles can kick out to the sides to search for command wires and aiming points and try to flush out triggermen from hiding positions. They can provide overwatch to the RCP as its elements focus on the road. When maneuver forces are following close behind the RCP, they can provide additional security by manning overwatch positions and additional resources to chase after triggermen or other suspicious personnel encountered during the mission.

Whenever possible, perform route clearance with the support of Afghan National Army soldiers. Because of their local knowledge, they provide the ability to better interact with locals, search suspicious *qalats* (mud huts in which many local nationals live), and detect suspicious activities or changes in local areas which may go unnoticed by allied forces.

Chapter 3

Anti-Afghan Forces Practices

Types of Improvised Explosive Devices

The improvised explosive device (IED) is composed of destructive, lethal, noxious, pyrotechnic, or incendiary chemicals designed to destroy, disfigure, distract, or harass. It may incorporate military items and/or nonmilitary items. IEDs are not the enemy; the people using IEDs are the enemy. Personnel can defeat the insurgents (emplacer and/or triggerman) who employ IEDs by being observant and watching for IED indicators. The enemy is watching you all the time—when you move, when you speak, and when you patrol. The enemy is always collecting information about your unit.

IEDs come in all shapes and sizes, but they are all fundamentally the same. IEDs have four basic components: power source, initiator, explosives, and switch. IEDs can be very dynamic, and there are not definitive rules for building them. IEDs use high explosive, homemade explosives (HME), or projectiles incased in propane tanks, fire extinguishers, oilcans, etc. The initiator depends on the intended target and terrain. The most commonly used switches or firing devices are victim-operated and command wire (CW).

IED Power Sources

Radio-controlled components provide the triggerman a great amount of standoff between himself and the IED, which often makes him hard to locate before or after he initiates the IED.

Radio-controlled components normally come in pairs: a transmitter and a receiver. The triggerman possesses the transmitter, and the receiver is attached to the circuitry of the IED to switch power to the initiator upon command. The command can be dialing the receiving cell phone's telephone number or pressing designated keys on a keypad of a two-way radio (personal mobile radio [PMR]).

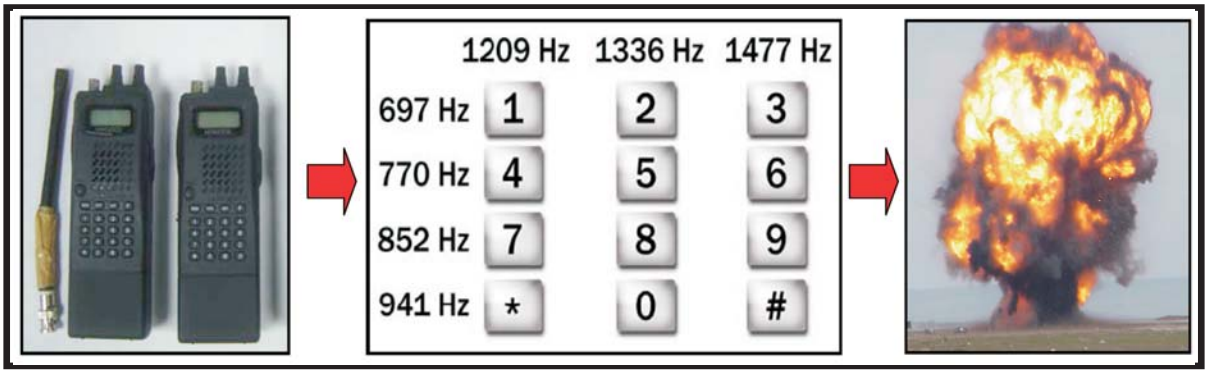

Figure 3-1. Radio-controlled

Types of radio-controlled devices

Dual tone, multi-frequency (DTMF) receivers. DTMF is the global standard for audible tones that represent the digits on a phone keypad. A pair of frequencies, one from the "low group" and one from the "high group," is assigned to each of 12 dial buttons on the telephone. When used in IEDs, DTMF receiver boards provide an encoding capability. The DTMF receiver is analogous to a combination lock. It requires the specific sequence of pre-programmed tones in order to

detonate the device. A triggerman can activate DTMF devices via most modern radio transmitter/receivers (known as transceivers). These transceivers are capable of sending DTMF codes by using a keypad on the face of the radio; many can also be programmed to store these DTMF codes. Common types of transmitter are Integrated Communications, Kenwood, and Motorola. Types of DTMF receivers include the following:

- MOD 1 receiver. The MOD 1 DTMF receiver (Spider) is typically but not always housed in a light ballast box as shown, sometimes with apparently genuine packaging. The box is simply a container that acts as camouflage, and the box has a normal, legitimate use.

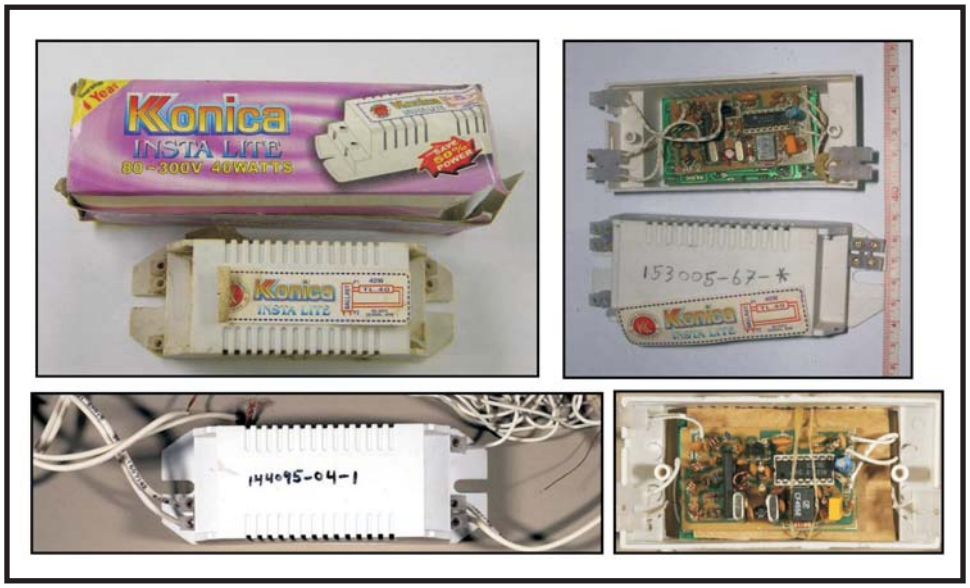

Figure 3-2. Many wire leads running into the box prompted Soldiers to call this device "spider."

- MOD 2 receiver. The MOD 2 differs from the MOD 1 in its housing and construction. It is normally contained in a plastic box labeled to disguise it as a "diesel timer" for a vehicle, and sometimes it is contained in apparently genuine packaging. Bomb makers use different brand names and packaging.

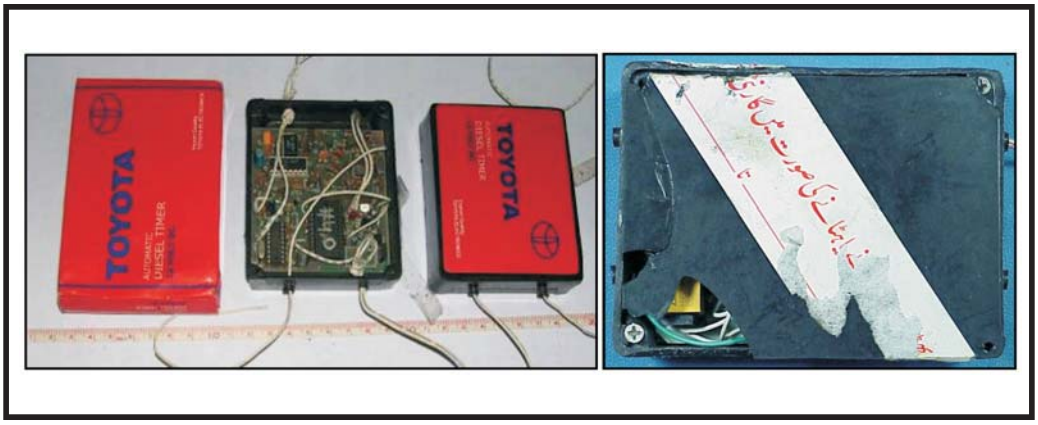

Figure 3-3

- MOD 3 receiver. The MOD 3 is built significantly better than MOD 1 and MOD 2. It is the most uncommon MOD device, perhaps because of its temperamental operation. It is normally contained in a black or cream-colored weatherproof plastic box and shrink-wrapped with clear plastic. Although, it could be disguised in any container such as a soapbox as shown below.

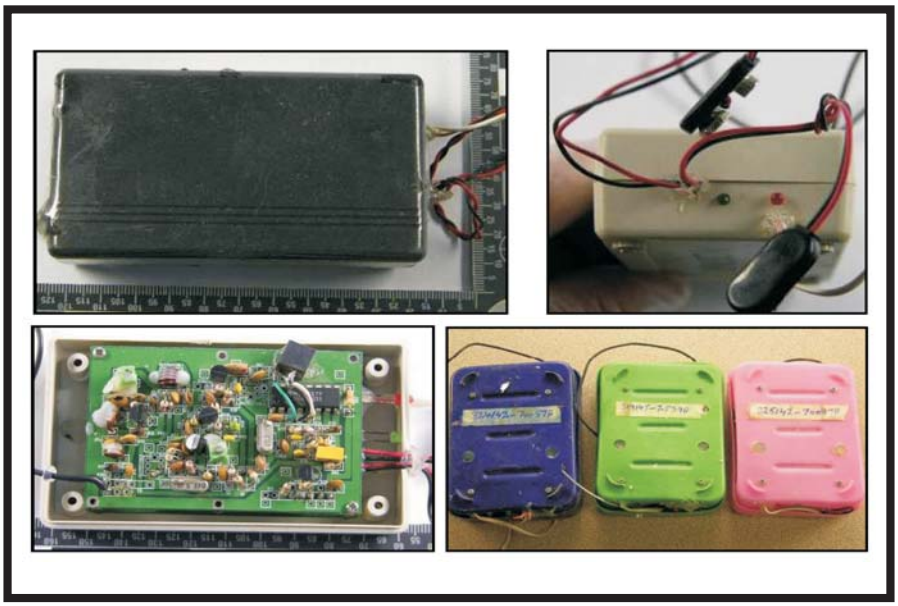

Figure 3-4

- MOD 4 receiver. The MOD 4 receiver is found in a black plastic box with four LED lights on the front. The MOD 4 has a large capacitor wired to the inside or outside of the black box; however, it functions like the MODs 1–3 DTMF receivers.

