

**NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
ORAL HISTORY TRANSCRIPT**

KAROL J. "BO" BOBKO
INTERVIEWED BY SUMMER CHICK BERGEN
HOUSTON, TEXAS – 12 FEBRUARY 2002

BERGEN: Today is February 12, 2002. This oral history with Bo Bobko is being conducted at the offices of the Signal Corporation in Houston, Texas, for the Johnson Space Center Oral History Project.

The interviewer is Summer Chick Bergen, assisted by Sandra Johnson and Jennifer Ross-Nazzal.

We're glad you could be here with us today.

Bobko: It's my pleasure.

BERGEN: Let's start out with a little background, even looking back to your childhood. Is there anything in your childhood that led you to your career as a pilot or led you to want to participate in the space program?

BOBKO: Well, of course, when I was a child, it was long ago enough that there wasn't a space program.

I had thought about going to West Point, and there was a lieutenant colonel that lived in our neighborhood and told me about the new Air Force Academy that was being developed. And so I applied and was accepted to the first class, and many of my instructors there were starting to talk about the new space program.

We had program managers who did things in the new missiles that were coming into the air force, and talked about how it wouldn't be terribly long before we started a space program, and so that was kind of my introduction to space. And, of course, being at the Air Force Academy made me desire to become a pilot as well.

BERGEN: That was a unique privilege to be in the first class of the Air Force Academy then.

BOBKO: Oh yes, it really was. We had a lot of instructors who were going to be later taking over departments, and they were usually very well qualified. My physics instructor was the range safety officer at Eniwetok [Atoll] atomic tests. My astrodynamics instructor was a deputy at the test pilot school. You know, it was on like that, so it was really quite a privilege to be there then.

BERGEN: And you graduated in 1959. So that was just when things were starting in the space program.

BOBKO: Yes.

BERGEN: So after you graduated from the academy, where did you go into next?

BOBKO: I went to pilot training. I became a fighter pilot. I served two tours as a fighter pilot and then went to the test pilot school. The test pilot school at that time had basically an aircraft test, and then they started talk about space activities. I applied to the Air Force Manned Orbiting

Laboratory [MOL] and was accepted, and that was my first tour as an astronaut, was in an air force program.

BERGEN: I know some of that's probably still classified, but can you still tell us something about your activities in the MOL Program?

BOBKO: The astronauts' activities there were patterned rather similarly to the astronauts' activities here at NASA. Of course, NASA had already been in operation.

I was stationed in Los Angeles [California] at, at that time, called Space and Missile Systems Organization and spent a couple of years there in the MOL Program, participating in the development of that activity.

BERGEN: Did you have any interaction with NASA at that time? I know they were planning on using an adapted Gemini capsule for that program. So did you interact in any way with NASA?

BOBKO: Yes, I came down here a couple of times and before that, even, when I was at the test pilot school, I had come down to NASA. I had done a little research on—the people were starting to think of the question of, "Okay, what do you do with a person who is not necessarily a pilot but whose skills are going to be necessary on a space vehicle?" And I can remember coming down here and talking to Al [Alan B.] Shepard [Jr.] about that.

BERGEN: The MOL Program kind of had a few setbacks and budget problems and things. Did the people you worked with in that program realize that it was potentially going to come to an end, or while you were there, did you really think it was going to come to fruition?

BOBKO: I think we all thought that it was going to come to fruition. It was a surprise that it was just cancelled one day. I can remember I had a classmate from the Air Academy that had come to the MOL Program and it was his first day, and they called everybody down to the auditorium, and they said, "Guess what, folks? The program's been canceled." [Laughs]

BERGEN: Oh, my goodness.

BOBKO: So he was kind of surprised, as we were all were.

BERGEN: And that was in 1969.

BOBKO: Yes.

BERGEN: That was a pivotal year that your program got canceled. About a month later, a man landed on the Moon. Vietnam was going on. After they came and told you that this program was canceled, what did you see as your options, and how did you make your decision what direction you wanted to go?

BOBKO: I decided that it was time in my career that if there was going to be a change, that I should go to school. And so I applied and was allowed to go to school and went to USC [University of Southern California, Los Angeles, California], which is right there in California, and, of course, also had applied for NASA here and was accepted into the astronaut corps here.

BERGEN: And you just continued your schooling until that was done, and then you—

BOBKO: Then came here. Yes, there were three of us who had gone to school for a year out of the seven who came here to become astronauts, and we just continued for a year. NASA said, "Yeah, we like you, but, we can wait an extra six months or so until you finish with your school."

BERGEN: Tell us about your first impressions when you came down here to be an astronaut, move to Houston, and getting indoctrinated into the NASA way of doing things, which was probably a little different than what you'd been used to.

BOBKO: Yes, of course, it was different. We came down here and purchased a house and got moved in. Perhaps the first year or so was rather, at times, rather frustrating down here. During the first year, we were told twice that we were fired.

BERGEN: Really?

BOBKO: Yes. [Bergen laughs] And then that was rescinded. They said, "The program is not going anyplace. We don't need you folks, and, so you're going to be let go and go back to the air force." But that was rescinded, and we stayed and got involved in the programs that were going on here.

BERGEN: So what was your initial training that you had when you came here? Were you trained in anything in particular?

BOBKO: First thing I started to work on was Space Station, believe it or not. [Bergen laughs] Not Skylab, but Space Station. And after the Apollo Program, there was a group that got together, a high-level group, and decided that the United States should have two things: one was the Space Station, and, two, was a way to easily get in and out of space, and that was the Space Shuttle.

And so it became evident rather quickly that they didn't have money to do both of those, and so they focused on the Space Shuttle, because you couldn't do a station without a shuttle.

So they did turn the Station around a little. They had talked about launching a station on top of a Saturn [rocket], and when they decided that the Shuttle was going to be the transportation system of the future, they redesigned the Station during that initial study and made it into a modular space station, which is the predecessor of what we have today.

BERGEN: So what was your role in participating in Space Station? Were you there to give the astronauts' perspective?

BOBKO: Yes, yes. And that didn't last for too long. The next thing was I was involved in a program called SMEAT, the Skylab Medical Experiments Altitude Test. I can remember I was out in California and was called, and they said, "We drew straws, and you won and you're gonna go to SMEAT."

I didn't even know what SMEAT was. [Bergen laughs] And so that took about a year of time, all the preparations for that and then the execution of that and then the follow-up.

BERGEN: It seemed like it was almost on par with doing a mission, because it was—

BOBKO: Well, except we were—

BERGEN: We're on the ground.

BOBKO: Right. [Bergen laughs] We tried to do as much as we could to make it be like a real mission. There were some things, obviously, we couldn't do.

BERGEN: What kind of training did you have to do to prepare for this?

BOBKO: For SMEAT?

BERGEN: Yes.

BOBKO: Oh, we had some medical training. I've pulled four teeth. I need one more to be an ace. [Laughter] You know, they gave us basically all of the—certainly the focus of SMEAT was the Skylab medical experiments. So they gave us all of the medical training that the Skylab astronauts were going to get in both preparation for flight and for medical emergencies and for conducting the medical experiments that were going to be on Skylab.

And, then, of course, we had to learn all the things about Skylab that we were going to be using within the experiment. So, as an example, we had to learn the food system and how to do all of that. Then there were some other activities because of SMEAT that were SMEAT-peculiar that we had to become familiar with.

So we learned, you know, the Skylab timelines and the way they planned each day and how they worked with the ground. We even set up our communications with the ground so they were on the normal Skylab communications cycle. At that time you didn't have satellites in orbit through which you could communicate all the time, so you only had, you know, 20 percent of each pass or each orbit that you could talk to the ground, and, so, in SMEAT, we only talked for 20 percent of the time.

