ORAL HISTORY 5 TRANSCRIPT

GLYNN S. LUNNEY
INTERVIEWED BY CAROL BUTLER
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BUTLER: Today is March 30, 1999. This oral history is with Glynn Lunney at the Offices of the Signal Corporation in Houston, Texas. The interview is being conducted for the Johnson Space Center Oral History Project by Carol Butler, assisted by Summer Chick Bergen and Kevin Rusnak.

Thank you for joining us again.

LUNNEY: You're welcome. Glad to be here.

BUTLER: Today let's start with talking about Skylab and your role in that.

LUNNEY: Okay. Probably the way to get into that is to recount how I got there. After Apollo 15, which was, I believe, in the summer of [19]'71, I was asked, or reassigned, I was asked to begin to start thinking about going to work in program management over in, I think it was called Building 2 at the time, the headquarters building at JSC [Johnson Space Center, Houston, Texas]. I had had a long run as an operator in the Control Center and as a flight director, and, as a matter of fact, found myself feeling like I had mastered that profession, and I probably was ready to get on and do something different.

So I was asked to go over to the program office and begin to get that kind of experience, which I did in kind of a small role though Apollo 17 in December of [19]'72, where the command and service module [CSM] management was performed by some other people for Apollo. But in parallel with that, there was a move to establish a project activity for the command and service modules that were getting ready for Skylab.

As I remember now, Bob [Robert F.] Thompson headed up a thing called AAP, Apollo Applications Program, and Bob's team was studying and working on the Skylab sequence and how that would be configured and so on. Sometime after I got over to the project office in mid-1971—that must have been '70. When was Apollo 15? Apollo 14 was in 1971, so Apollo 15 had to be in '71.

So I got over there and begin to manage the command and service modules that were being configured for the Skylab mission. I don't remember exactly when that occurred in the sequence, but I think the management of the command and service module for Apollo in the person of Aaron Cohen, I believe at the time, continued for the last Apollo series. But by that time I was very much involved in management of the command and service modules, actually four of them, three flights and a rescue ship, that were being readied for the Skylab mission.

By that time, the Skylab scenario was beginning to take form. It had been baselined at one point in a kind of a different way than the way we ended up flying, and it was a fairly complicated sequence and so on and so on. But fortunately, somewhere along the line there we got to something that was more doable in terms of the Skylab hardware itself, that we baselined and got started on.

Now, interestingly enough, two programs somewhat intertwined, because both of them used the command and service module. Before there ever was an Apollo-Soyuz Test Project, ASTP for short, we went to meet with the Russians in 1970. There was a fellow that was running the [Soviet] Academy of Sciences, his name was [Mstislav Vsevolodovich] Keldysh, Academician Keldysh. George [M.] Low and Tom [Thomas O.] Paine—Tom Paine was the administrator of NASA and George was the deputy—they began to be interested and have some conversations. By the way, I don't know whose initiative this was, and that would be interesting for you to fix that.

But between the two countries, sponsored by the political initiative of détente that Secretary of State [Henry A.] Kissinger was arranging for President [Richard M.] Nixon at the time, and equivalently on the other side, whoever the players were at that time—I think [Leonid Ilyich] Brezhnev was the [Soviet] General Secretary—there began to be the idea that we ought to meet and talk about how we could make rendezvous and docking systems compatible for the future, kind of like what would be standardized equipment, so that as people began to fly around in space more and more often, there would be a way for one ship from one country to rescue a ship from another country and rescue the astronaut. It was a very humanitarian-based kind of a thought and one that both countries could find it easy to salute, especially since it became kind of a thread in this tapestry, at least on the American side, Secretary Kissinger was weaving interactive activities between ourselves and the Soviet Union.

So in the fall, October of 1970, a group of us—there were only five or six of us. Dr. [Robert R.] Gilruth headed the delegation, Caldwell [C.] Johnson went, George [B.] Hardy from Marshall [Space Flight Center, Huntsville, Alabama] went, I went from operations, and we had an interpreter whose name I can't recall. Tough guy, tough guy, interpreter. I think that he had been involved, if we were doing them at the time, the assault stuff. So he was an American probably of Russian descent, either immediate or a generation removed. And Arnold [W.] Frutkin was in charge of international affairs out of Washington, D.C.

We went to open up discussions with the Russians on what we could do to derive some standards for rendezvous and docking systems, so that in the future that would work pretty well. This was before I went to the program office, which I didn't do until 1971, but I was involved as a representative of an operations point of view, rather than a design point of view, and how you could make the stuff play together and work together, because I'd been involved in all that kind of stuff in the Apollo flights.

There was a fellow who was the leader of the Russian delegation, or at least the *de facto* leader. I don't know if he was the official leader. His name was Feoktistov. First name escapes me. [Konstantin Petrovich] Feoktistov. He had flown as a cosmonaut, but he was also sort of an engineer/manager within their program. He was a very helpful, clear thinker, and clear kind of direction outliner for what we might possibly do.

On our side, we were probably a little bit more open as to what might come of this, but the conversation as orchestrated by Dr. Gilruth and by Feoktistov—I guess he was called Academician Feoktistov—went pretty well, and we worked on a whole set of standards for what might the rendezvous system, what kind of rendezvous aids would be have; what kind of lighting we would have; what kind of reflectors would we have; what kind of guidance control limitations would you have on bringing two ships together; how fast should you bring them together; and what would the mechanical construction be like.

The first meeting, I think was, I guess you would characterize it as exploratory. But in the course of that, we decided that we needed several working groups associated with the operations, associated with the design of the communications gear, associated with the docking system, associated with the suits and the life-support systems, because we had spacecraft that operated at two different pressure levels. They were at about fifteen pounds per square inch; we were at about five pounds per square inch. So they were kind of different in design.

So we began to work on that stuff, outlined what we had to do. Then when we left the meeting, began to work on follow-up to it. I think the next meeting probably occurred in the United States as follow-up to the first one. We probably had a total of about three, maybe, at most, four, but I think three meetings, when we began to conceive of the idea of having a test project that would test all these ideas. I would need to go back and establish the time line of that, but you could, because it was probably about a year. It was probably about

a year into this thing when the idea of a test project, which would probably put it in the 1971 time frame, to test these ideas and to see whether we could really work together.

We went to the Soviet Union to discuss this idea of a test project, with the approval of our government. At the time, we had begun, in conjunction with the Russians, to talk about it as a visit of the Apollo command and service module vehicle to the Salyut, which was a very small scale by today's standards, small scale, but the operative space station that they were engaged in operating in low-Earth orbit at the time. So we began, prior to that meeting, to have talks with them about how we could test all these ideas on the rendezvous and docking of the command and service module with the Salyut.

