



Space Exploration - Russian Style

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May 2016

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¹ Here a failure at the launch of a carrier rocket, there a satellite lost in orbit ... What has happened to Russia's space industry?

The chief spokesman on space is Deputy Prime Minister Dmitry Rogozin, who has a degree in journalism from Moscow State University. It is uncertain how much he learned about space there but, judging by his announcements, he didn't learn much about good journalism.

At one moment he is informing us that, 'Space exploration is integral to Russia's sense of identity: it is synonymous with the Russian world', because 'Russia cannot live without its space aspirations, outside its space aspirations. It cannot blunt its dreams of conquering the unknown, which beckons the Russian soul.' Then he is announcing that for Russia colonizing the moon is a strategic objective ('We are intending to arrive on the moon forever'), and that this is to be followed by 'exploiting the resource potential' of Mars. Admittedly, in December 2015 Rogozin suddenly changed his tune, presumably under the impact of the economic crisis, and stated that henceforth 'the main focus is not on the moon or Mars, but on cheap space.'

Of interest here is not Rogozin's linguistic aberrations, but the fact that they accurately reflect semantic aberrations, and primarily the absence of any coherent government strategy in respect of Russia's activities in space, or of any realistic approach to developing the country's space industry. There is no answer to the far from trivial question of why Russia needs space exploration. Is it to contribute to resolving global issues affecting the future of the planet? Is it purely a military, strategic necessity? Is because there are hopes of some major technological breakthrough in the near future? Or purely to maintain national prestige?

Black Holes in the Space Budget

Four years ago Dmitry Rogozin promised, 'By 2015 we will have a space centre in Russia or I'll eat my hat.' He was referring to the planned Vostochny Cosmodrome in Amur Province, a space centre which was to be completed by July 2015, with a first launch later that year.

Vostochny is needed to replace the Baikonur Cosmodrome which, since the collapse of the USSR, is on the territory of independent Kazakhstan. The Vostochny Cosmodrome is being built under Presidential Decree No. 1473s of 6 November 2007, 'On the Vostochny Cosmodrome', and of Government Order No. 30-r of 14 January 2009. The decree has not yet been made public and is not listed in the archive of kremlin.ru, the website of the President of Russia, The government order is also classified, although some of its provisions have been made public. At an early stage, several distinguished scientists and designers expressed major scepticism about the project. Prominent among them was Academician Yury Semenov, to date Russia's greatest designer of space technology. Semenov was one of the creators of the Salyut, Soyuz and Progress manned spacecraft and of the Mir space station. Until 2005 he was chief designer of the *Energia* research and production company. When asked how he viewed the project for a new cosmodrome, he said forthrightly, 'Negatively. It is obvious this will be a feeding trough for officialdom and a disproportionate burden on the economy.'

¹ This paper was written for the Russian Service of Radio Free Europe / Radio Liberty. It can be accessed at, Voronov, V. 'Kosmos "po-russki" [Space Exploration - Russian Style]', *svoboda.org*, 13 March 2016, available at: <http://www.svoboda.org/content/article/27604984.html>

Nobody, however, was going to pay attention to ‘whingers and doubters’: why would they, when vast fortunes were going to be up for grabs? In 2007 the cost of the project was estimated at 130 billion rubles. Later there was talk of 400 billion, and in 2011 *Roscosmos* [Russian Federal Space Agency - ed.] presented the government with an estimate of 493 billion rubles, almost US \$ 16 billion. In August 2015, Yury Koptev, former CEO of the *Roscosmos* and today chairman of the Scientific and Technological Council of the *Rostec* State Corporation, stated that the Vostochny Cosmodrome would be needing a supplementary 560 billion rubles.

Although the money flowed endlessly, construction deadlines were missed almost from the outset. By 2011, the news bulletins were reporting that this highly ambitious project was in jeopardy, and that the directors of the Russian Space Agency had informed Vladimir Putin that his requirement for a first rocket to be launched from the Vostochny Cosmodrome in 2015 could not be met.

