



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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OFFICE OF THE ADMINISTRATOR

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NOTES FROM VISIT TO SOVIET UNION, May 17 - 23, 1975

This was my fifth visit to the Soviet Union. The purposes of this trip included a visit to the Soviet launch site at the Baykonur Cosmodrome; participation in the joint flight readiness review for the Apollo-Soyuz Test Project; and informal discussions on future cooperative efforts.

Chronology

Friday, May 16

Left Dulles on Pan Am Flight #106 about three hours late. Apparently Pan Am had to switch equipment in Atlanta. This concerned me, since I had roughly a three-hour connection to make in London the following morning, and to the best of my knowledge, the connecting flight was the only flight to Moscow on Saturday.

Saturday, May 17

Arrived London three hours late and just barely caught my connecting flight. (Pan Am in Washington had cabled ahead so that I would be provided special transportation from one terminal to another in London, but Pan Am in London had never heard of me, was discourteous, and was of no help whatsoever.) I mentioned that I made the connection, but my suitcase did not. It was later to catch up with me in Moscow on Monday night. Met Yardley, Frutkin, and Kapryan, who were part of my group, at the London airport, and also Donnelly and Shafer, who were going over to work on the public affairs agreement. Arrived in Moscow on time about four o'clock in the afternoon Moscow time and met by Petrov, Vereschetin, Zonov, and Lunney. To the Rossia hotel, a brief meeting with Lunney to discuss how things were going, and

especially to discuss the failure of the Soviet's attempt at manned flight on April 5, and then off to bed for a good night's sleep.

Sunday, May 18

In the morning the entire group visited the Arkhangelskoye Museum-Palace in the outskirts of Moscow. Those of us scheduled for Baykonur left early, went back to the hotel for a quick lunch, and then out to Vnukovo airport for the flight to Baykonur. We left Vnukovo about 4:00 on a TU-134 (approximately DC-9 or 737 size) with Aeroflot markings. However, the plane was outfitted as an executive airplane with two cabins equipped with tables, comfortable seats, etc., and a section toward the rear with additional seats. It normally carries 72 passengers, but only 30 in the configuration we used. Bushuyev indicated that this aircraft was on a permanent lease from Aeroflot to the Academy of Sciences. He did not know how many other airplanes were used by the Academy. With us were Yardley, Frutkin, Lunney, and Kapryan on our side, and Bushuyev, Zonov, and a couple of others from their side. Bushuyev was very much at home on the airplane and apparently uses it quite often. This was Zonov's first trip to the launch site.

We arrived in the town of Leninsk just after dark at about 9:00 Leninsk time, were met by Dimitri Bolshakov, the Director of the launch site, and several others. They drove us through Leninsk to the cosmonauts' hotel where we were to spend the night. Had a full Soviet style dinner with many toasts and then turned in for the night.

Monday, May 19

Left for the launch site shortly after breakfast in the van normally used by the cosmonauts on their way to the launching pad. (Apparently the cosmonauts spend 7 - 10 days at the hotel where we stayed prior to a launch, then take the bus to the launch site where they arrive about 4½ hours prior to a launch, don their suits and leave for the pad 2½ hours prior to a launch.) The launch site is about 30 kilometers from Leninsk, and we arrived there in approximately one-half hour. We first went to the launch pad; then back to the industrial area. In the industrial area we saw some of the

checkout equipment, the space suits, and inspected the launch vehicle and spacecraft in detail. We had lunch there and subsequently were briefed on the results of the joint US-USSR tests of the communications equipment. Then we visited the cottages where Gagarin and Korolev stayed while at the launch site, and returned to the town of Leninsk. Drove through Leninsk, visited a couple of monuments, and the "Pioneers Palace" (Pioneers are like Boy Scouts or Girl Scouts), returned to the cosmonauts' hotel for another long dinner, and then left Leninsk shortly after dark for our return flight to Moscow. We arrived in Moscow about 10:30 p.m. Moscow time.