So, it was interesting. Well, you know, learn to do things like take blood and pull teeth. We didn't pull any teeth in orbit. They had done a good job, I think, and made a determination of the kinds of things that you might need to do if there was a dental emergency. They said, "Well, people who have been treated by dentists for some time," like we were, "and have basically healthy mouths, the kinds of things that'll probably go wrong are that they'll break a filling or that they might do something like have a root canal go bad, in which case you would have to pull a tooth." And so that led to us learning how to pull teeth.

BERGEN: So you were prepared in case any of your roommates needed to have that done.

[Laughs]

BOBKO: Have a tooth pulled, yes. Now I'm not sure, since we were on the ground, they'd make us pull each other's teeth, but certainly if you were in orbit, that was a consideration. If you said, "This tooth hurts," and somebody looked at it, and they knew that that one had problems in the past, you may consider that.

BERGEN: During that course of fifty-six days that you were in that enclosed environment, what were some of the things that you did while you were in there that really stand out in your memory from that time period?

BOBKO: You know, we'd perform the medical experiments on the same schedule as they worked for Skylab. We worked together as a team and with the ground, found little things that were wrong with the Skylab either equipment or processes or procedures that we critiqued and they straightened out later for Skylab.

It was a long time, but it was easy, and it seemed to pass rather quickly. I'm not sure if at the end of fifty-seven days if somebody had said, "Would you like to go for another fifty-seven?" that I would have volunteered, but, you know, generally, I think that the feeling that I had through most of it was that you're working, you've got a job to do, and there was even times you worried if we'd get it all done in the time that we had available.

BERGEN: I know you wrote a detailed report about all the specific experiments you did and the problems that you had. Did you have a chance, either formally or informally, to talk to the Skylab astronauts to share your experiences with them?

BOBKO: Sure. Sure. And there were a couple of those that were kind of a liaison with us, so they took the lessons that we had and took them into Skylab.

BERGEN: Were there any things in particular that you shared with them that you thought was really important for them to keep in mind on this long mission?

BOBKO: Oh. Yes, one of the things we found was that the urine system was probably undersized, that what they used in the hospital for a daily output, and, most of us, and probably most of the Skylab guys, drank a lot of liquids, and, so, produced more urine than they had anticipated, and what they did was, for each day, they collected the urine in a bag, and then they homogenized that and took a sample off and froze it. Okay?

Well, what would happen is that at two o'clock in the morning, you get up, and the bag would be full, you know. [Laughs] And so he'd have to—she'd have to—you know, here you are, you know, just kind of up groggy out of bed and have to change it out, and then the bags were not very strong. There was an occasion where we dropped one and it broke. Well, you know how messy it is to drop a half-gallon of milk on the floor. Well, you can imagine. [Laughter]

So that was one of the pieces of hardware that they changed. So they went to work on that and made it better.

BERGEN: What were some other duties that you had prior to really going into the Space Shuttle Program? I saw a couple of times maybe that you were CapCom [Capsule Communicator].

BOBKO: Yes. One of the other big activities—well, I think right after SMEAT I started getting involved in the Shuttle Program, and I had worked various things there. I had worked, you know, some of the flight control systems and auto land and things like that.

Then I got involved with the Apollo-Soyuz [Test] Project, and, you know, that was probably a year and a half or so there as well, where we were preparing to participate in the Apollo-Soyuz, and then there was a whole year where we worked with the cosmonauts, and the year went, you know, we'd have two or three weeks we'd be in Russia, and then we'd come to the United States, and there'd be two or three weeks when we'd be preparing for them to come, and then they'd be here for two or three weeks, and then we repeated that cycle about four times during the year. We had four visits there; they had four visits or I had four visits. They had three or four visits here, and I think it was indoctrination, normal procedures, emergency procedures, and then command and control.

So that was very interesting. In those days, remember, they taught—"mutual-assured destruction" were the words of the day. I can remember Bob [Robert F.] Overmeyer and I walking across Red Square and saying, "I never doubted that I'd be here. I always thought it would be at 200 feet and a full afterburner." So it was quite an interesting time to be going over to Russia. I think we were the first people to be down at the launch site in Kazakhstan and to know the Russians, to learn to speak Russian. So that was an interesting couple of years.

BERGEN: Yes, I remember reading something, while you were doing this SMEAT test, that you took time there study Russian. So, apparently, they had plans for you to do that before you finished that.

BOBKO: Well, the Russians were the other major space-faring nation, and there was some talk some, perhaps, cooperation, and so it seemed like a reasonable thing to do. Yes, I've studied Russian on and off. I've forgotten most of it now. It's been, you know, twenty-five years ago since the Apollo-Soyuz Program.

BERGEN: Tell us about the cosmonauts that you worked with. What were some of the differences between the way they did things and the astronauts did things and other, maybe, things that stood out in your mind as you got to know them and interacted with them?

BOBKO: Well, of course, there are a lot of similarities. Most of them were pilots. Most of them had done the same things that we've done. Their system is different. Star City is typically just cosmonaut training, and they don't participate in the development of their programs to the same extent that we do. So that was a big difference, you know. The society they lived in at the time was quite different from what we have here, what's there now, even. Russia, at that time, was still very Russian, you know.

I can remember going past a window and seeing a fur hat, decided, "Well, I'll go buy my son one of those." So I went into the store and in Russian said to the woman, "I'd like to see a fur hat."

And she said, "You wouldn't want one. You're American."

So I said, "It's for my son."

And she said, "He wouldn't want one more," you know, "less than you do."

I said, you know, "Damn it, sell me a hat," you know. [Laughter]

I mean, they could care less. They could care less if they sold a hat or not, because they didn't work on commission, you know. All hats were exactly the same price throughout Moscow. You know, it was just an interesting, an interesting situation.

BERGEN: That sounds very interesting.

BOBKO: But they took us around over there. We saw a lot. We tried to take them around over here and show them a lot. Neither of us had had the opportunity to see those sorts of things before. Like I said, I'm sure we were the first Americans down at Kazakhstan down at the launch site and probably lots of other places as well.

BERGEN: And the irony of the fact that you were a fighter pilot, you know, who trained most of your career to view them as the enemy, and here you were working together.

BOBKO: Oh yes. Yes. But that was the start.

BERGEN: So what benefit do you think that the Apollo-Soyuz Program had for NASA and for our country?

BOBKO: Well, I think it started cooperative space ventures between the countries, and perhaps helped them to learn to get along a little better together, which is still evolving now with the Space Station. You know, it's a tough thing to take two very, very capable and arrogant organizations and try to make it together.

BERGEN: Especially when you have such different cultural and language obstacles to compound the situation even more. So it was a pretty amazing feat, especially at the time. That's why it must have been very exciting to be part of that.

When you finished with your participation in the Apollo-Soyuz Program, what did you do next?

BOBKO: Well, one of the other things that I was involved in was the tests [Approach and Landing Tests, ALT] out at Edwards [Air Force Base, California] of the Shuttle and of the Enterprise, and so we worked for some time trying to get that all together. You said CapCom a couple of times. I had been CapCom on the Apollo-Soyuz. And then I was CapCom every other mission for the drop tests of the Shuttle off of the 747.

And then on the other side of that, I was flying the chase airplane alongside the 747 and the Shuttle. So that took quite some time. I don't remember exactly how long we worked on that, but I'll guess it was probably close to a year or two, you know, by the time we set it up and did all the training out there at Edwards.

