28-Feb-17 – The US Cannot Penetrate Russia’s Powerful Aerial Detection System

Description

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The Western press is continually repeating that a NATO intervention against Russia is imminent, following the model applied to the former Yugoslavia in 1999. Such an intervention would be justified, according to the hilarious logic cited by Admiral John Kirby, former State Department Spokesperson, by the notion that since the fall of the Iron Curtain, Russia has kept “advancing” right up to NATO’s doorstep — although it is NATO that has expanded, by admitting the former communist states of Eastern Europe and the former Soviet republics.

Russia takes these threats seriously and is looking for effective ways to respond to any aggression. Russia is going to be equipping its military with the most sophisticated automated systems of management and information integrating air and space surveillance systems.

The United States relied on its air superiority and ICBM (Intercontinental Ballistic Missile) strike capability in its recent aggressive actions, but these advantages have been reduced greatly due to Russia’s detection capacity. For those who think Russia is a backward country that can be easily brought down, remember that Russia has the same number of nuclear warheads as the US, and Russian ICBMs are far more sophisticated than the American ones.

Over-The-Horizon Radar

During the Cold War, the US planned, designed and built at least six huge OTH-type (over-the-horizon) radars. But since 1970, only four high-power radars (AN/FPS-118 OTH-B — Over-the-Horizon

Backscatter), with a range of 3,000 km were still active. One was stationed in Alaska, one each on the Pacific Coast and Atlantic Ocean, and one in the middle of the continental United States. From 1990–2000, all these radars were shut down due to their huge energy consumption and the fact that it was technologically impossible that any other state could hit the US mainland. These radars have been preserved, but the US does not have any OTH radar operational today.

With the new Voronezh radars, Russia's Ballistic Missile Early Warning System (BMEWS) is the most powerful in the world. The 77Ya6DM-Voronezh OTH (Over The Horizon) has a range of 6,000–10 000 km. It works in the metric and decimetric frequencies (VHF and UHF) and can simultaneously track 500 targets the size of a soccer ball, up to a maximum altitude of 8000 km. Its energy consumption is 0.7 MW, compared to 2 MW for the Dnepr OTH and 50 MW for the Daryal OTH, two older Russian radars from the same family.

Another outstanding advantage is that it is largely pre-fabricated, with a modular design, and can be built quickly. According to GlobalSecurity.org, "A station of this kind can be deployed in 12 to 18 months as compared to five to nine years for Dnepr…. The foundation of the radar is the phased array antenna, a quickly erected crew module and several containers with radio-electronic equipment, to provide fast, low-cost upgrade station during operation."[1]

Since Russia is surrounded by NATO countries, it has created a network of OTH phased array early-warning radars with ballistic capabilities along its western and northern borders, to defend itself from a nuclear or conventional attack. Russia has a Voronezh DM radar at the Dunayevka Airbase in the Kaliningrad enclave; a Voronezh M radar in Lekhtusi, near St. Petersburg, to replace the decommissioned one in Skrunda, Latvia; a Voronezh VP (RO-1) at Olenegorsk in the Kola Peninsula (bordering Finland); a smaller Volga radar (with a range of 2,000 km) near Hantsavichy in Belarus; and a Daryal (RO-30) radar (previous generation) with a 6,000 km range is in place in Pechora, near the Arctic Circle. In 2018, a new high-power radar is to begin operating in Novaya Zemlya in the Arctic.

Russia has also created a network of OTH early-warning ABM radars along its southern border. A Voronezh DM radar has been placed in Armavir in the Transcaucasus, between the Black Sea and Caspian Sea; and in Siberia, Yeniseysk, Barnaul and Mishelevka (both on the border with Mongolia), and Orsk (on the border with Kazakhstan) each have a Voronezh-DM radar.

On the Pacific Coast, Russia has a new Ballistic Missile Early Warning System (BMEWS). Near the port of Nakhodka (75 km east of Vladivostok), there is a Volna radar (range 3000 km). The early warning system includes other less powerful Podsolnukh-E (Sunflower) radars, with a 500 km range, located on islands in the Sea of Okhotsk and the Sea of Japan. Two similar but smaller Dunay 3M/U radars (with a range of 2,500 km) have been positioned near Moscow as part of the Russian capital's antiballistic shield. All the radar networks in the north, south, east and west, as well as Moscow's defensive ring, are connected to a modern C4i command and control center with three levels, in Moscow. It integrates these radar networks with Russian military satellites.

