



# European–Russian Space Cooperation

From de Gaulle to ExoMars

Brian Harvey

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Back cover image: ExoMars team with Proton Rocket. Credit: ESA.

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## **Author's introduction**

The long story of space exploration has traditionally been dominated by a narrative of Russian-American competition and rivalry, now replaced by their cooperation together in the world's largest collaborative engineering project, the International Space Station (ISS). Often overlooked is the level of cooperation between Russia and the third power to reach space, Europe. The first collaborative ventures between the Soviet Union and European countries, primarily France, date to the early 1960s and such projects became increasingly structured as time passed. The cold war liaisons of the Soviet period gave way to joint enterprises in which European astronauts flew to Russian space stations, the Soyuz rocket found a new home in European territory in the South American jungle and science missions were flown to study the deep space universe. Their climax was the joint, two-part ExoMars mission to explore Mars, the detailed planning for which began in 2012 and whose first launch took place in 2016.

The story of European-Russian cooperation is little known and its importance undervalued. Because France was the initial and principal interlocutor for this venture, language barriers meant that this cooperation did not receive the attention it deserved in English language publications. This book looks at how that relationship evolved; what factors – scientific, political and industrial – most drove it; who gained most; which countries participated most and least – and why – and the scientific and other outcomes, climaxing in their joint exploration of Mars from 2016. Although the primary focus is on the technical aspects and outcomes of cooperation, the relationship is set within the wider diplomatic contexts of the cold war, the triangle of Russian-European-American interactions, the sanctions regime reintroduced from 2014 and the other elements that strained the relationships between the two sides. Cooperation was often controversial and even difficult at times. The analysis suggests that there were substantial gains in science and industrial efficiency and that the alternative of non-cooperation had its own costs.

To explore this long and complex narrative, a combination of a thematic and historical approach is applied. The first chapter, *Early days*, traces Russian-European cooperation to the 1966 agreement arising from the landmark visit to the Soviet Union by French President Charles de Gaulle. It examines the early outcomes, namely sounding rockets and the inclusion of French instruments on missions to the Moon and Mars. The chapter also sets such cooperation in the context of France's distinctive foreign policy in the 1960s. The second chapter, *Scientific cooperation*, looks at how the 1966 agreement matured through successful space science projects between France and the USSR in the 1970s, expanded to Germany and the European Space Agency in the 1980s and has continued right up to recent successful projects such as Spektr RG. The next logical area of cooperation was manned or piloted flight (*Chapter 3: Human spaceflight*), developed initially by France – though not without political tension – then Germany and then the European Space Agency countries and which endures to this day on the International Space Station. *Chapter 4: Industrial cooperation* looks at the industrial field, especially launchers, with the most visible form of cooperation being the use of the Soyuz rocket at the European rocket base in Guyana. Chapter 5 records the most integrated and contemporary of all cooperative projects, the two-part joint ExoMars project to send orbiters, landers and a rover to the planet Mars, a project that came under threat as a result of the political tensions that developed from 2014. Finally, chapter 6 comes to conclusions about the experience and what has been learned of the science, industry, diplomacy, politics and practicalities of cooperation.

For convenience, 'Europe' is defined here as what might be called 'western Europe' prior to 1991 and thereafter all of Europe from the Baltic states and Poland westward. This is normally synonymous with – but by no means limited to – European Union and European Space Agency countries. This is not to deny the European vocation of those European countries in the USSR and the socialist block, but they have been covered in the literature on the Soviet programme. Readers seeking information on pre-1991 cooperative Russian-European missions – including those of the socialist block – should read Zakutnyaya, Olga and this writer: *Russian space probes* (Praxis/Springer, 2011) and Burgess, Colin & Vis, Bert: *Interkosmos – the eastern block's early space programme* (Praxis/Springer, 2016).

Two principal currencies are used: the Russian rouble (R) and the European euro (€) or its predecessor currency used by the European Union, the European Currency Unit (ECU). For convenience, the word 'Russia' refers to both the USSR or Soviet Union (1922–91) or the Russian Federation (1992–) and the people living therein as 'Russians'. However, the specific political terms will be used when the context requires.

**Brian Harvey,  
Dublin, Ireland, 2020**

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*To Judith; Valerie and Alistair; Charlie and Robyn; and Justin*

## About the Author

**Brian Harvey** is a writer and broadcaster on space flight who lives in Dublin, Ireland. He has a degree in history and political science from Dublin University (Trinity College) and an MA from University College Dublin. His first book was *Race into space – the Soviet space programme* (Ellis Horwood, 1988), followed by further books on the Russian, Chinese, European, Indian and Japanese space programs. His books and chapters have been translated into Russian, Chinese and Korean.