After we returned to Moscow, Frutkin, Lunney, and I had a meeting with Donnelly to discuss the public affairs negotiations and to decide on a course of action to take on those.

Tuesday, May 20

Tuesday was essentially unscheduled insofar as work was concerned, and we went on a visit to Zagorsk, and there visited a monastery which is the seat of the Russian Orthodox Church. With us were Petrov and Zonov. We first had a tour of several of the churches and the Bishop's Palace (which apparently has seldom if ever been visited by Westerners), and then went to the seminary and academy. There we had lunch with a young abbot, who is second in charge of the academy. Had interesting discussions with him about the role of the church in the Soviet Union. (This can best be described by "peaceful coexistence.")

Returned to Moscow in mid-afternoon, briefly went shopping, and then to the Kremlin Theater for a concert by the Beriyoska Dance Group.

Wednesday, May 21

The morning was devoted to discussions with Kotelnikov and others on future cooperative efforts. Then we had lunch at the Scientists Club, and in the afternoon visited Gizenko's Institute of Medical and Biological Problems in the Soviet Ministry of Health.

In the evening Petrov, Vereschetin, Bushuyev, Yardley, Frutkin, Lunney, and I visited in the apartment of Egon Loebner, the American Embassy's science counselor. This was pleasant except we found out late the next day from Loebner that his daughter had been diagnosed as having infectious hepatitis and that all of us had been exposed to her. (There was nothing we could do about this while still in Moscow, but as soon as we returned we all got gamma globulin shots, which hopefully will protect us.)

Thursday, May 22

Started the day with a meeting in Lunney's room to discuss the flight readiness review with our own people, and then left for the Presidium of the Academy of Sciences for that review. The review was co-chaired by Kotelnikov and me. Went very smoothly. Lasted from 10 o'clock in the morning until 4:30 in the afternoon. At the completion of the FRR, we signed a brief protocol, had a picture-taking session, made the usual statements, and then had not one but two press conferences. The first was held by the Soviets at the Foreign Ministry in a terribly hot room, and the second arranged for by Donnelly was at the American Embassy for the American correspondents only. Neither was very challenging.

During the lunch break Frutkin and I paid a courtesy call on Jack Matlock, the second in charge at the American Embassy. (Stoessel was out of town.) Matlock reported to us that at a meeting earlier in the week between Kissinger and Gromyko, it had been decided that there would not be a high-level visitor exchange during the ASTP flight. We had proposed to have a congressional party from the United States in the USSR during the course of the flight and vice versa. However, this was apparently turned down by the Soviets. Frutkin pursued this informally with Petrov and Vereschetin later, asking whether at least Congressman Symington could visit, but had a very hard turndown.

Thursday evening was an official reception and cocktail party at the Praha Restaurant sponsored by Kotelnikov ending the formalities of our visit to the Soviet Union.

Friday, May 23

Left Sheremetyevo airport on Aeroflot at 8:15 in the morning; transferred to TWA in London; arrived in New York at about 2:00 in the afternoon; went through customs there; and was back home by 5:00 in the afternoon.

General Impressions of the Soviet Union

During the course of my five visits to the Soviet Union, I have noticed a tremendous change in our relationships and also in the Soviet people. My first impression when I visited in 1970 was that the country was drab and cold, that the people appeared to be afraid and subdued, that there was very little laughter and very little color. Also in our official meetings there was a great deal of formality, a great deal of standoffishness, and even though we always accomplished a great deal, it was in a rather cold environment.

The contrast now is quite remarkable. There are more people in the streets, they seem to be moving at a quicker pace, they are more colorful, you hear a great deal of laughter, there are many more cars, more lights, etc. The official relationships have also improved. The best example, perhaps, was our meeting on future cooperation. My first meeting with Keldysh on a similar subject in 1971 was extremely formal, the Soviet position was completely prepared, and it was quite clear that the Soviets were unable to deviate even one inch from the prepared position. This time we had a much freer discussion and the Soviet side seemed to be willing to respond on the spot.