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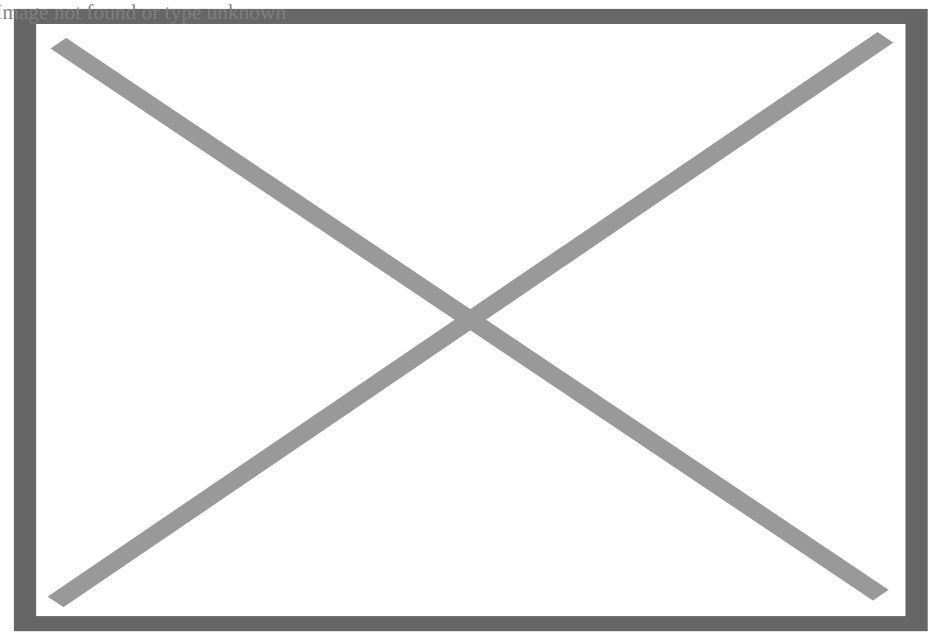


Russian Radars have a Long Tradition

The history of Russian high-power shortwave radars began with research on the behavior of the ionospheric shell of Earth's atmosphere. From 1950 to 1956, they were studying how ozone, nitrogen and their ions react in the presence of increased energy, in other words how plasma and ionized gases respond to heat. The separation of ions and electrons produces an electric field. This phenomenon is characteristic of the emission of radiation at different frequencies, including radar and radio waves. In the 1960s, the Soviets built a particle accelerator for this purpose in Protvino, a city near Moscow dedicated to nuclear physics research. Like the one recently built in Geneva by the European Organization for Nuclear Research (CERN), it has a circular tunnel in the ground, 60 m deep and 21 km long.

The first experimental high-powered radar, the Duga-1, was nicknamed the "Woodpecker." The Soviet Union developed it to enable the monitoring of R-7 Semyorka missiles as they were launched and entered orbit from the Baikonur Cosmodrome in Kazakhstan SSR. The Semyorka was the first intercontinental ballistic missile and the first to launch artificial satellites above the Earth. Duga-1 was placed in Mykolaiv, a Black Sea port in the Ukrainian SSR, (2,500 km away from Baikonur) in 1957.

The Duga-2 was built in the mid-60s on the same site in Mykolaiv (Ukraine), to track the trajectories of ballistic missiles launched in the Far East and from nuclear submarines in the White Sea and the Pacific Ocean. The Duga-3 was active from 1975, at the Chernobyl-2 base of the Ukrainian SSR, 50 km from the nuclear reactor — that was the only way to provide the huge amount of energy it required. The antenna system extended over 750 m; its 90 m pillars are still standing. Almost 1,000 Soviet troops worked at the Chernobyl-2 Base. It was abandoned soon after the disaster at the nuclear power plant in 1986. Other operational radars from the "Duga" family were the Volga, the Dnestr (maximum range 3000 km) and the Daryal-U/UM.

