

MAIER

# 25mm

The MODERN CALIBER

...for today's Modern  
**ARMY**



**TRW**  
JET & ORDNANCE DIVISION

THE 70'S • 25mm DEFEATS THE THREAT OF THE 70'S • 25mm DEFEATS THE THREAT OF THE 70'S • 25mm DEFEATS

# 25mm the modern caliber

Original Trade Studies conducted by TRW fully considered the "Threat of the 70's", the doctrine for employment of a VRFWS (Vehicle Rapid Fire Weapon System) and the impact of the configured Weapon and Ammunition System on the vehicle configuration and the resulting overall system effectiveness. The conclusion—25mm.

Recognizing the logistics impact of fielding a "new caliber" we looked beyond the primary role of the VRFWS-S System, to determine the probable use of the 25mm, and the attendant "Logistics Commonality" advantages. Preliminary analysis indicates substantial justification for consideration of the 25mm in these additional roles — Air Defense, Helicopter Armament, Close Air Support, Amphibious Assault.

**IN A FIRE FIGHT—SUPERIOR FIREPOWER PAYS OFF •**

**THE 25MM WEAPON AND AMMUNITION SYSTEM PROVIDE THAT SUPERIORITY . . .**

## **Here's why:**

**25mm USES ONLY — 1/3 THE ROUNDS . . .**

**1/2 THE WEIGHT**

**60% THE VOLUME**

for the same "mobility" kill of the threat vehicle at 500 meters as the 20mm, or for the same combat weight — the 25mm provides at least double the effective range of the 20mm — note range limitation of the 20mm.

**25mm USES LESS THAN 1/10 THE ROUNDS**

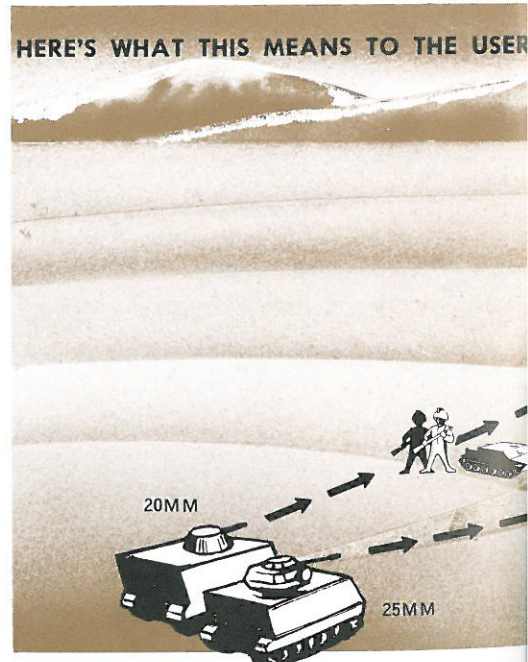
**1/5 THE WEIGHT**

**1/5 THE VOLUME**

to achieve the same personnel casualties to occupants of the threat vehicle at 500 meters as the 20mm.

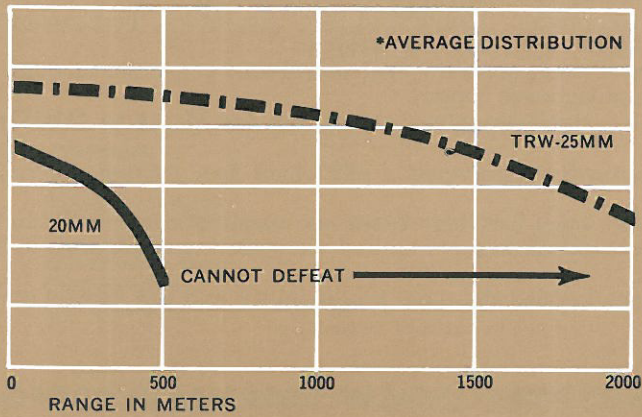
Similar advantages exist when AIRCRAFT TARGETS are considered.

The 25mm is a "Cost Effective" solution in the role of SUCCESSOR to the 20mm "Interim VRFWS System".

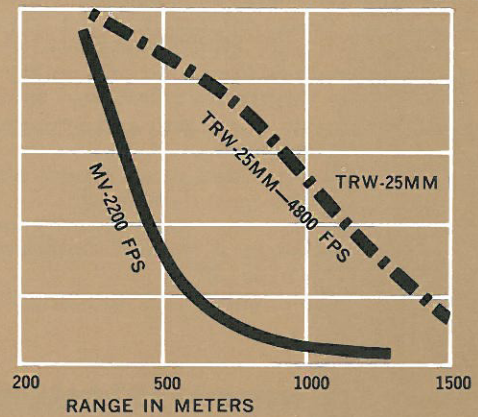


# or firepower superiority

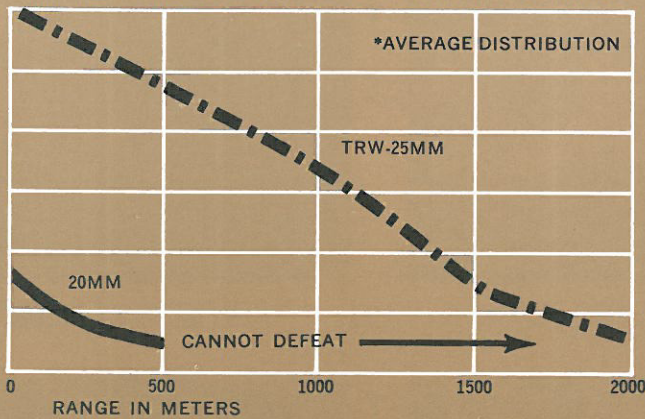
PROBABILITY OF M-KILL GIVEN A HIT\* AGAINST "THREAT VEHICLE" AS A FUNCTION OF RANGE



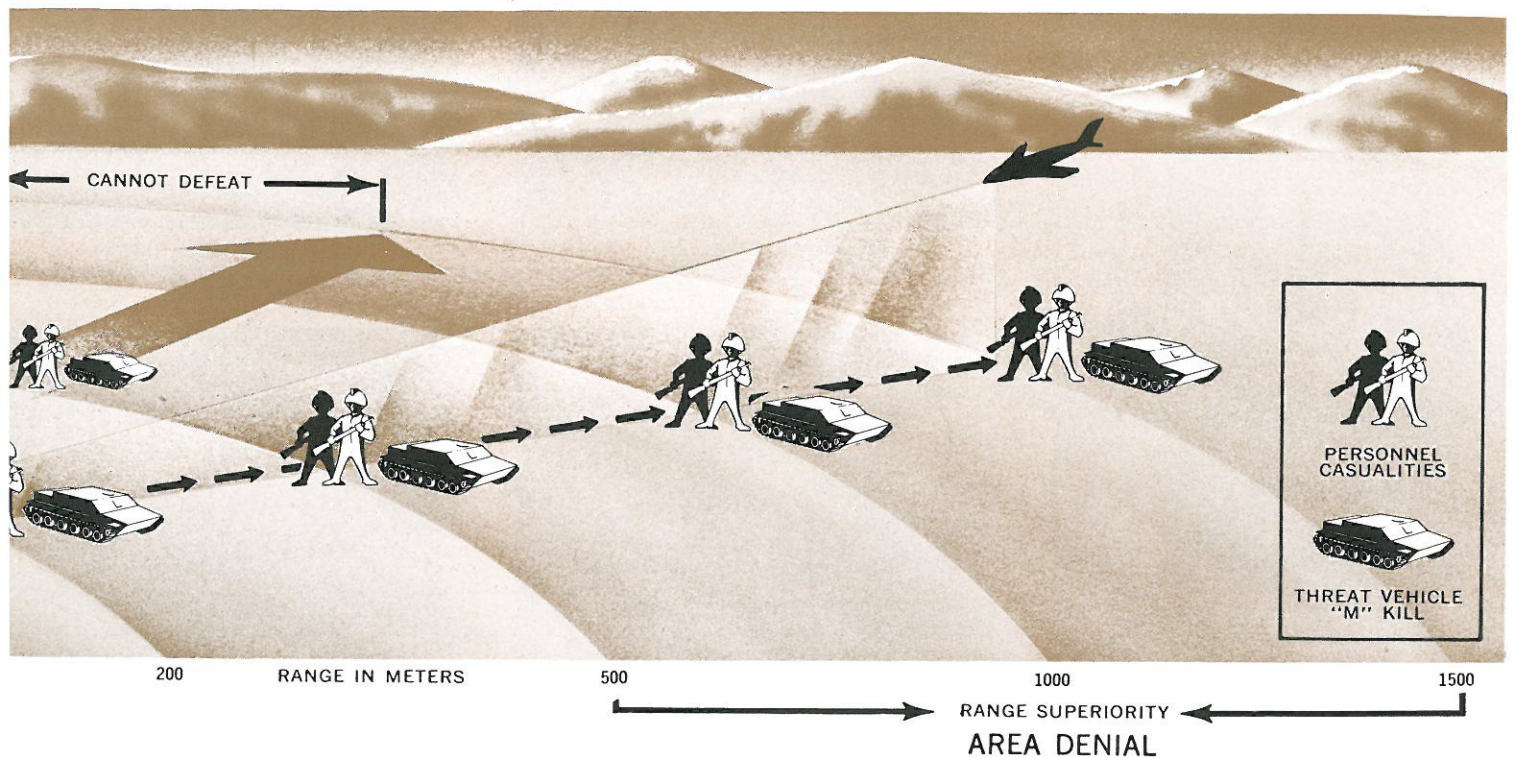
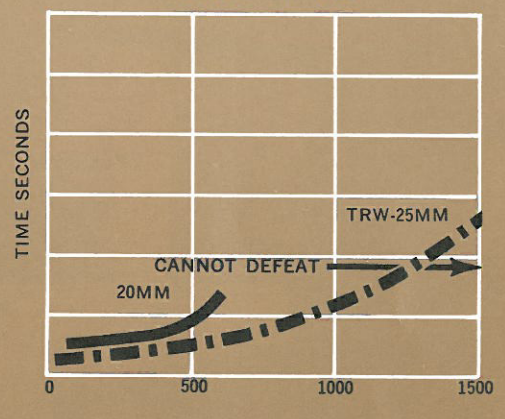
COMPARISON OF FIRST ROUND HIT PROBABILITY LOW MUZZLE VELOCITY SYSTEM VERSUS TRW-25MM



PREDICTED PERSONNEL CASUALTIES PER HIT\* ON ENEMY ARMORED PERSONNEL CARRIER AS A FUNCTION OF RANGE



AVERAGE TIME — THREAT VEHICLE "M" KILL



# 25mm Ammunition

THE 25MM FAMILY OF AMMUNITION is comprised of armor piercing, armor piercing high explosive and high explosive incendiary. (A fourth round is being designed to provide defense against massed personnel attack.)

