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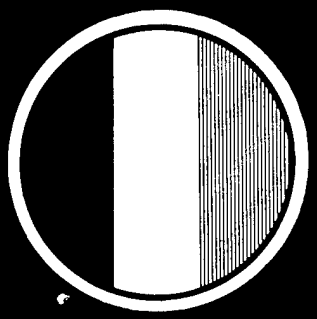
UNITED STATES ARMY TRAINING AND DOCTRINE COMMAND

TRADOC BULLETIN 1[U]



- WEAPONS
- TACTICS
- TRAINING

RANGE AND LETHALITY OF U. S. AND SOVIET ANTI-ARMOR WEAPONS

30 SEPTEMBER 1975

UNCLASSIFIED

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1. This TRADOC Bulletin is published in unclassified form to facilitate the dissemination of information previously printed in TRADOC Bulletin 1 (Sept 1974), which was classified Confidential. Information contained herein was declassified as of 21 May 1975. Some data contained in TRADOC Bulletin 1 (C) remains clasified and is, therefore, not reprinted here.

2. Knowledge of the weapons capabilities and suggested tactical techniques in this bulletin will assist combat units to pass their ARTEPs.

3. Weapons capabilities and tactical techniques are also presented in the "How to Fight" film series. The "Tank/Mechanized Infantry Team" (part 1, Modern Battle) depicts information similar to the contents of this bulletin.

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This bulletin presents basic data on the principal US and Soviet tank guns, antitank rockets, and antitank guided missiles. They illustrate that on today's battlefield: what can be seen can be hit; what can be hit, can be killed .

Curves and tables have been derived from information supplied by the Defense Intelligence Agency and the US Army Materiel Systems Analysis Agency. Each graph or table describes the best expected performance of the weapon: its capability under optimum conditions of full daylight, ease in target acquisition, complete target visibility during firing sequence, and operation by a skilled crew. Obviously, weather, terrain, combat stress, and inadequate training will degrade performance. But as both sides discovered in the recent Arab-Israeli War, modern weapons are terrifyingly destructive, and resourceful commanders can find ways to employ them to effect no matter what the situation.

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BULLETIN NO. 1[U]

RANGE AND LETHALITY OF U.S. AND SOVIET ANTI-ARMOR WEAPONS

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This TRADOC BULLETIN is intended to provide to commanders, and others concerned with military training, timely technical information on weapons, tactics, and training technique. It is not intended to supplant doctrinal publications, but to supplement material on "how to fight" with data derived from tests, recent intelligence, or other sources, which probe "why".

Comment or criticism is welcome, and should be directed to:

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US ARMY TRAINING AND DOCTRINE COMMAND
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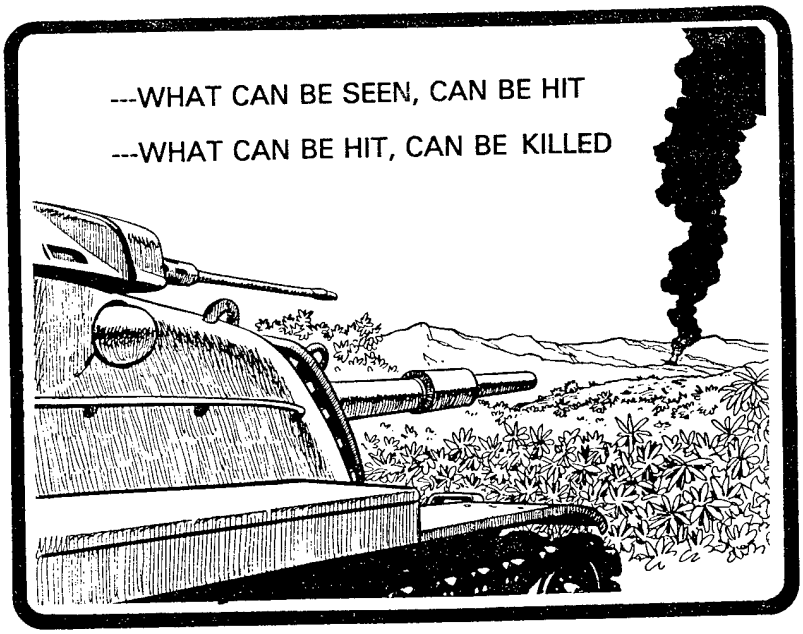
I
MODERN WEAPONS

Facts on the reach and killing prowess of modern tank and antitank weapons should be engraved in the mind of every commander of American troops. Ours is now largely an armored-mechanized force. More importantly, our potential enemies are lavishly equipped with advanced tank/antitank weaponry. Only the commander who knows the potential of Soviet equipment can counter it; and only he who understands what present US weapons can accomplish is prepared to use them to the best advantage of his mission and his men.

This Bulletin presents basic data on the principal US and Soviet tank guns, antitank rockets, and antitank guided missiles. They illustrate that on today's battlefield:

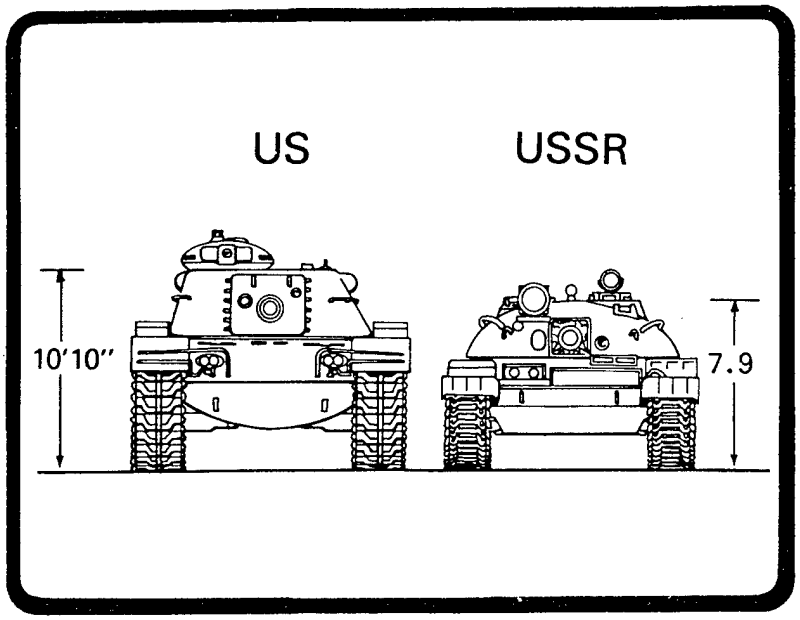


Curves and tables have been derived from information supplied by the Defense Intelligence Agency and the US Army Materiel Systems Analysis Agency. Each graph or table describes the best expected performance of the weapon: its capability under optimum conditions of full daylight, ease in target acquisition, complete target visibility during firing sequence, and operation by a skilled crew. Obviously, weather, terrain, combat stress, and inadequate training will degrade performance. But as both sides discovered in the recent Arab-Israeli War, modern weapons are terrifyingly destructive, and resourceful commanders can find ways to employ them to effect no matter what the situation.

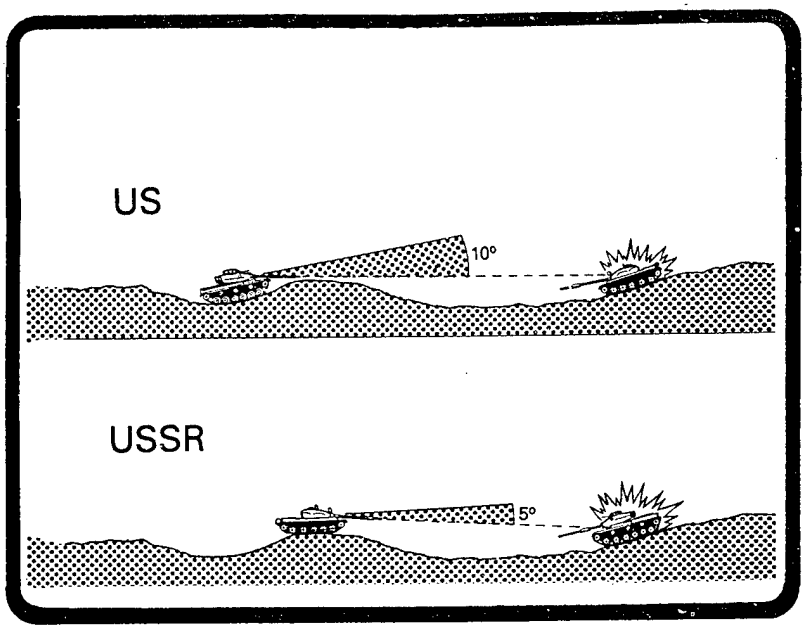
TANKS

	U.S. M60A1	U.S. M60A2	U.S.S.R. T-62
Weight, combat load (tons)	53	57.2	40.2
Length w/o gun (ft)	22.9	22.9	22
Width overall (ft)	11.9	11.9	11
Height (ft)	10'10"	10'10"	7.9
Max Road Speed (mph)	30	30	30
Cruising Range (miles)	310	310	310
Crew	4	4	4
Main gun (mm)	105	152	115
Rounds aboard	63	46 Plus (13 msl)	40
Elevation limits (degrees)	-10 to +19	-10 to +20	-5 to +18

From the foregoing data certain comparisons appear to be significant. The T-62 has a lower silhouette than the M60A1 or M60A2. This lower silhouette could be an advantage to a tank in the open.

