

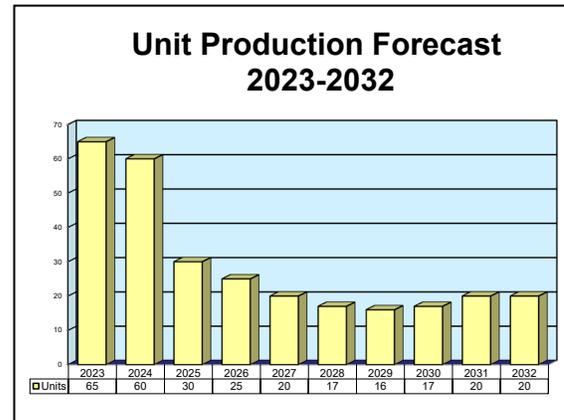
ARCHIVED REPORT

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Shtora-1

Outlook

- Variants of the Shtora missile countermeasures system have been produced for application on T-90, T-84, and T-72 main battle tanks
- Shtora is also installed on BMP-3 and upgraded BMP-2 vehicles for Kuwait and United Arab Emirates
- Ongoing Shtora production expected for T-90s and Russian BMD vehicles



Orientation

Description. The Shtora-1 is an electronic countermeasures system used to break or confuse inbound anti-tank guided missiles (ATGMs) or laser designation systems.

Sponsor

Ministry of Defense of the Russian Federation
 Main Automotive & Armored Material Directorate
 Russia

Status. In production and service.

Application. The Shtora-1 system is known to be deployed on Russian T-90, T-84, and T-72 series main battle tanks (MBTs).

Price Range. The overall cost of a Shtora-1 system has not been released. However, based on a review of the prices of the comparable systems, a median price of \$500,000 per system can be estimated (2022 dollars).

Contractors

Prime

<p>Electromashina</p>	<p>http://electromashina.com.ua/, 21, Mashinostroitelei, Chelyabinsk, Russian Federation, Tel: + 7 7351 255 22 33, Fax: + 7 7351 255 22 35, Email: inbox@electromashina.ru, Prime</p>
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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

Shtora-1**Technical Data**

	<u>Metric</u>	<u>U.S.</u>
Dimensions		
Electro-optical jammer	280 x 350 x 350 mm	11 x 13.78 x 13.78 in
Power supply	280 x 350 x 120 mm	11 x 13.78 x 4.72 in
Control panel	100 x 70 x 50 mm	4 x 2.75 x 2 in
Weight		
Electro-optical jammer	≤ 30 kg	≤ 66 lb
Power supply	≤ 15 kg	≤ 33 lb
Control panel	≤ 0.3 kg	≤ 0.66 lb
Performance		
Spectral range	0.4-14 or 0.7-2.5 μm	
Radiation sector	2 ±0.5 deg	
Electro-optical station radiation sector		
Vertical	4 deg	
Horizontal one-module design	20 deg	
Horizontal two-module design	40 deg	
Search field-of-view		
Horizontal	360 deg	
Elevation	-5 to +25 deg	
Direction-finding accuracy	1.7-1.9 deg	
Number of launchers	12	
Warm-up time	< 3 sec	
Effective duration	approx. 20 sec	
Maximum continuous operation	6 hr	
Maximum life (TShU1-7 only)	1,000 hr	
Radiation source life	50 hr	
Mean time between failures (MTBF)	250 hr	
Power supply	27 V DC	
Power consumption	2.2 kW	

Design Features. The Shtora-1 system was developed to protect an armored vehicle from attack by semi-autonomous line-of-sight and laser-guided ATGMs and artillery projectiles. This protection is accomplished via a combination of infrared (IR) jamming, smoke, laser warning, and slew-to-cue to allow firing down the laser track.

The system includes electro-optical (EO) jammers, millimeter-wave radar (MMWR), laser warning receivers, and grenade dischargers.

The EO jammers, designated TShU1-7, consist of two box-like structures composed of a circular IR port surrounded by cooling fins. The jammers are usually mounted on either side of the main gun, but it is also possible to mount one unit near the main gun and the other on the turret back. Additionally, the manufacturer claims that the system can be used as an IR illuminator or target designator.

The MMWR, which is mounted on the rear deck of the turret, is used to detect inbound missiles and aid in directing the EO jammers.

The laser warning system consists of four laser warning receivers, usually mounted to the turret, that cover a 90-degree arc per receiver. The grenade dischargers are mounted on the turret sides.

Methods of Operation

Laser-Directed ATGMs. When the tank is illuminated by a targeting laser, the laser warning receivers detect the transmission. The computer then begins to automatically slew the turret and lay the gun on the laser's point of origin.

Smoke is simultaneously discharged from the launchers to blur the tank's IR signature and diffract the targeting laser.

Wire-Guided ATGMs. An inbound wire-guided system is detected via the multiband, multimode radio assembly. The onboard processors can determine whether or not a missile is headed for a particular tank.

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Once it has been determined that a missile will hit the tank, the EO jamming pods begin to blanket the missile with IR emissions to take advantage of the specific

weakness of SACLOS (semi-automatic command to line-of-sight) missiles such as the Dragon, TOW, HOT, and MILAN, as well as the AT-3 Sagger series.

Variants/Upgrades

Shtora-2. While there is not much information available through open sources on this variant, which was apparently introduced around August 2002, it is believed that the system will most likely be installed on new-production T-90, T-84, and T-74 tanks.

Program Review

Shtora-1 was tested in the mid- to late 1980s and became operational between 1989 and 1992. The first confirmed application of the Shtora-1 system was on the T-90 tank, which entered service in the Russian Army in 1993.

