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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VLADIMIR SEMYACHKIN

July 17, 1998

Interviewers: Rebecca Wright, Paul Rollins, Carol Butler
[Interview conducted with interpreter from TTI]

Wright: Today is July 17, 1998. We are speaking with Mr. Vladimir Semyachkin. We are here with the Shuttle-Mir Oral History Project. We thank you for taking time. We are very honored that you are visiting with us this morning.

We know that you had several key roles that you played in the preparation and execution of Phase 1. Would you please describe them for us in some detail?

Semyachkin: Okay. First let me say that my professional activities at the Energia Corporation have involved the development of systems for motion control and for navigation for all vehicles and stations that have been developed and are launched into space from Energia. I think that it's fair to say—and it's not just my opinion—that systems for motion control and for navigation are probably the most complex and certainly the most important from among those to be found on a space vehicle.

The primary task of such systems is, among other things, to maintain attitude, which is paramount, because without the ability to maintain an attitude—here we're talking about space stations—it is impossible to perform any science or technical program. And if we talk about space vehicles that fly to stations, then we have a particular set of problems to address there. And if we're talking about space vehicles, we have, in addition to attitude control, the issues of performing maneuvers, burns, to change orbits, we have the problem of accomplishing a rendezvous and a docking, and then after the completion of a particular flight, the issue of descending or performing a descent to the Earth, and in the case of a manned vehicle, to a particular spot on the Earth.

I and my colleagues were all very pleased that finally the United States and Russia had the possibility to interact together for joint efforts in space. I remember in 1992 when the first group from NASA visited Energia for preliminary discussions to explore the idea of such joint work, and it was at that time the first hints of a program that would involve the interaction between Mir and the U.S. Shuttle became apparent. For us, it was very interesting to become familiar with the capabilities of the Shuttle and, in particular, its orbital systems, a knowledge in the absence of which it would be impossible to interact very closely together in space.

Eventually, work started, joint meetings took place in both Moscow and Houston, and finally concrete, palpable results could be seen. It didn't occur immediately, but eventually both Russian and

American experts arrived at the conclusion regarding the expediency of accomplishing a docking between the Mir station and the Shuttle. But when this decision had been arrived at and concurred, it then fell to me and my colleagues to address the problem of how to figure out a way, taking into account the capabilities of the motion control system on the Mir, to allow the American Shuttle vehicle to dock to the station.

Many things had to be clarified to the *n*th degree of detail. We had to understand, for example, the coordinate system used aboard the Shuttle and work out the correspondence between it and the system coordinates used aboard the Mir station. We had to also be able to determine the motion parameters, the values for those parameters, that would allow the Shuttle to dock to the Mir station, a very interesting and very stressful talk.

As always, whenever one starts in a new project, there are some difficulties, and here we faced a difficulty in understanding each other. However, thanks to the good will exhibited by both sides, those difficulties soon were eliminated. The apotheosis of all this turned out to be the docking of the Shuttle and the Mir during Shuttle mission STS-71, where I recall that I and my American colleagues viewed that event at the Mission Control Center in Moscow with great excitement and enthusiasm.

Understandably, having accomplished the docking of the Shuttle and the Mir did not indicate that an end had come to the work of myself and my colleagues. In the course of our development work, we had devoted very much time to come to a meeting of the minds on how such a large structure flying in space could be controlled. We agreed, after study of the problem, that the control of the mated stack could be accomplished by both the Mir motion control system and by the Shuttle motion control system. For both NASA and Energia engineers, we were faced with the interesting problem of having to control a large, complex, and elastic, flexible structure in space. What made it all the more challenging was that this is the first time in human history that such a problem had to be solved.

As an example of the differences when we're talking about attitude control being performed by Mir, one of the main agents of that control are gyrodines, gyroscopes, that allow the attitude to be controlled. Gyrodines are powered gyroscopes that are used to control the angular motion of the station without requiring the use of any propellant for engines. In addition, the use of gyrodines permits a very high accuracy to be maintained in the control of the station.

