NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
ORAL HISTORY TRANSCRIPT

VANCE D. BRAND
INTERVIEWED BY REBECCA WRIGHT
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WRIGHT: Today is July 25th, the year 2000. This oral history is being conducted with Vance Brand at the Johnson Space Center in Houston, Texas. The interviewer is Rebecca Wright with the Johnson Space Center Oral History Project.

Thank you again, Mr. Brand, for visiting with us today. In 1975, on July 15th, there was a historic moment in space when the two world superpowers for space exploration came together. You were very much a part of that. We'd like to visit with you about that role today. Could you tell us when you first became aware that the United States and USSR [Union of Soviet Socialist Republics] were going to have this mission, and what your thoughts were at that time when you heard about this never-before mission being planned?

BRAND: Well, the agreement to have the mission was made between President [Richard M.] Nixon and [Soviet Premier Alexei N.] Kosygin of the Soviet Union in 1971. So sometime shortly after that, I became aware that there would be such a mission. I became increasingly aware because people like [Vladimir A.] Shatalov, [Alexei S.] Yeliseyev, senior cosmonauts from the then Soviet Union, came over. They looked at our facilities and met us. They were taken out to ranches nearby. Of course, this was in the middle of the Cold War, and there was a lot of tension between the Soviet Union and the United States, so this was all a very unique sort of thing.

I, somewhere along the line, decided that this was very interesting to me personally, although as astronauts we didn't have too much say in what we were assigned to. I thought, well,

this would be a very interesting mission. At that time I'd just gotten off a backup assignment with Apollo 15, and I was a backup crewman on through the Skylab missions and very up to date on the command module and service module, things that would be used on the Apollo-Soyuz mission. I decided that I was interested enough that I attended some of the banquets that the Soviet cosmonauts were attending here. On my own, I went off, took Russian lessons. I paid for my own Russian lessons on Saturdays and got into their language and their culture a little bit.

Finally before the end of Skylab, sometime in 1973, as I recall, I was assigned to the mission. Tom [Thomas P.] Stafford had been assigned for some time, and he had been working in the Soviet Union doing advanced planning and that sort of thing. So when we were assigned, why, of course, I was elated. This was my first mission. We set about to get ready for it. Well, when I was released from Skylab, we started training, planning, getting familiar with the docking system which would be used on the mission.

Just let me say that the purpose of the mission… was, as I see it, twofold. One, it was to test the docking system, a unique new piece of hardware different from docking systems we had used in the past, which had been what we called probe and drogue-type units, like what was used on Apollo. This unique new docking system to be used on Apollo-Soyuz was called androgynous because the components on each side were more or less identical. It wasn't what had been used in the past, as I say, male-female; it was androgynous. It was two identical systems coming together.

So that was one purpose, and the other purpose was international relations. It was, how do we take two space programs that grew up from separate roots and coordinate them, make them work together. I think when you sort of dissect the international relations aspect, it was, well, let's improve coordination between these two countries, and a mechanism for doing that is using the very visible space programs of each nation.

There had been precursor events probably that led into this. One was at a Paris Air Show a few years before Apollo-Soyuz. Astronauts and cosmonauts had gotten together in a Russian transport airplane on the ramp and had toasts and had more or less a good time together at a Paris Air Show. So there was a reason to believe that, well, these people, cosmonauts and astronauts, they all are in the same business. So, well, maybe if they get along well at the Paris Air Show, maybe we could expand upon this.

Of course, there had been things that I was really unaware of at the time, but there had been early contacts between the Russian Academy of Sciences scientists and academicians and NASA and State Department people. George [M.] Low had been instrumental, for example, in pursuing this cooperation in the early stages, and Academician [Mstislav V.] Keldysh and others. And there were many more names. I think, actually in the early sixties, there was correspondence between academicians and people like Hugh [L.] Dryden. So, anyway, I digress, but that was some of the beginnings. I mentioned what the purpose of Apollo-Soyuz was.

So when I was assigned to a crew, why, our work was sort of cut out for us. It was just up to us to continue the planning in more detail and to be implementers. We were, in a way, as cosmonauts and astronauts, I found out later, setting an example, too, by being friendly and demonstrating cooperation. I think we were helping all of the engineers on both sides feel free to be more friendly and all that.

One thing it's hard to realize now, twenty-five years after Apollo-Soyuz, is what the climate was like back then. In a way, after the [Joseph] Stalin years and the [Nikita] Khrushchev years and all, Khrushchev pounding the [United Nations] lectern with his shoe and all that sort of thing, why, Soviets were very foreign to us, you know. After some of the things that happened, why, we

thought they were pretty aggressive people and, I won't say monsters, but they probably thought we were monsters.

So we very quickly broke through that, because when you deal with people that are in the same line of work as you are, and you're around them for a short time, why, you discover that, well, they're human beings. In retrospect, I would say the biggest difference between the cosmonauts and us was, well, aside from their technical approach in all of the space flight, was their history and their traditions. They were probably a more secretive society partly because their population had been overrun by invasions for a thousand years. You know, in this country we don't have that experience or that burden, so we tend to be much more open as a people.

Well, when we got with the Soviets, they had their security monitors, and you could see that it was a less trusting, more closed society, but on the other hand, as human beings [they] that opened up more and more, I thought, in our relationships. We actually came to have a very close relationship with the Soviet crew.