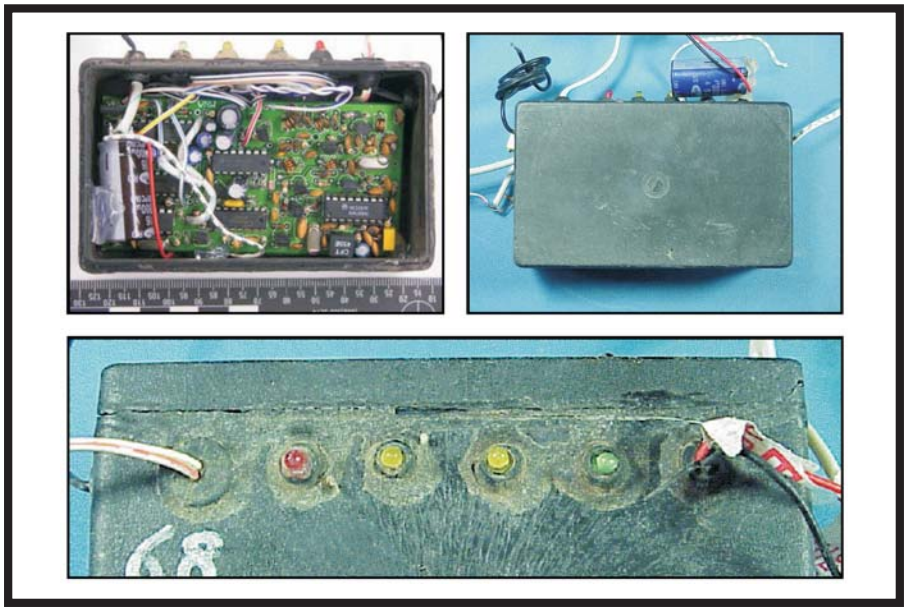

Figure 3-5

- MOD 5 receiver. The MOD 5 first appeared in 2005, and its function is similar to the MODs 1–4 with some additional operating enhancements. It is normally housed in a black plastic box that measures approximately 6 x 2 x 1 inches. Sometimes the bomb maker labels it "12 Volt Power Supply" or conceals it in a cardboard box like the one shown below.

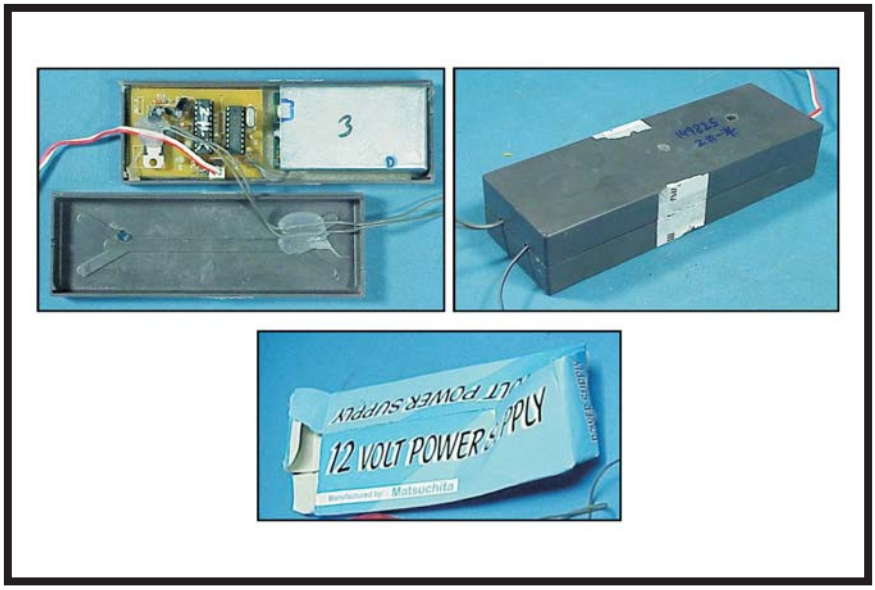

Figure 3-6

Long range cordless telephone (LRCT). Commercial LRCTs essentially operate in the same manner as the cordless phones found in electronic stores in the U.S; however, LRCTs found in theater are more powerful and can transmit at ranges up to 1,000 meters. Either the LRCT base station or handset can be used as the switch in an IED. The base station or handset detonates the IED either by activating the intercom system between the handset and base station or by receiving an incoming call. Emplacers also use copper wire to extend the LRCTs away (3–45 meters) from the IED explosive charge so they can recover and reuse the device.

Figure 3-7

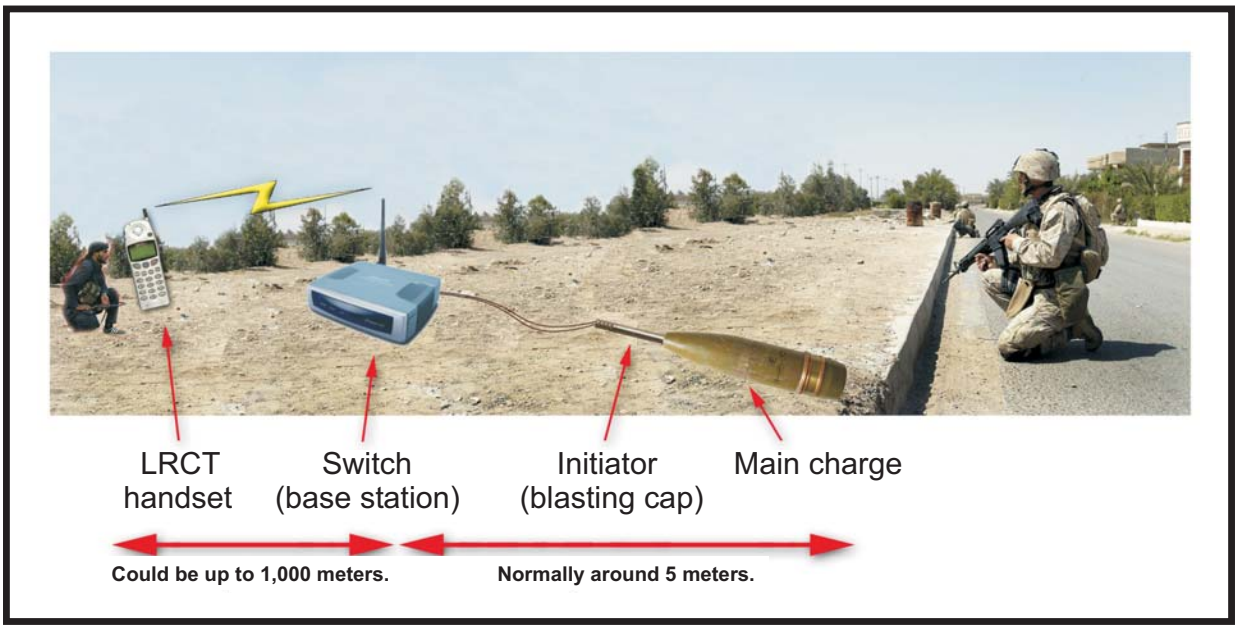

Figure 3-8

The following frequently found models provide some basic ideas of shapes and features:

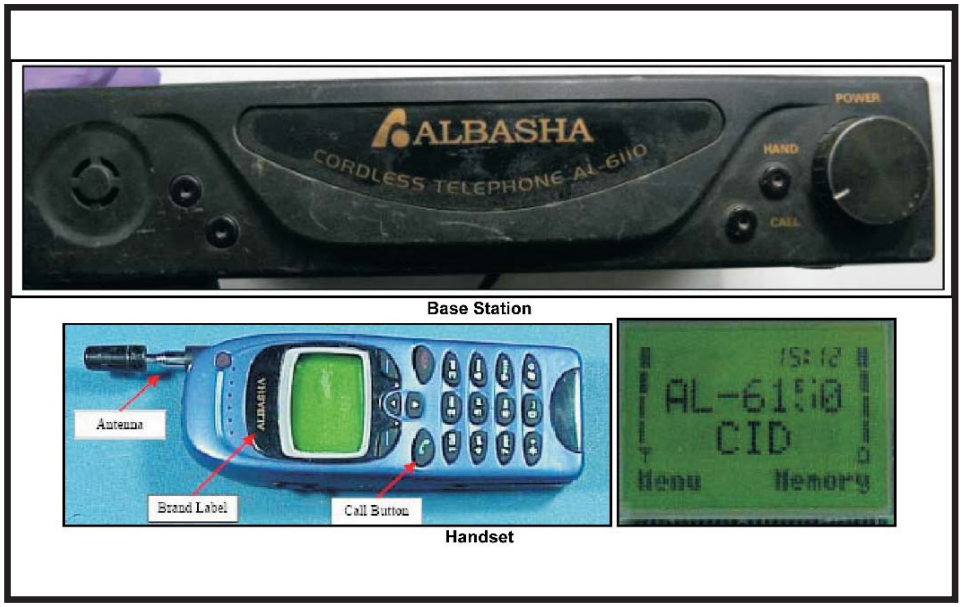

Figure 3-9. ALBASHA 6150 handset and base station

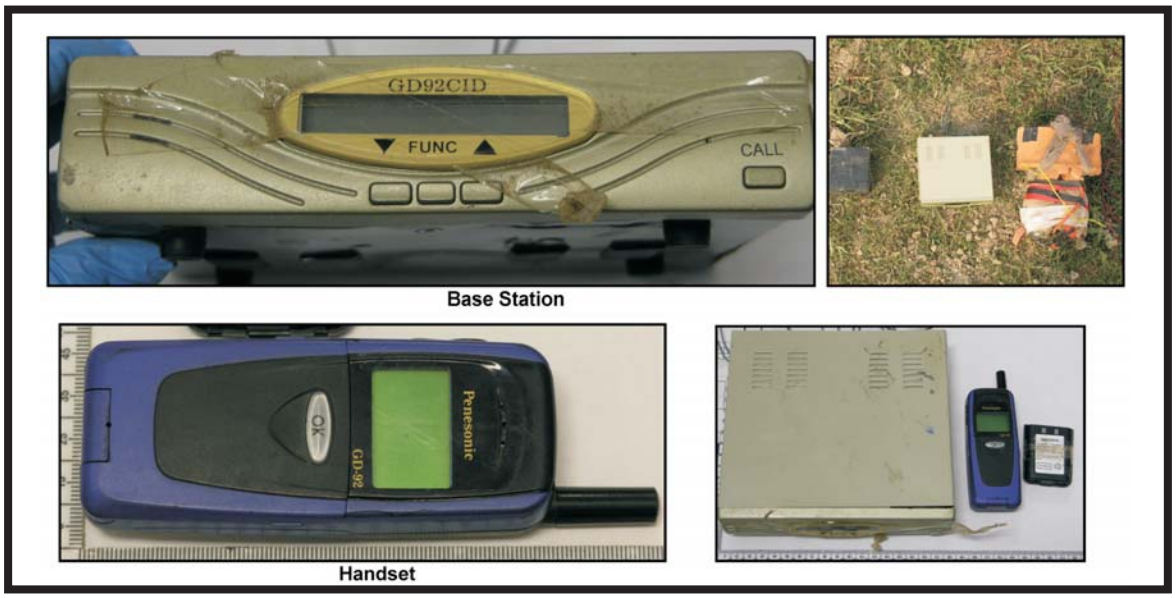

Figure 3-10. Brother GD-92-CID handset and base station

Wireless doorbells. Wireless doorbells are commonly available. Each doorbell consists of a battery-operated transmitter and a receiver that chimes or rings when it receives the signal. A very simple modification allows the bomb maker to make the receiver suitable for use as a radio-controlled IED. The range of 100 meters makes the wireless doorbell better suited to urban areas.