# 1



## Early days

European-Russian cooperation in spaceflight began on a hot summer's day, 20 June 1966, when a sleek French air force Caravelle passenger jet touched down at the newly built glass-and-steel terminal at Vnukovo airport, Moscow. The Caravelle was escorted in by a flight of MiG jets which quickly departed for their home airfields. Down the steps came the unmistakable, tall figure of the President of France, General Charles de Gaulle, accompanied by Madame Yvonne de Gaulle and their son Philippe, along with foreign minister Maurice Couve de Murville. They had scarcely been greeted by President Nikolai Podgorny, prime minister Alexei Kosygin and a guard of honour when a gun salute crashed out and a Russian military band struck up the *Marseillaise*. The visitors drove into the city in an open top black car, with the flags of each country on its wings. The glorious sunny weather was to last almost all of the next week. First there was a visit to the Bolshoi theatre and then Moscow Lomonosov state university, before the visitors travelled on 23 June to the capital of Siberia, Novosibirsk, Akademgorodok (the town for scientists) with its rows of apartments and riverside birch trees.

This was not the general's first visit. He had arrived in Moscow in 1944 as leader of the Free French by a long roundabout train journey via Baku. A hundred Free French pilots, the Normandie Niemen squadron, fought in the Red Air Force and would subsequently have 144 schools named after them. Earlier, when de Gaulle was a prisoner of war in Germany in 1917, a fellow prisoner was Mikhail Tukhachevsky, later Stalin's top marshal, so he had first-hand acquaintance with Russia [1]. Aviation links between Russia and France stretched back to the early 20th century [2].

The high point of the visit was on 25 June, when the President became the first westerner to visit the Soviet Union's main cosmodrome, Baikonour, in the heart of the Kazakhstan desert. The film record of his visit there is sparse, though that is

## 2 Early days

hardly surprising given the officially secret nature of the base. Once off the plane, de Gaulle was driven in another black car, using his hat to shield himself from the bright sunshine. He was then taken to a viewing area, where he saw a rocket heading skyward amidst billowing smoke. This was later identified as a weather satellite, Cosmos 122, using a Vostok 2M rocket. His son Philippe saw the launch alongside his father, exclaiming *Collosal! Collosal!* (translatable into contemporary American English as *Awesome! Awesome!*). Accompanying them were his *aide de camp*, Admiral François Flohic and Maurice Couve de Murville.



**President Charles de Gaulle. Bundesarchiv.**

Next, the French president met a visiting delegation from Warsaw Pact countries and the legendary Soviet designer Mikhail Yangel, who was there for the launch of one of his missiles. One account says that de Gaulle was the only person to see the launch itself and that the rest of the French delegation (some of whom might have been able to assess the rocket) were kept busy at another function. They were then brought to the town of Leninsk, home of the workers on the base. It was renamed for the day as Zvezdograd ('Star Town'), which in reality was the name of the cosmonaut training and living centre in Moscow, though nobody outside the space programme knew that at the time. The town got a facelift, with roads resurfaced, paint applied and fences fixed. The *aide de camp* commented on how the local population was unusually young, masculine and short-haired, suggesting that the military there had been taken out of uniform to present themselves

as a welcoming party. The whole visit was meticulously organized, with the Soviet authorities giving the operation the name ‘Palm Tree’: this was designated ‘Palm Tree number 1’ [3].

The rest of the president’s visit to the Soviet Union went equally well. The next day, his delegation flew to Leningrad, where their Soviet hosts thoughtfully arranged for them to attend mass at the Church of Notre Dame de Lourdes. Then it was on to Kiev and Volograd, with solemn moments to lay wreaths at the war memorials to the band music of Chopin’s funeral march. There were meet-the-people walkabouts, a visit to a power station on the Volga and even a mock tank battle (de Gaulle had been a tank commander and they had shared experiences of taking on German panzers). The diplomatic high point of the visit came on 30 June back in Moscow: two agreements, one on space cooperation, the other on scientific, technical and economic cooperation, along with a permanent Franco-Soviet Commission and a hot line between the Kremlin and the Elysée palace, presumably to match that between the Kremlin and the White House. The agreements were signed in the Kremlin and co-signed by the two foreign ministers, Andrei Gromyko and Couve de Murville. De Gaulle returned to France on 1 July. Both sides agreed that it had been a triumph, the diplomatic story of the year. A 42-minute documentary was later made about the visit by Jean Lanzi for ina.fr, *Voyage en URSS*. In another footnote, a French company got the contract to build the landmark modern high-rise Kosmos hotel beside the space memorial. There is an imposing statue of the general outside.



Statue of President Charles de Gaulle at Hotel Kosmos

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Fifty years later, in 2016, de Gaulle's visit was marked in Kazakhstan's then capital, Astana, at its National Space Centre, with an event organized by the country's Aerospace committee and attended by Kazakh cosmonaut Aydin Aimbetov and the first secretary of the Communist Party of Kazakhstan, Dinmukhamed Kunayev. There was an exhibition, which included postage stamps, a model of the first French satellite, Astérix, plus photographs of the 1966 visit. The French side involved the embassy, the Alliance française, President of the Fondation Charles de Gaulle, Jacques Godfrain and representatives of Space City Toulouse and Airbus.

