

NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT

ORAL HISTORY TRANSCRIPT

S. PETE WORDEN

INTERVIEWED BY REBECCA WRIGHT

MOFFETT FIELD, CALIFORNIA – DECEMBER 3, 2007

WRIGHT: Today is December 3rd, 2007. We are at the [NASA] Ames Research Center at Moffett Field, California to speak with Center Director Dr. Pete Worden for the NASA at 50 Oral History Project. Interviewer is Rebecca Wright, assisted by Sandra Johnson. In preparation for the space agency's 50th anniversary, the NASA Headquarters History Office commissioned this oral history project to gather the thoughts, experiences, and reflections from NASA's top managers. Information recorded today will be transcribed and sent to the history archives in Washington, DC where it can be accessed for future projects. Are there any questions that I can answer?

WORDEN: No, that sounds great. Great project.

WRIGHT: Okay. Well, thanks again for taking the time. We'd like to begin today by asking you to describe your background for us, and how you came to the current position of Center Director at Ames.

WORDEN: A long and interesting question. I started out in the 1950s as a young kid, give away my age that way, being marched into elementary school dining rooms to watch little black-and-white very small television to see the country's first rockets being launched, and blowing up quite frankly. I got very excited about the space program. About the same time I had a great-

aunt who traveled widely throughout the world, very rare in Michigan at that point. My family was from a small town in Michigan, although I grew up in the Detroit area. But at any rate, she came back from the UK [United Kingdom] and had bought a book on astronomy. It was really a book for high school students. I was a little younger than that. But I read the book and got really, really excited about astronomy, so decided I wanted to be an astronomer, and with the country going into the space program it dovetailed very nicely. So at any rate, I told everybody I was going to be an astronomer.

I went to the University of Michigan [Ann Arbor, Michigan] in 1967 and there were 120 people that were going to be astronomers, largely because of the Apollo program. In the end, six of us got undergraduate degrees in astronomy, then three of us went on to graduate school, and two of us got doctorates. I think I'm the only one that's actually doing astronomy now. So it was a very narrowing experience.

But at any rate, my true love was always space exploration. My interest really was in a longer-term topic of are there Earth-like planets around other stars and other life on those and so forth. That's been a guiding interest. But I had a slight detour of 29 years in the Air Force. Also when I was an undergraduate we were involved in the Vietnam War, and my father was an Air National Guard pilot and a corporate pilot as well. So I was persuaded to become an Air Force ROTC [Reserve Officer Training Corps] cadet. During the late '60s I was at the University of Michigan as both a science officer and Air Force officer student. When I graduated in 1971 there was the option of going to pilot training or going off to graduate school. The Vietnam War was winding down. I really didn't see they had a lot of need for pilots. So I chose to go to graduate school, which I was given what's called an educational delay. I went to the University of Arizona [Tucson, Arizona]. In 1975 I finished graduate work. It wasn't clear whether the Air

Force needed me or not. But in the end they said they did. We wangled an assignment at the National Solar Observatory in New Mexico where I'd done some of my dissertation work.

That's where I began to understand the power of political connections. Part of the reason that I got that assignment is that the director of the National [Solar] Observatory in Tucson was a good friend of Senator Barry Goldwater, who at that time was the ranking minority member of the Armed Services Committee. He contacted the Air Force and helped get me an assignment to do astronomy. I spent the next few years as an astronomer, also as an Air Force officer. It worked out pretty well because my only other job offer was a postdoctoral position at Harvard [Cambridge, Massachusetts]. A lieutenant in the Air Force gets paid more than a postdoctoral fellow. I was also getting to do what I liked, which was really observational astronomy.

I spent four years at that observatory. Ended up marrying the librarian. I had no intention of really staying in the Air Force, but we came up with this clever ploy that I would move to Los Angeles [California] and be an adjunct faculty member at UCLA [University of California, Los Angeles, California] of astronomy, but I had this day job as a captain in the Air Force at what's now the Space and Missile [Systems] Center.

