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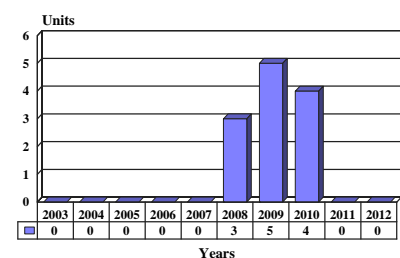
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155 TR F1 155 mm Howitzer - Archived 5/2004

Outlook

- Production of the 155 TR F1 is dormant but available for new orders
- Marketing continues
- Any additional production forecast to be very limited and for export
- Potential for 52 caliber cannon retrofit

10 Year Unit Production Forecast
2003 - 2012



Orientation

Description. A towed 155 millimeter artillery system.

Sponsor. The development and French procurement of the 155 TR F1 have been sponsored by the French Ministry of Defense/Délégation Générale pour l'Armement, Direction des Armements Terrestres through the Direction Centrale du Matériel de l'Armée de Terre.

Contractor. This artillery system was developed and manufactured and is marketed by Giat Industries, Weapons and Ammunition Division, Versailles-Satory, France. The piece is manufactured at Etablissement d'Etudes et de Fabrications d'Armement de Bourges.

Licensees. None

Status. The 155 TR F1 production line went dormant in July of 1993 following the completion of production for the French requirement. The line remains available for new-production orders and the marketing effort continues. The development of the 52 caliber version is complete.

Total Produced. As of January 1, 2003, a total of 148 155 TR F1 pieces had been manufactured.

Application. Fire support for the field army at the battalion and division levels.

Price Range. In equivalent 2003 United States dollars, the 155 millimeter 155 TR F1 has a \$546,000 unit price.

Technical Data

Crew. Eight

Muzzle Brake. Double-baffle.

Recoil System. Hydropneumatic

Breech Mechanism. Horizontal sliding wedge.

Carriage Type. Split trail.

Shield. None

Ammunition. The 155 TR F1 piece is chambered for separate-bagged ammunition in the following types: OE 155F1 (High Explosive); OE 155 56/59 (High Explosive); OFUM 155 F1A (White Phosphorous); OFUM 155 F2A (White Phosphorous); OX 155 56/59 (Target Practice); OX 155 F1 (Target Practice); OECL 155 F1 (Illumination); OMI 155 H1 (Submunition Dispensing/Anti-Tank); OE DTC 155 H2 (High Explosive-Reduced Drag); OE PAD 155 H3 (High Explosive-Rocket Assisted Projectile). This piece can

fire all NATO standard 155 millimeter ammunition as well as all patterns of Extended Range Full Bore projectiles. The 155 TR F1 is also compatible with the BONUS submunition dispensing projectile.

Dimensions. The following data are for the latest production standard. The traveling length (with the barrel over the trails) is 8.75 meters (28.71 feet).

	<u>SI units</u>	<u>US units</u>
Caliber:	155 millimeters	6.10 inches
Length overall:	10.0 meters	32.81 feet
Barrel length:	40 calibers/6.2 meters	40 calibers/20.34 feet
Traveling width:	3.09 meters	10.14 feet
Firing width:	8.39 meters	27.53 feet
Traveling height:	1.79 meters	5.87 feet
Firing height:	1.65 meters	5.41 feet
Traveling weight:	10.77 tonnes	11.87 tons
Firing weight:	10.75 tonnes	11.85 tons

Performance. The range figure is with an assisted projectile. The 155 millimeter 155 TR F1 is normally towed by a TRM 10000 6x6 truck at a maximum speed of 80 kilometers per hour (49.7 miles per hour).

	<u>SI units</u>	<u>US units</u>
Elevation:	+66°	+66°
Depression:	-6°	-6°
Traverse:	27° left/38° right	27° left/38° right
Maximum range:	33,000 meters	36,089.2 yards
Maximum rate of fire:	6 rounds per minute	6 rounds per minute
Sustained rate of fire:	2 rounds per minute	2 rounds per minute

The barrel life is 3,000 equivalent full charges.

