

ARCHIVED REPORT

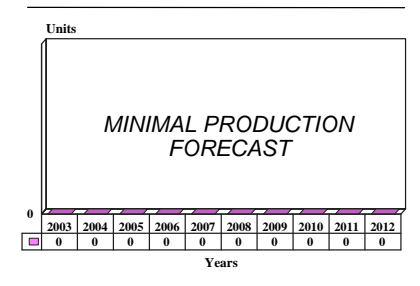
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FIROS 51 and 122 mm Multiple Launch Rocket Systems - Archived 8/2003

Outlook

- Production of FIROS 25 and 30 systems as needed to address domestic and export orders
- FIROS 6 no longer being marketed
- An additional order for FIROS 30 from export market is forecast
- These systems essentially have no modernization or retrofit potential

10 Year Unit Production Forecast
2003 - 2012



Orientation

Description. Wheeled multiple launch rocket systems.

Sponsor. The FIROS multiple launch rocket systems are private development programs funded by the contractor, SNIA BPD Difesa e Spazio, a component of SIMMEL Difesa.

Contractors. These multiple launch rocket systems have been developed and are manufactured by the SNIA BPD Difesa e Spazio component of SIMMEL Difesa, Rome, Italy. Major subcontractors include BAE Systems and IVECO-FIAT Defense Vehicle Division.

Licensees. None

Status. Development of the FIROS 6 has been completed. The system has been produced for and is in service with the Italian Army and one other nation; the system is no longer being marketed. The FIROS 25 and FIROS 30 systems are in production on an as-needed basis and in service with the Italian Army and at least three other nations. The FIROS 70 was in early development, but is now dormant.

Total Produced. As of 2002, 16 FIROS 6 and 146 FIROS 25/30 systems have been manufactured. At the same time, no FIROS 70 systems had yet been manufactured.

Application. A mobile rocket-based fire support system for the destruction of a variety of targets by means of multiple barrages.

Price Range. A complete operational FIROS 6 system with vehicle and 48 rockets was last listed in 1992 at \$312,000 in equivalent United States dollars. The individual high-explosive rocket costs \$5,284 in lots of 470. A complete FIROS 25 or 30 system with the vehicle and 40 rockets is listed at \$787,000 in equivalent 2002 United States dollars. The high-explosive rocket lists for \$8,200 in lots of 500, also in equivalent 2002 United States dollars. No price data is available for the FIROS 70.

Technical Data

FIROS 6

Crew. Two or three, dependent on vehicle.

Launch Vehicle. The FIROS 6 has been mounted on the FIAT 1107AD or Type 6614 armored personnel

carrier and Land Rover's LWB. It can be mounted on most other trucks of the 3/4 ton class.

Training & Elevation Mechanism. Manually operated.

Dimensions. The following data are for the FIROS 6 in its latest production standard. The dimensions are for the rocket with the high-explosive warhead.

	<u>SI units</u>	<u>US units</u>
Launcher		
Tubes:	48	48
Length:	2.08 meters	6.82 feet
Width:	67 centimeters	2.20 feet
Height:	93 centimeters	3.05 feet
Weight:	480 kilograms	1,056 pounds
Rocket		
Length:	105 centimeters	3.45 feet
Diameter:	51 millimeters	2.01 inches
Weight:	4.8 kilograms	10.56 pounds

Performance. The range figure is for the rocket with the conventional warhead.

	<u>SI units</u>	<u>US units</u>
Launcher elevation:	+45 degrees	+45 degrees
Launcher depression:	-5 degrees	-5 degrees
Launcher traverse:	360 degrees	360 degrees
Maximum rocket range:	6,550 meters	7,163.1 yards
Acceleration:	60 g	60 g
Speed:	515 meters per second	1,689.6 feet per second
Rate of fire:	10 rockets per second	10 rockets per second

Propulsion. The solid rocket motor uses an extruded double-base propellant.

centimeters by the manufacturer. All warheads weigh 2.2 kilograms (4.84 pounds).

