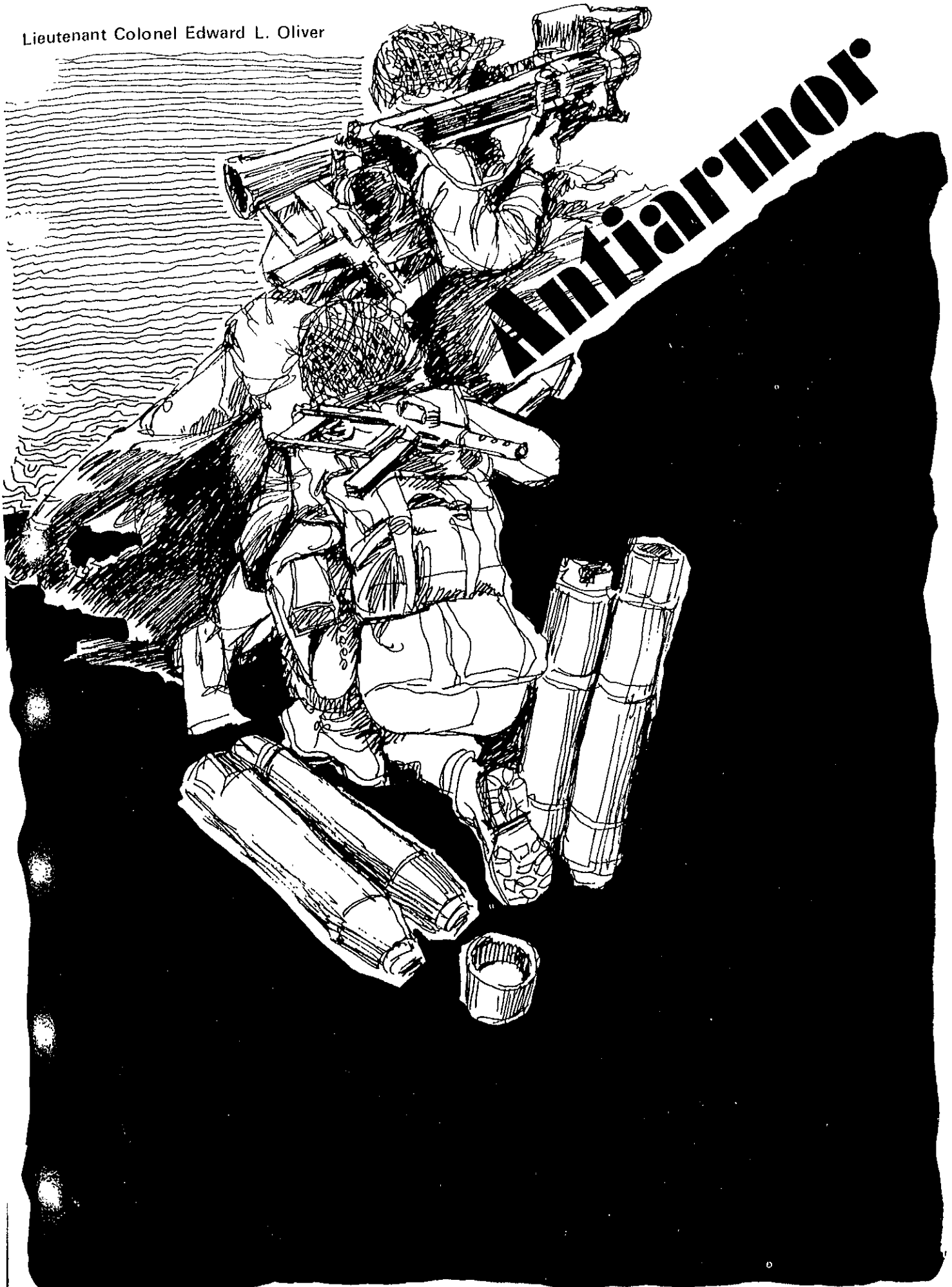


Lieutenant Colonel Edward L. Oliver



AMERICAN

The following account by an Israeli tank commander in the Sinai in 1973 describes the effects a coordinated antitank defense can have:

We were advancing and in the distance I saw specks dotted on the sand dunes. I couldn't make out what they were. As we got closer, I thought they looked like tree stumps. They were motionless and scattered across the terrain ahead of us. I got on the intercom and asked the tanks ahead what they made of it. One of my tank commanders radioed back: "My God, they're not tree stumps. They're men!" For a moment I couldn't understand. What were men doing standing out there — quite still — when we were advancing in our tanks toward them? Suddenly all hell broke loose. A barrage of missiles was being fired at us. Many of our tanks were hit. We had never come up against anything like this before . . .