Auxiliary Propulsion Unit. A 29.09 kilowatt (39 horsepower) spark ignition engine of unspecified manufacture is mounted on the front of the carriage. This engine drives three hydraulic pumps, one for each roadwheel and one for the ordnance training and elevation functions.

Variants/Upgrades

Variants. No specific variants of the 155 TR F1 have been developed. However, the new 52 caliber version of this cannon and associated components have been integrated with the Mercedes-Benz U 2450 L truck chassis. This integration, called CAESAR, was done by SOFRAME (formerly Lohr Industrie) in conjunction with Giat Industries. One developmental prototype has been fabricated and is under extended test by the contractors. This prototype has also been demonstrated in the Middle East and in Malaysia. (The CAESAR program, now in production, is covered in Tab A of this book.)

An export model, with a modified chamber and an elevation to 70 degrees, has been developed.

Modernization and Retrofit Overview. The 155 TR F1 system has been integrated with 45 and (beginning in 1989) 52 caliber ordnances, the latter complying with the Quadrilateral Ballistics Agreement. With the growing worldwide trend obviously toward the 52 caliber cannon, the work on the 45 caliber version has been in limbo for some years now. The integration of the 52 caliber cannon yields a range of 30 kilometers with unassisted projectiles and 41 kilometers (44,837.6 yards) firing Extended Range Full Bore/Base Bleed projectiles. While the 52 caliber version of the 155 TR F1 is available as a new-production item, the majority of the potential lies with retrofitting this longer cannon to existing pieces.

Program Review

Background. The 155 TR F1 (Le Cannon de 155 millimeter Tracte) was shown for the first time at the 1979 Satory weapons fair. This weapon was originally intended to replace all 155 millimeter OB 155-50 (Model 50) towed howitzers in French service through the 1980s.

Two different models were developed by Giat Industries. These underwent extensive contractor and service trials prior to a 1983 production decision. The 155 TR F1 artillery piece has characteristics similar in both concept and description to the FH 155-1 and FH-77 towed howitzers.

Description. The double-baffle muzzle brake-equipped barrel, when traveling, is swung 180 degrees and secured in position over the trails. The barrel is quite similar to the self-propelled AU-F1, but the 155 TR F1 has a horizontal sliding breech. The auxiliary power unit is mounted on the carriage and drives three hydraulic pumps, one for each of the two roadwheels and one for gun elevation and training functions. A crew of eight is required for the towing vehicle and ordnance. Six are normally required to actually load and fire the piece, but in an emergency, three men can bring the piece into action.

Above the carriage is the saddle that carries the elevating mechanism and the gunlayer's seat. The ordnance, which is almost identical with that used in the AU-F1 self-propelled howitzer (see separate report in Tab A), is mounted in a ring cradle, with the recoil cylinders mounted around it. The firing lock uses electric primers, and the primer-loading device is automatic. Hinged to the right of the cradle is a loading tray and hydraulic rammer; the shell is placed on the tray and rammed while the bag charge is loaded manually.

This piece is compatible with any NATO or French pattern 155 millimeter ammunition currently in use, as well as Extended Range Full Bore projectiles. The new

standard high-explosive projectiles are thin-walled, hollow base shells containing (in the OE 155 F1) 8.83 kilograms (19.5 pounds) of a 50 percent mixture of RDX/TNT or 100 percent TNT high explosive. Smoke and illuminating projectiles have also been developed. The Thomson-DASA Armements firm (formerly Thomson-Brandt) has developed a rocket-assisted projectile for the 155 TR F1; however, future French plans for the deployment and use of these projectiles are still in doubt, as some believe that the range increase does not warrant the loss of payload and accuracy that results from the increased dispersion inherent in such projectiles. The 155 TR F1 is also compatible with the BONUS submunition dispensing projectile. Several other new 155 millimeter projectiles are currently in development in France.

The design of this weapon incorporates a number of emergency systems to allow continued operation in case of damage. Emergency hydraulic system components allow an additional six rounds to be fired if the auxiliary power unit stops. Also, a malfunctioning gun's hydraulic system can be connected to an operational gun's system so both pieces can be operated from one piece's power. Various emergency manual systems allow for continued gun elevation and traverse. An export model, with a modified chamber and an elevation to 70 degrees, has been developed.

