

# ORAL HISTORY TRANSCRIPT

JAMES M. BEGGS  
INTERVIEWED BY KEVIN M. RUSNAK  
BETHESDA, MARYLAND – 7 MARCH 2002

RUSNAK: Today is March 7, 2002. This interview with Jim Beggs is being conducted in his home in Bethesda, Maryland, for the [NASA Headquarters History Office]. Interviewer is Kevin Rusnak, assisted by Rebecca Wright.

I'd like to thank you for inviting us into your home today. It will be a pleasure to talk with you about your experience as a former NASA Administrator, and if we could, as I suggested, talk a little bit about some of your experiences before you became involved with the space program.

BEGGS: I'm a graduate of the Naval Academy, and I went to sea for about seven years after I graduated. I graduated in 1947 and ended up in the submarines, which is kind of a funny background for a NASA type, although I am also a pilot. I ended up, my last assignment in the Navy was in the submarines.

When I got married, I decided to leave the Navy, which I did in 1954. Then I went to the Harvard Business School [Cambridge, Massachusetts]. After the Harvard Business School, I ended up with the Westinghouse Company in Baltimore [Maryland]. They were involved at that time in various kinds of electronics and aeronautical and space support kinds of things.

I stayed in Baltimore from 1956 until 1968... I'll have to refresh my memory; my memory's getting a little dim on dates anymore. In [1956-1960], I had worked for a man by the name of Frank Godsey, who had run the Baltimore operation for Westinghouse. Then he retired,

went down to Florida, and [NASA Administrator James E.] Jim Webb used Frank as a consultant. Webb had a habit of picking up people all over the place for various reasons. Frank worked off and on for the Administrator for several years. Anyway, Webb was a great recruiter, executive recruiter for NASA. He asked Frank [to recommend someone for the position of] the Associate Administrator for Advanced Research and Technology, what was then the Office of Advanced Research and Technology. It has been called many names since that time. That was his name at the time.

Mac [C.] Adams who had come in from AVCO [Corp.] to run that office—Mac is dead now, I think—but Mac wanted to go back to business and told Webb. So Webb was looking for candidates for that position, and Godsey recommended me. I never asked Frank why he did recommend me, but he did.

Anyway, Frank is long gone. I can—anyway, I went back down to see Webb, which was a real experience. It was a great experience talking to Webb, because someone described talking to Webb as you try to take a drink from a fire hydrant. It really was. [Laughter] Webb talked incessantly, but you eventually could get a word in edge-wise.

Anyway, Webb took a liking to me. About a month later, he called and asked if I was interested in taking the job. Well, we talked it over, my wife and I talked it over and decided that we would try it, but I told Jim at the time I was not interested in staying more than two or three years. It was right during the Apollo Program, and it was an opportunity to really participate in a very important and, I think, probably the most historic technical program this country's ever undertaken.

In any event, we said yes, and we moved to Washington, and I spent only a little over a year on the job because there was a change of administration. At the time I took the job,

everyone anticipated that Lyndon [B.] Johnson would remain in office, and it was quite a surprise when Johnson withdrew his name and decided not. Of course, as events unfolded, Richard [M.] Nixon won the election, and there was a change from Democrat to Republican.

Webb had decided to retire along that way. Tom [Thomas O.] Paine, who had been the deputy to Webb, was appointed Administrator by Johnson. When the new administration came in, Jim Webb self-appointed himself to be an executive recruiter for the Nixon administration and place NASA people all over town. I was offered several jobs in the Nixon administration because they were actively recruiting out of NASA. NASA had a reputation—whether well earned or not, I can't judge, but anyway, they had a reputation for having an exceptionally good and well-qualified management core in the agency.

The job I finally agreed to take was as Deputy Secretary [then called Undersecretary] in the Department of Transportation [DOT], and I spent Nixon's first term, another four years, which I had not intended to do. When John [A.] Volpe, who was the Secretary, talked to me, he said that he wanted me very badly. [Laughs] As a matter of fact, he said—he was a daily communicant in the Catholic church, and he said, "I went to church this morning and prayed to my God that you would not turn this down." And he said, "And therefore you can't turn it down." In any event, I didn't. But he said, "I do want you to commit to at least through the term, because we have a lot of work to do." We figured it'll take at least that time, and he was right. So I did, and we did ultimately spend five years in Washington at that time.

I maintained my contacts with NASA at that time. Of course, we were only right across the street in the old NASA Headquarters. We had initiated a study of the aeronautics industry when I was Associate Administrator. I and a guy by the name of [Roy] Jackson—he's still

around, you might want to talk to him—completed this study. That study is still very actively used on the Hill. It's probably the most [complete study of the civil aviation sector].

[Interview interrupted]

Anyway, that study is occasionally used. I occasionally get phone calls from staff on the Hill asking me about it; why we said certain things.

RUSNAK: What were the key points to that study?

BEGGS: It basically was a study of civil aeronautics, although it touched on military aeronautics. It pointed out that aeronautics was a very risky business, and still is. It was a reason for continuing a very strong aeronautics program. Of course, at that time we did have a strong aeronautics program, although it periodically came under attack as being some kind of corporate welfare, and still does. It pointed out that it was quite a risky business, and at that time—again, you could get the study. It's still around. We looked at all of the civil transport programs that had been launched since World War II. I think it was something like twelve or fifteen programs that had been initiated. Only two of them had reached a cumulative break-even. So it was, at that time, a very risky business. It's still a very risky business. As a consequence of that, none of the companies had an adequate amount of money to put into advanced research. So we recommended that the nation continue a strong program, a government-supported program in aeronautics, and that it continue to occasionally build experimental airplanes to demonstrate what we call proof of concept, carrying the technology to the point where the advances, where

the advanced technology has been demonstrated to the point that the manufacturers could feel confident enough that they could integrate it into a new design, a new transport, or a new military airplane without fear that they were in above the technological limits, if you will. And that's still true. As a matter of fact, we recommended that again just last year.

I stayed on in Transportation. We had ongoing at that point the supersonic transport [SST], the American supersonic, which I had a hand in trying to defend. Ultimately, we lost the program. It's sometimes forgotten that [John F.] Kennedy initiated two major programs when he came in, because he was concerned that the country was falling behind in its technological thrust and was going to lose a competitive edge, so he initiated both the Apollo Program and the Supersonic Transport Program.

Webb had been offered both programs. In fact, they wanted him to do the Supersonic as well as the Apollo Program. Webb said he didn't think that NASA was well enough staffed to do both programs. So they asked Najeeb Halaby, who was then the Administrator for the FAA [then Federal Aviation Agency], whether he would take it, and Najeeb, who loved airplanes, said, "Sure." So it ended up in the Department of Transportation. We carried that program to the point that we were starting to cut metal, when for whatever reason, the environmentalists came after the Supersonic, and the Congress was not convinced it was an appropriate program to support.

Bill Allen, who was then the chairman and chief executive of Boeing, decided, for whatever reason I've never been able to fathom, even though I asked Bill why he did it, came out one day in a press conference and said they had no intent of going to production on it. So it died. I've regretted that ever since, because if we could have just built the two airplanes we had been funded, been authorized and funded by the Congress, we would have learned an awful lot,

because our transport was going to fly at Mach number 2.7 whereas the Concorde is just a Mach 2 design. Anyway, we lost the program.

I left Transportation in 1973. We had accomplished an awful lot and done everything that we wanted to do, and it seemed to both [wife] Mary and I that it was time to go back. We have five children and they were growing up, and we had to think about how we were going to educate them.

While we were there, the Airports Airways bill was passed. [We obtained loan authorization to keep the Penn-Central Rail Road operating. Eventually] we took over the Northeast railroads, the six bankrupt railroads, which ended up as Conrail, a [corporate] board I served for a period of time. We started the first major budgetary authority for mass transit. We started with about a billion dollars for mass transit. What else did we do? We did a number of other things. [Amtrak was initiated. A railroad safety bill was passed.] Those four years were probably the biggest legislative accomplishment in transportation in this country, which has had a long history of government involvement in transportation.

But it was time to leave, and I left after Nixon's second election, shortly thereafter. I went with a company called Summa [Corp.] out in California, which was Howard Hughes' holding company. My responsibilities were for the airline, which was Hughes Air West. Hughes had a great ambition, after he lost TWA [Trans World Airlines], to put together another transcontinental, really worldwide airline. It didn't succeed, but that was his ambition, and we were supposed to look around and see whether we could find merger partners or build a larger airline. He also had a fixed-base operation, which I was responsible for, and a whole potpourri of different real-estate interests that he had.

I found it very difficult to work for Howard Hughes. At that time he was a recluse. He was holed up in London. He had two top floors at the Inn on the Park. If you ever stayed at the Inn on the Park in London, you know that two top floors is a big area. It overlooks Hyde Park and it's a beautiful place. He had taken two top floors, which made the innkeepers very unhappy, because those were their two prime—that's where their prime rooms were, on the two top floors, and they wanted to get him out of there.

This is kind of an aside, and you tell me if you don't want to hear it. We bought an airplane for him. He didn't like using the elevators, because, as I said, he had become a recluse at that time. He would talk to you frequently, but he didn't want anybody to see him. He was deathly afraid of having his picture taken, so he wouldn't ride down the elevators. He would go down the back stairs when he wanted to fly.

One day when he was going down the stairs, he fell and he broke his hip. I think it was his hip. But he broke his leg, anyway. Apparently, it was a very painful break. He had a personal physician who would attend to him. He had numerous ailments, or he thought he did. He was a bit of a hypochondriac. They put him on morphine, or one of the painkillers, I forget, and he became addicted.

So we had to get him out of England, and so we bought him a hotel in the Bahamas, the Princess Hotel on one of the southern islands, which I was very active in negotiating for his hotel. Then we had to get him into the Bahamas, because he had no passport. He didn't have a valid passport. The reason why he didn't have a valid passport is that he wouldn't get his picture taken. He called me one day and he said, "Can you go see the passport people? You know your way around. Can you go see the passport people and see if I can get a passport?"

Frances Knight was the chief of that bureau, and had been for many years, and Frances was a little bit of a character. So I went to see Frances, whom I had met, knew, because her husband was at that time the owner and publisher of *Aviation Week*, and I used to get invited to parties at their home, which is right down on Foxhall. I went to see Frances and I explained the situation. I said, "Mr. Hughes doesn't have a valid passport and he really wants to get one."

And she said, "Fine." She said, "I'll give him a passport immediately. All he has to do is send me a picture." [Laughs]

So I called him. I said, "Mr. Hughes, you can get a passport, but you have to send your picture. Frances will not waive that rule."

"Well," he said, "the hell with it. I'm not going to get my picture taken." So we had to bribe our way into the Bahamas. Literally that's what he had been doing in all the places he had stayed in—Nicaragua, several other places. He would bribe his way through immigration because he didn't have a passport.

Anyway, he stayed there and then I left the company. It was kind of fun working for him and for this company, because there was a lot going on; we had a lot of interesting things. As a matter of fact, we had a piece of property that we were seeking to develop down on the ocean off Sepulveda [Boulevard], which was a beautiful piece of property. He used to fly out of there. We were going to develop it and we figured that we could put at that time—this was 1973—we could put two million dollars' worth of improvements on the property and not sell a bit of the land. Whatever the ground rent was, probably ninety-nine years, he would have owned the whole thing free and clear. But he didn't think that was a good idea. We even made a model of it and flew it over to the Inn on the Park so he could see it. He sat with the model.



One day he called back and he said, “Yeah, I’ve looked at this damned thing, but I don’t think that’s the best and highest use we can put on our property.” Well, I almost fainted. [Laughs]

I also had responsibility for all his old airplanes. He used to collect airplanes. Some people collect coins. He collected airplanes. He had the first Serial-1 Catalina Flying Boat. Of course, he had that great big flying boat that he flew once, which was sitting down in Long Beach [California] at that time. And he had the Hughes [H-1] Racer.

Hughes used to come back to NASA. That’s the only reason that I was able to have a decent rapport with him while I was there, was that he knew the old NACA [National Advisory Committee for Aeronautics] very well. Because I had been with NASA, he assumed that I knew all about NASA, and he would tell me about some of the adventures he had had.

He used to come back to NASA in the thirties, late twenties and early thirties, to get all the latest technology from Langley. I think he built the racer in 1932. You could look it up. And he used all the best NASA technology. He had an engine cowling on it, which was the latest. He had retractable landing gear. He had a faired-in-wing body design on the thing. He had two sets of wings on it, both the best airfoils that NACA had that time, one for long distance and one for short closed-course racing. He flew that in the early thirties and set a closed-course record and a transcontinental speed record, which stood until World War II.

One day he called and said, “I’m getting old and I’d like to donate all my historic airplanes to the Smithsonian.” He said he had looked it up. He said, “Do you know Mike [Michael] Collins?” Mike, the astronaut who flew on the Apollo flights, a couple of Apollo flights, was then the curator of the Air and Space Museum. So I went to see Mike, whom I knew quite well. I walked into his office and I said, “Mike, I’ve got a deal for you.”

He said, "What's that?"

I said, "Mr. Hughes wants to give away all his airplanes and he wants to give them to the Smithsonian."

Mike's eyes got as big as saucers and he said, "You mean the racer?"

I said, "Yep. You can have the racer." And it's still in pretty good shape. It was down on his property, down off Sepulveda, in a hangar down there. I had gone down to take a look at it. He had hired a guy whose only job, if you believe this, was to watch over that damn racer. [Laughs] This guy had sat down there in his office looking out at the ocean, and I think he had been there for, like, twenty or thirty years, just watching the racer.

Anyway, Mike said, "That's great." But then he thought a minute. He said, "You don't mean I have to take that damn flying boat, do you?"

I said, "Yep."

He laughed. He said, "What the hell would we do with that damn thing?" It's still the biggest, in cubic size and volume, it's still the biggest airplane ever built. He said, "Where would I put it? How would I display it?"