The Egyptians had lured an Israeli armor battalion into an antiarmor ambush zone consisting of camouflaged, entrenched infantrymen armed with RPG-7 light antitank rockets and Sagger antitank guided missiles (ATGM). The Egyptians, coordinating their fires, had caught the Israeli tanks in the kill zone of both weapons at the same time and the combined effect was devastating. More than 35 Israeli tanks were destroyed, and the battalion commander was captured.

Recent Middle East fighting reaffirms the offensive potential of and the need for combined arms teams. It also continues to demonstrate the lethality of modern antitank rockets and antitank guided missiles against infantry fighting vehicles and the latest main battle tanks. Throughout the world, countries are lavishly equipped with the latest antitank rockets and ATGMs. A U.S. Army unit that deploys today, therefore, must be prepared, as the British recently experienced in the Falklands, to face many of these weapon systems. Accordingly, the capabilities of these weapon systems should be indelibly engraved in the minds of each of our battle captains, platoon leaders, and squad leaders. (While there are numerous antiarmor systems, this article, for brevity's sake, discusses only the latest and most significant ones.)

Most infantry antitank weapons fit into three general categories: heavy, medium, and light, and they are commonly referred to as HAW, MAW, and LAW.

HAWs are long-range systems that can engage targets beyond 2,000 meters. Their purpose is to destroy as many tanks as possible and break up the momentum of an enemy armored force before that force gets close enough for its direct fire weapons to affect the friendly forces. Most HAWs require a vehicle for transportation and employment and a crew for operation. They are usually centrally controlled at the battalion or brigade level.

MAWs, usually found at the company or platoon level, have a range of from 1,000 to 2,000 meters. Most of them are manportable (by one man or by a crew) and can be integrated as part of a combat vehicle's firepower. Their

purpose is to maintain a high concentration of fire in an antiarmor kill zone while the HAWs displace to alternate firing positions out of direct fire range.

The majority of today's HAWs and MAWs are ATGMs that carry the large, high-explosive, antitank (HEAT) warheads needed to destroy or disable modern main battle tanks. HEAT warheads use the shaped charge principle to "explode" a hyper-velocity metallic jet through a tank's armor to produce spalling and ricocheting fragments inside to kill crew members, damage instrumentation, and cause secondary fuel fires and ammunition explosions. ATGMs generally can be classified by their guidance concepts: manual, semiautomatic, or automatic.

A manual command-to-line-of-sight (MCLOS) ATGM system usually requires its gunner to track both his target and his missile visually while manually making missile flight corrections by moving a joystick, an operation similar to flying a model airplane. An MCLOS is sometimes referred to as "first generation" guidance and is typical of the ATGMs that appeared in the mid-1950s. Systems using this type of guidance are now considered obsolete. To make manual guidance possible, the missile velocity had to be slowed, and this resulted in a long time of flight. Additionally, the MCLOS gunners required an excessive amount of training to "fly the missile."

To overcome these deficiencies, semiautomatic command-to-line-of-sight (SACLOS) systems were developed. A SACLOS requires its gunner to track only the target. The missile is "tied" to the gunner's line of sight by an electro-optical guidance set that "watches" a signal — usually an infrared light (IR) source — from the missile. The guidance set detects missile variations from the line of sight and then computes and sends the required corrections by wire or radio to the missile. This type of system is often referred to as "second generation" and is found in most of the ATGMs fielded today. The SACLOS systems greatly reduce gunner training requirements and allow faster missiles to be used. The gunner, however, still has to track a target throughout the flight of his missile and remains vulnerable to suppressive fires.

Future ATGMs may use automatic guidance, which will not require a gunner to track either his missile or his target. The missile will home in on the target automatically. An automatic guidance system is often referred to as "fire and forget" or "third generation." While there are no systems of this type in the field today, the development of a "third generation" missile is under way in many countries.

The "bayonet" of the antiarmor battle is the LAW, which many call a final protective, self-defense, or last-ditch weapon. The LAW, an integral part of the close-in battle (300 to 500 meters), gives the infantryman a significant antiarmor role in such restricted terrain as woods and urban areas. LAWs are usually light, manportable weapons that are cheap to manufacture and simple enough to be spread throughout the battle area; they are also effective against such secondary targets as bunkers,

field fortifications, and light-skinned vehicles.

Today's LAWs are direct descendants of the World War II U.S. bazooka and the equally successful German *Panzerfaust* 150. They can be generally classified by their propulsion principles: rocket, recoilless rifle, and Davis gun.