Funding

Funding for the development and French procurement of the 155 TR F1 was provided by the French Ministry of Defense through the French Army.

Recent Contracts

Not available, as contractual information is not released.

Timetable

This timetable relates to the 155 TR F1 only and not to the AU-F1.

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1976	French Army issued staff requirement
	1977	Design conceived
	1978	155 TR F1 unveiled
February	1979	First prototype tested
	1980	Two preproduction prototypes fabricated
	1981-1982	Initial testing and evaluation
December	1987	Six preproduction systems delivered for operational evaluations
	1989	Development of 52 caliber version begins
July	1989	Serial production begins
February	1990	First deliveries made
May	1990	155 TR F1 designated field operational
July	1993	Production line goes dormant
Early	2003	Awaiting new-production orders; marketing and development continues

Worldwide Distribution

Export Potential. France continues to have a difficult time marketing the 155 TR F1 on the export market; the market is glutted with both new and used towed artillery systems. Some used pieces can be picked up at extremely low prices. Also, the 155 TR F1, at least in the standard 40 caliber version, cannot measure up to the 45 caliber/Extended Range Full Bore performance of the GC-45/FGH-155, GHN-45, G5, or any other new artillery system using this technology. And the new 52 caliber standard barrel is now being offered by an increasing number of players. While these systems did not represent a significant marketing threat in the past, the steadily expanding number of new systems with this technology is greatly enhancing the marketability of the technology. One of the major prospective 155 TR F1 customers, Norway, postponed its procurement decision in 1985. This did not bode well for the program, as Norway was one of the more affluent prospective customers. Also, the loss of the lucrative Indian contract in 1986 was a blow to this program; here, the 155 TR F1 lost out to the FH-77B.

France has established markets for its field artillery in Lebanon, Tunisia, Switzerland, the Middle East, and some of its former colonies. The 155 TR F1 has probably been offered to these clients, and an export model, with a modified chamber and an increased elevation to 70 degrees, has been developed. This is the model that was evaluated by Norway, where licensed production had also been discussed.

Only two export sales of the 155 TR F1 have been made: one to Cyprus and one to Saudi Arabia.

Countries. **Cyprus** (12), **France** (105), **Saudi Arabia** (28).

Forecast Rationale

The 155 TR F1 is still being marketed, albeit with the emphasis on the 52 caliber version that is increasingly the standard for any 155 millimeter artillery.

While no additional procurement is forecast for France, the fact is that some nations will purchase or otherwise

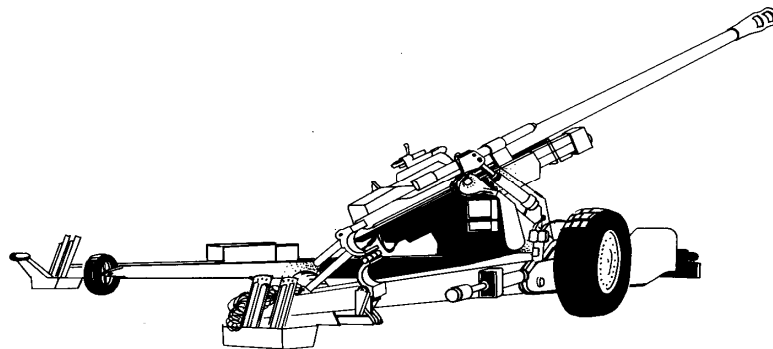
receive only French military hardware. Therefore, the evidence supports a moderate export sale of the 155 TR F1 later in the forecast period. Around the same time, France is expected to upgrade its inventory to the 52 caliber standard.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

Ordnance	(Engine)	High Confidence Level				Good Confidence Level				Speculative				Total 03-12
		through 02	03	04	05	06	07	08	09	10	11	12		
GIAT INDUSTRIES														
TR 155 (a)	NO ENGINE	148	0	0	0	0	0	3	5	4	0	0	12	
Total Production		148	0	0	0	0	0	3	5	4	0	0	12	

(a) The through 2002 production includes three prototype/developmental pieces of the basic weapon, one of the 45 caliber version, and one of the 52 caliber version.



155 TR F1 155 mm TOWED HOWITZER

Source: Forecast International