

# ARCHIVED REPORT

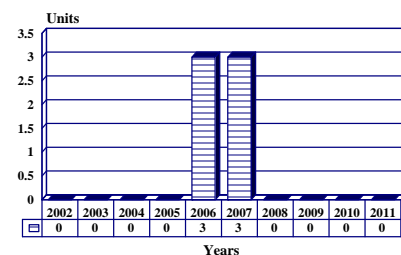
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## Teruel 145 mm Multiple Launch Rocket System - Archived 4/2003

### Outlook

- Minimal additional production forecast
- One additional sale on the export market is expected
- The Teruel system essentially has no modernization or retrofit potential

10 Year Unit Production Forecast  
2002 - 2011



### Orientation

**Description.** A wheeled multiple launch rocket system.

**Sponsor.** The development and Spanish procurement of the Teruel have been sponsored by the Spanish Ministry of Defense, Directorate General for Defense Armament & Materiel and the Committee for Rocket Research and Development through the Spanish Army.

**Contractors.** This system was developed and is manufactured by Santa Barbara SA, Madrid, Spain. In May 2000, it was announced that Santa Barbara was being purchased by General Dynamics; this sale was concluded in early 2002; the company now operates under General Dynamics as Santa Barbara Systemas. Major subcontractors include Pegaso.

**Licensees.** None

**Status.** The Teruel system is in serial production on an as-needed basis; development of the rocket and warhead continues.

**Total Produced.** As of January 1, 2002, a total of 23 Teruel systems had been manufactured.

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

**Price Range.** In equivalent 2002 United States dollars, a complete Teruel system mounted on the Pegaso model 3055 truck has a unit price of \$1,305,000.

### Technical Data

**Crew.** Five: commander, aimer, gunner, driver, and machine gunner.

**Training & Elevation Mechanism.** Hydraulically powered with a manual backup.

**Launch Vehicle.** Pegaso model 3055 6x6 truck; other platform integrations (including tracked vehicles) are possible.

**Dimensions.** The following data are for the latest production standard. The launcher data are estimated, with the weight being for a loaded launcher. The rocket data are for the short Teruel 2 rocket, with data for the longer Teruel 3 rocket in parentheses where different.

	<u>SI units</u>	<u>US units</u>
<b>Launcher</b>		
Tubes:	40	40
Length:	3.47 meters	11.38 feet
Width:	2.37 meters	7.78 feet
Height:	1.47 meters	4.82 feet
Weight:	8.16 tonnes	8.99 tons
<b>Rocket</b>		
Length:	2.04 (3.23) meters	6.69 (10.60) feet
Diameter:	145 millimeters	5.71 inches
Weight:	56 (76) kilograms	123.2 (167.2) pounds

**Performance.** The range figure is for the short Teruel 2 rocket, with the longer Teruel 3 rocket in parentheses where different.

	<u>SI units</u>	<u>US units</u>
Launcher elevation:	55°	55°
Launcher depression:	0°	0°
Launcher traverse:	240°	240°
Maximum range:	18,000 (28,000) meters	19,684.8 (30,620.8) yards
Acceleration:	55 g	55 g
Speed:	687 meters per second	2,253.9 feet per second
Rate of fire:	40 rounds in 45 seconds	40 rounds in 45 seconds

**Propulsion.** The Teruel rockets use a double-base solid rocket motor. The burn time of the motor in the short Teruel 2 rocket is 1.6 seconds; in the longer Teruel 3 rocket, 2.7 seconds.

**Warhead.** Both the Teruel 2 and Teruel 3 rockets can be fitted with three alternative warheads. The high-explosive warhead, containing 6.6 kilograms (14.52 pounds) of composition B explosive, weighs 18.6 kilograms (40.92 pounds). Two submunition-dispensing warheads are also available. The GCP warhead contains 42 anti-personnel submunitions, while the GCC warhead contains 28 high-explosive anti-tank submunitions. Contact, proximity, and timed fuzes are available for use as appropriate.

**Launcher Mode.** The Teruel launcher is composed of two 20-round modules, with each module having five rows of four launch tubes.

**Control & Guidance.** Four wrap-around fins at the rear of the rocket provide aerodynamic stabilization. In addition, various ranges can be achieved using an aerodynamic air-brake system.

**Fire Control.** In the two nations that use the Teruel, fire control is rudimentary. Fire control information is relayed to the Teruel launcher from a forward observer through a central fire control vehicle.

## Variants/Upgrades

**Variants.** As of mid-2002, no variants of the Teruel had been developed and none are expected.

**Modernization and Retrofit Overview.** This is not applicable at this time. Other than for the integration of new rocket munitions, no significant modernization or retrofit is expected over the life of the Teruel system.

## Program Review

**Background.** Following World War II, Spain was one of the few nations outside of the former Soviet Union and its satellites that continued to develop and field multiple launch rocket systems. Then, with the advent in the West of the M270 227 Millimeter Multiple

Launch Rocket System, ASTROS, and several other systems in the last two decades or so, this situation changed. In the 1980s and 1990s, multiple launch rocket systems became a hot item on the market.

In the early 1980s, the Committee for Rocket Research and Development, part of the Defense Ministry, decided to initiate the development of a new multiple launch rocket system to replace the older L21 and other obsolescent systems. The contractor was then-Empresa Nacional Santa Barbara, the largest defense firm in Spain. Subsequently, this firm was reorganized under the name Santa Barbara SA and sold to General Dynamics, where it now operates as a component of the firm under the name Santa Barbara Systemas.

