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## Russian Super Jet Su-35S Battle-Tested in Syria

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On March 26, Syrian government forces have re-captured the ancient city of Palmyra from the Islamic State (IS) terrorist group. This is a milestone victory on the way of routing the terrorists. A big chunk of Syria territory is to be repainted on the map.

The Syrian Armed Forces and their allies have been steadily advancing in the Palmyra (Tadmur) countryside thanks in large part to the Russian Air Force's relentless bombardment of IS positions that were considered impregnable 6 months ago.

Russian airstrikes were an important factor to contribute to the victory. This is the time the Russian brand new generation Su-35S, deployed to Syria in early February, took part in a combat action to display the unique capabilities of the aircraft (the «S» indicates the production model, which incorporates the latest features and modifications). Experts believe that the transfer of Su-35 to Syria solves several issues, including the protection of attack aircraft of the Russian Aerospace Forces from many threats, ensuring the necessary tests of the plane in combat conditions, as well as increasing the level of training of personnel and increased demand for fighter aircraft from foreign customers. Based on the results of combat tests of the aircraft, it may well form the basis for many technical solutions for aircraft of the fifth generation, tests of which are in the home stretch.

The *National Interest* reported that US defense officials were quite impressed with this the aircraft's performance. It cited a senior US military official with extensive experience on fifth-generation fighters as saying *«It's a great airplane and very dangerous, especially if they make a lot of them. I think even an AESA [active electronically scanned array-radar equipped F-15C] Eagle and [the Boeing F/A-18E/F] Super Hornet would both have their hands full»*.

German magazine Stern stated that the Su-35S can be considered the world's deadliest fighter jet other than the fifth-generation US F-22.

According to Stern, the Su-35 is significantly superior to its competitors, combining the best features of the fourth generation fighter and the basic features and properties of a fifth generation warplane.

The Washington Post writes that the Su-35S will add significantly to Russia's ability to protect its aircraft in any area of the Middle East in light of Turkey's downing of a Russian bomber in Syria in November 2015. *«The deployment also sends a message to Turkey that, in combination with the S-400 anti-aircraft missile system, Russia can defend its aircraft anywhere in theater with weapon systems equal to or even more capable than NATO can field»*, the newspaper said.

The Su-35S is a 4++ generation one-seater known for its incredible maneuverability outpacing all rivals in its class. Equipped with new avionics, modern radar and advanced engines, it can accomplish incredible tricks without deceleration. The potent multirole warplane flies a gamut of missions ranging from the suppression of enemy air defenses to air superiority.

By its aerodynamic design, the Su-35 is a two-engine high-wing aircraft with retractable tricycle-type landing gear and the nose gear strut. The Su-35 is equipped with AL-41F1S turbojet engines with an afterburner and a controlled thrust vector. Due to the special design of the engines, a controlled vector thrust of the Su-35 is quite capable of «pivot turning» and deceiving enemy missiles.

The one pilot jet is 21.9 meters long, has a wing span of 14.75 meters and a height of 5.9 meters. The Su-35 weighs around 18,400 kg and has a maximum takeoff weight of 34,500 kg, a maximum speed of 2,400 km/h and a maximum flying range of 3,600 km without external fuel tanks and 4,500 km with external fuel tanks. With its long legs (nearly 4000 km range) and high speed (Mach 2.4) the Su-35 easily outruns every Western fighter. This allows it to perform repeated probes and U-turns that can leave its opponent confused, exhausted and vulnerable in a dogfight.

Its service ceiling is 20,000 meters. The service life is 6,000 hours or 30 years.

The aircraft has 12 external bays for precision missiles and air bombs and two bays for electronic warfare containers.

The armament includes 30mm guns, a huge number of missiles and rockets. The combat load is 8 tons. The aircraft has 12 hardpoints for carrying external weapons and stores. Each wing has four hardpoints – one on the wingtip and three under-wing stations. There are two hardpoints on the underside of the fuselage on the centreline and one under each engine.

The aircraft's air-to-air missiles can include the Vympel R-27 (NATO designation AA-10 Alamo), the Vympel radar-guided medium-range R-77 (AA-12 Adder) and the Vympel short-range infrared-guided R-73E (AA-11 Archer).

The aircraft's air-to-surface missiles include the Molniya Kh-29 (AS-14 Kedge) tactical missiles, the Kh-31P (AS-17 Krypton) anti-radiation missiles and the long-range Kh-58UShE (AS-11 Kilter) anti-radiation missiles.