When we went to this meeting, which George Low was the head of the delegation for at that time, and I, by that time, had become—well, somewhere right in that period when it became a project, I became the—what was my title? Apollo-Soyuz Test Project director, I guess, for the American side. But the Russians had decided that for a variety of reasons of their own, they didn't want to do this thing with the Salyut. I don't know what all the reasons were. They had some that they expressed at the time. And the question was, well—and they'd put forward the idea of docking with the Soyuz spacecraft, rather than the Salyut station per se.

Our reaction to it in the meeting, in the course of our own private discussions around that meeting, was that, well, it was a change of vehicle, but it accomplished the same purpose. It would allow us to do all the things that we had planned to do by flying to the Salyut space station, get all the tests, get all the experience and so on and so on. So although it was a less grand idea, that is, of us going to what was their space station, small space station at the time, it seemed to fit the idea of accomplishing all the things that we had in mind in terms of our objectives. So we decided that that was as good as the other vehicle proposition, the Salyut, and it would be reasonable to do that.

Soon thereafter, and maybe even at the time, but I think both sides had to go back and confirm with their governments that their governments were willing to proceed with a test project, which then took on the name Apollo-Soyuz Test Project, and that was affirmed by both sides and was clearly consistent with the theme of détente that existed in the United States Government at the time, and was being responded to by the Russians, by the Soviet Union at the time, in somewhat an equivalent way, I guess. So they were positive about it.

By that time, I had finished up—I was close to, or had finished up, my last flight, Apollo 15, in the summer of [19]'71, and I moved over to the program office to get some experience in all that kind of work. That led to separating the Apollo command and service module from the ones that we were going to use for Skylab, and then another one that we would use for the Apollo-Soyuz Test Project. So I managed all the command and service module work and the development of the new docking module that would be used to account for the fact that one spacecraft was at three times higher pressure than the other one, and we weren't going to change that. So we had to have kind of an airlock thing in the middle, which is what the docking module was. It was a convenient place to put a docking system on, and it also then allowed us to airlock between our low pressure going to this vehicle, raise it up in pressure, and then open the hatches and go into the Russian vehicle. It was kind of a cumbersome way to do it, but we were both stuck with the designs that we had, and it was not easy to change or accommodate the same pressures in both vehicles. We went through a study about whether we could do that or not, and decided that it was not too practical. Plus, it would change so much of the basic vehicle, that that didn't seem right either, so it was easier to invent at this advanced stage of both command and service module flying, and Soyuz flying, some kind of a combination in the middle that would balance the two without changing the nature of the designs for the life support on both systems.

So as that rolled along and I moved from my role in the first meetings with the Russians as kind of an operations kind of a point of view or discipline, to then become one of

being the total project director, and that probably took a year or year and a half. You would be able to get the dates out of the records for that. Then that made the connection with the other spacecraft, the other purposes of the command and service module for our Skylab, made it a nice package, because we were going to use another one and so on.

So, Skylab. I guess these things kind of went on parallel. We continued to have a lot of meetings with the Russians to get ready for this Apollo-Soyuz thing, and we'll get into that story in itself. But in addition to that, we had the Skylab missions to support, which we planned to involve three command and service module launches to the Skylab space station.

So let me move ahead and just talk about the Skylab thing for a minute. The launch of Skylab was, what, May of [19]'73. May of '73, we finally launched what we was then called the dry workshop, as opposed to some of the other configurations that had been being talked about, which probably would have been too difficult to ever pull off. But thank God that we got focused on that.

But as you know, on the way up, we had a severe damage of the solar wing, lost one on the [primary] module, and some other unknown damage. It also removed a lot of the thermal insulation, damaged it as it tore away from the vehicle. And here we were launching our first space station, and lo and behold, I don't know how much we knew about this thing as it went up, but when we got on orbit, it was clear that not only was the power reduced because we lost the solar panel, but the thermal conditions on board the vehicle were much worse than we had designed for or had intended them to be, because we'd lost a lot of the thermal insulation, and the vehicle started to get too hot.

So we were faced with kind of an emergency, because the vehicle would only last so long up there. Of course, there were a lot of perishables on board, and so on, and the hotter it would get, the worse all that stuff become. So there was a fair bit of urgency in figuring out what, if anything, we can do about it. At first, in some quarters, there was a reaction that we had lost the program, that we had lost the program.

I remember the trip back from the Cape [Canaveral, Florida]. We came back on the Johnson Space Center's Gulf Stream, Gulf Stream One. I remember being on the aircraft with several other people. I can't recall who all of them were. George [B.] Merrick from North American Aviation [Inc.] comes to mind. Maybe even, I'm not sure of this, I don't know whether Don [Donald D.] Arabian was involved on the airplane trip. But in coming back on the airplane flight, I think it was the same day as the launch, we got to thinking about it and recognized—and we were told from Houston the extent of the damage to this thing and how the thermal protection was off on one side and the solar panel was gone. We had these little airlocks that were like, I don't know, I'm doing this, but they could be any size. They were like these little airlocks on both sides of the Skylab. One looked out where the solar panels looked, towards the sun, and one looked down.

On the airplane coming back, we talked about how fortuitous that was. I think it was Don Arabian was on the airplane, because he became such a key player in the design of the thing that finally was flown. But the idea that there was this airlock here will allow us to put something out, and we talked about it in the terms of an umbrella. See, you put out some kind of umbrella that would then provide the shade to allow the spacecraft, the Skylab itself, to survive in the thermal environment that it would be in. It just seemed to be ideally, almost accidentally, but ideally positioned on the vehicle in order to allow that to happen, if we could figure out how to design some kind of an umbrella. I think we ended up calling it a parasol.

When we returned to Houston, there were several other options being explored. Most of them were variations on an approach that said when you got close with the command and service module, the crew would open the hatch and put out a person, I think one person, not two, and with some sort of a fishing-pole arrangement, put some covers of some kind over the Skylab and attach it—I've forgotten how, but some way or another.

When we got back in Houston, this sort of a technique was the front runner in terms of options for how you might do that. I think people had thought about the airlock and so on, but it wasn't the highest-priority option that was being dealt with at the time. Don Arabian began to champion this idea of putting what he called a parasol of some kind inside this airlock and then shove it out and open it up and so on. Within a few days, literally days, a team of people here at the Center had devised that kind of thing. There was a lot of talk about what kind of material you had to have, and so on and so on. I think we decided we would accept a certain type of material, recognizing we might have to replace it later, which I think we did in the course of the Skylab missions, because the UV [Ultraviolet] would degrade it so much that it would lose its effectiveness.