The rocket principle, used with the U.S. LAW M72A3, for example, is the one most widely used today. The propellant is burned within the rocket before it leaves the tube. Because no initial pressure demands are made on the launch tube, it can be constructed simply with lightweight materials. This rocket principle does have the disadvantages of a large signature from smoke, blast, flash, and dust, and limited accuracy at ranges beyond 300 meters.

Recoilless rifles, such as the Carl Gustaf, are breech-loaded and have venturi tubes, or openings, in the breech-lock to "balance" the rearward thrust of the rocket. As a result, high internal pressures are placed on the tube. Consequently, because LAWs operating on this principle must be strong enough to withstand these high pressures, they are usually heavy and are not disposable. They also have large forward and backblast firing signatures, and their large backblast danger areas restrict their employment in confined areas.

The Davis gun principle, which the *Panzerfaust* 3 uses, requires a counter-mass from the rear of the tube equal to the mass of the rocket fired from the front of the tube, which provides a recoilless effect. These weapons weigh more than most LAWs. Their principal advantage is a smaller flash, blast, and smoke signature. A modification of this principle uses gases generated in the center of the launcher acting on two pistons. These pistons send the projectile out one end and a counter-mass out the other and then form seals at both ends of the tube. There is no launch signature (smoke or blast). This principle provides a solution for firing from an enclosed room or bunker.

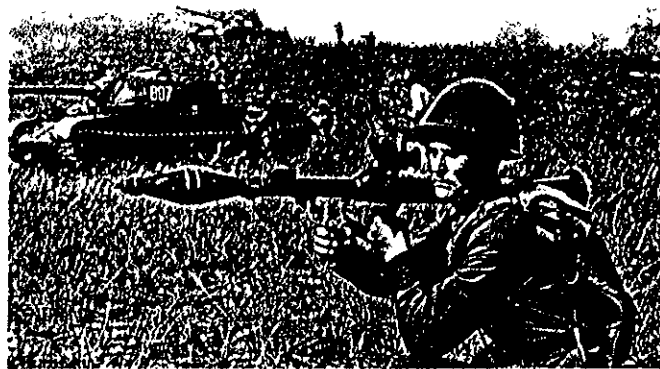
LIGHT ANTITANK WEAPONS

M72A3 LAW

The U.S. Army's M72 LAW was fielded more than 20 years ago as a longer range and more effective replacement for the 3.5-inch bazooka. It is an individual antitank weapon and is issued as a round of ammunition. The M72 series, now out of production, weighs about five pounds and can be carried by one man. A self-contained disposable weapon, it consists of a rocket within a telescopic launch tube and an integrated sight. Its effective range is about 200 meters and its 66mm warhead can penetrate about 300mm of rolled homogeneous armor (RHA).

RPG-7

A direct descendant of the World War II German *Panzerfaust* 150, the RPG-7 is the standard manportable antitank weapon used by the Soviet Union and its allies.



RPG-7

There are two models: the RPG-7V, issued to motorized infantry squads, and the RPG-7D, a break-apart version, issued to airborne infantry squads. Its rocket-assisted projectile is a unique feature that reduces the initial backblast and protects the gunner. Since it weighs about 22 pounds, the RPG-7 can be loaded and fired by one man, but is usually served by a two-man crew. Its effective range is 300 meters, and its warhead is capable of penetrating 330mm of RHA. In addition to iron and optical sights, active IR and passive starlight night sights are also available. Since the RPG-7's introduction in 1962, it has been used in many areas of the world.

RPG-16

The RPG-16 has recently been identified in the Soviet's manportable antitank inventory. When ready to fire, it weighs about 29 pounds and has a crew of two — a gunner and an ammunition bearer. Estimates are that its warhead can penetrate up to 375mm of RHA. Resembling a large RPG-7, it has optical sights, a trigger grip below the tube, and a conical blast shield on the rear of the tube. It has a bipod mounted on the front of the tube, which may indicate it has a heavier and more effective warhead than the RPG-7.

RPG-18

Another new addition to the Soviet Union's LAW inventory is the RPG-18. A disposable system consisting of a 64mm rocket loaded in a telescopic tube launcher, the RPG-18 weighs 9 pounds. The rocket is spin-stabilized, and its HEAT warhead can penetrate up to 375mm of RHA. The RPG-18 bears a remarkable resemblance to the U.S. M72A3 LAW, to include having its operating instructions on the side of the tube. Like the M72A3, it appears to be designed as a simple-to-operate antiarmor weapon to be used at all levels. A version of the RPG-18, the RPG-75, is manufactured in other Warsaw Pact countries.