I said, "Well, let's think about it, Mike." So we sat there. I had been down to see the flying boat, too. I said, "You know, it's a very interesting airplane." It had two decks. In the forward end of the lower deck there was a spiral staircase that went up into the flight deck, and the damn thing had had six engines. In those days, engines were not as reliable as they are today. So the wing chord, which you could access from the upper deck, the wing chord, where it joined the fuselage, was six feet high, and he had a catwalk built out through the wing. What he was going to do was to carry mechanics on board, and he was going to go out and work on the engines when they had trouble.

So I said to Mike, "You know, we could cut out that wing chord," which you could actually damn near walk through. Cut out that one piece of the wing, and then we could cut off the flight deck, and kids could run up the spiral staircase, and it would be a great exhibit.

Well, he said, "Yeah, if we could do that, I'll take them all."

So I went back to California and called Hughes. By then he was in the Bahamas. I said, "He'd be happy to have all your planes, Mr. Hughes, but he wants to cut up the flying boat."

Well, there was a long, pregnant pause. He said, "You tell him that he can't have my flying boat, goddamn it, but he can have all the other airplanes." So he kept the flying boat and Mike got all the other airplanes, including his [Robert J.] Collier Trophy. He'd won a Collier Trophy for the racer, the Catalina Flying Boat, which you can still see. Most of them are stored out at Silver Hill [Maryland], out here in the warehouse where they keep all the airplanes. If they ever complete this thing out at Dulles [Airport], a lot of those airplanes will be displayed out at Dulles. The racer is displayed down in the Air and Space Museum on the Mall. You can go down and take a look at that. It's a very interesting airplane. The most interesting part is, if you look at it, in the exhibit they've got pictures of the Focke-Wulf 190 and the Japanese Zero, which bear a striking family resemblance to the racer.

He offered the racer to Air Corps at that time, but they wouldn't take it, because at that time the Air Corps was dedicated to armored airplanes, and they didn't think that they could put armor in the racer because it was too lightweight. But it was very maneuverable, like the Zero and like the Focke-Wulf 190. Everybody remembers the Messerschmitt, the ME-109, but, in truth, Focke-Wulf was a better airplane. They just didn't build as many of them.

So I left Hughes and went with General Dynamics [Corp.] in St. Louis [Missouri], and stayed with General Dynamics, where I had responsibility for the aerospace side; for all the

airplanes and missile parts. The program that took off shortly after I got there was the F-16, which arguably is one of the most successful fighter aircraft produced since the war, certainly. We've sold over 5,000 of them. It now belongs to Lockheed [Lockheed-Martin Corp.].

By that program we had the missile programs, [in] which [was] included the cruise missile, which has since become very famous. All presidents liked the cruise missile, because we like to say the cruise missile has infinite courage. And it does. They're very easy to use because you're not putting anybody's life in jeopardy, and they are very accurate.

The Phalanx gun system, which is used extensively, is a close-in gunnery system, which is still used by the Navy extensively. The standard missile, which is still part of the Aegis system, will eventually, I guess, will become, if we ever complete it, part of the antiballistic missile program. The Red Eye and the Stinger programs, the Stinger, of course, became famous because it was given to the Afghans and shot down a lot of Soviet airplanes in Afghanistan, and a number of other miscellaneous programs, including pieces and parts of the DC-10 on various other transports.

I stayed with General Dynamics until I got a call after President [Ronald W.] Reagan was elected, and I forget who called me. It may have been Ed [Edwin] Meese, but I can't remember. It could have been Mike Deaver. But one of the several people who worked for Reagan called me one day in February and asked me if I'd be interested in the [NASA] Administrator's job. I said, "Well, that depends. What's the president's commitment? What does he want to do with NASA?"

He said, "Well, you have to ask him. If you come to town, we'll let you talk to him."

So I flew back to town. I came back here frequently anyways, and went in and talked to them. I talked to the president, and he said, oh, yes, he liked NASA. And he did; he was very

supportive. He didn't know why he liked NASA, but he did like NASA. Well, he knew why. He had very good instincts. But he didn't know anything about technology. He was very, very interested in what they were doing, but he didn't know a thing about it, and didn't want to know. When we took him around, which I did several times, to the NASA Center, he would "ooh and ah" at all these marvelous things and he would say, "I don't know a damn thing about that, but that's very interesting."

We took him out to Edwards [Air Force Base, California] one time. We had made one of the early landings of the Shuttle out there, and we asked if he'd like to come out, bring his wife and speak to the people out there about how he felt about the program. He said, "Sure." He came out, and we took him out on a tour and showed him all the experimental airplanes we were flying. He was like a little kid with them. I told him, "After you finish your speech—." We had mounted the Shuttle on top of the 747 to fly it back to Kennedy, and I said, "After you finish your speech—." It was Enterprise that we had on top of it. I said, "Just say, 'Enterprise, you're free to roll.'"

He said, "Well, what will happen then?"

I said, "Well, that 747 will rev up and it'll come roaring by and take off."

He said, "What do I say?"

I said, "You say, 'Enterprise, you are free to roll.'"

He said, "I can do that?"

I said "Yes, sir." [Laughs]

So he did, and when he left that day, he said, "That's the most fun I've had since I got this job." He just had a ball.

Anyway, I talked to him, and went back to talk to Mary, and we decided to take the job. So I called him late in February, and then I went through the torture of filling out all those damn forms, which is a terrible thing that they do to you. They announced me in—I forget, late in March or April. Then I went through my hearings in May, and was confirmed sometime in June, because I went to the Paris Air Show that year, in 1981, and I wasn't confirmed at that point, but I had been through the hearings.

So I left General Dynamics, I think in June of '81, and joined NASA for the second time.

RUSNAK: Can you tell us about the confirmation hearings themselves? What kinds of questions were you being asked? What was the interest of the senators and congressmen?

BEGGS: The Congress has always been very supportive of NASA, and, of course, most of them on that committee, the Senate committee, are interested in their own state's interest in the program, which is natural. They, of course, are interested in whether you will support the activities in their state. They also were very interested in what we were going to do next. They said, "You're now flying the Shuttle. What's next?"

George [M.] Low, who was an old friend, George, who had done many things in NASA, God rest is soul, he had been instrumental. He was the Houston manager for the Apollo Program. He had served as Deputy Administrator under, first, Paine and then [James C.] Fletcher. He had worked in high-level positions in both Gemini and Mercury. I think at one point—no, I don't think he ever ran a center, but he was Deputy Center Director to [Robert R.] Gilruth at one time down in Houston, at Johnson [Space Center].

Anyway, I was very fortunate in that George, who had by that time become chancellor of Rensselaer Polytechnic [Institute, Troy, New York], had agreed to serve as the transition manager of the Reagan transition team. George and I had become fast friends over the years, so I had the opportunity of chatting with George about what he had found at NASA, what problems he'd found, and what he thought the next move was and what we ought to do programmatically. So I was pretty well prepared to take questions. I said, "Well, the next logical thing we should do is the Space Station, because we've learned how to fly back and forth in space, to space with the Shuttle, and the next step is how to work and live in space long duration," which the Russians were doing at that time, but which we had done. We had started with Spacelab, but we had never pursued it.

As a matter of fact, when Jim Fletcher, who was still active in those days—and Jim and I were good friends and would chat from time to time—when Paine and Fletcher—they were going through transition—sold the Shuttle to President Nixon, they had proposed both a space station and the Shuttle. The White House thought about it a lot and figured it was too much money to put up at that time, although they had agreed to do it within the budgets that they had during the Apollo days. In the Apollo days, the peak was at a little over six billion dollars, and it was fast declining to about three. What Paine and Fletcher wanted to do was hold it at five or six and they would be able to do both—five or six in current dollars, I should add. Well, Nixon said no, but he said, "I'll give you one of them. You decide." So they took the Shuttle.

So the Space Station went on the shelf, so to speak. And George Low, when he had looked at it, thought, well, now we were through the major expenditures on the Shuttle, maybe we could sell the Space Station and get the other half of the program. So I told the committee that, that I thought the next step—and Hans Mark, who went through the same time, we had

chatted, said the same thing, that we agreed that Space Station was the next logical step. And the Congress was very pleased with that answer, because it would be a big program and a lot of money and they knew that would be spread around in appropriate places, and everybody was happy as clams.

[Senator Edwin Jacob] Jake Garn, who was on the committee, bearded me at that time, said, “When are you going to get around to letting other people fly on the Shuttle?” [Laughs]

I said, “Well, we’ve been thinking about that and will continue to think about it, but we’ve still got some safety issues. But we will give that mature consideration down the line.”

He said, “Well, all right, but when you do, I’m the first. I’m going to be number one.” [Laughs] And he later on became the chairman of the committee in the Congress, and every time I would see him, he would beard me and say, “I want to fly. I’m the most qualified.” He was, too. He had something like 7,000 hours’ flight time.

Anyway, those were two of the issues that came up. They were concerned about the fact that now the NASA budget had been in a long-term down trend, they were concerned about the Hubble [Space Telescope], which had overrun its budget very significantly. Subsequently, they were proven right. It had significant technical problems. You always worry about the wrong thing. The technical problems they were worried about were the control system and the various and sundry pieces and parts that we had run in trouble on, and nobody worried about the mirror. The reason they didn’t worry about the mirror is that Perkin Elmer, which was the contractor, had built all the reconnaissance mirrors for the Air Force, which had been proven enormously successful.

They were worried about the Hubble. They were modestly worried about several of the other programs which were ongoing at that time, but none were really in serious trouble. Once



again, they were worried about the aeronautics program, which had been come under attack. Mr. [David] Stockman, who was then the budget director, was again raising the argument that aeronautics was corporate welfare, and had cut the budget. Before I got there, they did a mean thing to me, made Stockman cut my budget. So I arrived and said, "Well, hey, wait a minute. The president likes this program. Why are you cutting my budget?"

He said, "Well, it's all we could find for the budget this time, but come back next year and we'll see what we can do." Anyway, that's where the program stood, and those were the primary congressional concerns.

RUSNAK: What were your short-term goals when you first came in?

BEGGS: First of all, we wanted to get the Shuttle operational. We had flown the Shuttle for the first time when I got there, and it showed that the system would work. Hans and I made an extensive review of the Shuttle Program. I had not followed the program in detail and neither had Hans, even though Hans was probably a good deal closer to the NASA Center people than I was.

We made an extensive review. The Shuttle is an ungainly stack. It's really a very complex system that we built, and there were a lot of unknowns in it, just the question of whether we could control this ungainly stack through liftoff and through Max Q [maximum aerodynamic pressure] and then through the main engine burnout, whether the recovery of the booster and booster cases, and whether we could separate the big cryogenic tank, all of those were unanswered questions. Well, as I said, we did it the first time and it looked pretty good, although

we did have some significant problems on that first flight, but it did work pretty much as advertised.

It was obvious that we were going to have to spend quite a lot of money to fix some things, which we went about doing. So that was priority number one, was to get the Shuttle to the point where we could declare it was operational as opposed to experimental.

The second objective was to get the various programs, including the Hubble, which was the biggest science program we had going at that time, back on track and make sure that we could assure the Congress that we had it under control, financial control as well as technical control.

There were several programs, other science programs, which were in various states of disrepair. For one, we wanted to get that whole science program back in shape. I looked around and hired Burt [Burton I.] Edelson, who had been with INTELSAT and COMSAT and ran their laboratory for a period of years, and got Burt to take over the Associate Administrator's job there. I wanted a manager, which Burt had been, as opposed to a technical guy.

The Science Office of NASA has always been a difficult office to staff properly. You want people who are dedicated to doing the science, because its major constituency are scientists, astronomers, scientists of various stripes, planetary people, and what have you, and you want somebody in whom they could have a good deal of trust, but at the same time, the programs have gotten of substantial size, even with Dan [Daniel S.] Goldin's emphasis on smaller and cheaper, they're still several-hundred-million-dollar programs, and some of them are several billion-dollar programs like the Hubble. So I wanted someone that not only could have the faith and trust of the science community, but also could manage the office, and that's a difficult role to fill. I think Burt did a good job at that. So that was either the second or third priority.

Getting the aeronautics program reestablished was a high priority with us. Hans of course, coming from being the Secretary of the Air Force, wanted a closer association with the DOD [Department of Defense]. I was not sure that was good a idea, but we ultimately did make a deal with the DOD. DOD was moving in the direction of these funny-looking stealth airplanes, and NASA ultimately made a major contribution to that. That was important. That's not very well known, and we can't talk about it because it's still behind the black curtain, but we did make a major contribution.

Finally, the fourth objective was to sell a space station to the president. I've always believed that four years is a short time, and I assumed that four years was probably all the time I was going to have, although I ultimately stayed a little longer than that and would have stayed a lot longer than that had it not been for the Justice Department. But even though four years is a short time, he ought to have a limited set of objectives. And interestingly, in my chats with the president, that was what the president believed in, too. He had a very, very restricted set of objectives when he took that office, and one, of course, was to bring the "evil empire" to heel, which he succeeded in doing. But he had a very limited set of objectives for his presidency and he stuck to them.

They always kidded about Reagan, that he would fall asleep in cabinet meetings, and occasionally he did, or at least he pretended to fall asleep. It wasn't that he was falling asleep because he was getting old; he fell asleep when he got into a subject that he wasn't interested in. He got bored. The cabinet soon found if you brought things up that he wasn't interested in, you were going to lose him very quickly, and a lot of cabinet officers did and were not successful because of that. But he had a very limited set of objectives and he went after them and he did

them. He accomplished them all. Peggy Noonan has written a recent book in which she described—he had about six objectives and he accomplished every one of them.

Anyway, my job was to sell him on a space station, which we finally did. He was not a hard sell. His staff was a very hard sell, but he was not a hard sell.

RUSNAK: How did you sell it to Reagan himself?

BEGGS: I told him what it would do. I gave him a number of presentations on the potential of the space stations, what we could learn, the potential of commercial activities, the potential for long-term research in space, microgravity research.