In establishing the design approach to the 25mm family of ammunition (required to meet the system performance of the VRFWS-S) extensive trade studies considered the merits of a rifled vs. smooth bore system.

To achieve the desired first round hit probability and overall down range accuracy against armored personnel carriers, aircraft and other point type targets the rifle bore, "spin stabilized" approach was chosen.

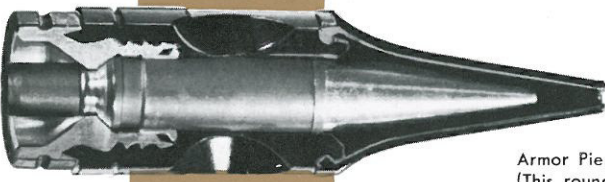
Subsequent system tests of weapon and ammunition fired from vehicles ranging in size from the M-114 to MICV-65 have fully substantiated this choice.

Tracers have been incorporated in all rounds and are essential on the high velocity 4600-4800 fps armour piercing round. Practice rounds have also been developed.

By designing the weapon and ammunition system concurrently, steel cartridge cases and steel rotating bands have been successfully incorporated in all rounds. Lubrication of the ammunition is not required for system performance in extreme environments -65° to +165° F.

Cost projections by experienced U.S. ammunition producers have verified the mass producibility and low cost of the 25mm ammunition family.

## ACTUAL FIRINGS DEMONSTRATE 25MM WARHEAD PERFORMANCE



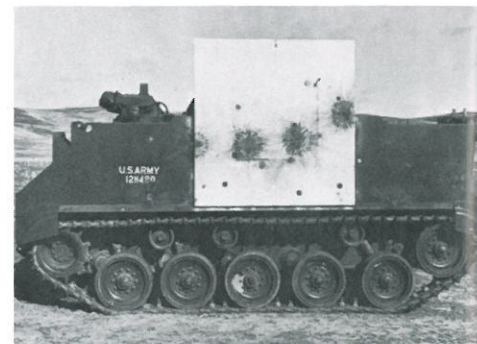
### APDS-T

Armor Piercing Discarding Sabot — Traced — Also Untraced  
(This round available with either tungsten carbide or "special alloy" penetrator.)

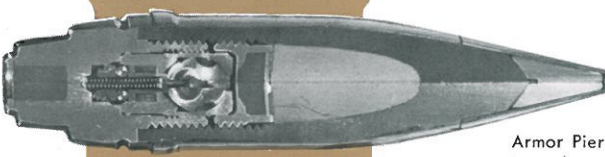
#### SPECIFICATIONS:

Round Weight	.95 lbs.
Muzzle Velocity	4800 fps
Time of Flight	0.76 seconds to 1000 meters
Tracer Burnout	at 1100 meters

\*Performance (defeats "threat" at 1000 meters) \*Classified



ACCURACY AT 1100 METERS  
ALL RND. ON TARGET



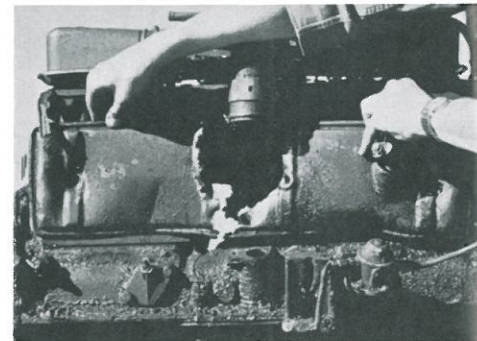
### APHEI-T

Armor Piercing High Explosive — Traced — Also Available Untraced

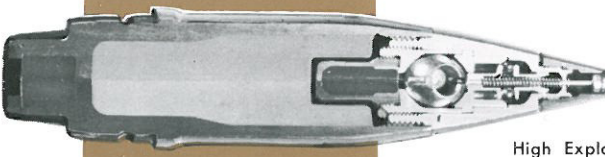
#### SPECIFICATIONS:

Round Weight	1.15 lbs.
H.E. Content	10 grams
Muzzle Velocity	3610 fps — matches high explosive
Time of Flight	1.19 seconds to 1000 meters
Tracer Burnout	at 1450 meters

Performance (penetrates 3/4" armor at 0° obliquity at 1000 meters then detonates the high explosive warhead inside of the "threat vehicle")



SINGLE ROUND DAMAGE  
TO TRUCK ENGINE



### HEI-T

High Explosive Incendiary — Traced — Also Available Untraced

#### SPECIFICATIONS:

Round Weight	1.15 lbs.
H. E. Content	27 grams
Muzzle Velocity	3610 fps
Time of Flight	1.19 seconds to 1000 meters
Tracer Burnout	at 1450 meters

Performance: High fragmentation (over twice the 20mm) plus blast and incendiary effects.



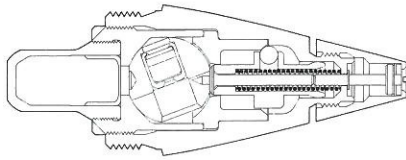
"VAMPIRE" AIRCRAFT WING  
WITH JET FUEL IN TANK

ACTUAL SIZE

# FUZES

TWO TYPES FOR OPTIMUM PERFORMANCE OF THE SYSTEM AGAINST VARYING TARGETS

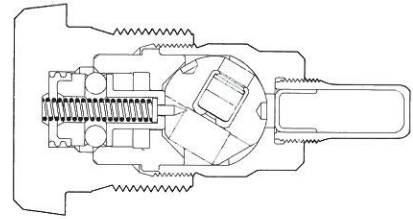
## HIGH EXPLOSIVE — NOSE FUZE



Designed for optimum performance against light material, aircraft skin, and personnel.

- Point Detonating
- Out of Line Detonator
- Self Destruct — 5-9 seconds at approximately 11° Q.E.
- Bore Safe
- Rain & Foliage Safe
- Graze Sensitivity
- Safe Arming Distance — 15-50 meters, currently  
15-30 meters, development goal

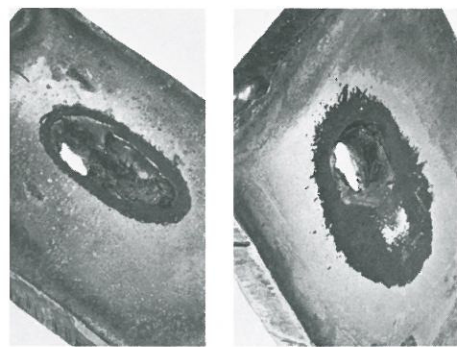
## ARMOR PIERCING HIGH EXPLOSIVE — BASE FUZE



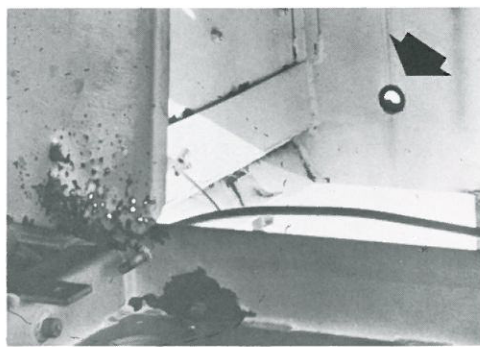
Special design for optimum performance against high density targets and for after-armor penetration blast effects:

- Out of Line Detonator
- Self Destruct — 5-9 seconds at approximately 11° Q.E.
- Bore Safe
- Rain & Foliage Safe
- Safe Arming Distance — 1 to 10 meters from muzzle

## AGAINST ARMOR—AIRCRAFT—CONCRETE BUNKERS—MATERIAL AND PERSONNEL



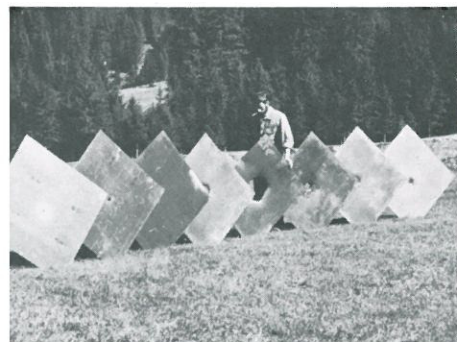
PERFORMANCE — PENETRATION  
OF "THREAT" ARMOR AT 1000 METERS



INSIDE VEHICLE — AFTER ARMOR  
LETHAL FRAGMENTS EFFECTS



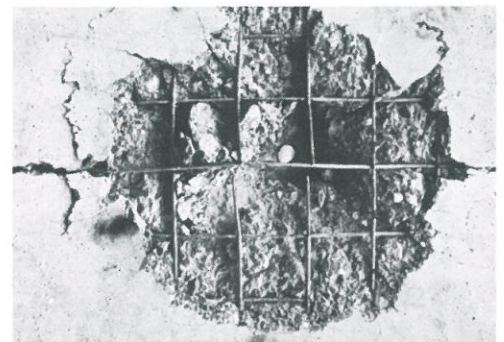
STRIKE SIGNATURE "SPECIAL  
ALLOY" AT 1000 METERS