LAW 80

The British LAW 80 is a platoon and small unit, manportable, one-shot, disposable antitank rocket. It is issued as a certified round of ammunition and weighs

about 21 pounds. The LAW 80's 94mm HEAT warhead is capable of penetrating more than 600mm of RHA. A unique feature of the LAW 80 is a five-round spotting rifle as a part of the launcher. This addition is supposed to increase the LAW 80's hit probability at an effective range of 500 meters.

Panzerfaust 3

The Federal Republic of Germany's (FRG) *Panzerfaust 3* operates according to the Davis gun principle



Panzerfaust 3

(countermass) and can be fired from closed rooms, bunkers, and other shelters. When ready to fire, it weighs about 26 pounds and has an effective range of about 400 meters. Its 110mm HEAT warhead is said to be able to penetrate more than 600mm of RHA. The weapon is designed as a two-piece system. A launcher and rocket form the cartridge to which a firing mechanism with a sight is attached. After firing, the gunner throws away the launcher. The firing mechanism with the sighting unit is reusable.

Armbrust

Another FRG manportable, expendable system is the *Armbrust*. It has an effective range of 300 meters and is issued as a round of ammunition that weighs about 14

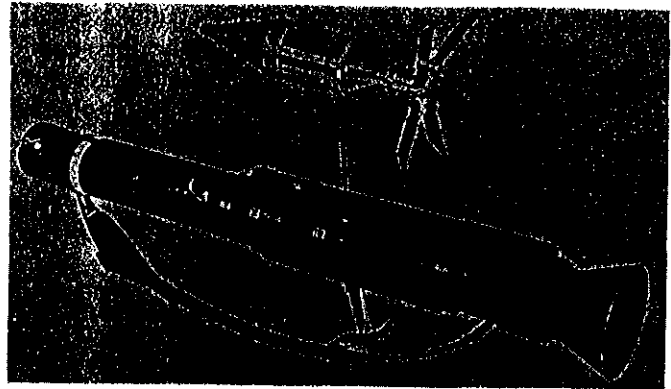


Armbrust

pounds. Its 67mm warhead is capable of penetrating more than 300mm of RHA. The *Armbrust*'s double-trapped piston design propels the projectile out the front and at the same time drives a "countermass" of 5,000 small plastic chips to the rear to balance the forward movement. As a result, *Armbrust* has no flash, smoke, blast, or recoil and has a noise signature that is similar to a pistol's. It can be fired safely from small enclosed rooms.

AT-4

The Swedish 84mm AT-4 is a lightweight, expendable, antiarmor system with an effective range of 300 meters. The AT-4 weighs about 13 pounds and consists of a lightweight, fiberglass launcher tube, front and rear battle sights, a firing mechanism, and a projectile. In addition to its armor penetration, which exceeds 300mm of RHA, its 84mm warhead has been improved for such behind-



Swedish AT-4 LAW

the-armor effects as overpressure inside the vehicle, blinding and incendiary effects, and mechanical damage to vital components by fragments.

FFV 550 Carl Gustaf

The Swedish Carl Gustaf is an 84mm recoilless rifle. It consists of a rifled tube and is breech-loaded. An open sight is available, and a telescopic or IR night sight can be mounted. The Carl Gustaf weighs about 40 pounds and

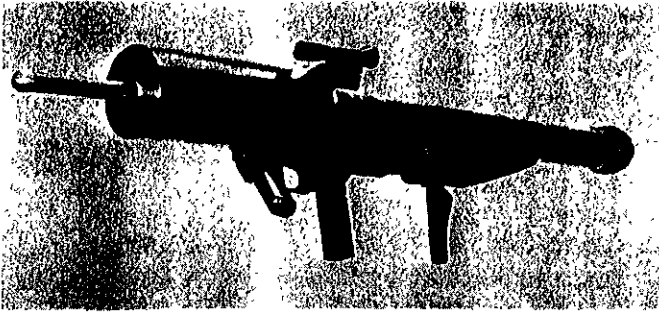


Carl Gustaf

requires a crew of two. Its HEAT round has an effective range of about 700 meters and can penetrate more than 400mm of RHA. An electro-optical telescopic sight is available with a coincidence rangefinder and an electronic lead finder. The Carl Gustaf also fires an anti-personnel round, a smoke round, and an illumination round.

