

# Russia's Advanced Research Foundation aims breakthrough high-risk research and development like US DARPA

The Defense Advanced Research Projects Agency (DARPA) is an independent agency of the U.S. Department of Defense, with a mission to prevent technological surprise to the US, and also to create technological surprise for its enemies. DARPA operates through Program managers that are hired for 3-4 years to find, fund and foster new innovation ideas based on technology visions that each of them is expected to develop. PMs fund multiple teams at universities, companies, and government labs who take ownership of these visions.

Russian Foundation for Advanced Research Projects (Russian: Фонд перспективных исследований) is an advanced military research agency, created in 2012, on the lines of the U.S. Defense Advanced Research Projects Agency (DARPA). The aim of FPI is to help Russia update its military equipment and develop new technologies. Some of the projects being implemented by the Advanced Research Fund have no analogs in the world, the Russian president said. In a visit in the Sverdlovsk region, Rogozin had said that Russia will not proceed like China and do not blindly copying Western models, but will have to develop by the ideas and technologies developed by itself.

Russia's "DARPA", the Foundation for Advanced Studies (FPI), should play a leading role in both prioritising tasks and ensuring the economical use of existing funds because of budgetary constraints, Russian president Vladimir Putin told members of the Military-industrial Commission. "It is obvious that the fund's projects are intended to play a crucial role

in the development of key new-generation weapons, military and special hardware. They should serve as the basis for the Russian armament system in 2025-2030," Putin said.

## **Aims and Objectives of Russian Foundation for Advanced Research**

The Advanced Research Foundation (ARF) was established in 2012 by a Presidential decree that tasks the government with "ensuring the dynamic development of breakthrough high-risk research and development, fundamental science and implementation of applied research programs in the interest of ensuring the country's defense and security" The foundation is tasked with informing the country's leadership on projects that can ensure Russian superiority in defense technology. It will also analyze the risks of any Russian technological backwardness and technological dependence on other powers.

"The main aim of this foundation is to eliminate a gap in our advanced research beside Western partners, after 20 years of stagnation in the whole Russian military science and defense industry" said Deputy Prime Minister Dmitry Rogozin in his speech in front of the Russian parliament, quoted by RIA Novosti.

Rogozin added that the new agency will initially employ 100-150 of experts to monitor on medium and long term "high risk" on research and development projects of Russian defense firms and scientific institutions. It received 3.3 billion rubles (\$100 million) of state funding this year, its spokesman said Monday. The foundation has a staff of 30 and is currently supporting 12 projects, selecting them from 1,100 proposals.

## Thrust Areas

Putin had advised, "The chosen projects should be ambitious but realistic, and there should be no sand castles, scientific and technological illusions, or groundless fantasies. Futuristic weaponry, equipment for soldiers and cyberwarfare are the three main areas of the foundation's research. One priority project will incorporate advanced medical technology into the battle gear carried by soldiers, the ARF's head of research, Andrei Grigoryev, said in October last year.

Another possible breakthrough targeted by 2020 is the launch of an orbital space plane from the super-heavy Antonov-225 Mriya transport aircraft, outlined last year in a report by the public council of the government's military-industrial commission.

RFARP is currently researching on Army Sixth Generation Systems, Air force Plasma-Stealth, Clean Fission, Army Survivalist Doctrine, Army New World Order, Army Integrated Military Systems and Air force New World Order.

## **Dogs learn breathing underwater as Russian scientists test liquid respirational technology**

The ability to breathe liquid is no longer just the realm of sci-fi anymore (or limited to fish) as scientists from Russia's Foundation for Advanced Research Projects have recently showcased their latest breakthrough, which makes this impossible feat possible. To demonstrate the novel technology, they dipped a dachshund in a reservoir with a liquid rich in oxygen.

"We are already holding live tests. We began with mice and other small animals. Now, we are carrying out experiments on

large animals. Dogs are acting as testers,” Davydov said. For now, dogs can breathe for half an hour at a depth of up to 500 meters without any health consequences, Davydov said.

Russia’s “liquid respirational technology” will allow humans to breathe underwater and not drown since their lungs will be filled with a special oxygen-rich liquid, which gets into the blood system. The Russian Foundation for Advanced Research Projects is developing the technology to save submariners of the Russian Navy from drowning should they abandon their stricken submarines underwater.

The main challenge, however, is to find a formula for a liquid that allows underwater breathing. It also involves developing the technology to inject the liquid into and withdraw it from the body. “A psychological barrier will also have to be overcome, a person would actually have to suffocate in water voluntarily to start breathing with the liquid filling his lungs,” according to Davydov.