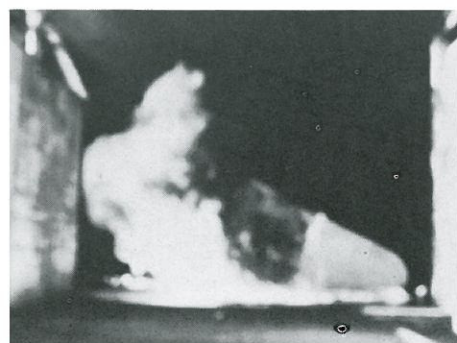
DAMAGE TO TYPICAL ARMOR  
PROTECTION OF PILOT COMPARTMENT



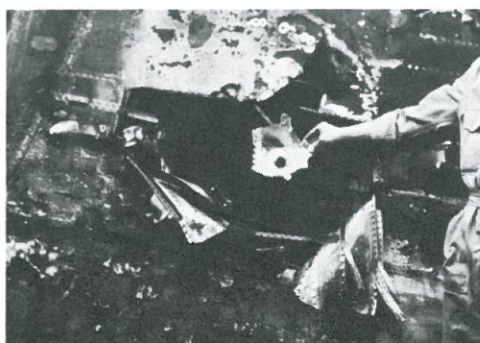
SINGLE ROUND DAMAGE TO  
12" THICK REINFORCED CONCRETE



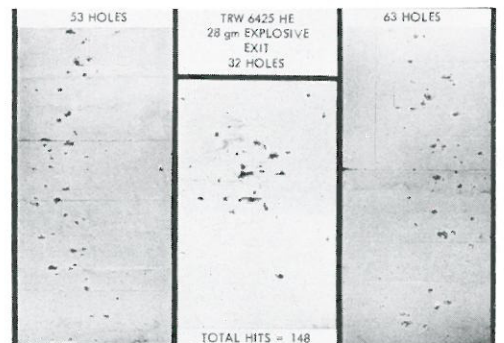
EXIT PENETRATION OF  
REINFORCED CONCRETE



INCENDIARY OF JET FUEL  
IN WING FUEL CELL



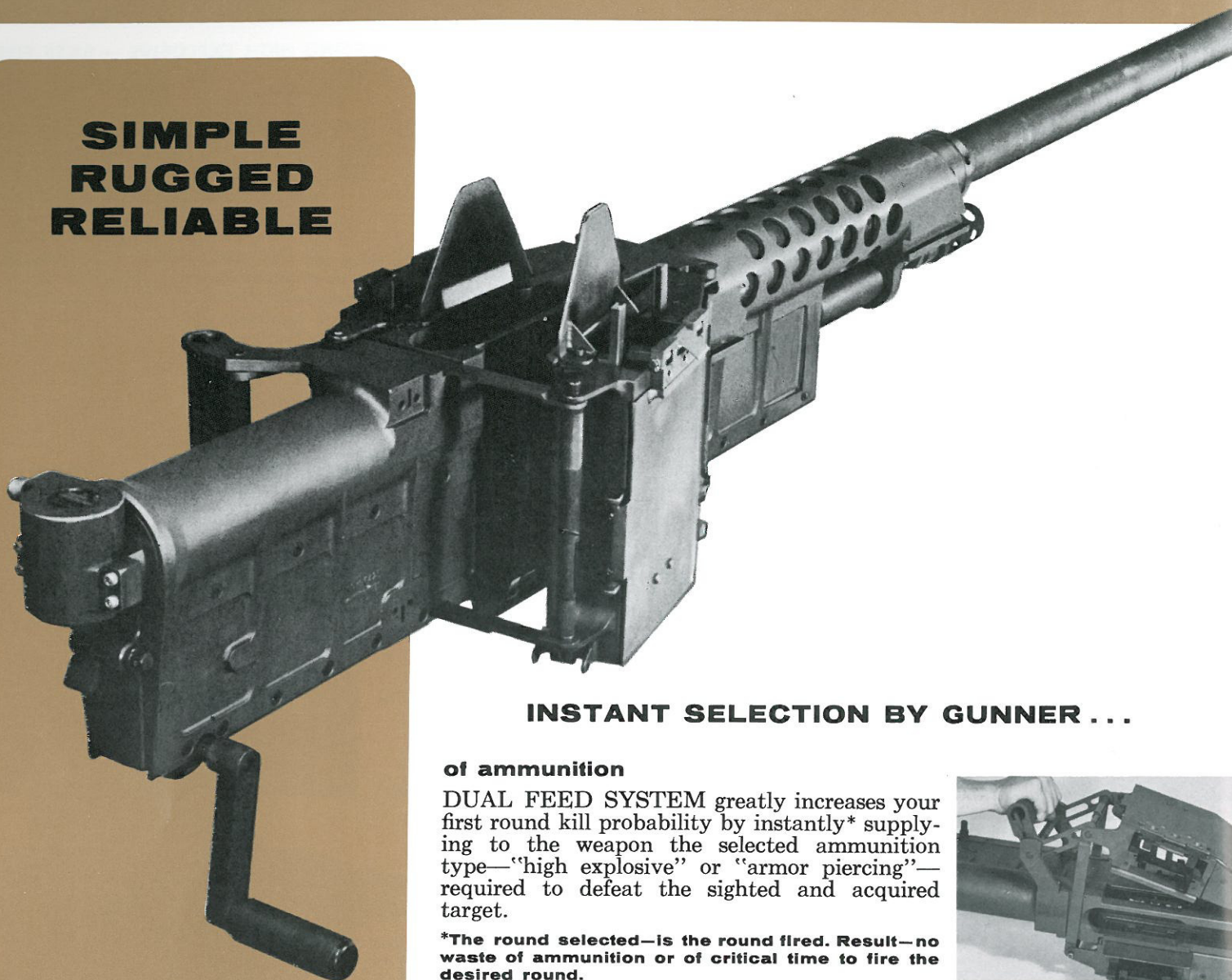
BLAST DAMAGE TO WING  
STRUCTURE BY SINGLE ROUND



148 PENETRATION OF 2" PINE  
SIMULATE WARHEAD LETHALITY  
AGAINST PERSONNEL

# 25mm automatic cannon

**SIMPLE  
RUGGED  
RELIABLE**

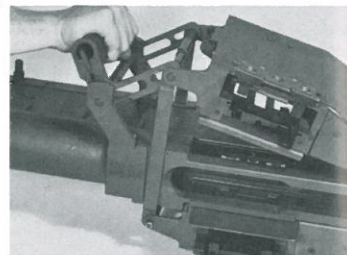


## INSTANT SELECTION BY GUNNER...

### of ammunition

DUAL FEED SYSTEM greatly increases your first round kill probability by instantly\* supplying to the weapon the selected ammunition type—"high explosive" or "armor piercing"—required to defeat the sighted and acquired target.

**\*The round selected—is the round fired. Result—no waste of ammunition or of critical time to fire the desired round.**



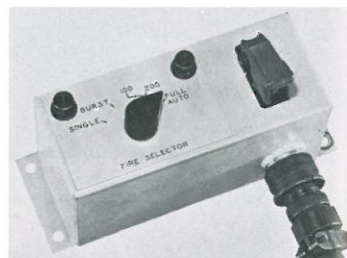
## WEAPON CHARACTERISTICS

- Rate of fire—540-600 RPM
- Recoil operated—rotary bolt with hydraulic boost
- Weight—165 lbs. Includes dual feeders—built-in charger—firing solenoid (No subcradle required)
- Link belt feed (Linkless feed also available)
- Overall length—70 Cal. barrel, 102"  
80 Cal. barrel, 112"

### rate of fire

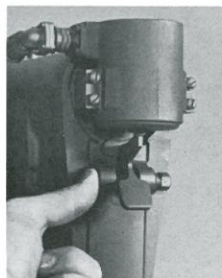
Can be selected by the gunner for optimum use of the weapon and ammunition for the target being engaged.

This "Ammo Saver" permits a choice of semi-automatic single shot—100, 200 and 570 RPM by use of the "rate selector".

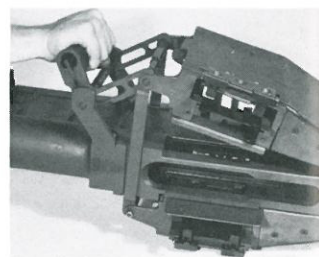
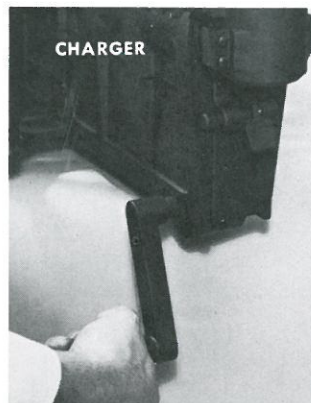


## MANUAL CONTROLS

ASSURE  
"POWER OFF OPERATION"  
OF WEAPONS...