AC300 Jupiter

The French *Jupiter* is a 24-pound, throwaway antitank weapon. The launcher is 70mm in diameter with a 115mm front portion that houses an oversized warhead. A probe



Jupiter

is collapsed inside the 115mm warhead for carrying purposes, and it must be extended when the weapon is prepared for firing. This 100mm probe, much like the probe on the improved U.S. TOW, increases the detonation standoff distance and contributes to the *Jupiter's* 700mm RHA penetration capability.

The disposable launch tube mounts a reversible 3-power day or night sight. Employing the counter-mass principle, it ejects a fin-stabilized rocket from the launcher tube, which then fires to attain its maximum velocity. *Jupiter* has an effective range of 330 meters and has neither a smoke nor a flash signature. Its noise signature is like that of a pistol, and like the *Armbrust*, it can be fired from small enclosed spaces.

Strim

The French 89mm rocket launcher, *Strim*, when loaded



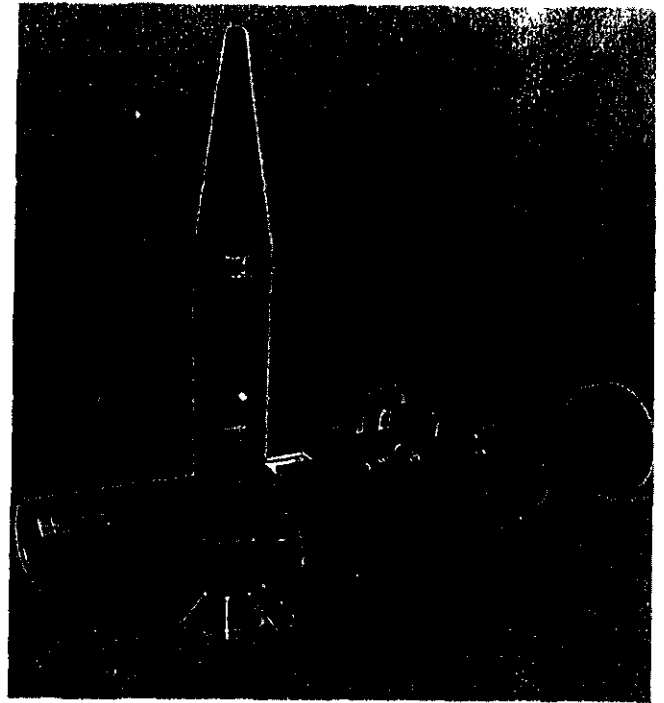
Strim

and ready to fire, weighs 19 pounds and has a range of 315 meters. Its fin-stabilized HEAT rocket warhead is capable of penetrating more than 400mm of RHA. *Strim* also fires smoke, illumination, and anti-personnel/anti-vehicle rounds.

Two components make up the total system: a rocket in a carrying tube and a forward launcher section with a tube that mounts an adjustable shoulder piece and fore-grip, a firing mechanism, and a telescopic sight. An image intensification night sight can be used in place of the telescopic sight.

APILAS

The French APILAS (armor-piercing infantry light armor system) in the carry mode is 50 inches long. The launcher tube, made of lightweight Kevlar and special plastics, and the projectile together weigh about 20 pounds. APILAS can be fired by either a right- or left-handed gunner by altering the position of the sight, hand-

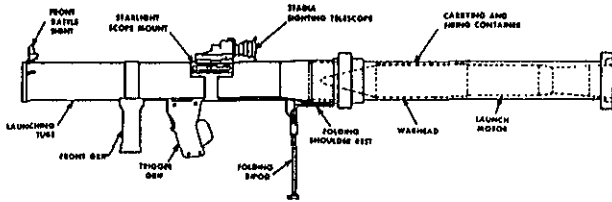


APILAS

grip, and shoulder pad on the launch tube. APILAS has an effective range of 330 meters when fired from the shoulder and can penetrate more than 720mm of RHA. With the addition of an 18-round firing aid (tripod and computerized optical sight), the effective range is almost doubled to 600 meters.

B-300

The Israeli 82mm B-300 is a man-portable, shoulder-fired system with an effective range of 400 meters. The B-300 is similar to the French *Strim*. It also uses a two-part launcher consisting of a reusable forward section capable of mounting a telescopic or starlight sight and a rocket in an expendable transport container that attaches to the forward section to form a complete launcher. The B-300,



B-300

loaded and ready to fire, weighs 18 pounds, and its HEAT warhead is capable of penetrating 400mm of RHA. There may be other projectiles available: one with an incendiary warhead and one with a follow-through warhead for use in urban areas or for bunker-busting. The B-300 is being evaluated by the U.S. Marine Corps as a shoulder-launched multipurpose assault weapon (SMAW).