You've got two things in space that basically are different than what you have here on mother Earth. One is microgravity, which you can't get—you can simulate for a short time on Earth, but you can't get at it long term except by going into space, and an extremely good vacuum. And, of course, the vantage point of being up. You can see an awful lot of both the universe and Mother Earth up there, which is a big advantage.

Many industrial processes require or like to have a vacuum, and the vacuum in space, which is there for free once you get there, is  $10^{-12}$  torr. As you know, 1 torr is the pressure here on Earth of 1 millimeter of Mercury. So,  $10^{-12}$  torr is a very good vacuum, and you've got it for free once you're up in Earth's orbit.

So I pointed out to him that we could do long-term research, and research is a thing that one does where you set up goals and objectives for an experiment, but often you find in doing the experiment that other results show up which you have to pursue if you want to take advantage of them, and that's what we will have. I'm distressed right now that with the current

overruns in the program and the problems they've encountered, that we're not going to have a sufficient crew, really, to take on manned experimentation, or man-tended experimentation, or woman-tended experimentation. With a three- or four- or even a six-man crew, you really don't have enough people. You need about eight, six to eight, to start doing some significant man-tended, person-tended, whatever the PC [politically correct] word is. And this is something we're going to have to worry that one through.

I pointed out, which is an argument that he liked, is that you'll be able to see it with the naked eye, which you are. It's an evening and morning star. He liked that. He named it—or agreed to a name, which they apparently for some reason are not using anymore, but they should, the *Freedom Station*.

Finally, I said, "This is the time to do it." And I said, "With a modest increase in my budget, if you give me just a 2 percent increase in real terms, I think we can do the program without any additional increase in budget." Well, the OMB [Office of Management and Budget] didn't adhere to that agreement, but that's neither here nor there. He agreed.

Anyway, knowing he was an actor, I quoted from Julius Caesar, which is not an apt quote, because both of the men who participated in the conversation were dead the next morning, but in the conversation between Brutus and Cassius the night before, they quoted those famous lines, "There is a tide in the affairs of men which, taken at the flood, leads on to fortune. Omitted, all the voyage of our life are spent in shallows and in miseries. On such a broad course we are now engaged and we must take the current when it serves or lose our ventures." He liked that.

Anyway, he agreed to the program. As I said, we took him around to various places to sell him, and he liked the NASA folk. Everybody likes the NASA people, and he did. He liked what we were doing and he liked the program that was going on.

He used to talk to the astronauts when they were in orbit almost every time. I never could get him down for a launch, though. He wouldn't come. I think part of it was, somebody told him we might have an accident. And, of course, we did. But he would never come down to the launch. The vice-president did. The vice-president, I might add, was a very great supporter. George H. W. Bush was a great supporter of the program. I don't know where his son stands. I haven't got a feel for that, but his father was a big supporter.

RUSNAK: How much influence did he have?

BEGGS: He used to say, "I don't have any influence with this president. I'm the vice-president, and the vice-president is the least influential man in the White House." And that's true. Historically, that's true. But I think he had some influence, but it was behind the scenes; it wasn't overt. In fact, when I made my presentation to the president in the cabinet room with the assembled cabinet, he didn't say a word. He was present, but he didn't say a word. The rest of the cabinet voted no. [Laughs] Fortunately, I had the only—as [Abraham] Lincoln said, the rest of the cabinet votes no, but I vote "aye" and the "ayes" have it. So I had the only important vote.

The vice-president was very helpful. After we had sold the Space Station, the president said, "Well, I want you to go sell this idea to our allies, because we should have all of them in bed with us on this thing."

I said, "How about the Russians?"

“No, not the Russians.” We were still in the cold war. But I would have brought the Russians in at that point, had I had the permission to do so, but I didn’t.

Anyway, the president said, “I will give you a letter of introduction to all of the presidents and prime ministers around the world.” Let me tell you, if you get an introduction by the President of the United States, you get in.

The vice-president was instrumental and gave me an airplane to fly around in. He got me an Air Force airplane to go around the world. We took a trip around the world. I met with [British Prime Minister] Mrs. [Margaret] Thatcher and I met with the French president, who was—that old curmudgeon. He’s dead now.

RUSNAK: [Francois] Mitterand?

BEGGS: Mitterand. Yes, Mitterand. And the Italian prime minister, the German prime minister. Who else in Europe? Then we met with the Japanese prime minister and the Canadian prime minister, who I think then was [Pierre] Trudeau. I can’t remember whether it was Trudeau or not. My memory’s getting very hazy on these people. Somewhere I’ve got all this written down, but I don’t know where it is anymore. No, I don’t. All my files were burned up in this fire I had, so I haven’t got much of that left.

Except for the English, they all agreed to join. I met with the ESA [European Space Agency] people. They were very interested in joining. They, of course, have to get a budget for it, for their various members, but they all wanted to participate. That was not a hard sell at all. Mitterand was his usual mean, hateful self, but he ultimately came around. The Italians were very interested in joining, and the Japanese were very interested in joining, and the Canadians as

well, although the Canadians wanted to attach conditions that we would not use the Space Station in any way, shape, or form for military activities. I said, "I can't give you that. I can't promise that, because the law says that if the military wants to participate, they can." The military didn't want to participate at that point, but they do have the right to if they want to. But anyway, the Canadians eventually came in without condition.

RUSNAK: What type of participation were they looking at at that time?

BEGGS: The Canadians, of course, were interested, having designed the arm of the Shuttle, they were interested in designing the arm for the Space Station, which is a much more complex task. That was a very easy thing to give them, because they had had the experience before and they had the people who had been trained in that.

The Europeans were all interested in the laboratory, because they very much had decided that this was an opportunity to make some money and maybe get some technological leapfrogs over the United States. And the Japanese were interested in the laboratory for the same reason, which was fine. I had no problem with that.

The biggest hurdle we had to overcome was that the Europeans and the Japanese always feel that they've been short-changed by the United States when they collaborate. In some respects, that's true. So they wanted something that had a force of a treaty, and we ultimately agreed to give them that.

I noticed in this current brouhaha over the overrun and the possibility of dragging it out, the Europeans have brought that out, and they are right. Those agreements do have force of



treaty. I think ultimately the State Department and the OMB have agreed it does have the force of treaty.

Anyway, the Congress was happy as a clam in high tide with the whole thing. They were very pleased with the initiation of the program. They wanted to know what it would cost, and I said, "Well, I don't know, but we will run this program in two phases. The first phase will be a complete base-line study of the configuration, and we will give you a cost estimate, which is the best estimate we can give you at that time."

I had estimated the program at 8 billion in current dollars at that time. That would be roughly, today, probably close to 18 or 20 billion. I don't know what it's going to cost, and I didn't know then, and I don't know now and neither does NASA. Somehow we expect that people in technology can figure out what something is going to cost down to gnat's eyebrows for things that are completely unknown from a technical point of view, but at the same time they take on jobs on highways and tunnels and subway systems and don't seem to mind when those overrun 2 or 300 percent.

When I was in the Department of Transportation, we launched the Washington subway system, and I'm at least partially responsible for that awful thing we did to the taxpayer. I went up and told the Congress we could do it for 2 billion. Well, it's cost 10, and probably before it's completely finished, it'll cost 15, but that's neither here nor there. Nobody objects to that, or nobody did object to it. I mean, they grouched about it occasionally, but the Congress never raises any serious problems about it. When it overruns, they shell out the money and things go on as normal. Even the OMB has trouble. People in the press who constantly harp on the overruns that the Defense Department and NASA run, never said a word about the subway. [Laughs]

RUSNAK: Wonder why that is.

BEGGS: Because they like the subway, and they're not necessarily sure they like—they're sure they don't like what Defense does, and they're not sure they like completely what NASA does. It's an easy way to attack. Besides which, they say, "We went to the Moon." Everybody forgets now how much trouble we had in the Apollo Program. I forget—I was there at the time, but I only have my memory to go on. I think the first six or eight probes we sent to the moon, exploratory probes, were failures.

Jim Webb did a smart thing. When Kennedy decided he wanted to go to the Moon, Webb figured, "Well, this is my first and last chance." He doubled the budget they gave him. I didn't have that luxury. But he doubled the budget, and as it turned out, it cost every bit as much as his doubled budget.

Another project we ran [at Transportation], we built the Strait Creek tunnel out in Colorado. It goes through underneath the Continental Divide. At that time, it was one of the longest hard-rock tunnels that we had built. We bankrupted three contractors on that job because the state of Colorado insisted on letting fixed-priced contracts.

I went out with Frank Turner, who was then the Highway Administrator, and I said, "You shouldn't do this. You shouldn't let a fixed-price contract. In the first place, that damn mountain is flawed. It's faulted," which we knew by the test shafts that it was faulted, badly faulted. It turns out you can lose a tunnel. I didn't know that until I got into the Highway program. But if you drill into a mountain or even trying to drill through hard rock in a subway system, and the rock starts to collapse on you, the rock above you starts to collapse, you can lose

the tunnel. By that I mean you cannot shore up enough to keep the rock from continuing to come down.

We damned near lost that Strait Creek tunnel a couple of times, because they did run into a fault line in the middle and it started to collapse. I forget how much concrete to shore that thing up. What they do is go in and shore it up and then pump straw and concrete into the cavity until they feel they've got it sealed.

But anyway, that tunnel probably overran our initial budget estimates by about 600 percent, but it is one of the Seven Wonders of the World. If you've ever driven up through that part of Colorado, it goes right under the Continental Divide for, I forget, a couple of miles. The people who go skiing should bless us every time they go through that tunnel, because if we hadn't been able to build that, it would be a lot harder to get out to the ski areas in the western part of the state.

But for some reason, people don't worry about civil works, but they do worry about NASA and they do worry about the Department of Defense to a degree I find extraordinary, or at least irrational. But those are the kinds of things you have to worry about. Then Hubble was another example of that. We kept running the budget of the Hubble up and up and up.

Finally, [Representative Edward P.] Eddie Boland, God rest his soul, was a great supporter of the program, but he was a real tough Irishman, and he used to grill me every time I came up here, and he said, "How do you know this is enough to finish the job?"

And I said, "To be honest, Mr. Chairman, I don't know whether this is enough. I really don't know. But I think it is. We've scrubbed this program as hard as we could scrub it."

Well, a year later we were back asking for more money, and he was getting awful upset with that program. Of course, he was retired when it was launched. After we fixed the problem

we had, and he saw some of the results, he was happy as a kid with a new toy. He, more than any other man in the Congress, in fact, more than any other man anywhere, he was responsible for keeping that program alive. He would really do his homework and when he went on the floor with the budget, he had all the answers.

There were a lot in the Congress that wanted to kill the program many times, but he kept it alive. But it was one of those programs we had a very hard time trying to figure out how to repair all of the problems that we had. Then even after we launched it, we had a lot more problems. We had problems with the mirror, we had problems with the solar cells, with the foldable arrays. We had problems with the control system. We had problems with the camera.

The camera was very interesting. Here I was up there getting beat up about the head and shoulders every year, twice a year, from Eddie Boland, and Burt Edelson would come over and he would want to spend more money on backups. One day he came over and he said, "I want to start a backup camera." I almost had a fit, because the program had overrun badly and I had just come back from getting beat up again up on the [Capitol] Hill, and he wanted to spend another 10 or 20 million dollars on a backup camera. This was not something you bought in a camera store; this was a \$20 million camera. But as it turned out, when we had the problem with the mirror, that backup camera was absolutely a lifesaver. That was the camera we took up for the initial repairs. So we did do some smart things.

The other smart thing that we did, we sat around in one of the very many design reviews, and I forget who it was that was saying, "Well, you know, eventually we're going to have to repair this thing. Even if it goes tickety boo from this first day, we're probably going to want to update and repair." And all the astronomers who were in the meeting shook their heads up and

down and said, "Oh yeah, we'll want to make improvements, as improvements become available."

So I said, and I think several of us said, but I said, "We ought to modularize each one of these things so that we can replace them as modules. We can just slide the thing in as opposed to going over in and having to do the wiring."

When an astronaut goes out there with those big gloves on his hands and tries to make a wiring connection, it ain't no easy task. So we did, except for the one they had to repair this time.

The power supply was the one thing we didn't modularize. It was too far gone at that point. But apparently I read by the morning papers that they have succeeded in rewiring it, which is great. But that was one thing we didn't modularize so you could just take the old module out and slide a new module in. But we did modularize everything else, and that's been a life saver, because we're able to go up there with the improved equipment and just take the old one out and slide the new one in and it's done. I make that sound easier than it is, but it is a lot easier than what it would have been. As a matter of fact, there's still a directive from the Administrator saying that in the future, anything we intend to refurbish or repair on orbit should be modularized. It was one of the old lessons we learned.

RUSNAK: That certainly makes good sense.

BEGGS: Yes. Well, that's what most of management is, applying good common sense ahead of time, not after the fact. We should have applied some good common sense on the mirror, but I'm still mad at the Air Force on that one, because Perkin Elmer was doing all the work on the

Air Force mirrors and they wouldn't let us back in the highly secure areas. Well, I got back to NASA and went up to Perkin Elmer and I found out we had only one man up there. We had only one NASA guy up there, and he wasn't allowed to go into the highly secure areas. I blew my stack and I called Pete Aldrich, who was then the Secretary of the Air Force, and I said, "This is nonsense. We're building a several-hundred-million-dollar mirror up there and he won't even let us in to take a look at it." So he agreed. We put three more people, but it was too late. The grinding had already been done and they had presumably tested it, only they tested it faultily. But I blamed that on the Air Force, and I still do to this day, not on NASA.

NASA has a policy of working with its contractors, which is a good policy. As a result, we do most of our work on cost-reimbursable contracts, whereas the Air Force has gotten into the habit of letting fixed-price incentive contracts, and they have a philosophy of "Well, we've contracted with contractors, and a contractor should do what's right, and if he doesn't, well, they're responsible." Well, that's fine if the contractor does everything tickety boo and everything turns out well. If everything doesn't turn out well, then you have to fix it after the fact. It's going to cost a whole lot more money and it's going to take a lot more time, and that's dumb. So I think the NASA policy is right and the Air Force policy is wrong.