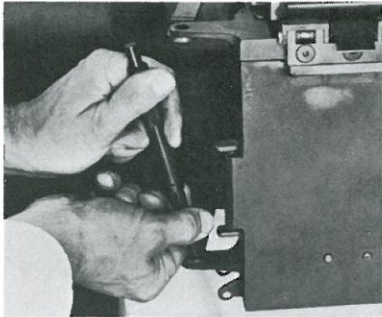
TRIGGER & SAFETY



DUAL FEED SELECTOR

THE TRW-25MM AUTOMATIC CANNON is a Gene Stoner design. It can be operated by one man. Fires from an open bolt, utilizing the "Combat Proven" front locking bolt principle. To date, the weapon has been successfully tested in environmental extremes of  $-65^{\circ}$  to  $+165^{\circ}$ F without lubricated ammunition. Field test firings in dust, snow and rain have further confirmed the simple, rugged and reliable features of the weapon which are clearly visible in the sequence that follows:

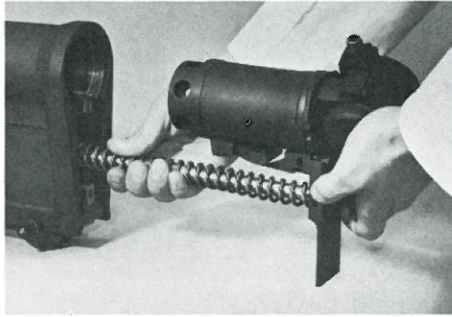
## FIELD STRIP IN SECONDS—WITHOUT TOOLS



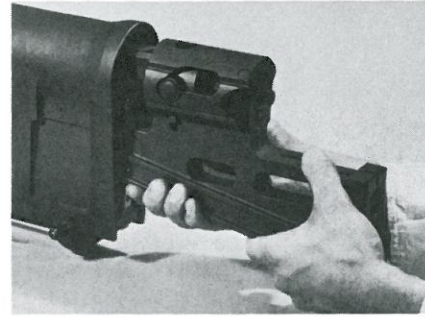
REMOVAL OF FOUR TELESCOPING PINS REMOVES FEEDERS



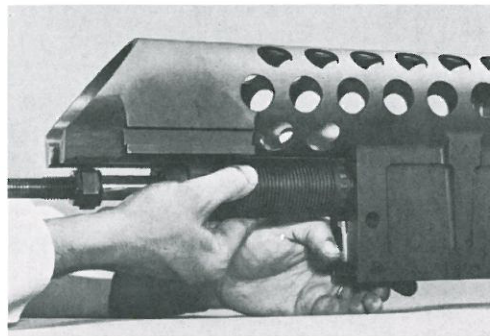
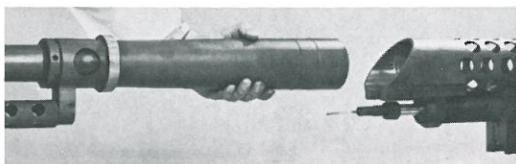
DEPRESS LOCKING PIN . . .  
ROTATE TO UNLOCK AND REMOVE  
BACK PLATE ASSEMBLY



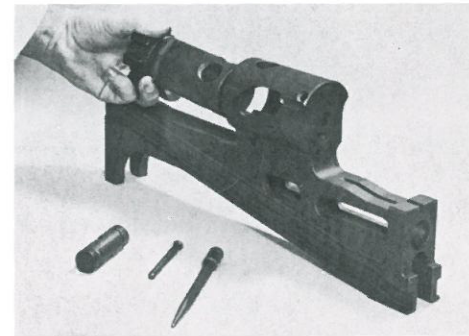
REMOVE BREECH ASSEMBLY



UNLOCK AND REMOVE BARREL ASSEMBLY



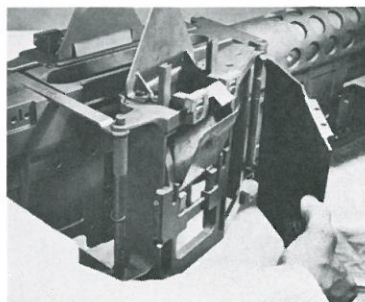
REMOVE ACCELERATOR ASSEMBLY



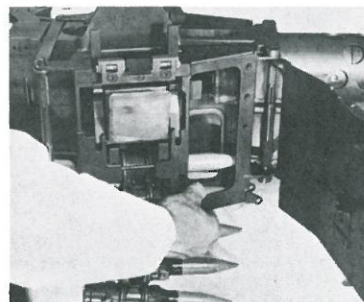
DISASSEMBLE BREECH ASSEMBLY

## SIMPLE LOADING

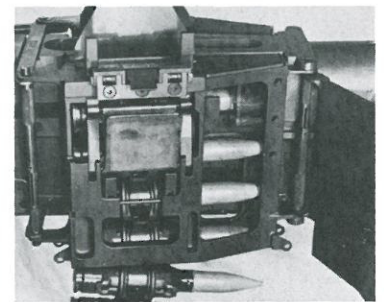
Re-supply of ammunition during combat conditions puts a premium on time. The simple feed system of the 25mm permits rapid loading of the weapon, without tools, in a matter of seconds.



MOVE FEED TRAYS OUT OF  
ENGAGEMENT . . . OPEN  
FEEDER COVERS



INSERT AMMUNITION INTO FEED  
GUIDES . . . SLIDE AMMUNITION  
UPWARD



ENGAGE HOLDING PAWLS . . .  
CLOSE COVER—WEAPON IS LOADED

# demonstrated 25mm firepo

**In combat—reliability, durability and accuracy are what count.**

The exceptional accuracy of the 25mm system has been frequently demonstrated. When evaluated against the "threat" at 1000 meters, the 25mm system's first round hit probability exceeds 80%.

## TRW-25mm Integrated Command Station

**39"**  
MOUNTING  
RING

... is the first one man station designed to take complete advantage of the tactical superiority of the dual feed - 25mm weapon and ammunition system.

Fully stabilized and electro-hydraulically controlled, the station provides the gunner with 360° panoramic vision and

these additional unique features:

Push button control of instant ammunition selection—armor piercing or high explosive

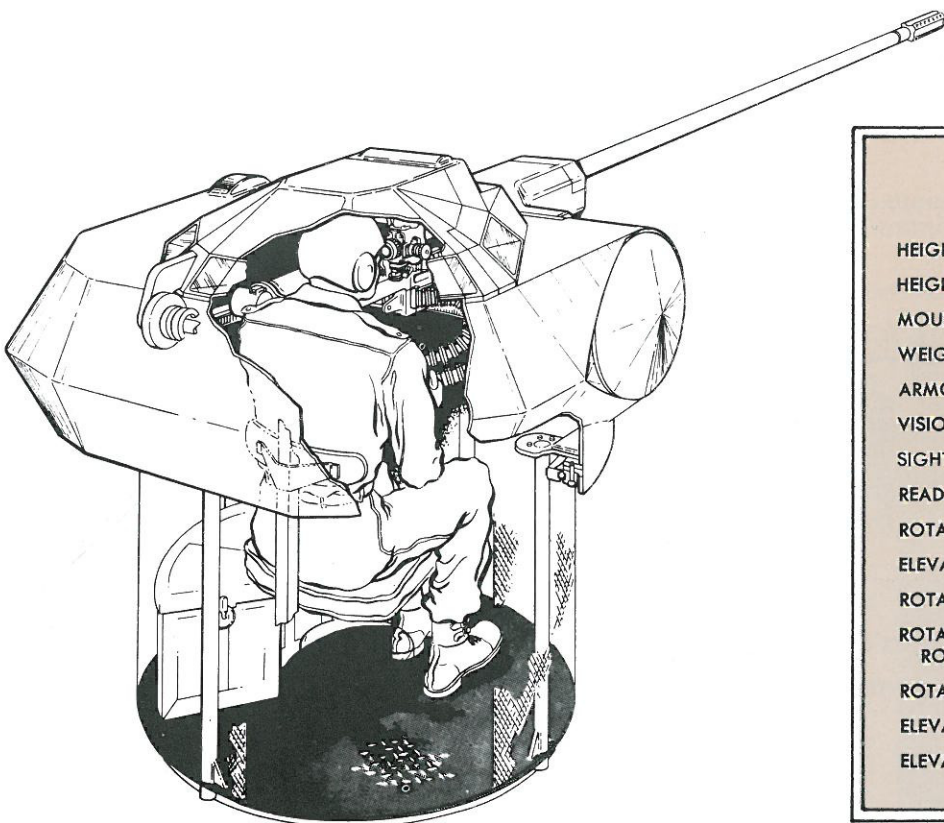
"Dial a Rate" of fire and automatic charger are controlled from the master panel

The station provides a compatible and efficient environment for the gunner to acquire, track and fire at ground and air targets through the TRW unity and 6-power sight. Should "power failure" be experienced, or for combat purposes a "power off" operation be desired, a manual dual feed selector, charger and trigger are combined with a hand pump power system to provide a reliable manual operation of the station.

The gunner's station has been designed to make quick and easy the essential trouble shooting and occasional field repair by providing for ready access to all components, and the provision for "field stripping," loading and unloading of the weapon while fully buttoned up and protected from enemy fire.



THIS UNIT MOUNTED ON THE M-113 IS CURRENTLY UNDERGOING U.S. ARMY TEST AT ABERDEEN PROVING GROUND.