M72-750 Norwegian LAW

Norway, the only producer of the M72 LAW outside the U.S., has developed an improved version called the M72-750 because of its muzzle velocity of 750 feet per second. A round ready to fire weighs about seven pounds (two more than the M72A3), has increased penetration, estimated at 380mm of RHA, and increased hit probability. These improvements are the result of an upgraded rocket motor and a new fixed probe warhead to increase the detonation standoff distance. Other improvements include a sighting system similar to the one developed for the U.S. Viper and a better "feel" to the trigger mechanism so that the gunner can better judge the moment of firing.

MEDIUM ANTITANK WEAPONS

M-47 Dragon

Fielded in 1975, the Dragon is the U.S. Army's man-portable medium ATGM. It has a range of 1,000 meters and is a SACLOS system. It was the first manportable guided missile system capable of destroying tanks and other armored vehicles within a platoon's area of operations. The missile and launcher weigh about 32 pounds.

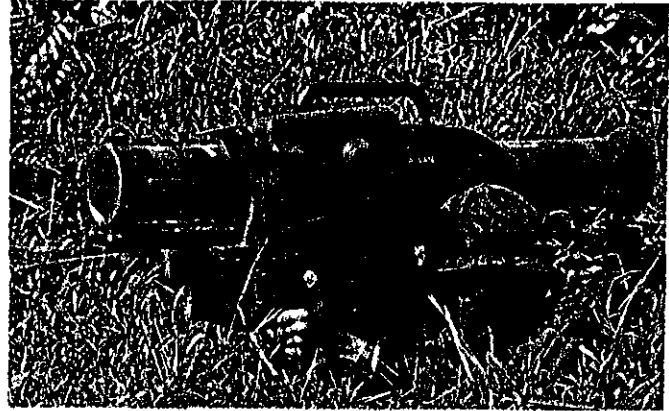
The Dragon consists of three major items: a round that consists of a missile preloaded into a sealed expendable launch tube that has a forward bipod attached to it; a tracker that is easily attached and removed from the round; and a thermal-imaging night sight that enables the Dragon to be used without artificial illumination. Dragon is used by many nations, a third of which are in the Middle East.

MILAN

MILAN (missile, infantry light antiarmor) is a SACLOS medium antitank system fielded in 1972 by France and the FRG. It was designed to be used by airborne, mountain, and dismounted infantry units at the

platoon and company levels. MILAN has a range of 2,000 meters, and its velocity — about twice that of the earlier ATGMs — enables it to reach its maximum range in 12.4 seconds. It requires a crew of two: an operator, who carries the firing unit, and a loader, who carries two missile rounds.

The firing unit has a sighting and guidance assembly mounted on a tripod, and each missile round has a launch tube and is handled as a round of ammunition. MILAN



MILAN with night sight

also has a thermal-imaging night sight that is capable of detecting targets at three kilometers. It is used by over 23 countries, including several in the Middle East and the People's Republic of China.

AT-4 Spigot

The Spigot is the Soviet's first medium ATGM using SACLOS guidance and is believed to have been fielded sometime around 1978. It bears a remarkable resemblance to the MILAN and almost certainly uses the same principles. It has a range of 2,000 meters, is believed to penetrate about 500mm of RHA, and is employed with a tripod, which gives its gunner a low silhouette. This last characteristic — coupled with its high velocity (185-200 meters per second) and its short time of flight (11 seconds) — increases its survivability as well as that of its crew. Spigot is used by Soviet units in Easy Germany and in other Warsaw Pact armies. According to newspaper accounts concerning Israeli operations against Syria, it also appears that the Spigot is exported to the Middle East.

HEAVY ANTITANK WEAPONS

TOW

The TOW (tube-launched, optically tracked, wire-guided) is the U.S. Army's company- and battalion-level heavy antitank/assault SACLOS guided missile weapon system. It is a portable system capable of being operated from the ground; from armored, light armored, or unarmored multipurpose vehicles; and from helicopters.

The "basic" TOW, fielded in 1970, has a range of 3,000 meters. In 1979, a program was begun to improve its capabilities, particularly against the evolving Soviet armor threat. An improved TOW (ITOW) missile with an improved five-inch warhead and an extendable standoff probe was fielded in 1981. This gave the weapon an increased armor penetration capability.