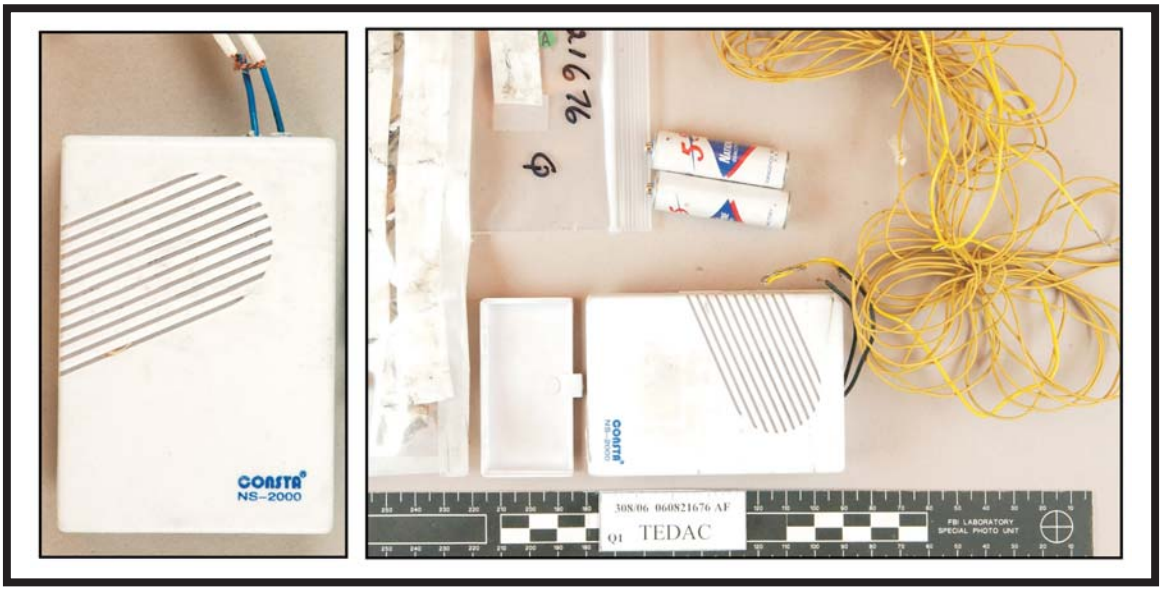

Figure 3-11

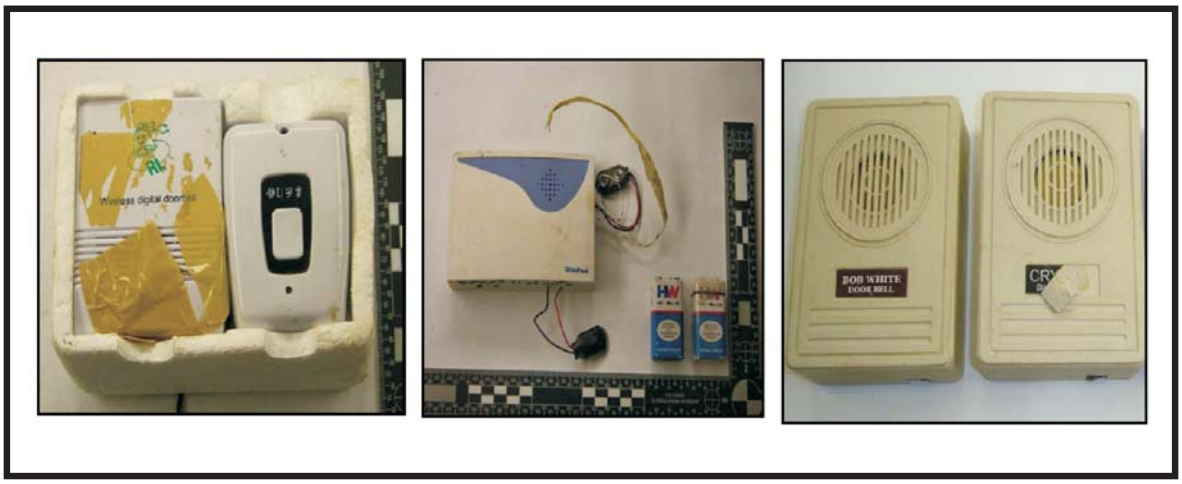

Figure 3-12

Cell phones. Cell phones are all commercially available and require little to no modification to adapt them for use as part of an IED. They can be used anywhere there is cell phone service and a clear view of the target area. Cell phones enable the triggerman to detonate the IED as the target enters the kill zone.

Figure 3-13

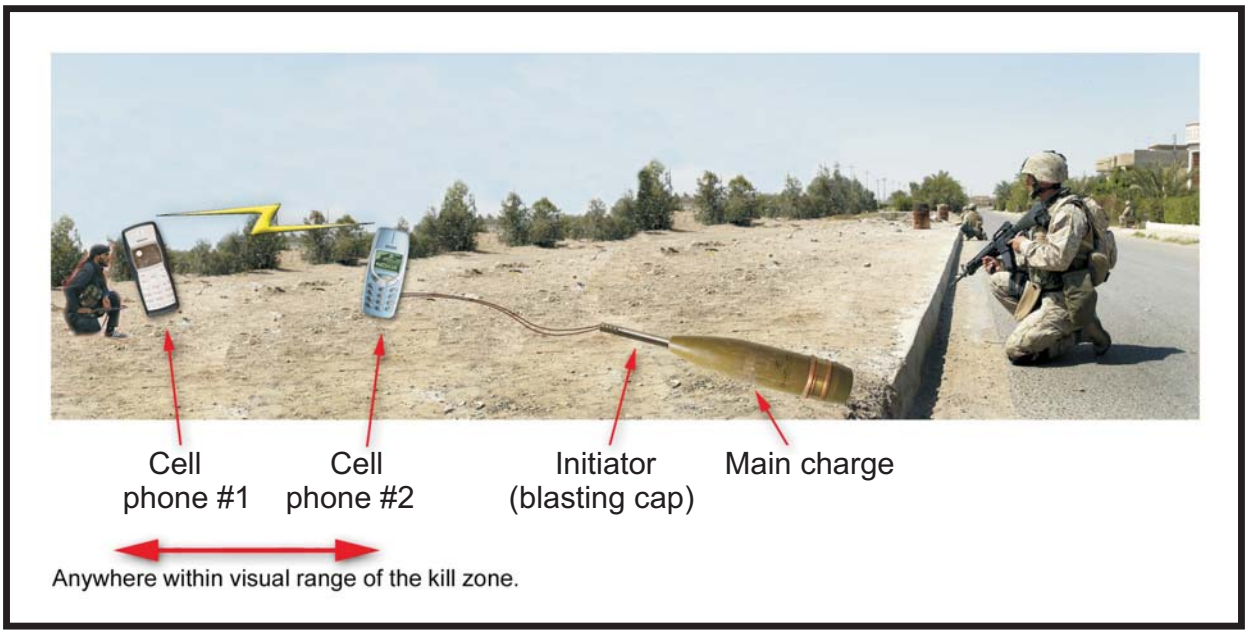

Figure 3-14

PMR. These radios are commercially available and usually sold in pairs. Very little modification is required to incorporate these radios into an IED initiation system. Because of the limited channel selection and the wide use of these radios, it is possible to inadvertently initiate an IED by using a similar radio in the vicinity of the IED.

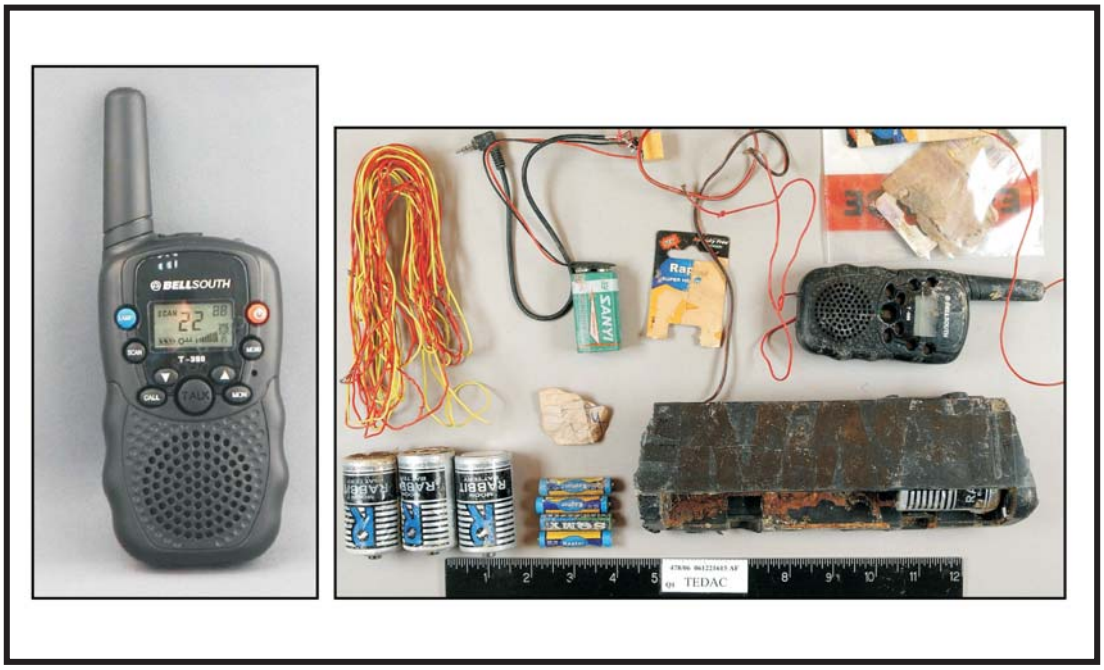

Figure 3-15

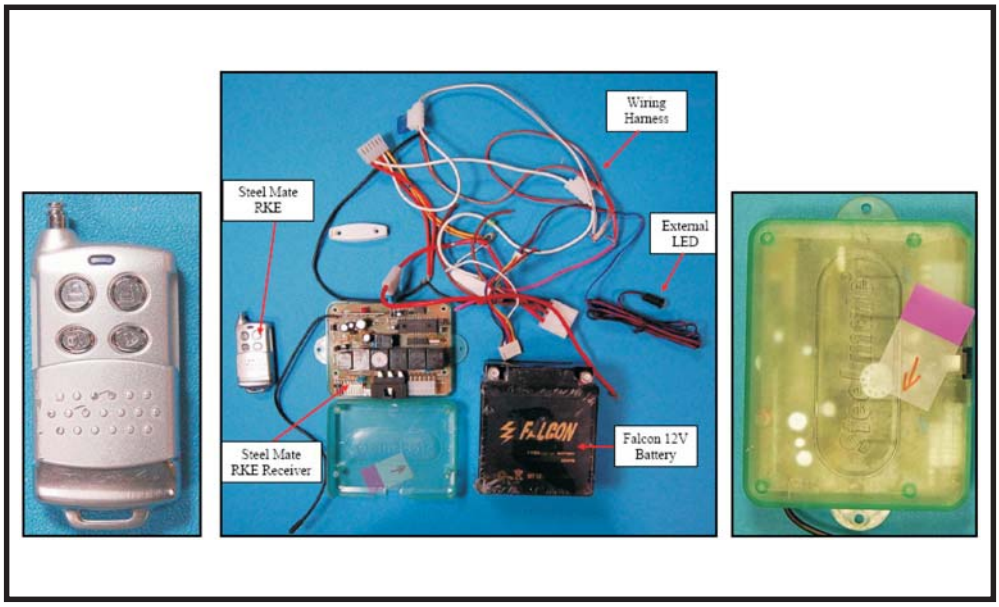

Figure 3-16

Keyless entry/alarm systems. Vehicle keyless entry and alarm systems are commonly available and are supplied with a battery operated transmitter and receiver. A very simple modification allows the bomb maker to make the receiver suitable for use as an IED, but its range of less than 600 meters line of sight makes it better suited to urban areas.