WRIGHT: You had a very unique challenge, because the bonding of your own crew was essential, of course, to your efforts, but then now you had to bond with this other crew and you had all these other barriers. Can you tell us about what training that your crew possibly did together with the Soviet crew that helped you become a closer unit?

BRAND: Yes, as you say or infer, our individual training and our American crew training eventually led into joint crew training. That was, well, it was very interesting because, on the one hand, we sort of had cultural training. We were taken around their country a little bit. I think I had four visits to the Soviet Union, three training visits, each being about three weeks long, and one summer visit

to go over and take part in a planning committee. So our joint training consisted of going to places like Samarkand, which was down in Uzbekistan near the launch site at Baikonur, getting familiar with various parts of their country.

They have so many languages, believe it or not, and cultures, subsocieties within their society, or they did at that time, that it was important for us to sort of see the diversity of the country. We went to Leningrad. We went to Kaluga, where they had a space museum, and we went to Zagorsk, which is the center of the Eastern Orthodox Church in Russia, where they train their priests. At that time the Church was somewhat subdued, but they showed us it still existed.

We went to Vladimir, which is a place, where [Valeri N.] Kubasov, one of our crewmates, was born and raised and where the golden hordes, five or six hundred years ago, from the east swept through the town. They had a history that showed that the people of the town finally, those that were left and fighting with the people from the east, the horsemen from Mongolia, they finally held out in a tower that was one of the gates to the town. So they were teaching us their history just a little bit.

As we were taking Russian lessons and we were getting to know each other and the country a little better, why, we could communicate better and finally went into a mode of we spoke Russian and their crewmen spoke English. So we did that, and that was part of the training. But we had fun doing it. Also we had communications training, talking through supposed emergencies, and what if there's fire in one of the spacecraft, or a pressure loss, and that sort of thing. It was useful to talk in their language and for them to talk in ours, in that case, because everyone tended to slow down and be more careful in what they said. We all thought communication would be better in case of an emergency or something like that.

We and they had systems training on each other's spacecraft. We had lessons in Star City, from their engineers and all, and they learned about our spacecraft. It was somewhat superficial because each side went into more depth in training about their own spacecraft, but at that time probably I could have deorbited Soyuz maybe, but it was a little bit simpler spacecraft than ours, too. So that's an example of some of the training.

Overlying all that were our own training schedules, like ours in Houston, a lot of simulator flying and things like that, working with mission control and joint simulations.

WRIGHT: Of course, the Russians came here as well to train in the Houston area and other places. Could you share some of those experiences? Were you with them as they went throughout the country training, or were they separate?

BRAND: Yes, we, too, reflected what they had done with us. We took them to local ranches. For example, we all went down to the King Ranch, which is in southern Texas. It just happens that the King Ranch, which is a vast area down in southern Texas, had windmill crews, crews that would go out and fix all the windmills that they have around the ranch. They get their vital, precious water for the cattle to drink. The windmill crew barbecued part of a side of beef and we were out in the brush country with them having Texas baked beans and barbecue and things like that, showing a little bit of what the West was like.

They went to Disneyland and Alexei made a big splash there. He's a very personable guy, Alexei Leonov. We, before the mission, went to a few places like that to show them a little bit of what America is like. Back then, America was a very foreign place to them. I'll give you a couple of examples. Some of our engineers took some of their engineers to a local mall. We had two or

three nice malls in the south part of Houston back then, which was twenty-five years ago. We have malls everywhere in the United States now. But the Russians went in and said, "Well, this is obviously not a place for the common man, because you don't have any lines in the mall." That was an interesting insight.

Once Alexei said to me, we were driving down the Gulf Freeway, and he looked out, and he said, "Why do you have so many colors of cars?" You know, back then, they just had grey, black, colors like that in the Soviet Union. These were examples of how this closed society and America was getting an eyeful of what was common in America and Europe back then.

WRIGHT: Did you find a lot of differences in how the Soviets trained their cosmonauts as compared to how the United States was training you as an astronaut?

BRAND: Well, there were similarities and differences. Of course, they had their simulators just as we have simulators. I think they learned…from us quite a bit in the training area. They probably got the idea of having water tanks for EVA [extravehicular activity] or space walk training from us.

But in general, we used to kid them and say that they were more like movie stars and passengers, and we said we had all this work to do. Well, I think that wasn't exactly right, but they were in what was then what seemed to be a godless society. They were somewhat revered as semi-gods. Some of them, [Yuri] Gagarin, for example, was sort of revered under Lenin and some of their Communist leaders back then. The church was suppressed. So, in a sense, these people, it appeared to us, were, in a way, sort of treated godlike.

So they ended up being at the leading edge of tremendous public relations events over there… [and] astronauts were [not] in the same position. [Cosmonauts] were [revered in] that way,

and their time lines back then were less packed. It seemed like we were to maximize every man-minute, or person-minute, in space, and they didn't have quite as much to do. So the training reflected that. Also, we were more intense on the technical details, I think.

WRIGHT: Personally, you mentioned that you took language lessons, even before you knew you were going to be selected as a crew member, so you had started to do some things on a personal basis that would minimize those challenges and difficulties. Are there other areas that you found or thought might be difficult for you and you were able to overcome as a person as well as an astronaut, moving into this whole new different type of mission that no one had ever done before?