Since then, the Shtora-1 system has been seen on Russian T-80U (standard) and T-80UK (command) tanks as well as on Ukrainian T-84s. The system is currently available on the open market and most likely could be fitted to any type of tank in a nation's inventory.

India Enters Picture as First Export Customer

In May 1999, the Indian Army began receiving its first complement of 255 T-90 main battle tanks, all fitted with Shtora-1.

Rosoboronexport, the Russian state trade organization and sponsor of electronic defense equipment, transformed itself in 2000 into a more efficient and proactive agency. Export sales of major platforms from Russia in the next year remained solid, providing fertile ground for future procurement of electronic support systems.

The Russian enterprise Uralvagonzavod announced in July 2001 that it had completed the prototype of its latest upgrade of the T-72 MBT. The new tank would be aggressively marketed for export to potentially 30 countries already in possession of the earlier versions of the tank. One of the upgraded vehicle's most proudly touted components was the Shtora-1.

In summer 2002, Russia began shipping 40 upgraded T-90 tanks to India as part of a newly increased order for 310 Russian-made tanks. (Options included in the contract could increase the total to 400 units.) The new tanks were also equipped with Shtora-1.

Reports of an updated system, Shtora-2, began to surface in 2002; however, little is known about the nature of the enhancement.

In April 2003, Shtora was ordered as part of an upgrade for 120 BMP-3 vehicles for Kuwait and 415 BMP-3s for the United Arab Emirates.

Since the early 2000s, India, through its purchases of the T-90 tank, has emerged as one of the biggest Shtora clients. In July 2006, the Indian Army awarded Heavy Vehicles Factory Avadi a contract worth \$2.5 billion for the procurement of 1,000 license-built T-90 main battle tanks.

In September 2011, Algeria signed a contract with Rosoboronexport for 120 T-90s, which were delivered in March 2012.

Russia announced in February 2012 that it would provide 120 additional T-90 tanks to the Algerian Army, all of which would include the Shtora system.

In August 2013, Azeri President Ilham Aliyev announced that Russia had provided Azerbaijan with \$4 billion worth of military and technical assistance. Under contracts dating back to 2011-2012, Russia provided Azerbaijan with \$1 billion in military equipment. The shipments included 94 T-90 tanks, among many other types of Russian-made vehicles and military hardware.

In 2014, Algeria signed a contract with Rosoboronexport for the licensed assembly of around 200 Shtora-equipped T-90 tanks. According to *Moscow Defence Brief*, the deal was worth around \$1 billion.

In July 2017, Iraq signed an agreement for T-90 tanks. According to Russian presidential aide Vladimir Kozhin, "A significant contract for a large batch" of T-90s was inked. Manufacturer Uralvagonzavod's annual report suggested that 73 tanks were delivered.

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In September 2017, Russia began testing a newly modernized version of its T-80 tank, according to the chief of the main armored directorate of the Russian Defense Ministry. Meanwhile, a T-90M variant, unveiled earlier that year, is intended to replace aging T-90 models. The upgraded tanks feature Relikt explosive reactive armor and the Shtora-1 missile countermeasures system.

In December 2018, the Russian Defense Ministry announced the extensive upgrade of roughly 600 BMD-2 second-generation vehicles, equipping them

with "new weapons and digital reconnaissance and control systems."

In August 2019, Russia announced that extensive upgrades to the BMD-2 were well underway, with the vehicles receiving the sensor-equipped "Bereg" combat module.

In March 2022, Russia invaded Ukraine, an event that in its early weeks featured multiple news reports of devastating Russian tank losses due to defender missile attacks.



Russian Army T-90 Tank with Turret-Mounted Shtora System

Source: Russian Army

Worldwide Distribution/Inventories

The Shtora system is known to be employed on **Russian** T-90, T-80UK (command variant), and upgraded T-72 tanks. It is believed that the majority of the Russian T-80s and **Ukrainian** T-84s have been fitted with Shtora-1. Russian-made tanks for **India**, **Kuwait**, and the **United Arab Emirates** are also believed to have been equipped with the system. **Algeria** has license-produced Shtora-equipped T-90 tanks since 2009. **Azerbaijan** acquired Shtora-equipped T-90s in 2013. **Iraq** signed an agreement to acquire T-90s in 2017.

Forecast Rationale

In the wake of Russia's invasion of Ukraine in March 2022, there is strong evidence that missile countermeasures systems, which include Shtora, may have failed to live up to expectations, and for all the world to see in video images of Russian tanks being blown to smithereens by missile attacks. Nonetheless, more tanks will likely be made to replace the hundreds lost in the war, and their associated sensor and

countermeasure systems – at least for Russia's newer tanks – will follow suit.

The Shtora missile countermeasures system has been produced for several military vehicle types, including widely distributed T-90, T-84, and T-72 main battle tanks. Production is not limited to main battle tanks, as Shtora has been incorporated into BMP-3 vehicles for Kuwait and the United Arab Emirates.

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vehicles receiving the sensor-equipped "Bereg" combat module.

Estimated total production in the Ten-Year Outlook below is based on expected Russian and export production for T-90 tanks and BMD-2 vehicles as projected by Forecast International's Weapons Group.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program	High Confidence				Good Confidence			Speculative			Total	
	Thru 2022	2023	2024	2025	2026	2027	2028	2029	2030	2031		2032
Electromashina												
SHTORA-1 <> Army												
Note: Worldwide												
	1,342	45	40	15	15	8	7	6	7	8	10	161
SHTORA-1 <> Russian Federation <> Army <> T-90												
	2,389	20	20	15	10	12	10	10	10	12	10	129
Subtotal	3,731	65	60	30	25	20	17	16	17	20	20	290
Total	3,731	65	60	30	25	20	17	16	17	20	20	290