I am quite sure that part of what I am saying here is real; part, on the other hand, may just be my own impression and my own attitude. This is the first time I was in Moscow in warm weather, the first time I saw blue skies for almost the entire time I was there, the first time I saw green leaves and flowers. Also, I felt reasonably comfortable in communicating with people even though my Russian, if anything, has become worse since my last visit because I have stopped studying since then. I am trying to say that my own outlook

may have changed, and this, in turn, may have had something to do with my perception of the Russian people.

Changes at the Academy of Sciences

My correspondence in setting up this meeting had been with Keldysh, and I had fully anticipated conducting the meeting on future cooperation with Keldysh and co-chairing the FRR with Keldysh. However, when I arrived in Moscow, Petrov told me that Keldysh had taken ill again and was in the hospital. He also asked me not to discuss this, since there was an election in the Academy of Sciences on Monday, and the membership-at-large did not know of Keldysh's illness.

On Tuesday morning when we returned from Baykonur, Petrov told me that the election had been postponed until fall. However, Keldysh had resigned as President of the Academy, and Koteinikov was now Acting President. Keldysh, however, would continue several of his functions, including the chairmanship of the Institute of Mathematics and the chairing of a committee awarding a special prize. It was not yet clear whether Keldysh would continue as the top man in the space program.

Visit to Leninsk and the Baykonur Cosmodrome

The City of Leninsk

Leninsk is a city of 50,000, generally closed to the public, and devoted entirely to the activities of the Cosmodrome. It started growing around the small railway station called Tyuratam probably even before 1957. I asked on several occasions how long it had been named Leninsk, and I was told that it was incorporated as a city with this name at least 10 or 12 years ago. I asked whether it appeared on any map, and I was told by Bushuyev that he didn't think so, but obviously after our visit it would appear on maps.

It is a typical Russian city, many apartment houses, a hotel in the middle of the city on Lenin Square, all kinds of stores and shops, and a large number of people walking about the city at all times. We saw few, if any, cars, but we were told that this was planned

so that our motorcade could move through more quickly. There is a monument of Korolev and another entitled "Space Is Science." The climate is hot and dry, the area is basically a desert, but many trees have been planted and are well irrigated, so that it is beginning to have a green appearance. People commute to and from the launch site by train. There also appears to be an integrated utility system with electricity and hot water being supplied by the same central power station. In other words the waste heat from the generation of electricity is being employed as heat for homes and apartments.

In addition to driving through the city and stopping at the various monuments, we also visited the Pioneers Palace. May 19 happened to be Pioneers Day. The Pioneers Palace is a huge building where the Soviet equivalent of the Boy Scouts and Girl Scouts hold their meetings, practice their various crafts, and apparently are very active. We watched classes in modern dance, ballet, painting, etc.

The Cosmonauts' Hotel

This building is at the outskirts of Leninsk in a guarded compound. We never left the compound unescorted, and I doubt that we could have even if we had asked. In the hotel we saw our own rooms and a dining room, but we understand that there are also physical exercise facilities and a swimming pool. I was told that typically cosmonauts spend 7 - 10 days there prior to flight. There must be about 30 or 40 rooms. Bushuyev told us that normally he would not stay at that hotel but at the hotel in town or at another hotel close to the launch stand. My room had two small bedrooms each equipped with a bed and a desk, a small sitting room, a bathroom, and a refrigerator. The beds were typical Russian beds, no more than about 27 inches wide, and less than six feet long. As a result, when during the middle of the night I stretched, my feet hit the footboard and my bed collapsed completely. At first this did not bother me since I had a

second bedroom, and I just decided to sleep in the other bed. However, within 10 minutes that bed also collapsed. So there I was at 3:00 in the morning, in the cosmonauts' hotel in the town of Leninsk completely taking apart both beds, cannibalizing pieces to get enough good pieces for one bed, rebuilding that one, and going to bed for the rest of the night.