BRAND: Well, it was mainly a case of, aside from our usual sort of training here at Houston, of just getting used to a mission that was kind of the first to come along that involved international relations. I think we didn't talk about it, but we all realized that it's possible to mess this up, just like you can mess up a technical mission if you don't do everything just right. So we knew it was important to get background, to get to know these people well and their way of doing business.

WRIGHT: Trained as a United States Marine Corps jet fighter pilot, did you have any type of hesitation of starting to move into an era where you were working with people that at one time in your life were viewed as the enemy? Did you have difficulty of overcoming those hesitations as well?

BRAND: No, there wasn't any problem with that. In the back of your mind, you knew that Alexei had been a fighter pilot for the Soviet Union. So…rather than being anything that bothered you, it

was a curiosity. I said, "Alexei, which airplanes did you fly?" and he said, "Well, MiG-15, -17, -19, and -21." So eventually we said, "Well, Alexei, you know we can get you a ride in the T-38 here in the United States. You suppose you could get us in a MiG-21?" Back then in their society, why, that was a complete impossibility. So although we could have given them a ride, they couldn't give us one. But that's just an example of how the fact that he'd been a fighter pilot wasn't a threatening thing, it was just a curiosity and something that was interesting to talk about.

WRIGHT: Just ends up being a common bond, in a way, that you had something to share. Of course, your crew members, your working with General Stafford and Deke [Donald K.] Slayton was something new for you because you had worked as a backup crew or support crew member, and this is your first time to be on a prime crew. Tell us about how you three started to bond for this crew and what efforts and what type of specific training did you have to go through as a group that got you prepared for the mission.

BRAND: Of course I had known Tom and Deke. They had been my bosses. Deke stepped out of a management position being the guy in charge of all of the astronauts and the supporting facilities like trainers and so forth. He stepped out of that job to become a crewman. He had had a heart murmur that later turned out to be a nothing, I guess, that prevented him from flying. So he was really anxious to fly in space.

Tom, at that time a brigadier general, had worked as Deke's deputy, so he'd been deep into management. So I knew both of these guys, and I knew them as bosses. So as we got into training, why, pretty soon I knew them more as fellow crewmen and friends. As you say, the more you get into training and everything, the more you bond. Of course, we started out in systems training, and I

was very familiar with the Apollo system, as was Tom. Deke had a little more work to do on that and he came up to speed very quickly. We learned the docking module, the docking system hardware, and we got into integrated simulations and also language training.

Four Russian-language instructors were settled in the office area, the Astronaut Office. So we had classes, I suppose, on the average of fifteen hours a week or so. We took these classes for probably a year and a half. Language training was a big thing. Also our trips to the Soviet Union. It was, in a nutshell, similar to standard Apollo training, except… on the language and the unique aspects of the mission.

WRIGHT: And your accommodations, of course, were different when you got to your destination. You stayed in Star City, and this was, of course, a place that not many Americans had ever been allowed before. What were your first impressions of the Russian training center?

BRAND: It was probably twenty or twenty-five miles outside of Moscow, and Star City was in a forest. They had sort of a hotel there which, in a way, was sort of a small palace in the forest. It was very nice. They had other things like simulator facilities. They had a centrifuge being built, and classrooms. It was at the edge of a military airfield, except completely separate. So it was a good place to train, but out in the forest and somewhat away from everything. At times when we would visit things in Moscow, like the Kaliningrad Mission Control Center, and when we had a reason to be in Moscow, we stayed in a place called the Intourist Hotel, which was a Western hotel, fairly new at that time.

WRIGHT: I'd like for us to move closer in to the time that you launched, for that moment. Would you like to take a second and have a drink and refresh a little bit?

As you had mentioned, it was twenty-five years ago that this event captured the world's eyes, that Apollo-Soyuz Test Project was going to become a reality. If you would, walk us through those days leading up to the launch, your final preparations and the actual events that took place, and tell us how you felt and what was going on in your life at that time.

BRAND: Well, it was a very busy and exciting time for the crewmen and their families. We were, just before the mission, of course, flying down to the Cape a lot, not that we would stay there very long, but we would go in quickly for tests, like equipment tests. We included the Russians in some of those tests. For example, tests where they would bring their cameras and things like that into our command module, see where to plug them in, make sure that everything worked right and the plugs fit. The test was called C-square, F-square [crew compartment fit and function]. It was sort of a fit and functional test. As crewmen we would go down for the integrated checkouts of the vehicle and things like that.

At the same time, we took our equipment over to Baikonur, which is the Russian launch site in central Asia, Khazakstan. It's such a secret place that they had us fly in at night and fly out at night so that we couldn't really see anything over the next hill. We were completely channeled into looking at the Soyuz launch pad that would be used, going to the place where the Soyuz spacecraft and booster were housed, and going through a similar C-square, F-square test, there.

We not only found out that all of our cameras worked in their spacecraft and you could plug them in, that other things functioned well, but we went out to a feast in one of the local leather tents. I believe it was called a "yurt" or something like that. They had delicacies like sheep's eyeballs and

things like that. If you had a beer or something like that with… the sheep's eyeball, why, you could get it down.

