
Interview: Academician Nikolai Anfimov



A Unique Institute Charts Russia's Future in Space Science

Dr. Nikolai A. Anfimov was born on March 29, 1935 in Moscow. He graduated from the Moscow Institute of Physics and Technology in 1958, and became a Research Engineer with the Research Institute of Thermal Processes, now the Keldysh Research Center. Since 1973 he has been at the Central Research Institute of Machine Building (TsNII-Mash), and became director in February 2000. Dr. Anfimov is the head of the Coordinating Scientific and Engineering Council of the Russian Aviation and Space Agency (Rosaviakosmos), which oversees the basic and applied research investigations on board the Russian segment of the International Space Station. Dr. Anfimov has authored and co-authored over 100 scientific works in aerogasdynamics, heat transfer, thermal protection, the ground testing of spacecraft and rockets, and the integrated analysis of prospective space transportation and space systems. He is a member of the Russian Academy of Sciences. He was interviewed by Marsha Freeman on Oct. 30, 2001, in Washington, D.C.

EIR: The history of your Institute is a very long one. It is my understanding that it has been involved in every program since the start of the Soviet missile program.

Anfimov: In recent years, the military and civilian programs have been separate, but we had civilian programs at all times. Before 1992 we had no official space program for civilian purposes, only some scheme, but no long-term public documents. I'd like you to understand that there are two branches of our institute. Originally it was united, joint. It was Research Institute No. 88. Its task was to develop and to produce the first Soviet long-range ballistic missiles.

In 1956, Sergei Korolov, together with all the designers, and all the factories, separated from the Institute and became independent—Special Design Bureau No. 1. This was the design branch. Today this is Energia Rocket and Space Corp., headed by Yuri Semyanov, general designer and president.

The second branch of the Institute was research. From the earliest days, we did research in materials, aerodynamics, the strength of rockets, and so on. After 1956, Research Institute No. 88 became involved only in research. We changed the name to TsNIIMash in 1967, and it became the research institute, which does not design or develop any flight hardware. Of course, we participate in different design

and development programs. We really follow all of the rockets, launch vehicles, and spacecraft designed and produced in the Soviet Union and Russia, because we are responsible for scientific investigations, ground testing, expertise at different levels, and so on.

EIR: Is it not the case that you also have input into the plans of the Russian Aviation and Space Agency, although you are a research institute? This is very different than in the United States.

Anfimov: Yes, it is very different. In fact, our Institute is very unique. All visitors from the United States and other countries say that there is no analogue in the world, because we combine very different activities and responsibilities. We are responsible for proposals for all the space activities. We prepare the draft of the Russian Federation space program. We receive, of course, proposals from many organizations, but we combine, analyze, and prepare a single draft. After this draft is discussed in the Russian Aviation and Space Agency, there are meetings at different levels, and we present this report to the Agency Board. After this, the space program is signed by the head of the Russian Space Agency, and is presented to the Russian Federation government for approval. Lower-level plans, yearly plans, are also prepared.

EIR: This means that your space plan is based on technical evaluation and scientific capabilities. In the United States, we start with a political evaluation.

Anfimov: First of all, we make a draft of the space plan with other institutes, because we are obligated to come up with joint programs also for other specialized institutes, so we work together. And the economic institutes are responsible for cost evaluations.

But here are a lot of political aspects. Our Institute and the Russian Aviation and Space Agency (Rosaviakosmos) are involved in discussions with the State Duma [parliament] in different committees. We talk there very often, and I personally have discussions and make some presentations because we consider that different committees in the Duma need to learn more about the problems of space activities—the pluses and minuses of space activity. Rosaviakosmos delegated our Institute to work with the Duma. Of course,

officials from Rosaviakosmos are also working there, and their input is the most important; but we assist them.

For example, when leaders of Rosaviakosmos have to give different speeches in the Duma, we prepare preliminary materials. Personally, Mr. Yuri Koptev, the director of Rosaviakosmos, works very hard himself, but we prepare drafts.