BERGEN: So did you actually participate in some of the training or what other activities? You said you were CapCom and you flew the chase plane. Were there other activities you actually participated in, in those tests?

BOBKO: The whole team worked to get the tests ready to go, figure out exactly what was going to happen, do all the things that were necessary, precede the tests.

BERGEN: Were there anything in those tests that really surprised people?

BOBKO: I don't think so. You know, the tests pointed out the viability of the Shuttle as a landing aircraft. We designed some of the things such as how the approach would actually be made in the Shuttle even before that started on that, and worked on items such as if we landed on a lakebed runway, was that adequate for a shuttle to land on?

You know, I can remember going through quite an exercise there. Using radar to look underneath the lakebed surface to see if there were any voids the Shuttle might fall through, because there are holes that appear out in the Edwards lakebed, and that's water that runs down and causes the holes to appear. And so we were looking at what the geology was underneath.

That was all just part of getting those tests together. The tests were challenging. I mean, the Shuttle and flying with a T-38 alongside the Shuttle was interesting, the two rather different airplanes. [Bergen laughs]

And the slow-speed Shuttle tests, you'd have the gear down, and you'd be even shaking the stick to try to get a little bit more drag into the T-38 to have it not overrun the Shuttle.

BERGEN: New and different challenges every time.

BOBKO: Yes.

BERGEN: After the Shuttle had been tested and it was finally ready to do the first launch, STS-1, you were in charge of the equipment checkout and testing. Is that correct?

BOBKO: Well, John Young had come up to me one day and said, "Bo," he said, "I'd like you to take a group of guys and go down to the Cape [Canaveral, Florida] and kind of help get everything ready down there," and he said, "I know it's probably going to take a couple of months." Well, it took two years. [Laughter]

So I traveled a lot down to the Cape. And so what we did was, we participated in the development and the testing that was going on of the Shuttle.

Give you an example. I gave Dick [Francis R.] Scobee the honor of powering up the Shuttle the first time, and he went in for a—I think it was an eight o'clock call to stations and a ten o'clock test start in the morning. I came in the next morning to relieve him at six, and he wouldn't leave until he had thrown at least one switch. They had been discussing the procedures and writing deviations and all that sort of thing the whole day before and the whole night, and so they hadn't thrown one switch yet.

So there was a big learning curve that we went through. So we tried to set up, you know, what the interfaces would be between JSC and KSC [Kennedy Space Center, Florida] for some of these tests, what the tests would be. You know, they asked me, "What do you think we should test?"

And I said, "You know, everything we can."

We developed the things like the launch count and the procedures for landing. I can remember going and saying, "Hey, our procedures for landing are not very good yet," and their saying, "That's why we want you to be in the cockpit when we run them the first time after they land."

So I started to gather myself a little kit of things to take into the Shuttle, and it became a big parachute bag, and they said, "What are you going to do, spend the night?" you know. [Bergen laughs]

And so what was supposed to take an hour and a half or so, I got out of the Shuttle thirteen hours after it landed. There were still quite a few rough spots.

So there was a lot of development that took place down at the Cape in getting things ready to launch the Shuttle, you know, to do all the things that are necessary down there.

BERGEN: So what did you keep in your kit?

BOBKO: Oh, you know, a bottle of water. Well, what do you need if you have a bottle of water? You need a bottle for urine, right? [Laughter] And, you know, some food and procedures and just lots of things.

BERGEN: Just to prepare for the long day ahead.

BOBKO: Yes, which wasn't supposed to be a long day, but it certainly turned out to be.

BERGEN: As you got into it, did you just kept seeing the complexities of it and more and more things that needed to be addressed that hadn't been thought of before?

BOBKO: Yes. You know, basically, down at the Cape, there was a lot of testing that had to take place, and that was all done under the umbrella of the tiles, and they had a lot of problems with the tiles, but just, you know, setting up. Well, what does a launch count look like, you know? And I was the crew participant on that. You know, what should the astronauts do when they get down to the Cape?

You know, and there was another gentleman by the name of Rick Nagano [phonetic] and myself sat down and talked about that for a couple of days and came up with a basic structure of, well, they're probably going to want to fly the Shuttle training aircraft. Well, we probably should have an alternate day that they can fly the Shuttle training aircraft. So that says they've got to come down a couple of days ahead of time. They're going to want weather briefings about the weather. You know, they're going to want briefings on the condition of the count and the condition of the Shuttle and the conditions of the payloads, and, you know, etc., etc.

So there were lots of things like that to be laid out and gotten ready for the first Shuttle's flight.

BERGEN: So were you basically given charge of these activities, or were you simply a crew participant in all these activities?

BOBKO: Usually, I was a crew participant in one of the Cape activities. They'd be coming up and doing a new test, and a lot of the guys at the Cape knew—I mean, they could tell you down

to a thousandth of an inch what this piece of machinery looked like, but a lot of them didn't know what it did. When you conduct a test, you're very interested in making sure that you test it in the operational mode in which it's going to be used.

BERGEN: So you kind of help put all the pieces of the puzzle together.

BOBKO: Yes, I typically had—well, started out with a couple, and then we got up to, like, four or five guys, four or five astronauts that were working for me that were down there helping all around the Cape.

BERGEN: Lots of work to do before this new system goes into space.

BOBKO: Oh yes, yes.

BERGEN: So did you watch the launch?

BOBKO: Oh yes, tears rolled down my eyes.

BERGEN: I bet that was exciting.

BOBKO: It was. It was.

BERGEN: When did you find out that you were going to be a pilot on the STS-6?

BOBKO: Oh, I don't remember the date. Either shortly after or maybe even before I came back from the Cape. I don't remember exactly.

BERGEN: I'm sure you were excited when you finally—you'd been with NASA for—

BOBKO: Forever, yes.

BERGEN: About ten years, I think, when—

BOBKO: More than that, yes. [Bergen laughs] There was times I felt that I was a cosine wave in a sine-wave world.

BERGEN: Was that because of the class you were in, with the astronauts that were in, that you were so low on the totem pole?

BOBKO: Well, no. I mean, the MOL guys got here, and the Apollo Program and the Skylab Program both just started to ramp down very quickly. NASA didn't fund them, and so they ramped down. And then the Shuttle Program was supposed to be ready much sooner than it was, and it took a lot longer to finally get into development and then to actually develop, and so it just took a long time. But there wasn't much fly—I mean, the Apollo-Soyuz was the only flight between Skylab and the Shuttle Program.

BERGEN: But you were patient and waited out till you got there.

BOBKO: We had interesting things to do. You know, it wasn't a drudgery job. There were things like SMEAT or working with the Russians or the testing of the Shuttle. Yes, there were interesting things to do.

BERGEN: So you're finally put on a crew. How did this change what you did? You started preparing for your mission.

BOBKO: It changes your outlook a lot. You know, you've got to do it. And so it just changes the way you look at things. It's not some thing out there in the mist; it's up close and personal. So I think, you know, there's a lot to be learned for a space flight, and it doesn't seem like there's ever enough time. You feel you want to learn it all, and it gives you a lot of incentive to work hard and try to learn as much as you can and get things as squared away as you can.

BERGEN: Tell us what a pilot does on a Shuttle mission as opposed to some other member of the crew. I mean, obviously, you fly the Shuttle.

BOBKO: Okay. Well, you fly it a little, but mainly you're a systems operator. So you've got the reaction control system and the engine system and the electrical system and all those systems that have to be operated to keep the Shuttle going correctly. And then if you're doing something such as a rendezvous, you're typically an assistant helping to get that accomplished.