## SPECIFICATIONS

HEIGHT	26½"
HEIGHT WITH SPACER	32½"
MOUNTING DIAMETER	39"
WEIGHT—LESS GUN AND AMMO	2250 LBS.
ARMOR PROTECTION	¾" STEEL THROUGHOUT
VISION	—360° OVERLAPPING WITH 6 VISION BLOCKS
SIGHT	—1X & 6X—EACH MONOCULAR—TRW MODIFIED M-20
READY AMMO SUPPLY	—150 ROUNDS (110 HE, 40 AP)
ROTATION, AZIMUTH	—360° CONTINUOUS
ELEVATION—DEPRESSION	+60° -10°
ROTATION, AZIMUTH (LO SPEED)	1 MIL/SEC
ROTATION, AZIMUTH (HI SPEED)	90°/SEC (CONTINUOUS ROTATION)
ROTATION, AZIMUTH (HI SPEED)	75°/SEC (STOP TO 90°)
ELEVATION & DEPRESSION (LO SPEED)	1 MIL/SEC
ELEVATION & DEPRESSION (HI SPEED)	45°/SEC



# ver packages... \*VRFWS

TRW-MODIFIED M-26 OR M-27

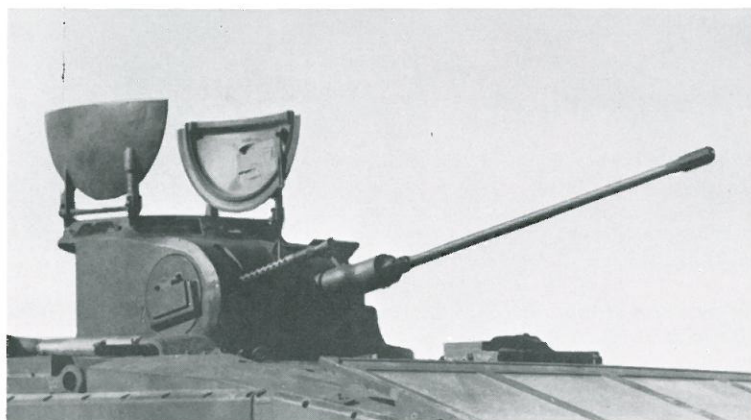
**34"**  
MOUNTING  
RING

## SPECIFICATIONS

IRREDUCIBLE HEIGHT—21"  
AMMO SUPPLY—EXTERNAL—75 HE—25 AP  
WEIGHT—LESS WEAPON AND AMMO—1350 LBS  
VARIABLE RATE OF FIRE  
DUAL FEED SELECTION  
ELECTRO-HYDRAULIC CONTROLS

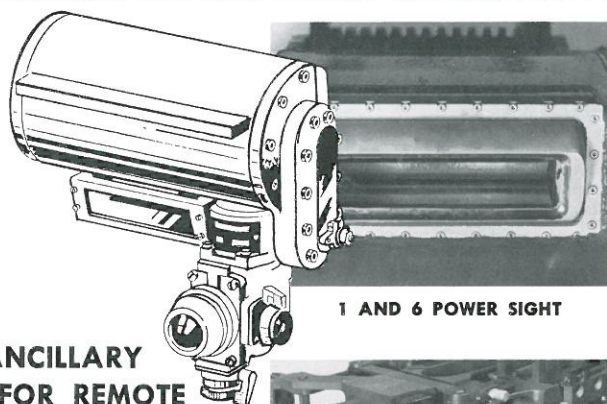


This cupola was designed to make optimum use of the existing M-26 and M-27 Command Stations currently employed on the M113 and M114 vehicles. A simple conversion kit permits the adaptation of the 25mm weapon and ammunition system to the M114, M113 and M113½ vehicles thus extending the useful life of these systems in the inventory.



"Two Man Station"—developed under government contract by Pacific Car and Foundry—configures the TRW 25mm weapon system with a CO-AX 7.62 machine gun in a cupola demonstrating compatibility of the 25mm with the MICV-65, a development configuration for the MICV-70. This system was successfully demonstrated against armor and material targets at ranges in excess of 1000 meters and met or exceeded the design objectives.

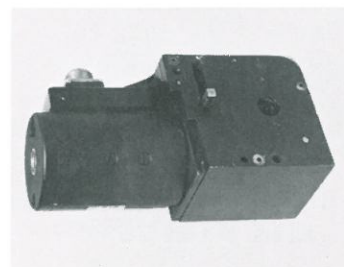
\*VEHICLE RAPID-FIRE WEAPONS SYSTEM



1 AND 6 POWER SIGHT

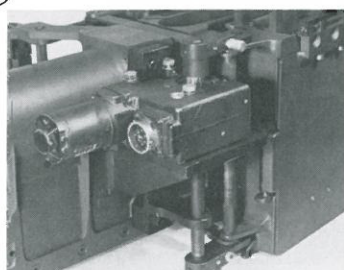


MASTER CONTROL BOX

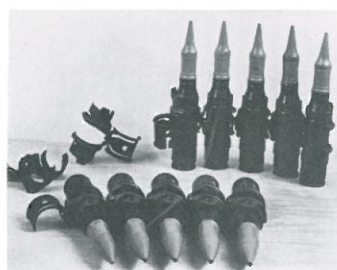


CHARGER

TRW-ANCILLARY  
DEVICES FOR REMOTE  
OPERATION  
OF 25mm WEAPON  
IN VEHICLE,  
HELICOPTER OR  
AIRCRAFT  
INSTALLATIONS



DUAL FEED SELECTOR



LINKED AMMUNITION

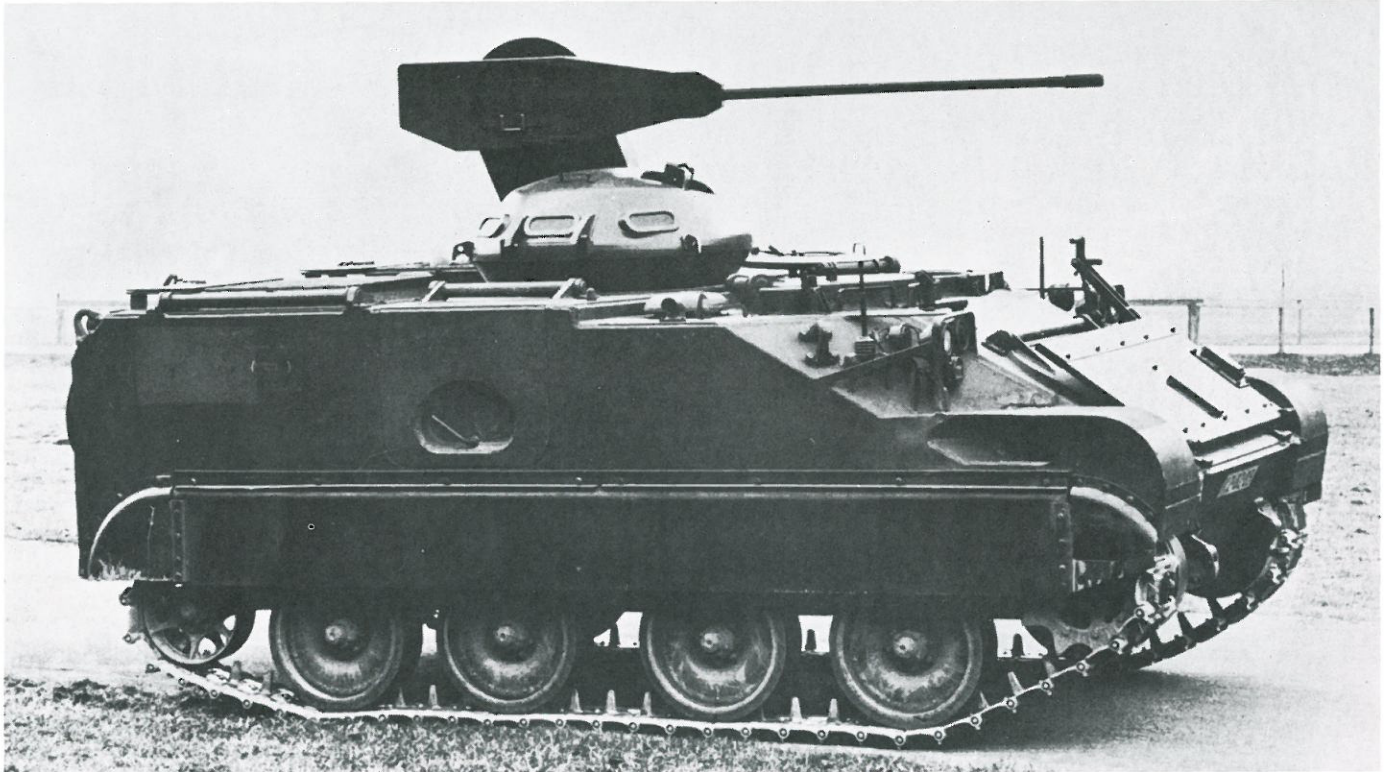


FLEXIBLE CHUTING

# 25mm Future roles provide

## for the existing 25mm system:

### OERLIKON-KUKA (Keller & Knappich) "LIGHTWEIGHT COMMAND STATION FOR EMPLOYMENT OF TRW 25mm WEAPON ON M113 & M113 1/2"



In response to NATO interests, Oerlikon-Kuka in cooperation with TRW engineers have developed this new light-weight command station. Here shown on M113 1/2 CR vehicle.

Externally mounted weapon is completely accessible to gunner from open hatch, yet isolates noise, gases and permits CBR protection. Internal ammunition supply permits ready ammunition re-supply from within the vehicle. (Detailed brochure available upon request.)

#### Other Characteristics:

All electric power controls and weapon operation — with manual back-up.

NATO Std. Vision Blocks.

Armor protection equal to 1½" thickness 5083 aluminum plate @ 45° obliquity

Sight — Modified M-20 periscope with 2 or 6 magnification.

Total system weight including weapon and 218 rounds of 25mm ammunition = 1875 lbs.