Warhead. The standard rocket uses a High-Explosive warhead. Also, Anti-Tank/Anti-Personnel, High-Explosive Incendiary, Pre-Formed Fragmentation, Smoke, Illumination, Target Practice, Target Practice/Smoke, and Dummy Warheads are available. According to our standardized formula for High-Explosive Anti-Tank Warheads, the Anti-Tank/Anti-Personnel Warhead has an armor perforation figure of 31.5 centimeters of rolled homogeneous armor. However, the performance of this formula falls off in the smaller diameter warheads, and actual perforation is claimed to be in excess of 25

Launcher Mode. A 48-tube launcher mounted on a variety of light vehicles is used for the FIROS 6 system. Firing is accomplished electrically.

Control & Guidance. Spring-out fins provide a measure of aerodynamic stabilization once the rocket exits the 2 meter launch tube.

Fire Control. The FIROS 6 uses only rudimentary fire control; it is either visually aimed by the launch crew or directions are relayed from a forward observer.

FIROS 25

Crew. Three

Training & Elevation Mechanism. Electrically powered with a manual backup.

Vehicle. The FIROS 25 has been mounted on the IVECO 6x6 truck; other applications, including tracked vehicles, are possible.

Dimensions. The following data are for the FIROS 25 in its latest production standard. The weight of the launcher includes the weight of the rocket fitted with the high-explosive warhead. The dimensions for the rocket are with the high-explosive warhead. The length of the FIROS 25 rocket with the submunition-dispensing warhead is 3.344 meters (10.97 feet), and the weight is 71.35 kilograms (156.97 pounds).

	<u>SI units</u>	<u>US units</u>
Launcher		
Tubes:	40	40
Length:	3.70 meters	12.14 feet
Width:	82 centimeters	2.69 feet
Height:	69 centimeters	2.26 feet
Weight:	1.57 tonnes	1.73 tons
Rocket		
Length:	2.68 meters	8.79 feet
Diameter:	122 millimeters	4.80 inches
Weight:	58.08 kilograms	127.78 pounds

Performance. The range figure is for the rocket with the conventional high-explosive warhead.

	<u>SI units</u>	<u>US units</u>
Launcher elevation:	+60 degrees	+60 degrees
Launcher depression:	0 degrees	0 degrees
Launcher traverse:	105 degrees	105 degrees
Maximum range:	25,000 meters	27,340 yards
Acceleration:	50 g	50 g
Speed:	475 meters per second	1,558.4 feet per second
Rate of fire:	16 rockets in 40 seconds	16 rockets in seconds

FIROS 30

Crew. Three

Training & Elevation Mechanism. Electrically powered with a manual backup.

Vehicle. The FIROS 30 has been mounted on the IVECO 6x6 truck; other applications, including tracked vehicles, are possible.

Dimensions. The following data are for the FIROS 30 in its latest production standard. The weight of the launcher includes the weight of the rocket fitted with the high-explosive warhead. The dimensions for the rocket include the rocket plus the high-explosive warhead. The length of the rocket with the submunition-dispensing warhead is 3.32 meters (10.89 feet); the weight is 71.05 kilograms (156.31 pounds).

	<u>SI units</u>	<u>US units</u>
Launcher		
Tubes:	40	40
Length:	3.70 meters	12.14 feet
Width:	82 centimeters	2.69 feet
Height:	69 centimeters	2.26 feet
Weight:	1.71 tonnes	1.88 tons
Rocket		
Length:	2.82 meters	9.25 feet
Diameter:	122 millimeters	4.80 inches
Weight:	65.03 kilograms	143.07 pounds

Performance. The range figure is for the rocket with the conventional warhead.

	<u>SI units</u>	<u>US units</u>
Launcher depression:	0 degrees	0 degrees
Launcher traverse:	105 degrees	105 degrees
Maximum rocket range:	34,000 meters	37,182 yards
Acceleration:	50 g	50 g
Speed:	475 meters per second	1,558.4 feet per second
Rate of fire:	16 rockets in 40 seconds	16 rockets in 40 seconds

Propulsion. The FIROS 25 uses a double-base, solid-propellant rocket motor providing 2.449 kilonewtons, or 5 tonnes (5.51 tons), thrust; the propellant weighs 22.2 kilograms (48.84 pounds). The FIROS 30 uses a composite base, solid-propellant rocket motor providing 1.470 kilonewtons, or 3 tonnes (3.31 tons), thrust; the propellant weighs 24 kilograms (52.8 pounds).