I noticed that the Air Force in their black programs doesn't do that, but they continue to do it and they continue to get in trouble. I don't think they're doing it now, now that we're at war. I noticed when they wanted to replace their precision ordnance, they went out and gave them whatever contract they had to do in order to get the job done quickly. Same thing as on all the cruise missiles are gone, too, and they're replenishing them in the same way.

RUSNAK: If we can continue this conversation in just a moment and take a short pause so Rebecca can change out our tape.

We were comparing the way NASA and the Air Force ran their contracts.

BEGGS: Right. Well, I think I've said all I need to say on that. NASA and the Air Force, more so than NASA and the Navy, although both of them have benefited from NASA aeronautical technology and space technology, but NASA and the Air Force have had a rather close relationship over the year. Of course, both Bob [Robert C.] Seamans [Jr.] and Hans Mark, who both were Deputy Administrators, served as Secretary of the Air Force, and generally speaking, that relationship has been, I think, satisfactory on both sides and very profitable and successful on both sides. It's not as strong today as it was ten, fifteen years ago, but it still exists.

One of the recommendations I've made to—we made, we have a group called the NASA Alumni League, which tries to help Administrators and administration, one of the recommendations we have made is that they try to restore that collaboration between the Air Force and NASA to a more serious—I guess would be the proper word—serious relationship as it was fifteen, twenty years ago. We'll see whether that happens or not, but it should. I think [current NASA Administrator] Sean O'Keefe, who also had experience in DOD, will want to do that. I hope so.

RUSNAK: Maybe you can point out some of the areas during your tenure as Administrator where this relationship was beginning to develop or the points where it became more serious.

BEGGS: Well, I can't, because most of that work was and is behind the black curtain. That was the direction where the Air Force was going, and it's still the direction they are going, although as I grow older, I'm very skeptical of the whole black aircraft program that both the Air Force and the Navy have ongoing. The Navy got themselves in a terrible situation on the A-12 and lost the program, which is a tragedy.

We all have noted that in both the Gulf War and in this Afghanistan incursion, or whatever it is—I guess it's war—all the airplanes fly above the anti-aircraft defensive. So they're really not using the black capabilities or stealth capability of the aircraft. And I doubt, in the way the world looks like it's going now, I doubt that they ever will. So this money was not very well spent.

Now, we did use it a little in the Gulf War and they did use it in Yugoslavia. In fact, the Air Force is awful upset about that, and probably should be, because they lost one in Yugoslavia. And there's no doubt that Yugoslavs passed that airplane right back to the Russians, or what was left of the airplane. When they lost that airplane, they should have immediately gone in with a strike force and destroyed it, but they didn't. Anyway, but that's the area that we have helped.

NASA has done some very significant work. Of course, you know, from the beginning of the space program, a lot of the things that we developed in NASA have moved right over into the military. For example, everyone realized that space would be a very important area for communications. The military, DOD, with the Air Force, launched a program called ADVENT. I think it was called ADVENT, which was a lower-altitude satellite communications system on which they spent a substantial sum of money, probably over a billion dollars before they cancelled the program. In fact, Burt Edelson was involved in that program, interestingly.



About the same time, the Hughes aircraft people came to NASA—that was the first time I was in NASA—came to NASA, and they said, “We have an idea of putting a spin-stabilized communications satellite up at geosynchronous, geostationary orbit.” A couple of the NASA scientists and engineers thought that was a great idea...

Hughes said, “We think we can talk our corporate fathers into giving us enough money to build a satellite. In fact, we don’t have access to—but we sure don’t have a lot of money to pay you for a launch. We need a launch, not just into LEO, into lower Earth orbit; we need to transfer it and go into [geostationary orbit (22,300 miles up)].” They advanced some good ideas, and so did NASA, on how to get to geostationary orbit.

So we agreed that if they’d build the satellite, we would launch it for them. And we did. They built a satellite, which I think it had five transponders on it, modern communication have up to thirty-six, but I think it had five transponders, but it may have been a few more or less, but it wasn’t much different than that, and we launched it and put it into geostationary orbit and it worked like a charm. It was great.

After we had demonstrated that, the Air Force and the folks in the military said, “Well, that’s a better way of doing it.” That’s what killed the ADVENT program. They started to design geosynchronous satellites for their communication.

We came up with the first ideas on navigation. NASA came up with the first ideas on mapping and Earth observation, all of which were adopted by the—not necessarily our ideas, but the concepts were adopted by the military, subsequently. So the military benefited significantly from the NASA research, and rightfully so. The money that we spent and the work that we did, if it has military application, should be moved quickly into the military area, and it has been.

The first photographs of what you could see up there were taken by John [H.] Glenn [Jr.]. John is an old friend, and when he flew this last time he was reminiscing about his first flight, and he said, “I wanted a camera. I asked NASA to give me a camera and NASA said, ‘We don’t have one.’ You may not believe this, but two nights before, I went down to the drugstore and I bought myself a little Kodak and tucked it into my flight suit.” Of course, that’s what he used to take the first photographs. Everyone that saw those were very delighted with them. After that, of course, cameras became a piece and part of every flight. Of course, the Air Force saw what you could see from orbit, and the rest is history.

The air force did a lot of things—or NRO [National Reconnaissance Office] does a lot of things from Earth orbit that really probably were instrumental in ending the Cold War. I believe—and I am firm in this belief—that the communications revolution that came about through worldwide satellite communications and the miniaturized electronics which came out, to a large extent, came out of the space program, which made it virtually impossible for the people of the Soviet Union to be shut off from the rest of the world, really succeeded in changing the world and is probably the greatest reason why the Soviet Union fell apart.

There’s an interesting story. A couple of my friends, a couple who have been our friends for twenty, thirty years, got interested in Russia. Rather, the wife got more interested than the husband. But they took a trip to Russia—this was thirty years ago—and went around Russia and they went the town that was [Vladimir I.] Lenin’s birthplace. I forget the name of it. Anyway, Betty, the wife, got to talking to a woman, a young Russian woman who spoke fluent English. She was an English professor, as a matter of fact, and they started corresponding. Her husband was an aeronautics engineer. His name is Alexander. On the side—this was back in the sixties

and seventies when the Soviet Union was still going strong—he had an electronics business. He would repair VCRs and televisions.

When the *perestroika* came in, they were allowed to travel, and they made a visit over here. They came over on the Aeroflot airplane and went to visit them. They live up in Boston. They went to visit them in Boston. He also went out to the West Coast.

When he got back to Boston, he had big boxes full of VCRs and various kinds of electronic equipment. My friend Charlie said, “What are you going to do with that, Alex?”

He said, “I’m going to refurbish my electronics firm.”

He said, “Who has all this stuff?”

He said, “Everybody has a VCR. Sometimes they’re pretty old and decrepit. So I made a good business out of this. I keep them in repair.”

Charlie said, “Where do you get the tapes?”

He said, “Oh, hell, there’s a whole library of tapes in Russia.” Like a lending library; they float around. You can get modem and you can get the latest movies and broadcasts and everything else.

So, obviously it was a lot more open than we believed. They were getting a lot of stuff through satellite communications and through the various and sundry things that were available off the airways. I think really that’s what changed the world, and I think NASA and the Air Force and the DOD, once they got into using space, had a major impact on that.

RUSNAK: Speaking of the Soviet Union, how much attention did you pay to what the Soviet space program was doing?

BEGGS: Oh, we paid a lot of attention. We knew them all. It's kind of interesting, when Jim [James] Harford, the retired president of the AIAA [American Institute of Aeronautics and Astronautics], wrote this book on [Sergei] Korolev, he made a number of trips to Russia. Of course, it was opening up then and he could talk to all the people. Korolev was dead by that time. But you could talk to all of the people who were in the space program, and they were pretty open as to what they were doing. We used to talk to them.

We had a considerable number of collaborative programs with them. We would fly on some of their science satellites and they would fly on ours. We'd put instruments on. There was kind of an amusing anecdote on that. After the animal rights people stopped us from flying animals, they were still flying monkeys, and we had an interest in that program. We were flying on one of their monkey flights. We had an instrument. In fact, they liked our instruments because we would share the data returns on all of this. They liked ours because ours were more advanced than theirs and we got better data.

So we were flying some monitoring equipment on this thing, and we routinely monitored their telemetry, and we knew that the monkey had died. Just before reentry, I think, the monkey had died. So we called the laboratory and didn't say what we knew, but we said, "When could we get the data?"

They said, "Something's happened. We can't get the data." Or, "The data was destroyed. Something happened to the data." This went on for several weeks. They wouldn't release the data to us.

Finally, I said, "Why don't we tell them we know the goddamn monkey died, and we understand that they don't want to give the data because we would know that the monkey had died. And we won't say anything about it. We won't make any kind of a publicity stunt out of

this.” So they did, and they released the data. But they were very, very reluctant to let us know that the monkey had died. I don’t know what they thought would happen. They probably thought we would make a big brouhaha propaganda event out of it.

But we collaborated with them extensively throughout. As a matter of fact, I [knew] Roald [Z.] Sagdeev, who was the civil head of their space program, he’s an academician, a plasma physicist, and he would visit the United States from time to time. He wanted to collaborate more than our cold warriors were willing to let us collaborate, and he would constantly have proposals to present to us.

Anyway, sometime in the early eighties, I forget, ’82 or ’83, the space treaty we had signed with them way back during the Apollo days was due for expiration and renewal. He came in and he said, “The Soviet Union badly wants to renew this treaty.”

So I recommended to the White House that we renew it. If we had any objections, it was a fairly innocuous treaty. It just governed the terms and conditions under how we’d exchange data. Of course, they routinely withheld stuff they didn’t want us to know, but we’d know it anyway, so it didn’t make any difference.

But the White House didn’t want to renew it. We were right in the midst of the serious arms-control negotiations, and for some reason, the wheels, the then-wheels, didn’t want to do it, and we didn’t. I went over and talked to—I think [Robert] McFarlane was then the National Security Council director. I said, “We really ought to do this. I’d a lot rather have an agreement where we can have some window into what they’re doing and I would have no agreement where we don’t have a window.”

Well, he agreed with me, but he said “I can’t persuade anybody to do it,” so we didn’t do it.

So this went on until the Soviets' collapse. It waited until the collaboration on the Space Station in the [William J.] Clinton-[Albert A.] Gore days. Gore was very anxious to do that, and they did put together another treaty, but we should not have let the first one lapse. But we now apparently have a satisfactory working relationship. But we knew all of the players over there. We even knew Korolev, although not well. The Russians had a paranoia about Korolev. As a matter of fact, they had a theory that we were going to try and kill him, so they kept him under wraps.

We knew Sagdeev well. As a matter of fact, Roald is a professor out at the University of Maryland and is married to one of our good friends, Susan Eisenhower, who's President Eisenhower's granddaughter. Susan got interested in Russia and studied Russia in the university and started an Institute on Russian Affairs, which still exists. Susan would make trips to Russia to exchange data. She met Roald in one of those trips in Moscow, and they fell in love. It was after the break in the Soviet Union, he came to the United States and they got married, which was kind of nice. I get to see Roald from time to time. I enjoy him.

We knew the Soviets, the scientists. We knew the people who were playing in their game. We knew roughly what they were doing. We watched them build their Shuttle. The intelligence people always thought that the Russians had some kind of spy system set up in our contractors, and they may have, but I've never seen that confirmed anywhere, but they may have. In any event, their Shuttle looks just like ours.

Then they came and said, "See, it looks just like yours." I said, "Yes, but what you don't understand is that our Shuttle is statically unstable. That's an unstable airplane." And the thing that makes it possible for us is that we've got good electronics and they don't.

I ran into [Alexi] Leonov, the cosmonaut, at one of the international meetings. I walked over to him. He speaks pretty good English. I said, “When are you going to fly your Shuttle?”

“Oh,” he said, “very soon.”

I said, “We haven’t observed you making any test flights on it as we did.”

“Well,” he said, “we’re not going to do that. We’re going to fly it the first time and that will be it.”

I laughed, and I said, “You must have very brave cosmonauts.” [Laughter] He laughed.

Well, it turned out they never did fly it. They flew it once in an automated mode, but that was all, and it was not a successful program, which I felt at the time it was not going to be.

RUSNAK: Did the events of the Soviet space program have any bearing on decisions made in the American program, either from a policy—

BEGGS: Generally, the Soviets followed us. They didn’t lead. They did go ahead and build a space station. They knew that we were proposing a station. I mean, von Braun made no bones about it while he was alive. He used to say, “We’ve got to build a space station.”

As you know, Wernher [von Braun] ran the—for a while he ran the planning arm of NASA here at Headquarters. That was one of his programs, the only program. He wanted to go to Mars, of course, but in order to go to Mars, you’ve got to start by getting experience in Earth orbit for long duration. That’s where he wanted to go first. The Soviets knew that, so they did. When we laid down the Shuttle Program, they went off and built themselves a space station. But it was really because we were going to build a space station.

They were relatively successful with that program. They killed a few people. We don't really know how many. Probably more than we do know, but they did kill some people. But unlike our program, when we had the Shuttle accident, we shut the program down for several years, they never shut their program down, never, in spite of the fact they had several accidents. They tried to go to the Moon, but it was primarily the challenge that President Kennedy had laid down that drove them into that program.

They copied our Shuttle, but it was not a successful program. The one area where they are probably better than we are is in their launchers, and the reason they are better than we are is they build them in very large numbers, so they get a lot of experience from them. I forget how many launchers they have gotten off, but it's probably in the order of 1,000 to 1,500. You can look that up; I think it's a matter of record. But it's a lot of launches.