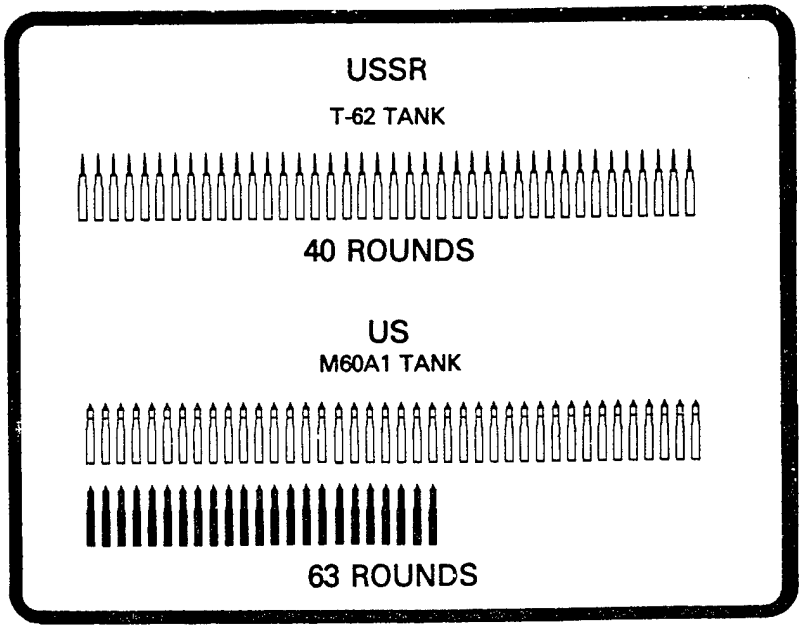


By designing a lower silhouette, however, Soviet tank designers have reduced the space in the turret above the gun trunion; this allows the main gun tube to be depressed only 5° below the horizontal. When firing from hull defilade positions this limitation is likely to force the Soviet tank to expose itself more than a US tank would in a similar position.

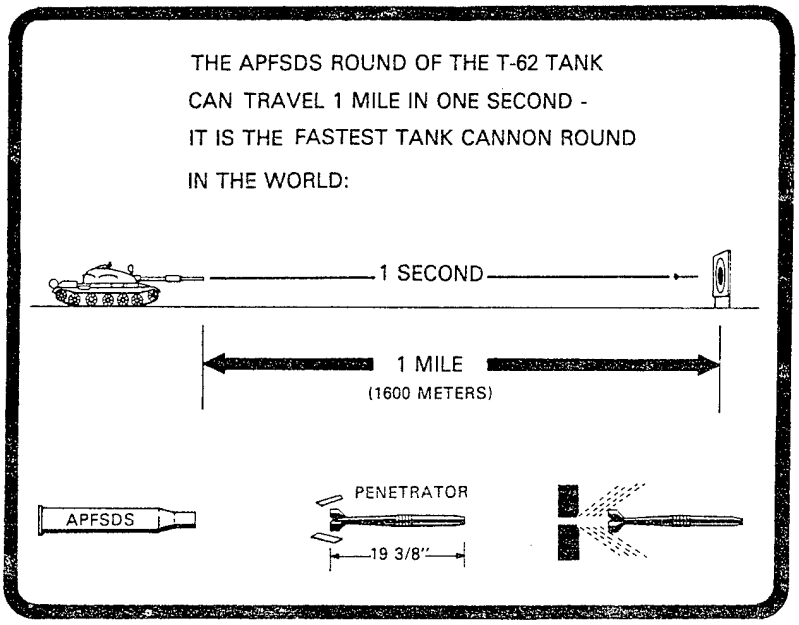


These comparisons have tactical significance for the US Army. They should indicate to us that it is to our best advantage to emphasize the use of terrain by maximizing the technique of firing from hull defilade.

Another comparison which favors the M60A1 is the greater amount of ammunition carried on board. Reports from Israeli tankers in the 1973 Arab-Israeli War indicate that the ability to carry more rounds than Soviet tanks frequently tipped the balance in their favor.



The Russian 115mm tank cannon is a smooth bore which fires finstabilized ammunition at very high muzzle velocity (5300 fps) — it is the fastest tank gun round in the world.



However, the 105mm American rifled cannon tends to offset the accuracy disadvantage of lower muzzle velocity by using more sophisticated fire control equipment. The U.S. M60A2 tank has the same basic chassis as the M60A1, but mounts a different turret with a 152mm gun-launcher, capable of firing either conventional ammunition or the SHILLELAGH missile, and mounts a laser range finder, and improved stabilization. Certain of these turret devices, retrofitted to the M60A1, will upgrade the performance of its 105mm system.

ANTI-TANK GUIDED MISSILES

Three Soviet antitank guided missiles are compared with three U.S. systems. All the Russian rockets use "first generation" technology, which means the gunner must fly the missile visually to his target, visually tracking both simultaneously throughout the firing sequence. The American systems are "second generation", meaning use of technology which requires the gunner to track only the target, while the system automatically follows the missile and issues appropriate commands to fly it into the intersection of his cross hairs.
(Note: The Shillelagh system is armament for both the M60A2 and the M551 Sheridan.)

	U.S.S.R.			U.S.		
	SNAPPER	SWATTER	SAGGER	DRAGON	TOW	SHILLELAGH
Length (in)	45.2	45.8	34	43	46.5	45
Diameter (in)	5.3	5.2	4.7	5.0	5.8	6
Weight (lbs)	53.5	59	24.9	13.5	40	61.3
Range (meters) Maximum	2500	3500	3000	1000	3000	3000
Minimum	150	500	150	65	65	800
Guidance linkage	wire	radio	wire	wire	wire	infrared
Armor Penetration (in @ 0 deg)	14–15	19	15–17			

ROCKETS

Also analyzed are two antitank rockets: the Soviet RPG-7, and the U.S. M72A2 LAW. The Russian weapon is a launcher of conventional bazooka or panzerfaust design, firing an oversize grenade which, its velocity tripled by ignition of a second stage, achieves a relatively high velocity, with a correspondingly flat trajectory and longer range. The U.S. LAW, on the other hand, is designed as a self-contained munition: its fiber tube is extended for firing, and then thrown away. Though LAW's warhead is as efficient as that of the RPG-7, its slower, more arcing flight makes it comparatively inaccurate and short-ranged.

	U.S.S.R. RPG-7	U.S. M72A2
Caliber of tube (mm)	40	66
Caliber of round (mm)	85	66
Weight loaded (lbs)	14.5	5.2
Length (in)	37.5	35.0
Muzzle Velocity	120	144
Effective range (m)	300–500	200
Armor Penetration (in @ 0 degrees)	13–14	14

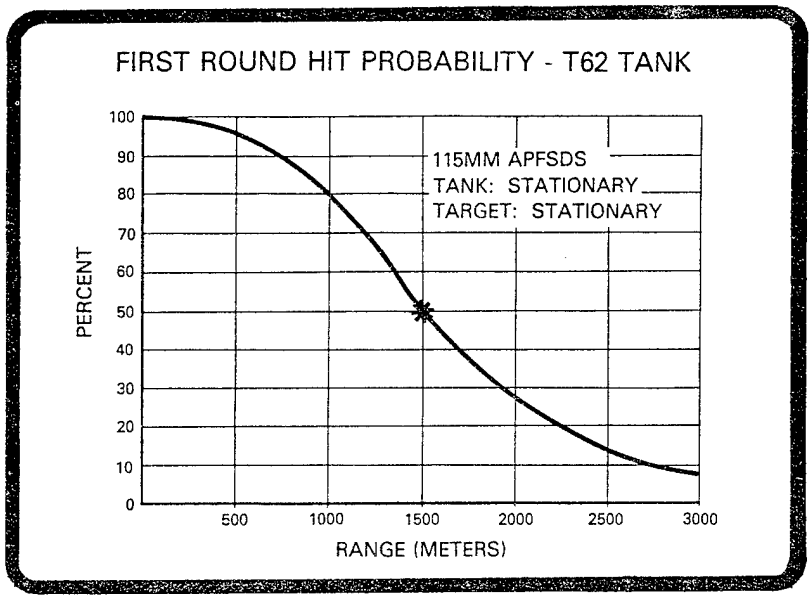
First we shall examine the hit performance of the Soviet weapons over range, and then comparable information on the American systems. Finally, we shall look at available data on lethality.