Two other radars in the “Duga” family were operating in the Ukrainian SSR starting in 1979: one near the naval base for the Russian Black Sea Fleet at Sevastopol, in Crimea (RO-4/Dnestr), with a range of 3,000 km; and one in Mukachevo (RO-5/), 70 km from the border with Romania. After the NATO summit in Bucharest in 2008, when Ukraine applied to join NATO, the government in Kiev decommissioned the Mukachevo and Sevastopol radars.

The 590 Network

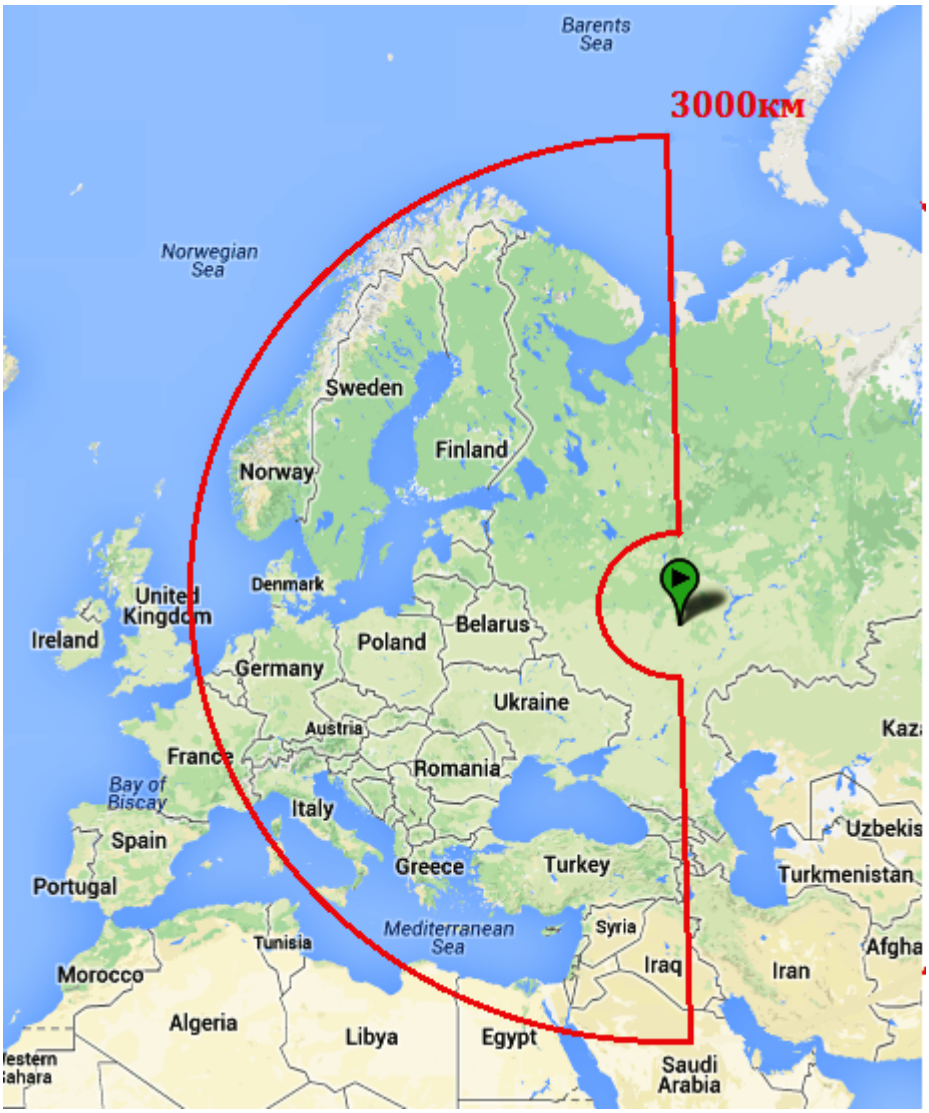
In the last two years, formations of up to ten Russian aircraft including the Su-24, Su-34, Tu-22M3, Il-76 and Su-30 began to show up in international airspace in the vicinity of NATO member states in western, northern and southeastern Europe. Russian crews were training for the operation in Syria. NATO claimed these flights were attempts to breach the airspace of NATO countries. These Russian military aircraft formations intersected the highly congested traffic flows in the Eurocontrol area without producing collisions or near collisions with any civilian or military flights, thanks to the Russian military’s continuous monitoring with the new “590” network of aerospace radars, which detects objects in the air near Russia’s western, northern and southern borders.