**The VERSATILITY and "GROWTH POTENTIAL" of the 25mm Weapon and Ammunition System make it a prime candidate for these new vehicles as they are developed and fielded.**

In addition to extending the useful life of vehicles currently in the inventory, the TRW 25mm Weapon System is a candidate weapon for these new vehicle systems:

U.S.-FRG-NMBT

P-12

ARSV

MICV-70

NEW MAIN BATTLE TANK

SECONDARY ARMAMENT

"NEW" MARINE AMPHIBIOUS ASSAULT VEHICLE

"NEW" ARMORED RECONNAISSANCE SCOUT VEHICLE

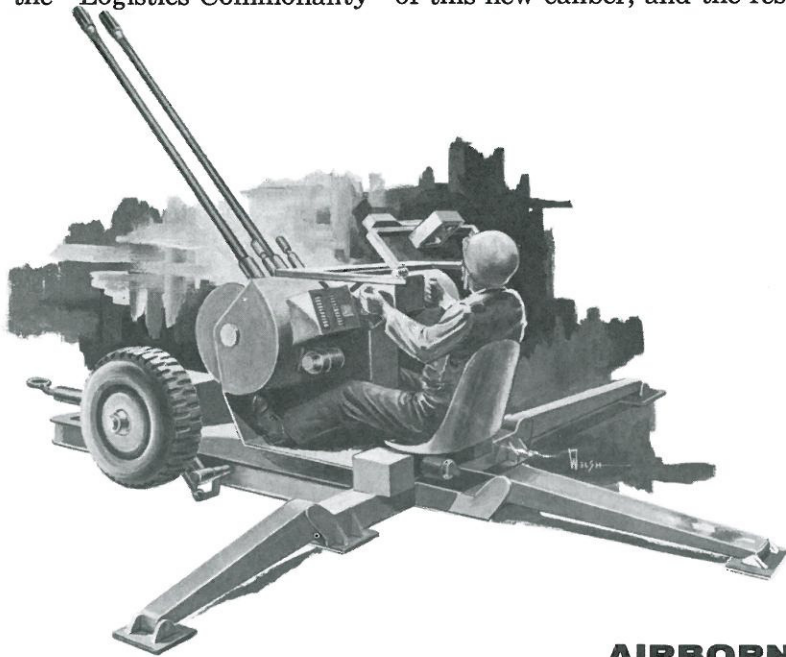
"NEW" MECHANIZED INFANTRY COMBAT VEHICLE

At TRW work is continuing to insure that the 25mm system, combined with a "Linkless Feed System" and additional ammunition warheads will provide the optimum Weapon System for each new vehicle's mission requirements while insuring "Commonality" with the basic Weapon and Ammunition System now undergoing tests at Aberdeen and NATO.

# Logistics Commonality ...

## for the 25mm caliber

It is the desire of TRW to combine present "Inhouse Efforts" with those of the Department of Defense to fully explore the significant advantages of the 25mm caliber in the air defense and airborne roles to establish the "Logistics Commonality" of this new caliber, and the resulting life cycle cost advantages.



### AIR DEFENSE

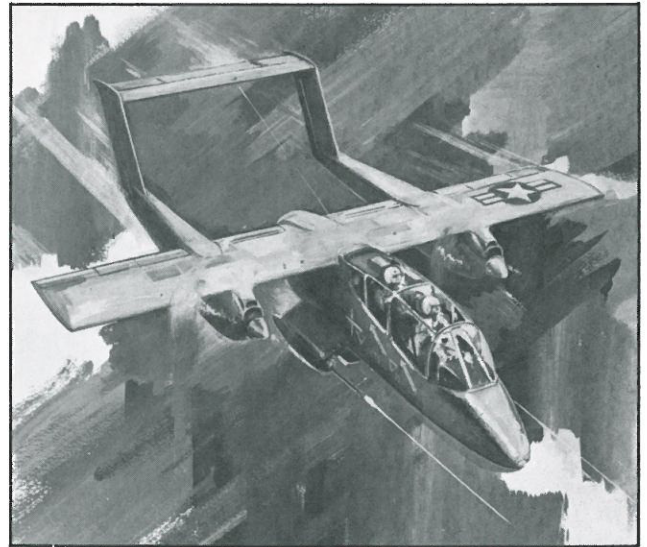
This light weight, low cost, high density, fair weather air defense system concept can be towed by  $\frac{3}{4}$  or  $2\frac{1}{2}$  ton vehicles, and is helicopter transportable.

Electrically powered by an independent power generator and battery pack. The complete system weighs less than 3000 lbs. including twin 25mm weapons and 400 ready rounds in the linkless feed system. Equipped with a reflex sight and a laser ranging device, this simple and rugged system provides substantial improvement in kill capabilities against aircraft compared to existing 20mm systems.

### AIRBORNE



HELICOPTER ARMAMENT



CLOSE AIR SUPPORT

**From the air the 25mm exceeds its own ground to ground superiority in effectiveness against armored vehicles and point targets.**

Short time of flight — flat trajectory and improved accuracy plus increased lethality of 25mm warheads, all add up to a substantial increase in system effectiveness when the 25mm is employed as an airborne weapon.

TRW, working with Bell Aircraft, has configured a "Twin" Pod Mounted 25mm system (artist concept) using the VRFWS dual feed 25mm, with a soft mount adapter, and ammo stowage blisters. This system's simplicity and overall effectiveness has convinced TRW engineers that the 25mm in its present configuration can be readily adapted to internal or external mounts on the Cheyenne and OV-10-A, as well as the Huey Cobra. Should close air support missions require higher rates of fire, the modified "High Rate 25mm" or the new Twin High Rate 25mm weapon should be considered.

In any case the superior fire power of the 25mm system and its weight and volume advantages warrant serious consideration in the air to ground role.

# 25mm

# system:

**DEMONSTRATED SUCCESSFULLY TO ARMY FOR VRFWS\***

1965	•	M114
1966	•	MICV-65
1967	•	M113

**STATUS:**

**NOW IN TEST**

**U.S.**

**FRANCE**

**ENGLAND**

**NETHERLANDS**

**AND UNDER CONSIDERATION BY SEVERAL  
OTHER COUNTRIES**

**AVAILABLE . . .**

**FROM NATO OR U.S. PRODUCTION BASE — 1969/70**

**\*VEHICLE RAPID-FIRE WEAPON SYSTEM**

FOR INFORMATION CONTACT  
FERNLEY G. SMITH  
MANAGER OF ORDNANCE  
V-JET AND ORDNANCE DIVISION  
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PORT CLINTON, OHIO 43452

*“with logistics commonality for future roles” in*

- AIR DEFENSE
- HELICOPTER ARMAMENT
- CLOSE AIR SUPPORT
- AMPHIBIOUS ASSAULT

**TRW**<sup>®</sup>  
ET & ORDNANCE DIVISION

Here is a current status report and descriptive brochure of the "TRW 25" which we believe to be the most advanced, cost effective vehicle weapon system available in the world today.

The threat that the Army assessed so accurately in the early sixties has become even more critical now with recent cancellation of the "interim" HS 820. There's nothing adequate to the threat in the U. S. inventory.

TRW, in close cooperation with the Army, has been working more than four years to provide a simple, rugged and reliable 25mm gun and ammunition system that can fill this "gun gap" by providing our forces with firepower superiority by 1970.

The United States and five other countries, have purchased some combination of 25mm weapons, ammunition and command stations for testing to support a purchase decision. These tests are going well and appear to have confirmed the TRW 25 design -- all scheduled tests should be completed in 1968.

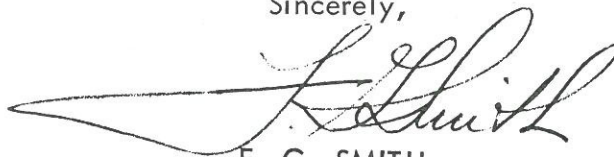
This corporation, now supported by an outstanding U. S. Ammunition Supplier, has prepared a sound plan for volume production of the 25mm Weapon and Ammunition. With a purchase decision by September 1968, production deliveries can be made in 1970.....this will be none too soon.

We often hear that "new vehicle" development schedules are slipping, and therefore "new gun system" requirement slips in "lock step" with the vehicle schedule. It would seem that this is all the more reason to make vehicles currently in the inventory more effective by up gunning them with superior firepower of the "TRW 25" pending later vehicle availability. The feasibility of this has been demonstrated by the simple and inexpensive conversion of the existing M-27 Command Station.

With the world situation as it is today - can we really afford the luxury of not having this weapon and ammunition system in at least limited production - ready for whatever vehicles we may be required to fight and defeat.

When does NATO need the 25mm? If not yesterday - certainly NOW!

Sincerely,



F. G. SMITH  
Manager of Ordnance

## TRW 6425 -- 25mm WEAPON SYSTEM

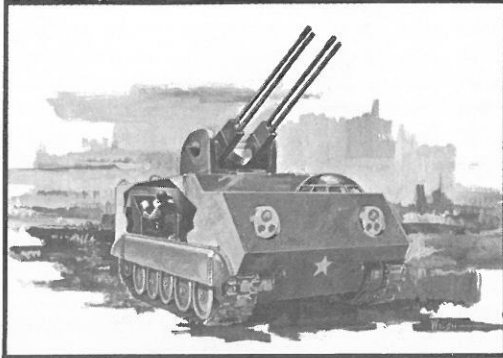
### FACTS

- 1965 - November
  - Demonstration
- 1966
  - Weapon #003 and Ammunition delivered for MICV-65 Development Program
- 1967 - February
  - Firing Demonstration on MICV-65
- 1967 - 1st Quarter
  - Advanced Armor Piercing Round Demonstrated at Aberdeen and at Yakima. Additional rounds now on order.
- 1967 - 2nd Quarter
  - Demonstrated in one-man fully stabilized Command Station mounted on the M113 Vehicle.
  - System delivered to Aberdeen for Military Potential Test.
- 1967 - 3rd Quarter
  - Completed environmental tests of weapon and ammunition as a part of Military Potential Test by Holland.
- 1967 - 4th Quarter
  - Vehicle mounting and accuracy tests completed on the M113 1/2 Vehicle as an additional portion of the Military Potential Test by Holland.
  - Design completed and fabrication started on new light weight station for the M113 1/2, M113 and XM765 Vehicles.
  - TRW Air Defense System Study completed.
  - A High Rate of Fire 25mm Weapon System Configuration established for aircraft such as the OV10, F-5 or AX.
- 1968
  - Tests under way and/or systems purchased by the United States and five other countries.
  - Management agreement reached with a U. S. Ammunition Supplier on the 25mm Ammunition production.
  - Preliminary plans completed for production of 25mm Ammunition in the U. S. (One million rounds per month can be delivered in 24 months from contract award, with limited quantities starting in 12 months.)