Other very important decisions are political. The most striking example, was the situation with the Mir space station. When we decided to stop the flight of the Mir station, there was a political and public storm. Those people who didn't give money for the manned space program, now said, "It is Russia's pride . . . don't kill it; don't make it descend. It is a national treasure." I heard a lot of speeches on our TV, and it was a purely political debate, of course, because last year, we had no other choice. From the technical and economic point of view, the Mir station had to descend.

This discussion started three years ago, and if there had been money for the support of the Mir station, it would have been possible [to save it] then. It could have flown several more years. It would have been possible to make repairs, the cosmonauts could have changed some devices. But there was no money, and no repairs, so the Mir station went to its end. It was a political story.

EIR: In addition to evaluating specific proposals and developing an overall plan for the space program, how are you involved in space science and technology?

Anfimov: Our second task is to apply our expertise to all the proposals and prospects in Russia for rocket and space technology. Each project from each organization is sent to our Institute and we must evaluate it. It may involve some other organizations that are specialized—for example, in rocket engines, the Keldysh Research Institute—but general conclusions are made by our Institute. Other organizations may sign or not sign, in different cases, but our signature is necessary.

After that, we participate in some design work. There are a lot of science and technology programs, and we are involved with many. Academy institutes are also involved. We are especially involved in ground testing, because we have unique facilities to test real hardware and simulate flight conditions.

An important part of our responsibility is the certification of rocket and space systems before the first flight.

EIR: So nothing flies unless you certify it?

Anfimov: Yes, we give the final permission to fly. We also collect permissions from leading organizations, for example, Energia Rocket and Space Corp., for manned flights. After that, we prepare the conclusion. According to Russian law, we need to have permission and certification for only the first flight of space systems. But for the most important missions, such as each manned space flight—including the Soyuz transport vehicle, the unmanned Progress cargo vehi-

cle, some distinct module—we prepare permission for every article and every flight.

EIR: How many people work at the Institute?

Anfimov: Today, about 4,600. Twelve years ago, it was approximately 12,000. (We have shrunk to the point that we were two and a half times larger then.)

EIR: Over the last year, it seems that President Vladimir Putin has put more emphasis on investment in economic infrastructure and rebuilding parts of the Russian economy. There also seems to be a policy to revitalize Russia's scientific manpower. Do you see any change in policy?

Anfimov: There are no big spurts. But really for ten years, we had a shrinkage of the space budget. Two or three years ago, the space budget was stabilized. It may have been slightly increased, but there was some inflation which ate the increase. In 2002, we have a draft budget, where we have a more serious increase.

It is necessary for our space industry to cooperate with foreign countries. We have income from commercial contracts, and this enables Russian space enterprises to survive. For example, at the Khrunichev Space Center, they did not do as well as they would like, but they did get good money from launches. Energia Corp. also gets commercial inputs. They do this to compensate for the deficit of government money.

EIR: A NASA official said recently that, in the West, you look at developing a new reusable launch vehicle, and it would cost about \$5 billion. No individual company could do this, only the government could do it. But in Russia, the new Angara rocket and Baikal reusable first stage are being developed, even though the economic situation has been so bad.

Anfimov: The Angara expendable launch vehicle is being developed mostly from commercial money (aside from Angara's rocket engines). Khrunichev Center uses its profits from commercial flights. A very small part is from our government.

Baikal, the reusable fly-back booster, is being developed *only* with commercial money, without any government support. Khrunichev Center is interested in using new technology to be competitive in the world market. They use their own money for this purpose. Khrunichev Center is a government company. It has no stockholders, so it can invest money in its future, advanced projects.

Recently there was a very interesting decision, by Yuri Koptev—by the way, this was published in *Space News*. There was a special decision of Energia Rocket and Space Corp., Khrunichev, and TsNIIMash, and approved by Koptev, for commercial activity on the Russian segment of the International Space Station. The sense of the decision is that commercial activity is done jointly, not done sepa-

rately by each organization. And the money from commercial activity must be deployed back into the Russian segment of the International Space Station.