II

SOVIET WEAPONS: RANGE

TANK

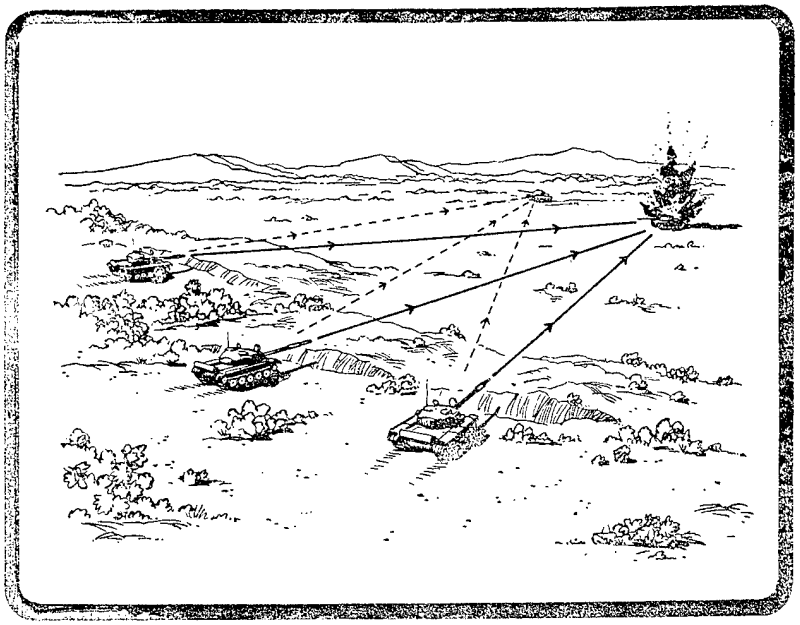
First round hit for a tank cannon is a function mainly of target range, projectile speed and fire control equipment. The more distant the target, or the lower the muzzle velocity, the greater the prospect for a miss. For the T-62, the best chance for a hit is with its fastest round, the 115mm armor-piercing-fin-stabilized-discarding-sabot round (APFSDS), which gives about 50% probability of first round hit on any stationary target within 1500 meters. The following graph plots those probabilities out to 3000 meters; note that tank and target are stationary.



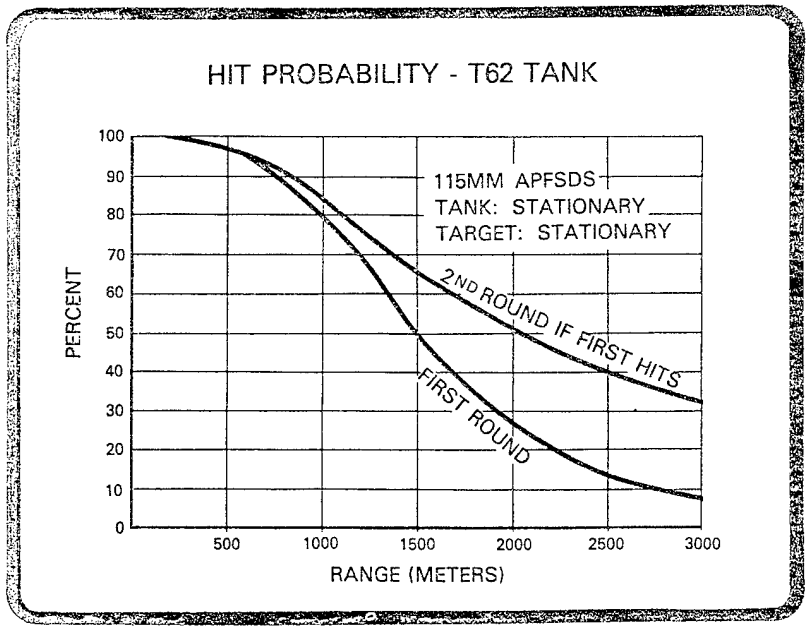
The above curve indicates that:

IF A U.S. TANKER HALTS IN THE OPEN, HE GIVES A T62 A 50-50 CHANCE OF HITTING HIM WITH THE FIRST SHOT AT 1500 METERS.

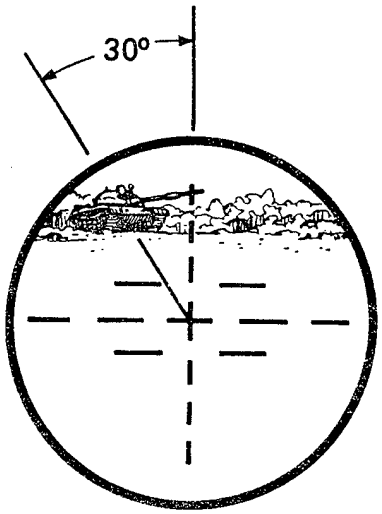
In tank-to-tank combat especially, first round hits are important, since he who hits first is usually the victor. The Soviet technique of fire is for the platoon leader to direct the fire of his entire platoon (3 tanks) on one target, then after the kill the fire is shifted to another target.

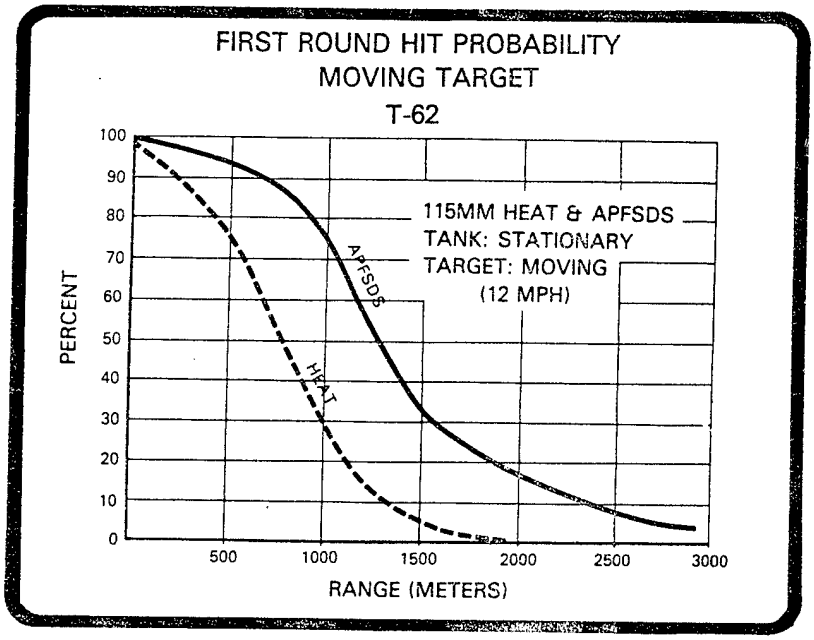


The Soviet APFSDS round is hard to sense if it misses; corrections are difficult. But, if the first round is a hit, the gunner can put a second round into the target with ease, as the following curves illustrate:



The probabilities of a T-62's hitting a target that is making a 30° approach at 12 mph are plotted below. HEAT and APFSDS are shown.

