Demolition Training

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Infantry units have an opportunity to train with demolitions and explosives about twice a year. Even when this training is conducted well, however, it does not always focus on the tasks that are critical to these units—usually because the trainer does not know which demolition skills are the most important to an infantry unit's combat mission. This wastes expensive training materials and valuable training time.

For these reasons, I would like to share a standard demolition training program developed at Schofield Barracks, Hawaii, that covers all the basic skills an infantry company needs to accomplish its combat mission. (A sample training schedule is shown in Table 1, and a sample list of the demolitions and explosives needed is shown in Table 2.)*

The program starts with a battalion level train-the-trainer course. The trainers, if possible, should be NCOs who have had previous experience working with explosives. Local engineers can help; it's their job to maintain the standard. At Schofield Barracks, for example, the instructors and range safety officers must be certified by engineers in a two-day course of classroom instruction before they conduct training with demolitions. Schofield Barracks also has an annual recertification requirement.

Once this battalion cadre has been trained, the trainers are sent to conduct the main-body training at company level. The initial training, which begins at skill level zero, takes five days—two days in the classroom and three on the range. The refresher training conducted six months later consists of three days of training—one in the classroom and two on the range.

The first classroom day of the initial training phase introduces the soldiers to explosives and demolition materials. (See Chapter 1 of FM 5-25, Explosives and Demolitions.) This introduction includes the tools the soldiers will be using, such as the components of nonelectric and electric demolition kits, the different uses and characteristics of each explosive, and the relative effectiveness (RE) factors, which compare the power of explosives to that of TNT. Although the soldiers do not have to memorize the RE factors, they should know which explosives are more powerful than others and which material each is best used against. Seeing the detonating velocity for each explosive will help them understand this relationship.

One of the most critical demolition tasks to be included in this instruction is calculating the time fuses, because a miscalculation could cause death or injury. The engineers at Schofield Barracks teach an accurate method of calculating a time fuse that detonates a charge to the very second. This process, which is not listed in any reference that I have found, is explained in the accompanying box.

At the end of this block of instruction, the soldiers should complete several practical math exercises until all of them are proficient in calculating the length.

*AUTHOR'S NOTE: I would like to express my appreciation to Sergeant First Class Ronald W. Ricci for his assistance with this article.

The next block of instruction covers the construction of three different types of firing systems—electric, nonelectric, and dual combination. It also includes constructing the initiating system (fuse igniter, time fuse, and blasting cap) and priming and detonating cord knots.

The most commonly used system, the nonelectric firing system, has three components—the igniter, the initiator, and the ring main. The igniter used is, of course, the M60 fuse lighter, which ignites the M700 time fuse. The time fuse with a nonelectric blasting cap initiates the detonation to the ring main, a loop of detonating cord that carries the explosive shock wave to the branch lines. A branch line (two lines if the charge is dual primed) connects the ring main cord to each charge. The purpose of the branch line is to complete the chain of detonation and carry the shock wave to the charge.

This block of instruction ends with a practical exercise that will put together everything the soldiers have learned thus far. The students use inert electric and nonelectric demolition kits to construct all three firing systems. If this is not possible because inert kits are not available, the soldiers should at least have an opportunity to prime a block of explosive, tie demolition knots with detonating cord, tie a Western Union pigtail splice with inert electric caps, and simulate crimping a nonelectric cap to a time fuse.

The next block of instruction, which covers safety, outlines the minimum standards for transporting and storing explosives.

CALCULATING A TIME FUSE

1. Determine the burn rate for the time fuse you are using by test burning a three-foot section and dividing the total number of seconds it takes by three to get the average seconds per foot.

2. To get the total desired burn time expressed in seconds, multiply the desired burn time by 60.

3. Divide the desired burn time in seconds by the burn rate to get the total length of fuse you will need in feet. Carry the division out to two places past the decimal. (The numerals before the decimal represent whole feet, the numerals after the decimal represent the remaining hundredths of a foot.)

4. To isolate the whole number, subtract the numbers following the decimal (the first remainder). To convert this first remainder from hundredths of a foot to twelfths of a foot (or inches), multiply the remainder by 12. This gives you the total inches of time fuse required after the last whole foot.