So they had some pretty unique things. They brought in some ponies that were used out on the vast steppes of Siberia and all, and Khazakstan. We rode these ponies with Kublai Khan-type headgear and robes on. So we were racing up and down a little roadway on these ponies. I'd ridden a lot as a kid, so it was kind of natural for me. Anyhow, we had fun things like that that happened.

We had planted our tree at Baikonur. It's a treeless sort of place. It's desert, like perhaps Nevada or parts of Arizona. So we planted a tree there and said, "Well, we'll be back and see it." I haven't been back to see it. I've been back there, but I didn't see my tree.

So as we were getting in close to the mission, we sort of had those interesting types of trips, but we were very much focused in, near launch date, focused in on just normal Apollo training, which was simulator-intensive.

WRIGHT: Then finally the day came, where after nine years you had waited, after becoming an astronaut, for your chance to go into space. Tell us about that. Describe what that was like for you to finally make that walk into the spacecraft that would take you on to your mission.

BRAND: Well, I'd made similar walks practicing to do that, but it was a nice feeling to know that launch day was finally here. Of course, there's so much that can go wrong with a complicated spacecraft before launch, that when you're finally there, it's only an hour to go or something like that, it's a nice feeling. Ultimately the best feeling is when you know that the engines are lit, the pulldowns are released, and you're on your way, because now you can even get measles and you're still on your way. [Laughter] So it's a big relief.

After that, you know—you've probably heard all about the launch. Actually a Saturn I-B launch, which is the booster we had—Saturn I-B is what we had for Apollo-Soyuz—it's very similar to a Shuttle launch. I think it took something like nine and a half minutes to get into orbit on a Saturn I-B, and on the Shuttle it takes eight and a half… But on both you have staging at a little over two minutes. You start out with a lot of shake, rattle, and roll, just after the engines light on the pad. You're lying down, looking more or less straight up on each.

When staging occurs, why, there are some sort of pyrotechnic events that happen, and you may be aware that you're getting separation and all that. Then on the second stage, everything smoothes out. You don't have a shake, rattle, and roll so much. It's more like going on overdrive. So finally after a few minutes on the second stage, when you reach orbit on both the Saturn I-B and the Shuttle, the engines cut off and you're suddenly floating in your straps. Although for the two types of vehicles, reentry had a lot of differences, there were similarities on launch.

WRIGHT: It was not very long, just a couple of days after you launched, that the moment the world had been waiting for, at least the United States and the Soviet Union had been waiting for, was going to happen. Tell us about your responsibilities and roles that you needed to play and fulfill before that docking could actually take place.

BRAND: Well, I was, I'd guess you'd say, command and service module specialist. Deke was docking module specialist. Tom was boss. So there was a lot of cross-training, and we all knew each other's vehicles. Deke was a specialist on the right side of the command module. I was a specialist on the whole command module. When I say the right side for Deke, I mean the electrical systems. He was sort of a systems expert that assisted the guy in the left seat who was flying the

vehicle. But Deke was—although we all knew how to make it through Deke's docking module into the Soviet spacecraft, why, Deke was really the specialist that fixed anything that would go wrong with the docking module. Hopefully, Tom and I [could] fix anything that went wrong with the command and service module. Deke—his specialty was applied mainly during ascent or entry, his knowledge of the electrical systems and all. If on orbit something went wrong, I was supposed to know more the whole spacecraft. Anyhow, we had that kind of division of labor. We all talked to the Russians and took part in the overall communications with the ground and things like that.

WRIGHT: There had been approximately five years of planning and training and new developments and technology for this mission, and it really all came together in space. Tell us what the docking was like, what you were thinking in anticipation of those hours before you knew you were going to meet up with the Soyuz?

BRAND: Well, you know, it took two days, once we were on orbit, to catch up with the Soviets. Before the docking, we had a lot of work to do. We had to go through many steps, each one which had to be successful. After you achieve orbit, you set up camp, so to speak. You know now that you're on a spacecraft that's turned… from being a launch vehicle to being something that sits on orbit as a platform for useful work.

So in the two days before docking, we did what was in Apollo called a transposition and docking maneuver, which was essentially detaching the command and service module from the booster, going out fifty feet or so, turning around, coming back, docking with the docking module, which was inside a canister at the end of the booster, and pulling it out. We pulled the docking module out. Then we departed the booster and it eventually reentered.

We started making burns that would get us synchronized with the Soviet spacecraft so that we could continue with the latter phases of our rendezvous. The first burn or two gave us a catch-up rate. They were way ahead of us in orbit… So we spent about a day and a half just catching up with them in a lower orbit that had us going around the Earth in a shorter time than they were.

As we got close to them, well, eventually probably, I don't know if it's exact, but possibly about five hundred miles out or so from them, we started looking for them with our optics. I eventually saw them through the telescope as just a white bright dot against the black background. So when we located them, then our computer, which is to make computations of, well checked, was the ground right in our catch-up rate and all that sort of thing, and eventually we had another sensor which was a range/rate sensor which locked onto them. So our computer was updated with good navigation information.

I think, as I recall, there were about seven or eight engine burns that we made in the rendezvous to eventually reduce our catch-up rate, get better synchronized with them, come in from a direction to meet up with them, [so we] didn't have the sun in our eyes, and [it] gave us a catch-up rate which kept decreasing, until eventually when we were just a few feet out from them, our catch-up rate was down to about one or two feet per second.