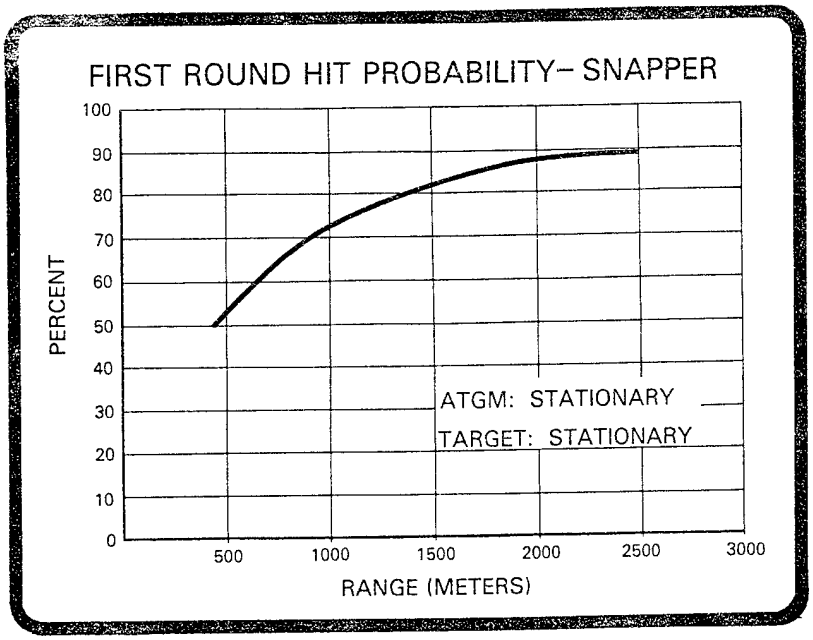




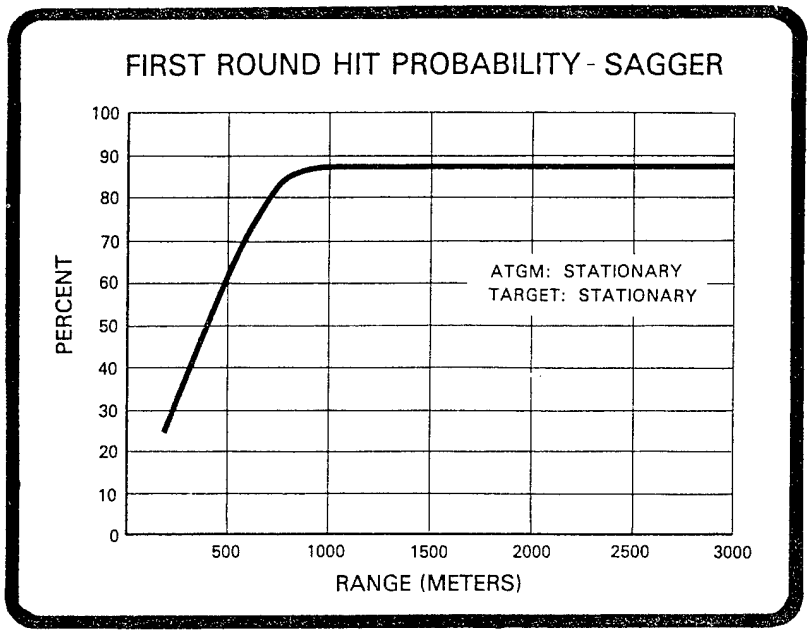
EVEN IF YOU ARE MOVING, THERE IS STILL A BETTER THAN 50-50 CHANCE THAT A T-62 WILL HIT YOU WITH HIS FIRST ROUND AT RANGES UP TO 1000 METERS.

ANTI-TANK GUIDED MISSILES

Unlike the tank cannon, however, Soviet antitank missiles increase hit probability with range. SNAPPER was the first such weapon generally available to Soviet forces and their allies (late 1950's), and resembled in performance the French (and American) wire-guided SS-11 ATGM. Skill with piloting the missile to the target is acquired from repetitive practice with a simulator, and with actual firings. The minimum range shown in the diagram is the distance needed for the operator to gain control of the missile after launch. The missile is stable in flight, and slow to respond to control; hence, corrections to bring it onto target must be bold, and timely. Generally, the longer the operator has to correct the flight, the better his chances of hitting. These factors are evident in the shape of the following curve:



The SAGGER ATGM, like the SNAPPER, is wire guided, but is a more modern (mid 1960's) smaller, lighter, more flexible system. SAGGER can be mounted on any Soviet APC, or scout vehicle, and can be employed from ground mount. Like in the SNAPPER system, operator training is arduous and continuous (SAGGER simulators were captured by the Israelis amid front-line units). The missile is easier to fly, however, and hit probabilities for a skilled operator are better than 80% from 1000 meters to 3000 meters.



SWATTER, the radio-command missile, is considered to be the most responsive and accurate of the three Soviet ATGM. SWATTER travels at higher velocity than the other two, achieves longer ranges, and is apparently easier to fly. Unlike SNAPPER and SAGGER, SWATTER has not been released by the Soviet for allied use, indicating that they may prize it more, or are fearful to expose its vulnerabilities to electronic countermeasures. SWATTER has been observed mounted on a variety of vehicles, including helicopters. SWATTER B — the latest known version — has a hit probability against a stationary target believed to be between .8 and .9 out to a range of 3500 meters; unconfirmed reports indicate that it may have even greater range. SWATTER does not arm for the first 500 meters of flight.

The results of the Yom Kippur War (Oct 73) testify to Soviet ATGM effectiveness. Arab gunners, particularly Egyptians, using SAGGER ATGM inflicted high losses on Israeli tanks from long ranges.

Reliable data on the Soviet ATGM versus moving targets is not available. If the target maintained a steady speed and unchanging aspect for the operator of the missile, hit probabilities would remain largely unchanged over range. However, evasive action by the target, especially late in the missile flight, is evidently extremely difficult for the missile operator to accommodate. Israeli tankers reported little difficulty evading SAGGER missiles, for instance, once they were aware of the firing. Moreover, their experience was that suppressive fire directed at the launch site readily disrupted the missile operator, as did smoke or other obscuration.

* SOVIET ATGM HAVE VERY HIGH ACCURACY AT RANGES FROM 1000 TO 3000 METERS. WITHIN 500 METERS, THEY ARE MUCH LESS EFFECTIVE.

* SKILLED TANKERS CAN LEARN TO DODGE SOME SOVIET ATGM IN FLIGHT; THE MISSILE THREAT CAN ALSO BE COUNTERED BY USE OF SUPPRESSIVE FIRES. GEOMETRIC FORMATIONS OF TARGET TANKS PROBABLY AID THE ATGM GUNNER IN HOLDING HIS AIM.

* SOVIET ATGM ARE VULNERABLE TO OBSCURATION BY SMOKE OR DUST.

RPG-7

The RPG-7 antitank rocket is designed for close-in defense. Although the system will loft the rocket more than 900 meters, probabilities of hitting a tank-size target are slight beyond 300 meters and negligible beyond 500 meters.

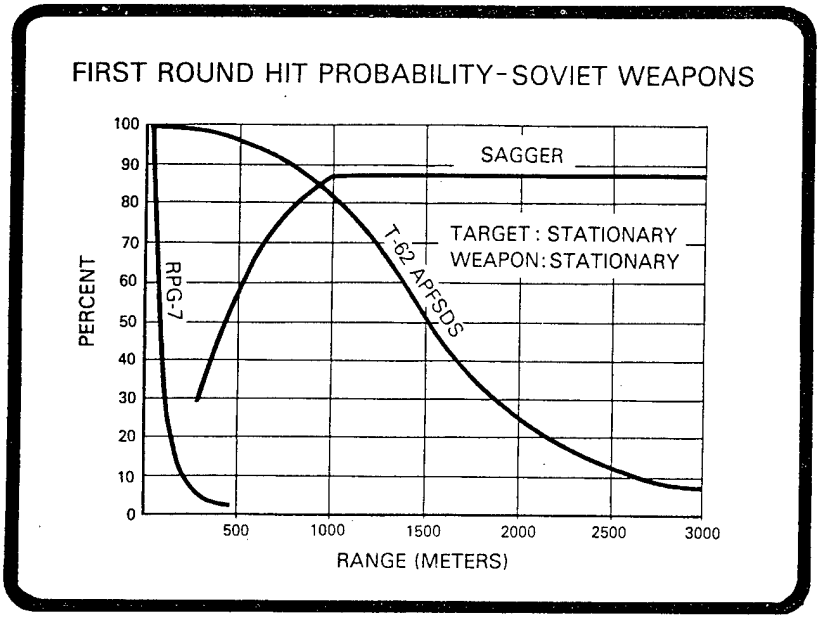
Firing at a moving target – a 7.5 x 15 foot panel, crossing at 9 miles per hour –indicated the following probabilities:

	Range (m)	Percent
RPG-7 Hit Probability Moving Target	50	100
	100	96
	200	51
	300	22
	400	09
	500	04

Like the ATGM, however, the RPG-7 is vulnerable to suppressive fire, and the Israeli's demonstrated that it can be countered with infantry attacks.

