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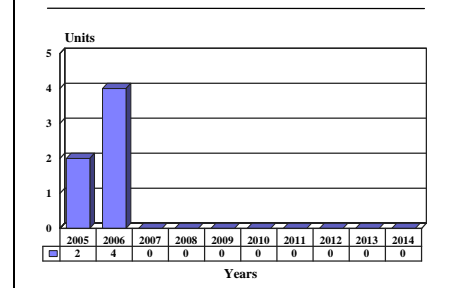
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## Palmara 155mm Self-Propelled Howitzer - Archived 4/2006

### Outlook

- The Palmara production line remains dormant; Oto Melara continues to aggressively promote the Palmara, especially in Africa
- Only minimal retrofit and modernization potential
- Production forecast (at right) reflects anticipated production for potential African procurement in the near-term of the forecast period

10 Year Unit Production Forecast  
2005 - 2014



### Orientation

**Description.** A tracked 155mm self-propelled artillery system.

**Sponsor.** The contractor, Oto Melara SpA, sponsored the development of the Palmara as a private venture.

**Licensees.** None

**Status.** Development through serial production. The Palmara production line is dormant, but available for further orders.

**Total Produced.** Through 2004, Oto Melara produced a total of 262 Palmara systems.

**Application.** Mobile indirect fire artillery support for maneuver forces at the battalion through division levels.

**Price Range.** In 2004 U.S. dollars, the Palmara carries a unit price of \$3.242 million.

### Contractors

Oto Melara SpA, <http://www.otomelara.it>, Via Valdicocchi 15, La Spezia, 19136 Italy, Tel: 39 0187 5811 11, Fax: 39 0187 58266, Email: [info@otomelara.it](mailto:info@otomelara.it), Prime

Alenia Spazio, <http://www.alespazio.it>, Via Giulio Vincenzo Bona 85, Rome, 00156 Italy, Tel: 39 06417231, Fax: 39 064114439, Email: [communications@roma.alespazio.it](mailto:communications@roma.alespazio.it) (Palmara Electronic Components)

Fiat SpA, <http://www.fiatgroup.com>, 250 Via Nizza, Turin, 10126 Italy, Tel: 39 011 686 1111, Fax: 39 011 686 3798 (Palmara Automotive Components)

MTU Motoren- und Turbinen-Union Friedrichshafen, <http://www.mtu-online.com>, Maybachplatz 1, Postfach 2040, Friedrichshafen, 88040 Germany, Tel: 49 7541 903366, Fax: 49 7541 903947 (MT 837 Ka 500 Diesel Engine)

Renk AG, <http://www.renk.newsfactory.de>, Gogginger Strasse 73, Augsburg, 86159 Germany, Tel: 49 821 57 00 0, Fax: 49 821 57 00 460, Email: [info.augsburg@renk.biz](mailto:info.augsburg@renk.biz) (RK 304 Powershift Gearbox)

## Technical Data

Crew. Five

Muzzle Brake. Double baffle.

Recoil System. Hydro-pneumatic; two buffers with one recuperator.

Breech Mechanism. Semi-automatic sliding wedge.

Ammunition. In addition to being compatible with all NATO-standard 155mm ammunition types, the Palmara can fire the following ammunition types, developed by the Simmel firm:

- P3 HE (High Explosive)
- P3 HE LT (High Explosive/Base Bleed)
- P3 HE RAP (High Explosive Rocket Assisted Projectile)
- P4 (Illuminating)
- P5 (Smoke)

Dimensions. The following data reflect the latest production-standard Palmara:

	<u>SI units</u>	<u>U.S. units</u>
Length overall:	11.47 meters	37.63 feet
Width:	3.35 meters	10.99 feet
Height:	2.87 meters	9.42 feet
Combat weight:	46 tonnes	50.71 tons
Fuel capacity:	800 liters	212.77 gallons
Ordnance caliber:	155 millimeters	6.10 inches
Ordnance length:	41 calibers/6.36 meters	41 calibers/20.82 feet

Performance. The automotive performance data reflect use on a paved road. The ordnance range reflects firing the P3 HE non-assisted projectile. The Palmara can achieve an initial burst rate of three rounds in 20 seconds, using the automatic loading system.

	<u>SI units</u>	<u>U.S. units</u>
Maximum speed:	60 kilometers per hour	37.26 miles per hour
Maximum range:	500 kilometers	310.5 statute miles
Step:	1.0 meters	3.28 feet
Trench:	3.0 meters	9.84 feet
Slope:	30%	30%
Gradient:	60%	60%
Fording:	1.2 meters	3.94 feet
Elevation:	+70 degrees	+70 degrees
Depression:	-5 degrees	-5 degrees
Traverse:	360 degrees	360 degrees
Maximum ordnance range:	24.7 kilometers	27,011.9 yards
Maximum rate of fire:	4 rounds per minute	4 rounds per minute
Sustained rate of fire:	1 round per minute	1 round per minute
Muzzle velocity:	817 meters per second	2,680.44 feet per second

Engine. Motoren- und Turbinen-Union MT 837 Ea 500 eight-cylinder, supercharged, liquid-cooled diesel engine. This powerplant generates 550 kilowatts (737.27 horsepower) with a power-to-weight ratio of 11.96 kilowatts per tonne (14.54 horsepower per ton).

