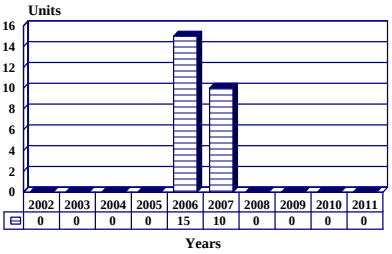
Folgore - Archived 3/2003

Outlook

- Continued minimal production likely to meet an export sale
- Development of further enhanced rounds anticipated
- Graph to the right is for launchers only



Orientation

Description. An anti-armor weapon.

Sponsor. The development and Italian procurement of the Folgore has been sponsored by the Italian Ministry of Defense through the Italian Army.

Contractors. The Folgore was developed and is manufactured by Breda Meccanica Bresciana, Breccia, Italy. Otobreda of La Spezia, Italy, acquired Breda Meccanica during the 1994 reorganization of the Italian defense industry. Officine Galileo and Alenia Difesa (BPD Difesa e Spazio) are the principal subcontractors.

Licensees. None

Status. In January 1986, Folgore was officially adopted by the Italian Army. Serial production to meet the 720-unit order for the Folgore launcher has been completed, but the manufacture of the munitions continues. The launcher is available for new orders.

Total Produced. As of January 2002, a total of 815 Folgore launchers had been manufactured.

Application. A man-portable anti-armor/multipurpose weapon available in both shoulder-fired and tripod-mounted versions.

Price Range. In equivalent 2002 United States dollars, the unit price of the launcher is $4,783. The serial-produced High Explosive Anti-Tank round has a unit price of approximately $116 in a 1,000-unit buy.

Technical Data

Crew. One to actually fire the weapon; normally two personnel comprise a Folgore fire team.

Breech Mechanism. Tilting ring-bolt.

Recoil Mechanism. Recoilless, modified Kromuskit type.

Dimensions. The projectile weight is for the High Explosive Anti-Tank projectile:

	SI units	US units
Total length:	1.85 meters	6.07 feet
Projectile caliber:	80 millimeters	3.15 inches
Total weight (shoulder):	17 kilograms	37.4 pounds

	SI units	US units
Total weight (bipod):	27 kilograms	59.4 pounds
Projectile weight:	5.2 kilograms	11.44 pounds
Cone stand-off:	3.8 calibers	3.8 calibers

Performance. After launch, the solid rocket accelerates the projectile to 500 meters per second (1,640.4 feet per second). The effective range figure is for the shoulder-launched version; the tripod version (with sight) is rated at 1,000 meters (1,093.6 yards). The armor perforation figure is that quoted by the manufacturer; it is somewhat low compared to the figure reached when applying our standardized formula to the Folgore High Explosive Anti-Tank round – 48.51 centimeters (19.10 inches). This disparity is probably due to the design, composition and internal geometry of the cone, as well as the fact that the projectile is slowly spun.

	SI units	US units
Muzzle velocity:	380 meters per second	1276.7 feet per second
Effective range:	500 meters	546.8 yards
Altitude:	line of sight	line of sight
Armor perforation:	45 centimeters	17.71 inches

Ammunition. The High Explosive Anti-Tank round is the only munition available for the Folgore at this time. A total of 1.75 kilograms (3.85 pounds) of explosive is contained in the warhead. The munition is manufactured by Alenia Difesa (BPD Difesa e Spazio). The propellant charge is composed of 1 kilogram (2.2 pounds) of US standard M10 single base explosive. An enhanced anti-armor warhead had been in development for some time, but this effort may have been terminated.

Control & Guidance. After the projectile leaves the barrel of the weapon, six fins spring-out at the rear of the projectile to aerodynamically stabilize it. These fins are canted to impart a moderate spin to enhance accuracy.

Variants/Upgrades

Variants. No variants of the Folgore have been developed, and none are anticipated.

Modernization and Retrofit Overview. This is generally not applicable to this weapon. Minor improvements to the weapon are incorporated as production cut-ins.

Program Review

Background. In the early 1970s, the Italian Army issued a requirement for a new recoilless anti-tank weapon to replace the obsolescent M18A1, a 57 millimeter recoilless rifle. Light weight, simplicity and low price were stressed for the new weapon. In 1974, Breda Meccanica began designing the weapon, working with BPD Difesa e Spazio on the ammunition. The first firing tests were conducted in 1976, and Folgore (Thunderbolt) then went through a rather extended operational and contractor testing period lasting some 10 years. The testing and development were completed in 1987. With the official adoption of Folgore by the Italian Army in January 1986, preparations for serial production were begun, and serial production ran into 1993. The original procurement objective of one thousand launchers was subsequently reduced to 720 launchers.