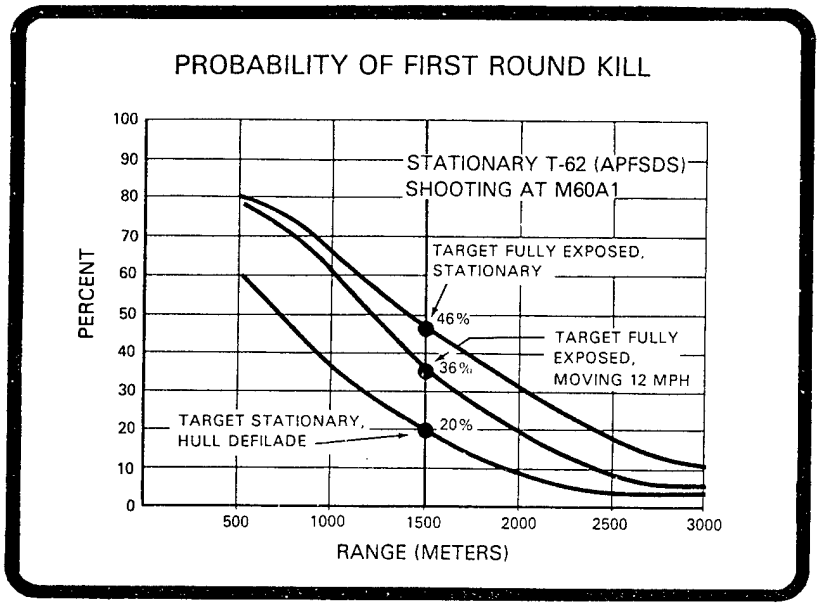
SOVIET CAPABILITIES

We can now assemble a composite picture of the range/hit capabilities of a Soviet force equipped with the T-62, SAGGER, and RPG-7; such as the Israeli's encountered in October 1973:



The systems complement one another: first-round hit probability remains above 80% out to 3000 meters.

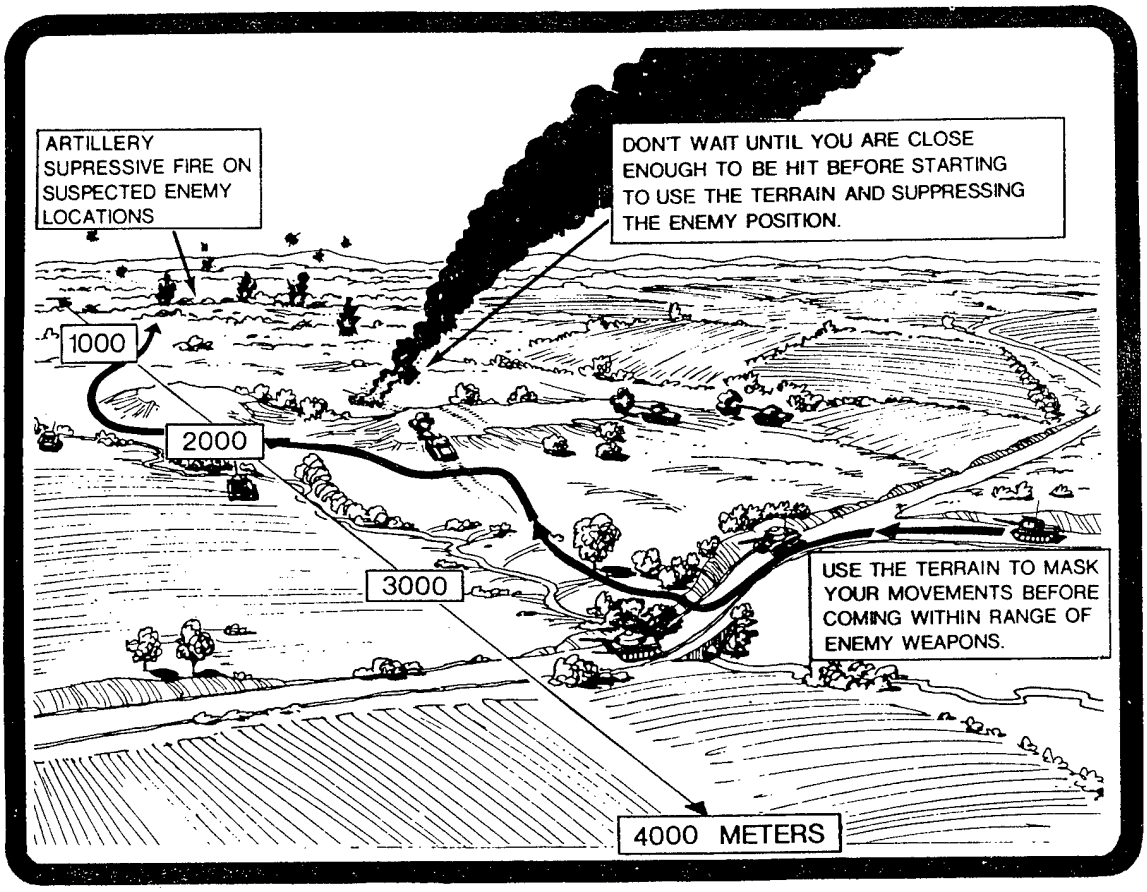
To counter the effectiveness of ATGM, suppression must be employed. Further, U.S. commanders must exploit terrain to the maximum, and take full advantage of their mobility. Note how T-62 first round *Kill* probability declines when the target tank moves, or cuts exposure:



* SOVIET WEAPONS FIT TOGETHER INTO A TACTICALLY IMPRESSIVE SYSTEM WHICH IS EFFECTIVE AT ALL RANGES OUT TO 3000 METERS.

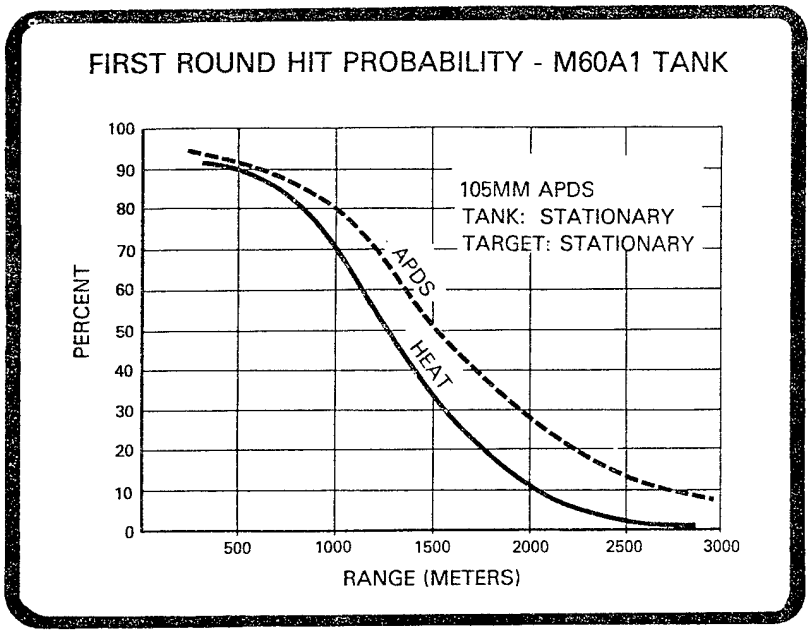
* U.S. ARMORED VEHICLES MUST THEREFORE TAKE ADVANTAGE OF EVERY FOLD OF GROUND IN CLOSING WITH AN ENEMY ARMED WITH SOVIET WEAPONS. WHEN UNAVOIDABLY EXPOSED, U.S. ARMORED VEHICLES MUST KEEP MOVING.

* U.S. COMMANDERS MUST LEARN TO COUNTER SOVIET MISSILES AND ROCKETS WITH SUPPRESSIVE FIRES AND TO USE INFANTRY FOR CLOSE-IN PROTECTION OF TANKS: THE U.S. COMBINED ARMS TEAM IS THE ANSWER TO THE SOVIET WEAPONS THREAT.



III
U.S. WEAPONS: RANGE

American doctrine for tank gunnery, reflecting our experience with European battle ranges emphasizes use of the HEAT round. Nonetheless, it appears that a better American round for range and hit probability is armor piercing discarding sabot (APDS).