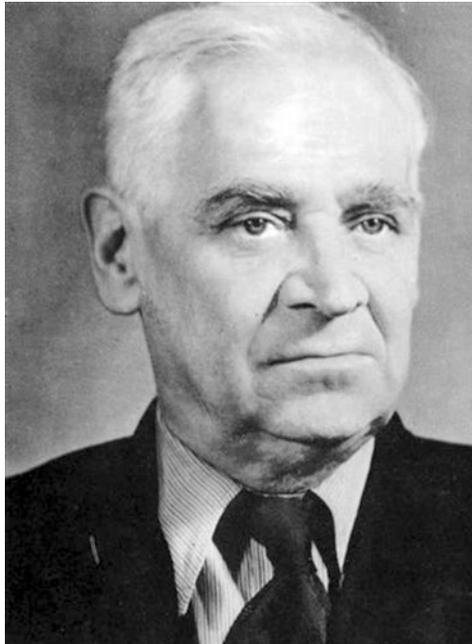
### Origins

While 1966 may have been the landmark year, the origins of European-Russian cooperation in space can be traced further back. From the start, the USSR participated in the International Astronautical Federation Congresses, whose first annual conference was held in Paris in 1950, so this offered an early opportunity for European space experts to meet and mingle with their Soviet counterparts. Indeed, the announcement of the launch of Sputnik was made just as delegates were gathering at the 1957 congress in Barcelona, Spain. Shortly afterwards, the Committee on Space Research (COSPAR) was formed as an international meeting place for space scientists, to enable them to meet outside the confines of government supervision. During the early days of what we now call the space race, there was a remarkably high level of cooperation that might seem surprising today. The two great, rival radiation scientists of their day, James Van Allen and Sergei Vernov, invited one another for lecture tours in their respective countries. As the cold war dragged on, however, such cooperation came to be regarded more suspiciously, certainly on the American side.

Soviet-French cooperation had an early personal and linguistic form in the character and life of Ari Sternfeld (1905–80). He was a Pole who lived his early professional life in France, where he was a mechanical engineer turned populariser of spaceflight. A supporter of the Communist movement, he wrote for the daily *L'Humanité* and, with shockingly bad timing, moved to Moscow in 1935. His main text was *Initiation à la cosmonautique (Initiation to cosmonautics)*, published in Russian in 1937, thereby inventing and introducing the word 'cosmonautics' as the distinctive path followed by the USSR. Presciently, he wrote *Artificial satellites of the Earth* in 1956 and his writing became enormously popular. In 1962, on the first anniversary of Yuri Gagarin's flight, the Soviet government ruled that a space 'man' was called a 'cosmonaut', a term also confirmed by the Academie Française in 1969 [4].

In March 1959 at COSPAR, the United States publicly offered to fly European payloads into orbit – principally using the small Scout rocket – an offer quickly taken up by Britain (Ariel, 1962), France and Italy. While this was a generous gesture in the heady, early days of space exploration, retrospective analysis suggests that the US was also motivated by the desire to keep any moves into the space field by Europe within the American, rather than the Soviet orbit [5].

At the meeting of COSPAR the following year, 1960, French space scientist Jacques Blamont cheekily asked the President of the Soviet Academy of Sciences, former artillery general Anatoli Blagonravov, whether the USSR would give France a place aboard one of its rockets. Nothing came of this immediately, but on 16 January 1961, Blagonravov made just such an offer. Nobody is really sure where, but it was picked up by *Le Monde* newspaper, so it was something that the government could not ignore. The timing was good, because April saw the flight of Yuri Gagarin which, as in the rest of the world, was a sensation in France. A sports centre in Marseille was named after Gagarin only two weeks later, followed by streets and schools, especially in those towns where the Communist Party was strong. Despite its image of secrecy, the Soviet Union attempted to make several gestures of openness, for example in giving two Australian journalists, Anthony Purdy and Wilfred Burchitt, a bird's eye view of its programme in 1961 [6]. On 27 September 1963, Gagarin arrived in France in a Tupolev 104 jetliner for the International Astronautical Congress in Paris and subsequently toured the country. He made another visit two years later for the Paris Air Show, where he met the prime minister, Georges Pompidou and flew a Caravelle jetliner into Toulouse Blagnac airfield. During the air show, French aviation journalists managed to organize an invitation for a tour of Soviet facilities, which duly took place in 1966. Gagarin made a third trip in September 1967, as part of worldwide ceremonies to mark the 50th anniversary of the 1917 revolution. He was followed to Paris by the first woman in space, Valentina Tereshkova, who was likewise given a rapturous welcome.