The developmental system was designated Teruel 1; the Teruel 2 became available in 1984 and the improved Teruel 3 shortly thereafter.

**Description.** As rapid cross-country mobility was a major design parameter from the outset, it was decided to mount the system on a wheeled chassis. The Pegaso model 3055 6x6 truck was selected for this purpose. This vehicle is noted for its ruggedness in the most difficult terrain as well as its ease of maintenance. Powered by a model 9220/10 six-cylinder, supercharged diesel engine rated at 164.12 kilowatts (220 horsepower) at 33.34 revolutions per second (2,000 revolutions per minute), the model 3055 entered production in the early 1980s as the standard medium truck for all the Spanish armed services.

The hydraulically operated launcher is mounted at the rear of the chassis, which also carries the five-man crew, communications gear, air conditioning system, and firing controls in the cab, which is protected from small-arms fire and ballistic fragments. Four hydraulically operated stabilizing jacks provide a stationary firing platform to reduce dispersion error. On top of the cab, a single MG-3S 7.62x51 machine gun is mounted for use in local defense.

The launcher consists of two 20-round pods; the pods are reloadable while on the vehicle. Once a rocket is inserted in the launcher, electrical contact with the firing circuit is made automatically. Several safety devices prevent accidental firing. Among these devices

are one to prevent firing while the vehicle is in motion, another to prevent firing while the launcher is being aimed, and a third to prevent firing in the cab danger zone. The system is completely protected from environmental effects, especially moisture.

The Teruel rockets are available in two versions, as described in the **Technical Data** section above. Both rockets use a modern double-base propellant. Burn time is 1.6 seconds in the Teruel 2 and 2.7 seconds in the Teruel 3, giving increased range/payload performance. Three differing trajectories are available by selecting two or four pop-out aerodynamic braking fins, or none. The rockets are supplied as a complete round in an environmentally secure container. Storage life is said to be a minimum of 15 years. A rocket can be handled easily by two people, aiding the task of stacking the rockets in storage facilities.

**Sequence of Operation.** In the Spanish Army, a battery contains six launchers. It takes two minutes to bring a launcher into or out of action. A salvo of 40 rockets can be fired automatically at the rate of one every 0.7 seconds or one-by-one manually as desired. One battery can saturate an area of 20 hectares (50 acres) with the high-explosive rocket; if the GCP anti-personnel rocket is used, the battery can saturate 56 hectares (140 acres). All 40 tubes can be reloaded in five minutes.

For rapid reloading, a specialized supply truck has been developed for the Teruel system. This vehicle, also based on the model 3055 truck, mounts a crane to speed the loading/unloading process and is designed to integrate with the launcher.

**Further Development.** In 1987, it was learned that a further improved Teruel rocket was under development. This new rocket is of the same diameter as the Teruel 2 and 3, but the range has been increased to 30 kilometers (32,808 yards). This new rocket became available for purchase in 1991.

## Funding

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Funding for the development and Spanish procurement of the Teruel has been provided by the Spanish Ministry of Defense through the Committee for Rocket Research and Development and the Spanish Army.

## Recent Contracts

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Not available, as contractual information is not released.

## Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Early	1980s	Development begun
	1984	Teruel 2 available on the market
Mid	2002	Production on an as-needed basis; marketing and further development ongoing

## Worldwide Distribution

**Export Potential.** Despite the fact that the Teruel is one of the more modern and cost-effective multiple launch rocket systems available today, the weapon has yet to have a significant impact on the market. While nowhere near as sophisticated as the Smerch or the multinational M270 system, it still is quite effective and works as advertised. The reasons for its relative lack of performance on the international market are unclear.

Gabon has purchased eight systems, and the purchase of the Teruel has been under negotiation by at least two other nations, one located in the Middle East. The Teruel is expected to have additional but limited impact on the export market, especially the less affluent nations of the Third World. A system of this type offers a tremendous amount of firepower for the price, a point not lost on nations facing threats backed with hardware from the former Soviet Union.

**Countries.** Gabon (8), Spain (14)

## Forecast Rationale

Serial production of this Spanish multiple launch rocket system remains dormant. The lack of a larger domestic procurement is almost certainly due to the fact that Spain has several other major weapons procurement programs pending. However, the Teruel is still being promoted on the export market in several areas of the world, especially the Middle East.

few years, possibly to Morocco, which has expressed interest in the system several times, or to a nation in the Middle East. While there is no indication of a renewed Spanish procurement, a Spanish inventory of 28 systems has long been mentioned. Therefore, we will continue to monitor this program for further developments.

We are now forecasting that the ongoing marketing effort will pay off in another moderate export sale in a

## Ten-Year Outlook

### ESTIMATED CALENDAR YEAR PRODUCTION

Ordnance	(Engine)	through	<u>High Confidence Level</u>			<u>Good Confidence Level</u>			<u>Speculative</u>			Total 02-11	
			01	02	03	04	05	06	07	08	09		10
SANTA BARBARA S.A.													
TERUEL ML ROCKET SYSTEM (a)	DOUBLE BASE SOLID ROCKET	23	0	0	0	0	3	3	0	0	0	0	6
Total Production		23	0	0	0	0	3	3	0	0	0	0	6

(a) The numbers are for systems, not individual rockets. The through 2001 production figure contains one developmental launcher system.