## **Integrated protective soldier systems**

The IPSS will work on the radical use of technologies such as nano technology, powered exoskeletons, and magnetorheological fluid-based body armor to provide infantry with significantly higher force multiplier than the opposing force. The Defense Ministry hopes to develop a fully realized end product sometime in 2028, incorporating research from the Defense Ministry’s exoskeleton project and the Soldier Nanotechnologies into a final design.

The first phase of the project involves a development of technologies to help reduce the soldier’s fighting load and power requirements and improving the soldier’s protection, lethality, and environmental and situational awareness.

## **Russia's invisibility 'membranes' pass initial testing: research center**

Russia's high-tech invisibility suits created for its defense and interior ministries have successfully passed preliminary tests Thursday, according to the head of the Russian Foundation for Advanced Research Projects (FPI).

The membranous suits are reportedly lightweight and make their wearer nearly invisible. FPI has not made public the technology behind the "membranes'" cloaking quality. Grigoriev had previously told Sputnik the suits would also protect wearers from disease.

"The obtained filter material by far exceeds all existing analogues in its ability to stop the most dangerous aerosol particles such as viruses, toxins, allergens. This technology could usher in a wide variety of protective materials for medical, military and other purposes," Grigoryev said in February.

## **Augmented Reality to Allow Superhuman Vision for Russian Combat Fighters**

Russian military pilots will soon have new helmets with augmented reality (AR) technology, the press service of Russia's Advanced Research Foundation reported, according to Rossiyskaya Gazeta.

AR is a view of real-world environment in which some elements are "augmented" (or added/supplemented) by computer-generated sensory data, such as sound, video, graphics or GPS data. The technology allows people to see information and data that they normally wouldn't be able to.

The new technology will be used to improve helmets of combat aircraft pilots, Rossiyskaya Gazeta said. AR will allow pilots to have additional information on the windshield of their helmet, such as visuals from angles that they can't see. Moreover, combat pilots will be able to aim at their targets hand-free, simply using a turn of their head to immediately fire weapons.

The project is expected to be sold in several stages, gradually developing complexity of AR technology and expanding its functionality, said Sergei Garbuka, a high-ranking official from the Advanced Research Foundation.

## **Russian Airships shall employ photonics based radar for Missile Defence in 2018**

KRET and the Foundation for Advanced Research (FAR) are working together to create a phased array antenna based on radio-photons. The radio-photonic radar system will be based on active radio-optical phased array (Russian abbreviation: ROFAR) technology being developed now by Radio-Electronic Technologies Concern (KRET), an integral part of the Rostech state corporation.

It is expected to open a new era of light and precise radar electronics for systems where weight is critical, such as drones and satellites. In the future, he said, the antenna system based on the principles of radio-photons can be mounted on airships and used as part of the missile defense system. "There is no need to build a huge antenna on the ground when you can simply raise the antenna to the necessary height and look beyond the horizon," said Vladimir Mikheev.

"The antenna will be designed within the next two years. "We are planning to begin production of the radar based on the

principles of radio-photons by 2020,” said Vladimir Mikheev, adviser to the first deputy CEO of KRET, as reported by TASS.

As previously reported, state investment in the project for developing an active phased array radar based on radio-photons will amount to 680 million rubles.

Radio-photons are an analog of electronics, though photons, unlike electrons, have neither mass nor charge. The new concept will reduce the weight of the equipment by 1.5-3 times, increase its reliability and efficiency by 2-3 times, and increase the scanning speed and resolution dozens of times over. This will help create broadband radars whose resolution and speed enable what is called radar sight.

Earlier this year KRET announced that radio-photon antennas will have “unique stability” regards electromagnetic-frequency impulses, such as those caused by close-range lightning strikes, solar magnetic storms and EMP effects caused by nuclear explosions.

KRET believes that radio-photon technology will pave the way for both military and civilian electronics of the future, as the tech will be applied in radio astronomy, radio detection and ranging, optical fiber and mobile communications and other practical fields. Such systems also have application in helping high-speed trains instantly detect obstacles on the tracks.

## **Russia developing combat Robots**

The development and production of robots in the country is currently being undertaken by the Russian Foundation for Advanced Research Projects (an equivalent of the American Defense Advanced Research Projects Agency or DARPA), as well as by various research institutes and centers.