5. Subtract again all the numbers after the decimal (the second remainder) to get the number of whole inches. Then multiply the remainder by 16 to get the total number of sixteenths of an inch after the last whole inch. Round this remainder upward if it is .5 or greater.

6. The exact length of fuse needed is the total number of feet, inches, and sixteenths of an inch.

EXAMPLE: If you want 8 minutes of time delay and the cord's burn rate is 43 seconds per foot:

Multiply 8 by 60 to get the number of seconds of time you need, 480. Divide 480 by 43, which equals 11.16. Subtract the remainder .16 from 11.16, which leaves 11. This represents the number of whole feet.

To get the inches remaining, multiply .16 by 12, which equals 1.92 inches. Then subtract .92 from 1.92 to get 1, or the number of whole inches over whole feet.

To get the sixteenths of an inch remaining, multiply .92 by 16, which equals 14.72. Round this figure upward to get 15/16ths of an inch.

The total length of fuse you need is therefore 11 feet, 1 and 15/16ths inches.

SAMPLE TRAINING SCHEDULE

DAY 1

0900-1030 Demolition materials
1030-1115 Calculation of time fuse
1115-1200 Firing systems
1300-1430 Construction of firing systems, PE with inert demo
1430-1630 Demo ambush, grapeshot charge, ditch charge

DAY 2

0900-1200 Calculation and placement of charges
1300-1430 Safety
1430-1500 Classroom course review
1500-1530 Written test
1530-1545 Test review
1545-1630 Briefing on the next three days of range training

DAY 3

0800-1200 Firing systems
1200 Release of main body of company
1300-1630 Demo ambush, ditch charge, grapeshot, daisy-chained claymores

DAY 4

0800-1200 Introduction to engineer charges: shaped charge, cratering charge
1300-1630 Calculation and placement of charges

DAY 5

0800-0930 Entire company reunites, platoons establish assembly areas
0930-1000 Platoons draw ammunition, platoon leaders receive operations order
1000-1200 First platoon goes through course
1230-1430 Second platoon goes through course
1430-1630 Third platoon goes through course