Transceiver radios. A transceiver is a device that both transmits and receives analog or digital signals. They are commercially available and very little modification is required to incorporate them into IEDs.

Figure 3-17

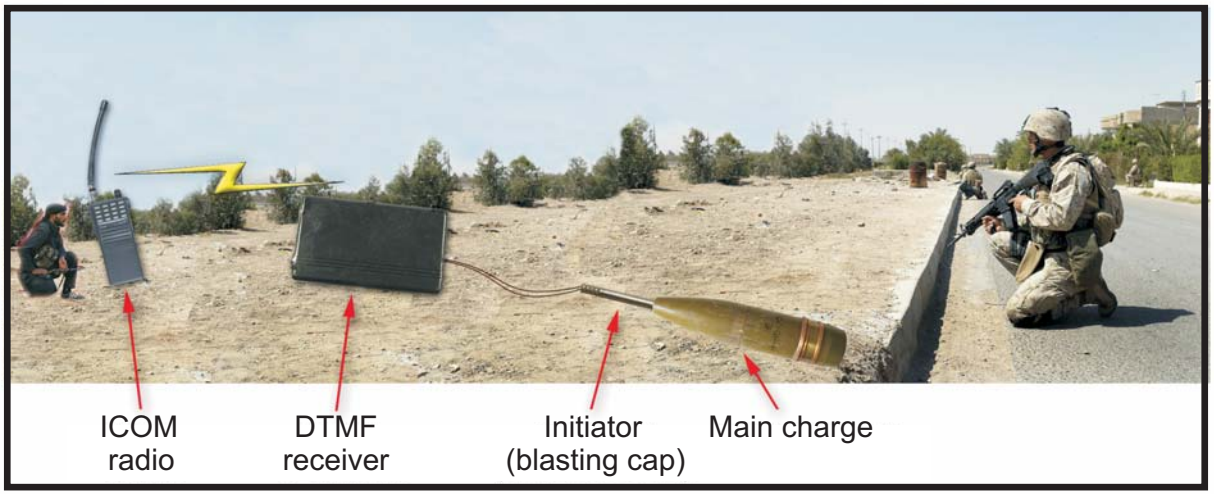

Figure 3-18

IED Explosives

Homemade explosives

The use of HME, typically ammonium nitrate (fertilizer) mixed with fuel oil (ANFO), has significantly increased throughout Afghanistan. HME is easy and cheap to acquire and is more effective than military ordnance against allied vehicles. Bomb makers can also pack HME into several types of containers that reduce the metallic signature of the main charge and make it difficult to detect. Typically, the bomb maker packs HME in large plastic jugs or pressure cookers.

Figure 3-19a. 5-gallon jug filled with ANFO

Figure 3-19b. Pressure cooker with HME

Land mines

Land mines are the most common form of ordnance used in Afghanistan. The dominant mine is the TC-6 antitank mine, which contains only 6 grams of metal. Another common mine is the MK-7 British antitank mine. The anti-Afghan forces use this mine less often because allied forces are so effective at detecting it prior to detonation.

Figure 3-20a. TC-6 antitank mine

Figure 3-20b. MK-7 antitank mine

Switches and/or Firing Devices

Victim-operated

Victim-operated components give the bomb maker (or triggerman) the distinct advantage of standoff between himself and the IED, which often makes the triggerman hard to locate. Once the bomb maker assembles and emplaces the IED, the victim's actions (driving over a pressure switch, lifting a projectile, driving by a priority intelligence requirement, etc.) initiate the device. Bomb makers can use victim-operated components in conjunction with other types of switches to booby-trap IEDs, ordnance, or any material. Switches can easily be concealed. When activated, the switch completes the circuit and enables power to the initiator, which causes the main charge explosive to detonate.

Types of victim-operated devices:

- Pressure plate (saw blades). The basic pressure plate construction consists of two conductive materials separated by an insulator. The conductive materials are usually made of metal (wire, saw blade, etc.). The insulator can be anything (including air space) separating the conductive materials. When pressure is applied, the conductive materials make contact with each other. The contact completes the circuit, which sends power to the detonator. The pressure switches can be concealed using tire tubes, tape, meals ready-to-eat bags, etc. Some pressure switches are robust, and the emplacer buries them. The emplacers often protect the pressure plates from gravel and stones by wrapping them in rubber removed from inner tubes or some other covering selected for its camouflage property.

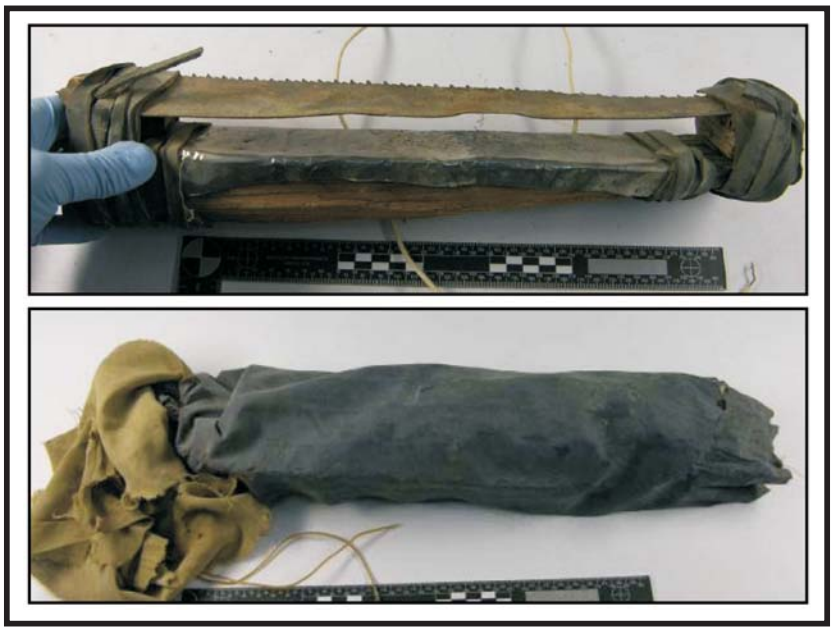

Figure 3-21. Pressure plate (saw blades)

- Pressure plate (push button). Bomb makers make some pressure switches with multiple push buttons mounted on a piece of wood or cardboard. The bomb maker links these push buttons together so that pressure on any button will cause the IED to detonate. The emplacer positions the push button pressure switches on or in the ground. Pressure from the weight of a person or a vehicle presses the button, which sends power to the detonator and causes the IED to explode.

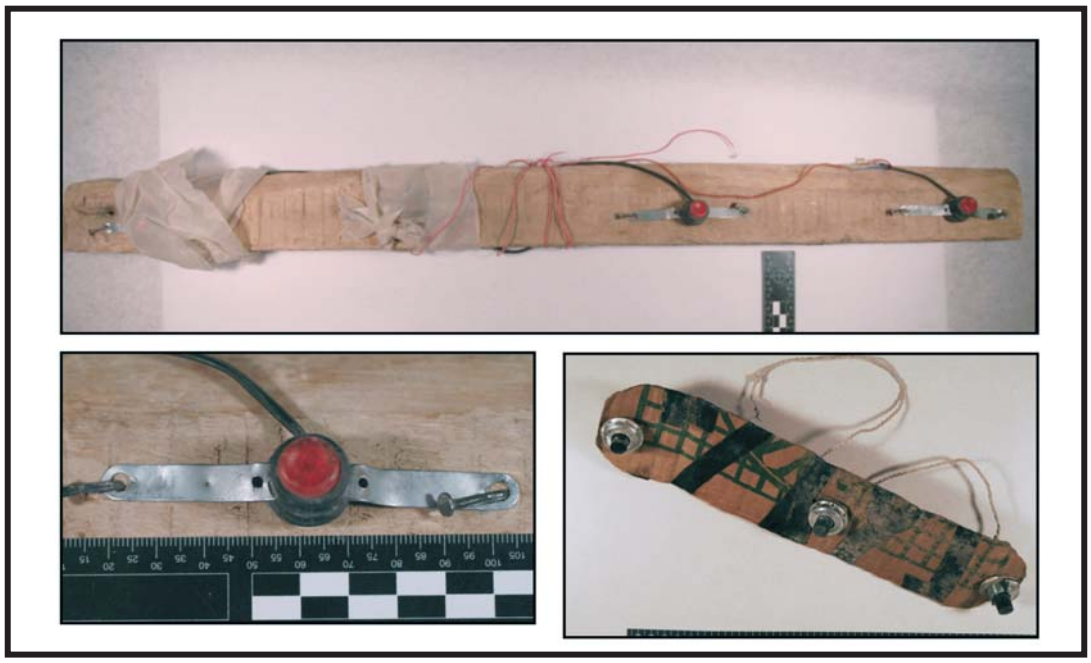

Figure 3-22. Pressure plate (push button)

- Pull (tripwire). Pull or tripwire devices are very simple in design and trigger victim-operated IEDs. Pull devices include the following:

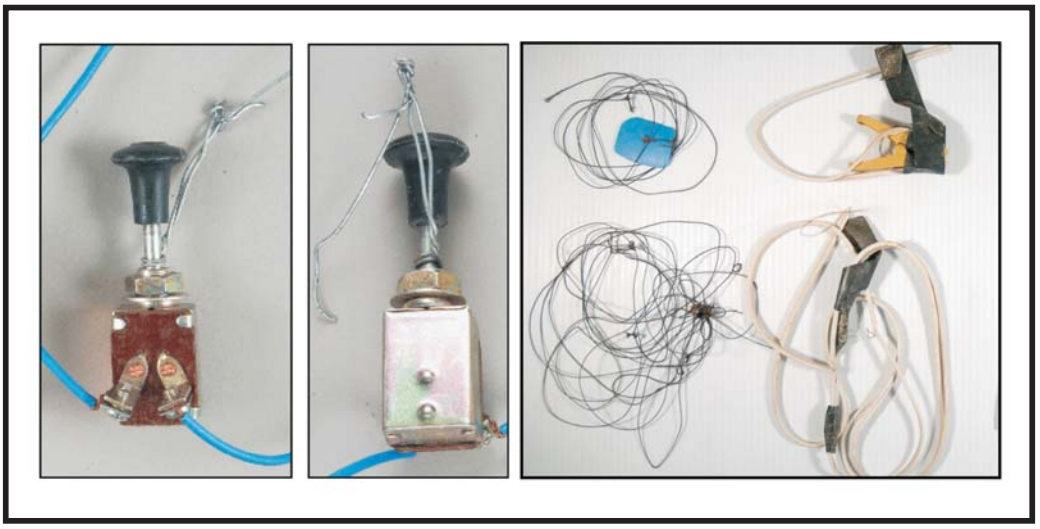

Figure 3-23. Pull (tripwires)

  - Clothespin switch. A clothespin switch works by attaching two wires, one to each side of the pin. The bomb maker inserts a tripwire tied to an insulator between the two wires. A pull on the tripwire removes the insulator, which allows the wires to touch and close the circuit. Bomb makers use a wide range of materials for the tripwire line, which usually blends in with the surrounding soil or vegetation.