The TOW-2, which has a full-caliber six-inch warhead with probe, will be fielded in the near future. TOW-2

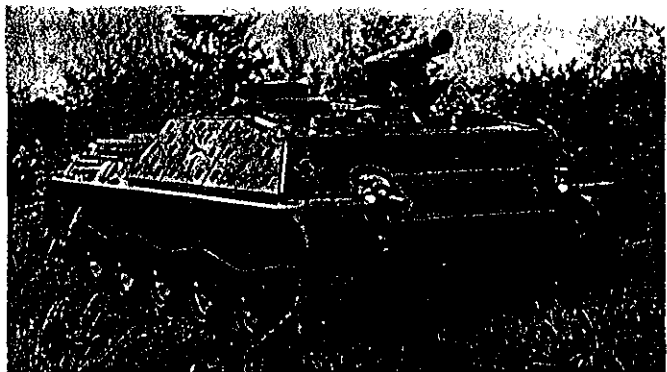


TOW with AN/TAS-4A night sight

provides further increases in penetration and range — out to 3,750 meters. The system can operate under all battlefield conditions provided the gunner can "see" his target through his optical or thermal-imaging night sights. TOW is used by eleven NATO nations and more than 40 other countries. It can be found in large numbers in the Middle East. Recent combat experiences in that area have demonstrated TOW's adaptability to hit-and-run tactics from ground, vehicle, or helicopter roles.

HOT

HOT (high-subsonic optically teleguided) was developed jointly by France and West Germany as a heavy SACLOS antitank system. Fielded in 1978, HOT permits the engagement of all main battle tanks known today from a variety of light armored vehicles and heli-



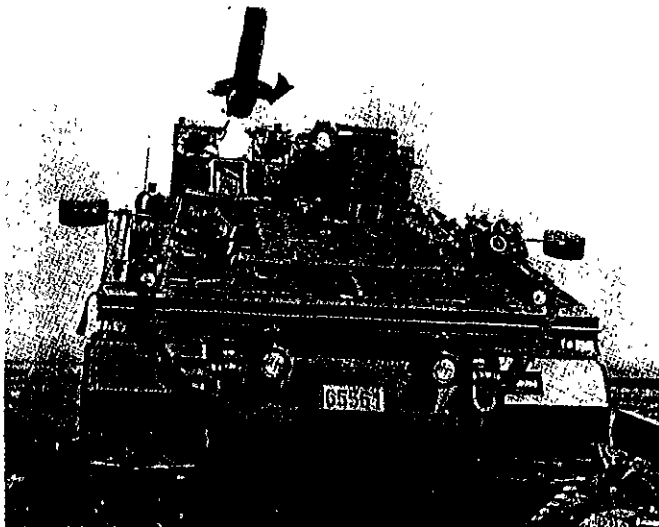
HOT on Jaguar 1

copters. HOT has a range of 4,000 meters, and its penetration is estimated to be more than 800mm of RHA. HOT's high velocity of 240 meters per second results in a time of flight of 17 seconds to its maximum range. HOT has been selected for use by over 13 countries, about half of them in the Middle East.

Swingfire

The United Kingdom's Swingfire has been in service since 1969. It is a first-generation MCLOS ATGM. Control is usually from a launch vehicle. The infantry variant known as Beeswing can be fired from launchers mounted on a Land Rover or can be dismounted and fired from the ground.

A unique feature that gives Swingfire a degree of tactical flexibility not found in the SACLOS systems is its ability to be fired with the launcher concealed behind cover and without an optical line-of-sight to the target.



Swingfire on Striker

The gunner, for example, can be up to 100 meters from the launcher and the missile is automatically gathered into his field of view. Because it is manually controlled, its hit probability is lower than that of SACLOS systems. Swingfire is mounted on a variety of vehicles and helicopters. Three other countries besides the United Kingdom use this system.

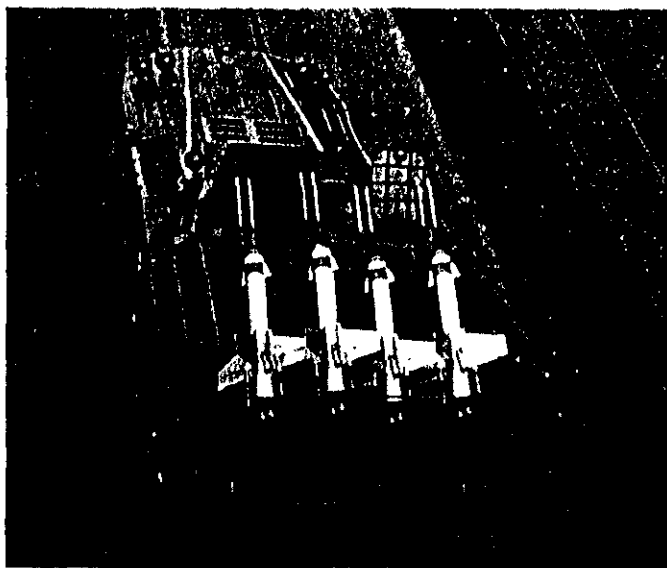
Snapper

The Snapper was introduced by the Soviets in the early 1960s. It is a first-generation MCLOS system now considered obsolete by the Soviets. It has been replaced in the Soviet force structure by other systems.