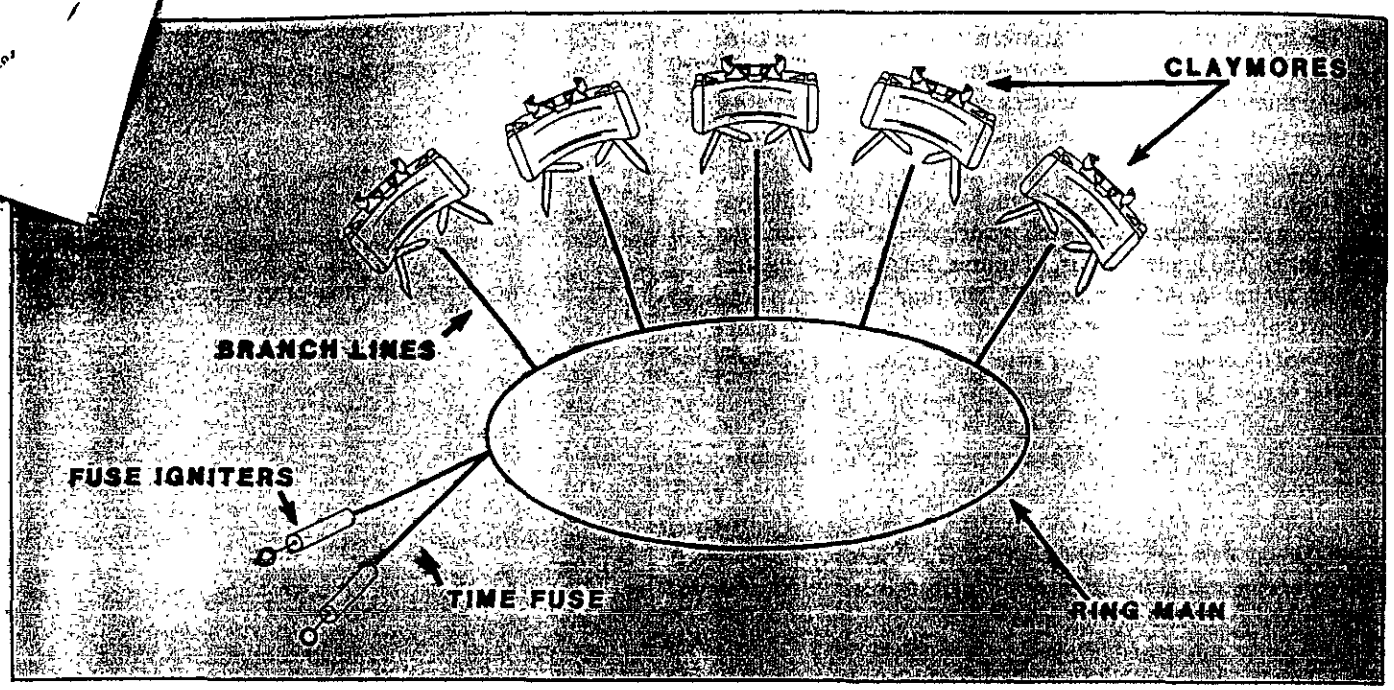
Table 1

Light infantry soldiers need only to know how to transport and waterproof explosives they carry in their rucksacks. But noncommissioned officers must also know how to store and transport large amounts of explosives in the event they are required to serve as range ammunition or battalion ammunition NCOs in the field trains.

It is not necessary to teach the soldiers how to calculate (using the cubed root formula) the minimum safe distance from which to observe detonation, but they should be taught how to use the minimum safe distance table on GTA (Graphic Training Aid) Card 5-10-28.

The next class teaches the infantrymen how to employ a demolition ambush. Because of the variety of demolitions that can be used in an ambush, this class should be divided into five subclasses: daisy chained claymores, field expedient claymores, indirect fire rounds, grenades, and ditch charges.

Daisy chaining puts multiple claymores on the same charge by linking them with detonating cord so they will detonate simultaneously. The most common method of daisy chaining is to run the detonating cord from one mine to the next. A method that is the quickest and the easiest to prime, and one



that ensures positive detonation for all the claymores, is to lay out a ring main and tie off one branch line for each claymore. You may use two branch lines if you want to have dual-primed claymores. A nonelectric blasting cap is crimped to the other end of the branch line and primed in the fuse well of the mine. Each claymore now has its own independent branch line off the ring main, and one dud claymore will not block the chain reaction and keep it from going on to the others down the line.

The field expedient claymore (the grapeshot) is used when standard claymores are not available. In this method, the bottom of a number 10 can (the kind a mess hall gets its canned peaches in) is stuffed with two pounds of C-4 explosive, smoothed flat. A rag or piece of cardboard is put over the explosive to act as a buffing material. The rest of the can is filled with nuts, bolts, expended brass, rocks, or anything else that makes a good projectile and the opening is taped to keep everything in. Then the C-4 is primed through a hole punched in the bottom of the can (see Appendix C, Field Manual 5-25).

The next subclass teaches how to incorporate indirect fire munitions into a demolition ambush. The munitions to use in this block are 60mm, 81mm, and 4.2-inch mortar rounds. To prime these rounds, one-third of a block of C-4 explosive is taped to their widest part to ensure detonation. When the rounds detonate, they have a massive shrapnel effect; they are even more effective if they are hung from trees.

Finally, the soldiers are shown how to incorporate grenades into an ambush. These can include fragmentation and white phosphorus grenades, or even smoke grenades if they want to screen an assault. All the pins of the grenades are pulled, the ring main cord is run under the spoons of the grenades, and they are taped down with electrical tape. This will give a delayed blast after the main blast. The detonating cord under the spoon will not detonate the grenade. For immediate detonation, the fuse of the grenade can be unscrewed and a golf-ball size clump of C-4 explosive packed into the fuse well and primed either with a blasting cap on the end of the branch line or with an overhand knot of detonating cord.

For a ditch charge (a separate charge but an integral part of a demolition ambush), three or four strands of detonating cord are taped together for the length of the desired kill zone. Nails are taped around the entire length of cord, and this charge is placed in a ditch in the ambush kill zone. The charge is camouflaged with earth and debris, primed with an electric blasting cap and firing wire (perhaps left over from one of the daisy chained claymores). When the ambush is activated, and the enemy takes cover in the ditch, someone sets off the firing device.