And then there is some flying, mainly on orbit. There's, of course, usually no flying going into space. There's a little bit on orbit. And usually the commander's the one that actually lands the airplane.

And things like on my first flight, it was the first time people had gone EVA [Extra Vehicular Activity], and so I had the responsibility of putting Story [F. Story Musgrave] and Don [Donald H. Peterson] into their suits.

BERGEN: Even though this was the STS-6, you had a lot of firsts on this mission: the first EVA, the first-time *Challenger*.

BOBKO: Sure, first flight of *Challenger*. First lightweight tank. Okay, we launched the big first satellite, the TDRS [Tracking and Data Relay Satellite-1]. Yes, sure.

BERGEN: A lot of firsts. What was it like when you watched the first EVA of the Shuttle Program? Did you have apprehensions about this?

BOBKO: No, I don't think so. You know, everything had gone well. Both Story and Don were well trained. I think we all, you know—they looked forward to it. They came back exhilarated after they came back.

My responsibility was getting them into the suits, which is not a small responsibility. I mean, you're putting them into their own little spacesuit or spacecraft. You know, it provides power and atmosphere and communications and meteoroid protection. It does everything. So it's kind of like launching a small satellite, except it's got a man in it.

But that went well. It was interesting to take photographs of them out there in the payload bay. It looks different when you're up in space and have somebody, one of your friends floating around back there.

BERGEN: You said you were responsible for putting them into their spacesuit. Did you discover any problems with that? I mean, you practiced on the ground.

BOBKO: Oh yes.

BERGEN: But it's probably different in space.

BOBKO: A little. Sure, but it went well.

BERGEN: Since this was the first flight of *Challenger*, were there extra things that you had to do during this mission to check out the spacecraft or anything of that nature?

BOBKO: Yes, there were a few small things, nothing of any great magnitude. You know, it was also the first flight of the HUD, the heads-up display, which I had on my side. And then there were little experiments and things that we had to check out the spacecraft.

BERGEN: My research show that there was some kind of problem with the guidance computer. Do you remember anything about that?

BOBKO: Oh sure, yes.

BERGEN: What was that all about?

BOBKO: It failed, but we were on orbit, and the shuttle is—the Shuttle, unlike the Station on orbit, is very benign. It doesn't take computers to keep it running. So it failed, and we were able to go through the whole procedure and bring it back up, change it to basically another position. When you fly the Shuttle, you have four computers and a fifth which is a backup, and those four computers have what are called strings, so each computer has different things that are hooked to it that it commands, and some of those strings are more important to it than others, so we took this computer and put it on one of the less important strings.

BERGEN: But you got everything back up and—

BOBKO: Everything was back and working, yes.

BERGEN: That had to give you confidence in the procedures that had been developed and making sure everything was going to run properly.

BOBKO: Yes, well, we had been through those procedures, you know, of, maybe not exactly that, but certainly something very similar before.

BERGEN: Tell us about your landing on that mission. It looks like that that was where the lakebed had been flooded.

BOBKO: Yes, so we landed on Runway 2-2 at Edwards. You know, it's a big runway. There wasn't anything that was really surprising about it. We just landed on the solid surface, or on the concrete runway, rather than landing on the lakebed. If the lakebed is dry, it gives you a little more latitude. You know, it's got very large runways, but, luckily, on this flight, nothing was wrong, so we didn't have to take that extra margin in any way. Landing on the concrete was just fine.

BERGEN: You also mentioned that you had deployed the first large satellite. Did you have any particular responsibilities in that deployment?

BOBKO: Yes, basically I was responsible for the attitude of the Shuttle, making sure it maneuvered to the right positions and keeping track of all the systems again.

BERGEN: Was there anything unusual that happened or anything new that you learned that you weren't necessarily—

BOBKO: I learned how big it was when it came out, you know. [Bergen laughs] I was up in the front in the pilot seat and the two guys were back there, and, you know, both of them said something like, "Oh, my God," when this big, you know, big satellite came out. It's ejected so that it comes kind of over the cockpit.

BERGEN: And they had some problems with that satellite, but it wasn't anything that you were responsible for.

BOBKO: No, no. And, luckily, they had planned to use the satellite for commercial purposes as well as NASA, and it was decided not to do that, but they didn't make that decision in time to take off some of the extra fuel that was required for using the satellite commercially, and so that fuel was available, and, luckily, that was what saved the satellite later. They were able to use that fuel to get in the right orbit.

BERGEN: Well, that's good.

BOBKO: Yes. Oh yes.

BERGEN: Sometimes things that appear negative initially turn out for the positive, and that's always good.

Is there anything else about that mission that you want to share that we might not have covered?

BOBKO: Oh, you know, space flight's exciting. Especially your first flight is always exciting. You never know quite what to expect. People tell you the stories about what it's like, but it's hard to really appreciate it till you've been there.

So, the launch is quick and dynamic. There's a tremendous power learned, you know, on orbit looking back on the Earth. I came back and it was decided that I would investigate ways to make my Earth observations better, and so I had studied for my next missions to be able to do that.

Just learned about the Shuttle, of course, and about the landing. I mean, when you come back into the atmosphere, things like—during the dark time of your approach, what happens is that the plasma sheath around the Shuttle will recombine over the top, and there's this big tongue of flame that's over the top of the Shuttle following you down, and just lots of other things like that.

BERGEN: You said after you came back you decided to study to make your Earth observations, improve your Earth observations. Was that something you decided to do personally, or why did you make that decision?

BOBKO: Oh, I didn't think that we—certainly, I didn't have it all pulled together as to how this would all look, and so I just kind of pulled together myself thoughts and ways to look at the Earth, and, afterwards, I gave some of the newer astronauts lectures on that. But once you've been there, you think, "Well, hmm, I should have thought of this in a different way," and once you do, it makes it easier.

BERGEN: Can you give us some example of that?

BOBKO: You've seen the charts with the white lines on it, like that, that display the orbits?

BERGEN: Yes.

BOBKO: I don't like to think of that as where you're going to be over the ground. I like to think of an orbit in space and the earth underneath it rotating. Okay? And so now, you know, once a day, the Earth, like the landing site, comes under that plain of the orbit. Or if you think about the sun, if you think of, what is the lighting like, when you look at the chart with these things doing that, the orbits looking like that, it's hard to figure out what the lighting is.

If you think about, say, if you're the sun and here's my orbit, okay, it's easy to see there that this side of the orbit is going to be illuminated, and this side of the orbit's going to be dark. Okay. And that if I'm in an orbit going this way, each descending note is going to be in the daytime, and each ascending note is going to be at night. And it's just things like that, you know, that I thought made it easier for me on later flights.

BERGEN: Just to kind of change your perspective on what you're doing.

BOBKO: Yes. Yes.

BERGEN: That makes a lot of sense.

BOBKO: Like if you're trying to figure out, "Well, if I'm in this orbit, where's the sun going to be?" Well, if I look at the orbits on the chart, it's usually pretty hard to figure that out. If I think

of it in this sense, it's much easier to figure out where the sun is going to be. Is there going to be—you glint off the ocean is going to blind me? Well, depends on where the sun's going to be.

BERGEN: So did you try to work with some of the geologists and oceanographers and things like that to help you with your Earth observation improvements that you'd hoped to make?

BOBKO: Well, most of the geologists are thinking about it from a ground perspective. Okay? And, you know, they're not necessarily thinking about things such as, "Okay, when I'm coming up to this thing, on this orbit, what's the approach path going to be, and what's maybe something before that's easily identified that I can use as an initial point to help me find my target?" Most of them didn't have that perspective on it, and so those were the kinds of things that I try to think of myself.