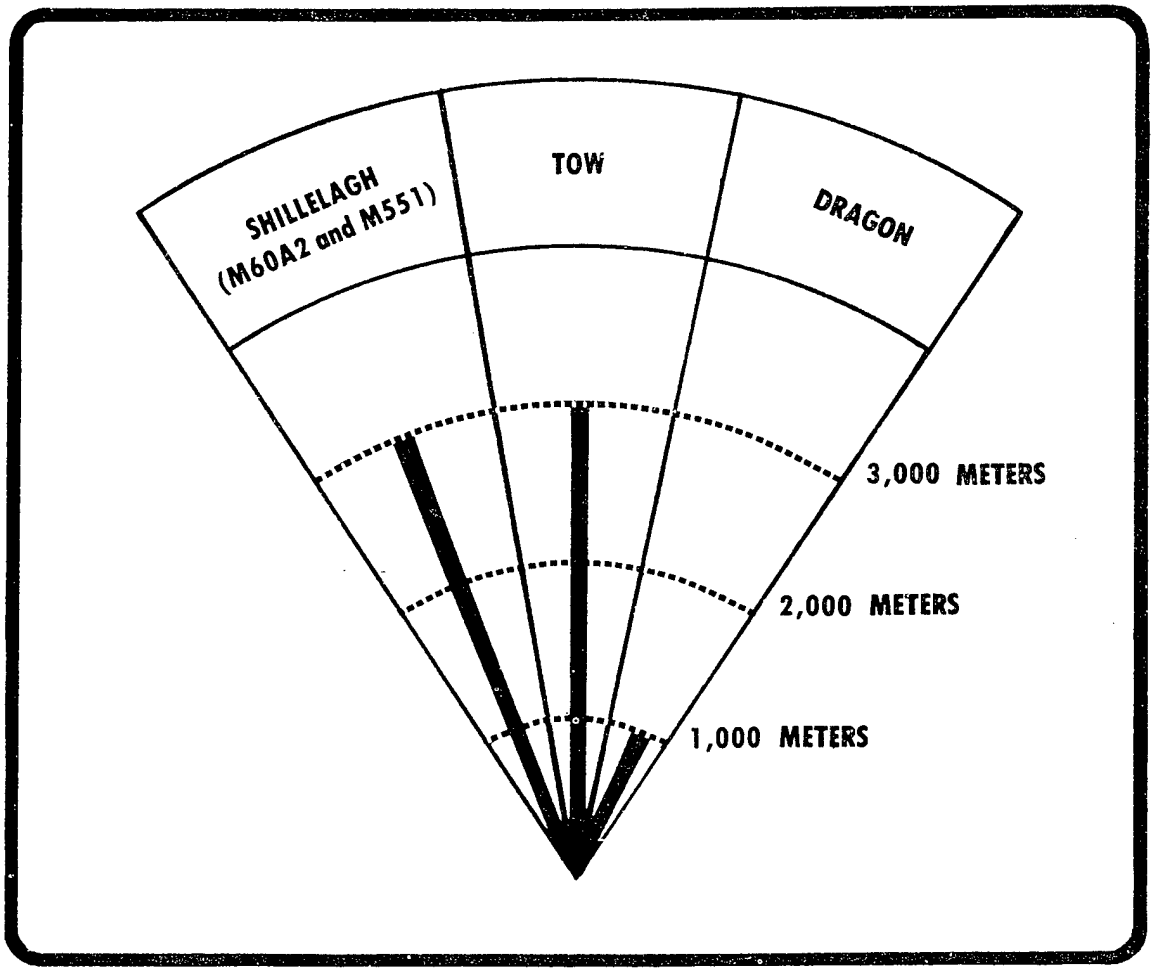


ANTI TANK GUIDED MISSILES

TOW, unlike any of the Soviet ATGM discussed, is relatively simple to operate, and the missile is responsive and accurate. While firings have established some differences of performance depending on target aspect and speed, for all practical purposes TOW accuracy, like that of SHILLELAGH, is insensitive to target speeds of up to 20 mph.

DRAGON is likewise easier to operate than Soviet ATGMs. Firings have indicated some falling off in accuracy against moving targets; however, even against moving targets the probability of hit remains high out to 1,000 meters.

The chart below depicts those ranges to which the probability of hit is high. (i.e., above 50%) Beyond those ranges the weapon is not considered to be effective.



NOTE: Detailed effectiveness data on these three weapons remains classified. For further information see TRADOC Bulletin 1 (CONFIDENTIAL) Sept 74.

THE LAW

The performance of the M72A2 LAW is heavily influenced by range estimation. Firings at a (7.5 x 15 foot) panel moving at various speeds from 10 to 20 miles per hour indicate the following probabilities of hit:

M72A2 LAW
HIT PROBABILITY
MOVING TARGET

Range (m)	Percent
50	100
100	95
200	28
300	07
400	03

It should be noted, however, that the LAW is a round of ammunition, carried by all soldiers, like hand grenades. Therefore, the LAW is not exactly comparable to the RPG-7, in that LAW should be present on the battlefield in significantly larger numbers. Moreover, those numbers should permit salvo tactics, in which single tanks are attacked by several M72A2 weapons simultaneously. Firing in pairs or in sequence, significantly raises cumulative hit probabilities.

*** U.S. ATGM AND LAW, LIKE THEIR SOVIET COUNTERPARTS, ARE VULNERABLE TO SUPPRESSIVE FIRE, AND TO INFANTRY ATTACK.**

*** HOWEVER, THE U.S. ATGM ARE RELATIVELY FREE OF MINIMUM RANGE PROBLEMS.**

*** IF CAREFULLY SITED TO EXPLOIT RANGE CAPABILITIES, AND IF INTEGRATED INTO A COHERENT TACTICAL PLAN, TOW, DRAGON, AND LAW AFFORD A U.S. COMMANDER A CLEAR TACTICAL ADVANTAGE.**

Concerning US weapons, the following points stand out:

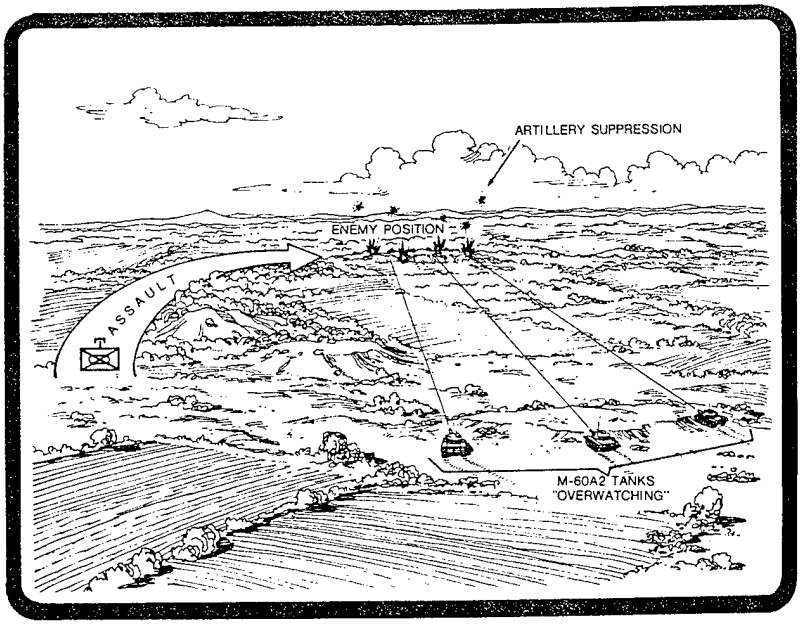
* **THE M60A1 MUST CLOSE TO WITHIN 1000-1500 METERS BEFORE IT CAN EXPECT BETTER THAN A 50-50 PROBABILITY OF HIT.**

* **THE M60A2, M551, AND TOW CAN HIT RELIABLY AT RANGES OUT TO 3000 METERS.**

* **HENCE, THEY ARE WELL SUITED FOR:**

  - OVERWATCH IN THE ATTACK
  - LONG RANGE ANTI-ARMOR FIRES IN THE DEFENSE AND DELAY

For example:



And also:

* U.S. TANKS HIT BETTER FROM THE HALT. U.S. TANK COMMANDERS MUST SEEK PROTECTED POSITIONS—HULL DEFILADE—IN ORDER TO DECREASE VULNERABILITY WHILE MAXIMIZING ACCURACY.