But anyway, a number of people got started on this idea of this parasol, and after the competition that goes on between ideas, the parasol emerged as a method of choice in the team for how to stabilize it. In the meantime, because of the damage and because of the unknown damage to equipment, and because of all the other things that would have to be carried on board the command and service module, we also began a study of how much stuff we could load on board the command module in terms of the weight and the CG [center of gravity] of the vehicle and still be okay. There were some limits for that, but they had been evolved years before in terms of how stable the vehicle would be in the water once it landed. A lot of the reasons for the limits were sort of lost in antiquity at this time, although they had been developed, I don't know, six or so years or before that time, but we didn't have a good basis for—we didn't have a good historical record for what the limits were and so on, but we just knew what they were and so on.

So we tried to work within them and probably stretched them a bit, to load all the equipment and eventually this parasol device, which got loaded in a great big square-looking square on the end, a very long canister, and a lot of other tools and this and that and the other thing that it would take to make it work, all the time worried that we weren't overloading the

command module so much that we would have a problem with it when it landed, if it landed during an abort sequence, and not be able to keep the vehicle upright, get the crew out like we'd have to. So we struggled through how much we could put on and so on, and still do that.

Within a matter of days—what does the record tell me, five days or so—we launched the vehicle with this parasol canister that we were going to stick out the airlock. Pete [Charles C.] Conrad [Jr.] was the commander of the flight, of course, and was involved in all the preps of all these different techniques and finally this one.

Of course, the whole time the Skylab itself was kind of degrading, because it was getting hotter and hotter, and so it was a bit of a race against the space station, Skylab becoming completely unusable because of temperature. Nevertheless, we got off in a few days, less than a week, I think. We had planned to launch the command and service module the next day, the next day, I believe, as I remember after the Skylab, but we had to postpone while we went through this invention of set of equipment to fix it.

Then off it went, and the technique worked. I think we had to replace the mylar, or whatever it was, we used somewhere later on in the sequence, maybe with another parasol thing, I can't remember. But it was kind of an amazing feat. I mean, people were working somewhat around the clock. At this time it was basically an engineering team here at the Center that was doing that. Don Arabian was the nominal, I think, leader of that activity and the chief advocate, if I could call it that, for that technique, and eventually it won. But all the people, whose names I don't even know, that participated in that did kind of an amazing job of designing something that would fit in the spacecraft, be compatible with the airlock, and yet would still achieve the kind of protection that needed to be achieved in order to save Skylab itself. So it was an amazing sequence of events.

Then five or so days later, we launched the first of the command modules, performed this emergency thing, but we were able to do it from inside. We didn't have people going

outside or any other complicated things. We were able to perform it from inside, that is, the astronauts were able to perform it from inside the vehicle, and it worked. It worked. Gradually, I would say that probably most of the first mission was devoted to recovering from the condition that we experienced during launch, but the crews were able to activate the experiments and get started with all the scientific experimental activity that they had planned to.

The first flight was, what, about thirty days or so, about a month long. Frankly, things are little bit of a blur for me. But that flight went, we landed the crew, it was fine. The next flight was about two months, and then the third flight was about eighty-four days, during which time we also had a rescue ship that was being prepped in case we had to rescue the crew from Skylab, in case something went wrong with their command and service module. The concern that arose was because we were leaving the command and service module in kind of a powered-down quiescent state on orbit that we hadn't really done before, for a month or almost up to three months at the end, and the concern was that we didn't know how it would behave. We didn't know all that we could know about how it would behave, although we had done a lot of tests, and how all the seals would behave and whether any of them would degrade. Some of the propellants, for example, that we were using were very corrosive, toxic kind of things, and the concern with the seals would be that they would be eaten up and maybe not work like they should, making the propulsion system inoperative. So we had this idea of a rescue ship coming along just in case something transpired with the vehicle because of its long stay on orbit that would make it nonuseable.

BUTLER: How was the rescue ship different than the original command module?

LUNNEY: I don't remember any details. I don't remember how it was different. I don't remember exactly how it was different. I don't know that it was terribly different. But

nevertheless, we had another docking port for it, as I recall, so had we had to go up and dock it, we could have docked it and put people on that going back.

For me, the Skylab was fun in the sense that we were preparing three ships, all of which got launched. We had this rescue thing to deal with on the front end. I attribute the solution of that to a lot of people worked awfully hard to invent some of these crazy ideas we had at the time, and then the one that we really ended up selecting worked like we hoped it did.

The rest of the missions kind of went in a blur for me, because in parallel with them, which went on for the best part of a year, in parallel with them we were also carrying on these negotiations. By that time in 1973, we were pretty deep into the idea of this Apollo-Soyuz Test Project and all of the things that were going on to make that a reality—meetings and agreements and designs and trading models, and then trading flight hardware and doing tests and so on. So we were neck deep into that stuff by 1973, because the flight date had been scheduled for 1975. So it was not that far away in terms of all the things that had to be done.

As a matter of fact, when we started it, we started the Apollo-Soyuz Test Project, I believe, in the spring of '71. So about four years later to flight, a little bit more than that, was a fairly short period of time for the templates of the day and also the fact that we were doing this with the Soviet Union at the time, which was quite a different thing. Just translation and interpreting added twice as much time almost to any discussion as one that you would have in English. But I'll talk about that in a minute.

So the Skylab mission, as seen from the point of view of either the crews or probably after the first crew, or the flight crews, or the people in the Control Center on the ground, was difficult and tedious. I think everybody got tired of the round-the-clock, two months, three months at a time kind of operations that were being conducted. Plus the Control Center guys, flight ops [operations] guys, had to continue to maintain the Skylab even then when it was

evacuated by the crews and before the next mission came up. So they were running around the clock, keeping the spacecraft itself, the Skylab, flying well, dealing with the fallout from the original problem, and all the other things that happened as they went along, and continuing to provide enough services and time lines so that the scientists who where operating this solar telescope and Earth resources instruments and all the medical experiments, so that they were happy. And that's always a little bit of tension, as I think talked about at one time, and that is providing enough resources, time, crew time, power, coolant, so that the scientists are happy that they're getting all the information that they think that they can get on any given period of time of flight.