BERGEN: I'm sure that was beneficial to other astronauts to come later to have that.

BOBKO: Like I said, I have given a couple of courses. It's not a big thing.

BERGEN: Well, I think it's a very interesting, interesting perspective of things that you don't normally think about.

BOBKO: Yes. Yes.

BERGEN: I think that's great.

So your next mission was STS-51E, which had changed names and—

BOBKO: Mary Lee used to be the lady that arranged the patches, and along the top of her office she had different plaques with all the different patches, and then you got to a corner, and there were four of them, which were all for that mission or its derivatives. [Bergen laughs] Okay? As a matter of fact, I've got a plaque which has the four patches on it. I could show them to you, but it would be hard to tell the difference, but little things always changed.

BERGEN: Can you take us through that transition?

BOBKO: No, it's too complicated. [Bergen laughs]

For instance, we got within a week of flight, and we had gone over to the isolation ward, and they decided to cancel a flight, and the reason was we were supposed to have a TDRS on board, and the TDRS, they thought, was having a problem, so they didn't want to launch it, and so we were changed to another flight.

Well, it all started with Hank Hartsfield. Hank Hartsfield had a fire on the—he had a shutdown on the pad, and so he got put to another mission, and so that bumped us down. And then on this one flight, we got to within a couple of days of flight, and they canceled it.

And then they were moving us—they didn't want to launch the TDRS, so they were going to move us to another flight. I had Jake Garn [Senator E. Jake Garn] and Patrick Baudry on the flight when it was canceled. Well, they were going to move us to another vehicle which had already an experiment set up in it that they didn't want to take out, so they swapped out one of the crew members. So that meant we changed the rockets. We changed what we were taking

to orbit. We changed a couple of crew members, and we changed the vehicle. So it took a while before we finally got that flight off.

BERGEN: So throughout those—other than those, maybe, payload specialists, your crew basically stayed the same?

BOBKO: The basic crew stayed the same, yes.

BERGEN: And did your basic mission objective stay the same or did it change dramatically from the beginning to the end?

BOBKO: They changed quite a bit. In the one case, we were going to launch one very large communication satellite which was going to be the same satellite that I had launched on my first mission, and that was the one that was canceled just a few days before we launched.

And then we were going to launch two smaller satellites, and then we were going to launch the two smaller satellites, and so that was quite a change, and as it turned out on that flight, what happened was that one of those satellites didn't work, and so we had backed off thirty or forty miles and then the ground decided that we would go back and attempt a rescue on it. And so that turned into quite a bit different situation than we had anticipated.

We had not done a rendezvous simulation or any training in like seven months or so, and we didn't have the books on board to do the rendezvous, so they sent us up this long teleprinted message, and I've got a picture of me at the teleprinter with just paper wound all around me floating there in orbit, which was a teleprinter message.

So we cut that teleprinter message up and pasted it into books to make a rendezvous book, which is, you know, I mean, you're bringing these two spacecraft that were doing 17,500 miles an hour together. So, you know, it's not a trivial task.

And then we had to send two guys EVA, which was an unplanned EVA for that flight, but, you know, and I had been the one who had sent Story and Don EVA earlier, so I didn't have anybody else learn that skill since we didn't have a scheduled EVA. So I was the one who sent the crew members EVA.

So that was quite different. And they strapped a thing that looked like a fly swatter on the end of the big arm, which we hadn't planned to use. So it turned out to be a rather different mission.

But, luckily, in training for the missions that had been scheduled before, we had learned all the skills that were required to do this. If we had just trained for this mission, we probably wouldn't have ever trained to do a rendezvous or the other things that were required.

BERGEN: So it all seemed to come together there.

BOBKO: It came together, yes.

BERGEN: It shows also how adaptable humans can be in space.

BOBKO: Oh yes, yes. Yes.

BERGEN: That's great.

So did you have Senator Garn on that mission?

BOBKO: Yes.

BERGEN: So he did fly that mission.

BOBKO: Jake was on that flight, and he was also going to be on the flight before. Yes.

George [W. S.] Abbey said to me one day, he said, "What sort of training program would you have if you had a new passenger that was only going to have eight or twelve weeks?"

I said, "Why are you asking me that question?" [Laughter]

He said, "Because you've got a new passenger, and you've only got—" I don't know, ten or twelve weeks to flight.

So, basically, what I had done was there was Mike [Michael J.] Smith, who was later killed in the *Challenger* accident [51-L], had been brought up to speed, because they thought that one of the astronauts, Loren [J.] Shriver, might have been exposed to measles, I think it was. And so they had given him extra training so to make him ready, and then he didn't have a flight. So he took Jake under his arm and got him ready so that it was easy to integrate him into the crew.

BERGEN: It must have been interesting to have a senator.

BOBKO: Jake was a great person. He had more flying time than I did. He knew what it was to be a crew member. You know, I'd call him up and I'd say, "Jake, we need you down here."

And he's say, "Yes, sir," and he'd be down the next day for the sim [simulation].

So, for a mission specialist, he was a great mission specialist. His only problem was that he got very sick on orbit.

BERGEN: Did you ever get sick on orbit?

BOBKO: Yes, but, you know, Jake got really sick on orbit.

BERGEN: [Laughs] That's unfortunate.

BOBKO: He was doing some of these medical experiments, and they find that one of the things that happens is that on orbit, if you get sick, your alimentary canal, your digestive system, seems to close down. So what they had were little microphones on a belt that Jake had strapped to him to see if they could detect the bowel sounds. So the story is—and I haven't heard it myself—they had me on the microphone saying to Jake, "Jake, you've got to get upstairs and let them see you on TV. Otherwise, they'll think you died and I threw you overboard." [Laughter]

But he was a good sport, and, like I said, he knew what it was to be a crew member, and, of course, he was just an interesting person, having been in the Senate, you know, a different kind of person than we normally rub elbows with over there at NASA.

BERGEN: Is there anything else about this mission that maybe I didn't touch on that you'd like to discuss? You were commander for this one, so you actually landed.

BOBKO: Yes. Yes, during one of those iterations, we were supposed to fly the first auto land. Our motto was, "[Latin phrase], "Look, Ma, no hands." [Bergen laughs] But that didn't come to be.

But it was an interesting flight. We became a very close crew after training so long together. As it turned out, we were able to meet all the challenges that that mission presented, which were quite a few.

BERGEN: I imagine since you got to land it, you were probably glad that you actually got to land it and didn't have to use the auto land.

BOBKO: Yes, sure. Although the auto land was interesting. People say, "Well, you're going to have to do auto land, so it'll be a lot easier."

Well, at least from my perspective, I had to define kind of a box of performance in which that during the landing if the auto land system got out of, I'd know that I couldn't take over from and safely make a landing. So it was a monitoring situation, and during the training, the problem was to try and define how to recognize when the auto system was diverging and not let it get so far that I couldn't take over and make a safe landing. So it required extra landing training on my part.

BERGEN: That makes sense, especially on the first run.

BOBKO: Yes, sure.

BERGEN: Did they eventually test—

BOBKO: No, they have never really done an auto, no. What happened was that we were going to land at Edwards for the auto land, because it was the first landing of auto, and we were going to land on a lakebed. And then that flight was canceled and we went to another, and they decided that that flight should go down to the Cape, and then they didn't want to do an auto land, the first auto land, at the Cape, and so we didn't do the auto land.

BERGEN: That was interesting, it sounds like you had a lot of interesting varied training in all that.