At the same time, we are faced with a particular problem, that during the Shuttle's approach to a docking port, its jets affect the motion of the Mir. So we, together with our American colleagues, set about solving the problem, and this involved them releasing to us, for example, data including the time line of the jet activations that would be employed during the final phase of the approach. We, on the other hand, have to take this data, and then to perform an assessment we did models for modeling in order to determine how seriously the use of the jets would affect the control of the motion of the Mir station. Thanks to excellent

cooperation on both sides, all of these issues were successfully addressed, documents and reports on the modeling were issued, and all of the conclusions that were derived on the ground were confirmed by actual operations on orbit.

There was also a number of problems, control problems, associated after the docking that had to do with how does one control this mated stack of the Mir station and the Shuttle. These were also interesting problems, and what is of particular importance is that their solution have application as well to the future International Space Station, where the same techniques will be used, because the point is that the Space Station, whose first elements are in preparation to be launched as we speak, is designed in such a way that control of its motion can be accomplished both by the Russian segment and by the American segment. In other words, both the Russian and the American control systems can solve the identical problems with regard to control of the station's attitude. Understandably, it makes a great deal of sense. It's very expedient to allow for the transfer of control from one system to the other, and, understandably, such an ability would increase the reliability of the station's operation.

It has turned out that the elements of this system that allow control to be transferred have been developed and tested, in fact, during the dockings between the Mir and the Shuttle. In particular, there was an experiment designed to mathematically link the Shuttle's coordinate system with the coordinate system of the Mir station, thus the work on these control systems has been very interesting, it's been very intense, and for me and my colleagues, perhaps the most intense period was at the beginning of the program.

Our problem in subsequent years was to assure the operability of the control system because, understandably, the Mir station is--how shall we say it?--far from being in the bloom of its youth. If we consider that we initially planned a nominal lifetime, it should fly for at least, say, three years, and that the operational lifetime of its components were designed to operate for not longer than three years, we, nevertheless, can sit here right now and observe the Mir is in its thirteenth year of operation. So it's understandable that in this intervening time we have had to deal with questions having to do with repair, refurbishment, replacement of various on-board equipment. We consider, however, that this experience has been very helpful and will be of great value in our work on the future International Space Station.

I've briefly outlined the highlights of our work for the Shuttle-Mir Program. Do you have any additional questions?

Wright: The Mir has had a beneficial impact on the world and even space exploration. What is its future fate?

Semyachkin: Good question. Let me answer this question in English. You understand that Mir was our

baby. We gave him birth, and, of course, similar to our other children, at first it was not so beautiful baby, but step by step it learned to walk, Mir became grown up, and we learned to walk with Mir. Less than one year left when we must stop its existence on orbit. A common opinion of my colleagues in Energia is that Mir would be able to exist on orbit further, but what to do? In this connection, I would like to speak a short Russian joke on this topic. Okay. A hospital nurse can raise the patient using the handcart. The patient dolefully asks her, "Nurse, maybe we'll go to the reanimate branch?" "In no circumstances," answers the nurse. "Doctor said in morgue. Then in morgue."

So I consider that Mir is a patient. Energia is the nurse who can raise it, but who is the doctor? Who said, "In morgue"? My understanding is that it's necessary to divide this responsibility between Russian Government, probably, and the American administration also would want to stop the existence in order to pay main attention to the new work on ISS [International Space Station]. The analogy that I was trying to draw, is that understandable?

Wright: Yes.

Semyachkin: Of course, it's a shame that our child who we gave birth to so many years ago, that we're going to have to put it to sleep, but, on the other hand, we understand that sometimes there's nothing to be done and that one cannot sit, as it were, on two chairs at the same time. Nevertheless, despite this sorrow with which we are faced with regard to Mir, we nonetheless do look forward to the future with a great deal of hope.

Are there any other questions?

Wright: Yes. The Mir's structure may be passing on, but her legacy will live on forever.