Tom made the first docking. He had a target which he could look at. The target was on their spacecraft, and he could look at it through an eyepiece that had cross-hairs, sort of like a gun sight sort of thing. He had controls. They were passive, waiting for us to come up and dock with them. [Tom] had controls that he could use to fly in. He had a rotation controller with an attitude hold, which allowed him to rotate our spacecraft, and he had in his left hand a… translation [controller]. So the translation controller was like a throttle on a car, except it wasn't just something

that would allow you to speed up or slow down in one direction like in a car, forward and backward, but it was in all axes. He could move it up… or down… sideways and fore and aft.

So he flew it in, keeping the target aligned in the center of the cross-hairs. We docked at a very slow rate, somewhere probably in the—I don't remember exactly, but in the neighborhood of one foot-per-second closure rate. When that docking occurs, you feel a bump, and you see that the spacecraft come together to make what's called a soft dock. You see the Soyuz move a little bit with respect to our spacecraft, but you can tell that they're essentially now locked together in a soft fashion.

Then you go through procedures which cause latches to mate, and you have what's called a hard dock. After that, when you're really solidly locked together, why, then you start adjusting [airlock] pressures and things to make it possible to eventually go through a tunnel to get to their spacecraft.

WRIGHT: Approximately three hours passed, I believe, by the time that you actually docked, until the greeting, official greeting, actually took place. You mentioned some of the things that were having to be done to set the spacecraft together. Would you share for us that feeling of what it was to see that hatch opening and know that you'd be able to go from one craft to the other, no longer on the ground but in space?

BRAND: Well, yes, it probably took about three hours. I don't remember exactly. Actually, conditioning the atmospheres between the spacecraft and things like that took less than three hours, but the whole job probably took about three hours. To condition the atmospheres, though, so that we could go from their spacecraft, from ours to their spacecraft, took about forty-five minutes.

As background, our spacecraft had a pure oxygen atmosphere at one-third of an atmosphere, about 5 psi. Their spacecraft had air essentially, which is eighty percent nitrogen, twenty percent oxygen, at sea level pressure. Well, actually, by the time we docked, they brought it down to 10 psi—We had a differential, still, though, between the pressures in our spacecraft, ours five and theirs ten. So this airlock, called the docking module, was an adapter or a tube between our spacecraft that actually we could change the pressure in it to make a transfer. It's sort of like escaping from a submarine. They have airlocks for that. Well, we had the same airlock concept between our spacecraft because they had different air pressures.

The important thing was that we had to also adjust the oxygen content as well as the pressure in the docking module we were going through, because if we ever had pure oxygen at a high pressure of 10 psi, well, there's a big fire hazard. On the other hand, in our vehicle, if you didn't have pure oxygen but if we'd had, say, a mixture that corresponded to air, why, we'd have had trouble breathing. So we had to be adjusting pressure and oxygen…content when we made one of these transfers. All this had been worked out on the ground and practiced, and the hardware had been designed so that this airlock would work, and it worked just fine.

On the first transfer, Deke and Tom [went] into the Soyuz, and I stayed back in the command module, sort of minding the store, so to speak, holding the attitude for the stack of vehicles which consisted of Soyuz and Apollo and docking module. Tom and Deke went in, and, of course, there was a big greeting—and they went into the Soyuz, [they] had something to eat, signed some documents, and more or less made an international relations thing out of the first visit.

Then later we had other transfers back and forth. I went over on one, and I was in the Soyuz for four and a half hours. Valeiy [Nikolayevich] Kubasov and I were together in Soyuz. Alexei, on the other hand, was visiting Tom and Deke in our spacecraft. We couldn't freely go back and forth

because of the airlock in between. Valeri and I did a lot of photography and had a pass across the Soviet Union where Valeri described things on the ground. We did joint experiments. Anyway, it was all working per plan, and we'd actually [be] together practiced all these things in joint simulations before the actual flight.

WRIGHT: Quite a triumph and I guess, in some respects, quite a relief to know that everything had come together as you had trained and you had planned.

BRAND: Yes, I found that each thing that would come up on our flight plan required quite a bit of orchestration and all. After we checked it off, why, I'd say, "Well, gosh, that's great. We got by that one and everything went okay. Let's see what comes up next."

WRIGHT: You mentioned the experiments that were there. Do you recall any of them, or is there any experiment that you worked on that really were outstanding in your mind, even today, that you were glad to have a part of?

BRAND: Well, I don't know as I remember all of the five joint experiments. One was a metal-mixing experiment, where mixtures of metal were melted in a furnace in the docking module. I think Tom, Deke, and Alexei worked on this one. Then these metals were allowed, in weightlessness, to solidify, to cool off. The idea was to look at this kind of a metal that had cooled in weightlessness to see if there were any advantages. Had these metals cooled down here on Earth at one-G, why, it'd be like oil and water. You'd have a layer of one metal and a layer of another

metal, which would solidify. But in weightlessness, why, there was a mixture. So it was hoped that this would have some advantage.

We also had an experiment in which we checked out the germs and bacteria and things like that, that had come up into space in each spacecraft and then transferred over. It was of interest to see how quickly and completely the germs migrated from one side to the other and to see if a germ or bacteria that actually had lived in Florida ended up eventually in Kazakhstan. So that was monitored by taking swabs of parts of the vehicle and things like that.