I was excited about it, because I got assigned to a highly classified program. I still can't tell you what it did. But what was interesting about it is when I went in for an interview, it was in one of these set of three or four vault doors that slam shut and everything, so it looked like *Get Smart* [1965 television program], and they wouldn't tell me what they did other than it was really cool. It turned out to be really cool. One thing led to another. I got involved in various exciting programs. I got promoted early to Major. Then someone decided I'd be good to go to the Pentagon [Washington, DC] and work on the Secretary of Defense's staff. But it turned out the day I showed up was the day that President [Ronald W.] Reagan had given the so-called "Star

Wars" [Strategic Defense Initiative, (SDI)] speech [March 23, 1983]. So I got involved right at the beginning of that program, ended up being assigned as the military assistant to James [C.] Fletcher, who was running the study that recommended what we were going to do technically in missile defense. He had been the NASA Administrator during the latter part of Apollo [Program] and was to be the Administrator again. Once again I had a connection with space science. I might add when I was in graduate school and at the Observatory I was involved in a couple of NASA solar physics Spacelab missions – I was a coinvestigator. It was fun. I always had this strong interest in space science.

I'd spent quite a little bit of time after that in missile defense, was on an arms control delegation in Geneva [Switzerland] for a year and a half. It was interesting. It was just like out of a movie, this big table, and on that side was the Soviets, and with the little Soviet flag, and the other side was Americans. You looked at yourself and said well, this is real, that's the real Soviets, it isn't a movie. It was clear to me that space was a key part of that. But that got me more and more involved in a lot of the policy issues.

I was the special assistant to the head of the Missile Defense Program, the SDI program, General James Abramson, whom you might remember was the second Director of Space Operations at NASA with the Space Shuttle. He had been selected for an astronaut in the 1960s but never flew. I might add, when I was a captain I was one of the Air Force nominees to be an astronaut but wasn't selected for reasons I never understood. I thought I was great. [Laughter] So I always had a little bit of jealousy to the people that got selected and got to fly. It's worked out well despite that.

I spent most of the 1980s and '90s involved in missile defense development policy and so forth. But probably the key job I had was because I knew various political types, including what

was then Senator [James Danforth “Dan”] Quayle and soon-to-be Vice President Quayle. When he was elected as Vice President I was asked to come and serve on the National Space Council at the White House, which was reconstituted from the 1960s National Aeronautics and Space Council. I was the staff officer there for initiatives, and particularly the Moon-Mars initiative [Space Exploration Initiative]. I got very excited about space exploration. As you might recall the senior President [George H. W.] Bush announced the Space Exploration Initiative. So it was really exciting, although at that time I became a bit of a skeptic of NASA's commitment to those kind of things and frankly fought with NASA quite a little bit. We were particularly at odds with the NASA Administrator. Our whole office at the White House thought we ought to be able to get to the Moon a lot cheaper than NASA proposed. In fact I and a couple of the other folks wrote the speech where Vice President Quayle first used the words faster, cheaper, better. Dan [Daniel S.] Goldin later perverted it to faster, better, cheaper, but it was faster, cheaper, and better.

I was there for about two years. The initiative failed for a whole lot of reasons. But then Mike [Michael D.] Griffin, a name we're pretty familiar with today, was the head of technology in the Missile Defense Program and an old colleague of mine and friend, wanted to go run the exploration program. We arranged for him to go to NASA while it [the Space Exploration Initiative] was still going. I took his old job as the head of technology in the Missile Defense Program. I was only there two years, but it was a neat job. I was the world's second richest colonel after [Muammar al-] Qaddafi. I had \$2 billion a year to spend.

It was a fun program, and we did a lot of space things. Two of them were particularly exciting. One was the mission called Clementine. It was the first US mission back to the Moon in 20 years. It was basically a sneaky space weapon test. But it was also a way to get to the

Moon. We were originally supposed to go to an asteroid. The second one was the DCX Delta Clipper, a reusable rocket. Both of these had been started when Mike Griffin was the head of technology. I finished them. But the Clementine mission wasn't done by the time the election occurred [1992].