Warhead. Two families of warheads have been developed for the FIROS 25 and 30 rockets. The conventional warhead options are high explosive, pre-fragmented high explosive, and smoke-white phosphorus. The submunition-dispensing warhead can dispense the following types of mines (the numbers of each are in parentheses): anti-tank mine (6), anti-personnel mine (22), and a dual purpose anti-personnel/anti-materiel bomblet (77).

Launcher Mode. The FIROS 25 and 30 rockets are launched from a 40-round launcher consisting of two 20-round modules. The launch tube is 3.7 meters (12.14 feet) long.

Control & Guidance. Spring-out fins at the rear of the rocket provide aerodynamic stabilization once the rocket leaves the launch tube.

Fire Control. The standard version of the FIROS 25/30 launcher has no associated fire control system; fire control directions are received from a forward observer or some other source. The firing mechanism allows the operator to select the number of rounds fired. A more sophisticated version of the launcher incorporates an inertial navigation system, ballistic computer, and servo control system for the launcher. BAE Systems (formerly Ferranti Defence Systems) provides the PADS Mark 2 position and azimuth determining system that is incorporated into the battery control center. In addition, a BAE Systems (Ferranti) FIN1111 attitude reference instrument is installed in the launch vehicle. This device provides the data required to lay coordinates.

Variants/Upgrades

Variants. None at this time, although the contractor has made a proposal to Singapore regarding a navalized version of the FIROS 30. This system, developed in conjunction with Otobreda, is based on a dedicated naval mount, a version of the stabilized 105 SCALR system. This mount can integrate one or two 20-round modules.

Modernization and Retrofit Overview. As noted below, the Improved FIROS 25/30 enhancements can be retrofitted to existing systems. Other than for this, and for the possibility of enhanced rocket munitions, there is essentially no modernization or retrofit potential for these systems.

Program Review

Background. The Field Rocket System (FIROS) 6 and 25 multiple launch rocket systems are area-saturation weapons developed during the 1970s. The FIROS 30 is an improved version of the FIROS 25 featuring a rocket with a greater range; the FIROS 30 was introduced in 1987. The FIROS 30 rocket is dimensionally the same as the FIROS 25 but has a greater range because it has a more efficient composite base, solid-rocket motor. The system is now generally known as the FIROS 25/30. These weapon systems fire unguided rockets, and range is primarily a function of the elevation at launch, since

the rocket burn time is somewhat variable. Reloading can be accomplished manually or by replacing the complete module of launch tubes.

Description

FIROS 6. The FIROS 6 system was designed to be lightweight for high mobility and operation in rough terrain beyond the reach of conventional artillery. Air transportability was also a prime design criterion. Target destruction is achieved only by barrage-type firing (either salvo or ripple) into a known target area. The FIROS 6 is highly versatile. In addition to the

more general operating concepts for multiple launch rocket systems, FIROS 6 can be used for single-shot and anti-guerrilla missions where high firepower and mobility are required. Ripples of 1, 2, 4, 8, 16, 24, 36, or all 48 rockets can be fired. The crew can operate the system beside the vehicle or at up to 30 meters away via a cable. The system's most salient feature is that it can be mounted on almost any light commercial truck and be reloaded by hand within five minutes.

The rockets are based on the widely used 51 millimeter rockets used on a variety of aircraft-mounted platforms for air-to-ground missions. At least 10 different warheads have been developed for this system. All warheads weigh 2.2 kilograms (4.84 pounds). The system can be supplied already mounted on a vehicle or as a kit.

FIROS 25/30. Basically, this version of the FIROS range of multiple launch rocket systems employs a variety of conventional warheads for the area saturation mission. The FIROS 25/30 system also includes a warhead capable of dispensing submunitions of various types. Testing of this warhead was completed in 1982. Effectiveness is a direct function of barrage-type firing (either salvo or ripple) into a known target array and presupposes organization of the system into several batteries, each with at least two FIROS 25/30 fire units. The FIROS 25/30 is relatively simple to operate in the field and is maintenance free. Initial setup takes less than 10 minutes, provided that the area has been pre-surveyed. The system's most salient feature is that it can be handled by readily available commercial trucks and be reloaded by hand or semi-automatically within seven minutes. Reloading can be accomplished manually or by replacing the complete module of launch tubes. An expendable 40-round module made from glass-reinforced plastic is also available. Although this module is designed to be expendable, it is reloadable if returned to the factory.

