

The oral histories placed on this Website are from a few of the many people who worked together to meet the challenges of the Shuttle-Mir Program. The words that you will read are the transcripts from the audio-recorded, personal interviews conducted with each of these individuals.

In order to preserve the integrity of their audio record, these histories are presented with limited revisions and reflect the candid conversational style of the oral history format. Brackets or an ellipsis mark will indicate if the text has been annotated or edited to provide the reader a better understanding of the content.

Enjoy “hearing” these factual accountings from these people who were among those who were involved in the day-to-day activities of this historic partnership between the United States and Russia.

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**PAVEL MIKHAILOVICH VOROBIEV**

**May 29, 1998**

Interviewers: Mark Davison, Rebecca Wright, Paul Rollins,  
[Interview conducted with interpreter from TTI]

*Davison:* Good afternoon. Today is May 29 [1998], and we're interviewing Mr. Pavel Vorobiev, who works in the Cargo and Manifest Scheduling Working Group.

Good afternoon. I'm Mark Davison. We met once before in Russia. I don't know if you remember. This is Paul Rollins and Rebecca Wright helping on the audiovisual.

*Vorobiev:* Very nice to meet you.

*Davison:* Nice to see you again, too. Can you tell us about your educational background in Russia, or a little bit about yourself, where you were born, where you grew up?

*Vorobiev:* I am a native of Moscow. I graduated from the higher engineering college named after Bauman, so called MBT. That's the name of the college I went to in Moscow. This school had a department at that time called rocket-building, and that was my specialty. I graduated in 1958.

*Davison:* How did your career begin in the space program? Right after college, did you start with Energia?

*Vorobiev:* Actually, yes. I started to work for Energia in 1957. I stayed there for forty-one year and am still there with them. I was hired among many of my classmates by Sergei Korolev, the director of Energia at that time.

I started to work at Department Number Three, which was headed by Sergei Korolev himself. In 1957, Sergei Korolev became the designer general of Energia Corporation, but still he was very much involved in all design projects that we were working on at that department. So I personally participated in many of the projects, including so-called Zond [umbrella] Project. That was the first satellite launched and orbited the moon. I also participated in a lunar expedition that was under development at that time.

So, for the first fifteen years, I used to work in the analysis department as a deputy chief of that department. We were involved in such different areas of research--ballistics, aerodynamics, and many others. Since 1989, I became chief of the design department. We worked on all of Mir station modules and vehicles such as Soyuz and Progress. Then we started to work on the NASA-Mir Project and now the

department is working on the Space Station Project.

*Davison:* Can you tell us how you got involved in the Phase 1 Mir-Shuttle Program and how that came about?

*Vorobiev:* In 1993, I was leading the Russian side of the joint Russian-American group, and that was the time when, for the first time, the project of the joint Russian-American flights came about. So, in 1994, both sides signed the contract. Of course, the American astronauts would be spending time on the Russian Mir station. So, since 1994, we had to take care of all various manifest issues, such as delivering of various cargo on Mir station.

So we formed the working group in 1994. The responsibility of this working group would be to evaluate various scientific and other hardware, Russian and American, that will be delivered by the Space Shuttle to Mir for future operation.

*Davison:* Did you look at both the Progress vehicle and the Shuttle, or just one vehicle?

*Vorobiev:* Both. The American cargo delivered by the Shuttle to Mir and also American cargo that will be delivered by Progress to Mir.

*Davison:* Did they look at how it would be integrated into the vehicle or how it would interface with the vehicle?

*Vorobiev:* Yes, that's exactly right. Many of the U.S. hardware has been delivered on two of Mir station modules, module Spektr and module Priroda. So we really were heavily involved in the physical integration of various units of cargo in these two cargoes prior to their launch.

*Davison:* Were they also concerned with the mass and the CG [Center of Gravity] of each one of these pieces of cargo?

*Vorobiev:* Whenever Russia cargo has to be integrated in the Shuttle, of course we provide data such as mass and center of gravity and like that. If it is an American cargo that is delivered by a Shuttle, then the U.S. side is doing all the calculations. As a result of our joint work, we have compiled a catalog of Russian cargo and it actually consists of more than 150 items, with various properties such as mass and CGs for each of these cargo. It really helps in our work, because when I would have a similar piece of cargo, all I'd have to do is just refer to the catalog and the information is already there.