The new administration was a little bit disorganized – the [President William Jefferson] Clinton administration. I don't know why anybody would think the Clinton administration was disorganized (smile), but so it wasn't until late in 1993 that they finally got around to putting a new director into the Missile Defense Program. The new administration wasn't very happy about space weapons or anything that smacked of that. But I was fairly hard over that we ought to do that, and I eventually got fired over it. But the mission got launched. It was the one that might have discovered ice on the Moon. It's still an open issue. But it did discover something interesting. I feel that was a start of our current effort to refocus on going back to the Moon.

It was an interesting couple of years. After that I was back in the Air Force, but some Air Force senior generals thought I was a good guy, so they made me a Wing Commander. I ran one of the four space wings. Our wing actually flew most of the military satellites. I used to tell people I was the commander of the US Star Fleet for about a year and a half – the 50th Space Wing. During that period that wing took over this entire base here at Moffett Field. This is the second time that I've had a senior position related to Moffett Field. But our headquarters were in Colorado Springs [Colorado]. I was there for a few years – various staff jobs, and got promoted to brigadier general.

Then 9/11 [September 11, 2001 attack on the World Trade Center, New York, New York, and the Pentagon, Washington, DC] happened. I was well known to people like Secretary [Donald H.] Rumsfeld and Deputy Secretary [Paul D.] Wolfowitz and Undersecretary for Policy

Doug [Douglas J.] Feith. They asked me to come and run the information war. In late October 2001 I was the “minister of information” – I guess some would say “minister of propaganda,” for the Defense Department, and worked with a number of folks that were quite impressive, including Newt [Newton L.] Gingrich. We came up with a program which I still maintain was the right approach to understanding that the long-term problem with terrorism was that it’s an information war, a war of ideas. We started a number of things, including providing direct broadcast radios and direct internet connections to a lot of these [terrorist] areas that were denied open information and help with education.

Not everybody thought what I was doing was great, and I was accused by various folks, including I think some of the people that worked for the Assistant Secretary for Public Affairs in the Pentagon that we were doing disinformation. I once again learned the negative power of the press. My picture appeared in the front page of the *New York Times*. My wife called me up and asked me why it was there, and I said “Dear, it’s never good news for a government employee to be on the front page of the *New York Times*.” Within a few weeks or a few days actually they disestablished the office, and I was sent back to the Air Force with pious promises, “Oh your career will be great.” It wasn’t. Within a few years I was politely asked to retire. But as I like to tell people, that actually opened more options than it closed.

I ended up taking a job as a professor at the University of Arizona, professor of astronomy, and later optical sciences and planetary sciences. But very quickly turned around and went back to Washington to work as a congressional fellow for Senator Sam [Samuel D.] Brownback, who was at that time the chairman of the subcommittee in the Senate that does the NASA authorizing legislation. He brought me there because President [George W.] Bush was starting the Vision for Space Exploration. I got to spend about ten months as a congressional

staffer. I was a rather old congressional staffer, older than everybody in the office, including the Senator. But I gained new respect for the people that work in congressional staffs, and the members. I helped write a lot of the legislation that the next year got passed – our authorizing legislation for the Vision for Space Exploration.

I then went back to the university. I think Senator Brownback threw my name in the hat to be the NASA Administrator. Wasn't sure I really wanted it then, and when they picked Mike Griffin I said that's the right guy, not me. He is the right choice. It was really a good opportunity. I talked to him several times and he had me work on the ESAS study, the Exploration Systems Architecture Studies, in I think it was 2005, in the summer after he came in. So once again I got very excited about space exploration and hardware.

Eventually Mike Griffin suggested that if I was interested in coming to be a Director of a NASA Center that he thought I would be very competitive. Initially he mentioned some other Centers, but he finally said well, I think Ames is going to become open. Are you interested in that? I said I'd be delighted. This is an area I've always had a lot of excitement for, but I competed for the job and showed up here as the Director in May of 2006. That's how I got here, but it's been the most fun job I ever had.