Description. The Folgore is available in two versions: shoulder-launched and tripod-mounted. The weapon is not a true recoilless rifle, but a recoilless rocket launcher. The Folgore launcher is fabricated from nickel-cobalt steel. The shoulder-launched version is fitted with a bipod, shoulder rest, sight and forward grip. The sight fitted to the shoulder version is essentially a simple optical device of five-power magnification with adjustments for elevation, azimuth and temperature; stadia lines are provided for range estimation. This sight is designated Sistema Ottice di Puntamento Semplificate. The tripod version contains a more sophisticated optronic sight with a coincidence rangefinder, a telescope, and a timing device for computing lead. It is produced by Officine Galileo. This sight, plus the stable mount, allows the effective range to be increased to 1,000 meters.

The barrel and chamber are combined. At the fore end, a flame guard is provided; the trigger is located in the middle of the weapon. The gas discharge nozzle at the rear of the weapon actually allows some recoil, but it is minimal.

Sequence of Operation. The Folgore is very simple to operate. Assembly is especially easy, even in difficult conditions. Although this weapon can be carried and fired by one man, two-man operation is the norm. The weapon is loaded by releasing the nozzle clamp at the rear of the weapon, opening the nozzle and inserting a round. The target is sighted and the trigger pulled. A simple percussion primer method for ignition. One round can be fired every 15 seconds.

After ignition, the projectile is pushed out the barrel and the fins spring out. An inertia-activated pyrotechnic delay is activated, igniting the dual-base rocket propellant. The trajectory is relatively flat, and the projectile reaches 500 meters in 1.28 seconds.

Explosive Reactive Armor. A caveat must be made regarding the Folgore, as well as all other anti-tank weapons using High Explosive Anti-Tank warhead technology to defeat armor: the use of explosive reactive armor on tanks essentially renders High Explosive Anti-Tank warheads on man-portable anti-armor weapons *ineffective* in any possible caliber. Several avenues of High Explosive Anti-Tank warhead technology are currently being explored to address this latest swing in the defensive-offensive weapons see-saw, and an enhanced anti-armor projectile is in development for the Folgore. The warhead technology employed by the Folgore is effective only against conventional (non-explosive reactive) armor.

Funding

The development of the Folgore was funded by the Italian Ministry of Defense

Recent Contracts

Contractual information is not released.

Timetable

Month	Year	Major Development
	1974	Development begun
	1975	Design begun
Early	1976	Prototype fabricated
October	1976	First test firings
	1976-1981	Contractor tests
	1979-1986	Operational tests
June	1987	Initial production order
August	1987	Initial low-rate production begun
Mid	2002	Serial production dormant but available for new orders; development of warhead technology continues

Worldwide Distribution

Export Potential. With the Folgore program, the contractor has obviously been trying to emulate the unprecedented success of the former Forenade Fabriksverken (now Bofors) with its similar Carl Gustaf. However, during the Folgore's lengthy development period, Carl Gustaf and other man-portable systems were reaping healthy sales and locking in customers. Therefore, we believe that the contractor will have its best chance on the export market with a few African and Middle Eastern nations. While no export sales of the Folgore have been announced, we know that negotiations were under way with at least two customers. Libya, Tunisia and other nations that normally buy Italian military products have been the main marketing targets for Folgore.

Countries. **Italy** (815)

Forecast Rationale

The Folgore marketing effort is ongoing and the development of new munitions continues. Contrary to reports from other sources, our research continues to indicate that the serial production of the Folgore launcher has been dormant for some time. The related rocket munitions continue to be manufactured, however.

While the Italian requirement objective was met almost a decade ago, the Folgore continues to be promoted on the export market, especially on a regional basis. Based on this sales effort, at least one small sale on the export market can be expected during the forecast period.