BOBKO: Oh sure, yes. Let's see. On that one we had the little toys. Carolyn Sumner [phonetic] came to us and said, "Hey, we'd like to have you guys use toys to demonstrate physical principles."

What they do now is they give the kids—well, they're on their third or fourth iteration, but they give the kids a bag of toys, let them play with them, and say, "Okay, how would these react in space?" And so then they'd talk about the physics, and then they show pictures of us doing the toys in space.

BERGEN: What toys did you do?

BOBKO: I had the gyroscope. It seems like I had another one. Certainly I had the gyroscope, yes. And we decided, we said—and so NASA public affairs said, “Oh, we can’t have any downlink of this stuff. They’re going to think you guys are playing around in space.” [Bergen laughs]

I said, “It won’t last. Okay.” It lasted about a week. [Laughter] And then they decided, “Oh, we’ve got to get downlink of that.”

BERGEN: It looks like fun playing with toys in space.

BERGEN: Is there anything else about the mission you wanted to mention before we move on?

BOBKO: The crew was—like I said, we spent a lot of time together. We trained for a lot of things.

BERGEN: Who was on that crew with you?

BOBKO: Don [Donald E.] Williams was my pilot; [M.] Rhea Seddon, let’s see, I guess she was the second woman; Jeff [Jeffery A.] Hoffman; [S. David] Griggs; and then the two payload specialists were Jake Garn and Charlie [Charles D.] Walker.

BERGEN: So you all remained fairly close after that since you—

BOBKO: Yes, we see each other, you know, etc.

BERGEN: Your next mission was STS-51J, which was a DoD [Department of Defense] mission, so there may not be a whole lot you could tell us about this mission.

BOBKO: That was first flight of *Atlantis*, which was interesting, because the first flight of *Challenger* was delayed a long time. They were doing flight readiness firings. They were firing the engines at the Cape and were finding problems, and so it took a number of those to get that all straightened out. So that launch was delayed.

And the second flight—well, I've already told you the story about how many times that was delayed.

So on the third flight, my wife says—my wife is a management consultant and travels all over the world—and she says, "Bo," she says, "you're not telling me exactly what day you're going to land, but I think it's going to be pretty close to a day I have a program in Baltimore [Maryland]."

So I said, "Diane, it's the first flight of a new vehicle, you know. Probably the safest thing you can do is go ahead and schedule that right now."

So she did. Well, as it turned out, it went off exactly on time. It landed on the day she had figured out. [Bergen laughs] So she was there to meet me at California, gave me a hug, and then she had to leave right away to go catch the airplane, to drive down to Los Angeles to catch the airplane to go to Baltimore.

So that night I was home in bed and the phone rang, and I said, "You're in Baltimore?"

And she said, "No, I'm still in Dallas trying to get to Baltimore."

So, you know, it was interesting that that last flight was one that went—it was still a new vehicle, and it went exactly on time.

BERGEN: Another interesting thing about this flight is you had to—did you have to go back into air force? Had you gotten out of the air force while an astronaut?

BOBKO: No, the military astronauts are here. They are detailed to NASA. So they're still military officers while they're here. They're just detailed to NASA.

BERGEN: So you didn't have to make any special—

BOBKO: Nothing, no.

BERGEN: And you had all this, whatever, security clearances and everything.

BOBKO: Well, security clearances are separate from being with NASA, but I had to have lots of them anyhow, going all the way to back to MOL.

BERGEN: Did the training for this mission have the same characteristics of the trainings that you had to have for your previous missions? I mean, now this was your third mission, so—

BOBKO: Basically, the only problem with that, the basic problem was that the second mission slipped, so it slipped into the training mission, the training time for the third mission. So the crew had to go kind of train without me to start with, and then I joined them later.

BERGEN: I noticed that it was interesting that you'd spent over ten years at NASA without flying, and then here you were already on your third flight in just a couple of years, so that must have been exciting.

BOBKO: Yes, well, the second and third mission were pretty close, and, of course, we had gotten to the point on flights before the second mission when we could have actually flown the mission. I mean, we had trained right up until that point.

BERGEN: I don't know much about this mission since it's classified or was classified. Is there anything that you maybe learned from this mission that was different that you can share with us?

BOBKO: Oh, let's see. What can I tell you about the third mission? The third mission was pretty vanilla. I mean, we went on time and we landed according to the schedule. The fact that it was classified was a pain, but you lived with that.

I've tried to find out whether it's been unclassified since, and haven't been able to find out. It probably isn't because it would probably take effort to unclassify it that nobody wants to expend to get it unclassified. But, you know, it was a good mission. It was the first flight of *Atlantis*, which was very clean, cleaner than *Challenger* was, even. We did pretty much the normal things, landed at the Cape, landed at a different runway there 2—I don't remember—2-3 or 2-5.

That was an interesting landing, because you come in and you make a turn. You come in from the west and make a turn to go back east. I'm sorry, come in from the west and make a turn to go back west. And there was 100 knots of wind at altitude, and so that meant that there was a

large wind blowing us out of this turn, so it meant we had to make a tight turn, and so I rolled into the turn and pulled what I thought were a lot of Gs, and my pilot, Ron [Ronald J.] Grabe, says, "One-point-two." It's just that being in space, you know, being deconditioned to Gs, now it felt like a lot more, but it wasn't a problem.

BERGEN: Just another challenge to overcome.

BOBKO: Yes. Like I said, I can't tell you much about the flight, because it may still be classified.

BERGEN: You mentioned that it being classified made it complicated. Did it make your training for it complicated?

BOBKO: Yes. Somebody might be doing an experiment, and he could be working on the experiment out in the open as long as it was away from NASA, but having the experiment associated with that Shuttle flight was the classified part of it. So I couldn't call a person, because the commander, if I called them, it would give an indication that that experiment was on that Shuttle flight. It may be a very simple experiment of what sort or another.

BERGEN: So were you able to overcome that by—

BOBKO: Yes, you overcame it. It just was a little bit of an additional burden.

BERGEN: A few months after this mission, the *Challenger* accident occurred. Looking back on that, what kind of effect do you feel that that had on NASA or JSC specifically, but NASA in general?

BOBKO: Well, NASA had been, I think, rather cavalier in expecting the Shuttle to be something that you could just throw passengers on, and when the accident occurred, it caused them to go back and look at everything in the program, look at every nook and cranny, and in the time that was required to get the rockets back up, they spent that time really polishing all of their procedures and making sure things were done right. So it made quite a difference.

As an example, well, something I did that was interesting, after my flight, I was in my office and P. J., P. J. [Paul J.] Weitz, who was my first commander, called me up and said, "Bo," he said, "we're going to activate a new TAL [Transoceanic Abort Landing] site."

I said, "Who's going? When's he going? And how long is he going to stay?"

And he said, "You, tomorrow, and I don't know." Which happened to be Morocco at the time. Okay? And the problem was that they were getting—you get these large dust storms that form up in the Sahara [Desert], had come out over Dakar [Senegal], which had been their TAL site, and then float over the Atlantic [Ocean] and eventually becomes hurricanes.

And so that dust was obscuring Dakar, and they wanted a new TAL site up in Morocco. So I went to Morocco, and we activated a TAL site for that flight. That's where I was when the *Challenger* accident occurred.

But what we did was we went and we activated another site in Morocco as the TAL site, went from Dakar down to Banjul and activated a TAL site there, upgraded the ones in Spain, so

all those TAL sites were re-looked at, reexamined, and changed as necessary, and that all happened after *Challenger*.