**Anatoli Blagonravov**

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At this stage, political and diplomatic factors came into play which set the context for cooperation in spaceflight. A diplomatic rapprochement between France and the USSR began, with respective foreign minister visits by Couve de Murville and Andrei Gromyko. There was also a brief moment of opportunity for détente in 1963, in the aftermath of the Cuban missile crisis. The United States and Soviet Union signed the nuclear test ban treaty that year and on 10 June, US President John F. Kennedy made what many consider to be his least well-known but most remarkable public address, *Strategy for peace*, a text that would make salutary reading to this day. He proposed a reconciliation with the USSR in a speech which so moved his rival, General Secretary Nikita Khrushchev, that he asked for the entire text, unedited, to be circulated across the Soviet media. That October, the opening rounds of discussions began on America's Moon project becoming a joint venture with the USSR and progress was being made at the very moment Kennedy was assassinated. His successor, Lyndon B. Johnson, was much less interested in détente and the Vietnam war caused a hardening of positions.

De Gaulle in effect resumed where John F. Kennedy (whom he greatly respected and was terribly shaken by his death) left off. De Gaulle had his own reasons too, for he saw his role as rebuilding France as a great European nation in the aftermath of the war and the political uncertainty of the Fourth Republic. De Gaulle designed a policy of independence and equilibrium: independence from the Atlantic world of Britain and the United States; promoting equilibrium between east and west. He spoke of the importance of a less bipolar world and of France being less dependent on the US, with an 'opening to the east'. In 1965, he was re-elected president and on 7 March 1966, to demonstrate independence and equilibrium, he withdrew France from the NATO command. France also took its own line with China. Although the government of the Fourth Republic did not formally recognize the government of the People's Republic of China (PRC) in 1949, it nevertheless maintained lines of communication. In 1962, de Gaulle initiated the process that would lead to formal recognition of the PRC – with the exchange of full ambassadors – on 27 January 1964. France wanted to be seen to be even-handed in dealing with the space superpowers and prepared to demonstrate its independence, recognizing that the Soviet space programme offered opportunities not available in the United States. De Gaulle was very clear that he did not want the kind of 'special relationship' that the United States had with Britain, which he regarded as subservience by the latter.

The withdrawal of France from the NATO command was criticized both at home and abroad, but de Gaulle was by no means uncritical of the USSR. He declined to sign a much closer 'treaty of assistance and friendship' (a form of 'best friend' or even ally status), refused to recognize the German Democratic Republic (GDR) and, in Gdansk in September 1967, encouraged Poland to shake off Soviet

domination. He spoke of a 'greater Europe from the Atlantic to the Urals', an idea re-invented, equally unsuccessfully, as 'the common European home' by Mikhail Gorbachev in the 1980s [7].

While de Gaulle's policies, especially the withdrawal from NATO, infuriated the Americans and British and created fears that the USSR would use the French connection to weaken NATO, de Gaulle always made clear his affirmation of 'France first', not least through the independent French nuclear deterrent which, unlike the British one, did not operate a dual control system with the Americans. Neither de Gaulle nor his successor Georges Pompidou were ever going to weaken NATO fatally – France found its way back in – nor the European Communities, which France led.

This was the backdrop to a visit to the Soviet Academy of Sciences in 1964 by Gaston Palewski, Minister of State for Scientific Research and Atomic and Space Questions, which included a meeting with Nikita Khrushchev. Space cooperation was also discussed in Paris when General de Gaulle received Soviet foreign minister Andrei Gromyko on 27 April 1965. On 1 July, Gromyko sent a memo to the French ambassador in Moscow, Philippe Baudet, which began the paperwork for formalizing some kind of relationship in the space field. In the meantime, France and the USSR signed an agreement for cooperation in nuclear energy.

In October 1965, a Soviet delegation led by Leonid Sedov, a leading member of the International Astronautical Federation, visited the French space agency, the Centre Nationale d'Études Spatiales (CNES) in Paris to see what might be possible. The French felt that they were working in the dark regarding both the preparedness of the USSR to cooperate and what the practical limits were, so they decided to bring matters to a head at a meeting between Sedov and the head of the French space agency, Robert Aubinière. The French foreign ministry supplied a Russian aristocrat, Prince Konstantin Andronikov, as interpreter, who combined elegance with a perfect knowledge of the two languages. Sedov told the French that they could ask for any mission: there were no limits. This was welcome, because Soviet rockets were powerful whereas both the small French Diamant and the American Scout launchers limited their satellites to only 150 kg.

The French were astounded when the USSR suggested launching for France a high-altitude (40,000 km) scientific satellite, a communications satellite and a lunar orbiting probe, something that had not yet been done. This was far beyond France's technical capacities, not to mention budget. The Quai d'Orsay, the French Ministry for Foreign Affairs, described this as 'extremely ambitious'. Prime Minister Georges Pompidou recoiled, telling his minister for space affairs, Alan Peyrefite, that they were getting carried away if they thought they could do this.

