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## Tor M2U: New Russian Air Defense System Enters Service

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7/25/2016



This month Russia's new anti-aircraft missiles defense systems Tor-M2U have been deployed to Eastern Military District (the Republic of Buryatia, Siberia) after successful live-fire exercises at the Kapustin Yar range in the Astrakhan region.

The Eastern Military District said previously that the latest Tor-M2U systems will replace the Osa-AK air defense systems.

The Ground Forces' Air Defense Force chief Alexander Leonov had said that Russian army will receive two new air defense systems Tor-M2U before the end of the year.

This year Tor M2U took part in the Victory Day parade on the Red Square (May 9).

The Tor missile system (NATO reporting name – SA-15 «Gauntlet») is an all-weather low to medium altitude, short-range surface-to-air missile system designed for engaging airplanes, helicopters, cruise missiles, precision guided munitions, unmanned aerial vehicles and short-range ballistic threats (anti-munitions). It was also the first air defence system in the world designed from the start to shoot down precision guided weapons like the AGM-86 ALCM day and night, in bad weather and jamming situation. Tor can detect targets while on the move.

The air defense system was created to protect important administrative, economic, and military facilities from strikes of antiradar and cruise missiles, remotely piloted aircraft, glide-bombs, airplanes and helicopters.

With the crew of three people, the Tor-M2U system's 12 ground-to-air missiles can hit targets flying at speeds up to 700 meters per second at a distance of 12 kilometers (7.4 miles) and an altitude of 10 kilometers (6.2 miles). The system is able to hit four targets simultaneously. It can also hit targets on the move. The air defense system's possibility to maintain ceaseless fire as it is moving makes the Tor-M2U the best in its class.

Kill probabilities are amazing:

- 0.92-0.95 against aircraft;
- 0.80-0.96 against helicopters;
- 0.60-0.90 against cruise missiles (with an effective range of around 5km/3 miles);
- 0.70-0.90 against precision munitions;
- 0.90 against UAVs.

The reaction time (from target detection to engagement) is 8 seconds, however, it can be somewhat longer (around 10 seconds) whilst in motion and firing in short halts. To facilitate this mode of operation, an auxiliary power unit (APU) is fitted so that the main engine can be shut down while the radar and missile system continue to operate when stationary, enabling long periods of readiness. Target threat classification is automatic and the system can be operated with little operator input. The high performance computing system combined with a passive electronically scanned array radar are the main reasons for the system's high degree of accuracy, ability to intercept small, fast and highly maneuverable targets, and the very fast reaction times of the system.

The Transporter-Launcher and Radar (TLAR) features a turret with a top mounted target acquisition radar, and frontal tracking radar, with 16 ready to fire missiles stored vertically between the two radars. The new 9M338 missile has been developed by Almaz Antey offering a smaller size. It enables the modified Tor-M2 to be equipped with 16 missiles as opposed to the original 8 (with the 9M330 version of the missiles).

The target acquisition radar is a 3D F band pulse doppler radar, equipped with a truncated parabolic antenna. It features a 32-degree sector view, and has an average power output of 1.5 kW, which provides a maximum detection range of 25 km/16 mi.

The target engagement radar is a G band/H band (later K band) pulse doppler radar with a passive electronically scanned array antenna. Classed as a thinned array (design using fewer elements), it incorporates only 570 phase shifters and uses linear polarization. The radar has an average power output of 0.6 kW. It detects aircraft at a range of 25-27 km, helicopters at a range of 12 km and UAVs at a range of 9-15 km. Tracking range is about 20 km. System can search for targets while on the move. Tor can also detect and intercept anti-radiation missiles.

The anti-aircraft missile system is based on a 9A331 (GM-5955) tracked combat vehicle, which can travel at a road speed of approximately 65 km/h for a range of 500 km. One single chassis contains all the system's components. Typically, a battery of four Tor vehicles is accompanied by mobile command centers (Ranzhir-M/Polyana-D4), which provides automatic interaction with other air defense systems, integrating them into a whole. The combat vehicle provides simultaneous detection of up to 48 targets.

The Almaz Antey state-owned company is working on a navalized version.

The Russian armed forces are receiving a new air defense system that is capable of striking targets with astounding precision on the move. The Tor-M2U is another confirmation of the fact that today Russia is an unequalled world leader in the development and production of anti-aircraft missiles.