

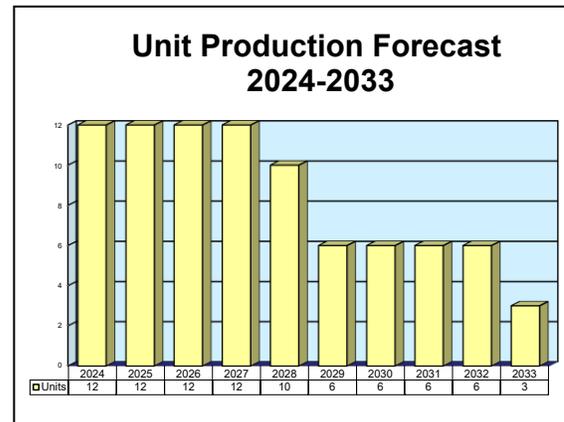
ARCHIVED REPORT

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Raad-1 122mm and Raad-2 155mm Self-Propelled Howitzers

Outlook

- Iran has reportedly been standardizing its self-propelled artillery assets based on the Raad-1 and Raad-2
- Export potential is minimal, at best
- Forecast reflects Raad-1 and Raad-2 serial production for Iran's domestic requirements



Orientation

Description. Tracked 122mm and 155mm self-propelled artillery systems.

Sponsor. The Iran Ministry of Defense, Defense Industries Organization (DIO), sponsors the development and procurement of these systems.

Licensees. None.

Status. Development through serial production.

Total Produced. Through 2023, we estimate the DIO produced 250 Raad-1 and 390 Raad-2 self-propelled artillery systems.

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

Price Range. In 2024 U.S. dollars, the estimated unit price of the Raad-1 is \$1.23 million; the Raad-2 carries an estimated unit price of \$1.41 million.

Both estimates reflect Iranian procurement and bear little relationship to prices on the international market.

Contractors

Prime

Iran Defense Industries Organization (DIO)

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Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 75 Glen Road, Suite 302, Sandy Hook, CT 06482, USA; rich.pettibone@forecast1.com

Raad-1 122mm and Raad-2 155mm Self-Propelled Howitzers

Technical Data

122mm Raad-1

Note: *Technical data concerning the Raad-1 and Raad-2 remain fragmentary. The information in this report reflects the Forecast International Weapons Group's latest assessment of the Raad programs, based on a variety of sources.*

Crew. Four: commander, gunner, loader, and driver.

Muzzle Brake. Double-baffle.

Recoil System. Hydropneumatic.

Dimensions. The following technical data reflect the production-standard Raad-1; height is to the top of the turret roof.

	<u>SI Units</u>	<u>U.S. Units</u>
Length overall	6.50 m	21.32 ft
Width	2.67 m	8.76 ft
Height	3.00 m	9.84 ft
Combat weight	17.5 tonnes	19.29 tons
Ordnance caliber	122 mm	4.81 in
Ordnance length	39 cal/6.05 m	39 cal/19.83 ft

Performance. The automotive performance data reflect use on a paved road. The ordnance performance data reflect the basic 122mm HM51 (Russian 2A31) ordnance firing non-assisted high-explosive ammunition. The vehicle carries a total of 35 122mm projectiles and charges.

	<u>SI Units</u>	<u>U.S. Units</u>
Maximum speed	65 km/h	40.39 mph
Maximum range	400 km	248.56 stat mi
Step	80 cm	2.62 ft
Trench	2.30 m	7.54 ft
Slope	40%	40%
Gradient	60%	60%
Fording	Amphibious	Amphibious
Elevation	+72 deg	+72 deg
Depression	-3 deg	-3 deg
Traverse	360 deg	360 deg
Maximum ordnance range	15,200 m	16,622.72 yd
Maximum rate of fire	5 rounds/m	5 rounds/m

Engine. Unidentified eight-cylinder air-cooled diesel engine. The powerplant reportedly generates 235 kilowatts (315 hp), with a power-to-weight ratio of 13.4 kilowatts per tonne (16.3 hp/ton).

Gearbox. Manually operated gearbox, with five forward and two reverse gears.