We had two main meals at the cosmonauts' hotel, one on the first night and one on the second night, and, of course, breakfast on the morning of our visit to the launch site. Both main meals were hosted by Dimitri Bolshakov, who was introduced to us as the Director of the Cosmodrome. However, in response to some subsequent questions, it isn't clear exactly how much of the Cosmodrome he is the director of. He seems to be reasonably well known at the cosmonauts' hotel, however. He told us he had been at the launch site in his present job for six years.

The Trip to the Launch Site

We left for the launch site at 9:30 Monday morning in the van normally used by the cosmonauts on their way to the launch pad. Even though I call it a van, it is much more like a bus with the cosmonauts' area apparently isolated and especially ventilated. On the way out we got a briefing over a loud-speaker system by a man sitting in the front of the bus, but the briefing had much more to do with the general area (Kazakstan) than it had to do with the Cosmodrome itself. We passed the Baykonur telemetry and tracking station and a substantial number of warehouses, big buildings, "hotels," fuel storage areas, etc. When we asked about the various large buildings, we were told that they generally belong to industrial firms having to do with "other programs."

After about 30 minutes we passed through the industrial area and drove right out to the launch stand itself.

Visit to the Launch Pad

Here we first stopped at a small monument commemorating Sputnik I which went from the same launch stand on October 4, 1957. Then we walked past the trailer which is used to bring the launch vehicle and spacecraft out to the pad in a horizontal position (actually railroad car would be a better description than trailer) and out to the launch stand itself. This same

pad was used for Sputnik I, for Gagarin's flight, and will be used for one of the ASTP birds. We asked how many launch vehicles had gone off this pad and got two different answers: one being 100 and the second being 300. It was well preserved and painted, and apparently had been repainted prior to our visit. The basic sequencing is all mechanical. The vehicle is not held down but is guided by various arms which are part of the stand. It flies out of the launch pad without holddown, and the arms and booms which support the launch vehicle fall back under counter balance and the force of gravity. Various platforms underneath the launch vehicle are moveable and apparently collapse in a certain way so that they can all be rolled underneath the pad.

It was very windy at the launch pad, and we were told that the temperatures in the summertime go to $+40^{\circ}$ C. and in the winter to -40° C. I asked about the hardships of working in the very cold temperatures, and the response was that they don't do a great deal of work at the launch pad, and what work they do do is done under a blanket of hot air being blown at the workers.

We also had a discussion as to why we in the United States hold down our vehicles*, whereas the Russians decided not to hold theirs down. Apparently they measure the thrust buildup curve for all 20 engines and can shut down during the buildup until just before liftoff. Therefore, they do not need a holddown, avoid the complexity of the holddown system, and also have a slightly more efficient vehicle from the point of view of fuel consumption. In response to question, they say they never have yet lost a launch vehicle as a result of improper thrust buildup.

Around the pad are various fuel storage tanks and a subterranean blockhouse. I asked whether we could see the blockhouse and was told that it is now being modified and it is not possible to visit it. On top of the blockhouse are a large number of concrete pillars which look like "tank traps." I asked what they were for and was told that they were a primitive way of guarding against the impact of the full launch vehicle on top of the pad. These "tank traps" would serve to break up the launch vehicle and distribute the load should there be such an impact.

*NOTE: I learned after our visit that we only hold down the Saturns, and that Atlases and Titans are not held down.

Not too far away there appears to be another large launch pad, and in response to my question I was told that this is for another space program which has nothing to do with ASTP.