Journalists from Russian Business Consulting [RBK - ed.] established that the planning estimate documentation was two years in arrears, and when the estimates did arrive, the remuneration rates for work which they prescribed were half what *Spetsstroy* [Federal Agency for Special Construction - ed.] had already paid. The budget had been overspent, and it was impossible to say what work had been done. In 2013 the situation became critical, the delay in several areas having risen to 18 months. For these shortcomings, in July 2013 Grigoriy Naginsky, the head of *Spetsstroy*, was dismissed. In September of the same year, Lieutenant General Yury Khrizman, the head of *Dalspetsstroy* [Federal Agency for Special Construction in the Far Region - ed.], was also dismissed, and in October the same fate befell Vladimir Popov, the head of *Roscosmos*.

Criminal prosecutions were instituted. The sheer scale of the corruption in this ‘project of the century’ has already far outstripped even the Winter Olympic Games in Sochi. According to the Public Prosecutor’s Office, as of late 2013 - early 2014, over 800 violations of the law during the building of the cosmodrome had been identified. A commission of enquiry was hastily set up under Deputy Prime Minister Rogozin. It began digging with great gusto, and the already dismissed Yury Khrizman was appointed as the first scapegoat. The Investigative Committee of the Russian Federation indicted him on a charge of embezzling, or misappropriating, no less than 1.8 billion rubles. By October 2015 the total losses being ascribed to the actions of Khrizman and his accomplices had risen, according to the investigation, to 5.16 billion rubles, the documentation of the criminal case comprising 230 volumes. Alas, all these detentions and arrests had no impact on either the pace of construction or the ongoing levels of embezzlement.

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How could they? When in July 2015 Russian Business Consulting’s journalists investigated the activities of 112 of *Spetsstroy*’s non-governmental subcontractors and suppliers with the largest contracts in respect of the cosmodrome, they turned up a great deal that was of interest. Specifically, 40 of these companies possessed almost no buildings, machinery or other equipment of their own, and 15 were controlled offshore or had nominee owners. One of the largest subcontractors, *Stroytransgaz-M* Limited, is 52% controlled by joint stock company *Stroytransgaz* which, in turn, is 94.6% owned by *Stroytransgaz* Holdings Limited (Cyprus), an organization associated with the Volga Group of Gennadiy Timchenko. This company of a Putin crony was awarded two construction contracts, one for 4.5 billion rubles and

the other for 5.6 billion rubles. Another joint stock company, Dalmostostroy, is controlled through offshore companies for the benefit of the Minister for Open Government, Mikhail Abyzov. Another company involved in the space project, joint stock company Bureyagesstroy, also until recently belonged to Abyzov. According to Russian Business Consulting [RBK - ed.], at least 18 companies out of 112 are directly or indirectly linked to representatives of the state authorities, law enforcement agencies, or former or current employees of *Spetsstroy*. At least 29 companies with contracts totaling 32 billion rubles have two or more indicators of suspicious activity.

In spite of all this, the Soyuz-2.1a carrier rocket for the first launch was successfully transported by rail from Samara to the Vostochny Cosmodrome on 24 September 2015. Unfortunately, when it arrived it was discovered that the rocket was 'a bit big' for the cosmodrome.

The designers had made a mistake and the construction section of the processing building, where units arriving at the cosmodrome are supposed to be kept warm and in clean room conditions, was designed and built for a different modification of the Soyuz: the rocket delivered to the cosmodrome was the wrong size.