*Davison:* Good idea. Can you tell us a little bit about the water-transfer operations that went on between the Shuttle and the Mir? Was your group a part of that operation and that process?

*Vorobiev:* Yes. According to our contract, Space Shuttle must deliver water besides dry cargo. On our cargo Progress vehicle, we have special round bottles which we use to transfer water. The containers are designed in such a way that the water can actually be stored for a very long time and not lose its properties. So when it was decided that the Shuttle would assist us in delivering water to the Mir station, we thought we would use something similar, and we'd use the Russian water, a special kind, to load it on the Space Shuttle and deliver it to Mir.

Then in the process of our joint work, we realized that there is water in the fuel elements on the Shuttle which is disposed after the fuel is used. Unfortunately, that water would not be appropriate for the crew to use as drinking water and for other purposes. So we started a whole new program in order to find out how we can keep this water on board the Mir station for a longer time and still make it useable for the crew. So, in our opinion, it was a very successful program, because now we don't have to waste the water. We can just process it and use it, and I think this was one of the very important achievements that we were able to accomplish.

*Davison:* I agree.

*Vorobiev:* This technique actually allows us to save about 65,700 liters of water that we would have to deliver on Shuttle if we didn't have the means to process the used water.

*Davison:* And you would have had to have brought that up with the Progress otherwise?

*Vorobiev:* Yes, this is right.

*Davison:* Can you tell us about what materials you were able to bring back from the Mir via the Shuttle that you didn't have that capability before, some of the old spare parts or whatever?

*Vorobiev:* There are actually several different types of cargo that we are very much interested in returning back to Earth, and it became possible only after we started the Shuttle to Mir. First of all, one type of cargo would be scientific cargo, the result of scientific experiments. The second type would be just various hardware, different materials that were exposed to the space environment for a very long time. We are very much interested in bringing them down, evaluating them, and maybe finding some ways of improvement of these materials so they can serve better during the next phase.

For instance, during STS-89 flight, we have returned a few solar panels. Some of them are in Russia and some of them were sent to the United States for analysis. We are studying the effect of degradation. We have already obtained some interesting results.

The third type of hardware would be just the instrumentation that we plan to reuse on future missions. For example, we returned a few items that are part of the rendezvous system, Progress-Soyuz rendezvous with Mir station, a sample of KURS [course] system and TORU system.

*Davison:* The antenna, the KURS antenna?

*Vorobiev:* No, we didn't return the antenna as part of these two systems. We only returned the actual instruments, the units that were inside. The antennas were outside. So the actual units are the most valuable items because it's very complex electronics and it's quite expensive.

*Davison:* What is your most memorable story or experience since you've been working in the space program? You've had a great career there, forty years with the Russia space agency. We'd like to hear some of the stories that really mean a lot to you.

*Vorobiev:* The history, actually, of Energia is very rich. We just turned fifty in 1996. One of the most memorable stories would be my meetings with Sergei Korolev and just working with him. It was extremely interesting, memorable. But, of course, the brightest memory I have was [Yuri A.] Gagarin's flight. That was a real victory for us and it was really a huge event in the country, in Energia. I remember just a few days after the landing, he came to our company with Sergei Korolev, and there was a sea of people all around them. They were standing on this improvised podium, and it was just amazing to see his face. He was so young. It was a remarkable experience.

*Davison:* He identified with the people and the workers of the company very well, I've heard.

*Vorobiev:* You mean at Energia, right?

*Davison:* Yes.

*Vorobiev:* Of course, Because I've been there for more than forty years, you can learn a lot from people.

*Davison:* We've enjoyed talking with you and hearing your stories. Is there anything you'd like to add?

*Vorobiev:* I just would like to add a few comments regarding the responsibilities of our working group. You see, now after all these few years we've really achieved some quick results and we can really say that

the Space Shuttle can operate now in stack with the Mir station, which was totally impossible and unthinkable when we just started the program.

Over the course of our work, we were able to develop a whole technique of loading cargo into the orbiter based on the needs of the station. We were able to achieve a certain flexibility which was also never practiced before. For example, whenever we need to load something that is urgent for the station or maybe such cargo as food items or something that is required in case of sudden contingency, we now are capable of doing these things. So now we're going to use this valuable experience during the next phase, Phase 2 of the Space Station, and I think that was the main result of work for the last few years.

*Davison:* I agree. You did a good job.

*Vorobiev:* Thank you.

[End of interview]