WRIGHT: Sounds like your life moves into other ventures.

WORDEN: Right. Until I get fired from this job. I tell people never be afraid to push new things. You may lose a few jobs over it and people will be upset, but in the end other opportunities will open. So the vector tends to be in the right direction.

WRIGHT: Well, the Center has always been recognized for its cutting edge on flight research and aeronautics. Share with us your thoughts of what you believe to be historically the mission of Ames, and what you believe today's mission is, and your strategic vision for what you want it to be in the future.

WORDEN: Ames, as I've told people, is the coolest part of the agency. I'm sure the other Center Directors would disagree, but they're wrong. This has always been—I'm going to use the word the “un-center”. It's always been the place that has the freest thinkers; some people would say the most out-of-control thinkers and doers. Our historian, Jack Boyd, who by the way is a phenomenal individual and been a huge asset to me, tells me that Ames was founded in the late '30s with the radicals from [NASA] Langley [Research Center, Hampton, Virginia] that wanted to try a different approach. I think that character has held true, that partly has to do with why we're here in Silicon Valley even long before it was Silicon Valley. California usually appeals to the more free spirits. That has obviously continued throughout all of its [Ames] history.

Ames started as an aeronautics Center. But it became, over the last few decades, equally divided between aeronautics, exploration-related advanced technology, and science. I think my objective is to build on that tradition of innovation, and there are a couple particular areas I really want to focus on, that we are in Silicon Valley, the Vision for Space Exploration has as one of its tenets that the private sector and private development, is essential for our expansion into space. Our job is to be in the entrepreneurial center of the world, and to start making those connections. My predecessor had already done a pretty good job of that with people like Google [Incorporated] and others. We're building on those connections, looking at other companies as well, not just Google. But things like the Google [Lunar] X Prize that was just announced – that

Google is going to finance going to the Moon, is an example. I played a small role in helping persuade some of the folks over there that was a good idea. I hope they think it's a good idea. But that's an example of what I mean.

I think first and foremost Ames is to be a place that we can do entrepreneurial things. I think this is in the best tradition of this Center and probably the research centers in general that grew out of NACA [National Advisory Committee for Aeronautics]. Our job was to midwife new industries under NACA. I think our job is now to midwife new space industries. This Center is particularly well situated to do that.

Second, Ames has always been a place that can come up with the one percent solution. During the '60s we did the Pioneer probes here that were the low-cost way to get early to the outer solar system and the inner solar system as well. In the 1990s we did the Lunar Prospector mission, which was a novel private sector approach. It was the next Lunar mission after Clementine, my mission in DoD [Department of Defense]. Lunar Prospector confirmed that there was something interesting at the poles of the Moon, whether it's water or other hydrogen compounds still remains to be determined, but it was an interesting program.

What I've tried to bring here is the idea that following on the faster, cheaper, better effort of a decade or so ago that we can do low-cost missions. Low-cost missions that are largely robotic, but not just robotic, can journey throughout the solar system. We've set up a small satellite program here, which has huge promise. We've got a couple small satellite programs going now, including the LCROSS [Lunar Crater Observation and Sensing Satellite] mission, which actually got started before I was here, but it's a \$75 million capped mission that will be a secondary on the lunar reconnaissance orbiter mission going to the Moon in late 2008. It'll impact a polar crater and blow material 100 kilometers or so above the Moon that we'll be able to

assay and hopefully see evidence of water. It's the kind of mission that is after my own heart, and we hope to do a lot more like that.

Another objective is that the Vision for Space Exploration is incredibly exciting. It will be the vision that wraps everything NASA does together. Over the last decade or so I think a lot of the things NASA did, because there didn't seem to be this overarching vision, wandered off into different unrelated areas. I'd like to get this Center back integrated into a lot of things, and we've had a lot of help from the rest of the agency, very positive help, to put us in critical paths of some of the key exploration programs thermal protection systems for example, software, human factors work, and so forth. I'm quite excited about the role of this Center. We retain a central role in traditional areas of expertise like science, aeronautics, and that's one to continue. But I've been really impressed since I've been here with the quality of the people. Ames really has and continues to attract the best and brightest from around the world.