The Foundation will be the organizing large-scale tournament in underwater and marine robotics on behalf of the board of the Military Industrial Commission of Russia and the Deputy Prime Minister Dmitry Rogozin in 2018. "There are many tasks that need to be addressed in open maritime areas of Russia—including scientific and technical tasks related to the need to ensure the security of the country, as well as important environmental tasks—for example, monitoring the state of the water area and counteracting poachers. Vast expanses of the sea require constant monitoring, including in the sparsely populated regions of Russia, where the use of appropriate robotic systems has helped to ensure full and continuous monitoring of the state of the ocean," commented Alexey Kononov, the deputy head of the National Center for the Development of Technology and Basic Elements of Robotics, Foundation for Advanced Research Projects.

## **Underwater robot for protection**

Russia's advanced military technology agency is working on a special underwater robot to protect Russian shores from foreign underwater intruders, news agency TASS reported. The project will be taken on as part of ongoing research into methods of detecting and locating ultra-quiet underwater objects.

"In the course of this project, the laboratory is creating a special underwater robot," a spokesperson for the Foundation for Advanced Research Projects told TASS. The underwater robot appears to be an answer to a similar U.S. Navy and DARPA program, known as the Persistent Littoral Undersea Surveillance, or PLUS, program. PLUS has already seen limited deployment, The Wall Street Journal reported last year.



## **Combat robot-android**

State-funded Russian Foundation for Advanced Research Projects has developed a human like Fedor, which at the moment, is able to lift weights, crawl and drive in a straight line. Fedor rose to internet fame earlier this year when Russian Deputy Prime Minister Dmitry Rogozin posted a video of the android firing a gun in each hand, but the minister denied Russia was working on a “terminator” bot.

Andrey Grigoryev, director-general of the Advanced Research Projects Foundation (ARF), told RIA-Novosti: A combat robot-android that resembles a human in appearance, will be able to run, cross a barrier line and perform other actions, according to our plans. It will be controlled by human brain via new brain-computer interface technology. The robot was seen driving a 4×4 bike through an obstacle course, is expected to learn how to run.

Russia’s state space agency Roscosmos announced in March that it has selected Fedor to pilot the agency’s new spacecraft Federatsiya into orbit in 2021—a flight he may undertake solo. Fedor is supposed to be ready to join preliminary tests for Federatsiya’s first training flight in 2020, with an eye on joining the crew of the International Space Station by 2024, Russian newspaper Izvestia reported, citing Sergei Hurs, the project director.

## **‘Quadcopter’ Controlled by Human Thought**

The Zelenograd company Neurobotics, working for the Advanced Research Foundation of the Russian Federation (ARF), which supports programs of interest to the defense industry, created a neuro-interface that can control a quadcopter through brain impulses, literally, by the power of thought.

“For the technology to be of use on the battlefield, we had to do more than just control the copter,” said the Executive Director of Neurobotics, Vladimir Konyshv. “Our demonstrator moved while operating the copter, and it could recognize direct as well as programmed commands, for example a flight to a specific point. We proved that under the right conditions the copter can be controlled by the mind.”

“A soldier running with his gun is being fired on by a sniper,” Konyshv says. “After several months of training, he would be able to drop to the ground while mentally ordering the copter to transmit an image of where the fire is coming from to his tactical goggles.”

The generation of commands, or “states”, as we call them (the sensors on the demonstrator’s head record them) is tied to the use of special psychic techniques. A person in a given situation proposes actions that the system can recognize. For example, he can imagine clenching a fist three times.

## **Comparison with DARPA**

One of big difference is that DARPA’s budget is nearly \$3 billion, while the Foundation for Military Research has a budget of 3.3 billion rubles (\$100 million). DARPA’s success is based on highly innovative US culture, excellent research centers and manpower, mature and globally competitive Industrial Base and excellent Industry-Academia interactions.

“Unlike DARPA, Russia lacks the specialists to identify the promising areas for breakthrough technologies,” said Igor Korotchenko, editor-in-chief of the National Defense magazine. What projects the foundation has received are mostly based on past research rather than new innovative ideas, he said.

The goal should be to put aside the issues the defense industry is faced with today and to plan 10 to 20 years ahead,

just what DARPA is doing, Korotchenko said. “But we have a problem with strategic planning. There is no such culture; we are looking only three to five years in the future.”

## **References and resources also include:**

<https://themoscowtimes.com/articles/russias-darpa-working-on-underwater-battlebots-to-protect-coastline-48005>

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