AT-2 Swatter

The Swatter is a long-range — 3,500 meter — system and was apparently designed by the Soviets specifically to be mounted on armored reconnaissance-type vehicles. It can also be found on a variety of other vehicles. Swatter

AT-6 Spiral



Swatter

has been made in three versions: the AT-2A, AT-2B, and AT-2C. The AT-2A and AT-2B are first-generation MCLOS (radio controlled by joystick) systems that have a range of 2,500 and 3,500 meters, respectively. Both have a relatively low hit probability — less than 70 percent — and an armor penetration of an estimated 500mm of RHA. The AT-2C system is a product-improved second generation SACLOS system used apparently only on helicopters. Swatter is used throughout the Warsaw Pact and by several Middle Eastern countries.

AT-3 Sagger

There are two versions of the Soviet Sagger: the AT-3, first generation MCLOS system that has been in service for approximately 18 years, and the AT-3C, which incorporates a second-generation SACLOS product improvement. The result of the product improvement is an increase in its hit probability from 60 percent for the AT-3 to over 90 percent for the AT-3C. The AT-3 is a three-man, crew-served weapon, while the AT-3C is a vehicle and helicopter system. Both have a range of 3,000 meters and a time of flight of about 25 seconds. Sagger can penetrate an estimated 400mm of RHA. This system has seen extensive service in the Middle East and in Vietnam.

AT-5 Spandral

The Soviet Spandral was first seen in 1977. It appears to be a SACLOS system and the replacement for both the Swatter and the Sagger. It is similar to the TOW and the HOT in range and use. It has an estimated penetration of 500-600mm of RHA and a range of 4,000 meters. Spandral is mounted on the BRDM-2. There are also indications of a night sight. A large, wide-angle periscope seems to be mounted on the BRDM-2 so that the gunner can acquire and engage targets from a buttoned-up position.

The Spiral, the latest Soviet antitank missile, appears to have been developed for helicopter use. It is believed to have a higher velocity than other currently fielded ATGM systems. It is described as a large, powerful missile, which appears to indicate that the Soviets believe only a large warhead will be effective against the improved armor of the latest generation of main battle tanks.

COUNTERMEASURES

Antitank weapons depend on a gunner's ability to acquire a target, estimate its range and speed, obtain a sight picture, hold a steady aim until he can get a shot off, and, in the case of an ATGM, maintain his guidance and link with the missile until it hits the target. Any means of killing or disrupting the gunner — denying his visual contact, subjecting him to suppressing fires, or disrupting his link with the missile — negates his effectiveness.

The weapon mix of the combined arms team provides the most effective way to attack or suppress an antitank gunner. When infantry and armor are cross-attached, the direct fires of their various weapon systems, along with artillery and mortar indirect fires, can be brought to bear on antiarmor positions. But a good combat leader will always remember that LAWs, MAWs, and HAWs are usually placed in depth, and he should plan for this. His reconnaissances and map studies should identify likely LAW, ATGM positions and possible kill zones, and these and any discovered positions should be targets for supporting indirect fires and smoke.

Our doctrine calls for the combined arms team to undertake offensive operations to control the combat zone. A well-planned antiarmor defense can be devastating to a unit that is caught by surprise and that violates combined arms principles.

At the National Training Center in California, many of our task forces have found it difficult to maneuver and defend against the OPFOR. One of the reasons for this difficulty is the inability of the U.S. battalions to counter the OPFOR's heavy antitank missile opposition.

If our commanders know the capabilities and vulnerabilities of the various antiarmor systems they may have to face, and if they train their units to defeat those systems, they will tremendously improve their chances of surviving and winning on any future battlefield.



LIEUTENANT COLONEL EDWARD L. OLIVER, an ROTC graduate of the Citadel, also holds a master's degree from Clemson University and has completed the Defense Systems Management College. He has commanded Infantry, airborne, and mechanized Infantry companies and has served with the Infantry Board and the Combined Arms Combat Development Activity. He is presently assigned as DA System Coordinator for TOW, Dragon, and Rattler in the Office of the Deputy Chief of Staff for Research, Development, and Acquisition.