WRIGHT: Part of what the future involves is with the Lunar Science Institute?

WORDEN: Yes.

WRIGHT: Do you want to talk just a few minutes about that?

WORDEN: One of the reasons I came here was to work on lunar missions. There was an unfortunate decision [in 2006] to take the management of the overall lunar robotics away from this Center. There might have been good reasons to do that. To use the military term, it was above my pay grade. But it was unfortunate and disappointing. But I think in some sense, again,

like most things that you look as negative at the time, it might have turned out positive in the end.

The real forte here at Ames is probably not building large-scale missions but to do small fast-paced creative things. A recognition of that I think was the decision recently made to place a Lunar Science Institute here, modeled on the very successful Astrobiology Institute that is using 21st century technologies of networking and so on to be the virtual center of scientific development of the Moon and science from the Moon, on the Moon, and about the Moon. We're just in the preliminary stages of setting that up. We're searching for a director. The number of people who will be here will be small obviously, under ten or twelve. But the idea is to develop a new community of lunar scientists. In the '60s there were hundreds of lunar scientists in the United States. I think there's now probably a dozen or so, frankly most of which are not "spring chickens" anymore. Neither am I for that matter. But we need to have a focal point for developing the next generation of scientists.

So by having a virtual institute that will cover a number of universities and other research centers, I think our goal is to develop 50-100 scientific experts at various places that can really make use of the science opportunities the Vision is going to afford. We hope to have by March of 2008, the institute up and running. Seems now we have a couple foreign partners interested in setting up parallel institutes. So this will really be a global institute, very much as the Astrobiology Institute is. I'm delighted to see that here. I think this is the right place for it. It's more than just a couple scientists here thinking about the Moon. It's going to be really the center of a global effort.

WRIGHT: As you move forward putting Ames into the future, what about the importance of aeronautics and the role for NASA? Where do you feel it's going to fall especially here?

WORDEN: Aeronautics is a critical part of NASA. It always has been, and I think it always will be. There are two areas that are particularly exciting to me. That doesn't mean that the rest aren't important. But NASA needs to retain its position at the forefront of aeronautics research, and I mean research, not just support. A lot of people can help figure out how to do air traffic control and so forth, but very few people are able to do the research that's necessary to support where we're going in this next century. An example is figuring out how to get a lot more traffic in the limited airspace. A lot of the software capabilities are being developed here. That's an example of aeronautics at its finest.

Another area is that at some point we're going to have hypersonic aircraft, aircraft that can take you anywhere in the planet in an hour or so. Time is incredibly valuable. It gets more valuable the older one gets actually. So I think that from an aeronautics standpoint—strictly what the public would consider aeronautics, both taking care of the research ends of current aeronautics things, that includes advanced information technologies, as well as things like hypersonics and so forth, are really important.

The other area—and this is really something that I don't think people understand to the degree that it's important—and what the Vision for Space Exploration is all about, is we're going to settle the solar system. We're going to settle Mars at some point. To get there you have to go through the Martian atmosphere, and to get back you have to get back into our own atmosphere. That's an aeronautics problem, not a space transportation problem. As we enter planetary atmospheres, either for science or eventually for settlement, we need to provide the technology

and the basic research underpinning for that. I see aeronautics as really critical. Indeed, the ability to build thermal protection systems for atmospheric entry is one of the things that we've always been an expert on, and that will be even more important in the future.

WRIGHT: Speaking of that, what do you believe to be the relative importance of the human and the robotic space flight and the interplay between the two to reach the success?

WORDEN: I like to say that humans and robots are going to settle the solar system hand in claw, that it's really like anything one does now. We are linked to robots today and robotic systems. When I get in my car, that's a robot. As it gets more and more sophisticated, it tells you which way to turn and so on. The human could go walk someplace, but if you're going to get where you want to go, you are connected to a robot. The same thing is true in space. As we get to more and more hostile environments into more difficult areas, from the initial exploration and science all the way to the settlement, we're going to have to be linked with robots. In a second sense is, I frankly think that as the century goes on we will find that robotic systems are going to be more and more integrated in our human existence.

