Russia develops co-orbital anti-satellite capability

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Russia appears to be developing a co-orbital anti-satellite system. *Bart Hendrickx* examines the evidence in open sources about Russia's satellite development programmes that points to the existence of the project

Key Points

- An analysis of open-source documents related to a development project designated 'Burevestnik' suggests that Russia is developing a co-orbital anti-satellite (ASAT) system that may be designed to operate in a geostationary orbit.
- The technology behind these systems is likely to be related to a series of satellites demonstrating close-up inspection capabilities that was launched by Russia between 2013 and 2017.
- Combined with Russia's development of ground-based ASAT systems, this suggests intent to threaten satellites from low earth through to geostationary orbits, and would give Russia a greater ASAT capability than the Soviet Union possessed.

Since 2013, Russia has launched several satellites that have demonstrated the ability to perform close-up inspections of other objects in orbit. Although these satellites could be used to assess the status of Russia's own satellites, the same technology could also enable satellite inspection or kill operations against an adversary's satellites (see box 'Russian inspector satellites (2013–15)').

An assessment of Russian-language open sources conducted by *Jane's* found evidence that Russia is working on a new co-orbital anti-satellite (ASAT). Such a system would augment the capabilities of several ground-based ASAT systems that *Jane's* has previously assessed are under development (see *Jane's Intelligence Review* , Volume 30, Issue 8).

Kosmos-2519

On 23 June 2017, Russia launched a satellite designated Kosmos-2519 into a sun-synchronous orbit from the Plesetsk cosmodrome on a Soyuz-2-1v rocket. The Russian Ministry of Defence described the satellite as a "space platform on which several types of payloads can be installed", identifying the payload as "equipment for remote sensing of the Earth and to photograph objects in space".

Two months later, on 23 August 2017, Kosmos-2519 deployed an object (Kosmos-2521), which the Ministry of Defence described as "a small satellite" intended to "inspect the state of a Russian satellite". The *Izvestiya* newspaper on 26 October 2017 quoted sources in the Ministry of Defence as saying that the small satellite had changed its orbit and had subsequently returned to its mother satellite to conduct a close-up inspection.

On 30 October, Kosmos-2521 itself released a payload (Kosmos-2523). The Ministry of Defence described this as "an inspector satellite capable of diagnosing the technical condition of a Russian

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satellite from the closest possible distance", adding that the data obtained would determine if the satellite could be restored to working order.

Using publicly available orbital data published by the US Department of Defense, Western space analysts Phillip Clark and Jonathan McDowell found that Kosmos-2519 and -2521 later performed several slow and fast fly-bys, and flew in close formation in March-April 2018. Kosmos-2523 lowered its perigee by about 100 km shortly after being released from Kosmos-2521 and has not come close to any other satellites, suggesting that it may not have been used for its officially stated goal.

A montage of images showing preparations for the launch of Kosmos-2519 from the Plesetsk cosmodrome on a Soyuz-2-1v rocket on 23 June 2017. Two further smaller satellites (Kosmos-2521 and Kosmos-2523) were also deployed on this mission. (Russian Ministry of Defence) 1728319

Speaking to the Conference on Disarmament in Geneva on 14 August 2018, Yleem Poblete, the US Assistant Secretary of State for Arms Control, Verification, and Compliance, described Kosmos-2523's behaviour as "inconsistent with anything seen before from on-orbit inspection or space situational awareness capabilities".

Index code 14F150 and 14K167

Publicly available procurement documents and company annual reports analysed by *Jane's* connect the Kosmos-2519/2521/2523 mission to the Ministry of Defence index codes 14F150 (denoting individual satellites) and 14K167 (denoting the combination of the launch vehicle, payload, and all launch and control support equipment). The code name associated with these designators in official documentation is Nivelir ('Dumpy level'). A dumpy level is a type of optical measuring instrument. Another code name possibly related to space inspection missions is Napryazheniye ('Voltage' or 'Tension').

The documents note that one of the satellites carries a control moment gyroscope (CMG) called SGK-5. CMGs are used to accurately point on-board optical systems without consuming propellant. The website of satellite engine manufacturer OKB Fakel notes that Kosmos-2519 carries the

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company's K-50-10.5 thermal catalytic thrusters. These constitute a low-thrust engine not capable of performing major manoeuvres that may mainly be used for attitude control and desaturation (returning momentum to a normal value) of the CMG.

Construction contracts available online show that at least one ground control station for Nivelir has been built at the NIP-4 satellite tracking facility near Yeniseysk in Siberia. It is described as a "unified ground station" (Obyedinyonnaya Zemnaya Stantsiya: OZS), which can be used not only for command and control functions, but also to receive data from the satellites for subsequent transmission to customers.

Analysis of publicly available contracts and publications carried out by *Jane's* provided an insight into the organisational background of the mission. At least one of the manufacturers involved in the satellite prodution is NPO Lavochkin, and another organisation with a key role in the mission appears to be the Central Scientific Research Institute of Chemistry and Mechanics (TsNIIKhM), which signed a contract about the mission with NPO Lavochkin on 1 December 2011.

TsNIIKhM's website states that it has two divisions involved in the space programme: a Nanotechnology Research Centre and a so-called Design Bureau for Applied Mechanics. Publications and procurement documents that are available online show that TsNIIKhM ordered parts for the OZS ground control centre, as well as for microsatellites, raising the possibility that the institute built one or both subsatellites.

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