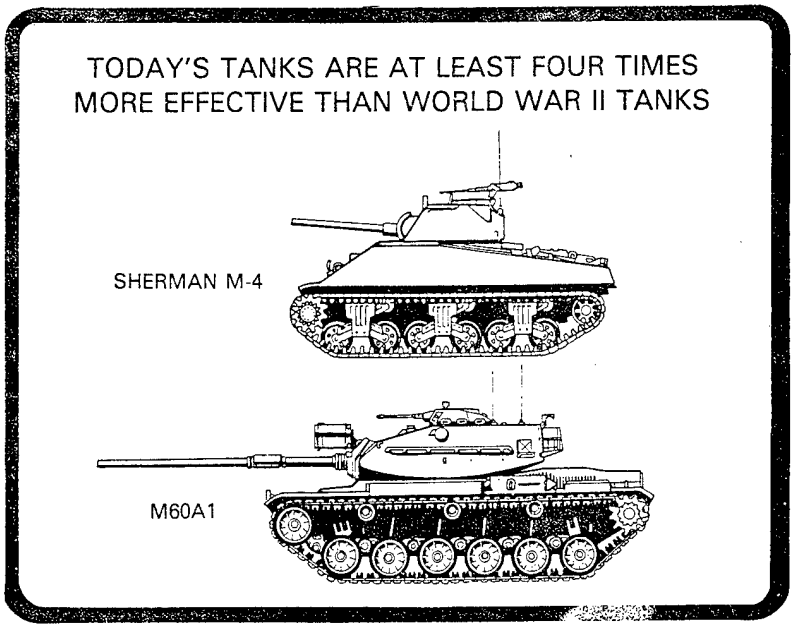
* SHILLELAGH AND TOW ARE ACE LONG-RANGE WEAPONS FOR A U.S. COMMANDER; HIS TACTICS MUST EXPLOIT THEIR 3000 METER REACH IN THE ATTACK, DEFENSE, OR DELAY.

* DRAGON AFFORDS U.S. COMMANDERS DISTINCT ANTI-ARMOR ADVANTAGES AT CLOSE AND MID-RANGES (UP TO 1000 METERS).

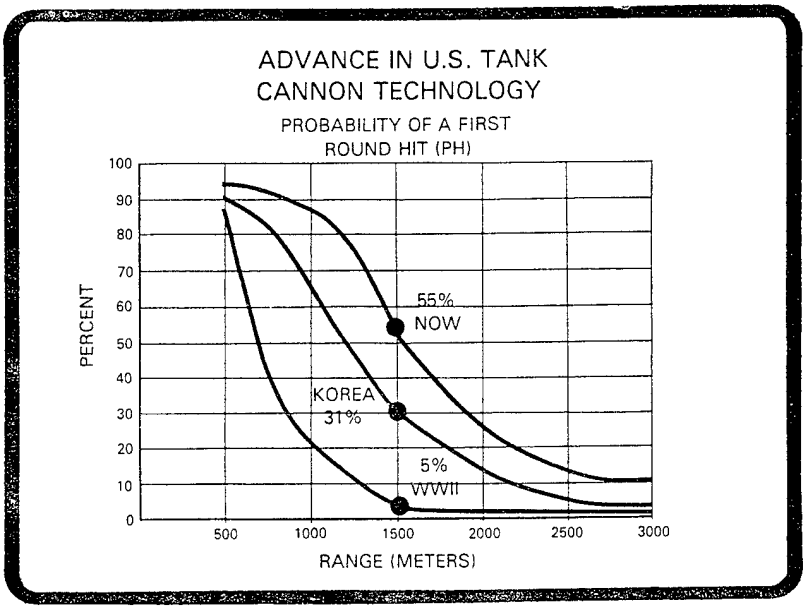
* LAW SHOULD BE USED IN PAIRS OR SEQUENCE; LAW GUNNERS SHOULD "GANG-UP" ON A SOVIET TANK.

IV
LETHALITY

Many American military professionals do not appreciate the sweep of armor-antiarmor technology over the past thirty years. General Patton's Shermans had to close to within 500 meters of a PzV Panther before the American 76mm gun could punch through the German's 4.8 inches of frontal armor. Today the Seventh Army's M60A1 tanks can penetrate, using solid shot ammunition, the 8 inches of frontal armor on the Soviet-built T-62 at a range of more than 2000 meters. Hence:



Actually, in terms of hit probability, today's tank cannon is 11 times more powerful than its World War II predecessor.



The kinetic energy tank cannon round, however, which was the mainstay of World War II combatants, is by no means the only tank killer on today's battlefield. Efficient, chemical-energy rounds have been devised for tank cannon, as well as for antitank rockets. The High Explosive Antitank (HEAT) rounds of both the M60A1 and the T-62 can defeat frontal armor three times the thickness of the Panther's. And, in the TOW, the U.S. has an infantry weapon which has significantly higher accuracy (.88), at all ranges greater than 500 meters, than the T-62, and sufficient power at 3000 meters to penetrate frontal armor *three times* that on the T-62.

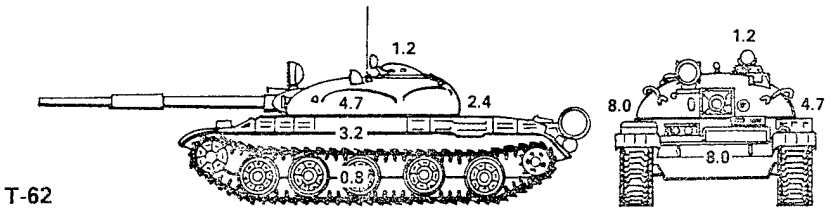
ARMOR BASIS

In any contemporary battle which finds American and Soviet armor opposing, the M60A1 and the T-62 will constitute the core of the offensive potential for each protagonist. Both are impressively armored; each is designed to present sloped surfaces to attacking weapons, so that the "armor basis" of each – thickness measured along the path a projectile would follow in penetrating, expressed in equivalent inches of vertical armor – is formidable:

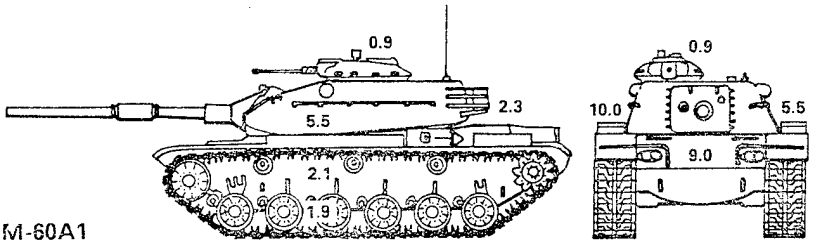
ARMOR BASIS

(Equivalent to inches of rolled homogenous armor @ 0° obliquity)

		HULL		TURRET			
SOVIET T62		Front	Side	Front	Side	Top	Rear
	Maximum	8.0	3.2	8.0	4.7	1.2	2.4
	Minimum	8.0	0.8	–	–	–	–



T-62



M-60A1

		HULL		TURRET			
U.S. M60A1		Front	Side	Front	Side	Top	Rear
	Maximum	9.0	2.1	10.0	5.5	0.9	2.3
	Minimum	9.0	1.9	–	–	–	–

The *side* armor of these tanks is thicker than the *frontal* armor of World War II tanks:

	TANK	Wt (tons)	Gun (mm)	Max Armor Basis		
				Front	Side	Rear
1944	U.S. M4A "Sherman"	36	76	2.8	1.6	1.4
	German PzV "Panther"	50	75	4.8	1.7	1.8
1974	U.S. M60A1	53	105	10.0	5.5	2.3
	Soviet T-62	40	115	8.0	4.7	2.4

Despite their much heavier armor, both the T62 and the M60A1 are vulnerable at far longer ranges than any tank of 1944. Today's direct fire weapons can penetrate very formidable armor.

ARMOR PENETRATION CAPABILITY

(within mid-range)

U.S. Weapon	PEN#
M60A1 — APDS	10
M60A1 — HEAT	17
M60A2—HEAT	17
M72A2	13

U.S.S.R. Weapon	PEN#
T-62 — APFSDS	13
T-62 — HEAT	17
SNAPPER	15
SAGGER	15-17
SWATTER	20
RPG-7	14

Penetration in inches of rolled homogeneous armor at 0° obliquity

Modern tank guns are indeed powerful and destructive, but modern antitank weapons have even longer reach and greater hitting power. The Arab/Israeli War has vividly dramatized the lethality of modern antitank weapons, which can kill out to 3500 meters. The following table summarizes these facts by showing approximate probability of a kill if the tank is hit. For example, a T-62 tank shooting APFSDS ammunition at 1500 meters range has a 71% probability of killing an M60A1 tank if he hits it.

APPROXIMATE PROBABILITY OF KILLING A TANK IF IT IS HIT

U.S. Weapon	Range (meters)	* $P_{H/K}$
M60A1 — APDS	1500	54%
M60A1 — HEAT	1500	75%
LAW	200	33%

U.S.S.R. Weapon	Range (meters)	* $P_{H/K}$
T-62 — APFSDS	1500	71%
T-62 — HEAT	1500	75%
SNAPPER	2500	67%
SWATTER	3500	67%
SAGGER	3000	69%
RPG-7	300	40%

* $P_{H/K}$ = probability of a kill if hit.

NOTE: Above data for SHILLELAGH, TOW, and DRAGON remains classified. See TRADOC Bulletin 1 (Confidential) Sept 1974 for further information.