We had an ultraviolet experiment in which, after we undocked, our spacecraft flew around the other and our spacecraft beamed an ultraviolet light beam to their spacecraft. It bounced off a mirror on the outside of the spacecraft [and] came back. By measuring how much that signal was attenuated by the very thin atmosphere in space up there consisting of a few atoms of nitrogen and oxygen, well, you could get an idea of, at that altitude at that time, just what that tenuous atmosphere in space consisted of. That was a joint experiment that was fairly complicated. We flew all around their spacecraft taking these measurements. So those are three out of the five, which gives you an idea.

WRIGHT: You had mentioned that as you approached Soyuz, you could see it as a tiny light. As you were leaving, after you had been docked and finished the experiments, and then, now, of course, on your way back to Earth, were you able to track it by your eye to see how it was disappearing?

BRAND: Yes, after the final undocking, they went to a lower orbit and speeded up and went ahead of us. We had tried to play a little joke on them at that point. Before the mission, on the ground, I

had made a tape at home, and my daughter Stephanie and a friend helped me make it. We turned on shower water. They weren't in a shower, but it sounded like it. Both girls were about eighteen or nineteen years old, and so they made a lot of noise, which made it sound like somebody was in a shower just having a ball, a lot of giggling and stuff.

So after the Russians were ahead of us, oh, three or four hundred miles, and we had watched them go out ahead of us and probably tracked them a little bit, why, we played this tape over the VHF communications, which both spacecraft had, and we said, "Hey, we're having a ball here," and then we played this noise… And there were all these female voices and stuff. So I'm not sure that they heard that tape, actually, because after the mission Alexei was asked and he didn't act like he knew about it, but we tried, anyway, to play a little joke on them.

WRIGHT: It was fun for you, anyway. Speaking of communications, you had tried so hard as crews to make sure that communication was done very well on the ground, and spoke both languages. Did all go well during the mission?

BRAND: Oh, yes, very well. We probably had a lot of accent in our Russian. You know, Tom always claims to speak "Oklahomaski," which is a combination of Oklahoma—well, it's Russian with an Oklahoma accent. I know we all had an accent, and they had accents. We all had varying degrees of expertise with the other person's language. They did very well in English, I thought, and it was always hard for me to judge how well we did in Russian because you can't really hear yourself like a Russian would. But we had excellent communications, could understand each other very well.

WRIGHT: The mission was over and you're on your way back to Earth, and this was also not the end of just the Apollo-Soyuz Test Project mission, it was also basically the end of the Apollo era, and the last splashdown was a bit different than other splashdowns. Could you share with us what happened during your reentry process and then those minutes after you hit the water?

BRAND: Sure. Well, as you know, we always did water landings back then. The Apollo command module reentered. It had a big heat shield. So when we were coming in, the heat shield, well, was on the bottom of the cone. The apex of the cone was trailing, and the heat shield was into what you'd call the relative wind, I guess. We could look outside during reentry on the dark side [of the Earth] after we'd started down over probably…the Indian Ocean, we could look outside and see what appeared to be a doughnut of fire behind the spacecraft, about twenty feet behind the windows that we were viewing through. Everything went sort of nominal per a normal Apollo entry.

As we got down to low altitude, of course, the automatic system was to be armed to let first the apex cover come off, which exposed the parachutes, which were packed in the top of the vehicle, then the drogue chute would come out, stabilize the spacecraft, and finally when you got down to about 10,000 feet of altitude, why, the main chutes would come out.

I was responsible for throwing the switch, but for whatever reason, the automatic system didn't get armed. So as it turned out, when we were expecting to see things happen, like apex cover come off, a drogue chute come out, etc., why, nothing was happening. We got a lot of training in what to do in that case, which was consisting of pressing a series of buttons to make those things happen manually. So I pressed the buttons that made all of the automatic events happen manually.

In the course of that, an unexpected thing happened. Because the spacecraft was jostling around and the RCS [reaction control system] jets were not yet turned off, why, the jets started

pulsing, trying to stabilize the spacecraft, which was on a drogue chute. The firing jets left an exhaust of nitrogen tetroxide, which came in an air vent into the cabin and sort of gassed us. So we all got a lot of whiffs of nitrogen tetroxide, which is really a bad chemical to breathe because when it sees the moisture in your lungs, it turns into an acid—and I forget, nitrous, probably nitrous acid, could be nitric, but I think it's nitrous acid.

So we realized that we'd been gassed. So when we were down on the water—well, I was right next to the vent, so I passed out momentarily after we got on the water, and Tom had us all soon on oxygen masks. Then I came to, and we knew we needed to get the hatch open, to get fresh air in the cabin, but we weren't real quick to do that because we wanted to make sure the docking collar was around the spacecraft. We [didn't want] any water in the cabin… but eventually we got the hatch open and fresh air.

Once we were out of the sea and the spacecraft was up on the carrier and we stepped out, why, we told the docs we thought we'd had some gas, so they checked us out. Sure enough, they could see it on our lungs, and so we were in the hospital on sort of a lung treatment protocol that was very good. It actually eventually reduced the irritation in our lungs, and I guess within two weeks I was jogging, and I haven't had any effects since then. So it was a nominal entry, except for that.