And they did something very smart, which was probably due to Korolev: they standardized on the engines. That's a good news-bad news story, because they never went for a big engine like the ones we developed for Apollo. They were trying to fly to the Moon with something like thirty engines in tandem, a very large number, and it didn't work. But because they standardized, they got a lot of experience, and they were able to improve them as they went along, and the engines they're flying today are probably a good deal more reliable than our engines, and they're certainly a hell of a lot cheaper than ours. They build them in quantity and put them in storage. Of course, they have that luxury in a socialist system where they can get a budget and build a batch of them and they didn't have to worry about the cost of their inventory. We don't do that. But as a result of all of that, their engine technology and the reliability of their launch vehicles is probably better than ours, and we could learn.



What we ought to do is just buy them from them now, since they're willing to sell them, buy the better ones, as the Boeing people are on their Sea Launch. That's a good idea. If we want to design some new vehicles, like the X-33 and X-34 programs, we should have bought Russian engines or tried to adapt Russian engines. That's what George [E.] Mueller is trying to do up there in Seattle with his little program, which I'm afraid is not going to go, although he says it will, George says he's going to fly it out of Woomera in Australia. We'll see.

But other than that, they're still very much behind in flight control and electronics. They're still very far behind in a lot of the aeronautical sciences. They don't understand near as well how to do computational fluid dynamics [CFD] as we are starting to do, or have been starting, which was another program that happened on my watch. We got CFD work started out at Ames [Research Center, Moffett Field, California].

RUSNAK: Computer technology is a key component of that.

BEGGS: Yes. There's a funny aside. Roald Sagdeev came to see me one day and he said, "Will you do me a favor?"

And I said, "If I can, Roald."

He said, "I want to buy some DEC [Digital Computer Corp.] computers for my laboratory. Would you go down to the White House and see whether you can get those cold warriors down there to permit me to buy them."

I said, "I'll do it. I'll ask, Roald, but I doubt whether they're going to do it."

He says, "Well, tell them I'm getting the damn DEC computers anyway. I'm buying them on the black market. I can get as many as I want, but they cost me three times what I can

buy them in this country. I've got a limited budget in my poor little laboratory, and I really need to buy them off the shelf here in the United States.”

So I went down and asked them. Sure enough, they said no. So he had to continue to buy them off the black market. But, yes, they had to use our technology, because we were so far in advance with anything they were doing. They're pretty good at software; pretty good at writing software. So if they could get the computer, they could write the programs for it. Of course, they could also pirate our programs, which were available commercially, to a large extent.

RUSNAK: Your mention of the Soviets, now Russians, their advances in the boosters, brings to mind another point about, under your watch, the Shuttle was supposed to replace expendable launch vehicles, but there were some issues there with the Department of Defense still wanting to have some availability.

BEGGS: Well, they wanted backup. Of course, at that point the agreement was that they would build a launch site for the Shuttle on the West Coast, and they were in the process of doing that. But they continued to express a concern that reliance on a single system was not advisable, that there ought to be a backup. Of course, they wanted Titan. They kept saying Titan was cheaper, until we finally got the numbers out of them and Titan isn't cheaper. As a matter of fact, if anything, its more expensive.

But I did negotiate with Pete Aldrich an agreement whereby NASA agreed that they could continue a backup Titan program. We signed an agreement to that effect.

Of course, they're not using the Shuttle anymore. We did a dumb thing after the *Challenger* accident when we decided we weren't going to use Shuttle to take up commercial payloads. What we did with that decision—I was gone by then; I would have argued vigorously against that, and Jim Fletcher, to his credit, did argue against it, but to no avail—that we would not fly commercial payloads on the Shuttle. The argument was you shouldn't risk lives. Well, you're risking the lives anyway when you fly the Shuttle. I mean, I don't follow the logic of that.

The net result of what we did was we turned the market over to the French. Ariane now has half the market, probably a little more than half. And that doesn't make any sense to me. I don't know whether it makes sense to anybody else. But our capability at that time was as good or better than the French, and our ability to launch was as good or better than the French.

If we wanted to back it up with expendables, I had no problem with that. Expendables are arguably more expensive. The Air Force and some of the people who build expendables would argue with that. But if you take into account all of the costs of launching an expendable, it's more expensive than launching them on a Shuttle-like vehicle.

As it's turned out, because of the various events, we don't fly the Shuttle enough to take on the commercial market anyway. So I guess it doesn't make any difference. The arguments that you need a backup to make the system more robust, that it's more secure, is a silly argument. It's a silly argument because they can all go down at the same time, as they did.

When the *Challenger* accident took place, the Titan had an accident. It went down for several years. The Atlas went down for several years and the Delta went down for a year or two. They all went down at the same time. Nobody has taken much note of that, but it's true. So they all can go down, and they're all equally vulnerable. A launch vehicle sitting on a pad getting

ready to launch is the most vulnerable machine in the world. All you have to have really is a high-powered rifle with somebody that's willing to land on the beach in the dark of night and take a couple of shots at it. So the security argument for a launch vehicle is silly. Of course, that doesn't say you shouldn't take every precaution and put a secure force around to detect anybody coming in, but they are highly vulnerable.

RUSNAK: What effect do you think the maintenance of some expendable launch vehicle capability had on the Shuttle during the years that you were there?

BEGGS: Well, I think it was a wise course to keep the assets for them around during that time, because we really didn't know whether the system was going to work to the satisfaction of the commercial interests. The commercial interests, at the time of the *Challenger* accident, were pretty well coming to commit themselves to the Shuttle launches. As a matter of fact, Hughes sued the government later on because they had signed a long-term contract to launch all of their communications satellites on the Shuttle, and NASA reneged, and they sued.

As I say, I had no problem in the argument with Pete Aldrich. If he wanted a backup, it's fine with me. The rest of the assets we were prepared to either give to the contractors, or if the contractors didn't want to sell them—it turned out they didn't want them at that time, and we did sell one, and that got into litigation.

The contractors were pretty much convinced that it was going to go Shuttle, except for the Air Force, who would have an occasional launch on whatever. So they're going to have to decide sometime in the near future what they're going to do with the Shuttle Program in the future. [And what the next generation launch system will look like.]

We've built the system to fly 400 flights and we're now just a little over a hundred, so we've got a long way to go yet. But at some point you're going to have to replace the Shuttle. That's another job that Sean O'Keefe is going to have to wrestle with, as to what the system is going to look like.

I would be inclined at the present time not to build another truck like the Shuttle, but to build a smaller vehicle. We had talked about that, still a manned vehicle, but something that would carry human beings around back and forth to lower Earth orbit. The Russians have done it so many times that it's very well proven you can now put the big payloads up with expendables or a redesigned recoverable expendable, the kind of thing the Air Force is trying to think about for an advanced launch vehicle. That's what George Mueller's fooling around with out there in Seattle, making something that you could get most of it back, refurbish and fly again.

If I understand the Air Force program, they'd like to be able to fly twenty times a month. Well, if they can design a system to fly twenty times a month, it is recoverable and refurbishable, then NASA could tag along on that and use that same vehicle to fly a smaller manned vehicle of some sort. You have to man-rate the system, but that ought to be fairly easy to do these days. And if they set up the infrastructure to launch a maximum of twenty times a month, they're never going to use that except in dire emergencies, so we could tag along for free or maybe for minimum cost. But they're going to have address that problem, and we were starting to wrestle with it while I was there.

RUSNAK: For the Shuttle Program, you were looking at the beginning of having a flight rate, not quite twenty times a month, but something more significant than what they manage now.

BEGGS: Yes. When I got back, they had in the plan a forty-times-a-year program, three and a half a month. With the problems we were having, everything from the tiles to the main engines, the turbo pumps in those engines had a very, very short mean-time to repair. Replacing tiles when they needed replacement, they needed replacing almost every flight, the turbo pump problem, the problems on the other engine components, the ability to ramp up to get the number of boosters, that quantity of boosters and the quantity of tanks, were just far beyond the production capability we were putting into place. So Hans and I sat there very early and we cut that back down in stages from forty back down to eighteen, or one and a half a month.

My feeling at that time, as was Hans Marks' feeling, was that probably we would never launch more than twelve, one a month. We thought that was well within what we had in place. We had four Shuttles; four vehicles. We had sufficient production capability to get the boosters. We had sufficient production capability to get the tanks. And we started a backup program on turbopumps, which Marshall fought tooth and nail; they didn't want to do it. Of course, neither did Rockwell, the main prime contractor on them. It turned out that was the most lucrative piece of business in the whole Shuttle. They were buying turbopumps like cracker boxes. But we started a backup program and it's taken them—let's see, it must have been 1982. This is now 2002. So, that's twenty years.

They finally are producing backup, a new designed turbo, which was designed by United Technologies, Pratt & Whitney, and they're flying them now. But with that we thought we would have sufficient capability to fly one a month and maybe if we had a reason to, one a half a month. We had succeeded in turning the vehicle around in less than two months, and we had plans to build a bigger refurbishment facility down there, which, it turns out, never was necessary. So we could have ramped up to eighteen if we had wanted to. As it turned out, we

never wanted to. But if the Air Force goes ahead, then we've got a program to piggyback on. That would make a lot of sense. Maybe they can do that.

RUSNAK: You said a couple of times that you never had the need to ramp up to eighteen or possibly more, I guess, flights a year. What sort of market was there for even twelve flights a year?

BEGGS: The market comes in three parts. One is the military market. At that time we were planning that the military would fly perhaps three or four times a year with their big payloads. The Shuttle was sized to handle the Air Force's big payloads. That's how we set the size of it. So we figured they might fly three or four times a year. The market for the NASA science and other payloads was another five or six flights year. So, there's eight or nine.

And then the commercial market at that time was anywhere from twelve to eighteen satellites, and we didn't see much growth in that. Of course, we were not looking at some of the newer ideas around where they were going to fly a lot of them, although a lot of those ideas have come a-cropper now, things like Iridium and Global Star and what have you, where they were wanting to fly lots of satellites into orbit. But the market, you could see, was twelve or fifteen large geostationary, geosynchronous-type satellites, and we could carry two of those on each flight. We could carry two of those and even do some science at the same time. So there's another six or seven flights a year. So you add all that up and it adds up to about fifteen, eighteen flights, and that's what we were looking at.

Subsequently, of course, the military is now flying a little more than they used to fly, but not much more, but the commercial market expanded really significantly. Until the market

collapsed a couple of years ago, they were looking at forty flights a year. Now it's back down in the twenties, I guess. But that's the market we were looking at, and we figured we had ample capacity to handle that market, particularly since Ariane was determined to bite into it. They were starting to buy in. They would offer extremely favorable terms to win some launch contracts. Of course, the Europeans, in their own way, would keep the ones that they launched on Ariane. If we hadn't had the accident and if we had continued, which was dumb on our part to have the accident, but if we hadn't had the accident and we had continued to fly normally, we could probably have handled the market adequately. Ariane would have taken a piece of it and we would have continued to get our share.

RUSNAK: Looking at those numbers that you've just suggested, it doesn't seem to leave a whole lot of room for putting up a space station.

BEGGS: Well, we wouldn't have. We would have had to either take something off or ramp it up even further.

The Shuttle is a very interesting program. The Shuttle is a lot like any other kind of airplane program. In order for an airplane to fly from here to there, you've got to have several things: you've got to have an airplane; you've got to have airports; you've got to have an air control system, flight control system or ground flight control system; and you've got to have maintenance people who make sure that all the stuff works when you need to fly. Once you have bought and paid for that, once you have paid for the vehicles, the airports, put in place the flight control system and everything else, providing you don't reach capacity for that system, all it



costs you to fly another flight is what you pay in fuel and what you pay the crew, which is de minimus if the machine is very productive, as modern flying machines are.

The Shuttle Program was that way. Once you had built the launch capability, once you had put in place the infrastructure to control this machine while it was in orbit and while it was flying, once you had the standing army, you could maintain it and keep it flying, you could fly until you reached the capacity of that system, you could fly as many as you wanted, and all it cost you was what it cost you for the expendables, the fuel and the various other consumables that we take into orbit. So, the more you fly it, the cheaper they get.

The cost of one additional flight for the Shuttle is probably in the order of forty to sixty million dollars, as opposed to the number that they quote when they say the Shuttle costs a billion or a billion and a half or a billion-two or whatever number they bring around. Yes, that's true because they're only flying it, what, eight, ten times a year, eight, nine times a year, sometimes even less. You've got to keep your people around, no matter what, if you're going to fly at all.

Furthermore, I argued, and I continue to believe, that below a minimum number you ought not to fly at all, because unless you exercise a system, you're not going to be competent enough to make sure that you can guarantee flight safety. But with all that, my assumption was that when we sold the Space Station, that we would be able to add a sufficient number of flights to the system that we could adequately handle it.

At that time we didn't even count on the Russians as being part of it. Now that the Russians are part of it, they can launch pieces and parts up there using their expendables, which are cheap, and we'd use Shuttle only for those things that require manned attention. Right now the system is not—quite the contrary, the system is not overstrained; it's under-strained. Again,

that's something Sean O'Keefe's going to have to come to grips with. In my period, we thought we were adequately covered for any foreseeable contingency. What we weren't prepared for was an accident, and nobody ever seems to be prepared for an accident.

RUSNAK: What sort of reaction did you get from the standing army in terms of the accelerated flight rate, the people actually at the centers and the directors of those?

BEGGS: Well, generally speaking, they wanted to fly more than I wanted to fly. [William R.] Lucas down at Marshall [Space Flight Center, Huntsville, Alabama], he was prime driver in the forty-per-year number. Chris [Christopher C.] Kraft [Jr.] was still down at Houston when I got down there, and Chris was dedicated to flying forty times. I don't know what Chris would say now, but as I recall, he thought we ought to fly more rather than less. The Kennedy [Space Center, Florida] people, we were bringing on the second launch site down there, the second launch pad, and they didn't see any particular problem with launching two or three or four a month with two pads in operation, of course. But I did. I didn't think it was a realistic number. Besides, we weren't willing to back it up with enough money, we weren't able to back it up with enough resources to sustain that flight rate. We didn't have the spares. We didn't have the maintenance capability. We were missing a lot of things. We could have flown—with what we were putting in place, we could have flown eighteen, and I still think we probably could fly eighteen if they set their mind to it. You ought to ask the U.S. Alliance [United Space Alliance, USA] people what they think they could fly if they turn them loose.