It may have eventually changed. Well, possibly, but certainly the *Challenger* was the impetus which caused lots of things to be reevaluated and changed in the program.

BERGEN: Did you participate in any way in the investigation?

BOBKO: Yes, a little. I got wrapped up with the TAL sites, but I did participate a little with the investigation. It was more things that were happening here rather, and these were periphery to the actual investigation of the accident itself.

BERGEN: You received a NASA Exceptional Service Medal for work on getting the Shuttle Program back to flight status. Was this that work that you were talking about that you did?

BOBKO: Yes, yes.

BERGEN: What—

BOBKO: So after *Challenger*, they said, "We're going to reevaluate the TAL sites. Who's been to Africa?"

Well, I had been the only guy that been to Africa, so I got sent back. [Laughter] And so we went up and down

BERGEN: You had the qualifications.

BOBKO: That's right. So went up and down the west coast of Africa looking from TAL sites, from Banjul up through Morocco, you know, all those sites.

BERGEN: Must have been an interesting experience.

BOBKO: Oh yes, yes.

BERGEN: What kind of problems did you encounter in doing this work?

BOBKO: We were looking for a good runway. Found the one we settled on in Morocco was Ben Guerir, and it was an old U.S. Air Force base that had been closed down, and so it was a nice long runway, but the surface had kind of become cracked because it was asphalt, and the volatiles had basically evaporated, and so they needed to add that stuff. There were other things that needed to be added to all the runways, weather reporting, you know, capabilities to store some things, electronic landing aids, a net at the end of the runway to catch the orbiter if it didn't stop. So there were a number of challenges there.

BERGEN: After you finished that, is that when you got the position of Assistant for Operations to the Director of Flight Crew Operations?

BOBKO: Yes. Well, that was kind of in the middle of that. As a matter of fact, from that, I was detailed to the program office to help in the development of the landing sites.

BERGEN: I don't have much information from the last part of your career with NASA. Is there anything else that you did that was significant that you want to talk about?

BOBKO: I don't think so. I mean, I had participated with—oh, there was a gentleman by the name of Thorsen [phonetic], who was in charge of all of the landing sites worldwide, and I helped him try to get the requirements and all the things necessary to get those landing sites up to speed and get the necessary processes in place and decide, for instance—and I don't know if they're still doing it, but they were getting a C-130, which is an air force transport, to fly down, which had rescue guys and a medical team on board that would come down to the TAL site and be there in case they landed there, in case they would have any accident, because some of the places that the TAL sites are located have very rudimentary medical capability.

BERGEN: So you had to make contingencies for all the kinds of situations you might entail.

Did you mainly work just in that geographical area or did you concern yourself with other ones around the world?

BOBKO: Oh, no, some other ones around the world. We activated Hawaii at the time and Hickam [phonetic], but I never got to go to Hickam.

BERGEN: In 1989 is when you left NASA. Is that correct?

BOBKO: Yes, the end of '88, the very beginning of '89.

BERGEN: What led you to decide to make that decision to leave NASA and go into the private sector?

BOBKO: I was coming to the end of my air force career and had to do something. So I decided to go into the private sector.

BERGEN: And where'd you go when you—

BOBKO: I went to a company called Booz-Allen & Hamilton, and they had a couple of contracts here associated with Space Station, and so I was the site manager lead here in Houston.

BERGEN: What kind of contracts were they for?

BOBKO: One was for the training systems. It's now Raytheon that has that contract, but they make the simulators that are required to train the astronauts.

And then another one, there was a company which—they had the integration contract for NASA Headquarters, and they had a group here in Houston, and Booz-Allen was part of that team, and so there were people that I had that were working operations questions. And those are probably the two biggest. Then there was also the contract for the mission control center. We had some people working with the development of that, too.

BERGEN: You mentioned simulators. I wanted to ask you how—I forgot to ask you earlier what your impression of the Shuttle trainer was.

BOBKO: Which trainer?

BERGEN: The—what is it, Shuttle aircraft trainer, the one that actually—the airplane that you fly that's supposed to fly like the Shuttle. How well did you feel that—did that prepare you for actually flying the Shuttle?

BOBKO: Very well. Very well. I think it was on my second flight. I think it was with Don Williams that we were coming around, getting ready to line up, and I said, "Are we in sim yet? Do I have it?" which are the things that you would say if you're flying the Shuttle training aircraft.

BERGEN: So it prepared you very well.

BOBKO: Very well, yes.

BERGEN: So after—you're with Spacehab now.

BOBKO: Yes.

BERGEN: So did you go there from Booz-Allen?

BOBKO: Yes, about two years ago.

BERGEN: And what do you do now at Spacehab?

BOBKO: I am the V.P. [Vice President] for strategic programs. So we're kind of the think part of the company looking forward. We're working with NASA. We just put in a proposal, a number of proposals to be working on an altered access to Station task. I don't know if we'll get it or not. I imagine that we've got a good chance, which would be looking at providing a service to NASA that would transport cargo, process and transport cargo up to Station.

Spacehab is a little bit different, you know. Spacehab looks at things from a commercial perspective. As an example, now they have modules that fly in the Shuttle. They're owned by Spacehab. They're maintained by Spacehab. When we get the equipment, we get the things that need to be transported to the Shuttle. We do the analysis on them and the packing of them and that module is then taken and put it into the Shuttle and taken up to the Station. So basically NASA has very little oversight about this whole process. It's a commercial process.

BERGEN: That's interesting.

BOBKO: Yes.

BERGEN: If I have my time right, I think it's about time for Jennifer to—it may be a good time for Jennifer to change her tape.

Jennifer: We have about ten more minutes.

BERGEN: I just kind of have some general looking-back-on-things sort of questions. Maybe let's look at some of your—you spent your time at NASA as an astronaut, and when you came in, there was this group of astronauts that had been to the Moon. How did you and your comrades from the MOL Program kind of become part of this group of astronauts? How did you interact with them and did you feel welcome by them or was there somewhat of a—

BOBKO: Oh, no, I thought they treated us fine. We weren't going to take any of their slots to go to the Moon. We were there, and they could have us help them. We weren't certainly any threat or any competition at the time.

BERGEN: So you were just a helpful resource to them by this time.

BOBKO: Right.

BERGEN: So that's good.

You talked earlier about how you were a crew representative in tests and things of that nature. What was the interaction like between the astronaut corps and the engineers and other parts of NASA?

BOBKO: I think usually very favorable. Occasionally we'd get into some fights, but that's true in any development program.

But you might be looking at something such as a control system, then they'd want somebody to fly the simulator. And so they'd choose a crew member, obviously, to go fly the simulator, and you might fly, you know, a hundred runs to get some statistical analysis of what this control system change meant. Or you'd be discussing just various things, what the requirements would be to do something.

BERGEN: Another thing that astronauts have to deal with is working with PAO [Public Affairs Office] and public relations. How did astronauts, in general, and you, in particular, feel about the public relations aspect of your job as an astronaut?

BOBKO: I think it's usually interesting. Occasionally you'll get somebody that's off the wall, but most people are interested in what you're doing, and I'm always interested in sharing what I've done. And we've been to some great places, have made friends we still communicate with.

Remember we were discussing my second flight, and during one of those times after we had come off of, I don't know, the second cancellation or something, I went to PAO, and I said, "Send me someplace." [Laughter] "I want to get away from here."

So they said, "The only place we've got to send you is above the Arctic Circle in Sweden."

And I said, "I'll go." [Laughter]

So they sent me to Kiruna. The Swedes were opening a new ground station or a processing plant for some of their telemetry, and so we went. And they also invited my wife. So

we went and met some folks in Stockholm, and they showed us a great time and went up to Kiruna and had a good time up there.