Reprinted from

Guns Magazine

DECEMBER, 1967



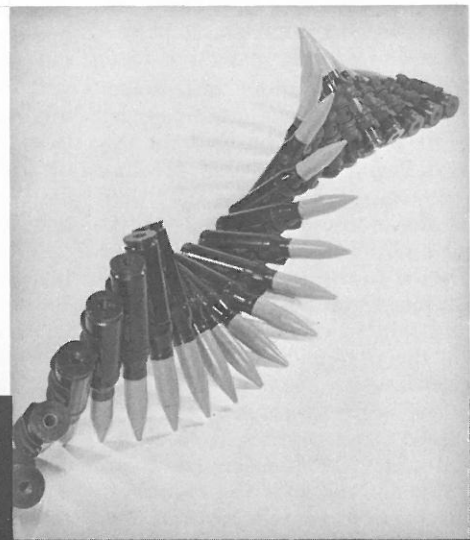
# HOT NEW 25 mm AUTOMATIC

NOT A POCKET AUTO, THE TRW 6425 IS A  
NATURAL SUCCESSOR TO THE .50 BROWNING MACHINE GUN



A handwritten signature in black ink, which appears to read "George C. Nonte".

By Maj. George C. Nonte



Ammunition for the 6425 is belted, as shown, and fed to gun through flexible chutes.

**D**URING WWII, the U.S. .50 caliber Browning Machine Gun—air, ground, and vehicular configuration—proved to be one of the most effective gun/cartridge combinations in existence. Though a couple of more powerful heavy machine gun cartridges existed, they did not achieve the world-wide usage and acceptance of the .50 Browning. Possessing the capability to destroy general-purpose and light armoured vehicles, and also to penetrate field fortifications, it was greatly feared by the enemy. In the air, multiple installations, firing as high as 1200 rounds per tube, were extremely destructive on enemy aircraft.

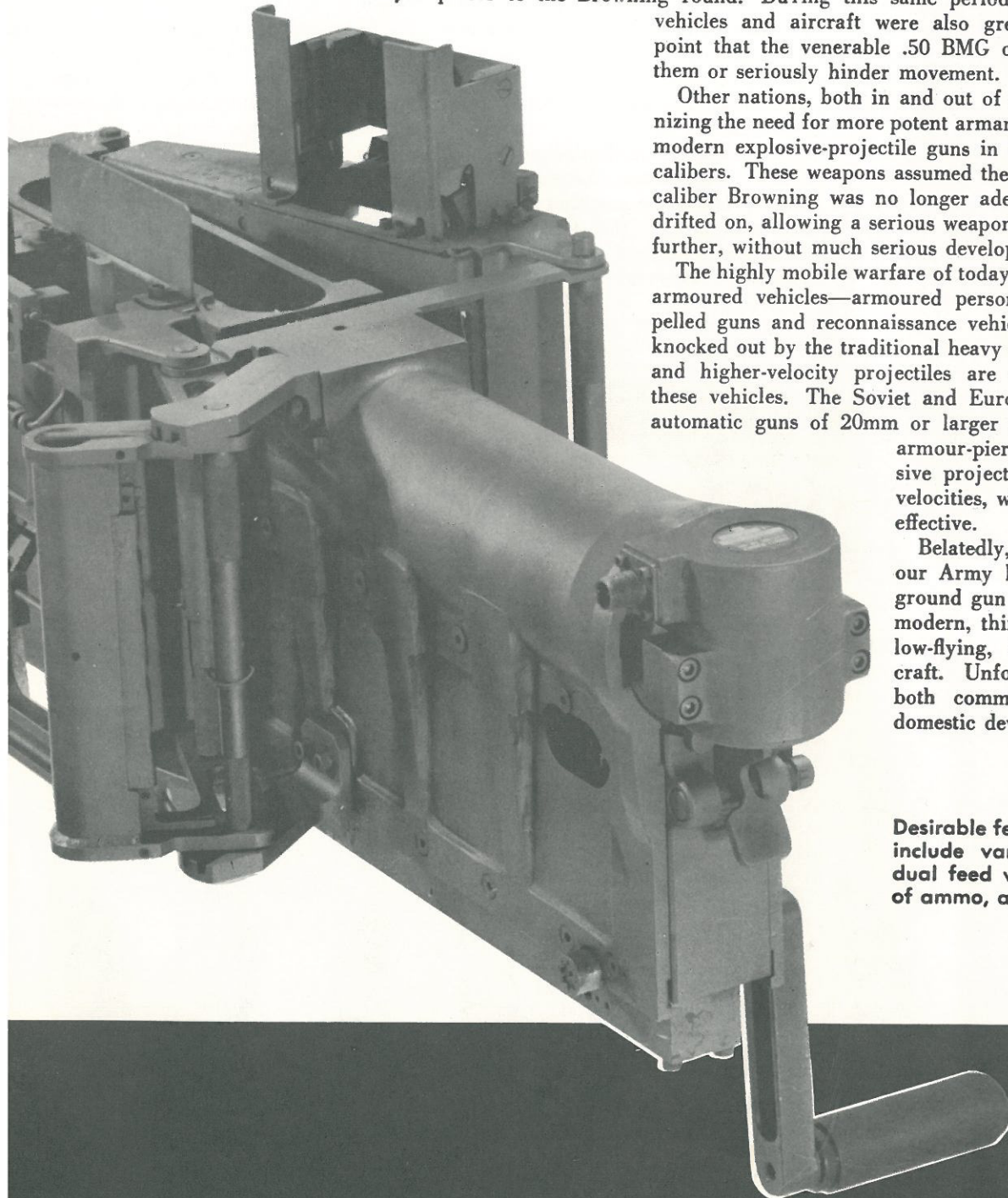
The U. S. Armed Forces became so enamoured of the Fifty that in the years to follow development of a more potent replacement was sadly neglected. Other world powers, though, were much more progressive. For example, the Soviet 12.7mm cartridge—even though *already* superior to the .50—gave way to a high-velocity 14.5mm (.58 cal.), vastly superior to the Browning round. During this same period of time, thin-skinned vehicles and aircraft were also greatly improved to the point that the venerable .50 BMG could no longer defeat them or seriously hinder movement.

Other nations, both in and out of the Soviet Bloc, recognizing the need for more potent armament, rapidly developed modern explosive-projectile guns in 20, 23, 25, and 30mm calibers. These weapons assumed the role for which the .50 caliber Browning was no longer adequate. Yet, the U. S. drifted on, allowing a serious weaponry gap to widen even further, without much serious development work.

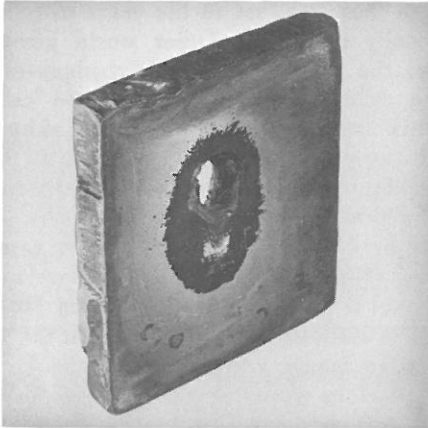
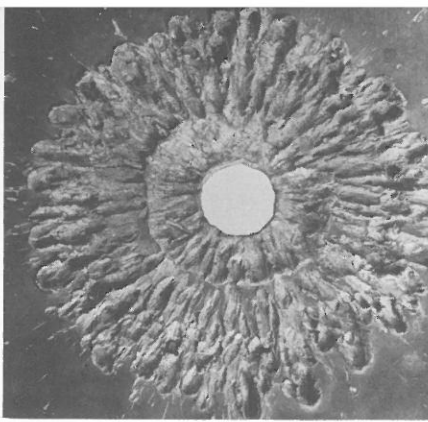
The highly mobile warfare of today employs many lightly-armoured vehicles—armoured personnel carriers, self-propelled guns and reconnaissance vehicles—which cannot be knocked out by the traditional heavy machine gun. Heavier and higher-velocity projectiles are required to penetrate these vehicles. The Soviet and European trend is toward automatic guns of 20mm or larger caliber, utilizing both armour-piercing and high explosive projectiles at extremely high velocities, which have proven very effective.

Belatedly, in the early 1960's, our Army began searching for a ground gun capable of destroying modern, thin-skinned vehicles and low-flying, high-performance aircraft. Unfortunately, by acts of both commission and omission, domestic development in this field

**Desirable features of TRW's 6425 include variable rates of fire, dual feed with instant selection of ammo, and toolless stripping.**







Penetration of the new round in both aluminum and steel armor is great.

had been discouraged. Consequently, European guns were evaluated, this culminating in the recent highly controversial purchase of the German Rheinmetal HS-820 20mm Automatic machine gun.

This fresh interest in guns of this class prompted, 3½ years ago, initiation of privately funded development work by Thompson-Ramo-Woolridge of Cleveland, Ohio. TRW secured the services of Mr. Gene Stoner—successful designer of the AR-15/M-16, AR-10 Series, and Stoner 63 Weapons System. Working from his basic multiple-lug rotating bolt design, Stoner produced a recoil-operated, heavy caliber automatic gun with a unique selective feed mechanism which enables the gunner to choose instantly the type of ammunition best suited for his immediate target.

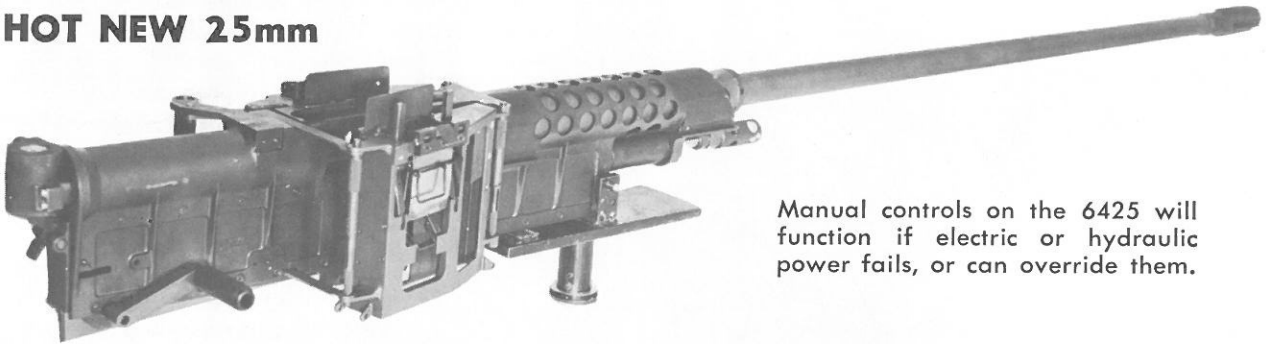
This design was formalized as the "TRW 6425 25mm Automatic Cannon." This is the gun that I recently examined at the TRW Ordnance Development Center at Port Clinton, Ohio. The 6425 (as we will call it from this

point forward) has been developed concurrently with highly effective HE (high explosive) and AP (armour piercing) ammunition, the latter being a product of Oerlikon of Switzerland.