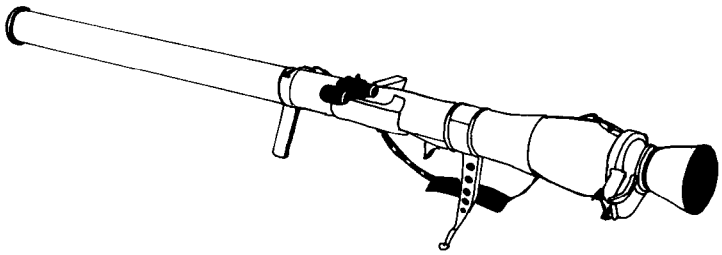
For the Italian requirement, about 250 rounds have been manufactured for each weapon in order to maintain an active inventory of about 190 rounds per weapon plus 35 in reserve and 25 for training needs. The figures in the forecast chart are for launchers only and not for the projectiles.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

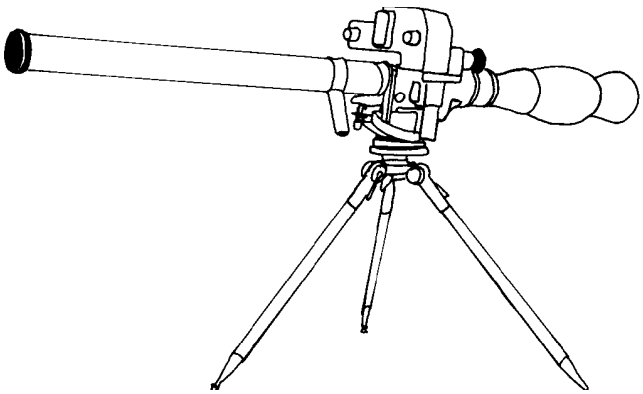
		High Confidence Level				Good Confidence Level			Speculative			
Munition	**through 01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**Total 02-11**
OTOBREDA												
FOLGORE (a)	815	0	0	0	0	15	10	0	0	0	0	25
Total Production	815	0	0	0	0	15	10	0	0	0	0	25

(a) The through 2001 production figure contains 15 developmental, contractor and operational test weapons. The numbers in the forecast chart are for launchers, not the individual rocket munitions.



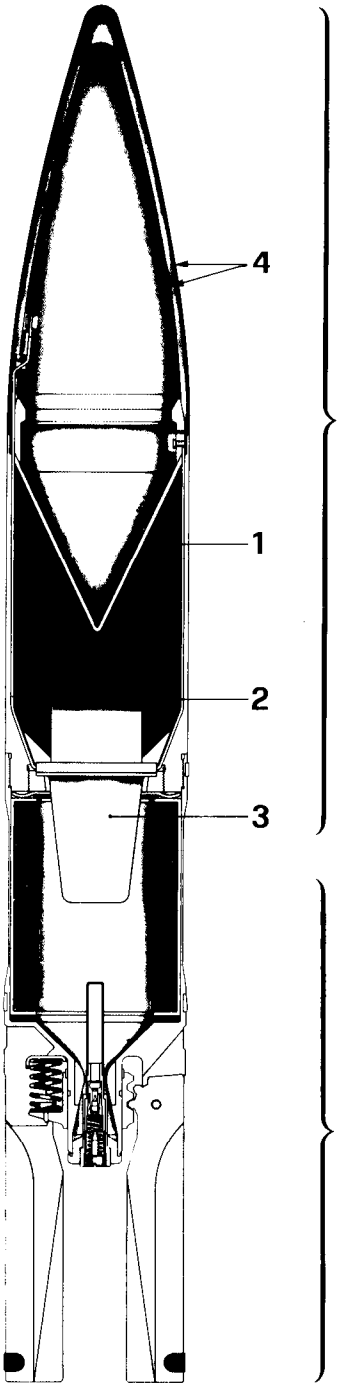
FOLGORE - BIPOD VERSION

Source: Forecast International



FOLGORE - TRIPOD VERSION

Source: Forecast International



THE PROJECTILE

The components of the projectile are:

The WARHEAD, composed of:

- Hollow charge (1); teflon resonator (2) incorporated in explosive, retained by copper liner with walls of uniform thickness obtained by rotary extrusion.
- Fuze (3), power provided by induction coil, with double safety system: first safeguard is released only when the projectile achieves the necessary acceleration, whilst the second authorizes fire only on impact;
- Double nose (4) constituting impact sensor and closing firing circuit.

The PROJECTILE BODY, composed of:

- Cylindrical motor grain (1) with double extruded base, capable of applying to the projectile in flight the increase in velocity necessary to obtain the flattest and shortest time of flight trajectory.
- Motor casing (3); pyrotechnic igniter (4) and aerodynamic stabilization assembly (2). The pyrotechnic igniter is designed to ignite the motor grain at sufficient distance from the muzzle and is inertia operated. The aerodynamic stabilization assembly is composed of six fins, which open simultaneously with the exit of the projectile from the muzzle, and are then positively locked in place. The fins are canted so as to impart to projectiles in flight a predetermined spin, to maximise accuracy.

FOLGORE PROJECTILE

Source: Breda Meccanica