We had a conference here this last week with Ray [Raymond] Kurzweil who's written extensively on this topic, called the singularity, that he believes eventually we're going to be merged with artificial life. Now I don't know whether that's going to happen the way he suggests, but certainly more and more you see we walk around with these little BlackBerrys [wireless handheld device] all the time, particularly if you're a senior NASA official, so we've already begun. But I see eventually robots to be more and more integrated with us and more and more through a direct connection. We are going to become one with the robots, particularly as

we expand in the solar system. I don't see it as either-or. It's got to be together. Robots can go some places we can't, but as we become more and more part of a virtual reality with them, then we're going to travel with them, and merge with them.

WRIGHT: You explained to us how your career moved you along the path that it did, and so much of it was parallel and distantly but still somewhat connected with NASA. So you've been an observer and you've also been involved with it. Tell us how NASA has changed over time and how you see it changing in the future for its next 50 years.

WORDEN: Well, NASA is an interesting agency. I guess I wouldn't say it's linear. It's fairly circular. It's a continuous circle. We started out as NACA as I mentioned, and our job was to midwife new industries. I think that's going to be more and more important in the future. I think we might have gotten away from that a little bit with Apollo and through the '70s and '80s and '90s. But I think we're coming back to that with the new space industries, the private sector development of systems to get to space such as the commercial orbital transport system, things like Virgin Galactic and other things that people are doing – Jeff [Jeffrey P.] Bezos's Blue Origin [privately-funded aerospace] organization and so on. It is our job not to run those things, nor to ignore them, but to assist them, assist them with expertise, assist them with customers, assist them with facilities and so forth. I see that we're returning to that initial NACA mission.

Second, of course NASA meets the needs of the nation and the taxpayers. In the '60s that was a security. We were part of the national security apparatus. I think in the next decade we're going to be part of the national security in a different sense. I would call it part of soft power. When I worked at the White House I got an interesting lesson. Most of the people ignored the

National Space Council until the President had to go someplace and talk to some leader, that he didn't have anything much to talk about with. They'd come down and say look, we can't agree with President whoever it is of this country on anything, but we know they're interested in space, so we need some space thing to discuss. We found that space was really a glue that had a lot of policy implications. I call it soft power. The Europeans call it that too. I see that what NASA is doing in the next decade or two—and we're already seeing that with the [International] Space Station—is that space cooperation becomes a means to bring countries closer together, an instrument of influence of formidable capability. So the national security mission that we had in the '60s is returning in a different way.

Finally, I think that NASA is at the verge of its most fundamental mission, as I noted before, which is leading the settlement of the solar system. That's an entirely new mission. It's one that we've always talked about. In fact we thought it was going to start in the '60s, but it's now real. I think we're seeing that technology has gotten to the point, the world economy has gotten to the point where this is an imperative. It's going to happen regardless. Again NASA is in the best position to lead that. I don't think I'd have been enthused about NASA if it was just midwifing new industries. I'd rather go work in those industries. Or if it was just some refurbished security issue. But if you add on top of that the human imperative to expand, it is really incredibly exciting.

Last and certainly not the least, NASA has always been a science agency. The scientific returns from NASA are phenomenal. I speak as a scientist. That continues unabated. I think if anything it's increased. But it's really all four of those, where NASA is going.

WRIGHT: What lessons that you've learned and skills that you've acquired through the years will you be able to apply in your leadership role here at Ames?

WORDEN: NASA is an interesting agency. Obviously with any organization there's good and bad things. Let me start with the good ones, which vastly outweigh the bad. In the good sense, I have never worked for an agency that is more competent. The people are both very competent and very dedicated. People don't come to work for NASA to get rich or just because they didn't have anything else to do like some in the military, but because they believe in the things that we do, these things I mentioned. They're also very good; it's very competitive to become a NASA employee. It's a great honor. So I think from that perspective it is really a fabulous agency.