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A formal text was sent to Paris by Andrei Gromyko on 17 March 1966. This was followed by a delegation of CNES president Jean Coulomb and his scientific advisor Jacques Blamont (scientific and technical director, CNES, 1962–76) heading to the USSR the following month. In advance, the French government advised them to limit themselves to ‘a little science, some meteorology and no communications’. When they arrived in Moscow, the CNES delegation was accommodated in the skyscraper hotel *Ukrainia*, with its infrequent lifts, *dezhurniyas* (floor managers) and slow service in the crystalline restaurant. They were taken to meet Mstislav Keldysh (1911–1978), later to become President of the Academy of Sciences, together with all the key figures of the Soviet space science programme, in a big hall under the watchful eye of a portrait of Peter the Great. Keldysh not only came from a highly educated family of engineers and mathematicians, he also spoke perfect French. He spoke to the delegates about how he would like to undertake a joint mission to Mars, carrying an instrument for detecting life. The French were taken aback a second time, not with any offer but with an invitation for a state visit to the Baikonour cosmodrome.



Hotel Ukraina. CC Gennadiy Grachev

The idea of cooperation in spaceflight was probably something that appealed to General de Gaulle, not out of any rosy notions of exploring the cosmos, but because he saw it as part of his country's process of national modernization. Ever since 1939, when the Centre National de la Recherche Scientifique (CNRS) was established by President Albert Lebrun, the French state had taken a directing role in science in a way unimaginable in the Atlantic world. CNRS became an empire of public service institutes and laboratories. It now boasts over 30,000 scientists and engineers and is adjudged one of the most prestigious, highest-performing scientific bodies in the world. De Gaulle was keen to complete the process of recovery from the scarring effects of the war on the economy, infrastructure and politics. He was an old man in a hurry, who desired a new republic in which France would have a leadership position in Europe, build a strong defence and modernize, reconstructing its railways, aircraft industry, airlines and its scientific and technological capacity. Although an economic conservative – his electoral foe was the socialist party candidate François Mitterrand – de Gaulle was a strong believer in the state directing investment into key industrial and scientific areas and locations, aided by state agencies and enterprises; what we call *dirigisme*. The government directed that its industrial base should be the capital of the backwater south-west, a deliberate – and successful – attempt to reinvigorate provincial areas. In 1964, his prime minister, Georges Pompidou, approved the construction of a French launch base in Guyana, which General de Gaulle visited the following year and announced that it would be 'the site of a great French undertaking, one that would be recognized throughout the world'. The following year, France launched its first satellite. So, space fitted in well with de Gaulle's ideal of a resurgent, modern France.

The French decision to set up a space programme was made at a remarkably short meeting of the government of prime minister Michel Debré in 1961, which de Gaulle concluded by saying 'just do it!' before walking out. The French space agency, CNES, was set up by year's end. France had a three-pronged strategy of developing its own national space industry (CNES), working with 'Les Grands' (the USA and USSR) and building a European space industry. The latter turned out to be the most difficult part, not least because of low spending by Germany and Britain's lack of interest (Britain did not set up a space agency until 2010). At CNES, Jacques Blamont pondered the reasons for the Soviet advances. They wanted western technology and they could offer their powerful rockets. They would not talk to the Germans, while the British were hostile and in the American camp, so this left only the French. Long-standing links between the French and Russian intelligentsia helped.



CNES

Despite political backing from the very top, French space scientists faced an on-going challenge to win political support, for space activities in general and cooperative efforts in particular later. Prime minister Georges Pompidou made it clear that, in his opinion, it would all cost too much. ‘We can do something, but around the Earth. Missions further afield: that’s for the big powers. We have to look after the [war] veterans’, he warned.

In the meantime, the story of Soviet-French cooperation is interrupted by a detour into what could have been an important strand of Soviet-British cooperation. Britain had one great asset: the most powerful radio telescope in the world.

### **Soviet-British cooperation: Bernard Lovell, Alla Masevich**

Given France’s pre-eminence, it is now difficult to imagine that Britain had long been seen as the country most likely to lead European space cooperation. Britain had been the world leader in what we would now call electronics and its radar systems had played a key role in winning the Battle of Britain in 1940. Determined to maintain this lead, its scientists constructed what for a long time was the world’s largest radio telescope, Jodrell Bank near Manchester, directed by Bernard Lovell (1913–2012). Jodrell Bank had tried to follow the first Sputnik, eventually picking up its signals as it passed over the Lake District on 12 October 1957. This led to a request for the tapes from Russia on 25 October. Two years later and tired of

international allegations that its Moon flights were a hoax, the Soviet Union asked Jodrell Bank to track the Second Cosmic ship (Luna 2) as it approached the Moon. Jodrell Bank would be able to provide independent verification that they had actually reached the Moon, which it duly did. Jodrell Bank also assisted the Americans with tracking their Moon shots, but less well known was its role in the American-British early warning system against Soviet missile attack.