Breech Mechanism. Vertically sliding breech block.

Ammunition. The Raad-1 is compatible with all types of Russian-pattern 122mm munitions.

Armor. Steel alloy armor, with a maximum thickness of 17 millimeters (0.67 in). The Raad-1 may also mount Iranian-developed explosive reactive armor (ERA) to the hull and turret.

Suspension and Running Gear. Torsion-bar suspension system, with six rubber-tired roadwheels and an undetermined number of return rollers on each side. The drive sprocket mounts to the front of the hull.

Fire Control. Data currently unavailable.

155mm Raad-2

Crew. Five: commander, gunner, two loaders, and driver.

Muzzle Brake. Double-baffle.

Recoil System. Hydropneumatic.

Breech Mechanism. Interrupted screw, stepped-thread breech block.

Ammunition. The Raad-2 is compatible with all NATO-standard 155mm munitions.

Armor. Same as Raad-1, with a maximum thickness of 20 millimeters (0.79 in). The Raad-2 may also mount Iranian-developed ERA to the hull and turret.

Raad-1 122mm and Raad-2 155mm Self-Propelled Howitzers

Dimensions. The following technical data reflect the production-standard Raad-2; height is to the top of the turret roof.

	<u>SI Units</u>	<u>U.S. Units</u>
Length overall	9.14 m	29.98 ft
Width	3.38 m	11.09 ft
Height	2.60 m	8.53 ft
Combat weight	36 tonnes	39.7 tons
Ordnance caliber	155mm	6.10 in
Ordnance length	39 cal/6.05 m	39 cal/19.83 ft

Performance. The automotive performance data reflect use on a paved road. The ordnance performance data reflect the basic 155mm M185 ordnance firing non-assisted ammunition. The ordnance can achieve a range of 24 kilometers (26,246.4 yd) firing base bleed projectiles. The vehicle carries a total of 30 155mm projectiles and charges.

	<u>SI Units</u>	<u>U.S. Units</u>
Maximum speed	65 km/h	40.39 mph
Maximum range	450 km	279.63 stat mi
Step	80 cm	2.62 ft
Trench	2.40 m	7.87 ft
Slope	40%	40%
Gradient	60%	60%
Fording	1.20 m	3.94 ft
Elevation	+75 deg	+75 deg
Depression	-3 deg	-3 deg
Traverse	360 deg	360 deg
Maximum ordnance range	18,100 m	19,794.2 yd
Maximum rate of fire	4 rounds/m	4 rounds/m

Engine. Russian-pattern V-84MS diesel engine. This powerplant generates 626.4 kilowatts (840 hp), with a power-to-weight ratio of 17.4 kilowatts per tonne (21.16 hp/ton).

The Raad-2 can also mount the Russian-pattern 5TDF liquid-cooled diesel engine. This powerplant generates 522 kilowatts (700 hp), with a power-to-weight ratio of 14.5 kilowatts per tonne (17.63 hp/ton) in the Raad-2M application.

Gearbox. SPAT 1200 automatic gearbox, with one reverse and seven forward gears.

Suspension and Running Gear. Same as Raad-1, with the addition of hydraulic shock absorbers and a live-track system.

Fire Control. Data currently unavailable.

Variants/Upgrades

Variants. The only known variant is the Raad-2M, which employs the 5TDF powerplant (see **Technical Data**). Other than the powerplant, this vehicle is a standard Raad-2.

Modernization and Retrofit Overview. Not applicable at this time.

Program Review

Background. Ever since the fall of the Shah in 1979, Iran has been striving to develop its indigenous defense industry. This all-encompassing effort has included heavy armor and self-propelled artillery.

technology. Although rumors first surfaced concerning the Raad-1 and Raad-2 programs in the early 1990s, Iran did not publicly reveal these systems until November 1997.

The Defense Industries Organization (DIO), through the Armor Industries Group, began developing indigenous self-propelled artillery designs in the late 1980s. To facilitate this program, the Iranians relied on foreign

Description. The Raad-1 and Raad-2 self-propelled howitzers both exhibit a heavy reliance on foreign self-propelled howitzer designs and technology.