Six Directors in Five Years

The top management of the industry over which Dmitry Rogozin presides is constantly being replaced because there are so many failures. A period of just under five years has seen six directors removed. For seven years, until 29 April 2011, the *Roscosmos* was headed by Colonel General Anatoly Perminov, previously commander of the Space Forces who, before that, had served in the Strategic Missile Forces. After the failure to launch a rocket with three GLONASS satellites on 5 December 2010, Perminov, was reprimanded and soon afterwards replaced by Army General Vladimir Popovkin, First Deputy Minister of Defence and also a former commander of the Space Forces. After an accident with a Proton-M carrier rocket on 2 July 2013, Popovkin was reprimanded by Prime Minister Dmitry Medvedev 'for failure to perform the duties of his office in the manner required' and, in October that year, removed from his post. For 15 months he was replaced by Colonel General Oleg Ostapenko, a former commander of the Space and Aerospace Defence Forces. In January 2015 Ostapenko too was dismissed and Igor Komarov was appointed head of the Federal Space Agency. Komarov had never had anything to do with rockets or space: he was a former Soviet planner and bean counter and, since 1992, had been chief accountant and first vice-president of *Incombank*, first vice-president of National Reserve Bank, and deputy chairman of the management board of the Savings Bank of the Russian Federation. For several years he was deputy director general of Norilsk Nickel with responsibility for economics and finance, then moved to *Rostec* as adviser to Sergey Chemezov. From *Rostec* he was parachuted into *AvtoVAZ*, initially as first executive director, then for four years in the driving seat as president. In October 2013 he moved to *Roscosmos*, at first as deputy head. He was briefly director general of the Joint Rocket and Space Corporation, before moving back as head of *Roscosmos*. In August 2015 he was replaced by Alexander Ivanov, who had previously served at the Plesetsk Cosmodrome and was briefly an army chief as deputy commander of the Space Forces with special responsibility for armaments. Then, on 28 December 2015, Vladimir Putin issued Decree No. 666, abolishing the Federal Space Agency. Its functions were taken over by the already established *Roscosmos*, whose director general was, yes, Igor Komarov. From an economics department, to the National Reserve Bank, to Norilsk Nickel, to *Rostec* and *AvtoVAZ* are undoubtedly landmarks in a dazzling career, only not one with anything to do with space.

No Forge, No Blacksmiths

It would be unfair to say that the only reason experts in monitoring financial flows and ‘effective managers’ who failed to turn around *ArtoVAZ* or *Uralvagonzavod* are being launched into orbit in the space industry is to assist in carving up the space budget cake. ‘Effective managers’ are the last straw for the Kremlin to clutch at in a completely hopeless situation: they have no other qualified senior people. Igor Marinin, the editor of *Space News (Novosti kosmonavtiki)*, has warned there is no reserve of leaders, and indeed a catastrophic shortage of directors and chief designers in the space industry.

The root of the problem is a lack of experienced middle managers in their 40s and 50s. Design offices are not infrequently directed by very elderly people, by non-professionals, or by engineers in their early thirties who lack the practical experience and maturity essential for doing the job. In reality these young people are not directing but themselves still learning; that, according to Marinin, is the situation throughout the space industry. It is even worse, he suggests, when military personnel are appointed as designers who have never been near a design college or otherwise educated in design. Not even that option is really available: the last few military space experts have all but vanished and will not be replaced. The forges which produced them were closed down during the so-called military reform carried out under Anatoly Serdyukov and continued under Sergey Shoygu. That is why we are seeing citizens appointed as designers whose training and experience are in accountancy. Someone with that background may be well qualified to keep a wary eye on financial flows, but we can be sure they won’t be designing any space rockets or orbiting space stations.

The situation with staff at lower levels of the space industry, the people who actually assemble the rockets and satellites, is also nothing short of disastrous. The most qualified, highly experienced people, on whom everything depends, are disappearing from the production facilities for several obvious reasons: some are reaching retirement age, and the rest are being paid derisory salaries. Equally obvious is the reason why talented young people were not entering the space industry: the system for training them had been effectively destroyed. Recently, we are told, young people have started coming back, but that will not address the deficit of skilled and experienced workers in the 30-50 age range, only a few of whom are left.

The high churn rate of those responsible for developing the Russian space industry only confirms it is in deep trouble. Accidents are the most visible sign of this and, in 2015, there were three major incidents which have seriously undermined confidence. On 5 December 2015, a Soyuz-2.1v carrier rocket taking off from the Plesetsk Cosmodrome succeeded in putting two military satellites in space, but one failed to separate from its upper stage and had to be written off. Earlier that year, on 16 May, another malfunction put paid to an attempt to launch a Proton-M rocket from Baikonur to loft a Mexican communications satellite: the satellite, along with the third and fourth stages of the rocket, crashed back to earth in Chita province, evidently owing to a failure of the navigation system. On 28 April 2015, the launch of a Soyuz-2.1a carrier rocket from Baikonur ended in disaster, with the loss of a Progress M-27M spacecraft due to deliver cargo to the International Space Station. This failure will have cost the Russian treasury at least five billion rubles.