WRIGHT: And it was ending to a historic mission and an historic time in the space program. Was that ever playing on your feelings or your mind or of that of the crew, of knowing that you were the last mission to close out the Apollo era?

BRAND: Well, the last use of the Apollo equipment was a thing to stop and think about. It'd been equipment that had been developed to go to the Moon and had been very successfully used. It… was equipment that was developed by probably hundreds of thousands of people that were behind the Apollo Program, and, yes, here it was, the last usage. Too bad. Too bad we can't take it back to the Moon for a few more times [and] use it. But at that time, of course, we had the Space Shuttle just starting its development, so everybody was saying, "Well, but we won't have to land in the water anymore. We'll have a craft that you can land like an airplane, and that'll be better." So everybody was a little sad, but at the same time looking to the future and a more improved system, we hoped.

I must say, though, there were things about the Apollo equipment that were not as good as the Shuttle, but there were some things that were probably better, like the rendezvous software in the computer. It could compute a rendezvous from beginning to end, whereas in the Shuttle you depend on the ground until the very last part of the rendezvous. You depend on them to give you your navigation and guidance [at the start] and then the computer, [the] onboard computer, takes over. The Apollo equipment was more independent of the ground in a way. Also, you had so much propellant that was required for the burn out at the Moon on an Apollo mission, not Apollo-Soyuz, but on an Apollo mission to get you back, you had a tremendous amount of propellant that you could carry. With that equipment you could go out 250,000 miles and come back. With the Shuttle, of course, we're limited to maybe 500 miles of altitude or something like that. So each system had its own advantages. Overall, of course, the Shuttle is better because of its more modern technology.

WRIGHT: And about twenty years after your mission, the Shuttle helped bridge another partnership with the Russians, with the Shuttle-Mir Program, where Americans were able to keep the

continuous presence in space for approximately two years as a resident on the Mir Space Station. How do you think your Apollo-Soyuz mission helped form the basis for that partnership in the [19]90s that the Americans had with the Russians?

BRAND: Well, it's only now becoming apparent what all that led to, what the first cooperative mission with the Russians would lead to. Twenty-five years ago, after Apollo-Soyuz, why, nobody really knew if this would lead to anything. The Russians said, "Well, let's start a program to go to Mars together." Alexei was always saying that. Back then everyone thought, "Well, it would cost so much to go to Mars. America isn't ready to do that."

We had ups and downs in our international relations after Apollo-Soyuz. If you will recall, we had Afghanistan, so there was a feeling against the Russians because they were beating up on the people in Afghanistan. Also, we boycotted an Olympics back around 1980, I think. So relations stayed level or went down a little bit after that. Then later, relations got better again, and I was very happy to see that we would fly together with the Russians on Mir because it meant that there was a rejuvenation of some of the goodness that came out of Apollo-Soyuz in keeping international communications.

I really believe that we were sort of an example, the space program, an example to the countries. We were a little of a spark or a foot in the door that started better communications. It's hard to know what all that led to. Probably historians won't be able to figure that all out completely. But we have pretty good communications with the Russians now, and we even have people, our companies, working with their companies and things. So Mir-Shuttle was a step along the way in that improvement in communications, too, I think.

Of course, now we have International Space Station following on, which hopefully is a further improvement. Of course, the whole scene has changed. We were sort of enthusiastic and inspired twenty-five years ago. Now we're down to more of a day-to-day business sort of thing. I notice these days that there are great successes in our relationships with the Russians. Well, on the other hand, there are some things that aren't so good. We have our rough spots, too. So it'll be interesting to see where it leads, but, in general, something that was unique and enthusiastic in the beginning is now evolved into day-to-day business and a lot of communication and cooperation and competition more on the business level.

WRIGHT: Just a few weeks ago, you traveled to Russia. Tell us about the trip and your purpose and then your impressions of being there after so many years.

BRAND: Well, I hadn't been to Russia for twenty-five years. We had a magnificent tour of the then Soviet Union after the mission, in the fall. Gosh, we got all around the country, Stalingrad, went out to Novosibirsk and Siberia, went up to Leningrad—all these places have different names [now] but that's what they were called then—down to the Black Sea, to Soviet Georgia.

At that time it was still a very rigid country under the authoritarian control of the socialist communist system back then, so they were highly organized and very disciplined as a population. But when we went around the country, why, we saw crowds of Russians and they were very enthusiastic. So there was a lot of good feeling.

Well, now, twenty-five years later, I [went] back. Now there're signs everywhere. They used to have—about the only thing you'd see in the way of… a neon sign, was a restaurant sign. Now there are signs everywhere—Pepsi-Cola, whatever. Back then they didn't have many cars.

Now there're quite a few cars. I wouldn't say every Russian family has a car, but there are a lot of cars and they have traffic problems like we do. The country appears to be having a hard time adapting to a Western-style economy. It may take them a while. But on the other hand, in talking with people over there just a couple of weeks ago, I got the impression that the younger generation is catching on fast to…western ways of doing things. They seem to be enjoying the newfound freedom and all.