It is important for the soldiers to know how to calculate charges using various types of explosives against different types of material. Here again, they need not be taught all the mathematical formulas for each charge, but they do need to learn how to use the calculation tables on the GTA card.

The abatis charge for antiarmor ambushes and the concrete-breaching charge for urban operations are of particular interest to infantry units. The soldiers should know how to compute the total amount of explosive required when using multiple charges. They should go through several practical exercises during which they must calculate the total amount of explosive to use and the size of each charge.

This two-day classroom training closes with a half-hour review and a written examination, complete with mathematical calculations. The review and examination help in two ways: First, they enable the trainer to critique his own instruction by seeing how well the soldiers retained the information. Second, they identify the soldiers who show the most interest in demolitions and who have a knack for math. These are the soldiers who should be selected for the unit's demolition teams.

Those teams should consist of two soldiers per squad, and these soldiers should be identified before the range training begins. Obviously, a soldier on a machinegun team or the unit's PIR (priority intelligence requirements) recorder would

not be good candidates. And the designated sniper would be too far from the objective to also serve as a demolitions man. In any case, the platoon leaders should make the final decision.

(For cross training, the soldiers should be rotated on and off the demolition teams annually. Or, if the training resources are available, entirely new crews can be trained. In a COHORT unit, though, it is more efficient to train demolition teams initially and keep them throughout their enlistment tour.)

Up to this point, the soldiers have been taught everything they need to know about demolitions to operate safely on the range. The next block of instruction should outline the training schedule on the range for the next three days. Then there will be fewer questions and less confusion when the soldiers go to the range.

On the range, trainers must assume, though, that nobody has any demolitions experience, and start with the basics. After an initial orientation, the soldiers should be required to prepare a nonelectric firing system, an electric firing system, and a dual combination firing system. This gives each soldier an opportunity to prime three blocks of explosive and tie them into a firing system. The designated demolition teams should be retained and the rest of the company released for other training until Day 5.

During the next day and a half the demolition teams are trained on specific charges. Although many of these charges are not directly available to the infantry, the soldiers will probably see them in combat and need to be familiar with them—for example, charges such as the 15-pound and 40-pound shaped charges, cratering charges, bangalores, and prefabricated satchel charges. Also an M-21 antitank mine should be primed nonelectrically in the booster well on its under side, placed under a junked vehicle—without the fuse—and detonated to demonstrate its blast effect.

SAMPLE ORDER OF DEMOLITIONS AND EXPLOSIVES

1 box electric blasting caps (6 each)
150 nonelectric caps
4,000 feet detonator cord
1 case dynamite
4 cases C-4
1 case 1-pound blocks of TNT
300 ¼-pound blocks of TNT
16 claymore mines
2,000 feet time fuse
2 prefabricated satchel charges
1 15-pound shaped charge
1 40-pound shaped charge
1 40-pound crater charge
1 bangalore torpedo
75 M-60 fuse lighters
1 basic load 7.62mm, 5.56mm, 40mm, and grenades for each platoon
1 extra box fragmentation grenades
5 nonelectric demolition kits
1 electric demolition kit
6 number 10 cans
20 pounds of nails, nuts, bolts, and rocks
20 rags
20 pounds 16-penny nails
5 rolls electrical tape
1 roll communication wire, unspliced
25 cardboard silhouette targets
2 telephone poles, destructible timber
1 slab of concrete or masonry wall
Scrap lumber (preferably plywood and 90 2x4s)

Note: Actual amounts of materials depend upon the number of soldiers being trained.

Table 2

Light infantry units are not authorized many of these materials for training, but a supporting engineer unit may be able to lend the infantry unit one of each type in a joint training venture. (The engineers at Schofield Barracks detonate these munitions quite frequently and are happy to let infantry units send a few men over to train with them.) The engineers will not always be able to support the infantry unit's specific training schedule, but they can help a great deal, and a close working relationship should be established with them.