So the guys who are dealing with that in the Control Center, I think, had a tough road. I think the whole idea of running a space station that had a month, two-month, three-month kind of mission cycle duration, and where the incentive was to do as much as possible, my impression is it wasn't very relaxed in terms of what people were trying to do scientifically. The scientific agenda was very aggressive, like you'd expect it to be. So it was not kind of a laid back three months, where you call the crew and see how they did yesterday or the day before or last week, but rather it was kind of a minute by minute. Some managed somewhat in the same style that we would manage a ten-day Apollo flight, with a tense kind of interaction all the time with the crew.

I think it wore on the flight crews. I think they just got physically worn out, because everything turns out to be more difficult and take longer for them than is perceived, or believed, or assumed on the ground. For example, just finding all the pieces, finding all the parts to a camera, to get everything put back together in a slightly different configuration for the next experiment. From the ground point of view, gee, they used this camera two days ago, what's the big deal? But from the crew point of view, there was all this putting things together and taking them apart, taking care of themselves, spending enough time physically maintaining their condition, and then all the other housekeeping things that they had to do to

tend to this fairly large ship. Think of it in terms of a couple-hundred-foot—what was it? Probably close to a couple-hundred-feet ship maintained by three sailors. So that's a lot of stuff to keep running and keep shipshape. And then there was a high demand for their scientific schedule.

So I was kind of in a high-energy mode for the launches and the reentries of the command and service module, but other than that, they were fairly dormant. The other guys, who were really operating the Skylab, were hustling and bustling the whole time, trying to be sure that they were getting everything done, and with a lot of pressure on them from the scientific community to do this, do that, and do more all the time. So I think it got a little contentious and a little difficult, tedious for people in that respect.

For me, it was relatively fun, because we had high-intensity periods and we had relatively quiet periods during which this whole other activity called the Apollo-Soyuz operated in parallel. So we were kind of doing two things as we went along and doing them in parallel. I didn't have to be involved in all that day-to-day struggle in the Control Center about what they were going to do next in terms in the scientific experiments. A struggle for them. And I think a lot of the guys would tell you, if you interviewed them, that they didn't like it. [Laughter] I think the crews got stressed, the crews on the ground, the flight crews, I think the crews on the ground got stressed, and it was tedious. We need to find a way when we do the next space station to be somewhat more relaxed in terms of moving away from minute-by-minute scheduling of crew activities into something that's a little bit more hourly or maybe even daily by way of giving them a schedule for the day and leaving them alone.

The minute-by-minute is a carryover of our history where we have flown relatively short missions with lots to do, so we always tried to squeeze the most out of every mission. That's been an institutional cultural thing that's built into so many people here at the Center, and it will take some adjustment to get a little bit more reasonable about how we manage time when we get to a space station. Because if you don't, you'll drive everybody crazy and

your effectiveness will go down. It isn't that people get angry about it, it's that their effectiveness will go down. So we are going to find that to be more effective, I think we're going to have to give people more freedom in how they use their time on board and not try to micromanage them as much as we have done in the past. But that's another story.

BUTLER: Do you think people will learn from the Skylab, and even from the Shuttle-Mir?

LUNNEY: No, no, because most of the people operating the Skylab are gone. [Laughter]

BUTLER: True.

LUNNEY: They may learn by listening, but people tend not to learn by listening. It's like your parents. Right? You kind of have to get out and get a little burned yourself before you believe certain things are true. Now, I think the Mir may have been helpful in that regard, but the American role in Mir is very different than the American role is going to be on the International Space Station. So that's not quite a good model.

I think the Center and the folks in it have certainly paid a lot of lip service to how they're going to behave in this more rational way. I predict that what they're going to do is operate in the same old way for a while, until there get to be several shouting matches, and then it will probably become more reasonable. It's going to be hard to break the carryover of the way in which things have been managed, flight things have been managed in the past. I know they're going to carry that into the space station. And it's going to be a problem. They are going to drive the crews crazy until somebody finally shouts loud enough to stop it and then it will seek its level, whatever that is. They'll be all right, because they're going to have to do it for years and years and years, so they will have to arrive at some accommodation so

that people are not driven crazy with constant calls and constant assignments and constant changes to assignments and procedures.

So the Skylab stuff, from my point of view, went very well. It was exciting, especially on the front end. It was interesting for me to be involved in what may have been, I don't really know, what may have been the first discussions of this parasol we called an umbrella, an airplane thing going out the airlock. It was interesting when we got back here to Houston that people were all favoring some other options, and it was interesting that the parasol one eventually became the selected method. It only took a few days. Do you know offhand how many days did we go from the Skylab launch to the first command and service module launch? It wasn't very many.

BERGEN: I think it was ten.

BUTLER: I know that they had to get up there within ten days. I think it was right around that.

LUNNEY: Was it? It was not long. A week. But to put this all together and repack the command module and design this stuff and get it to the Cape was quite a venture. A lot of people worked around the clock, almost, with no rest.

BUTLER: We have been fortunate enough to talk with Jack [A.] Kinzler, who was involved in the construction of it.

LUNNEY: Yes, he was. Yes, I think Jack originally was a parachute connected guy. I think he had some background in parachutes, because he was always the guy we'd call on for the vehicle's parachutes.

They tested it in one of the big thermal vacuum chambers out here. That in itself is a story worth exploring and getting from people, because it's something that you could pull together. Because we launched even within ten days or less than that. The idea had to be conceived, built, tested, and then it took on the other end of getting it to the Cape and getting it installed, there was at least two or three days to ship it to the Cape, get it in place and get it in location. Although I had the feeling, as I remember, that we had equipment arriving all the way through the countdown, almost, in terms in things that had to be there and getting stowed on board the command and service module, so they would be ready to be used when we got there for flight.

BUTLER: It's quite a feat. It showed all the training and all the years of experience through Apollo, Gemini, Mercury had paid off.

LUNNEY: Paid off again in this case. A tremendous effort by the engineering team to design these things. The operations team was busy interacting with these techniques and contributing to them, but also maintaining Skylab, because it wasn't behaving right. It was in a dangerous kind of environment that it wasn't going to be able to survive in very long, so they had to kind of manage all that stuff so that it didn't go off the deep end on us and become unusable. So it was a high old time for all parts of the Johnson Space Center, and quite a story, quite a story, the recovery—let me call it the recovery of the Skylab vehicle. It's quite a story.

BUTLER: Absolutely.