Of course, we're having political change over there. Twenty-five years ago we talked with [Leonid I.] Brezhnev and we were still talking with people that were the old communists. Now who knows where the new regime is going to take Russia? So it's a very fast-changing scene. I wouldn't say we're out of the woods yet, but after Russia has another ten or twenty years to adapt, for their population to become used to our commercial ways and the ways of Western Europe, why, it may be a safer world.

WRIGHT: And the main purpose of your trip?

BRAND: The main purpose of the trip was to commemorate Apollo-Soyuz. It was a very great trip. We saw a lot of Russians that we hadn't seen for twenty-five years and had a few toasts and went down to Kazakhstan to Baikonur—watched the very successful Proton launch. The Russians still know how to launch things into space, and they do it very well.

WRIGHT: An exciting time. Of course, tonight the [Zvezda] service module is supposed to join with the current modules [on the International Space Station]. Do you also have something special this evening that's planned as well?

BRAND: Yes, there will be a dinner tonight, and everyone will [commemorate the anniversary]—oh, I don't think we'll have the cosmonauts here because it's not like it's three days of celebration or something like that to justify their trip. But we're looking forward to a dinner and hearing people tell a few stories of what happened twenty-five years ago. It's very nice that the JCS NASA alumni would have this dinner and give us an opportunity to all reflect on that, because I look back on it and I consider it to have been a very successful mission.

WRIGHT: And I believe historians would agree with you on that as well. Our time is starting to wind down here. Before we move off of Apollo-Soyuz Test Project and this one role of your vast career with NASA, are there any other thoughts or any other areas that you can think of that we would like cover? Anything else that you might want to say about the impact that the mission had on the technology or even on the social and cultural aspects of people working together? We really didn't talk too much about that. I know, as far as the astronauts, you talked about that briefly, but you must have seen also some changes in the actual work force of how the engineers learned to work with other engineers, even though they were of a different country.

BRAND: Well, let me try to reflect on some lessons learned from the mission. Yes, the cosmonauts and astronauts worked together well. The technical people really got together and they were able to coordinate these two space programs that grew up from separate roots, and it was a successful mission. After that, as I alluded to, we had our ups and downs in international cooperation with the Russians. We had a slow period for a while after the mission due to what was happening internationally, and then things got better. We've had a resurgence of cooperation.

I think the lesson there is that it's easier to coordinate things between two different countries technically than politically. Human relations is tougher than solving technical problems. But probably… people will look to other star systems someday. Well, that's a very difficult job, but that's probably an easier job than making everything roses between countries on Earth. I think, though, as was shown on Apollo-Soyuz, that the technical cooperation can be a vehicle that can get a foot in the door on international understanding and cooperation and may enhance it.

Another thing that was learned, back then we didn't understand much about the Russians' technical capability. What we found out was that they had very reliable spacecraft that could do the job that they were built to do. We had more advanced technology. [For] example, we had a computer at that time in the spacecraft, and they didn't in theirs.

They had what we called a jukebox that was an electromechanical [controller, a] cylinder that had a rotating drum inside. So they could move that drum inside the cylinder so that a column came up and then you could go up that column and find commands. That's why we said it was a little bit like a jukebox. It was electromechanical, and on the drum were all of these commands, and you could finally get to the right one by rotating the drum and going up a column and finding, well, here's the switch to turn on a light, or here's another switch that activates the reentry program, something like that.

We were doing all that on the computer, plus we had a lot more complexity and capability in the command module because it had been designed to do more than just live on orbit, but to go to the Moon and come back. Its thermal control system was more extensive to keep the temperatures right on everything. It had a lot more propellant…things like that. So at that time we thought we were a little bit ahead of them, even though their spacecraft was very good at doing whatever it was

designed to do. It had been used many times, and little problems had been fixed so that it was very reliable.

So those are a couple of things that we learned. We learned about what the Russian person is like. We didn't have much information on that at the time, although we had people that have come to the United States from Russian for over a hundred years. Many of those people were pre-revolutionary-type people. The more modern, post-revolution, post-1918 Russian—we sort of got to understand how he thought, a little bit, and how he thought as a communist or a socialist, and to understand whether or not we should be afraid of him or not. The upshot was that we really shouldn't be afraid of them, but we shouldn't sell them short.

We learned back then that if they decided to do something, like build an army, build a space program, that they could put a lot of resources into that, and they had very smart people that could do a good job on that and achieve a goal. We learned they know how to prioritize. They could put a lot of effort into that army or into that space program. You would see the effect on new apartment buildings after five years. There wasn't a lot of quality going into apartment buildings, for example, and back then people were standing in line to get luxury items and even staples. They didn't have a big infrastructure like for distribution of goods—like we have here in the United States. We just got a better feel for all of that. Those are some of the things that we learned about them.

WRIGHT: I believe history's proven every time we have a chance to learn, that will just help us to know more. Of course, between now and the next time that we visit, we'll have an opportunity to watch the coming months and how the latest international technology is coming.

BRAND: Well, better communication is the key to a lot of things, and world understanding depends on better communication. One thing that's helped in the intervening twenty-five years is that, like us, the Russians have TV, the whole world has TV, and you see Russians going down the street with cell phones. So communication is getting better and that's… got to be better….

WRIGHT: We thank you for your time today, and we look forward to the next time that we visit with you to hear about the other aspects of your career with NASA.

BRAND: Thank you.

WRIGHT: Thank you.

[End of Interview]