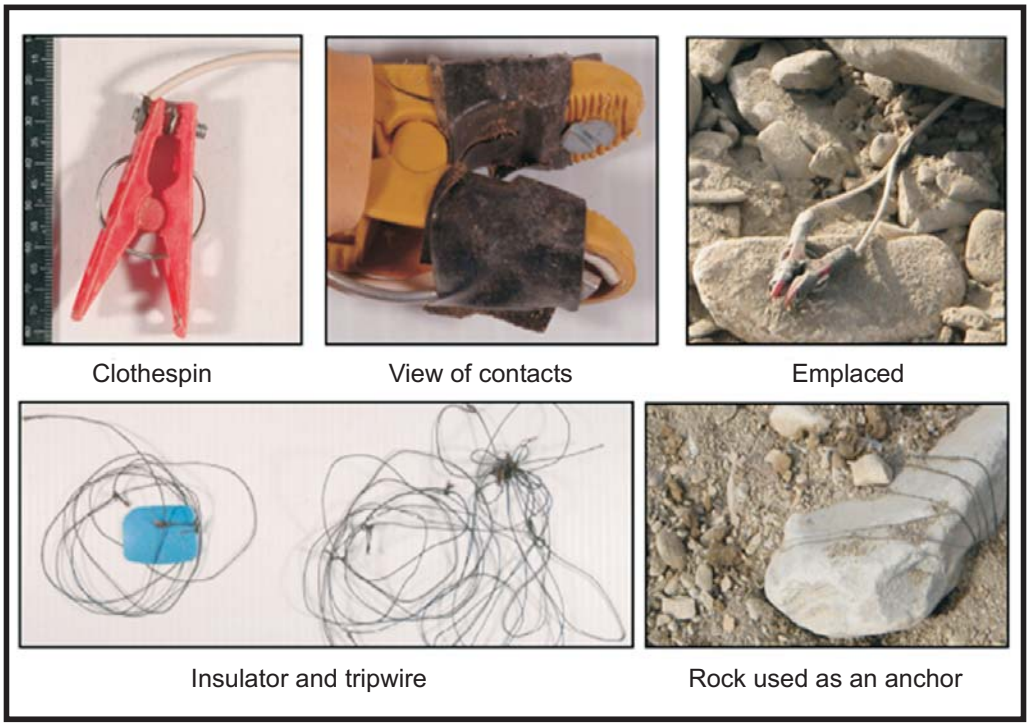

Figure 3-24. Clothespin switch

- MUV-2 tripwire. The mortar round shown to the left has an MUV-2 pull fuze taped into the fuze well. Notice the tripwire running left from the mortar round across the trail.

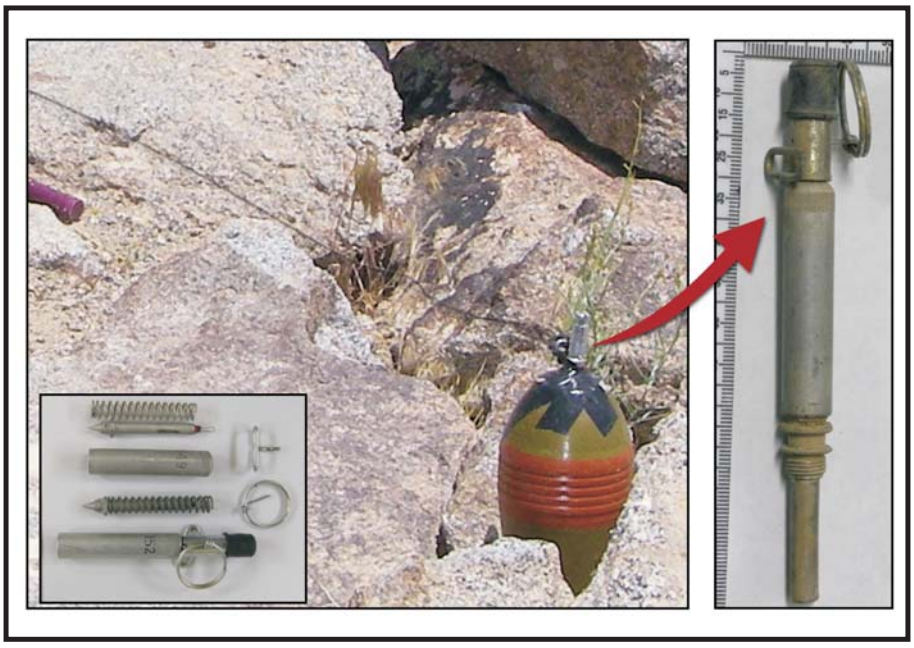

Figure 3-25. MUV-2 tripwire

Command wire

CW devices are essentially copper wires with either a plastic or enamel coating laid from the IED main charge to a hidden firing point. The CW gives the triggerman a great amount of standoff between himself and the IED. It also provides positive control over when to detonate the device.

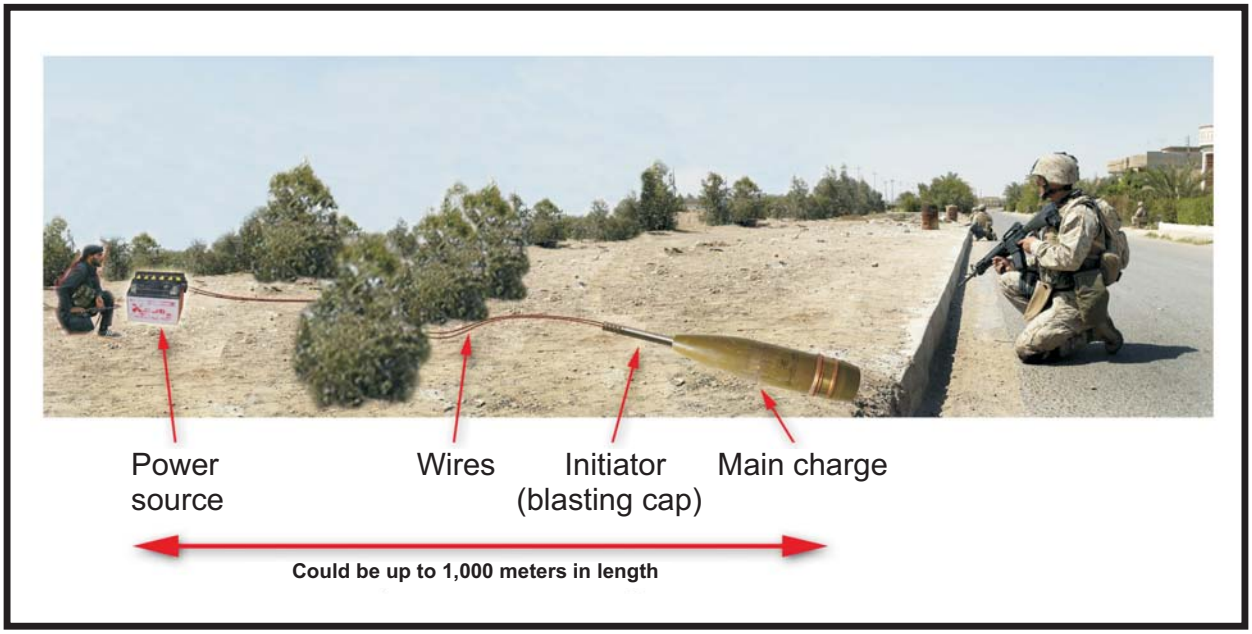

Figure 3-26. CW

Emplacements

Insurgents typically use casings that are of readily available material and blend in with the local environment. It is common for emplacers to bury IEDs next to roadways or place them on the surface with no container at all. To spot an IED, stay alert and look for the following:

- Out of place items
- Items that were not there the day before
- Disturbed or freshly dug up dirt
- Wires
- Freshly filled in pot holes
- Target reference points
- Abandoned vehicles

Chapter 4

Route Clearance Operations

As units rotate through Afghanistan, the threat continues to change based on training, resources available, and the motivation to fight; the counter-improvised explosive device (C-IED) efforts will continue to evolve. The route clearance (RC) mission performed by engineers will continue to be a main focus of this C-IED initiative. However, the way engineers conduct RC missions will continuously change to address the most current threat. The current focus for RC is providing assured mobility to the maneuver forces within theater.

The fundamentals of assured mobility are predict, detect, prevent, avoid, neutralize, and protect:

- Predict actions and circumstances that could affect the ability of the force to maintain momentum.
- Detect early indicators of impediments to battlefield mobility and identify solutions through the use of intelligence, surveillance, and reconnaissance (ISR) assets.
- Prevent potential impediments to maneuver from affecting the battlefield mobility of the force by acting early. Political considerations and rules of engagement may hinder the maneuver force's ability to apply the fundamental early in a contingency.
- Avoid detected impediments to battlefield mobility of the force if prevention fails.
- Neutralize, reduce, or overcome (breach) impediments to battlefield mobility that cannot be prevented or avoided. The breaching tenets and fundamentals apply when forced to neutralize an obstacle.
- Protect against enemy counter-mobility effects.

These fundamentals are part of the full spectrum of operations that follow a continuous cycle of planning, preparing, and executing engineer operations that support decisive, shaping, and sustaining operations. Achieving assured mobility rests on applying these six fundamentals. These fundamentals describe actions that sustain friendly maneuver ability and preclude enemy maneuver ability, and they depend on superior situational understanding (SU), shared knowledge, and decisive execution.

The most critical aspects of this framework are the links among these fundamentals. The links between predict and prevent, between detect and prevent, between detect and avoid, and between detect and neutralize are essential for success. A failure of any of these links will diminish a commander's ability to achieve decisive results. The fundamentals of assured mobility are applicable from the strategic to the tactical level.

When applying the fundamentals of assured mobility in the C-IED fight, unit leaders must develop an understanding of the larger picture of improvised explosive device-defeat (IED-D). The focus of IED-D is often the IED itself. However, the device is merely the end product of a complex set of enemy activities.

Successful IED-D operations begin with a thorough understanding of the enemy's activities associated with an IED attack. These activities include the leadership, planning, financing, materiel procurement, bomb making, target selection, recruiting, and attack execution. Understanding the enemy's activities assists commanders and planners in identifying vulnerabilities. The commander can exploit these vulnerabilities to break the enemy's

operational chain of events. As part of the broader mission, the unit conducts IED-D operations by employing the six fundamentals of assured mobility.