RUSNAK: That brings up another point. Speaking of USA, one of the things that happened near the end of your administration was the STSOC [Space Transportation System Operations Contract] contract.

BEGGS: You mean starting to turn parts of it over to—

RUSNAK: Exactly.

BEGGS: Well, that's an argument. I don't know. The NASA folk don't like to be shut out of operations, and I understand that. I think it's important. I always thought it was important that the internal NASA folk were capable of doing anything they asked contractors to do, because the reason for that is that you ought to have your people well enough trained so that they can oversee a contractor and be able to quickly respond if they see something going wrong.

The first time with NASA, Jim Webb and Bob Seamans, and, before him, Hugh [L.] Dryden, wanted to be sure that the young engineers they were bringing in got thorough training in how programs were run, what problems you ran into, how to handle a technical crisis, how to handle a financial crisis, how to handle any of the various and multitude of problems that you ran into. So people who were very young got some very, very high-altitude kind of experience in those days. We had guys running big programs who were in their late twenties, early thirties, something that would be unheard of in the modern day.

As a result of that, NASA, of course, we inherited a lot of capability from NACA and also from the Naval Research Laboratory and other places around the circuit—Bureau of Standards. That's where we got Hugh Dryden, who had had a lot of experience. From 1960 to

about the mid- to late seventies, we were developing a lot of very competent people. We started to lose them in the late seventies because they were cutting back. NASA's employment peaked at something over 30,000, at the time of Apollo. When I got there [back in 1981], I think it was 22 or 23,000. They tried to cut on a selective basis, but when you're cutting a third of your employment, it's pretty hard to keep all of the skills that you'd like to keep. Furthermore, starting about the mid-seventies, we didn't hire any new engineers; we didn't hire any fresh-outs. When I came, I said we're going to hire 100 to 200 fresh-outs a year and we're going to find a way to do it. It took a while, but we finally did.

So what I'm saying is that I think it's important, and the NASA people resist, when you want to turn the whole operation over to an outside contractor. At the same time, I felt that unless we succeeded in getting some pressure on the system to reduce the cost of it, we were never going to get the cost down. That drove you into the direction of turning over segments of what we were doing to contractors and putting incentives in their contract to try to work the cost down. And that's what we were really trying to do, and they're still trying to do that till this day, although they haven't had a great deal of success lately. But U.S. Alliance, I guess, is working [at it]. The trouble is, the people I've talked to at U.S. Alliance will tell you that they don't have the freedom to do what they'd like to do. Whether they do or not, I don't know. I'm not that close to it.

RUSNAK: What were some of the other areas they were looking at for commercialization at that time, some of the things that might be turned over to the—

BEGGS: There were various proposals, everything from turning the whole fleet over to a private contractor and letting them take over the primary operational responsibility with a minimum of NASA oversight. Hans and I felt we had too many people on the payroll in the operational functions. We didn't know the half of it, because they doubled it after the *Challenger* accident. They doubled that manpower. But we thought we had too many, and we thought it could be cut by a third if somebody really worked at it, without endangering flight safety.

I don't know. We looked at various options. We looked at various options, but as everything of that type, you cannot do it overnight. You've got to plan your way into that. We were starting down that road. The accident caused a hiatus in that for a period of time, but they're back on that same road now. I'm too far away from it to judge what they ought to do. But at that time I felt that we could cut it back by a third or so. I thought we could get the total costs of the system that we were spending down perhaps by a quarter. At least that was good target to aim at, and we could use that money to— hopefully, the OMB would let us keep it to do other good things.

And we didn't think we'd jeopardize flight safety. Well, you say, "You had an accident." Yeah, we did. The accident was not due to the—in my understanding, and I've read all the reports of it—I was out of NASA at the time of the accident, but of course I was vitally interested, and I felt some degree of responsibility and frustration on it. But as I read the reports, we launched into a very bad environmental situation. It was probably a twenty-five-year cold spell that morning. If we hadn't launched in that—furthermore, we'd had had some experience in launching in the cold before. We launched one of the unmanned Apollo flights on a very cold morning, and we lost the vehicle.

The problem, when it gets below freezing, is you don't know how much internal ice accumulates, and internal ice tends to change the vibration characteristics of the piping and the machinery, and it can literally be catastrophic. I remember that morning I was worried about that, as a matter of fact, to the point that I actually asked Milt [Milton] Silveira, who was then the chief engineer, to go call them and tell them to call a meeting and worry about internal ice. But that was the wrong thing to worry about. What happened was that the seals froze up and then burned through.

But if we hadn't launched in that cold—it's another case of fate playing tricks on you. That launch was scheduled to go off on Super Bowl Sunday. They decided that they'd had a problem the night before—or two nights, I guess, or three nights, and they decided not to launch on Super Bowl Sunday. Super Bowl Sunday was a fine day. If they'd have launched then, they wouldn't have had any trouble. So they held it over and caught the cold spell and lost the vehicle and the crew. Anyway. And it changed the nature of the program significantly.

RUSNAK: As you said, you were out of NASA at that time, but you hadn't officially left. What kinds of things were you doing involved with the investigation?

BEGGS: I was totally involved with the lawsuit at that point. In fact, from November, when I was indicted, until May of two years later, I was in a state of lawyerly discussions.

Whether I would have done anything different at the time, I've thought about that. I think I would have, but that's pure conjecture. People have asked me about it, and say, "Well, I really don't want to ruminate about that, because I don't know." No one knows. No one knows.

Although I did tell Milt Silveira of my concern, and he tried to call and couldn't get a hold of anybody. Of course, they were all sequestered by that time.

They shouldn't have launched. I don't know why they did launch, and I've asked several of them since, "Why did you launch?" They don't know. It's one of those things that just happens, and no one understands why it happens after it happened, which is the nature of an accident.

RUSNAK: The Teacher in Space Program was something that you had developed. Maybe if you could give us a little bit of background on how that came about.

BEGGS: I forget the exact genesis of that. We had talked a number of times about sending people in space. Jake Garn was the first one to put the idea out that we ought to be flying folks. We now had the capability. Up until this time we didn't have the capability of flying them, but the Shuttle was capable of carrying—I think at one time we carried seven, but we certainly could carry six. He wanted to fly, and I saw no reason why he shouldn't fly. As a matter of fact, I saw a lot of reasons he should, because he was chairman of the committee and he could help us a lot if he was more significantly familiar with what was going on in the program. So we did; we decided to fly Jake.

I was up in his office one day, one of my usual visits. I tried to maintain a steady contact with my chairman and ranking minority. Anyway, I was up in his office, and every time I went up to his office, he would say, "When can I fly? When are you going to let me fly?" And we had discussed it, and finally we had agreed that we could invite him to fly. So I was up in his

office and we were talking about some other matter, so I was about to leave and he said, “Well, have you decided when I can fly?”

And I said, “How about—,” whatever month, “the month of—.”

[Laughs] His jaw dropped open, his jaw slackened and his mouth dropped open, and he said, “You’re kidding.”

And I said, “No, I’m not.” So we let him fly.

Well, we had been thinking about the idea of taking a journalist up for a long time, because we thought if we could get a journalist up there, at least somebody would be able to write about it and give us, if not good publicity, at least a lot of publicity. And I forget who came up with the idea of a teacher. I think it was [S.] Neil Hosenball, who was the general counsel. Neil said, “Why not a teacher.”

And I thought about that for a little bit, and I said, “Well, why not.” Because the biggest receptive audience we have in this country are the kids. Kids love space. A teacher could give you an introduction to those kids that no one else could. They could translate the thing into lesson plans and books and all kinds of things.

So we talked it over and finally we decided to do it. Then came the question of how do you select which teacher, and we went through a procedure, and did. Then fate caught us again, because she was flying on *Challenger*.

I think they should get back to that. I think they ought to go back and do it again [and Sean O’Keefe is]. NASA is very careful in explaining to people that there are risks in flying. Actually, the Shuttle Program has been the most reliable and safest space vehicle we’ve ever flown. We’ve got one accident in a hundred and umpteen flights, so that’s less than 1 percent. That’s better than anything that’s ever flown. But that doesn’t make it good enough.



RUSNAK: Is there any way to make it good enough, do you think?

BEGGS: No. No flying machine is 100 percent safe. We have flying machines that fly in the air and aren't 100 percent safe. We still have accidents. It doesn't mean you can't keep trying, and we do keep trying. That's why the aeronautics program in NASA is doubly important, because the more we understand about flying machines, the safer they're going to be, but they're not 100 percent safe and they never will be. In my estimation, they never will be. The unsafest vehicle you can ride around in is an automobile, but none of us think twice about jumping in the car and going 1,000 miles across country.

But could we make it better? Yes, we can make it better. But the one we've got is pretty safe. Even the expendable launch vehicles are getting better as we go along. They're learning how to fly them better, but they're still not 100 percent either.

RUSNAK: How did NASA approach this inherent risk while you were the Administrator?

BEGGS: Well, we talked about it. I mean, almost every year in the hearings, we would be asked about flight safety. As I say, anyone who went into the astronaut corps or who was sent up to fly was taken aside and it was explained very carefully that there were risks involved in flying. We emphasized, or we pointed out the risks of flying in space from the fact that more than half of them are going to get sick when they go up there. We have to explain that to them. We have to explain to them that there are risks in exposing yourself to the space environment itself. There

are risks in the vehicle. There are risks of strikes from debris, space debris. There are all kinds of risks involved in flying in space, and there are risks in launch and landing.

Certainly we put a whole lot more emphasis on explaining and trying to get them to understand the risks of flying than you do when you fly on an airplane. You know when you get on a commercial transport that you're taking a small risk, because you've read the papers and you know that occasionally they crash, but nobody takes you aside when you get on the airplane and says, "Hey, you realize that you got a one in 17 million or 18 million chance," or whatever the number is these days, "of having an accident?" It's just assumed that you know that. And I suppose most of us do.

I don't know what else NASA can do other than explain very carefully what people are involved in, and they do try to make it clear to them, but, you know, 50 percent or more of them still get sick when they go up, and we haven't figured out an answer to that.

RUSNAK: Certain risks like astronauts getting sick in space aren't ones that you really can have any control over. You can just do as you said, explain.

BEGGS: Well, we've tried various things. We've tried various drugs and we try to condition them. We fly them on that airplane down in Houston and give them various kinds of training and expose them to the kinds of environments they're going to see, but I concluded, after looking at that problem very carefully, that there wasn't very much more that we could do. We hired the best people on vertigo and all the other things you run into in flight, and tried to figure it out, but we couldn't figure out anything that would help significantly, so they just have to live through it, and they do. Most of them live through it fine.

RUSNAK: Ironically, I heard Jake Garn was one of those that had an unpleasant experience in that regard.

BEGGS: I don't know. To be truthful, I never asked, and I never wanted to know. The reason I never wanted to know is I never want to be in a position of meeting him someday and looking at him and accidentally saying, "Jeez, I heard you had a bad experience." Nobody likes to talk about that.

A couple of the more experienced astronauts, though, did have a bad experience. As a matter of fact, the astronauts had people that they would sometimes not want to fly with an individual.

[Tape interruption.]

BEGGS: NASA is a decentralized organization in that the centers are semi-autonomous in the administrative sense. You give them a job to do and then you expect them to accomplish their tasks within the budgetary authority, or budgetary controls that you have. Within a decentralized organization, however, it is extremely important that you have a control system in place that allows you to monitor and assure yourself that the programs are being carried out to the plan, and a strong control system, both financial and technical control system, are very important.

When I was first in NASA, we set up a system of initiating and controlling the programs that we authorized, and the Centers didn't like it. To my surprise, they didn't have that before I

arrived, but we put it in, which required that when they wanted a program, or when a program was initiated, they had to write up a several-page request which told what their objectives were, what they planned to do, how they planned to do it, how much time it would take, and how much money it would take. That system that we installed when I was the Associate Administrator is still used in NASA.

The same kind of philosophy we applied to everything out of the Administrator's office. I wanted to know periodically how it was going, and for that purpose we had periodic reviews, technical reviews of the programs. If the program was developing trouble, as the Hubble was at the time, we scheduled more frequent reviews. But if the program was going well, sometimes once a year, sometimes twice a year was adequate.

I asked Tommy Newman, who was my controller—comptroller, he liked to be—he was a comptroller controller. I'm more familiar with the term "controller," but he was a comptroller—which is all right—to set up a very strong financial reporting system, and he did.

So those two things, fairly frequent technical reviews of the program and monthly reports from the Centers in the financial control system.

Now, that doesn't stop overruns. Everybody thinks that somehow overruns are caused by financial controls being out of whack or out of control. That's not true. The best financial control system in the world is not going to stop overruns. It may permit you to discover the magnitude of them earlier, and it may permit you to do some things to mitigate them, but it's not going to eliminate them. And on my tenure we had a lot of them. NASA's always had them until today.

I think one of the problems that Dan Goldin ran into with the Space Station is that he relaxed the centralized control a little bit and so they didn't—whether he knew it or not is

another question, but the control system, at least, it can be argued, didn't highlight the development of the overrun on the Space Station early enough. But that's neither here nor there, and I'm not being critical of that, but it's just an observation. But that's what you try to design the system to do; to give you an early warning when trouble occurs.

I asked Hans Mark, my deputy, to make fairly frequent visits to the Centers and give me an assessment of how he thought they were doing. We changed a lot of the Center directors. In fact, we changed all but one during my tenure. We were fortunate in that we had good men to replace them, but we felt that in many cases a change was necessary. We probably should have changed the one we didn't. But that's neither here nor there.

RUSNAK: Can you make a comment on one of those specific ones just to give us an example?