The Su-35 anti-ship missiles include Kh-31A, the long-range Kh-59MK (AS-18 Kazoo), the long-range Kalibr and the heavy long-range Yakhont missile.

The aircraft can be armed with a range of guided bombs, including the KAB-500Kr TV-guided bomb, KAB-500S-E satellite-guided bomb, LGB-250 laser-guided bomb, Kab-1500Kr TV-guided bomb and KAB-1500LG laser-guided bomb.

The Su-35 can also be armed with 80mm, 122mm, 266mm and 420mm rockets.

Western military experts were especially impressed with the Su-35S's sophisticated phased-array radar control system Irbis-E, which allows the plane to detect targets at distances of up to 400

kilometers. It can simultaneously track up to four ground targets or up to 30 airborne targets, as well as engage up to eight airborne targets at the same time. The radar has a friend-or-foe identification capability for aerial and maritime objects, is capable of identifying the class and type of airborne targets and can take aerial photos of the ground. An oscillator with peak power output of 20 kW used in the passive phased array radar makes Irbis-E the most powerful radar control system on par with the best state-of-the-art international designs, and ahead of most US and European active and passive phased array radars.

The Su-35S sent to Syria are also equipped with a state-of-the-art electronic warfare equipment. The «Khibiny-M» suite includes a radar warning system, radar jammer, co-operative radar jamming system, missile approach warner, laser warner and chaff and flare dispenser. A relatively small container in the shape of a torpedo is mounted on the wingtips of the aircraft to make the jets invulnerable to all modern means of defense and enemy fighters.

The cockpit is fitted with two 230 mm x 305 mm high-resolution MFI-35 liquid crystal displays with a multifunction control panel and an IKSh-1M head up display with a wide 20°x30° field of view.

The pilot has two VHF/UHF encrypted radio communications systems and a jam-resistant military data link system between squadron aircraft and between the aircraft and ground control. The navigation system is based on a digital map display with a strapdown inertial navigation system and global positioning system.

For in-flight refuelling the aircraft is equipped with a refuelling probe on the port side of the nose. Two external fuel tanks, type PTB-2000, provide an additional 4,000 L of fuel.

High-strength, low-weight, composite materials have been used for non-structural items such as the radomes, nose wheel, door and leading-edge flaps. Some of the fuselage structures are of carbon fibre and aluminium lithium alloy.

At the end of 2015 the Russian Air Force ordered fifty Su-35S fighter bombers to enter service before 2020.

The aircraft is a success on the world market.

In November 2015, Russia and China signed a contract, estimated to be worth \$2 billion, on the delivery of 24 Su-35 fighter jets.

The delivery of the jets is expected to begin this year.

The Indonesian Air Force intends to buy 16 Su-35S fighters from Russia. A contract for 10 Su-35S is reportedly to be signed in April 2016.

Vietnam and Algeria are also interested in this aircraft. In February 2015, one of the Su-35 was tested at Tamanrasset Airport in Algeria. According to Russian Kommersant daily, the Algerian military were satisfied with the fighter's flight characteristics and now Moscow is waiting for a formal application. It is expected that the first phase will focus on the acquisition of at least 12 aircraft.

The success of Russian weapons systems tested on Syria's battlefields has become an eye-opener for many defense experts. It shows that the country's ambitious rearmament program is in full swing. On March 11, President Vladimir Putin said that the Russian armed forces received 96 new planes, 81 helicopters, two multi-purpose submarines, 152 air defense systems, 291 radar stations, as well as more than 400 armored vehicles and artillery systems in 2015.

*«Modern Russian military hardware has been on full display in recent conflicts from Ukraine to Syria, where the Russian armed forces are battle testing new hardware and refining tactics. NATO has been surprised at the Russian show of new military capability. From launching cruise missiles to attack Syria from the Caspian Sea to SU-35 fighter aircraft deployed in northern Syria along the NATO, Turkish border, NATO military planners and strategists are noticing»,* says Todd Wood, a Washington Times staff writer.

*«Putin can take a victory lap. The campaign to shore up president Bashar al-Assad's faltering army has been a success, and it has accomplished another major goal for Moscow: It has shown the world that an immensely expensive, multi-decade program to rebuild Russia's armed forces is working»,* Vice News reported recently.

The military operation in Syria showcased some of the best weapons in the inventory of Russian military. The Su-35S is a good example of the success story.