As an option, Oto Melara can install the MTU MT 837 Ka 500 engine. This eight-cylinder, supercharged, liquid-cooled diesel powerplant generates 745.7 kilowatts (1,000 horsepower) with a power-to-weight

ratio of 16.21 kilowatts per tonne (19.72 horsepower per ton).

The 24-volt electrical system consists of a nine-kilowatt generator and six 12-volt/300 ampere-hour batteries. The Palmara also carries an unspecified 31-kilowatt (41.55-horsepower) diesel auxiliary power unit for hydraulic and electric power.

**Gearbox.** Renk RK 304 powershift unit, with four forward and two reverse gear ratios. The unit also features a hydraulic torque converter.

**Suspension and Running Gear.** Trailing arm, torsion bar suspension system, with seven double roadwheels and five return rollers on each side of the hull. The first three and last two roadwheel stations feature dual-action hydraulic shock dampers.

**Fire Control.** As the Palmara is an indirect fire system, targeting data originates with the forward observer, passing through a fire direction center command post before reaching the individual Palmara. The fire control suite consists of a dial sight, the PN186 panoramic sight for indirect fires, and a PN170 telescope attached to a Bofors mount for direct fire.

## Variants/Upgrades

**Variants.** The Palmara, like the OTO 76/62 (OTOMATIC) self-propelled anti-aircraft artillery system, uses the chassis and automotive components of the OF 40 tank as its basis.

**TAM/Palmara.** In 1985, Argentina ordered 20 Palmara turrets for integration with Argentina's license-produced TAM tank chassis. However, the Vehiculo de Combate de Artilleria program fell apart in 1986, due to funding problems with the TAM program. Following a partial revival of the TAM program, Argentina proceeded with

the integration of the Palmara turrets (delivered in 1986) with the TAM tank chassis at a slow pace. By mid-1997, Argentina had two prototypes for testing; 10 systems were ready by 1999. The program has not progressed since then, with no further production.

**Modernization and Retrofit Overview.** Not applicable. As the Palmara is still a relatively new system with acceptable components, Oto Melara has not yet developed any significant retrofit and modernization programs.

## Program Review

**Background.** In 1977, Oto Melara began redesigning its 155mm ordnance, incorporating a fume extractor and a longer barrel (from 39 to 41 calibers). Oto Melara then mounted this ordnance on a chassis broadly based on that company's OF 40 tank. Although the Italian Army rejected the Palmara in favor of the Oto Melara-developed M109 variant (the M109L), the Palmara has proven to be a moderately successful export product.

**Description.** The Palmara shares the basic interior layout of the OF 40 tank. The driver sits in the right-front of the hull. The driver's station features a single-piece hatch cover and three periscopes; the center periscope is interchangeable with a night vision device. The turret mounts at the center of the hull; the engine compartment occupies the rear of the hull.

In the turret, the commander sits to the right of the ordnance. The commander's cupola features eight periscopes for 360° observation; this station has no sighting equipment for the 155mm ordnance. The commander's cupola provides access to a pintle-mounted 7.62x51mm NATO (.308 Winchester) machine gun or 12.7x99mm (.50 caliber) machine gun on the turret roof. Each side of the turret mounts four electrically operated 76mm smoke grenade launchers.

The 12.5-tonne (13.77 ton) welded aluminum turret is hydraulically controlled in traverse. An auxiliary power unit provides electrical and hydraulic power for ordnance elevation/depression and turret traverse when the main engine is not running. All major functions feature manually-operated backup systems. The gunner's station features a PN186 panoramic sight and a PN170 direct aiming sight for gun laying (aiming).

The turret features a crew access/ammunition reloading door on each side and two external storage racks mounted at the rear. The Palmara employs an automatic projectile loading system, mounted at the rear of the turret. The automatic loader holds 23 rounds, with seven more stored in the hull. The crew must load propellant charges manually.

The standard power plant has less power than in the basic OF 40 main battle tank; as mobility is less important in a self-propelled artillery system, this is not a significant issue. Customers can order a higher-rated powerplant, if desired (see **Technical Data**, above). An automatic firefighting system, crew intercommunication suite, and bilge pumps are standard equipment. The vehicle floor features an emergency escape hatch.

## Funding

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Oto Melara funded the Palmara as a private venture.

## Recent Contracts

Not available, as contractual information is not released.

## Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1977	Development begins
March	1981	Oto Melara completes turret development
July	1981	Turret-hull integration; firing trials
November	1981	Low-rate production begins
March	1985	Argentina orders turrets
Late	1986	Argentinian turret deliveries
	2005	Production line dormant, available for new orders; marketing continues

## Worldwide Distribution

**Export Potential.** The Palmara features an efficient loading system and a simple, user-friendly fire control suite. The resulting high rate of fire, combined with a unit price at the low end of the international 155mm self-propelled artillery market, makes the Palmara an attractive option for less affluent nations seeking new-production self-propelled artillery systems. Libya placed the first export order; Nigeria followed suit in May 1982. Despite these advantages, the Palmara suffers from the present glut in the international market, where large numbers of used artillery systems are available at bargain-basement prices.

**Countries.** **Libya** (210); **Nigeria** (50). In addition, **Argentina** has the 20 Palmara turrets purchased for integration with the TAM tank chassis.

## Forecast Rationale

The Palmara 155mm self-propelled howitzer production line remains dormant; Oto Melara continues to promote this weapon system's effectiveness and low unit cost in comparison with U.S. and other European designs. African nations in particular are the prime target for this "more bang for the buck" marketing strategy.

Nevertheless, the ongoing glut of self-propelled artillery systems on the international market continues to hurt the prospects for Palmara export sales. Further, given the relative youth of the system, opportunities for modernization and retrofit business are likewise limited.

Our ten-year production outlook (below) reflects the Forecast International Weapons Group assessment that Oto Melara may still secure at least one export order for the Palmara in the near-term of the forecast period. At least one African nation is reportedly considering an order of up to 10 Palmara self-propelled howitzers.

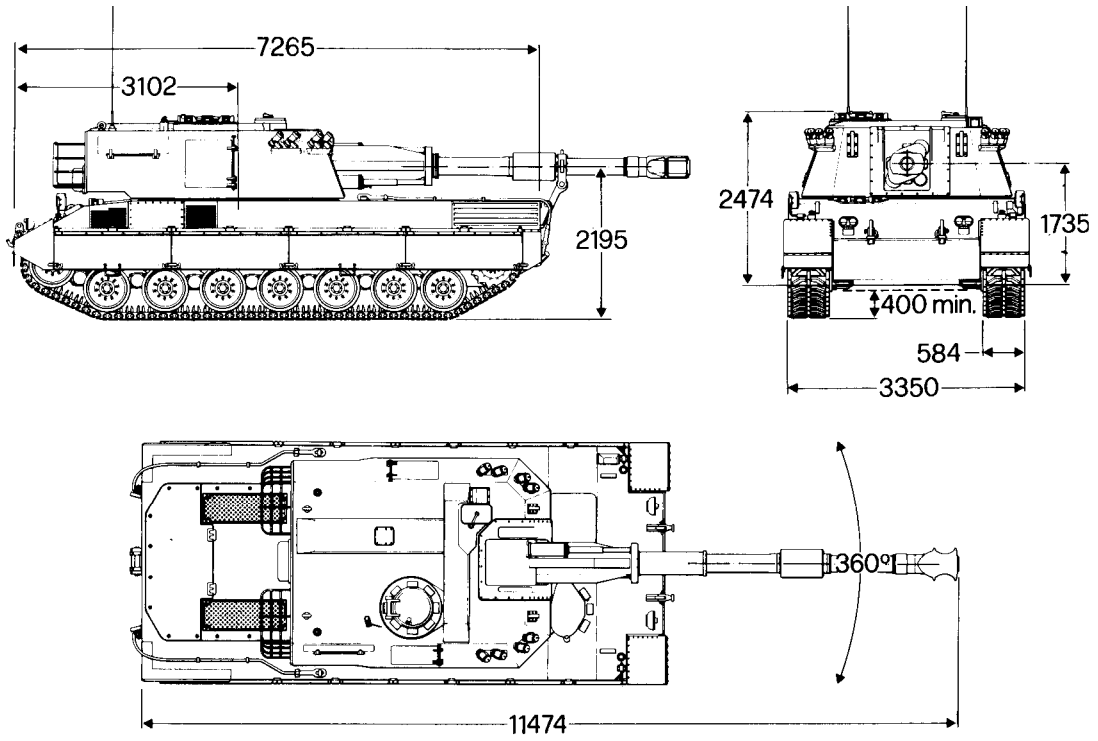
However, if no further export sales materialize by the mid-term of the forecast period, we will consider this program to be effectively dead; we will then archive the Palmara report. In the meantime, we will continue to monitor the Palmara program for any developments.

## Ten-Year Outlook

### ESTIMATED CALENDAR YEAR PRODUCTION

<u>Ordnance</u>	<u>(Engine)</u>	thru 04	<u>High Confidence Level</u>			<u>Good Confidence Level</u>			<u>Speculative</u>			<u>Total 05-14</u>	
			05	06	07	08	09	10	11	12	13		14
OTO MELARA SPA													
PALMARA (a)	MB 837 EA	262	2	4	0	0	0	0	0	0	0	0	6
Total Production		262	2	4	0	0	0	0	0	0	0	0	6

(a) The through 2004 production includes two prototypes. In addition, Oto Melara delivered twenty Palmara turrets to Argentina, for integration with the TAM tank chassis.



Palmara 155mm Self-Propelled Howitzer

Source: Oto Melara SpA