**Jodrell Bank. CC Mattbuck.**

When the first Soviet spacecraft to Venus broke down after only a few days in February 1961, the USSR dispatched one of its top scientists to attempt to regain contact. She was Dr Alla Masevich (1918–2008). Born in Tiflis, Georgia, to a wealthy family with a Polish and French background, at school Masevich was inspired by the space writings of Yakov Perelman, with whom she had a lengthy correspondence. She graduated in physics from Moscow University in 1941, going into metallurgy during wartime but beginning the astrophysics career she always hoped for straight after. She became Professor of Astrophysics at Moscow University in 1956 and was charged the following year with devising the tracking system for the first Sputnik, which used a combination of optical and radio tracking. She could speak four languages and became involved in developing scientific contacts abroad, so she was well qualified, both linguistically and technically, for the Jodrell Bank assignment. Later, she became professor of space geodesy,

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authored key texts on stellar evolution and was rated one of the ten most influential Russian women of her time. Despite her tsarist-period background, Masevich was a party member and trusted by the authorities to travel abroad, journeying to the International Astronomical Union in Rome in 1952. In 1953, she made waves when she denounced the steady state theory of the universe [8].

Jodrell Bank was immediately asked to assist in finding the Venus probe and listened in for signals on 4 and 5 March, once more for a Venus flyby on 19 May and again thereafter. Alla Masevich travelled to Manchester with a colleague, Jouli Khodarev, on 9 June 1961, spending several weeks trying to recover signals. They did indeed pick up weak signals on 11–12 June from the expected location, but they were not from the spacecraft. Their final attempts were on 20 June, after which the two Russians returned home.



Alla Masevich. CC Josef Blažej

The USSR reciprocated by inviting Bernard Lovell to visit Russia. This was the highest profile visit by any European scientist. It was directed by Jouli Khodarev and guided by Alla Masevich, who also acted as his interpreter. Lovell arrived on 25 June and spent the first two days at Moscow University and the Academy of Sciences. On the third day, he flew to Crimea, where he spent four days visiting its tracking facilities, notably the deep space tracking antennae. The main one was called ‘the battleship’ because it was built from left-over ship parts (the same was true of parts of Jodrell Bank). Lovell was the first westerner to see the facilities, with no one else getting such an opportunity for at least 20 years. He was not

allowed to take photographs and was asked not to disclose its exact location (though the Americans already knew it). While there, Lovell made an agreement for cooperation between Jodrell Bank and the Crimean Astrophysical Observatory over radio observations of the stars and planets.

The Bernard Lovell visit had a number of postscripts. Firstly, he came back with the story that the USSR was not in the Moon race, which was true (the USSR did not commit itself to a Moon landing until August 1964). Secondly, the claim was made – not by him – that the Russians had tried to persuade him to defect. It is certainly possible that they offered to build him a radio telescope, with no expense spared, which he could direct, but there did not appear to be a condition that he would forever have to live there, so the term ‘defect’ may not be appropriate. Thirdly, there was an allegation that he had been radiation-poisoned, in what was speculatively claimed was an attempt to wipe the memory of the Yevpatoria visit from his brain. Certainly, Lovell was unwell after his return, but his son later explained this as his tiredness after such a hectic visit [9]. The story was revisited after Lovell’s death when the *Daily Express* claimed that Alla Masevich had used her charms to front a KGB operation to persuade him to defect, but that he proclaimed himself to be an Englishman always loyal to his country (and the game of cricket, he might have added). The historical records have no evidence that the connection between the two was anything other than a professional friendship [10].



Bernard Lovell. CC Jodrell Bank.

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However, the 1963 visit was the basis for starting a British-USSR axis of cooperation. But just as the French-Russian romance was reaching a critical stage, the British one ended abruptly. In February 1966, Jodrell Bank picked up Luna 9's signals that sent the first photographs from the surface of the Moon and published them the next morning in the *Daily Express* before the USSR had the chance to do so. The Russians were furious and all their subsequent spacecraft sent encoded signals. Either way, a promising line of British-Russian cooperation had run its course.

### France and USSR move on

President de Gaulle's visit was a big event in European, cold war and diplomatic politics, even if it did not attract much attention in the anglophone media. This was a high-visibility break in the bipolar world, one that marked the end of the almost complete isolation of the USSR. De Gaulle returned from Moscow with his stature at home greatly enhanced. He even attracted unexpected bonus support from the political left and the intelligentsia – not his natural allies, but both sympathetic to the Soviet Union and critical of American foreign policy. As for the agreement, its precise terms were:

*The governments of France and the Soviet Union:*

- *Recognizing the importance of the study and exploration of outer space;*
- *Considering that cooperation between France and the USSR in this field will enable the extension of cooperation between the two countries and will be an expression of the traditional friendship between French and Soviet peoples;*

*have decided to prepare and implement a programme of scientific and technical cooperation between France and the USSR for the peaceful study and exploration of outer space.*

The agreement specified annual conferences, alternating between the two countries and organized by CNES and the Soviet space cooperation body, Interkosmos, respectively and, in particular:

- The study of space, with the USSR to launch a French satellite
- Cooperation in three fields: space science; meteorology and aeronomy; telecommunications
- Exchange of information, conferences, studies and exchanges of students
- Scientific information shared equally between the two parties.