Visit to the Industrial Area

The industrial area connected to this launch pad is only a relatively short distance away from the pad itself. Yet in the industrial area there appeared to be homes for some of the workers and a hotel. When I asked about this, I was told that the area is evacuated during the time of a launch. At the industrial area we went into a huge building and were taken to various checkout rooms with equipment to check out, for example, the onboard television, the onboard communications systems, and a console for the overall switching and control of the entire checkout. Since both of the spacecraft for ASTP are very nearly completion of their checkout, there didn't appear to be a great deal of activity. We were also taken to a room where the cosmonauts are normally suited before the flight and were shown the space suits for Leonov and Kubasov. These were the same type of intra-vehicular suits that we saw at Star City during my last visit there in 1973. Then we were taken to the floor of the "vehicle assembly building." On one side was the launch vehicle for the first of the two ASTP flights. (To avoid confusion, I have been talking about two ASTP flights. The Soviets are preparing two vehicles--Soyuz I and Soyuz II--in the event one fails or does not get into orbit. One will be launched from the launch pad we visited, and both the launch vehicle and the spacecraft for that launch were in this building. The second one would be launched, if necessary, from a launch pad about 30 kilometers away. The spacecraft for the second one is being checked out in this building, but the launch vehicle apparently is close to its launch pad.) At any rate we saw the launch vehicle for Soyuz I and both the Soyuz I and Soyuz II spacecraft. Spent considerable time walking around the launch vehicle, asked a lot of questions all of which were answered. As I mentioned earlier, the same launch vehicle or variations thereof had been used since October 1957 and the first Sputnik launch. It appears that "block changes" are periodically introduced, either to enhance the reliability or because some of the piece parts are no longer available.

We were told that the ASTP launch vehicle is one in a series of which more than 10 have already been flown. The April 5 launch was conducted with a launch vehicle left over from the previous series. The failure of the April 5 launch was explained to us again in detail, and our people appear to be satisfied with the explanation and with the fact that the changes made in the ASTP launch vehicle should prevent this kind of a failure. The launch vehicle (all three stages) was on the right hand side of the center aisle. On the left side were the two spacecraft and the spacecraft shrouds. The launch vehicle was horizontal; the spacecraft were vertical. In order to place the spacecraft inside the shrouds, they are tipped to a horizontal position and cantilevered horizontally from the launch stand. The shroud is then slid over the spacecraft and attached to the bottom ring. At some point in the process, the spacecraft is then taken out on a railroad car and fueled. Then the launch vehicle and spacecraft are mated in a horizontal position on the car which ultimately takes them to the launch pad.

Most of the checkout appears to be done in the building with only a minimal amount of checkout performed once the launch vehicle and spacecraft are out on the pad.

As I said before, we asked a lot of questions, all of which were answered. We then had lunch, and after lunch were briefed on the results of the joint tests of the US communications system installed in the Soyuz. (We had had, I believe, 16 people at the launch site during the previous week to conduct those tests.) There were no significant anomalies, and the main purpose for briefing us on the test results was to take television pictures of us during the course of the briefing.

Visit to Korolev and Gagarin Cottages

Not far from the Vehicle Assembly Building are several small cottages, one of which apparently was Korolev's at the launch site; the other one was the one used by the cosmonauts for early flights. Both are now preserved as museums. When we visited Korolev's cottage, Bushuyev told us that he spent much time there with Korolev and apparently stayed there on several occasions. On further questioning, he told us that

he started working with Korolev right after World War II, had worked on the launch vehicle for Sputnik, and also on the spacecraft itself. Since then he has concentrated mostly on spacecraft and has been involved in many of their manned flight activities.

Following our visit to the two cottages, we returned to Leninsk for a tour of the town, then dinner, and our return flight to Moscow.

Talks on Future Cooperation

Participating in these discussions were Frutkin, Yardley, Lunney, Loebner, and myself on the US side, and Kotelnikov, Petrov, Bushuyev, Tsarev, Tulin, and Vereschetin on the USSR side. Tatischev and Zonov were the interpreters. Tsarev and Tulin, whom we had seen in previous meetings, were introduced to us as representing the Soviet industry side.