Raad-1 122mm and Raad-2 155mm Self-Propelled Howitzers

Raad-1: Iran's 2S1. The Raad-1 system reflects a strong design basis in the Russian SO-122 (2S1) self-propelled howitzer and its 122mm 2A31 ordnance. Our research indicates that Iran maintains 58 2S1 systems in its inventory. Like the 2S1, the Raad-1 exhibits a conventional layout. The driver sits to the left-front of the hull (which is essentially that of the Iranian Boragh armored personnel carrier); the powerplant and gearbox mount in the right-front. The driver's station features a single-piece hatch cover and three periscopes; the middle periscope is interchangeable with a passive night vision device.

The power-operated turret mounts on the rear of the vehicle. The commander and gunner sit to the left of the ordnance, while the loader sits to the right. The commander's powered cupola can traverse through 360 degrees. The cupola provides access to a pintle-mounted machine gun, possibly a 12.7x99mm (.50 cal) M2HB, on the turret roof. The loader's station also features a single-piece roof-hatch cover. The Hadid HM51 ordnance features 360-degree traverse, with elevation from -3 degrees to +72 degrees. While a front-mounted trim vane suggests an amphibious

capability, our research indicates that a fording capability is more likely.

Raad-2: Iran's M109. The Raad-2 was probably the first of the two systems to actually complete development and enter fielding. In terms of layout and general design features, the Raad-2 appears to be essentially a copy of the ubiquitous 155mm M109 series self-propelled howitzer. (For a detailed discussion of the M109, see the "M109 155mm Self-Propelled Howitzer" report in this service.) The Raad-2 incorporates technologies from a number of other vehicles, such as its powerplant and gearbox. The Raad-2 has the same secondary armament, as well as turret traverse and elevation, as the Raad-1. The Raad-2 also features a nuclear, biological, and chemical (NBC) protective suite.

Iran's Rebuilding Effort

The Raad-1 and Raad-2 self-propelled artillery systems are key components of Iran's military rebuilding efforts, born of the Iran-Iraq War (1980-1988). Iran is rapidly gaining on the learning curve with these systems, and production is slowly but steadily ramping up. Both systems are currently in service with the Iranian Army.

Funding

The Iran Ministry of Defense funds the development and procurement of the Raad-1 and Raad-2 self-propelled artillery systems.

Worldwide Distribution/Inventories

Export Potential. Minimal. Iran's status in the international community, combined with the already glutted international market for self-propelled artillery systems, will be a major handicap to the export potential of the Raad-1 and Raad-2.

Country. Iran (250 Raad-1; 390 Raad-2).

Forecast Rationale

Serial production of the 122mm Raad-1 and 155mm Raad-2 self-propelled howitzers is ongoing for domestic procurement by the Iranian Army.

The Raad-2 reportedly led the Raad-1 in development and entry into serial production. The Iranian Army apparently places greater priority on the development and production of the heavier 155mm Raad-2 ordnance than on its 122mm counterpart.

The only significant modernization and retrofit potential for the Raad systems involves the integration of an upgraded 45-caliber barrel onto the Raad-2.

Doubtful Export Prospects

As a result of Iran's status in the international community and the saturated state of the world market for self-propelled artillery systems, we do not forecast significant export sales of the Raad-1 or Raad-2. Even bargain-basement prices are unlikely to spur substantial market interest in these systems.

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Production to Standardize Inventory

The Forecast International Weapons Group anticipates that over the course of the next decade, sustained serial production of the Raad-1 and Raad-2 will allow Iran to

completely standardize its self-propelled artillery force by replacing its disparate collection of nearly 300 weapons systems – ranging from 122mm to 203mm pieces – with the new-production Raad systems.

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	
Iran Defense Industries Organization (DIO)												
Raad -1 <> Iran												
	250	5	5	5	5	3	3	3	3	3	3	38
Raad -2 <> Iran												
	390	7	7	7	7	7	3	3	3	3	0	47
Subtotal	640	12	12	12	12	10	6	6	6	6	3	85
Total	640	12	12	12	12	10	6	6	6	6	3	85