LUNNEY: Because, as I said, some people, immediately after the event, shortly after the event, were of the mind that all was lost, all was lost. And it was understandable that people

felt that way, because, I mean, this thing had been torn apart. But within a short period of time, people began to focus on, "Well, okay, this is what we've got. What can we do about it?" A number of ideas emerged, perhaps any one of which would have worked fine. This one, the umbrella-parasol thing, had a lot of charm to it. It just seemed like a natural fit for the problem that we had. It didn't require EVA [Extravehicular Activity], it didn't require putting the crews outside in some kind of strange environment and so on, trying to do something from hanging out the door of the hatch of the command module. So it turned out to be a good solution.

BUTLER: A good solution, and Skylab ended up returning a lot of good science, some of which is still being praised today.

LUNNEY: Right. And they're probably still analyzing some of it today.

So as that went along, both of those programs, Skylab was executed and the Apollo-Soyuz Project was running along in parallel.

I should probably back up a little bit and talk about something in the nature of my own experiences as I transitioned from the operations work that I had done for ten or twelve years in the first part of my career, to the program management work that I was headed towards when I moved over to the project office.

I have to tell you that because of the nature of what we did in the flight operations business, I was relatively ignorant of what a lot of other people did in terms of designing vehicles and getting through all the things you do to get them ready to fly and all the disciplines that apply to that. There were a whole set of things that were completely beyond my purview, or my operating experience when I was in the Control Center, that when I came over to the project office I began to run into, I mean to the extent that at times I felt like I didn't know anything. [Laughter] I mean, it was just a different world and a different way of

looking at things, and a different rhythm to the things that you did and the things you had to watch out for. So it took me a while to learn to adapt to all the new demands of this job.

I found myself quite shocked by—although I was prepared intellectually by my experience in the operations business, I didn't feel like I was really competent to deal with or to even know what all the considerations were of these fellows that had been doing this design engineering work for so long, and it took me a while to get comfortable with that. One, to catch onto it, and, number two, to get comfortable with it over a period of time, because it dealt with budgets, and how much is it going to cost to do this, what's the schedule, how do you know, and what do you have to look for. As you move into more and more of a management role, you have to be more and more discerning about what's the right choice, what can give us a problem.

It becomes more of a "where are we going" kind of leadership, rather than how we get each nut and bolt tied together, which there is a lot of engineers that know how to do that, but the "where are we going and how are we going to get there" at the big level was a skill that operations work provided a good foundation for, but there were a lot of things that I didn't know that I had to begin to develop. Like when you're going to design something, you can say—or when you have solve a design problem, you can solve it any one of a number of ways, which means you're choosing to have this class of problem and you're avoiding this other sets of problems by the choice you make about the design.

It takes a little while for new people to that world to begin to realize that that's really what you're kind of doing. It's a little like governments. I mean, they decide to do this and usually that means that they're not doing a couple of other things, so they're choosing to deal with the problems that this course of action represents and will present, and they're avoiding the ones on the other side. It took a little while to develop the experience and judgment and so on that that set of choices really are based on.

As a matter of fact, I was forced into that fairly quickly, because although the command and service module for Skylab was fairly well conceived and developed and in work by the time I got there, and it was mostly a matter of seeing that it got done the way it had been planned, there was no plan for this Apollo-Soyuz Test Project, and here I was the director of it.

LUNNEY: So I was involved in having to decide what of all of these different options, not at the detailed design level, but at the higher level of, for example, are we going to change the pressure in both the spacecrafts, or are we going to use this airlock device in the middle called the docking module. Well, that was a set of tradeoffs as to which set of problems were you going to tackle and which set of problems were you going to avoid.

Had we tackled the higher-pressure problem, either going all the way up to the Russian pressure or having them come down to some metered pressure, both our sides would have had to deal with all the implications of a different pressure in the vehicle. On our side, higher pressure, structural integrity, life-support systems to support it, etc., etc., and on the Russian side, lower pressure, lower partial pressure of oxygen. So we could have done that or we could have built this device that turned out to also be a convenient platform upon which to attach all of the new things that we had to add to the flight and avoided adding them to the design of the command and service module as it was.

So the choice of making a docking module/airlock module in the middle turned out to be, I think, the right thing to do. It worked out that way, anyway, and it gave us a nice big vehicle upon which to hang lights, docking aids, radios where we need them, antennas, and, of course, the docking system itself, plus all the air bottles that we would need to pressurize this thing up, and then allow it to depress and then pressurize back up when we go back into the Russian vehicle and so on. So it turned out to be a neat solution. But that's what I meant

by the example of choices you make about which problems are you going to tackle and which problems are you going to avoid.

So it was a very fast learning experience for me starting in [1971], when I went over to the program office, to move from an operations-oriented background to a program-management orientation where you had to make those kind of choices, some of which were also determined by how well you thought that people could build the things you were talking about. And, of course, you did that with consultation with people. But I was right in the middle making some significant engineering design choices, and I didn't have a hell of a lot of background in that thing by the time I was neck deep in doing that myself. But there were a lot of good people around that helped a lot in that regard.

Fairly early on in the work—let's see. We set this work up in working groups. Working Group 1 was kind of operations. Pete [M. P.] Frank did that. Working Group 2 was guidance and control. Ed [H. E.] Smith chaired that for a long time for us. Working Group 3 was the docking service itself. Caldwell Johnson was kind of the American initiator behind a lot of that, but the group itself, I think, eventually was run by Bob [Robert D.] White. Work Group 4 was the communications group; that was R. H. Dietz. Working Group 5 was the life-support stuff, and that was Walt [Walter W.] Guy.

Then we had sort of an unnamed working group, I guess, or attached to what we ended up calling Working Group Zero, was the management group, because we had assigned all the technical disciplines and realized that we had no management working group, program management working group. We ended up calling that Working Group Zero, and the Russians Working Group Null, which does sound like Zero. And we attached a public affairs operations to that as we got closer to the flight and had to arrange all the communications and releases and so on and so on and so on. And that structure held us pretty well.

The flight crews, I can't remember where in the sequence Tom [Thomas P.] Stafford and the crew got named, but the naming of Deke [Donald K.] Slayton to the crew was, for

me, a kind of small scale, perhaps, déjà vu of what it must have been like for Deke Slayton. But I remember—and I don't know if we talked about this—I remember being in Bermuda, I think being in Bermuda with Deke, on MA-6. I believe he was the capcom [Capsule Communicator] up there, and he was going home to get ready for MA-7, after John's flight, when this heart murmur thing—I think I have the timing right, when that heart murmur thing got him bumped when he got home, and [M.] Scott Carpenter ended up flying the second manned orbital flight that became MA-7.