The “590” network covers various airspace sectors from Russia’s borders. It is supported by several hundred data storage facilities and its own servers, with powerful, cutting-edge data processing, using satellite communications equipment. Once the “590” radar network has detected something, Russian object recognition microprocessors help determine what type of aircraft it is — in real time — and automatically track aircraft within European airspace. Microprocessors extrapolate the flight path of each aircraft, based on its declared route, speed and technical characteristics.

The 29B6 Container Radar

The Russian military introduced the most complex and modern radar system in the world, known as “29B6-Container,” on 2 December 2013. Intended for long distance air and space reconnaissance, it is related to OTH radar and is an important element in the Russian “590” detection system. The 29B6 radar has a field of view with an aperture of 240°, and it monitors the air space up to a distance of 3,000 km. The 29B6 can detect high altitude and low altitude targets throughout almost all of Europe,

the Middle East and the Arctic. The radar can track all airborne targets (including planes, helicopters, drones and cruise missiles) and objects in space.



The 29B6 is a bi-static radar system, with separate transmitters and receivers located far away from each other. The transmitter antenna is 440 m long and includes 36 components; it is located in Nizhny Novgorod (250 km east of Moscow). The 29B6 receiver antenna is in Kovylkino (150 km south of Nizhny Novgorod) and has 35m-high pylons spread out over 1.3 kilometers. The 29B6 radar system is far more advanced than the “Duga” family, working in wavelengths in the range of 10–100 m (3–30 MHz frequency).

Most military detection and fire control radars (land, sea or air) operate in the centimeter and millimeter range. Since waves from centimeter and millimeter radars are sent parallel to the ground, they cannot pass barriers in the relief. These radars are limited in performance by the curvature of the earth to a range of 300–450 km maximum.

In contrast to the centimeter and millimeter radar range, short wave radars like the 29B6 emit pulses at an angle of inclination up to 45 degrees from the ground. They are repeatedly bounced off the ionosphere to look beyond the horizon without significant loss of signal. This ionospheric refraction

gives the radar an optimal zone for detection of aerial targets in the range of 400–4000 km from the broadcaster. Thus, ballistic missiles or fighter planes can be discovered by radar placed on Russian territory, while they are still in flight above the Atlantic Ocean.

Russia could also start rebuilding and updating the OTH radar in Sevastopol (RO-4), bringing it up to the Podsolnukh-E standard. The Sevastopol radar can monitor the US antiballistic shield at Deveselu (Romania).

Conclusion

There are many aspects to “stealth” technology including the shape of the aircraft, the type of materials used in aircraft construction and the coatings and paints covering the skin of the fuselage, the wing and tail surfaces, and the cabin. Stealth technology reduces the reflectivity radar waves in the spectrum most often used, i.e., in the centimeter range. The 5th generation multirole aircraft (F-22 and F-35) have been designed specifically to make them invisible to X band radar (7.0–11.2 GHz), i.e., in the centimeter and millimeter range. These planes are not invisible to OTH radar and 29 B6 Container radar, which operate in the decimeter and meter ranges.

The special radio-absorbent paint covering the F-22 and F-35 is very thin (2–4 centimeters) and is effective only in the centimeter and millimeter frequency range. In order to be invisible to OTH and 29B6 Container radars operating range meter and decimeter, the radar-absorbing coating would have to be at least 40–50 cm thick. However, such a large amount of paint increases the mass of the aircraft and reduces its aerodynamic qualities.

By comparison, the B-2 5th-generation bomber, which is 6 to 8 times larger and can carry 14 tons of weapons, the radar-absorbing coating can be as much as 50 cm thick. That makes it less visible to OTH and 29B6 Container radar than the F-22 and F-35 multirole aircraft.

Starting from these considerations and noting that the US has no operational radar comparable to the OTH and 29B6 Container radar, it is possible that Russians are counting more on the design and

construction of the PAK DA-White Elephant stealth bomber, similar to the American B-2 stealth bomber.

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