For background, we had tried for some time to engage the Soviet Union in discussions on future cooperative efforts beyond ASTP and beyond the Low/Keldysh Agreement. When Keldysh visited the United States in 1972, Fletcher and I met with him in Houston and we proposed a number of possible joint projects, including a joint Mars sample return mission. Then at a later date we talked to the Soviets about possible ASTP follow-on missions in 1976. When Fletcher visited the Soviet Union in 1974, he met with Keldysh and they agreed that we should have our next set of discussions on future cooperation in the spring of 1975. However, when we proposed this later on, the Soviet side said they were not yet ready for two reasons: One, many of their people were involved in ASTP, and two there would be an election in the Academy of Sciences and people would be involved in that. Finally on March 24 of this year I sent a letter to Keldysh indicating that I understood that he would not be ready to undertake substantive discussions on future cooperation, but I nevertheless proposed that we should have informal discussions which would help prepare the agenda for a substantive meeting later in the year. A copy of this letter is attached. The meeting on May 21, 1975, was a result of this letter.

After the normal preliminaries, I introduced the subject by reviewing history (as I just did in the previous paragraph) and suggested that during the course of the morning meeting we should talk about the kinds of things we might discuss in a future substantive meeting, that I had a number of these to propose, that I would like to hear additional proposals from the Soviet side, together with the Soviet reaction to my proposals, and that we should try to firm up on a date for a future meeting.

I indicated that we had considered several possibilities, including projects in manned space flight, unmanned scientific missions, and projects in the field of space applications.

In manned space flight I talked about the cooperation in biomedicine, which is now on the way; that in the intermediate time period I could see USSR experiments on the Shuttle and on Spacelab, possible Soviet use of the Shuttle to provide logistics support for USSR spacecraft, and possible Shuttle-Salyut flights. In the long range I could visualize us cooperating on an effort leading to an international space station involving other countries as well as the United States and the Soviet Union. However, here I would foresee our preliminary efforts being devoted to studies so we could define what we meant by an international space station before we make commitments to a hardware program.

In the unmanned scientific area I discussed the possibility of exchanging experiments on each other's flights, the possibility of a joint effort in the unmanned exploration of the Moon involving lunar polar orbiter spacecraft for remote sensing, and a lunar farside landing supported by a lunar communications satellite. Next I described the possibility of a Mars surface sample return mission, indicating that the approach proposed by our scientists would involve a landing and return to Mars orbit by one country's spacecraft and a Mars orbiter by the other country. The two would then rendezvous in Mars orbit with the orbiter spacecraft taking the sample from the landed spacecraft and returning it to Earth. I also mentioned that there might be a second approach which would involve a Mars surface rendezvous. For some reason the second possibility really intrigued the Soviet side. Finally in the area of unmanned scientific satellites, I mentioned Alfvén's proposal for an asteroid

sample return, but stated that from my point of view this kind of a mission would probably be more difficult and less interesting than a Mars sample return mission.

In the area of space applications, I mentioned three related projects having to do with the atmosphere and the environment involving an Earth energy balance measurement, the accurate determination of the solar constant and solar spectrum, and stratospheric ozone research. Interestingly enough the Soviets had not heard about the potential problem with freon and were very much interested in it. Also in the area of applications I talked about the possibility of a joint search and rescue satellite program.

Following my presentation there were a number of questions and then Petrov and Kotelnikov both responded. Basically, their response was as follows: They are very much interested in further cooperation in manned space flight, particularly in a Shuttle-Salyut mission. There is no question that they would like to go on with the momentum built up in ASTP and that it appeared to them that the next step would be a Shuttle Salyut mission.

Insofar as an international space station is concerned, this, too, is of interest, but they agreed that studies would be needed before any commitments are made. The Soviet side would like to hear more from us both about the organizational concepts for such a space station effort and whatever designs we might have in mind. They think it is very important that the concepts be further developed before either side makes a commitment to a hardware program.

There appeared to be less interest in flying USSR experiments on the Shuttle or on Spacelab, or on using the Shuttle for logistics support for Soviet spacecraft. However, Petrov said that if there were important experiments to be done that could better be done on the Shuttle than on their own spacecraft, they would, of course, be interested in this. I also invited the participation of Soviet cosmonauts in Space Shuttle/Spacelab flights and was thanked for the invitation.