The content of assured mobility as it relates to IED-D includes the following:

- Predict:
    - Identifying patterns of enemy behavior
    - Identifying emerging threats
    - Predicting future enemy actions
    - Prioritizing ISR missions
    - Exploiting IED threat vulnerabilities
    - Targeting enemy IED attack nodes (funding and supplies)
- Disseminating alert information rapidly to specific users: Analyzing forensics and enabling better on-scene technical analysis
- Detect:
    - Detecting and identifying explosive material and other IED components
    - Detecting chemical, biological, radiological, and nuclear material
    - Recognizing suicide bombers
    - Conducting forensic operations to track bomb makers and/or handlers
    - Conducting persistent surveillance
    - Training to improve detection of IED indicators by digital means
    - Using collected intelligence to link and synchronize detection assets to named areas of interest
    - Using detection means from the full range available (imagery, mechanical-clearance operations, search techniques, dogs, etc.)
    - Recognizing individual Soldier actions and awareness in all activities (what makes some Soldiers better at detection than others?)
- Prevent:
    - Disrupting enemy operations and support structure
    - Denying critical IED-related supplies to the enemy
    - Increasing awareness of enemy tactics, techniques, and procedures
    - Denying the enemy the opportunity to emplace IEDs

- Rewarding local nationals' cooperation in determining the locations of caches and bomb-making sites and/or providing information about bomb-making emplacing activities
- Removing IED concealment locations (trash, debris, and abandoned vehicles) from primary routes

- Avoid:
  - By maintaining effective SU of the area of operations (AO) and disseminating related information in a timely manner
  - By ensuring timely and accurate status reporting and tracking
  - By altering routes and routines
  - By marking and bypassing suspected IEDs
- Neutralize (destruction or reduction of enemy personnel, explosive devices, or supplies):
  - Conducting operations to eliminate or interrupt the enemy's leaders, suppliers, trainers, enablers, and executors
  - Neutralizing or rendering safe procedures against identified IEDs, caches, ammunition, etc. (**Note: Explosive ordnance disposal (EOD) teams are the only units authorized to render safe IEDs.**)
- Protect (improve the survivability of IED targets through hardening, awareness training, or other techniques):
  - Providing blast and fragmentation mitigation for platforms, structures, and personnel
  - Creating greater standoff distances
  - Incorporating unmanned platforms
  - Using jamming devices
  - Reducing time and distance within IED range
  - Executing more effective reaction and evacuation operations
  - Avoiding establishing patterns and predictable forms of behavior
  - Conducting precombat inspections and rehearsals for all operations
  - Treating every operation as a combat mission (from a simple convoy to daily forward operating base security)

The RC battalion is the action arm for the engineers in the assured mobility mission. RC is the detection, investigation, and the marking, reporting, and neutralization of explosive hazards and

other obstacles along a defined route to enable assured mobility for the maneuver commander. It is a combined arms operation that works best when the maneuver unit conducts a reconnaissance of the route the RC battalion will clear.

The ability to move forces and material within an AO is fundamental to combat power and critical to assured mobility. Maneuver relies on the availability of lines of communication (LOCs) within an AO. During asymmetrical war, LOCs are essential to the movement of forces. Units must conduct route and area clearance operations to ensure pulse logistics and maneuver forces have the ability to maneuver as the commander dictates. The aim of route reconnaissance and clearance is to detect and neutralize explosive hazards and to improve and know the route in order to conduct future change-detection operations.

Route Clearance Package Employment

The route clearance package (RCP) is not the 100 percent solution to defeating IEDs along a route. The RCP detects road-emplaced explosive hazards, verifies their presence, and neutralizes them using the proper assets. As much as it serves as a detection asset, RCP also serves as a deterrent to emplacing explosive hazards through presence patrolling. Units use RCP in close conjunction with intelligence products, trends analysis, and pattern analysis.

Pattern analysis is the ability to observe a selection of events or actions over a period of time in a defined location or area. Units use pattern analysis to discover likely patterns or similarities that lead to a logical conclusion that the action or event will occur again in the same location. If there are four routes in a given AO, and two have no IED events and the other two have twelve each, the focus of the RCP should be on the two routes with known anti-Afghanistan forces' activity.

RCPs are not the silver bullet to the IED-D strategy; however, RCP presence on routes denies the enemy a chance to emplace explosive hazards.

EOD assets will neutralize IEDs unless otherwise directed by EOD leadership or the landowner's higher command. Trained and skilled operators are necessary to accurately detect the explosive hazards. Equally important are the knowledge and skills of the other members of the RCT. Units must train Soldiers in the identification of IED indicators and pay close attention throughout the clearance process in order to visually identify IEDs placed to the side or on the shoulders of the routes the RCP is clearing.

Trained operators are a must. All deploying units receive training on route clearance equipment (RCE) and RC principles at Fort Leonard Wood, MO. All RC team members must receive training on known IED indicators and AO-specific munitions. In-country training should include the following subjects:

- Mission preparation/routing
- IED finds
- IED explosions
- Small arms fire, RPG rocket fire, ambushes, and complex attacks

Chapter 5

Route Clearance Recovery Procedures

Recovering Mine Resistant Ambush Protected (MRAP) Vehicles

Recovering MRAP vehicles, such as the Buffalo or Joint Explosive Ordnance Disposal Rapid Response Vehicle (JERRV), in Afghanistan is a very difficult mission. The terrain throughout Afghanistan is rugged, and there are no tracked recovery vehicles in country. The maximum recovery capability in Afghanistan is the M984 heavy expanded mobility tactical truck (HEMTT) wrecker. In many cases, units conducting recovery operations must borrow M916A3 light equipment transporter 6 x 6 tractors with M870 lowboy trailers (newer version trailers, as older versions could not support) to conduct recovery missions for MRAP vehicles that are damaged by improvised explosive devices (IEDs).

There have been times when a route clearance (RC) patrol has struck an IED with both the Buffalo and JERRV on the same mission. The task of recovering this equipment to the nearest forward operating base (FOB) was daunting and required coordination among units to get the right equipment to the right place as soon as possible. Most of this needed equipment was not readily available. Both vehicles had severe front axle damage from the IED blast. Available assets at the FOB nearest to where the strike occurred were an M984 HEMTT wrecker and a 20-ton crane for lift. Recovery was possible because the route clearance package used the combat logistics patrol (CLP) to deliver available parts and borrowed two M916A3 tractors with M870 trailers from an engineer construction battalion.

In the situation cited above, the following recovery assets were on site: two M916A3 tractors, two M870 trailers, one M984 HEMTT wrecker, and one 20-ton crane. The mission was to load the Buffalo onto one of the M870 trailers and the JERRV onto the other. The engineer battalion maintenance sergeant and CLP platoon sergeant assessed the situation and executed the mission as follows:

- Because one 20-ton crane cannot lift a Buffalo, two M916A3 operators backed their attached M870 trailers up to each other, rear end to rear end, and the crews then dropped the goosenecks of both M870 trailers to the ground to form a “bridge.”

- The HEMTT wrecker then towed the disabled Buffalo up one side of the “bridge” and onto the other trailer. This positioned the Buffalo on the first trailer with the front of the Buffalo facing the rear of that trailer (see Figure 5-1). (Towing a Buffalo or JERRV with a HEMTT wrecker is not recommended; however, it can be executed over very short distances on flat ground.)

Figure 5-1. HEMTT wrecker lifts and tows disabled Buffalo onto M870 trailer.

- Next, the 20-ton crane and HEMTT wrecker crane pulled up next to the Buffalo and centered it on the trailer, both side to side and front to rear. Because the 20-ton crane was not strong enough by itself, the HEMTT crane was used to augment the 20-ton crane and lift the Buffalo's front end 18 inches. Once the crane/HEMTT lifted the front end of the Buffalo, maintenance personnel slid a used HEMTT tire under the "pumpkin" (the large center piece of the differential) for safety. When the nose of the Buffalo was raised, maintenance personnel removed the good Buffalo tire so that the front end could rest on the damaged, rimless tire. This procedure placed the damaged tire under the bumper shackles and the "pumpkin" square on the deck of the trailer. Finally, the crew slightly deflated the intermediate tires and left the rear tires with full air. When the Buffalo was centered and level, the crew used the winch on the M916A3 tractor to pull the Buffalo tight up against the now-raised gooseneck of the trailer (see Figure 5-2).

Figure 5-2. Using the winch on the M916A3 tractor, the maintenance crew brings the rear tires of the Buffalo up flush against the now-raised gooseneck of the M870 trailer.

- The above tasks put the Buffalo in a cradle, which keeps it from shifting during movement. The next step was to tie down the vehicle with chains. The chaining points were critical. First, the crew chained the Buffalo from the upper rear lifting eyes to the M870 trailer sides, toward the cab. Next, they chained the Buffalo down to the deck, from one side to the other at the rear. Then, they created a "V" and chained the middle of the Buffalo down with opposing directional force using two shackles built into the deck. (These shackles are on each side of the front axle if the MRAP vehicle is correctly placed.) This procedure bound the axle tight to the deck on both sides. Finally, to complete the tie down, they ran a chain across the front bumper side to side (see Figure 5-3).

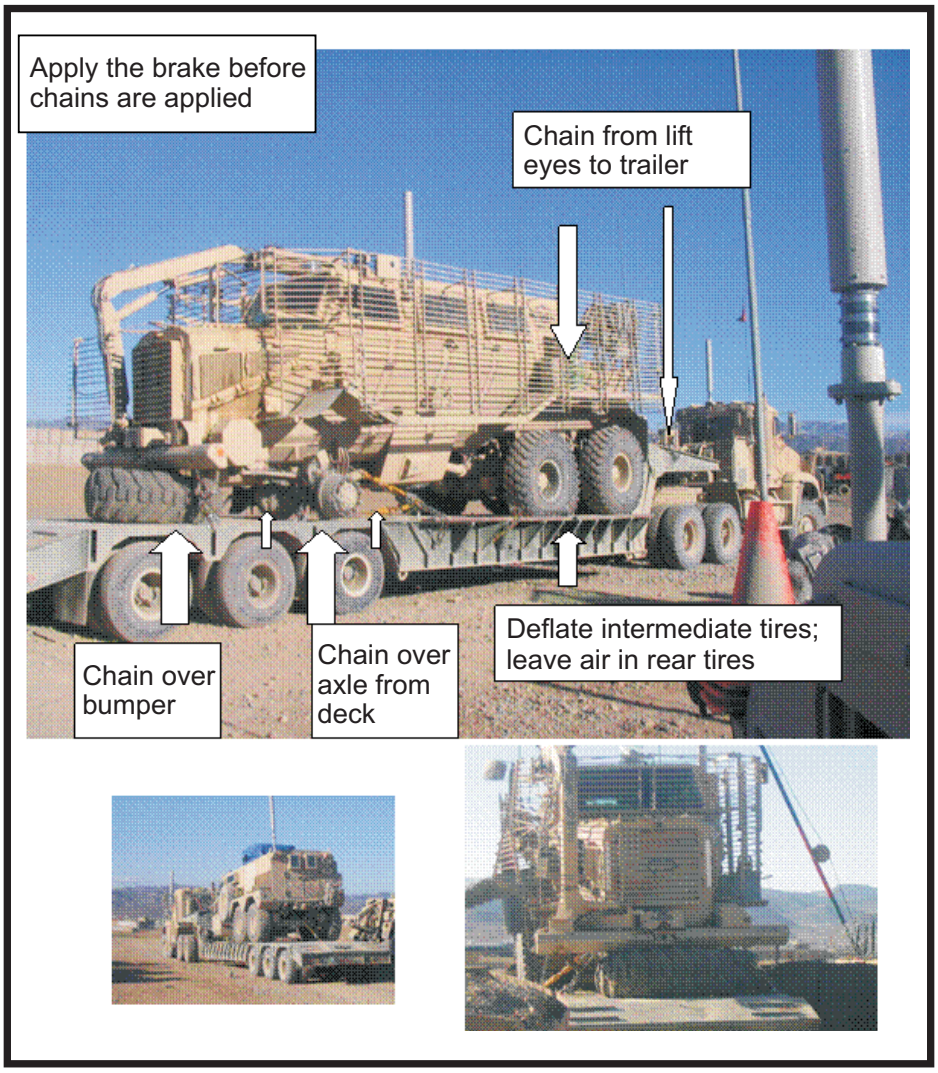

Figure 5-3

- The final step was to load the other MRAP vehicle onto the other M870 trailer. The JERRV, similar to the MRAP Level II version vehicle, fits much more easily on an M870 trailer. With the M870 trailer disconnected from the tractor and its gooseneck dropped to the ground, the crew backed the second damaged vehicle onto the trailer. (**Note:** If a vehicle cannot move under its own power, improvise using a crane and a HEMTT wrecker to safely load it.) The crew used the same methods described above to center the vehicle and tie it down to the trailer. Based on the extent of the damage, they were very careful in selecting and rigging the actual tie down. The recovery personnel chained the JERRV from the lifting points, crossing the chains under the JERRV, which kept the vehicle from shifting during movement.