V
IMPLICATIONS FOR TRAINING

The data presented in this bulletin present weapons systems in terms of their optimum performance. But they represent capability, the stuff of military estimates. U.S. Army commanders must accomodate these facts in training and operations:

* THE TECHNICAL CHARACTERISTICS AND CAPABILITIES OF US AND SOVIET WEAPONS DIFFER; HOWEVER, THESE DIFFERENCES ARE NOT GREAT ENOUGH TO ENSURE A DECISIVE TACTICAL ADVANTAGE TO ONE SIDE OR THE OTHER.
* TANKS AND OTHER COMBAT ELEMENTS THAT EXPOSE THEMSELVES TO ENEMY ANTI-ARMOR WEAPONS AT RANGES UNDER 3000 METERS ARE HIGHLY VULNERABLE. THIS VULNERABILITY CAN, HOWEVER, BE DECREASED THROUGH IMPROVED TACTICS AND TECHNIQUES OF MOVEMENT, WHICH COMBINE BETTER USE OF TERRAIN, AND APPLICATION OF SUPPRESSIVE FIRE.
* TERRAIN IS MORE IMPORTANT THAN EVER BEFORE, IN THAT IT CAN BREAK THE LINE OF SIGHT OF DIRECT FIRE WEAPONS, AND MASK FIRES. COMMANDERS MUST MAXIMIZE USE OF TERRAIN.
* SUPPRESSION AND/OR OBSCURATION ARE COMPANION TECHNIQUES FOR REDUCING VULNERABILITY.

* SYMMETRICAL OR GEOMETRIC FORMATIONS OF ARMORED VEHICLES SHOULD BE RELEGATED TO HISTORY, FOR THEY ENHANCE THE EFFICIENCY OF ENEMY ATGM AND FORECLOSE CAREFUL USE OF TERRAIN.
* VEHICLES SHOULD KEEP MOVING UNLESS BEHIND COVER; IF IT IS NECESSARY TO EXPOSE A STATIONARY VEHICLE, HULL DEFILADE, AT LEAST, IS IMPERATIVE.
* U.S. ARMOR SHOULD ADVANCE UNDER OVERWATCH FROM TOW OR SHILLELAGH TO COUNTER ENEMY TANKS. U.S. ATTACKS MUST BE SUPPORTED BY SUPPRESSIVE ARTILLERY AND MORTAR FIRES TO COUNTER ENEMY ATGM.
* U.S. INFANTRY SHOULD ACCOMPANY OUR ARMOR TO COUNTER ATGM AND RPG-7.
* U.S. FORCES ON DEFENSE OR IN DELAY SHOULD OPEN FIRE WITH TOW AND SHILLELAGH AT MAXIMUM RANGE.
* U.S. GUNNERY TRAINING, BOTH FOR THE TANK GUNS AND ATGM SHOULD STRESS FAST, ACCURATE ENGAGEMENT AND PROFICIENCY IN LONG RANGE FIRES.

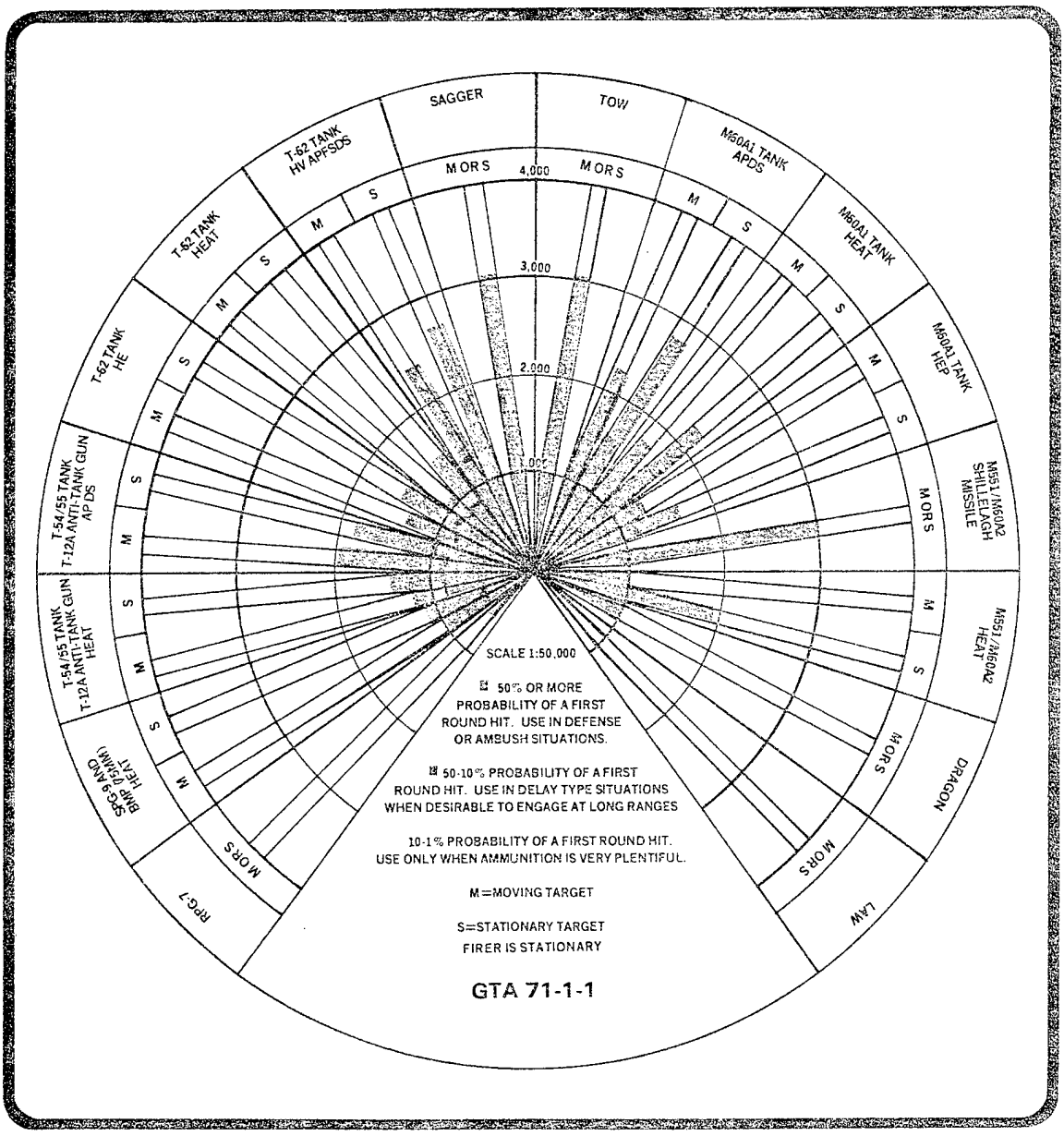
TRAINERS NOTE:

Each TASO has master copies of the diagrams and pictures in this Bulletin, from which you can order color Vu-graph transparencies for use in officer schools or other training.

VI
TRAINING AIDS

THE RANGE READER

The Range Reader will assist small unit combat leaders to more effectively employ their anti armor weapons and to know the effect of threat weapons. This GTA, a circular plastic disc with range lines on a scale of 1:50,000, is presently in production and will be distributed to each armor, infantry, and armored cavalry company sized unit. It will also be available at your local TASO.



VII
OBTAINING TRADOC BULLETINS

Purpose. A series of TRADOC Bulletins are being published by HQ TRADOC to provide commanders timely technical information on weapons, tactics and training technique. It is not intended to supplant doctrinal publications, but to supplement material on "How to fight" with data derived from tests, recent intelligence, or other sources, which probe "why?"

Applicability. TRADOC Bulletins are developed by Headquarters, TRADOC using the most comprehensive and current military and civilian data available. Army Training and Evaluation Programs (ARTEP), Field Manuals (FM) and Training Circulars (TC) will continue to be the primary training references. TRADOC Bulletins will supplement them with an explanation of why we are training in a given manner. TRADOC Bulletins should enable commanders to better stimulate and motivate subordinates to understand why we train the way we do.

Index of Series. TRADOC Bulletins are cataloged in DA Pamphlet 310-3, "Index of Doctrinal, Training and Organizational Publications." The series are numbered consecutively and each TRADOC Bulletin is announced at time of printing in the information bulletin distributed to all pinpoint account holders by the US Army AG Publications Center.

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Reference for Distribution Procedures. DA Pamphlet 310-10 explains the pinpoint distribution system and how to establish or update an existing account at the US Army AG Publications Center. TC 21-6-1, "Use Your Training Publications," will be helpful also in understanding the pinpoint system.

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