On the subject of the unmanned scientific exploration beyond what is going on under the Low/Keldysh Agreement, there was no interest. The official reason given was that we should concentrate on one major effort and not two, and the manned space flight area is of more interest to them than the unmanned planetary area. To me this means one of two things: either the Soviets are deemphasizing their planetary efforts as a result of recent failures, or they want to continue this as an area for competition and, therefore, want to have their own "firsts" without being involved with us. (The Soviet side did express interest in the exchange of experiment packages to be flown on each other's spacecraft, but viewed this as being within the realm of the Low/Keldysh Agreement.)

The Soviets were interested in all of the applications areas and asked me for additional "proposals" in these areas. I stated that I had made my proposal and that if indeed they are interested in a cooperative effort then we should work together rather than the US doing all of the work. The next step should be joint discussions on what kind of work should really be carried out. The Soviets agreed.

After we had completed the discussions, questions, and answers, both Kotelnikov and I summarized what we had discussed and what conclusions we had reached. We then decided that we should have a substantive meeting before the end of the year. (Subsequently Petrov and I thought this meeting should be in late October or early November.) Leading up to that time Vereschetin and Frutkin were designated to work together to define the agenda and to do whatever preliminary work is needed, with "teams of specialists" if necessary, to make sure that the meeting this fall or winter will be productive.

Flight Readiness Review

The flight readiness review was the last formal joint meeting prior to the flight itself. It was co-chaired by Kotelnikov and me with participants on the US side including Lunney and his working group chairman, Yardley, Frutkin, and Kapryan. On the Soviet side, in addition to Kotelnikov, were Petrov, Bushuyev and his working group chairman, and Tulin, Tsarev, Rumyanstev, Novikov, and Sagdeyev.

The format was quite similar to the mid-term review. Vugraphs were not used but instead we leafed through notebooks of charts prepared in both Russian and English. Lunney and Bushuyev each made a presentation giving the history of the vehicles on each side of the ocean. This was followed by presentations by various working group co-chairmen (from one side or the other), reviewing the results of joint activities. Each presenter would make the presentation in his own language and it would then be interpreted sentence by sentence.

There were no serious open issues, and it was quite clear that this review was considered to be a formality by the "extras" on the Soviet side (i.e., Tulin, Tsarev, Rumyanstev, etc. who paid little or no attention to the review but instead were constantly talking among themselves.) In fact, during the morning session, I was the only one who asked questions, and after lunch Petrov asked a few and Kotelnikov asked one. This might signify that there is really no check and balance above the Bushuyev level on the Soviet side. On the other hand, it might also mean that the checks and balances come from a different organization which we normally don't see, and that it is difficult for the Academy people, who are not directly involved in the project, to become deeply involved during the course of an FRR.

On the positive side there were no real open issues and no matters for serious concern. All of my questions were well answered by the working group co-chairmen from both sides.

My remaining concern after this FRR has to do with command and authority of command, particularly in contingency situations. At no time is there a single commander in space nor is there a single flight director on the ground who is in charge. The project has tried to accommodate this situation by trying to anticipate all possible contingencies. I asked what would happen in the event of an unanticipated contingency or in case there is a difference in interpretation of whether or not a contingency exists. Although these questions were answered rather forcefully, I am still not convinced that this is not a potential problem area.

The flight readiness review lasted about five hours and covered the subjects from the mid-term review until now quite thoroughly. At the conclusion of the flight readiness

review, Kotelnikov and I jointly signed a protocol indicating that ASTP was ready to proceed toward its July 15 launch.

George M. Low

George M. Low
Deputy Administrator

Attachments:

1. March 24, 1975, letter to Keldysh
2. Summary Minutes of the Joint Review of the Flight Readiness of the Apollo-Soyuz Project, May 22, 1975

cc:

① Dr. Fletcher
W/Gen. Crow