BEGGS: Well, I'd just as soon not. The record is clear on the ones that we changed. Suffice it to say that we were dissatisfied in one way or another with the way they were running the Center, or in some cases we didn't feel they were being completely honest with us, not being totally frank about what was going on.

But other than that, I wouldn't want to highlight a particular individual. I still consider all of them to be friendly with me. I don't think I made any—well, that's not true. I probably did make a few enemies, but by and large, they all took it in good grace.

But we did change a number of them, and we got good men to replace them. As a matter of fact, I was fortunate in being able to—when Bruce [C.] Murray decided to retire out of JPL [Jet Propulsion Laboratory, Pasadena, California], we were fortunate in getting Lew Allen [Jr.]

to go out there, and Lew did an excellent job at JPL. That's one. But it was Bruce's decision to retire.

Other than that, I think all of the Center directors, save one, were members of the National Academies, and I don't put great credence in being a member of any honorary organization, but if a man is elected to the National Academy, it means that his peers think he's very capable. And we were fortunate, as I say, in having all but one of those directors, either when we appointed them or subsequent to that, become members of the academies.

RUSNAK: Did the change in the Centers' leadership have the effect that you anticipated?

BEGGS: Not always. Not completely. But then again, in my long career in managing both on the industrial side and on the government side, you never find the ideal manager, including me. No one man or woman is totally without fault. The important thing, the science or the art of management—it's probably an art more than a science—the art of management is in getting the most out of your people and knowing both their strengths and their weaknesses. If you do that and try to take cognizance of what their strengths are, build on their strengths and minimize their weaknesses. That's the art of management, and that's what you try to do. Whether you do it well or poorly really is the measure of the success of the organization.

Jim Webb used to say—and I thoroughly agree with him—that there is no perfect organization and there is no perfect management, and he's right; there isn't any. There just are better and poorer, and sometimes things happen that are really beyond the control of the management. You try to anticipate as much as you can, but sometimes you don't succeed.

Anyway, that's long been my philosophy of management, no matter where I was. Generally speaking, I tried to develop my people and let them help me develop, and to take advantage of what strengths they had, but if I had I felt that at a certain point we'd done all we can and we still weren't getting the results we needed, then you had to change. And we did.

RUSNAK: Within the upper management of a highly technical organization like NASA, what is the relative value of technical expertise versus managerial expertise?

BEGGS: Well, at the program level, if you are—well, let's go below the program level. At the engineering level, the guy on the line who's on the boards or at the bench trying to develop something, technical expertise is by far the most important. He has to develop a sense of how to work on a problem within a limited set of resources. Nobody gets everything that he wants or thinks he needs to solve a problem, but at the lower level, at the engineering and science level where they're working at a computer, on a bench, or drawing up a design on a board, technical expertise is by far the most important.

As you move up the line to group management and program management, and then into the area management or management of a broad set of resources, the technical expertise gets less important and the managerial expertise gets more important. But I went to the Harvard Business School, and there was a popular theory at the Harvard Business School in those days—this was back in the fifties, early fifties—that a good manager could manage anything. When they would expound this theory back then, I thought, "That's bull," and I still think it's bull. If you don't know anything about the thing you're trying to manage, you're not going to be a good manager, no matter how good a manager you are. You've got to know something about it. It's important.

First of all, it's important to speak the language, and NASA has a certain *patois* that if you don't have it, you don't understand what they're talking about.

In the second place, you've got to have some understanding of what they're doing. When we had a problem, I wanted to see the drawings. I wanted to see the design. I wanted to see what it was they were building. And they soon found that when they came up to Headquarters they brought the details with them so that we could understand what we were trying to cope with.

At the same time, I didn't—I hope I didn't—I tried not to, I never got into the business of suggesting how they ought to change their design or how they ought to fix their technical problem. That was their job. But I did want to understand it [and to understand the solution or change]. And I think that's important that a manager do understand the technical details, but he doesn't have to get so immersed in them that he becomes a part of the problem.

So the ability to direct the individuals, the ability to pull them together and point them in the right direction and make sure that they feel that they're being supported adequate to get the job done is the job of the manager. And I hope that's what I did. As I said before, you can't always give them everything they think they need. There isn't that much money in the whole world. [Laughter]

RUSNAK: That's very true.

How did you organize your staff at Headquarters and how did the Center directors, for instance, report through that system?

BEGGS: Well, I went back to the system I had grown up with in NASA. NASA goes through cycles. Periodically they have all the Centers report to the Administrator, and periodically they



have them report to the Associate Administrators. I went back to have them report to the Associates, because I was comfortable with that system. At the same time, Center directors at NASA always realize they can call up the Administrator any time if they have a problem they think should be brought to his attention. But that was basically the way we operated. As I said before, we had a strong financial control system, and I think we had a pretty strong technical control system. It didn't always work perfectly, but the system was there.

The Headquarters staff has to be competent enough to know how to dig through the details to get to the truth. Centers, being decentralized, won't always tell you what you need to know, so you've got to be able to dig through what they are saying, to read between the lines, and figure out whether there's a problem developing.

We put in a strong chief engineer in Milt Silveira. Milt had the authority and the privilege of going anywhere he wanted to and looking at any problem. As a staff officer, he wasn't supposed to go down there and tell them what to do, but if they had a problem, he was supposed to go down and make sure that the problem was being highlighted and worked on in a proper way.

We had a strong chief scientist. I think that's important. It's important to have strong staff. If you don't have strong staff and someone's able to pull the wool over their eyes on any problem, then you're in deep trouble. I think we had that, or at least we tried to have it.

It's important to have Associate Administrators or people who are managing substantial program areas to have enough insight and management ability to focus in on problems early, and I think we generally tried to do that.

I went to the Air Force and asked for Jim [James A.] Abrahamson, Major General Abrahamson, to come over and run the manned program, because I had worked with Jim on the

F-16 program, and I thought highly of his capabilities. John [F.] Yardley had departed, and we really didn't have a successor, so I borrowed Abe from the air force, and he did a good job on the manned side.

I asked Burt Edelson in on the science side, science and applications side. We had a good guy working the various aspects of the infrastructure, in Ed [Robert E.] Smylie. Generally speaking, I was very satisfied with the competence. I only went outside NASA when I felt we really didn't have an adequate replacement. Otherwise, we tried to promote the NASA people when they were qualified, when an opening occurred.

RUSNAK: How did you handle intercenter relationships at this time? Because obviously one of the things NASA's famous for is a sort of rivalry, if you want to put it that way, between Centers.

BEGGS: Well, there's always rivalry between the Centers, and I think there's always a certain amount of jockeying to get a bigger part of the budget. We tried to define the roles of each one of the Centers very clearly. We didn't always succeed, but we did get them to focus on one specific role. I had periodic meetings with the Center directors. We had long been in a down-trending budget, and I said, "I'll work as hard as I can to get more money, but we've got to spend the money wisely. That means we can't duplicate. We can only cover the areas that we have to cover, and each Center has to focus on the things they do best, and that's it." And we defined what roles we thought were appropriate. That's about all you can do.

As I say, if you're dissatisfied with the way a Center is operating, you have only two choices, or maybe three, but you really have basically two choices. One is to try to work with

the Center director, whoever is managing the Center, to bring him back to doing the right thing, or to replace him. I mean, that's all you can do.

What you can't do is to manage the Center yourself out of Headquarters. That's impossible. Some people have tried that, but that won't work. They've got too many ways of running your end. There's too many ways they can frustrate you.

RUSNAK: What did you see as the advantage to NASA's decentralization, the way this works?

BEGGS: Well, the advantage is that you can establish centers of excellence where you have a better chance of solving problems. Centralized organizations, if you try to overcontrol from a central organization, it's very easy to kill initiative and to leave the outlying organizations with a feeling of frustration and inability to operate. If you have a good, well-oiled decentralized organization, they can respond more quickly to problems, they can do things in a more effective way than you can by trying to direct it from a central headquarters.

The disadvantage, of course, is that it can get out of control, and you can't really stand an out-of-control organization working out in the field for very long. So, as I said earlier, the trick is to have a good enough control system so that you can prevent a maverick organization running out of control, at the same time giving them enough freedom to exercise their responsibilities and do the things you'd like them to do, meet the goals and objectives you set for them.

The best-run companies in the country, best-run industrial organizations and the best-run government organizations, generally speaking, operate under a decentralized philosophy. I've spent my life studying organizations. When I was in the Department of Transportation, I worried a lot about the FAA, and I still worry about the FAA, even though I can't do anything about it.

The FAA is basically a decentralized organization in that the centers, the flight-control centers that are manned around the country, basically operate under their own management and with their own responsibility to control a discrete part of the air traffic network. At the same time, it is a network and they have to tie into the overall net of the country—in fact, of the world.

We've all had the experience of trying to fly from here to there and being grounded someplace not because that area is under any severe problem, but because [New York] LaGuardia [Airport] is down or because [Chicago] O'Hare [Airport] is down. If you've got an air traffic control center in one of those areas that's not doing as good a job as they should be, the network quickly comes to a halt. And that's where the management control comes in.

The problem with the FAA is that they've never really had a very good centralized control system. Their controllers are superb, which is what makes the system work as well as it works, but the management in many cases has been weak. Furthermore, they have no technical capability at the—in fact, there's very little technical capability around in the whole system other than the ability to train controllers and route traffic. But when you look at FAA and look at its operational responsibility and say, "How are we going to take what we're doing now and move it up a whole notch, move it up a whole generation," they don't know how to do that.

NASA does know how to do that. It knows how to take what they've got now and make a much better system in the next generation. NASA's problem is that it does not run the system as well as it might. It's incapable, or maybe not manned, maybe not staffed to operate the system as well as it should. And that's what drove me in the direction of wanting to figure out ways of moving it more in the direction of turning over operational responsibility into a more business-oriented organization.

But NASA is able to define what is necessary, what the objectives of getting from here to there are, how you should go about doing it. In short, how to plan a program. And they do it pretty well. They still do.

RUSNAK: Did you recognize that shortcoming in NASA when you were trying to get the Shuttle to operational speed, or was that something that developed over the several years?

BEGGS: We had no choice. One of the problems of government organizations is that the top management turns over rather too often. Five years is a short time. Even ten years is a short time. If you look at the best-run industrial organizations, generally speaking, the chief executive has been on the job for fifteen years, ten to fifteen years. Where you see big turnover in the executive suite, you sell the stock. But NASA has to operate under a political system, and the top management changes every five to ten years. Dan is the longest serving. I think most of the rest of us served well less than seven or eight. I served less than five, and Jim Webb was there for, I guess, almost six. I forget. Well, you can figure it out, because we've had, what, six, seven, eight, nine Administrators?

Anyway, you're there for a short time, and NASA compensates for that by appointing senior people who have had a lot of experience to the Centers, and that's another advantage of the decentralized organization. They get their chance to spread their wings and you get a lot of experience, and they generally stay there a long time. So when a new Administrator comes in, if he's got any smarts, he calls them all together and he says, "I'm going to have to rely on you guys to keep me up to speed. Otherwise we're all in deep trouble."

But anyway, he's there a short time, so, as I said earlier, you've got to decide what you're going to do because you've got a short time to do it. Hopefully, you get the organization to back you on your objectives, and that was one of the other things we did. Hans and I, very early, we made sure they all understood what it was we were trying to do, and they all agreed. Then again, it was in their interest to agree, but that's what makes the thing go, if it's in their interest. But they all helped. I think, with a few exceptions, we had a good relationship.

RUSNAK: We've been talking generally about management. Maybe you can tell us how that was applied practically to the Space Station Program, where you actually had a chance to get this program going from the ground up.

BEGGS: Well, there again, we drew on the strengths of the organization. We pulled in Phil [Philip E.] Culbertson. Phil had been with the agency since Apollo, or shortly thereafter. John [D.] Hodge, who had worked on all of the manned programs. And we pulled in people from the Centers, from Johnson and Marshall, who had had experience, and we organized a task force and set out to define the program.

Phil and John, first thing they did was to set up a control system for the program that would enable them to be able to follow what was going on. It was going to be a big program. It would have contributions from a number of different Centers, so they wanted an adequate information control system that allowed them to follow the thing in as much detail as they decided they needed. Spent a lot of money on that, but I think it was worth it. Somewhere along the line it broke down, but anyway—but we pulled in senior people. We pulled in people from all the Centers that were going to be primarily involved in the thing. We set up a task group, five

altogether, in a single place so that they talked to each other every day. That's important. And defined the program.

Interestingly, as I look at what's finally being built up there, what we defined in the first iteration is about what they're going to build. Unfortunately, this is one of the problems that the agency has in changing management. Each new manager that came in after Jim Fletcher, Jim was well acquainted with what was going on, but after Jim Fletcher, everybody, when the program had troubles, everybody decided to redesign it. I think we've redesigned it three times, but it still looks like it did back the first time we did it. But that's one of the problems of having new people come in, and, of course, having people who don't know anything about the program in OMB and elsewhere, tell you, "Well, you know, we've got to figure out a way to do this for less money."

RUSNAK: What involvement did you have with defining and assigning the work packages to split up amongst the Centers?

BEGGS: I didn't have much input on that. Phil and John, they're better witnesses to this than I am. I left it to them to decide where the competencies were in the Centers and where the various tasks should go, and I think they did a pretty good job of that initially.

If you're interested in this, Phil is getting as old as I am. As a matter of fact, Phil might be a little older than I am. You should get him to contribute, if you haven't. He's down in Cocoa Beach [Florida]. He lives down in Cocoa Beach. But he could give you more insight on how that was done.

RUSNAK: What did you think of the lead Center concept?

BEGGS: You've got to remember I left the agency relatively shortly after we had put all this together.

RUSNAK: The Space Station, at the point when you left, had it been going along how you had anticipated at that point?

BEGGS: Yes, I was generally satisfied. We had not really gotten very far along, but what we had done, I was very satisfied with the design concept. As I say, that hasn't really changed a whole lot since that time. They were still arguing about details, but the core concept had been put together, and I thought it was a good one, and still do.