Semyachkin: That's very important. And, in addition, yesterday, for example, we had a gathering that one could almost call kind of a goodbye gathering, kind of to celebrate the end of Phase 1. And when the Russian program director, Valery [Victorovitch] Ryumin, stood up to deliver his assessment of the results of the program, the first item that he noted was not the solution of the engineering problems, despite the fact that they were nonetheless very significant, if I have in any way made that clear in the course of a short interview, he said the most important thing was the joint common experience that had been gained, the working together of people, the mutual work of experts and specialists, the mutual understanding, the good will, and that it was these qualities that would assure successful future work in space.

Wright: We have spoken to many people as part of this history program. That sentiment has been expressed by almost everyone.

Semyachkin: The same.

Wright: The same.

Semyachkin: I understand.

Wright: It has been a common thread of all we've talked to. They talk very successfully of the technical achievements and have much pride in what they accomplished technically and for the future of space, but you can tell that their hearts overflow with the feeling of getting to know their international partners very well as friends and colleagues and know that this will set the pace for the next part of the space station exploration.

Semyachkin: So I understand. We, in Russia, call it that manual factor. You understand?

Wright: Yes. What are your future plans?

Semyachkin: Of course, I've got rather grand plans, big plans. I have for a fairly long time now been involved in Phase 2. I'm the director on the Russian side of the working group on rendezvous and docking. We've got a number of years of close work with our American colleagues in front of us, because, as was the case with Mir, the International Space Station will be visited by space vehicles from both Russia and America. There's a number of technical and engineering issues that face us, and some of them will be more complex than those that we faced with the Mir-Shuttle program, so we have quite a bit of work to do, and we look forward to a successful accomplishment of that work when we're ready to perform it. Despite the fact that we have all of these issues to contend with, some of which will be addressed after the start of station construction, we nonetheless have a certain core set of problems that must be addressed in the short time frame before we start the International Space Station.

So those, briefly speaking, are our plans, and as I've said before, thanks to our successful work in Phase 1, we stand ready to work with our American colleagues toward the successful resolution of the issues to do with the International Space Station.

Wright: This concludes our interview with you, and before we say thank you once again, we wish you many successes, and we hope all of your challenges are achieved without too much stress.

Semyachkin: Thank you very much.

Wright: You've welcome, and thank you again for spending time with us this morning.

Rollins: Would you share on camera the interview that you--would you explain about your interview that took place in Russia. Tell us again about the magazine* so that we can have it on the recorder so we will be able to share that with others. *[*Semyachkin presented a copy of a magazine to NASA JSC Oral History Project that featured an article about him.]*

Semyachkin: Okay. As the magazine [Russian title], several years ago it was the most popular magazine in Russia. During the years of *perestroika*, it was this magazine that was the standard-bearer and reporter of all things new that were occurring in Russia, a very popular magazine. Today, perhaps, it's not quite as popular. Nevertheless, it still enjoys very wide distribution. As regards this particular article which is an interview with me, its history is as follows. Basically it turns out that, in my free time, I enjoy translating from English into Russian, and I translate English poetry. You can consider it a hobby. I started with translations of the humorous works of various English and American authors, but in addition to that, I've also accumulated some experience in the translation of some more serious poetry. In some way it turned out that my literary efforts became known to some literary critics, and after I gave them the opportunity to acquaint themselves with my work, they suggested to the editorial board of this magazine that the magazine might be interested in conducting an interview.

The interview is structured in such a way that the first portion is centered on my professional career working in space. For example, here you can see a photograph of the occasion of my being awarded the Silver Snoopy, and that's Alan [B.] Shepard [Jr.], the U.S. astronaut, who's pinning it on my lapel. And the second part of the interview is devoted to my literary work. There are some examples of my translations of the sonnets of Shakespeare and a selection of short translations of humorous verse of a variety of American and English authors. In particular, for example, we have Ogden Nash. That's it.

Wright: We look forward to having it translated so that we can read it.

Semyachkin: Please try to do it.

Wright: Thank you once again.

Semyachkin: You're welcome.

[End of interview]