During movement back to the maintenance-capable FOB, patrols conducted maintenance halts every 30 minutes to check tire pressure, tie-down chains and binders, and distribution of the load. During the units' movement of these two vehicles, two binders broke and two tires popped.

To mitigate the risk of these minor failures, engineer battalions personnel should consider the following:

- Chain binders should be reinforced with 12-inch pre-cut links of chain and a strong bolt with two washers and a nut. This configuration keeps the extreme force applied by the MRAP vehicles from opening or snapping the binders.

- M916A3 tractor operators should be experienced. They must possess knowledge on centering loads and properly tying down heavy equipment. The operator cannot let the load get past a 45-degree angle, or the center of gravity will shift enough to pull the trailer over onto its side. This situation is difficult to avoid on some of the roads and terrain of Afghanistan. Operators must know when to shift gears while traveling up or down steep hills to avoid losing control of the M916A3 tractor's brakes and ultimately causing more damage to equipment and putting Soldiers' safety at risk.

The mission to recover vehicles and return to the nearest FOB with the maintenance capability to fix the damage becomes the primary mission. Units must try to meet the commander's intent to fix as far forward as possible to reduce the impact on overall mission readiness.

Summary

Recovery operations for MRAP vehicles in Afghanistan are very difficult and dangerous missions because of the weight and size of these vehicles, as well as the rugged terrain. With no heavy recovery assets and not one tracked vehicle (to include an M88 recovery vehicle) in Afghanistan, units must often improvise to recover an MRAP vehicle that is non-mission capable because of an IED strike or simply because of maintenance faults.

Based on available vehicles currently in Afghanistan, units should design recovery operations to include an M870 lowboy trailer at the location where the MRAP vehicle becomes non-mission capable. This practice will reduce the wear and tear on other MRAP vehicles (if used to tow the disabled vehicle over a long distance) and M984 HEMTT wreckers. However, if the enemy situation dictates, units should move the non-mission capable MRAP vehicle to the nearest FOB by whatever means available. Once there, the unit may be able to coordinate with other units that own lowboy trucks to evacuate the MRAP vehicle to the nearest maintenance-capable FOB.

Recommendations:

- Resource RC battalions in Afghanistan with one M916A3 tractor and the newest version of the M870 trailer for each assigned RC platoon. This equipment has regularly proven capable of retrieving disabled MRAP vehicles quickly and safely from the battlefield.

- MRAP vehicles save Soldiers' lives and are the future for operations in both Iraq and Afghanistan. Based on the rugged terrain and the different fight encountered in Operation Enduring Freedom, units must find a permanent solution for safely recovering these vehicles from the battlefield.

Chapter 6

Maintenance Procedures

Because of the types of vehicles in the route clearance package (RCP) and the constraints encountered in the Operation Enduring Freedom (OEF) theater of operations, vehicle maintenance becomes an ever changing and very difficult operation. The majority of the vehicles units use are still undergoing operational assessment, and therefore, almost every vehicle is unique. There are five generations of RG-31, three generations of Husky, and three generations of Buffalo.

It is difficult for maintenance crews to determine exactly what model vehicle they are working with, so ordering the correct parts can be difficult. Transporting replacement parts to where they need to go is extremely difficult. High winds and low visibility caused by dust, rain, and any number of other unforeseen problems can keep parts from arriving at their required destination. Convoys are not accustomed to transporting parts for vehicles; however, it is actually faster to transport them over ground because of the unpredictable nature of air travel.

Since RCPs often go out on missions for several days at a time, it is critical that they bring embedded maintenance teams and replacement parts with them on all missions. Because they may not be able to get support from other units along the way, mechanics must become extremely resourceful in developing fixes or recovery techniques in order to get the damaged vehicles back to a maintenance facility. In cases where the vehicles are too heavily damaged to recover or repair parts are not available, the RCP leaves a small team with the vehicles at a remote forward operating base or combat outpost and moves on. When the necessary parts or recovery vehicles become available, the damaged vehicle and personnel are recovered and brought to a maintenance facility.

For all of these reasons, preventive maintenance checks and services (PMCS) are absolutely critical for route clearance (RC) vehicles and equipment. Remote locations mean a long lead-time for repair parts. The lack of simple PMCS can take a vehicle out of service just as quickly as a direct hit from an IED.

Maintenance Hubs

Different field service representatives (FSRs) repair different vehicles in theater. RC vehicles include the Husky, the Buffalo, and the RG-31. Support package vehicles include the heavy expanded mobility tactical truck (HEMTT) wrecker, the HEMTT Palletized Load System, 5-ton trucks, the M916 tractor with the M870 semitrailer, and any other vehicles the unit may have.

Levels of Maintenance

The operator performs the first level of maintenance, and he should conduct PMCS before, during, and after the operation of all vehicles.

The next level of maintenance is performed at the unit level. Each RCP should have at least two mechanics and a tool box, and there should be a mission load list of tools and parts for each vehicle.

The maintenance hubs perform the next level of maintenance, and FSRs perform all sustainment and rebuild operations.

The code out or replacement level performs the final level of support. Vehicles that sustain a hull breach or have armor that is significantly torn are deemed not repairable. Vehicles that will require greater than 90 days to repair are replaced with a new vehicle.

Common Maintenance Issues

The vehicles hold up well mechanically. Damage from IEDs is the greatest maintenance problem RC vehicles encounter. Some mechanical defects cause the vehicles to malfunction; however, units develop field fixes to bridge the capability gap until they can perform a full recall of faulty components.

One example of a mechanical failure recall problem was with the RG-31 generators. The generators were built with two pieces. When a vehicle sustained a blast or was close to a blast, the pieces would become disconnected, and the vehicles would become inoperable. There were a variety of field fixes to address this problem until one-piece generators could be obtained and replaced in all the vehicles. Some units attempted to weld the two pieces together; others used pieces from high mobility multipurpose wheeled vehicles to replace the malfunctioning parts. Some of these fixes worked well in the short term; however, they caused other problems as they outlasted their intended immediate fix lifespan. At present, the problem is nearly 100 percent resolved.

The RG-31's front springs are another problem. Currently, units are addressing the issue by torquing the springs every 1,000 miles.

The continuous revisions to the platforms in theater cause other maintenance challenges. The latest models of the Husky, Buffalo, and RG-31 are at least the third generation of the base vehicle, and many parts are not interchangeable:

- The latest version of the Husky, the A3 model, was fielded to RCP units in October 2008. The previous model, the A2, comprises approximately 70 percent of the fleet. Few A1 model Huskies are operating in theater.

- The latest version of the Buffalo, the CAT III, was fielded to RCP units in September 2008. The previous model, the CAT II, comprises approximately 60 percent of the fleet. Few CAT I model Buffaloes are operating in theater.

- The latest version of the RG-31 is the Mk5E, commonly known as the mine resistant ambush protected (MRAP). There are RG-31 Mk1, Mk2, and Mk3 vehicles in theater as well.

Efforts are being made to pure fleet the base platforms so this issue resolves itself; however, for the time being, there are still many different models in operations.

Maintenance Difficulties

One of the biggest challenges to maintaining RCP vehicles is recovering and transporting the Buffalo. The Buffalo is the heaviest vehicle in the RCP. RCPs use the HEMTT wrecker as the primary recovery vehicle during recovery operations. The wrecker can flat pull a Buffalo, but when it comes to lifting and towing the Buffalo, the wrecker is overstressed. Although a wrecker can only tow the Buffalo for short distances, the recommended way to transport a Buffalo is on a M916 tractor with a M870 40-ton lowboy trailer. However, the new M870 A3 trailers do not allow the wrecker to drive on one end and off the other end of the trailer. Without this drive-through loading feature that allows the wrecker to drag the Buffalo onto the trailer, getting a Buffalo onto the trailer is much more difficult.

A Stryker recovery vehicle has been identified as a possible solution to this problem; however, because of the way it lifts the load from the side of the inoperable vehicle onto the trailer, it is likely that terrain will hinder its capability in this theater. These vehicles are scheduled to arrive in theater in November 2008.

Avoidable Maintenance Issues

There are a limited number of RCP vehicles in theater. Operating without an operational float means that when a vehicle breaks down, the unit must wait for it to be repaired or operate without it.

To ensure vehicles stay operational, adhere to the following guidelines:

- Soldiers should not operate or repair equipment unless they are trained to do so. There are instances when a field fix is required to continue the mission; however, the unit mechanics are trained to document these field fixes so that when the vehicle comes back to the repair shop, mechanics can identify and repair the field fix correctly. When untrained Soldiers start splicing wires in order to power their iPods or MP3 players, the added strain on the electrical system can cause unusual failures to occur.

- Perform proper PMCS before, during, and after operating the vehicle. Each vehicle has a battle damage assessment kit to help the maintenance personnel make routine repairs in the field. Properly inventorying this kit and ensuring that the necessary components are present will speed up any field expedient repairs. Shortages in this kit could delay repairs or reduce the life of the repair, which may cause the vehicle to become inoperable for a second time before it can reach a proper service location.

- All operators should become familiar with their vehicles. An operator who is familiar with his vehicle is better able to notice small issues with its performance. Operators can make simple repairs that will prolong the life of the vehicle instead of waiting for something debilitating to happen. Operators should pay attention to the small details of the vehicle. For example, some Buffalos have left-handed lugs on the tires. Cross threading a lug because of carelessness or turning a lug nut in the wrong direction can cause as much down time as a more serious problem, but it is probably the most preventable type of damage.

Repair Time for Common Maintenance

Every commander wants to know when non-mission-capable equipment will be up and running again. While every piece of equipment is a little different and every repair will take a different amount of time, there are some right-hand limits to these questions. All repairs should take less than two weeks. Contractors who make repairs to RC vehicles are required to get the vehicle back up and running in two weeks or less or justify the delay to the mission. Vehicles that appear to have damage that will take more than two weeks to repair are taken out of service and replaced by a vehicle from the theater sustainment stock (TSS). When the severely damaged vehicles are repaired, they are put back into the TSS to backfill the shortage.

