

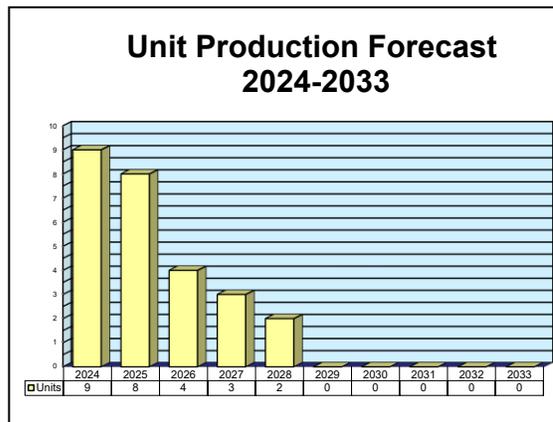
ARCHIVED REPORT

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ASTROS Multiple Launch Rocket Systems

Outlook

- Production forecast reflects Brazilian Army procurement and export of ASTROS II series systems, as well as potential for some ASTROS III and ASTROS II Mk 6 sales
- Production forecast is conservative given a limited history of sales
- A possible acquisition of the system manufacturer makes production forecast largely speculative



Orientation

Description. The ASTROS (Artillery Saturation Rocket System) multiple launch rocket system (MLRS) is a wheeled multiple rocket launcher of Brazilian origin.

Sponsor. Avibras Indústria Aeroespacial sponsors the ASTROS program as a private venture.

Licensees. None.

Status. In service. Development through serial production.

Total Produced. Through 2023, Forecast International estimates the contractor produced 313 ASTROS II and 26 ASTROS III systems.

Application. A mobile MLRS fire support system optimized for the destruction of area targets.

Price Range. In 2023 U.S. dollars, a complete ASTROS II launcher with 32 rockets reportedly maintains a unit price of \$1.401 million. The basic ASTROS III launcher with 84 rockets costs \$1.627 million.

A complete ASTROS 2020/ASTROS II Mk 6 battery package – consisting of 18 launchers, with all associated support vehicles and components – currently carries a unit price of \$175 million.

Contractors

Prime

Avibras Industria Aeroespacial SA	Avda Brigadeiro Faria Lima 3305, Parque Martim Cerere, San Jose dos Campos, Sp, Brazil, Tel: + 55 12 3955 6000, Fax: + 55 12 3951 6277, Email: gspd@avibras.com.br , Prime
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Subcontractor

Daimler AG	http://www.daimler.com , Mercedesstrasse 137, Stuttgart, Germany, Tel: + 49 711 17 0, Fax: + 49 711 1722 244, Email: dialog@daimler.com (ASTROS Automotive Components)
Tectran, Tecnicos em Transporte Ltda	http://www.systra.com.br , Rua Pirapetinga 322, sala 504, Bairro Serra, Belo Horizonte, Brazil, Tel: + 55 31 3045 1418, Fax: + 55 31 3045 1445, Email: tectran@tectran.com.br (ASTROS Vehicle Chassis)

ASTROS Multiple Launch Rocket Systems

Technical Data

Crew. Five: commander, aimer, gunner, driver, and assistant.

Vehicle. Tectran 6x6 truck.

Traverse & Elevation Mechanism. Hydraulic power, with manual backup.

Dimensions. The following data reflect the basic ASTROS II SS-30 launcher configuration. The rocket dimensional data reflect the SS-30/SS-40/SS-60 rockets.

	<u>SI Units</u>	<u>U.S. Units</u>
Launcher		
Tubes	32	32
Length	4.27 m	14.01 ft
Width	2.37 m	7.78 ft
Height	1.15 m	3.77 ft
Weight	7.06 tonnes	7.78 tons
Rocket		
Length	3.9/4.2/5.6 m	12.79/13.78/18.37 ft
Diameter	127/180/300 mm	5.00/7.09/11.81 in
Weight	68/152/595 kg	127.6/334.4/1,309 lb

Performance. The rocket performance data reflect the SS-30/SS-40/SS-60 rockets.

	<u>SI Units</u>	<u>U.S. Units</u>
Launcher elevation	55°	55°
Launcher depression	0°	0°
Launcher traverse	240°	240°
Maximum range	33,000/39,000/70,000 m	36,088/42,650/76,552 yd
Acceleration	55 g	55 g
Speed	611 mps	2,004.6 fps

In 1995, the contractor introduced the SS-80 rocket for coastal defense application as well as for conventional fires. The SS-80 features a lighter series of warheads (see below) and a solid rocket motor with an improved design, yielding a maximum range of 80,000 meters (87,488 yd). The SS-80 weighs 595 kilograms (1,309 lb).

Propulsion. The SS-30, SS-40, SS-60, and SS-80 rockets feature double-base, solid-fuel rocket motors of unknown designation and thrust ratings.