I've usually enjoyed the PAO things. You know, occasionally you'll get some guy who's—he's trying to make a point, and you know how it is, they'll pressure you for an answer that you don't want to give, or it's not true, you know, but that's part of the job, I guess.

BERGEN: You spent a lot of time helping develop the Shuttle and then flying the Shuttle. What's your view of the Shuttle as far as relating to what its original purpose was and what kind of performance that it provides?

BOBKO: I think it's worked very well. It's been very versatile. You know, we've learned a lot. It's the first reusable space vehicle we've had, and so we've learned a lot. It's probably still going to take some more time before we ever get to a vehicle that truly fulfills all of the desires. Engineers tend to oversell, which, I think still happens. "What's the next vehicle going to do?"

"Well, next vehicle's going to be great," you know.

But I think the Shuttle has done really quite well, and, surprisingly enough, because NASA is careful, which is justified, they took a lot of time between missions in preparing the vehicles. They've cut the time for processing the vehicles in half now, and it needs to come farther down, and new technology will enable that to happen in future vehicles. But, still, flying in space is a complicated business.

BERGEN: Now we're in the age of the Space Station, and you mentioned that that was the first thing you worked on, was Space Station. What are your impressions of the International Space Station as a technological entity and also as the political aspects of doing it with other countries?

BOBKO: I think the two big things with the Station are, one, that we assembled it on orbit, and they're going to have to maintain it on orbit. We haven't done that before. Other than that, we've had Station. And the second big thing is that we've done it with an international organization, which is very difficult to get all these people together to do anything, never mind something as complex as the Station, with people that are culturally diverse such as the Russians. Apollo-Soyuz was really very, very simple in comparison to the Station.

And then we've got all these other countries that are working there as well. So, to me, those were a couple of the very large challenges. But it seems to have been doing just great so far. It's gone together basically without a hitch. It's been operating just fine. Hopefully, we can get it up to its full potential.

BERGEN: What do you think is the future for space? I mean, you're in the commercial side of it now, but you've been on the government side of it for so long. What would you like to see happen in the future?

BOBKO: Well, I think that NASA can probably assign more of the activities to commercial organizations. I mean, certainly Spacehab is doing the job that it's doing right now with its modules without much government oversight, and that can occur, and I think that Congress is supportive of that.

You've got to get there if you're ever going to really open space to the general public. It's hard to bring passengers, paying passengers, along for the first time, but probably necessary. It's going to happen eventually. You know, we wouldn't have all the airplanes flying with all the passengers around the country if we didn't have passengers at some time on airplanes.

And, hopefully, we can go back to the Moon or on to Mars or some other places that are truly exploratory, which private industry is not going to do. Private industry has to have some guaranteed reward for the task that they're going to take up, and there aren't any right now that we know of in going to the Moon or going on to Mars, but I think the role of government is to lead the way in some of these new areas and then let industry follow.

BERGEN: If you look back on your career, what do you feel like are the greatest challenges that you've had?

BOBKO: There have been a lot of challenges. I'm not sure that I could identify any one as the greatest. I don't have one that stands out as the greatest challenge.

BERGEN: Are there any significant people that really impacted your career or that you worked with that really made an impact on you?

BOBKO: Sure. Started all the way back in grade school when I had a teacher that suggested that I go to a school that was Brooklyn Technical High School, and she kind of steered me towards that, and then the professors at the Air Force Academy were starting up the space program, and

through all the people here at NASA. There's certainly a lot of people that have influenced me all the way in my career.

BERGEN: Is there anything else that you'd like to maybe talk about that I didn't bring up or open subject to?

BOBKO: I can't think of anything. Appreciate talking with you.

BERGEN: If you don't mind, I'd like to see if Jennifer or Sandra have any questions.

BOBKO: Sure.

BERGEN: Jennifer, do you have any?

ROSS-NAZZAL: Actually I don't. I think that you've answered all my questions every time I had one.

BOBKO: Okay.

JOHNSON: You said that the Shuttle training vehicle prepared you for flying with Shuttle and landing. Could you just describe the difference between the Shuttle and other aircraft that you flew, or jets, and landing it?

BOBKO: Well, a number of years ago, I opened a *Time* magazine, and I said, "Oh, they've interviewed an astronaut or had something in NASA." So I said, "I wonder who they spoke to."

And I found there was one person that they quoted, and it was me. [Laughter] And they quoted me as saying that the Shuttle flew like a brick. Well, it does. [Laughter] And so the guys over in engineering, as a matter of fact, got a mason's trowel, and they all signed it, sent it over to me. I built the Shuttle out of Legos for their wind tunnel studies, sent it back to them. [Laughter]

If you look at a time domain, if I look at a normal airplane, if I'm flying an instrument approach, I'll typically have a weather minimum of like 200 feet. So if the ceiling is less than 200 feet above the ground, you're not supposed to make an approach to that airport.

An airplane, they have a rate of descent of about 600 feet a minute. So that says you've got twenty or thirty seconds from 200 feet to touchdown. If you're doing it right, the airplane is all trimmed up, the power is set, you're coming down a stable light path, if you don't do anything, it'll probably land okay. If I look at that same time in a Shuttle, the Shuttle is coming down a twenty-degree glide slope, approaching the ground at a rate that if you jumped out of it without a parachute, it would still beat you to the ground. You're about 2,000 foot above the ground, and you have to do what's called a pre-flair. You have to precisely pull the nose up and get set up to land, and, in that, you lose about a hundred knots of airspeed. So it's a very, very dynamic situation.

So if you speak to a lot of pilots about 200 hundred feet, they say that's pretty low. But that's equivalent to about 2,000 feet in the Shuttle. I was flying in the backseat of a 104 once doing some of this under the hood, trying instrument approaches out at Edwards, and Bill Daner

[phonetic] was up in front, and he said, "Why don't you pop the hood and fly this once we get down to about 2,000 feet."

And I said, "Sure."

He said, "Okay."

So I popped the hood, and it only took me a couple of seconds to figure out, to visually figure out where I was, but by that time he had taken over, because he was afraid that we were getting too low to be safe, and we probably were, and it's just that things happened so quickly and have to be done right to get the vehicle to land properly.

Now, on the other side of that, we have a Shuttle training aircraft that does simulate the Shuttle very well.

I was going to England, I think, talking to some of the folks over there about emergency landing sites, and I had looked up the least number of Shuttle approaches in the Shuttle training airplane that a commander had at that time, and it was well over 1,000. So the people are trained very, very well to do that in a good training machine. We've had more than a hundred flights, and they've all been landed quite successfully.

JOHNSON: Also, when you began working on the Shuttle, did you envision or did the Shuttle Program envision the vehicle itself lasting as long as it has?

BOBKO: Well, they talked about it lasting for a hundred flights. That's what it was supposed to be designed for, and I think most of them are probably about thirty flights now or so. And they've done a lot to the Shuttle.

JOHNSON: The design itself, though, lasting or did you think that they may change the design twenty years in?

BOBKO: And they've changed quite a few things. Every time I think about it, I can never think of a system on the Shuttle that hasn't been changed since they started flying. The fuel cells have been changed. The rocket engines have been changed. They've made lots of change to the big engines. The way they've done the tiles and stuff has changed since the beginning. Not dramatic changes, but changes.

Sandra: Thank you.

BOBKO: Okay.

BERGEN: We've enjoyed having you here today and hearing your history.

BOBKO: Thank you.

BERGEN: It's been great.

[End of interview]