In its present form, the 6425 weighs 165 lbs., with a length of 112.2", width of 10.6" (dual feed), and height of 8.8". It is designed primarily for ground vehicular installation, but appears well suited to use in both rotary and fixed wing counter-insurgency and ground support aircraft. Ammunition for the 6425 has reached a high state of development, with the discarding-sabot, tungsten-carbide core, APDS round at 4750 fps capable of destroying light armoured vehicles, to at least 1000 meters. The high explosive round, at 3600 fps, can immobilize most armoured vehicles and destroy field fortifications and troops.

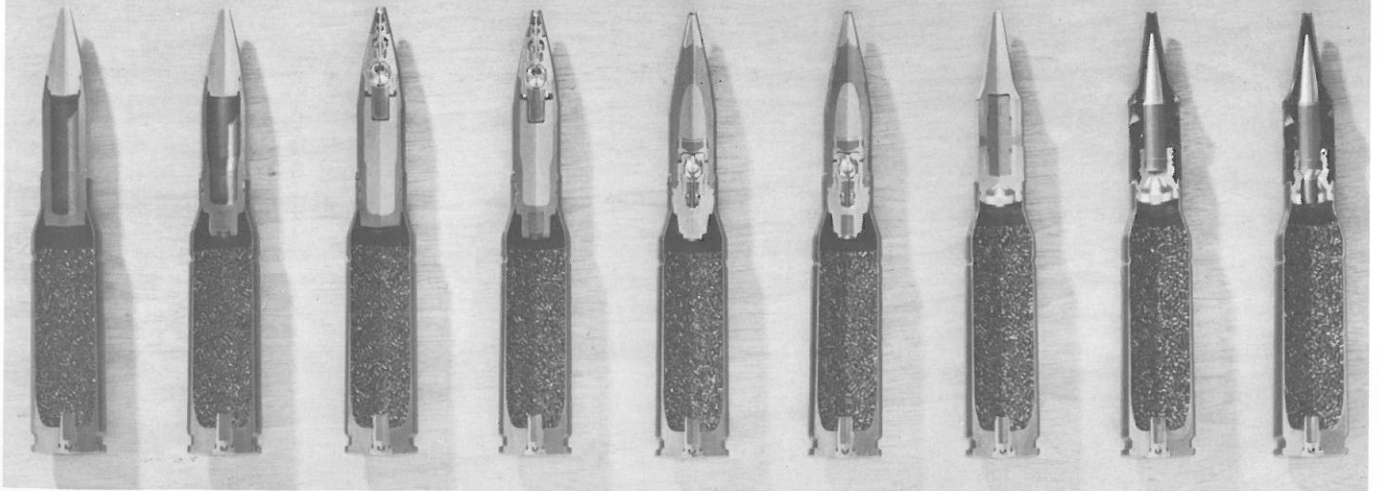
Simplicity and productibility are keynotes of the 6425 design. The gun is of short-recoil design, the barrel traveling 1.5". During this movement, the heavy bolt carrier is moved the same distance (*Continued*)

## HOT NEW 25mm



Manual controls on the 6425 will function if electric or hydraulic power fails, or can override them.

## TRW 25mm AMMUNITION



**HIGH-EXPLOSIVE**

**ARMOR PIERCING**

## NEW 25mm AUTOMATIC

to the rear, then speeded up and thrown to the rear by a simple hydraulic accelerator mechanism. Thus, when the barrel is halted, the bolt carrier continues rearward at high velocity—during which movable cam slots act upon a transverse pin to rotate the bolt, disengaging the seven locking lugs from their abutments in the barrel extension. This is accomplished in a very short distance, after which bolt and carrier continue rearward to strike a multiple Belleville-spring buffer. During rearward movement of the carrier, a roller on the feed slide rides in a cam groove in the carrier, forcing the feed slide one cartridge space toward the feedway. The slide thus carries the next round in the ammunition belt into the feeding position. In full automatic fire, the bolt/carrier assembly then starts forward under the influence of the recoil spring (plus the "bounce" imparted by the buffer) and the bolt strikes

the base of the cartridge in the feedway, stripping it from the disintegrating-link belt and driving it into the chamber. As the bolt chambers the round fully, barrel, bolt and carrier continue forward until the barrel is halted in battery. At this point, bolt movement ceases and the carrier continues forward, while the cam slots and pin rotate the bolt into the locked position. As bolt locking is completed, the fixed firing pin assembled to the carrier moves forward to strike the percussion primer and fire the round—at which time the complete cycle will be repeated. During carrier forward movement, the feed slide is also retracted one cartridge space in preparation for the next cycle. The 6425 fires from an open bolt. This characteristic eliminates the "cook-off" problem common to closed-bolt designs during high rates of sustained fire. In addition, it is essential to the simple selective-feed system used. The gunner may select one of two types of ammunition by movement of a lever pivoted on the receiver. Two separate feed mechanisms are utilized, one being on either side of the receiver, pivoted at its forward end. The feed selection lever is connected to the rear of both feeders, and has three positions: Neutral, right and left. In its neutral (central) position, the rear end of both feeders is forced outward from the receiver, moving the cartridges out of the path of the bolt. Consequently, as the gun is seared and the bolt drives forward, no cartridge is fed into the chamber. With the lever in its left position, the left feed mechanism is forced against the receiver, while the right mechanism moves even farther away. Thus, as the bolt moves forward, it strikes

the base of the cartridge in the left feeder and drives it forward into the chamber. The cartridge in the right feeder is completely clear of the bolt path. Placing the lever in the right position reverses this condition, moving the right feeder against the receiver and the left away—presenting the cartridge in the right feeder for chambering as the bolt goes forward. This is an unusually simple and trouble-free arrangement.

Consequently, HE ammunition can be placed in one feeder and AP in the other—or any other combination of types. This gives the gunner the ideal option of using one type of ammunition against the target for which it is best suited, then switching instantly to the other type for his next target. Thus, he can destroy troops in the open with HE and immediately switch to AP to engage accompanying vehicles. Of course, if the situation requires it, both feeders can be filled with the same ammunition.

This type of ammunition selection appears to be far more practical than some of those proposed in the past, where electrical and/or hydraulic power was essential to operation. Some of the systems proposed would make a production engineer's hair stand on end, while the TRW/Stoner 6425 design is adapted to speedy, conventional production and assembly methods, as well as rapid modular replacement in the field.

Both the basic mechanism and the selective feed system are of extremely simple design. The complete unit is designed with basic manually-operated controls for firing, charging and ammunition selection. Provision is made for accomplishing those functions by means of electric (hydraulic also possible) ancillary equipment; however, when this is done, the manual controls remain functional and will override whatever other system might be in use. In essence, this means that in the event of a power failure in the remote charging, selection or firing controls, the gun may still be operated manually. In these days of over-sophistication and over-designing, this is a most valuable feature. This also means that the basic gun need not be limited to a very few specialized powered installations but can even be rigged with a rudimentary ground mount and operated by a one- or two-man crew almost anywhere.

Of course, all this doesn't mean much to the soldier in the field if the weapon doesn't have the needed accuracy, reliability and controllability. Observation of the gun, and test reports I've seen indicate the 6425 has

these qualities to a greater degree than other modern guns with which I am familiar. Regarding accuracy and controllability, I examined photos which show the result of a single slow-rate automatic burst on a target APC at 1000 meters. There are seven hits on the target.

To provide this degree of accuracy, the gun is equipped with ancillary electrical rate-of-fire control equipment. By turning a knob on the control panel, the gunner can select semi-auto fire or full-auto at rates of 100, 200 or 550-570 rounds per minute. The slower rates, of course, produce the best accuracy. An electrical searing delay produces the 100 and 200 rpm rates, while 550-570 represents a free-running gun.

In addition, an electro-hydraulic stabilization system has been developed to permit firing from a vehicle under way. This system is characterized by unusually quick and smooth response, which keeps the gun precisely on target at normal combat vehicle speeds. Firing from a moving platform over representative terrain with the stabilization system in operation produces accuracy approaching that of stationary firing.

TRW once envisioned this gun in the more-or-less standard 20mm caliber. The 5mm increase in bore size to 25mm may not seem significant, but the gain in target effect is far out of proportion to the increase in size and weight of the gun/ammunition combination. The 25mm HE projectile contains three times the amount of explosive bursting charge that can be crowded into a 20mm of comparable design. This results in greatly increased blast and fragmentation effect at relatively little cost. Complex systems analyses conducted privately by TRW, and by various interested governments indicate that 25mm represents the optimum caliber for this type of gun when all known factors are considered. It produces the maximum effect on target per pound of weight and dollar of cost.

The TRW 6425 and ammunition is currently being tested by France, Switzerland and Great Britain, and is also under consideration by the U. S. Army. Thus far, it seems to me that it is drawing ahead of competitive designs by a pretty good margin. Of course, nothing less than years of field service and a couple of nasty wars will *really* prove a military weapon design. At the present time, though, the 6425 does look as if it may well be a worthy served us so long and so well.