Warhead. The SS-30 rocket mounts a standard high-explosive (HE) warhead; the SS-40 and SS-60 can mount HE warheads or anti-personnel/anti-armor submunition warheads. The contractor also developed an anti-airfield submunition-dispensing warhead featuring heavy submunitions that can perforate 40 centimeters (1.31 ft) of reinforced concrete.

Launcher Mode. The SS-30, SS-40, SS-60, and SS-80 rockets can launch from 32-, 16-, and 4-round launcher configurations.

Control & Guidance. Unguided. Four wraparound fins at the rear of the rocket provide in-flight stabilization.

Fire Control. The fire control vehicle features the indigenous EDT-FILA fire control suite.

The Unimog-based fire control vehicle, designated Veiculo de Comando e Controle, can control up to three batteries of six launchers each (18 launchers total). The contractor also offers a radar-based fire control system mounted on a second vehicle as an option.

ASTROS Multiple Launch Rocket Systems

Variants/Upgrades

Variants. The ASTROS multiple launch rocket system is currently available in three configurations:

ASTROS II. The basic two-pod modular launcher, which is mounted on a Tectran 6x6 vehicle.

ASTROS 2020. A variant of the ASTROS II, which is capable of firing 190 rockets in 16 seconds. It can fire SS-30, SS-40, and SS-60 rockets. The export version carries the designation ASTROS II Mk 6.

ASTROS III. A variant of the ASTROS II, which features two larger capacity modular launcher pods. ASTROS III launchers can carry and fire up to 84 rockets, compared with the 32-rocket capacity of the ASTROS II.

Modernization and Retrofit Overview. Other than for new rocket munitions, this is not currently applicable.



ASTROS II Live Fire

Source: Brazilian Army

Program Review

Background. Avibras Indústria Aeroespacial SA emerged as an important force in Brazil's penetration of the international market. In 1979, Avibras began private development of the ASTROS multiple launch rocket system specifically for the export market.

A Mature MLRS Design

Prior to developing the ASTROS, Avibras had been supplying X-20 and X-40 rockets to the Brazilian Army for the XLF-40 launcher. They were mounted on a modified X1A1/X1A2 tank. The contractor applied its ASTROS I designation to the Avibras 108-R, a 16-tube towed system firing 108mm rockets. The Brazilian Army procured the ASTROS I – designating the rocket FGT108-RA1 – and the trailer-mounted X2A1 launcher. The ASTROS II, which is mounted on a Tectran 6x6 vehicle, represents the maturation of the ASTROS design.

Description. The complete system features a common launcher that can accept various rocket pods, according to mission requirements. The modular launcher design facilitates easy maintenance.

Modular, Pod-Based Launcher

The common launcher can mount two 16-, 8-, or 2-round pods; the pods are reloadable while on the vehicle. As a rocket enters the launch tube, it makes

electrical contact with the firing circuit. The ASTROS features three primary safeties to prevent accidental firing:

- One safety prevents firing while the vehicle is in motion.
- A second safety prevents firing until the aiming sequence is complete.
- A third safety prevents firing into the armored cab danger zone.

The system completely protects the firing mechanism from environmental effects, especially moisture.

Rugged Platform

The 10-tonne (11.02-ton) Tectran 6x6 vehicle exhibits an especially rugged design that maximizes the use of standard DaimlerChrysler commercial components to simplify maintenance. The ASTROS resupply vehicle, which is based on the same Tectran chassis, features a hydraulically operated crane. The battery-level fire control vehicle (the Light Armored Vehicle) features the EDT-FILA fire control suite on the ubiquitous Unimog truck chassis. The new specialized fire control vehicle (the Veiculo de Comando e Controle) also features the EDT-FILA fire control system, as well as additional communications equipment. A single VCC can control up to three batteries (18 launchers).

ASTROS Multiple Launch Rocket Systems

Multiple Rocket Options

The ASTROS II rockets are available in two basic versions, both of which employ modern, double-base solid propellant. The SS-30 can only mount an HE warhead; the SS-40 and SS-60 can mount either HE or submunition-dispensing warheads. The newer SS-80, while optimized for the anti-ship mission, can also mount lighter versions of the standard HE and submunition-dispensing warheads. The contractor supplies each rocket as a complete round in an environmentally secure container. Maximum storage life of the rocket (according to the contractor) is 15 years.

The contractor had reportedly planned to develop three new rockets for the ASTROS application:

- The SS-150, with four rockets in one pod; available for orders.
- The FOG-MPM, featuring fiber-optic link guidance; in development.
- The MTC-300 tactical cruise missile.

The contractor marketed the standard ASTROS II (with the SS-80 rocket) as a coastal defense system. In 1995, the contractor delivered two batteries (12 launchers) to the Brazilian Army specifically for this requirement.