Further details were agreed when Palewski's deputy, Alain Peyrefitte, visited Moscow in October 1966. There was a 'Grande Commission' of the President of CNES and the President of the Advisory Board of Interkosmos, meeting annually

to review past, present and future projects. They were assisted by four working groups: science; meteorology; medicine and biology; and communications and annual reunions. The 1966 agreement between France and the USSR was later formally renewed on 4 July 1989, specifically adding new areas of cooperation: the terrestrial environment; space vehicles (including new flights to Mir and the development of shuttles); telecommunications; and Mars. The accord was formally dated as decree 90-79 in French law on 17 January 1990. The 1966 agreement was legally replaced by a new one 30 years later on 26 November 1996, recognizing the extinction of the Soviet Union and adding industrial and commercial cooperation. There were other supplementary agreements en route (e.g. piloted flight 1979), but the original 1966 agreement is still legally on the books [11].

The annual, week-long reunions became a key part of the process of cooperation. It was agreed from the start never to meet in Moscow or Paris, but in interesting provincial locations. They chose places intended to be both suitable for meetings and scenic, visiting a new place very time (Yerevan and Ajaccio both hosted two meetings, but they were the exceptions). Two turned out to be wet: Rodez and Kishinev, while some were not well known to the other side. The French travelled not just to Leningrad or Kiev, but to Samarkand, Tbilisi, Baku, Minsk, Pitsunda, Talinn and Kaliningrad; while Soviet visitors travelled to Marseille, La Grande-Motte, Toulouse, Rambouillet, Trouville, Tours and Cannes. About 60 scientists, engineers and technicians attended from each country to review present and future programmes. Typewriters clacked throughout the night before the last day to agree the final text, which would be the bible for the next year's work. Any changes and it all had to be retyped. There was also a social programme: football matches, cruises on the Dnepr and, in Russia, concerts, ballet and opera. The Soviet side offered tours of the golden ring, Vladimir and Suzdal, while the French offered Versailles and the chateaux of the Loire. Many records of the annual reunions have photographs of happy picnics, with stories of late nights, toasts and vodka. They were considered important events, being reported in the French press. The host country paid for the costs of the visitors and interpreters, with all participants given daily allowances (*per diems*).

The working methods were simply to agree projects at an annual meeting alternating between the two countries, an arrangement that is still in effect. All scientific results of cooperation would be shared and the principle of 'no exchange of funds' adhered to (human spaceflight later became an exception). CNES dealt with Interkosmos, the body attached to the Academy of Sciences that dealt with all cooperating countries, both in the socialist block and further afield. It was originally headed by Boris Petrov (1966–80), then by Vladimir Kotelnikov, the Director of Radio and Electronic Engineering and an expert in planetary radars. With an initial 12 or so administrative staff, it had the full confidence of the government which did not interfere in its operations. At government level, the French found themselves dealing with Vladlen Vereschetin, his first name being a

concatenation of ‘Vladimir’ and ‘Lenin’. Neither a scientist nor engineer, this brilliant, omniscient administrator was able to get all the paperwork through the highest levels of government.

The French found some of the Soviet working methods challenging, especially compared to the Americans. They could only meet with scientists and did not have access to engineers, the space industry, or industrial or launch facilities. The exact status and timetable of a joint project was difficult for the French to ascertain, as their Soviet colleagues were frustratingly vague despite being full of goodwill. On the positive side, there were never any arguments about costs or funding and the programme clearly had support at the highest levels of both governments. Procedures could be slow, however and by the 1990s, other problems began to surface as the Russian programme, though more open, began to contract in the growing economic chaos and financial issues became dominant. The French were always struck by the brilliance of the Soviet scientists, which they contrasted with the quite challenging environments – organizational, political and working conditions – in which they found themselves. There were surprises too. One western scientist recalls how discussions about flying his equipment on a Soviet spacecraft finally concluded in mid-morning. The Russians organized a celebration at which there were two ground rules: the first was that once a bottle of vodka was opened, it must be finished, which it was; the second was that vodka should not be drunk without food, so bread and pork sausage were provided.

Jacques Blamont admitted that he had no idea how to deal with the nebulous Soviet space programme. ‘They refused to explain their organization, their working methods, their plans. The function of the people we met was unknown, they were not allowed to speak of future projects and they could say little about their earlier experiments. We had to guess who was who and who did what. When we presented our ideas, we had no idea if they interested them or not. We got a yes or a no or a counter proposal.’ Later, as the annual reunions allowed each side to get to know one another better, the French pressed the Russians to explain their organization, only to be told that they did not understand it themselves. Western scientists also dealt with the institute for space research, IKI, but although it was a civilian institute it was not well-known domestically and visits were under escort. Over time, foreigners came to learn the interplay of roles between the Academy of Sciences (which included IKI) and its space committee, the ministry responsible for the space industry (the Ministry of General Machine Building), the various design bureaux responsible for spacecraft design and testing (OKBs in Russian) and the production centres (*zavod* in Russian). There was an invisible, never described, but real and complex decision-making cycle.

