

# NNPU-50 Gun Mount for T-50 Fighter In Trials At Gknipas Testing Ground

## *Defense-aerospace*

MOSCOW - The testing of the 9-A1-4071K aircraft gun, a part of the NNPU-50 gun mount designed for the T-50 fifth-generation fighter jet (PAKFA), is in progress at the State Aircraft Systems Testing Ground (GkNIPAS), the press office of the United Aircraft Corporation (UAC) writes in its blog.

The testing of the aircraft includes a wide spectrum of efforts from the early phase of its designing all the way to its full-rate production. The tests involve its fuel system, power plant, survivability equipment and ejection, fire-suppressant, weapon and many other systems. The systems of the future tactical aircraft - the T-50 fighter - are in trials at GkNIPAS as well.

The testing of the NNPU-50 gun mount, including the 9-A1-4071K gun - a lightest weapon in its class, continues. The gun is a derivative of the GSh-30-1 that proved itself on board Generation 4 through F++ fighters. However, the Russian fifth-generation fighter's cutting-edge technologies, materials and layout are calling for out-of-the-box approaches to the testing of the gun mount.

A mock-up of the T-50's cockpit has been set up at GkNIPAS.

"Its design is identical to the cockpit of the real plane," says Sukhoi Design Bureau Deputy Chief Designer Vladimir Sokolov. The gun is a key source of dynamic load on the fighter's airframe and systems in the area close to it as far as the plane's weapons suite is concerned. The 9-A1-4071K is effective against virtually all present-day armored targets. It is able to fire the ammo load of 130 30-mm blast-fragmentation/incendiary and armor-piercing/incendiary rounds on a single sortie.

The website of the Tula-based Instrument Design Bureau (KBP) says there were the flight trials of the upgraded 9-A1-4071K rapid-fire gun on a Su-27SM (NATO reporting name: Flanker) fighter in 2014, with the weapon capable of using up the whole ammo load in any operating mode. Plans provided for launching the development work on integrating the gun with the T-50 in 2015, once the tests were completed.

The 9-A1-4071K has been derived from the world's lightest 30-mm GSh-30-1 single-barrel aircraft gun equipping the Russian Air Force's Mikoyan MiG-29 (Fulcrum), Su-27, Su-30 (Flanker-C), Su-33 (Flanker-D) and Su-35 (Flanker-E) fighters and tactical bombers.

The 9-A1-4071K embodies unorthodox 'resource- undemanding' weapon design and operating principles: the round as an element of the automatic devices, non-percussion 'throw-type' chambering, gas-operated extraction of spent cases and partial overlapping of these operations. The gun's key feature is its self-contained barrel water evaporation cooling system.

The unique recoil-type basic automatic design has minimized the weight of the weapon and afforded it the highest single-barrel rate of fire among 30-mm guns.

The ring recoil spring and two-way hydraulic brake effectively dissipate the excess energy of the moving parts and stabilize the operation of the automatic devices when the gun fires in bursts. The weapon has the belt-type dual feed, electro-pyrotechnical reloading and a rounds counter.

The 9-A1-4071K has a rate of fire standing at 1,500-1,800 rd/min. and a muzzle velocity of 860 m/s while itself weighing a mere 50 kg, with the round's weight equaling 832 g and the projectile's one 390 g.

The gun mount is being debugged at the testing ground in Faustovo for endurance trials. Certainly, missiles are the most formidable weapon of present-day fighter jets, but aircraft guns remain relevant even to fifth-generation fighters. According to expert opinion, the T-50's cutting-edge sights will boost the effectiveness of its gun that is far more preferable in certain situations than pricey missile are.

The reliability of both the gun and aircraft assemblies is being tested at Faustovo. There are dozens of factors to be considered. When the gun fires, the flame, which temperature is about 3,000°C, scorches the composite skin of the airframe. The shots generate vibration with a frequency of 2-2,000Hz. The vibration may be harmful to both systems (e.g. liquid-crystal displays of the fighter's 'glass cockpit') and the pilot. The plane's designers considered the factors as far back as the design stage, of course, but the accuracy of their calculations is being checked out during long-time ground tests of individual systems first and then the aircraft as a whole.

"The trials have revealed the drawbacks of the aircraft's layout. Unfortunately, flawless design is not always achieved in the design phase," Sokolov sums up.

Every test includes the recording of numerous data. The test bench is equipped with more than a hundred sensors for this purpose. The bench tests are to ensure the reliable and safe operation of the basic systems on the extreme fringes of the plane's operating envelope.

Concurrently with testing the gun, Sukhoi Design Bureau personnel are testing a number of the T-50's other weapons and its life support system as well. In the future, the testers will streamline the work of the systems and units on a full-scale example - the T-50-KNS.

"The trials of a full-scale aircraft allow the comprehensive assessment of the reliability of all of its systems," Sokolov says. "However, the aircraft/pilot symbiosis is needed for complete test data perception and test safety."

Sukhoi is the first company in the country to have established for this purpose a service of operator-testers running tests, taking into account various factors and controlling the systems from the cockpit.

"We are using dozens of various sensors to gage system parameters at test rigs," Vladimir Sokolov explains. "It is important that specialists scrutinize the aircraft before an operator-tester gets into the cockpit. Still, the operator-tester's experience and gut feeling are

indispensable."

The Sukhoi Design Bureau has always paid close attention to devising ways and means for the experimental development of in-design aircraft. Several laboratories were established for this purpose as far back as 1953 by order of Pavel O. Sukhoi himself. At present, the design bureau has a wide range of its own research and test divisions. Its ground-based labs and test benches allow a broad range of research and test work on aircraft systems and whole aircraft. Planes and their systems also are proven at testing grounds and bases of other Russian companies and the Defense Ministry as well, according to the blog of UAC's press office.