EIR: Do you know how much of the money that Russia will need to meet its responsibilities for the ISS, will have to come from commercial activity on the station?

Anfimov: We need approximately a twofold increase, for Russia to meet all of its responsibilities. The government money is enough only for the most-needed, immediate work, not for next year, and the year after. So the commercial money will have to match the government budget money.

For example, a Soyuz transport vehicle is under production for one year and nine months. To launch Soyuz vehicles in 2003, we need to begin producing this hardware now. Usually, Energia Corp. asks for credit for this purpose. But in the future, they need to pay for this credit.

This is a very delicate question, of course.

EIR: When the fight was going on between Russia and the other partners on the ISS, about launching space tourist Dennis Tito to the station, most news stories never mentioned that Russia needed the money he was paying for the flight, in order to meet its responsibilities to the partners and the program.

Anfimov: We talked about it, but Western officials didn't understand it; the Congress of the United States . . . Representative Sensenbrenner, a very "dear friend" of Russia, was permanently against Russian initiatives.

EIR: But since the Russian government policy has been changing, it may be more possible to increase cooperation.

Anfimov: Russian government policy was very good all the time, in words; but not in budget payments. There were many holes in our Russian budget.

EIR: Your predecessor, Dr. Vladimir Utkin, played an important role in the U.S.-Russian cooperation during the Shuttle-Mir program. Do you play an active role in the U.S.-Russian cooperation?

Anfimov: Yes, we are continuing this work. There is a very special joint, bilateral commission, for the safety of flights to the International Space Station. Gen. Tom Stafford (ret.) is the chairman from the American side, and I am the chairman from the Russian side. We provide a special analysis and prepare a recommendation, for Mr. Goldin—up until now—and Mr. Koptev, before each new crew flight to the ISS. Next week, the American commission will be in Moscow at our Institute and we will work toward the mission for the Expedition 4 crew flight, at the end of November. Messrs. Goldin and Koptev have approved the work of this joint commission, and due to recent events, consider it very important for the interactions between the United States and Russia on joint space flights.

By the way, before the Tito flight, we worked together very hard to come to a decision on this flight. We signed a joint decision. The American crew departed from Moscow on Saturday at 11 a.m., and we signed the joint decision on Saturday at 1 a.m., after midnight.

EIR: Regarding Sept. 11, it was quite extraordinary, that after U.S. forces were put on alert, the first foreign leader whom Bush spoke to was President Putin. In previous times, the Russian military would also be on alert, but President Putin said that the Russian forces would stand down, because he understood the security threat to the United States. It would seem that there are changes in the U.S.-Russian relationship, after Sept. 11.

Anfimov: We are seeing the first positive steps in this direction, of a closer point of view, and a mutual understanding. I hope this understanding will be closer. It's very important, from our point of view, that before Sept. 11, there was no understanding from American, and Western organizations, of the events in Chechnya.

They conceived this as a battle of the Chechen people for their independence, but the roots of these two events are the same. Terrorism was financed by the same bin Laden, and there are a lot of foreign fighters among the Chechen troops. We see that now in the United States there is a much better understanding of the unity of these two problems. Of course, there is a big difference. Chechnya is a part of Russia, and always will be an area of Russia. For you, bin Laden is far from the United States and you are not fighting on your ground, but in another country. This is the difference. But the roots are similar.

EIR: There have been a number of joint military R&D projects, some of which were not being funded adequately in the United States. Are they continuing?

Anfimov: I can't answer your question, because our Institute is not involved in military projects with foreign countries. There are other people in the Ministry of Defense who work with foreign companies. We work with the Ministry, for Russian military forces, but not jointly on American military projects. They worked independently from us.

I know the RAMOS [Russian American Observation Satellite] project. It is led by Academician Anatoly Savin, former head of Cometa, a scientific production organization, which is involved in developing satellites which watch areas of potential missile launches—special early warning spacecraft.

Our Institute is involved only in some scientific projects, such as the investigation of the radiation of rocket plumes, because a launch is detected by the radiation of the plume. This is our specialty—the investigation of physical processes, such as radiation.