RUSNAK: The original Station seemed to have quite a diverse constituency in terms of supporting the missions for the Station, and some of those have dropped off or come back or been added or changed over the years. Maybe you can share with us some of that process in terms of recruiting these different organizations.

BEGGS: I emphasized—and I think Phil was in accord, full accord—that we ought to develop as big a constituency for it as we could, because one of the reasons for encouraging international participation is that you get a good deal of support and backing for continuing the program, and for doing what you started out to do. We wanted to court the scientific community, although they were understandably skeptical on what they could do. They warmed up somewhat in the



last few years, particularly since they agreed to put a centrifuge on it, which was one of the early arguments on the thing, whether we ought to have a centrifuge or not, but once they settled that argument, late, you got some of the scientific people to come in support.

We wanted to develop some commercial support, and hopefully get them to sign on to use it. That has been handicapped by reason of the fact that NASA and various administrations have had an on-again-off-again attitude on how much money they're willing to spend to gain commercial support. You can't expect a commercial entity to agree to spend a significant amount of money on developing, let's say, an experiment or a product-development effort in space if the government is not willing to accommodate that particular experiment or that product-development effort with a little money of their own by either accommodating the Station or making sure that the facilities they need are made available to them and so forth and so on.

Not to mention the fact that these periodic reexaminations of the Station don't leave a commercial manager with a very warm feeling in the pit of his stomach, because if the program's going to go away and he's convinced his management, "We've got to spend several million dollars," in developing something that will go on it, and all of a sudden he gets a call from the boss, "What the hell is this I read in the morning paper, they're going to cancel the Space Station? What happened to all our money?"

"Well, I don't know."

There are no guarantees in this business. But it's a problem. If you want support from the commercial sector, you've got to accommodate the commercial sector. And since this entails long-term commitment of money and resources on their part, you've got to assure them that if they spend that money, you'll be there for them, and NASA had a hard time doing that.

What I'm saying is, to hold a constituency like that together, to get the scientists, the industrial sector, the foreign sector, the various and sundry people like the military, if they were ever interested, and get them all together, you've got to give them some assurance that you can take care of them. And they haven't always been able to do that.

RUSNAK: One of the things you mentioned earlier was having to operate within the political system, and that's something we haven't really talked about very much today. I was wondering if you could tell us about having to work with the Congress and then the president's staff.

BEGGS: Well, the Congress is probably, with some exceptions, probably the easiest of the various and sundry influence groups that you've got to work with. Most of the congressmen like the space program and they generally support it.

You've got two problems with the Congress. The first problem is that the Congress is constantly turning over. Everybody reads in the paper about the fact that you've got all of these very senior people who serve as chairmen of the committees, and that's generally true, although that's changing a little bit in the modern day. But the average tenure of a congressman is about five years. So it's constantly changing, and the committee membership is constantly changing.

If you want the support of your committees—and you have to have the support of your committees if you're going to get the support of the Congress, because the committees are the people who sell your program to the whole Congress—you've got to constantly be available to keep them up to speed, to brief the program, tell them why this is important, tell them what's going in their district, what it is that we plan to do in both the near term and the long term, and you've got to be able to talk to their interests.

One of the members of my Senate committee was Jack [John C.] Danforth from Missouri. Jack is a ordained Episcopal priest, and I would go up and talk to him about the Hubble program. I kept trying to figure out how I could relate to Jack, and suddenly it dawned on me. I said, "Senator, do you realize that when you look far out into space, you're looking back in time?"

"Oh," he said, "that's interesting. How far you going to look back in time?"

I said, "We're going to look back in time close to the beginning, with the Hubble." That got him.

"You mean we're going to see back to creation?"

"Well, not quite, but almost." See, you've got to figure out what it is they're—some of them have various interests, and tweak them in various ways. There's nothing wrong in that. Everyone has his own feelings and his own intellectual pursuits and what have you.

But that's one of the big problems with the Congress, is they turn over rather frequently. You've got to keep working at it, and it's hard work. It's time-consuming, and, as I say, you've got to be able to size up and figure out what it is that each one of them is interested in. Of course, all of them are interested in what you can do for them in their district, but then they have other interests, which are important. But that's how you work the Congress, and we spent a lot of time working the Congress. It's sometimes frustrating, but you do the best you can.

The White House and the OMB are a horse of an entirely different color. If you've got a good advocate over in the White House, it goes very well, and, fortunately, we had some people on the NSC [National Security Council] who were very helpful. Gil [Gilbert D.] Rye, who was a colonel in the Air Force, was working in the NSC, and he gave us very significant support. That

helped. He was able to talk McFarlane and the senior staff into doing things that were very helpful.

Having a president who is supportive is absolutely essential. Having a vice-president is important, too. You take the support where you find it. I was fortunate in having a president who liked the program. I had a vice-president who was very supportive. And, as I say, we had several on the staff.

On the other hand, the OSTP, the Office of Science and Technology Policy, was totally unsupportive, in fact, to the point where they were almost belligerent. But that's another story.

So you work that; you figure out who's with you and who's against you, and you work around the ones that are against you and work with the ones that are with you. If you can get the number-one man to go with you, well, you've got a shoo-in. That's a lock, because you only need that one vote. But once he approves it, you've got to go sell it to the Congress, and, as I say, that requires a lot of time and due diligence.

RUSNAK: Where does the OMB fit in that process?

BEGGS: They oppose anything that costs money, and they keep making you want to do dumb things, like doing cost-benefit analysis, which doesn't apply. I kept telling them, "This doesn't apply to research." If you do cost-benefit analysis on research, you'd never do any research. Any good financial analyst can tell you that if it takes longer than seven years to bring a research project to fruition, you can't justify it. So you shouldn't do it, because the costs greatly exceed the benefits. Even if you use a low discount rate, [and] they tend to use a high discount rate, and a high discount rate—if you use a discount rate of, let's say, 8 percent, which at that time was

what the government was paying for money, 8 percent is a double every nine years, so if your program is going to cost a billion dollars over the next seven years, you've got to be able to show benefits of two billion dollars at the end of that time, or close to that. Very hard to do. And we wouldn't do very much research.

But you can turn that argument around and say, "If we don't do advanced research and technology development, if you stop it, you won't see results very quickly, but if we have competitors out in the world who are doing it, in seven to ten years you're going to lose your competitive advantage." And what's that competitive advantage worth? Well, you can't quantify that.

But this country generally does what it needs to do to stay competitive. When we were getting in trouble in the solid-state electronics field and the chip business, and the Japanese were stealing our market so fast that we couldn't even develop the statistics to watch it, we initiated two big programs at several hundred million dollars a year to win back our lead, and we did. So, the United States tends to do the things it needs to do, and we do the same thing in the space program. Fortunately, we have people who are far-sighted enough to know that if you let yourself fall behind in this field, you will very quickly be overtaken. That's the reason presidents and vice-presidents and sometimes people in the NSC, who are paid to think about maintaining a technological lead in the world, generally support the program.

RUSNAK: You see that as a big motivating factor for support for the Space Station?

BEGGS: No, but it's a factor. I think President Reagan saw it as a national leadership issue. It was something that was important that the country do. I think he believed it was something that

would enhance the national reputation, the national posture, the way in which the world viewed the United States.

When I travel around the world—I did it several times both when I was in the business world and I also did it when I was in the government, both in transportation and NASA—when you talk to people around the world, they literally are like a very unsophisticated—when you talk about technology, which was my field—they look at it at a very unsophisticated way. They believe—and it’s sort of like an article of faith—that if the United States decides to do something technological, we will do it and we will succeed. That’s the reason Reagan was so successful with [Mikhail] Gorbachev in the Strategic Defense Initiative. He really believed that if we set our minds to it, we would do it. The value of that is incalculable. The fact that they believe that when we set our minds to do something that we will do it, is worth six armies. It’s worth anything. You can’t put a price on that. And they really believe that.

When I would talk to the French or the Italians or the English or the Germans or the Japanese and say, “We’re going to do this,” “Oh, yes. Oh, well,” they believe it. They believe it. You don’t have to make a big argument. It’s an article of faith. “If you’re going to do it, you’ll do it.” And then in the next breath, they say, “We want to be a part of it.”

“Okay, that’s what I’m here for.”

But, again, if you go back and try to do that on a financial analysis, you can’t do it. You can’t plug that benefit into the cost-benefit analysis, but it’s very important. And fortunately, we’ve got leaders in this country who believe it.

RUSNAK: I don’t want to keep you all afternoon, but I did have a—

BEGGS: I'm about done. I'm running out of steam.

RUSNAK: All right. I don't know if you wanted to make any final comments before we wrap up, either about leaving NASA or what you've done since then.

BEGGS: No, what I've done since then is, unfortunately, they broke my life in two parts when they took me to court. I was fortunate in that I was completely exonerated, but after I got through, all of the opportunities that would have been there had gone a-glimmering. So what I have been doing is working with small companies mostly in technology, startups and companies that need help in various ways. I helped found three or four different companies, about half of them successful and half of them unsuccessful. Sat on a bunch of boards here and there.

No, all I can say to anyone else that would perhaps read this in the future is that it's a great privilege to serve your country in a position as the Administrator of NASA, or in any other position of similar responsibility. The Congress and the various things that have happened in the last thirty years have made it much more difficult for people who come in out of the private sector. It's much more difficult for a private-sector individual. Fortunately, people still come, and the young President Bush has managed to attract a very superior group of people, but they've done it at significant sacrifice in many cases.

I don't think the American people realize how much sacrifice a man, a successful man, which is—or woman, who are the ones you want to attract, do. When I came with the government, I played by the rules. Some people don't play by the rules, but I played by the rules. I sold all my stock in any company, and I paid income tax that year. The interest on the income tax I paid that year would more than have paid my salary forever, but I recognized that it

was what I had to do, and so I did it. But it is a sacrifice. I think that that's the least of the sacrifice.

The major sacrifice that they require is that you have to publicize everything and you have to fill out all these damn forms. Some of the people that I had to put through that, their wives grew apoplectic. They say, "If this all gets public, our kids will get kidnapped." Anyway, well, it's an imposition, and they don't need all that data. They really don't. The argument that they present is that full financial disclosure and full disclosure of everything in your past life—I mean, they ask you silly questions like some of the things that are in that questionnaire, "Have you ever been in a subversive organization?" without defining what a subversive organization is.

"I don't know. Yeah, I'm a member of the Catholic church." Silly things that they want to know.

"Tell me where you've lived for the last thirty years." Well, I really had to work on that, because we've lived in a lot of different places in the thirty years prior to my coming.

But anyway, they're finally coming to realize that that's a large imposition on people. It used to be that you had to fill all these things in by hand. Now at least they've put it on a computer, and you can bring it up on your computer and have that advantage.

The forms are duplicative, and again, the computer program will help on that because it can fill in all the blanks that are similar. They want to know of any past criminal record. Does that include traffic tickets? Well, you don't know. Anyway, it's an imposition, and they ought to do something about that.

But other than that, it's a great privilege to serve in these positions. If you get something done and accomplish something in a period, it's a great feeling of satisfaction. You make a lot of friends, some enemies, but you make a lot more friends than enemies, and you carry them with



you the rest of your life. I still hear from a lot of people in NASA. I get telephone calls, and when I travel, I see a lot of them. I see them here in Washington at least once a year at the AIAA Fellows dinner, where a lot of my colleagues are members.

So it's a satisfying experience, and it's something that I would recommend to anyone who feels so inclined.

RUSNAK: I think that's a great way to wrap up.

WRIGHT: Mr. Beggs, I have one question for you. How long would you have liked to have stayed at NASA if you would have had the choice to remain longer?

BEGGS: I would have stayed—Jim Webb gave me a good benchmark on that. He said, “The trouble with these jobs, you enjoy these jobs a lot, and they're a lot of fun,” and it's good argument for term limits because, he said, “There comes a time, if you stay too long, when you think you own it.” And I guess that if I'd have stayed another two or three years, I probably would have stayed through the second Reagan term, which means I would have stayed about seven years or so. But even if I were to have been asked, which I wouldn't have been, I would not have stayed longer than that.

But Webb's advice is good. When you start to think that this job belongs to you and this agency is really your agency, then you ought to leave. That's the time to leave. Webb's advice is probably the best advice that I could give anybody who asked me.

Webb is a very unusual and bright man. Webb was not very technically deep. He understood technology, he understood what they were talking about. He was a pilot and had

flown in the Marine Corps, and he was probably one of the best-prepared individuals who ever came into any job in Washington. He had been a Deputy Secretary of State under [Dean] Acheson. He had been a staffer up on the Hill, and worked with a number of the old giants of the Hill, people like Sam [Samuel T.] Rayburn and [John C.] Stennis and people like that. He had been a director of the Bureau of the Budget, and he had worked under Harry [S.] Truman not only in the Bureau of the Budget, but in the White House. So he knew where everything was and how everything was done in Washington, and I learned an awful lot from Jim over the years.

He was also blessed that he had Hugh Dryden. Hugh Dryden was his first deputy until he died, and Hugh had been the director of the Bureau of Standards and had run NRL, and had done a number of other things around town. It was said of Hugh—I knew Dryden, but not well—but it was said of Dryden that if you wanted to get anything done in the technical establishment of the United States, and Hugh Dryden agreed it should be done, you could go to Hugh, and with three phone calls, it was done. And I believe that.

The Webb-Dryden axis was a very strong and very good one, and you could learn a lot about how things get done in Washington and the United States by studying what they did and how they did it. The sum of what I've told you this afternoon is what I learned from them. Some of the rest of it is what I learned by going through the school of hard knocks, but I learned a lot from them.

WRIGHT: We thank you for your time. We certainly have learned a lot and will be able to pass it on to others.

BEGGS: All right.

WRIGHT: Thank you, sir.

BEGGS: Good luck.

[End of interview]