The year before, in May 2014, an Ekspress-AM4R telecommunications satellite, launched from Baikonur using a Proton-M carrier, had also been lost. Before that, on 2 July 2013, the ‘highly spectacular’ crash of a Proton-M carrier was shown live from Baikonur on television. The rocket was to have put three GLONASS navigation satellites into space, but 10 seconds into the launch it

suddenly veered off course. The commentator just had time to say, 'Something seems to be going wrong,' before the rocket exploded.

Here again, the loss was over five billion rubles. The enquiry into the disaster led to a major scandal: if the official report can be believed, as far back as 2011 when the carrier was being assembled at the M.V. Khrunichev State Space Research and Production Centre, the angular rate sensors were installed incorrectly. Blame was laid on Denis Grishin, a specialist products electrician who had just begun working at the facility after graduation; this was only the second time he had performed such an installation. Other 'saboteurs' included a technician and a supervisor. The armed forces' representative at the facility was accused of negligence, but the enquiry found no grounds to rebuke the, no doubt highly effective, managers of the centre or the captains of the space industry.

Audits from the National Audit Office

Praise where praise is due: the National Audit Office has long had an eye on the doings of the heirs of Korolev and Gagarin and seems to have been the first to recognize that the Russian space industry is in reality a black hole. Back in September 2007, Sergey Stepashin, the Audit Office chairman, announced that numerous irregularities had been found in companies associated with *Roscosmos*. He calculated that Russia had lost hundreds of billions of US dollars owing to the industry's ineffectiveness in protecting intellectual property rights. On 14 December 2007, the Audit Office's Board blasted *Roscosmos* and all its works, and concluded that the Russian space industry was a world leader in generating new technologies, but that 'the profits from commercialization of the most competitive space technologies are not repatriated.' At this time the auditors also uncovered various offshore companies, and complete chaos in *Roscosmos*'s financial records: of 83 organizations accountable to *Roscosmos*, only 19 had submitted full reports and accounts.

In May - August 2009, the Audit Office published the report of an extensive inspection of how state funding for the Federal Space Programme was being used. The Russian satellite group had no space relay devices of its own; the payload in most Russian communication satellites was manufactured abroad; the orbital group of geostationary satellites provided no coverage for 'users in the vast subpolar regions of the Russian Federation', and this had led directly to delay in bringing them a range of technologies and services available to those residing in the rest of Russia.

It was only in 2013, however, that the Audit Office began uncovering truly outrageous facts. In July of that year the lengthy title of a report on an audit by the Office reads as though it might relate to a legal verdict: 'Inspection of the effectiveness of the application of public resources for the development of activities in space in the Russian Federation, as well as of the extent to which the proprietary interests of the Russian Federation in the establishment and functioning of joint ventures in the space industry have been respected'. The Audit Office, which Tatiana Golikova took over that year from Stepashin, revealed that, despite an almost 250% increase between 2006 and 2015 in the funding of the Russian Federal Space Programme, 'its performance is extremely poor'.

The Audit Office was particularly incensed by the saga of the Angara carrier rocket. It noted that this project had been under development for a world record-breaking 20 years and more but that, despite the incalculable sums invested in it, the vehicle was, to all intents and purposes, not yet ready. There was, admittedly, one prototype. The report states in black and white that the levels of corruption are truly 'cosmic', and the inspectors surmise that activities funded by the budget 'are prioritized according to the narrowly commercial interests of particular organizations'. These

typically have 'opaque mechanisms for allocating budget funds' and 'a blurring of responsibility for the outcomes of funds invested'. This, in turn, frequently leads to the funding of 'obsolescent or obsolete production facilities', which prevents fulfilment of 'the tasks assigned to the rocket and space industry'. The report also cautiously indicates one of the techniques for siphoning funds abroad. According to the Audit Office, the supplying of Russian engines for space rockets through RD Amross, a Russo-American joint enterprise, leads to the profits remaining in the US rather than being repatriated to Russia. '*Roscosmos*,' the Audit Office concludes, 'is both one of the largest and one of the least disciplined organizations in the field of public procurement, openly flouting legal requirements and best practice.'