Over time, cooperation with France became so well developed that quite a number of the Soviet scientists had learned French (and some of the French learned Russian). Although interpreters were provided by the host countries, some

western countries were short of Russian interpreters, so exceptions were made to allow some Russian interpreters to travel to western countries accompanying their delegation, a much-prized opportunity for them.

Then there was the cold war. The French had their own (intelligence) ‘service’ present and participants departing for the USSR were briefed about not taking technical documents with them, using only fresh notebooks and assuming that rooms would be bugged. French visitors were sometimes asked to bring in medicines not available in the USSR, which they did, on one occasion even saving the life of an astronomer who was suffering from cancer. Later, others brought antidepressants not otherwise readily available. Both sides provided cash *per diems* for their guests, but for westerners there was little on which to spend money in the USSR, while the Russians saved their cash to spend in the *beriozhkas*, (foreign currency shops) on their return. In the case of one meeting in Moscow, the western scientists and engineers in the *Akademicheskaya* hotel were given a bundle of rouble notes as *per diems*: ‘It was difficult to find much on which to spend the notes, illegal to leave with them and impossible to change [them] into western currency [for which one would need documents to show how they had been acquired]. So any excess was pushed into the hands of one of the locals before leaving.’ French visitors liked to bring back caviar from the kitchen of the *Ukrainia* hotel, typically smuggled inside Lenin statues that were missed by the x-ray machines and customs officials. There was the occasional attempted honey trap of French visitors by friendly ‘students’. Some genuine romances took place, but on the Russian side they knew they could never leave the USSR legally and that defecting during one of the reunions would have bad consequences for their families. Rooms were searched when participants were attending conference sessions, or, as one French participant put it, the KGB was never very far away. When the Russians came to Erange, Sweden, in the 1970s, the Swedes quickly noticed a nervous man who did not really fit in: his job was to anticipate and prevent defections.

One of the practical problems that they had to address was data: the Russians simply handed the French magnetic tapes, but as the volume grew, this became problematical. Accordingly, a 10,700 computer was installed in Toulouse to take data direct from IKI in Moscow, with a data officer available day and night via a hotline.

How did Russians react to the arrival of the French? Those who were involved in formal cooperation entered a new world of people, ideas and travel – even fashion, for they used to compare the different French fashions afterwards. Those not involved were jealous of those who were. They had to be wary of any in their midst who might be professional stool pigeons, ready to report on those too free with their political opinions, especially under the influence of vodka or wine. Translators had to supply a report afterwards indicating any political deviations or

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anyone ‘at risk’ of defecting, with one mischievously but correctly identifying all the spies in her group and declaring them to be the most ‘at risk’. For Soviet visitors to France, there were unexpected freedoms. Roald Sagdeev stayed on two weeks after the end of a meeting to ‘edit his notes’ (at least, that was what the embassy was told). In fact, he rented a car and explored around France on his own.

The two sides developed their own circles of who-knew-what. In a discussion on the first proposed satellite, the Soviet side accidentally let it slip that the upper stage could not spin satellites before releasing them, their embarrassment being immediately and obviously visible because that was officially secret information. The information stayed tightly within the group, as ‘our secret’. IZMIRAN, the centre for terrestrial magnetism with whom they were then dealing, had no photocopier, because organizations were not permitted them in case they were used to copy documents that should not be copied. On the western side, photocopiers were on the list of prohibited exports, but still the French found a roundabout way of sending ‘repair’ parts. Over time, the French and Russian scientists became aware of who in their network knew what and what they were supposed to know and not know – a trust that was never broken.

Following the 1966 agreement, CNES proceeded to plan both a 150 kg satellite in an eccentric orbit (180,000 km), ROSEAU (Radio Observation par Satellite Excentrique à Automatisation Unique, normally written Roseau) and a lunar probe, appointing principal investigators to each. The idea of the lunar probe reached France even before de Gaulle had returned from Russia [12]. Roseau was first in the queue and the design was signed off by April 1968. There were seven instruments, of which five were called *Sondeur*, *Champs électriques*, *Radioastronomie*, *Particules* and *Rayons cosmiques*. They offered a leap forward for France, as the Diamant launcher could only put quite small payloads into low Earth orbit. The only hiccup was that the Russians refused to provide any details about their launcher, which was secret, nor would they permit the French to integrate their satellite with the Russian launcher at the pad. The embarrassed Russian scientists explained that they could not integrate their own satellites at the pad either and they appeared to know as little about their own launchers as the French. They always handed over their satellites to the military in Moscow, who took over from there. That was the last they heard until they got the good news that the satellite was in orbit.

Then came the May 1968 political crisis in France. Georges Pompidou had always been sceptical of space projects and the government blamed scientists, thinkers, researchers and intelligentsia for causing them all the political trouble that year. Roseau was cancelled in the middle of the political upheaval, along with the lunar probe. Those involved in the project were taken aback by the sudden, brutal nature of the decision, the lack of explanation and how it was communicated. Moreover, the CNES budget, which had been one million French francs