There are not enough repaired vehicles to backfill the shortages in the TSS. When a vehicle is taken out of service, the unit goes on a waiting list for the next vehicle returned to the TSS. The unit that has waited the longest gets the first vehicle back in service, unless the command specifically directs that another unit needs the vehicle due to mission critical requirements.

This policy is not necessary. Maintenance and repair contractors keep all the necessary parts short of a spare vehicle hull to completely rebuild a vehicle in their repair shops at all times. They also have the ability to ship parts from the continental U.S. (CONUS) or anywhere else outside of theater to their repair sites faster than the regular Army systems can produce the parts.

The Buffalo takes the longest to repair because of the numerous and complex electrical systems found throughout the vehicle. The Buffalo has an on board computer that tells maintenance personnel what is wrong with the vehicle. If the maintenance personnel do not have access to the on board computer, they must bring the vehicle to a location that has this capability. Once the maintenance team identifies the repair, it can swap out most parts one for one. The drive train parts, engine, transmission, and transfer case are available through the maintenance contractor, and he can easily swap out these parts in the shop. However, a broken motor mount can cause some long delays in the maintenance schedule. The cooling fans for the Buffalo and the Husky routinely present maintenance problems.

Transporting parts is the biggest contributor to long delays in repair times. The repair contractors are able to get parts into theater faster than the Army's logistical system; however, getting the parts out to the locations that need them can take weeks. Air transportation is often delayed or cancelled, or parts are bumped off flights because of higher-priority cargo. Ground transportation is susceptible to slow travel speeds because of the lack of paved roads, the threat of IEDs or ambushes, and looting by bandits in the remote areas between bases. Weather can reduce the capabilities of both air and ground transportation, and the remote location of the damaged vehicle can require a combination of air and ground transportation, which means even more coordination.

It takes approximately two days to ship a part from CONUS to theater. After that, it can take as little as two days to move the part by air or weeks to move the part by ground transportation. CLP convoys are more reliable; however, they do not run as often as "jingle" truck convoys. "Jingle" truck convoys run more frequently but are much more unreliable for delivering their cargo to its final destination.

Training for Maintenance Personnel Prior to Deployment

During the training period before a deployment, maintenance personnel should attend several courses specifically focused on repairing the vehicles found in a RCP.

The Combined Explosive Hazards Center located in Fort Leonard Wood, MO, offers a Route Reconnaissance Clearance Course for maintainers that focuses on the unique challenges of recovering and repairing RC equipment. Access the Website at <http://www.wood.army.mil/CEHC/R2C2-M.htm>.

Aberdeen Proving Grounds, MD, offers an MRAP repair course as well. Additional training can be included as a part of the mobilization training offered to reserve component Soldiers before their deployment or at National Training Center, Joint Readiness Training Center, or Combat Maneuver Training Center during their predeployment evaluation period.

Vehicles in Need of Repair

The Husky will require the most repairs because of the damage these vehicles sustain in IED explosions. The Buffalo is the least maintenance intensive vehicle of the RC fleet. RG-31s fall somewhere in the middle in terms of repair; however, they present another challenge.

Because of the number of add-on pieces of equipment, the RG-31 platform is susceptible to maintenance issues unrelated to the base vehicle itself. Reconnaissance cameras, interrogation

arms, blowers, mine rollers, and other devices can be added to these vehicles. When one of these specialty pieces of equipment requires maintenance, an FSR is required to perform the maintenance. Sometimes it is difficult to get the vehicle to a location where the FSR can fix it, and sometimes, the FSR tries to travel to the site of the damaged equipment. Either way, repairs can take a considerable amount of time. The unit may not be able to be take the vehicle out of service to make the repairs, so the vehicle must operate without the use of the add-on device. Units consider these vehicles to be mission capable but not fully mission capable. Vehicles may stay in that state for several missions, depending on the operational tempo and the availability of the FSR.

In-theater variations to RCP vehicles include the following:

- Gunner restraint system (Southwest Asia improvement)
- Eagle machine gun mount (secondary weapon mount for upright capability)
- Snow chains (required for operation in the winter months)

The RCP itself is task organized differently in OEF than it is in Operation Iraqi Freedom. In the OEF environment, there are an additional two RG-31s for all RCPs. This task organization creates some minor issues when considering if the vehicle is a standard RCP vehicle or part of the theater-wide MRAP vehicle issue. Contractors often work on the vehicles according to the vehicles' fielding initiative.

Chapter 7

Data Collection/Data Fight

The route clearance mission is important; however, the accuracy and timeliness of reporting information collected on the ground are more important. Through the accurate collection of data and evidence, maneuver units can take actions to carry the fight to the enemy and attack the IED "left of the boom." Decisions at all levels are based on the information Soldiers collect and report.

Reporting happens at several levels. Decision makers collect and sort through different pieces of information to put together the best picture of what happened at the scene of each event. Each report tries to capture a specific group of details so units can take immediate actions to address the issues at hand.

The 9-line improvised explosive device/unexploded ordnance (IED/UXO) report is designed to get first responders to the scene with the appropriate equipment to interrogate, exploit, or neutralize the threat. Blue Force Tracker or Force XXI, battle command—brigade and below is a method to send 9-line IED/UXO reports. It also is a great tool for sending spot reports back to the tactical operations center and communicating with other vehicles in a convoy. Units use these tools to track the movement of friendly forces on the battlefield, which facilitates their analyses of IED events.

Command Post of the Future (CPOF) is used by battalion-level units and higher. Units use this system to consolidate all messages reported to higher and record the locations of all units on the battlefield. CPOF enables all headquarters units to see the same picture of the operational environment and enhances the abilities of adjacent units to support the units' efforts. CPOF captures information that documents what is going on right now, but the system does not typically add this information to the database of record.

Combined Information Data Network Exchange (CIDNE) is the database of record. Units document all significant activities (SIGACTs) in the CIDNE database. Brigade-level units ensure subordinate units accurately report all SIGACTs in CIDNE so division and higher levels of command can make operational- and strategic-level decisions.

Without accurate and timely reporting, the information documented at each step of the process may be misleading, and high-level commanders will make decisions based on imperfect information. If a unit does not report how many IEDs it has encountered in its area of operation, high commands will not allocate counter-IED (C-IED) assets for that area. To those people looking at the database of record, it will appear that the area of operations in question has little to no IED activity, and therefore, the higher-level command will send C-IED assets to an area that appears to have more activity based on the events recorded in the database.

Several agencies are involved in documenting events. The unit that first encounters the IED must send a 9-line IED/UXO report requesting the support of an explosive ordnance disposal (EOD) team. The EOD team will come to the site and interrogate the IED. If the IED is of special interest, the team may render the item safe and make it ready for transport to laboratories which can further exploit the item. If the IED has already exploded, the team may investigate the site and collect any additional evidence. Once the EOD team collects and documents the evidence, it sends the evidence to the combined explosives exploitation cell (CEXC).

The CEXC documents the evidence and processes it to identify more clues as to who was responsible for creating, emplacing, and exploding the IED.

Each of these agencies creates a report documenting its findings; however, agencies typically create these reports after the unit has recorded the event in the CIDNE database. Agencies can attach their exploitation reports to the event in CIDNE to build a fuller picture of what happened at that site.

When all these pieces of the reporting process are complete, planners and decision makers can sort and analyze this data to uncover trends and make assessments of enemy activities. This data becomes a very powerful tool in countering the actions of enemy forces.

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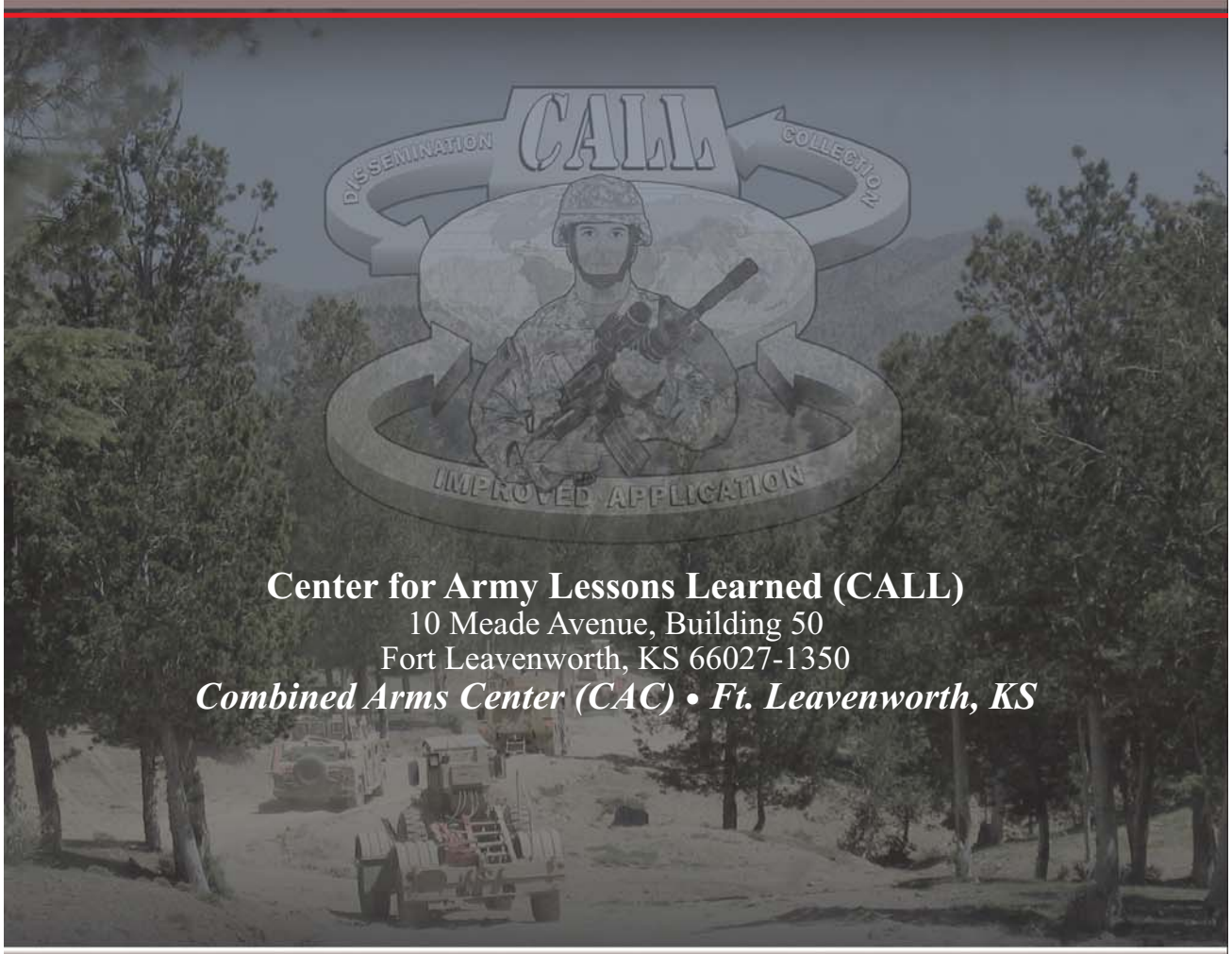

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