In January 2015, Tatiana Golikova stated that cost overruns in constructing the ground infrastructure of the Vostochny Cosmodrome amounted to more than 13 billion rubles. At the same time, it transpired that workers building the cosmodrome were not being paid for months at a time. They went on strike in March 2015, and in April announced a hunger strike. This is probably why it was decided to draft in, to assist with construction of the cosmodrome, a student brigade! In June 2015, when the Audit Office published a new report on *Roscosmos*, the financial irregularities discovered now totalled 92.9 billion rubles. Given that in 2014 the space industry was allocated an overall budget of some 180 billion rubles, it seems that just over half that amount had been used not quite as intended.

Requiem for the Russian Cosmos

Cosmic corruption is a consequence, not even of the general state of the space industry, but of the overall structure of state power in Russia. We have to face the fact that people had their fingers in the till, helping themselves to the state budget at the first opportunity, both under the tsars and under Stalin: it is a concomitant of an authoritarian state. In spite of that, people in Russia managed from time to time to come up with something, sometimes even making it outstandingly well, if only in the military sphere: guns, tanks, ships, planes, missiles ... Occasionally there was something really extraordinary, like the great space breakthrough. Suddenly, however, the space effort, which was once a source of such pride and delight in the Soviet Union, deflated. 'Russia is no longer a power in space.' Sergey Ivanov, promoted from Minister of Defense to First Deputy Prime Minister, said in 2007, 'Our national industry has effectively lost its capacity to develop and manufacture a significant proportion of the devices and components required.' This was why development engineers had no option but to purchase them abroad, and why Russian satellites now consist almost 80% of imported components.

That is absolutely true, but Sergey Ivanov is nevertheless being disingenuous in one crucial respect: Russia never was a space power: the space power was the Soviet Union. The collapse of the USSR meant not only that it fragmented into 15 new states, but also that the entire Soviet aerospace industry fell apart. The rupture was not confined to economic ties but extended to the whole network of links between and within industries. The Soviet Union's main launch site at Baikonur was now in Kazakhstan, and the Plesetsk site in the north of Russia was an inadequate replacement. Additionally, a whole raft of design offices, research institutes, industries and sources of raw materials essential to the Soviet project of 'storming the cosmos' were now in Belarus, Ukraine, Kazakhstan, or Kyrgyzstan, together, of course, with their personnel. The RSFSR did inherit a large proportion of the USSR's space facilities, but it was still only a proportion, and the launch infrastructure for manned space flights, for example, was now entirely outside the borders of Russia.

For some time it was possible to hold out by feeding off Soviet stocks and cannibalizing Soviet designs, as was duly done.

In the USSR, the space industry was an integral part of the military-industrial complex and inextricably tied up with something which had nothing to do with space exploration. Like the rest of the Soviet military-industrial complex, it was an offshoot of the Stalinist mobilized economy, honed by global confrontation with the United States. When the Soviet colossus collapsed, one of its lumps, the Russian Federation, was no longer capable on its own of competing in space with the United States, and in any case the motive for doing so was gone. A vast Soviet legacy remained, but it could not last forever and the time came when it ran out. The lagging behind in technological modernization of industry, observable already in the 1960s, only worsened with the passage of time.

The collapse of the former Soviet space industry was inevitable, not least because it was an integral part of the state defence industry. The US space industry, although firmly guided by the state, has always been a great conglomerate of private manufacturers and enterprises for whom lucrative space-related orders from the state are only a part, if an important part, of their businesses. They could perfectly well survive without these orders, just as the state can perfectly well flexibly order the same components from a different manufacturer. In the USSR, on the other hand, everything was one-off, unique, specific, under the direction of the state. When that state disintegrated, the manufacturers in the space industry were redundant. They did not know how, and had never been allowed, to make anything other than the 'widget' they had been set up to manufacture. They were in turn themselves dependent on a severely restricted range of suppliers of raw materials and components, decreed from above and refined over decades. That circle suddenly fell apart and the socialist state itself was turned into a market economy; more precisely, it was turned into an authoritarian corporatist state where 'public property', including almost the entire space industry, was looted and carried off to privately owned companies by 'effective managers'.

On Saturday 12 March 2016, the launch of a Soyuz-2.1b carrier rocket was aborted. The *Roscosmos* website reports that an engine was automatically switched off during the countdown.



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