ASTROS III

In April 2002, Avibras announced the manufacture and testing of two prototype ASTROS III systems. The ASTROS III launcher mounts on a Tectran 8x8 truck.

The 8x8 vehicle reportedly features DaimlerChrysler commercial components. Its diesel engine reportedly generates 476 kilowatts (638 hp). Like the ASTROS II, the ASTROS III features an armored cab at the front and the powered common launcher mount on the rear chassis.

The ASTROS III common launcher mounts 84 SS-30 rockets, compared with the 32 of the ASTROS II system. Otherwise, it is essentially the same launcher as featured on the ASTROS II. The ASTROS III became available for orders in 2003, albeit without any export sales to date.

ASTROS 2020 for Brazil

On August 26, 2011, the Brazilian Ministry of Defense (MoD) awarded Avibras an initial contract worth \$28 million to commence development of the ASTROS 2020. This system is an improved, all-digital version of the ASTROS II that is compatible with the AV-TM cruise missile. This variant is capable of firing 190 rockets in 16 seconds. The six-year ASTROS 2020 program carried a potential value of \$659 million.

In June 2012, the Brazilian MoD awarded Avibras a procurement contract worth \$525 million for three ASTROS 2020 batteries (54 launchers). In April 2014, Avibras reportedly delivered the first three ASTROS 2020 launchers to the Brazilian Marine Corps.

In June 2014, the Brazilian Army inducted its first batch of nine system vehicles — six standard multiple launchers, one recovery vehicle, one command-and-control firing station, and one meteorological station. The Brazilian Army planned to receive a total of 50 ASTROS 2020 launcher vehicles by 2018. Brazil had reportedly also planned to export the system to the Middle East and Southeast Asia.

Avibras delivered the third batch of ASTROS vehicles to the Brazilian Army in September 2018.

ASTROS II Mk 6 for Indonesia

In November 2012, the Indonesian Ministry of Defense awarded Avibras a procurement contract worth an estimated \$350 million for two ASTROS II Mk 6 batteries (36 launchers).

In June 2020, 27 Astros II Mk 6 rocket launchers and associated ammunition were delivered to the Indonesian Army.

ASTROS Future Uncertain

According to an Avibras statement from April 2024, the ASTROS manufacturer was in talks with Australian defense company DefendTex regarding the acquisition of Avibras. The two companies are reportedly in advanced talks to facilitate a potential investment aimed at the economic and financial recovery of Avibras, in order to keep its manufacturing units in Brazil, resume operations as soon as possible, and maintain the supply stipulated in contracts with the Brazilian government and other clients. Avibras did not disclose the value of the potential sale.

Funding

Avibras Indústria Aeroespacial SA funds the ASTROS program as a private venture, with some support from the Brazilian Ministry of Defense.

ASTROS Multiple Launch Rocket Systems

Contracts/Orders & Options

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Worldwide Distribution/Inventories

Countries. Brazil (55 ASTROS II; 26 ASTROS III; 77 ASTROS 2020); Indonesia (36 ASTROS II Mk 6); Iraq (60); Malaysia (24); Qatar (four); and Saudi Arabia (60).

Export Potential. The ASTROS II acquired a proven combat record with Iraqi forces during the Iran-Iraq War (1980-1988) and with Saudi Arabian forces during Operation Desert Storm (1991). However, this combat record has only translated into limited sales. Although Iraq originally ordered up to 560 ASTROS II systems, Operation Desert Storm curtailed deliveries after only 60 systems.

Sales of the more modern ASTROS III and ASTROS 2020 will depend on the continuity of Avibras.

Forecast Rationale

The ASTROS multiple launch rocket system is a wheeled multiple rocket launcher of Brazilian origin. Despite the system's proven combat record, the ASTROS launcher has only received limited sales. Modern variants, the ASTROS III and ASTROS 2020, could generate new sales. However, this is unlikely given that the ASTROS series simply cannot compete with comparable systems on the international market.

Moreover, the future production of the system is largely uncertain as the manufacturer — Avibras Indústria Aeroespacial — has incurred significant amounts of debt and is in talks to be acquired by Australia's DefendTex.

Understanding this, Forecast International predicts a conservative, albeit speculative, production future for the ASTROS system.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program	High Confidence					Good Confidence			Speculative			Total
	Thru 2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	
Avibras Industria Aeroespacial SA												
ASTROS (Artillery Saturation Rocket System) II												
	130	6	5	4	3	2	0	0	0	0	0	20
ASTROS (Artillery Saturation Rocket System) III												
	26	3	3	0	0	0	0	0	0	0	0	6
Subtotal	156	9	8	4	3	2	0	0	0	0	0	26
Total	156	9	8	4	3	2	0	0	0	0	0	26