A unique and apparently non-accidental marketing feature of the FIROS 25/30 is that the rocket has the same 122.4 millimeter caliber as the widely exported BM-21 system, although the Italian rocket has a 5,000-meter longer range and a 90 percent greater payload capacity. Therefore, SIMMEL Difesa can offer either the rockets or the system to those countries that have "difficulties" with the original supplier of the BM-21. In the past decade or so, such sales have been confirmed along with the needed modification to the launcher, which is described as minor and provided by the contractor.

The FIROS 25/30 is normally deployed in a battery of six truck-mounted launchers, a command post vehicle, and 6 to 12 other support vehicles. The FIROS 25/30

launcher vehicle can also be used singly with the fire control data supplied from some other source.

Improved FIROS 25/30. In April 1985, it was announced that an improved FIROS 25/30 with a greatly enhanced fire control system was available. BAE Systems (then Ferranti Defence Systems) provided the PADS Mark 2 position and azimuth determining system that was incorporated into the battery control center. This gyroscopic inertial sensing platform provides accurate position data that can be transmitted to the individual batteries. This eliminates the need for a time-consuming site survey each time the battery moves. In addition, a Ferranti FIN1111 attitude reference instrument is installed in the launch vehicle. This device provides the data required to lay coordinates.

The enhancements can be fitted to new-production examples of FIROS 25/30 or retrofitted to existing systems. In case of power failure, the features of the original system are retained as a backup.

FIROS 70. In early 1989, the contractor announced that it was developing another member of the FIROS family, the FIROS 70. The FIROS 70 was to be a 315 millimeter rocket with a range of 70 kilometers (43.49 statute miles). The rocket was to be mounted on a twin-rail launcher mounted on a truck. Several warheads were in development for the FIROS 70, including one with terminal guidance. This program was in development until mid-1997; most likely the program went dormant in the late 1990s.

Troubles in Program. In early 1995, one customer of the FIROS 25, the United Arab Emirates, became disenchanted over the performance of the system. While the details of the problems were never released, our investigation indicated that there were rocket motor ignition problems and premature warhead detonations. The customer also expressed displeasure that the contractor was not more helpful in addressing the problems. For its part, BPD Difesa e Spazio stated that the rockets had been improperly stored; high temperatures are the suspected reason for the degraded performance. Negotiations to address the problem between the contractor and customer were undertaken, but the results were never released. The FIROS 25 systems were removed from service in late 1996, and as of mid-2002 are still held in reserve.

Operational Analysis. Despite the hope that some FIROS 25 users would also purchase the smaller FIROS 6 system as a complement, this never came to pass. Also, interest in other (naval) applications never led to any sales, resulting in the demise of the program.

While an export sale of the FIROS 6 was finally made to Mexico, it seems that the international market does not believe that the FIROS 6 is a viable weapon system. Our research indicates that 51 millimeters is perceived as too small a caliber for a multiple launch rocket system. In fact, the generally accepted minimum caliber for a mortar is 60 millimeters. Worldwide, it is

perceived that it is not worth the time and expense to deploy a multiple rocket system with such a minimal level of terminal effects, especially against armored units (the type of target these systems are usually designed for). Essentially, these factors invalidate many of the arguments in favor of FIROS 6.

Funding

Funding for the development of the FIROS 6, 25, and 30 has been provided by the contractor. Funding for the FIROS 70 was also being supplied by the contractor.

Recent Contracts

Not available, as contractual information is not released.

Timetable

This timetable is for the FIROS 6 and the FIROS 25/30 only.