In cases where an actual munition cannot be detonated, the charge can be constructed by field expedient methods to show its effects. (Appendix C of FM 5-25 shows how to make a field expedient shaped charge.) For instance, a field expedient bangalore can be demonstrated by placing TNT blocks end-to-end with U-shaped pickets taped around them. If U-shaped pickets are not available, bamboo poles or broomsticks will do—anything to hold the TNT blocks stiff. If even improvising is difficult for a particular munition, a class on it can be presented and a diagram of it shown.

The soldiers should also be shown how to construct small two-pound satchel charges for the demolition teams to use. Two blocks of C-4 are broken in half and then taped together. The charge can easily be carried in an M60 or M245 machine-gun bandoleer.

The demolition team members should be allowed to calculate and place abatis and concrete-breaching charges so they can see the results of their own calculations. They should not be given too much leeway, though, during this calculation exercise. Competition can cause the sizes of the charges to get out of hand with no regard for economy of explosives or for the target.

The fourth day ends with the construction of a demolition ambush and a ditch charge. Then the demolition teams are reunited with the rest of the company for the live fire exercise on the next day, which takes six hours—two for each platoon.

The platoons move into assembly areas behind the ready line of the range and immediately assume tactical postures. All ammunition is issued immediately so the platoons can prepare their charges during the troop leading procedures. Then the operations order for a raid or an ambush is issued.

The commander walks the platoons through the course before the actual live fire exercise takes place. For a raid, the scenario should require that the soldiers remain undetected until they are right up on an enemy position so they can move up within 35 yards of it to place out a daisy chain of claymores. They then back away to the safety of a berm.

If range control procedures allow it, the platoon initiates

the raid with the claymores as the soldiers lob hand grenades and fire M203 grenades on the objective. When the platoon opens up with machinegun fire on the target, the breach teams conduct a hasty minefield breach with a grappling hook or entrenching tool and rope, and move toward the barrier wire. The breaching team then blasts through the concertina wire barrier with a bangalore torpedo.

For safety reasons, the wire barrier should be simulated, perhaps with engineer tape, because the wire can be blasted into so many missiles that they become hazardous. Later, when the unit becomes highly proficient with live fire exercises, the bangalore can be placed in actual wire, provided range control allows it and the soldiers keep their heads down.

This bangalore detonation signals the support unit to shift fires. When it does, the assault element sweeps through the objective and conducts its actions according to standing operating procedures. All three squad demolition teams get an opportunity to train as each squad places separate charges on the same objective. (Leaders should try to have something on the objective for the demolition teams to gather and place their charges on—such as scrap lumber, steel, or old tires.) The platoon leader, by tactically supervising his primary demolition team, rehearses his own actions on the objective. And range safety officers or noncommissioned officers monitor each of the three demolition teams for safety.

Another ambush is conducted in a similar fashion, but with a wire breach substituted for the demolition ambush and ditch charge.

Fragmentation grenades may not be safe to use in the demolition ambush, depending on the configuration of the range and the experience and confidence of the soldiers, and the indirect fire rounds must not be fired without overhead cover. Some commanders may also want to skip having their soldiers throw live grenades.

The ditch charge can be simulated with four lengths of detonating cord taped together without the nails taped to it. The chief instructor or range safety officer must always check the length of the time fuse that the students have calculated and cut.

The refresher training conducted six months later is only an abbreviated version of this initial training. The classroom training should open with a pre-test to determine how much the soldiers have retained. After all the soldiers receive hands-on refresher training with inert demolitions, most of the company can be released for other training and only the demolition teams retained for calculation exercises.

The next day, on the range, to familiarize the company with demolitions, each soldier in the company is given a single charge to prime. Then, for the rest of the day only the demolition teams are put through some adventure training and allowed to experiment with calculations. This is a treat for the teams, and it builds their confidence with the explosives they must use.

The final day, of course, should be a live fire exercise, with the two scenarios rotated between an ambush and a raid. A raid on an urban objective will require the breach teams to perform calculations for a concrete-breaching charge placed center of mass at waist level and vertically to facilitate ease of passage. If the company feels confident with explosives, a night live fire version might also be tried.

This demolition training program places priorities on the demolition skills that are critical to a light infantry unit. It teaches the basics. But it is just a guideline. Each commander needs to tailor it according to his available resources and range requirements. Used properly, it will make the most of those resources and teach infantry soldiers what they need to know about demolitions.

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