EIR: One technology moving now into flight testing in the

United States, is hypersonic technology. What research is being done in Russia in this area?

Anfimov: We cooperate with Americans in scientific conferences in hypersonics. For many years, I was a member of the committee of the American Institute of Aeronautics and Astronautics, which arranges these conferences. I represented Russia there. Now another man from our Institute is a member of this committee.

At TsNIIMash we have supersonic and hypersonic wind tunnels, a unique piston gas-dynamic facility with multi-cascade compressions (PGU), and high-temperature electric arc facilities. One of our first commercial projects with the United States was with the GASL—General Applied Science Laboratory—under NASA, which is on Long Island in New York. We did special testing in a PGU for a hypersonic vehicle. It was the first testing of a model hypersonic ramjet engine with a supersonic combustion process. It was six or seven years ago.

EIR: What are the most important projects that the Institute is working on now?

Anfimov: Perhaps our cooperation on future launch vehicles. We are working hard investigating new technologies for future launch vehicles. I can mention also new technologies for small spacecraft, among which are very effective electric thrusters, so-called ALTs (anode layer thrusters). By the way, last year ALTs developed and produced at TsNIIMash flew on an American research spacecraft.

EIR: Are you looking at reusable or expendable launchers?

Anfimov: We are looking at both. We are looking at the modernization of expendable launch vehicles; new fuels, such as methane, liquid natural gas; and also in the reusable direction. We are responsible for systems analysis and the total program. We invite other organizations to participate.

For example, we always do the work with materials. We are testing samples for vehicle construction and for thermal protection, and construction elements in various test facilities, which simulate flight conditions and the space environment. We don't develop new materials, but work with other research institutions that develop them.

EIR: How is the technical data transferred from your Institute to an organization, such as the Khrunichev Design Bureau?

Anfimov: Khrunichev Center designs vehicles themselves, but they often use our preliminary results to design their vehicles. It was our finding, for example, that it was the most important for Russia to have a reusable first stage, for a future Russian reusable launch vehicle. This was the conclusion of our research, over several years. Khrunichev Center is using this idea for designing their Baikal boosters. In addition, they then ordered a lot of different partial investigations and testing from our Institute. They asked for re-

search concerning gas dynamics, acoustics, etc.

We used their money, among other things, to pay our staff.

EIR: What is the advantage of the Baikal, the reusable liquid fly-back booster?

Anfimov: A reusable first stage will have the advantage of a lower total cost. But more important is the environmental situation. Your launch site is at the ocean shore, so you have much less of an environmental problem of spent boosters and stages falling down on land.

We have continental cosmodromes. Our first stages cross over the land of Russia, Kazakstan, and Turkmenistan. In 1999 we had a lot of problems due to accidents with two Proton launch vehicles. Kazakstan forbade launches of Protons from Baikonur for some period. That is why we are interested in not having the first stage fall down, but fly back to the launch site.

We could use other launch areas, such as Kapustin Yar, on the Volga River near the Caspian Sea, if there were no possibility that the first stage would fall down. But if it is a fly-back stage, other launch sites may be used. It is much more flexible.

EIR: Do you plan to have launches from Australia?

Anfimov: Some agreements are signed. There must be a new launch vehicle developed, the Aurora, which can be considered a modification of the Soyuz launcher. It will have a new central core stage, with NK-33 rocket engines, which were developed and produced in the 1960s-70s for the Russian Moon rocket, the N-1. Our Institute is involved in some testing, and is providing expertise on this project.

EIR: What do you see as the longer-term goal of space exploration?

Anfimov: A manned expedition to Mars is the dream of rocket technology pioneers. Now it is time for conceptual and feasibility studies of such an expedition. Such research is now under investigation in Russia, at the Keldysh Research Center, Energia, TsNIIMash, and other organizations. The main questions under investigation are the mission scenario, power/propulsion complex, etc.

Today we can forecast manned Mars expeditions in 2015-25.

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