So here we were [19]'62 to '72, at least, later than that, ten years, were Deke had performed a tremendous service for the country in terms of organizing and really managing, controlling the astronaut corps during those years, and, in a sense, he was a natural for it, because he had been selected, he would have been one of the flyers bumped for reasons beyond his control, but looked up to and respected pretty much by all the people in the astronaut corps, and relatively a "keep it to himself" person, I think, in terms of how he managed the office, which may well have been the necessary style. That's a whole other subject, management of the astronaut office, a tremendous of very forceful, strong ego—I mean that in a positive sense—strong ego kind of personalities. And it took kind of a seasoned veteran to deal with that kind of a collection of personalities, and Deke did that very well.

Then Alan [B.] Shepard [Jr.] also found himself with an inner-ear problem and he became a key player in helping Deke, between the two of them, manage the astronaut office. And I suspect that's a story that would be interesting to explore, and probably some people have, although I was a little remote from it and a little bit junior to that. I mean, I was couple of levels down, although we interacted with them with them a great deal in the flights and in the Control Centers as peers or even, strange as it may seem, we were the boss of what happened during the flights. In general, I was ten years younger than these fellows. Some of

them, for example, Deke flew combat missions over Europe in World War II. In World War I. But that's an interesting story that someone will capture.

But the management of all these personalities, all of whom were jockeying in one way or another to do this and do that or get this assignment, and the assignment of flight crews was sort of like a mystery that had occurred in some unfathomable gas and out of which came these assignments, and I think the guys spent lots of time trying to figure it out so that they could play it. I'm not sure it was "figure-outable."

But Deke and Al performed a major service for the country and certainly the Center in their role as managers, leaders of that activity for most of the sixties, most of the sixties. Then, of course, Al came back and flew in Apollo 14, Deke came back and flew on Apollo-Soyuz in [19]'75, about which and for which many people were happy that he got an opportunity to do that.

So, to return to the Apollo-Soyuz thing, I wish I had a time line of all of our meetings and activities. Maybe I can look at one of those and do a better job for you the next time we talk about this.

BUTLER: I think that we may even have one in the book *Partnership* [*The Partnership: A History of the Apollo-Soyuz Test Project*].

LUNNEY: The [Edward Clinton and Linda Neuman] Ezell book? Yes, I should look at that. I probably have it, but let me take your copy so I don't have to look for it. Because I haven't freshened myself up on that. It was quite a thing. I didn't take any time to describe the October '70 visit to Moscow.

BUTLER: Even how you got involved in that.

LUNNEY: I don't know. Chris [Christopher C. Kraft, Jr.] just called me and said, "Glynn, you're going to Moscow." [Laughter] I had not worked very closely at all with Dr. Gilruth, except, of course, I knew him in Houston, in the Control Center a lot of during the high-profile things and so on. I knew how much Chris and Max [Maxime A. Faget] and others respected and almost revered Dr. Gilruth. So for me it was a big opportunity to work with him and to work with Caldwell Johnson. I think I have also said that at the beginning of my career, and I still have it, a drawing that Caldwell did for the original Mercury spacecraft in June of [19]'58 was the first time I saw anything that told me what this thing, Mercury, what became Mercury—didn't have that name at the time—might look like. And that was my introduction to, and perhaps bait for, intellectual bait, for joining the activity that was going on at Langley Field [Hampton, Virginia] in what became the Space Task Group.

So I had a [first] chance to work with Caldwell, although Caldwell was involved also in the design of the Apollo spacecraft. It was interesting at the Center, in that the operations folks and the engineering folks came together during the flights, and this engineering support followed along in parallel, as I talked about, but they didn't really work in each other's world and they didn't have a lot of knowledge of what other folks did. As matter of fact, that was painfully obvious to me when I left operations and went into program office, where basically I had to manage a design and development kind of…activity. Totally different set of stuff. Of course, the engineering guys' view always was that we ops guys didn't know anything and we just went on TV and talked to the media and smoked cigars when the vehicle landed. [Laughter] So we had some hills to climb in terms in capturing the respect of the people who were in the engineering team.

But let me talk just a little about that first visit, and then I want to refresh myself before we get into all the other things.

BUTLER: Okay.

LUNNEY: Somewhere along the line, Chris called me and told me he wanted me to go to Moscow with Dr. Gilruth, and probably gave me some idea what this was about. There were five of us: Dr. Gilruth, myself, Caldwell, George Hardy, and Arnold Frutkin, and an interpreter. We were going to explore this idea that had been raised about making rendezvous and docking aids sort of mutually compatible, so that in the future everybody would have—it's sort of like having the same kind of lifeboats on your ship so that somebody else could pick them up, I suppose.

Now, this was 1970. I mean, we were in Vietnam. It had been very, very difficult. The Russians, of course, were backing the other side, the Soviet Union was backing the other side. We were very deep into the Cold War in terms of the threat of nuclear exchange. There was an almost implacable sense to, at least my senses, implacability that we were playing into. [Nikita Sergeyevich] Khrushchev had already been to the U.N. [United Nations] and banged his shoe and told us what he was going to do to us, and so on. So there was a fairly cold feel to it, a monolithic kind of sense of the Soviet Union, who was going to try their best to bury us, in accordance to Khrushchev.

We, of course, had been involved in Apollo race and felt keenly the sense of competition with the Russians on our front not being a military one, but a technological one, but the whole thing was fairly cold and forbidding and dark. I mean, words like that come to mind to kind of describe what you felt was the relationship between the two countries. That's probably even a wrong noun to use. It was more like it defined a sense of competition or hostility, adversarial hostility, that existed at the time. There was not trust, there was nothing like that.

So here we are in October of 1970, this kind of—I don't mean to say it this way, but a thrown-together group of Americans, most of whom didn't know each very well at least, certainly hadn't worked real closely with each other over our lifetime. We were joined by

Arnold Frutkin, who, by the way, ended up making major contributions to the Apollo-Soyuz thing. He was in charge of the International Affairs Office in Washington and helped NASA and the NASA people with a number of international projects. He was very good at what he did. He was kind of like a—not really, but if we were a technical, he was kind of like a political. It wasn't like he was a commissar, but it was like he helped with how you do things, how you go see the embassy and pay your respects. He knew the courts of Caesar and who all you had to deal with and how you had to deal with them and so on, so he helped us through what could otherwise have been a very difficult kind of set of stuff for us to blunder along with. He also had some sense about how you arrive at agreement and how substantive an agreement needs to be, does it commit people to enough stuff, and is there a schedule to it. So he kind of had a set of criteria that we, of course, would also have, but that he had exercised in a number of other international activities. So he was very good at helping us put that kind of stuff together.

