sight) would be needed on deflection scales so that the 0-3200 line could be identified. (If this step were forgotten, reciprocal lay would be fouled up considerably.)

Next, instruction in the geometry of the sight would be more complicated — the 0-3200 line would be along one constant orientation during reciprocal lay but afterwards would be in different directions as dictated by the mounting azimuth.

Finally, the value of the aiming circle as an azimuth measuring instrument would be considerably reduced, unless we accepted the complication of two sets of scales — one clockwise and the other counterclockwise.

I can envision a few other aspects of this question, and INFANTRY readers may think of still others, but the discussion here seems to cover the mechanics and the major *pros* and *cons* of deflection versus azimuth. I believe deflection is simpler and therefore preferable, but the case is not overwhelming. Nevertheless, Mr. Hoyle has done us all a favor by asking us to think through an ancient procedure that we have tended to take for granted.

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Antiarmor Weapons in Cities

CAPTAIN FRANK A. EMERY

Because of the extensive urbanization in Western Europe, we have known for a long time that any future war there is likely to include combat in cities. The Soviets have known this, too, and have prepared for it. (See "Soviet Military Operations in Built-Up Areas," by Major A.E. Hemsley, INFANTRY, November-December 1977, pages 30-34, and "MOUT and the Soviet Motorized Rifle Battalion," by Lieutenant Colonel Lester W. Grau, INFANTRY, January-February 1985, pages 24-27.)

The current Soviet doctrine for combat in cities shows that a Soviet division will operate in two echelons at each level of command and use frontages of four to six kilometers, with two to three kilometers for a regiment, 400 to 600 meters for a battalion, and 200 to 300 meters for a company.

The divisional and regimental axes of advance will be along major roads so that these units can capture key areas, disrupt the defense, and cross the area in the shortest possible time. A battalion might advance on two or three parallel streets, with one company axis per street.

During offensive combat in cities, Soviet artillery will be decentralized. Up to half of it may be attached to assault groups and used in its direct fire role. Howitzers and mortars will be used for counter-battery tasks. Preparatory fires will be shorter than normal, 5 to 20 minutes usually. Tanks will be used to sup-

TOW crew prepares for a shot during training with the Berlin Brigade.

port infantry and to neutralize enemy strongpoints. Soviet doctrine calls for strong reserves of tanks at both battalion and regimental level.

Clearly, then, if our infantry units are to have an advantage in combat in cities, we must have some efficient means of getting firepower into the killing zone from all sides, especially from the flanks. But our current antitank weapons have certain limitations that may make them ineffective in city streets.

First, antiarmor ranges in city streets will not usually exceed 1,000 meters. Although our light antiarmor weapon (LAW) has the appropriate range, its ability to penetrate Soviet armor is questionable. (The AT-4 may do somewhat better in this regard.) Conversely, the TOW and the Dragon have proved that while they can destroy Soviet tanks on a conventional battlefield, they may not be as effective in cities because they cannot take on targets at short ranges. In addition, both of these weapons are antitank guided missiles (ATGMs), and the tracking distances will be limited; there is little open terrain in cities where a gunner can track a target for the required 5 to 16 seconds.

There are other limitations to using ATGMs in cities, primarily because of the numerous obstacles found there. One of the most overlooked of these is electric power lines. In the Federal Republic of Germany, for instance, voltages in power lines range between 8,000 and 100,000 volts, and TOW guidance wire is insulated to withstand only 100 volts. High voltages can induce currents in a TOW guidance wire, and while they might not break the wire immediately, they can melt the wire's insulation and flow back to the gunner and the TOW vehicle. Even the best electrical ground can reduce this voltage by only a fraction. Obviously, such voltages can cause serious injury to a gunner and serious damage to the ground equipment.

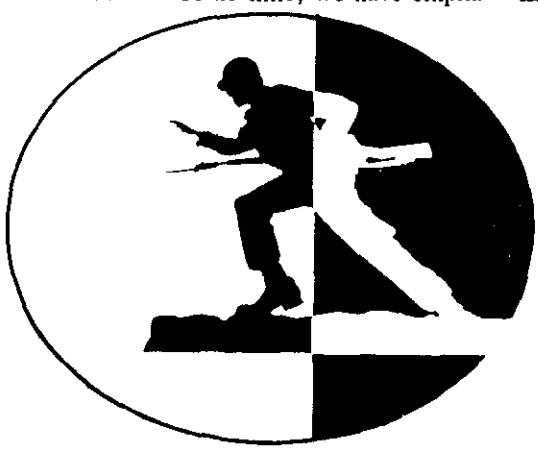
Another obstacle for TOW and Dragon gunners is the tank barriers that we will probably emplace along the armor avenues of approach. An abatis is such a barrier. For an abatis to be effective, the stumps in it must be 5 feet high, the tree length 20 feet, and the barrier depth 250 feet. Such a barrier will decrease the effectiveness of an antitank gunner because it will interfere with his target sight and cut the wires to the missile. Triple-strand concertina wire that stands over 5 feet high can also cut TOW and Dragon wires.

ENGAGEMENT

The urban environment itself provides a substantial obstacle, because it forces the gunners to engage armor targets from the front. Frontal engagement is not recommended, because a gunner's position can be more easily identified by his weapon's backblast. Also, the mobility of the TOW systems could be seriously limited because of the debris created by indirect fires. Finally, urban conditions may not permit a TOW system to engage its target from a mounted position, and when TOWs have to be dismounted, the heavy equipment will burden the crew and greatly reduce its mobility.

Another problem with our antiarmor weapons is that we overlook the importance of conducting tactical training with them. For some time, we have emphasized tracking with the TOW using the M70 training set while placing little or no stress on training in tactical skills. (This emphasis on tracking seems to stem from the fact that the M70 trainer generates numerical scores that can be used to separate good TOW gunners from bad ones. Tactical training, on the other hand, is hard to evaluate — especially when an individual does not understand the expected level of warfare, the threat, and the common engagement situations to be trained for.)

The Soviets recognize that close combat is one of the most characteristic features of action in a city and that it requires a special organization of their system of fires. The chief role in that system is played by the infantry with its small arms and grenades supported by armored vehicles and mobile artillery. Accordingly, to counter the Soviet offensive threat, we must develop a multilevel and multilayered field of fire over the entire terrain in front of a defended object as well as within buildings.

In recent years other nations have been making improvements in their close-range antiarmor weapons. We, too, must recognize their importance and come up with an alternative to our current weapons. We can either develop such an alternative ourselves or adopt a weapon developed by one of our allies. Either way, we must give our infantrymen a weapon they can use effectively in urban warfare.

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