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1976	Development of FIROS 6 and 25 initiated
April	1978	Developmental testing begun
	1980	Operational tests begun
February	1981	All testing completed
October	1981	Ready for production
October	1982	Testing of dispensing warhead completed
February	1983	Ready for production
May	1984	Serial production begun
	1987	FIROS 30 introduced
August	1989	Small production order from Italian Army
January	1990	FIROS 70 announced
	1994	Navalized FIROS 30 system first revealed
Mid	2002	FIROS 25 and 30 available for production; development continues; FIROS 6 no longer being marketed

Worldwide Distribution

Export Potential. Prior to 1994, the only sale of the FIROS 6 had been to the Italian Army; however, several countries had expressed interest in the system, and in 1995 it was learned that Mexico had purchased a few. The contractors stated in their marketing that FIROS 6 provides a more cost-effective and efficient method of fire suppression than mortars or highly vulnerable and expensive helicopters. Among the potential customers that evaluated the system was the United States Marine Corps. However, by 1995, the FIROS 6 was no longer being marketed.

The world interest in multiple launch rocket systems continues to be healthy, but the FIROS 25/30 has yet to generate any real excitement. The best prospects for sales of this system should be countries in North Africa and the Middle East, especially nations that can no longer or do not wish to deal with the United States.

Countries. **Italy** (10 FIROS 6, 20 FIROS 25); **Mexico** (four FIROS 6); **United Arab Emirates** (40 FIROS 25). At least two additional countries in the Middle East (possibly **Syria** or **Libya**) operate the FIROS 25 system. Sales of the 122 millimeter rockets have been reported to **Libya**, **Syria**, and possibly **Egypt**.

Forecast Rationale

Production of all the FIROS systems has been dormant for some years now. The FIROS 6 program is most assuredly dead; there has been no marketing of the system for over a decade. Therefore, no further production is forecast.

So far, the FIROS 25/30 has had little success on the market. But, based on the ongoing marketing effort, we continue to forecast one additional export sale, most likely to North Africa or the Middle East. The Italian Army has not renewed procurement of the FIROS 30, and has instead purchased and fielded the multinational 227 millimeter multiple launch rocket system.

The robust market for multiple launch rocket systems, plus the continued demands for more range and payload capability from such systems, apparently led to the development of the FIROS 70. However, in light of the rapidly changing international situation, which is seeing a tremendous glut of former Eastern bloc/Soviet military equipment (including used but “as new” BM-21 systems), the future of the FIROS program is less than sanguine. Indeed, the evidence indicates that the contractor first slowed, then suspended the development of the FIROS 70.

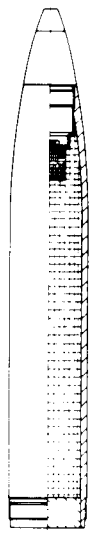
Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

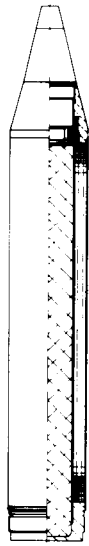
Ordnance	(Engine)	through 02	High Confidence Level				Good Confidence Level			Speculative			Total 02-11	
			03	04	05	06	07	08	09	10	11	12		
SIMMEL DIFESA														
FIROS 25/30 ML ROCKET SYS (a)	DOUBLE BASE SOLID ROCKET	146	0	0	0	0	2	3	1	0	0	0	0	6
FIROS 6 ML ROCKET SYSTEM (b)	DOUBLE BASE SOLID ROCKET	16	0	0	0	0	0	0	0	0	0	0	0	0
Total Production		162	0	0	0	0	2	3	1	0	0	0	0	6

(a) The numbers are for launcher systems, not individual rockets. The through 2001 production includes four developmental and contractor demonstration systems.

(b) The numbers are for launcher systems, not individual rockets. The through 2001 production figure includes two developmental systems.



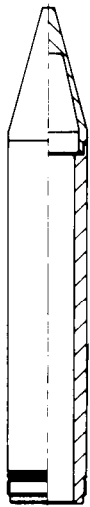
HEI



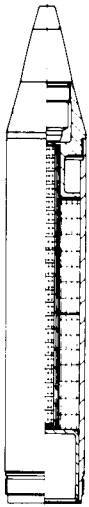
PFF



AT-AP



TP



SP



TP-SM



FIROS 6 ROCKET/WARHEAD CONFIGURATIONS

Source: SNIA BPD Difesa e Spazio