So we go over there, it's just like I thought, it's cold and it's dark and there's snow all over the place, and it's gray and it's forbidding. It's forbidding. We had these meetings with, I want to say [Konstantin Petrovich Feokitistov]. It will come to me. He has several sets of players, but he clearly was the leader of the thing. And in the course of that meeting, I had to say that I came to respect his abilities quite a bit. He was the primary spokesperson and there wasn't a lot of interaction with other people, but as a person that they selected to lead this, he was good. He was very good at what he was assigned to do in this whole area of manned space flight, and was very knowledgeable about it.

We went there at a time when, I believe, most American delegations on any subject would be viewed as being full of CIA [Central Intelligence Agency] spies by the Communists at the time, probably because they did the same thing. But it was interesting in that a number us had at least had a public reputation. Dr. Gilruth did. Caldwell, I don't know that he was publicly known, but it was fairly clear in five minutes of discussion that he was a

technical guy. Myself, and they had heard my name in association with missions. By the way, that first visit came six months after Apollo 13, where, of course, I'd been involved in the management of the recovery of that flight. So we had some credibility. They didn't know George Hardy. And I think they knew Arnold from other scientific things that had gone on outside of manned spaceflight, that had gone on with the Academy of Sciences in Russia. And the Academy of Sciences was the group that was sponsoring us.

We never could really figure out exactly how the Russians worked internally, because we dealt with a lot of people who were either—they weren't all in the academy, but they were sort of managed by some leadership people that were in the Academy of Sciences, and it looked like they came from various institutes. Then behind them were how things got built, hardware got built, in the country. And I had the feeling that we never saw very much of that, that that was all mixed up with high-security stuff. I mean, even their space program was high security. They dealt with that as real a high-security thing. But I think they were built in factories where they built a lot of other military equipment, too. So they had a very strong, really strong sense of security and protection and defensiveness about this kind of stuff.

Our first meeting, I guess I would say, was very exploratory, although we did end up agreeing that we could continue to pursue it. We set up this little organization structure of the working groups to look at it, you know, technical disciplines to look at the different subjects that applied, and we went on from there.

The first set of days we were there, it was really—I mean, it was different food, for me, it was a different hotel. We'd been briefed on how careful to be and all the rest of this stuff. I came over with all the background that an average American citizen would have about what it would like to be in the Soviet Union and so on, and it was forbidding. It was really forbidding. So, the technical discussions that we had were actually a breath of fresh air, in that we were all grappling. We found out that we were grappling with the same things

that they grapple with, because they're doing the same sort of thing. Same business, same mission and so on. So in that respect, they were fun.

We went out and visited Star City. [Laughter] Now, that was entertaining. We went out there, and there were five of us, six with our interpreter, I guess. It would be incomplete to talk about some of these discussions with the Soviet people at the time, Russians, without mentioning this. I don't want to belabor it, because it sounds a little funny, but there was this thing they did about toasting and the vodka, and some of it was natural for them and very real for them. I always had the feeling that some of it also was kind of in the category of having the other person lose face by having too much to drink. But I don't mean that it was all intended that way. I think there was a natural tendency on their part to enjoy themselves, enjoy the vodka, and they were very, very social when they had these sort of occasions.

So we went out to one of these events at Star City, and there must have been about twenty guys standing around in generals' and colonels' uniforms, and then the people were with us who were dressed in civvies. Some of whom were civs [civilians] and some who probably were not and we didn't know. We went out there, and oh, my God. I had the feeling that—I mean, it was a nice event and from their point of view they were being very hospitable and so forth, but I had the feeling like we had been ambushed. [Laughter] We'd been ambushed, because it was clear that they wanted us to drink vodka, and, you know, none of us ever drank vodka to speak of. We were beer guys, right. Some people would have a martini, but I never had a martini to speak of.

But it was quite an event, and, you know, my story is, we held our own and we whipped them at their own game, and I'm sticking to that forever, and I think I'm mostly right, but we were vastly outnumbered, we were new to the game, but we held on and we did fine with it. It was not embarrassing or anything like that, and it went fine. They looked a little ragged to me by the end of the evening.

But it's a curious thing, and I've seen it over and over again and I think it still goes on. I would say one other thing about it, and that is that as relationships mature, that seems to pass. Once you establish something with a counterpart or other people, or so on, then I think the compulsion to participate and compete, if that's the right word, in that kind of what for us is adolescent behavior becomes much less so after time. As relationships build, it's much more of a mature thing.

But on the front end you had the feeling that you were being tested somehow. I did. I also had the feeling that we were kind of ambushed by an awful lot of people who knew exactly what they were doing, they were very experienced at it, and we were kind of new and quite small in numbers compared to theirs. And I had the feeling it was kind of a cultural thing. I don't know how to describe all the dimensions of it, but they considered it important. You couldn't just, on the first go, ignore it, or not participate or whatever. But I would also say that we graduated away from that very quickly, and as things went along, people were fine. There wasn't that sense of competition. The first time out, I mean, it was quite a go for me, especially coming in this mood that I was experiencing about this cold, dark country with a lot of snow and kind of a forbidding feeling to it, almost sort of alien feeling to us as we trooped around over there.

Had a little home when we did our work and then we went to this other thing and it was quite a test. But I would say that the Russians, to us, they were very gracious. They were very accommodating. They were very concerned that everything was arranged properly for us. They went out of their way to show us a nice time and visit the sites. For example, we would go to the Bolshoi Ballet and so on. They would have a little party arranged at whatever half-time is called in ballet. [Laughter] Intermission.

So they went out of their way, almost to the point of us feeling like we were being occupied too much. We had no time to sit down and talk amongst ourselves, or even get a good eight hours' sleep. It was kind of like our schedules were booked fairly heavy, and that

was true of our first meeting and probably several after that, until we gradually just insisted that we calm these things down and it was not necessary to schedule us. A little bit like my discussion of ground people scheduling the flight crews all the time. After a while, you need some time to just relax amongst yourselves and talk amongst yourselves about things.

But that first meeting was quite an eye-opener for me. I was a young fellow at the time. What was I? Thirty-three, still. I had had this image of the Soviet Union that had been operative in America for twenty years maybe, almost, and when I went there, it felt fairly tough. The people that we dealt with were tough, I would say, but they were professional. They were actually, in some respects, better hosts than we were, or guests, either way. They had a tradition of always being sure to have a gift for people. I mean, they must have had some unlimited number of things in bags that they could pull out for all occasions, and we Americans don't carry that around, at least my segment of America, doesn't carry that around as a tradition, where you've got all these little things, books and pictures and so on, or patches, or whatever that you can pull out of a bag and present to people as you go along. But they were very good at that.

I mean, they taught us something about their element, that element of courtesy that was very important to them. We gradually began to realize that and started to stock our own supply of handouts for various occasions as we went along, because whenever we went anywhere in America, if we went to someone's house or we took the Russians to some event, they could always could pull something out and give it to whoever was sponsoring the event at that place and make a fuss over it. And the person receiving it would remember it and so on. It was kind of a very nice thing to do, and we learned that we should be more sensitive to that, too, and do it.

But that was my first opening and my first meeting with the Russians, and it was a quite a sobering thing, and yet it was kind of optimistic in the sense that, yes, all the conditions, all the environmental conditions around this meeting were what they were, but

the men that we talked to seemed to have a kind of positive attitude towards this thing, as we did. So work got started, and then it eventually led to this idea of a test project within a year or so, probably less than that, and off we went.

I'll try to be more prepared next time and have a time line of all that stuff for you, so I can talk about it, and get to read the *Partnership* book again.

BUTLER: Absolutely. Before we do go, you mentioned that the whole feeling and the idea of what the Soviet Union would be like in comparison to what we knew in America and so forth, and the race that you had been in with them, and how once you got there it fit in somewhat what you had thought, but what did you think when Chris Kraft called you and said, "Go to Moscow"?

LUNNEY: I was thinking, "Why are you asking me to do that? I don't know anything about that." It was typical of Chris, though. He always was extremely good at stretching people. He also was willing to give us a shot at things and give us a chance to grow and so on. I mean, it was almost typical of how he managed us young Turks at the time, in terms of challenging us and giving us new things to do and new things to think about. Chris was the one who moved me over to the program management group work, told me it was time for me to go learn how to do that, young man.

So the Russian thing was typical, but I felt sort of overwhelmed by it. To me, there hadn't been a glimmer of this sort of thing going on, and just out of the blue, at least for me, came this assignment to go do this. The other thing about it that I hadn't really dealt with very much, or thought about very much, but I could also sense in some of the American NASA people who were not involved in it, that there was still a residual of distrust that carried over from their experiences one way or another, or lack of, with the Russians, but their point of view, I should say. They were, you know, objective to neutral about it. They

were not overtly hostile towards the idea, but they weren't overly supportive, either, of it. They kind of stood their distance from it.

There was a small band of us who eventually went off and did this thing, a small band of us within NASA, but we were kind of on our own. We had fairly quick lines to the top of the agency through the Center director. But the rest of the Center didn't really participate with us very much. There was probably, gee, I don't know a hundred, two hundred people, until we added a lot of people in the Control Center for the flight. Probably of the people who were actively involved in it, two hundred is probably a high number for the people who were NASA people, who were actively involved at the Center. So it was a relatively small-scale operation of interacting with the Russians and helping manage the contractor to get the spacecraft and the docking module built the way we wanted. But the rest of the Center kind of kept its hands off.

Some of that was probably what I said, some concern or not being quite being comfortable with the idea of the Russians, but some of it also was the recognition that if you're not involved in something, it's hard to mess around with it and make inputs to it or make suggestions, because you don't have a background of what's going on. Some people know that about what they're qualified, if that's the right word, what their backgrounded to participate in. In this case, it was all done in kind of, not that they were classified or anything, but that they were just meetings involving relatively small numbers of people. They were ongoing and fairly continuous and so on, so other people didn't have much chance to interact to it, although we would certainly bring out the design, for example, the design approach with the docking module that was conceived, and aired that with the people outside of the immediate cadre of people involved in the Russian interface to be sure that that sounded good and acceptable and right track kind of test. And we got support for all that from people as we went along.

So it was quite a time. It was quite a time for a young man, and I'll talk about this some more, to interact with a brand-new society that I had been taught was the enemy, and to interact in a way that we could—the other thing I learned about our interaction was this is a lot different than a cultural one. We saw some of those, by that I mean an exchange of operas or whatever. And those things end up being the one-night stands of sorts, it might be a week sometimes, but just sort of one-night stands and there is no—I guess maybe I'm not sensitive enough, but this is the only I can think, of substance that gets done in an interactive way. One group does one thing and one does another, and it's very nice and they have a lot of parties and backslapping and so on, but there's no ongoingness to it.

What we were involved in was something that had to be ongoing, that we had to continue every day to touch them, feel them, talk to them, question them, and so on, evaluate the results. So it was ongoing and it was objective in the sense that things had to work, and you couldn't fake it. It had to be there, and ultimately it had to be launched and be successful in space. So it was very tangible. So the tangibility of it, the hardness of it, and the ongoingness of it made it a different adventure than exchanges of ballet groups. I don't mean literally ballet, but various cultural kind of things that happened while this was going on, and they always seemed to me be unsubstantive in terms of producing any long-term result of any kind. I suppose they do some good, but by comparison to the ongoing thing that we did and what had to be developed in order to pull it off in terms of relationship and trust, it's just not the same kind of thing. As a matter of fact, sometimes I had the sense that the Russians had some degree of contempt for those sorts of things and that they were exactly that.

I also noticed that especially among Americans who seemed anxious to please, that one of the things that I observed and I became more observant about it and reacted to it more as the project went along, is especially when Americans for the first time would meet this Russian delegation. They had a tendency to fall all over themselves in terms of being accommodating. I could almost see the Russians responding to it as in, "Well, okay, if

they're going to be this dumb about it, then we're going to play this fool for however much we can string along for." I used to have to chop those things off along the end of the line.

It was an interesting phenomenon, because the Americans, primarily, maybe solely, in their first meeting with them in some sort of circumstance or another where we would take the group to see something or another, they would almost fall all over themselves. It was embarrassing for us, for me and for my team. It was a little bit embarrassing to see how foolishly the American groups, new groups, would behave in that regard. So we would always try to get things back on the track that we were used to and not allow this sense of falling over yourself to continue very long. It occurred often enough that it was clear to us that it was going to occur almost every time we got them in a new environment. And the Russians, they kind of could see it coming and they would try to take advantage of it, and we'd have to learn how to manage that.

Well, anyway, there you are. That's today.

BUTLER: Wonderful. Thank you. It's been good.

[End of Interview]