The second point about NASA is that you can go around the world, like I said, I used to work for the Air Force, and you tended not to tell people in airlines, particularly if you were in the Middle East or something, that you worked for the US Air Force – but you can tell people everywhere that you work for NASA. I was in Korea a month or so ago and was visiting some places, and I told one of my hosts, "I forgot to bring my passport." But I had a NASA badge on a little pin on my lapel.

He said, "You've got all the passport you need with that NASA pin." I found it's really true that you go someplace, if people see that pin, say "Oh you work for NASA, come right this way, let's show you this or that or whatever." So it really is America's brand. People can be mad at us over some policy issue or security issue or economic issue, but they all love NASA. I think that's a second point. As I mentioned, we have the most exciting missions.

On the downside is that because NASA's products are in the future, it's hard to get the same level of immediacy that some of the other agencies have. If you're in the Defense

Department, somebody says if you don't do your job then some enemy army shows up. That's a very immediate thing. Or if you're in the Education Department if the young people don't get educated, then our economy collapses and so on. Those are very immediate kinds of things. But you say well look, if NASA doesn't do its job, it means that somebody else will settle Mars 50 years from now. Well that's okay with most people. It's a little harder to sell. You find that although the support is very broad, it's diffuse. It also means then that we're a lot more susceptible to particular agendas, it might be congressional agendas. I've always criticized that NASA is what I called a self-licking ice cream cone, that a lot of times you did things because it got the support, jobs and so forth. So that's a problem.

I think that this Administrator has done a fabulous job of undoing some of that. He's changed the governance structure so that Center leadership is not involved in deciding programmaticas. And secondly he's linked all the Centers into the Vision for Space Exploration, so it's not an us versus them activity. That's helped defray some of the problems. Although local political leaders are very excited about what we're doing here, they always want to help you more than you want. They often say, "Can I take this program from somebody else and put it here?" Now I can legitimately say, "That doesn't help us, because if you take it from them then you're going to destroy an effort that we have other things in. You need to work with us to help the overall program." But that's a challenge. It's a lot more living in a fishbowl if you will.

The other thing is again both a positive and negative thing. The fact I can talk about everything I do is neat, but the fact is that everybody knows what you're doing. If we make some decision within I think nanoseconds it's on the Web. So you're in that fishbowl. At least The Defense Department can count on a few days of secret things staying secret. But again it's a

different environment. All in all the downsides are pretty minor. Naturally we don't have enough money, but who does?

WRIGHT: Well, the agency is going to celebrate or note its 50th anniversary next October. What do you feel is NASA's impact on society and what would you like to see it be, the impact, in the next 50 years?

WORDEN: I think NASA's central impact is really it's helped define America and Americans as a sense that we lead on frontiers, and that the frontier remains part of our psyche. There is nobody else that does that. Yes, there are scientific frontiers and so on, but real physical frontiers matter. NASA is continuing that character of America which makes it unique. America would obviously exist if NASA went away tomorrow, but it wouldn't be our America I think. The idea that others are now leading on frontiers would change our view of ourselves, and I think much to the worse. So that's the single most important thing that we can do, is to say if you're an American we are there, we're at the very edge of the known moving into the unknown.

WRIGHT: Well, as it begins its next phase of its life of the agency and people are needed to accomplish the goals that have been set out, why would you encourage someone to begin a career with NASA?

WORDEN: First of all, you'll have a lot of fun, and you'll have the most interesting intellectual and stimulating job, and you'll be part of the future of mankind, and that's worth a lot. You don't come and work for the government for the pay. You certainly don't come for all of the side

benefits and the short hours. But in the end it's really that intellectual high that one gets for being on the edge of the unknown. That takes a special person, but there's a lot of them in America. I think that especially with the Vision for Space Exploration we have no shortage of people, the very finest the country has to offer, and the world for that matter, wanting to come and work for us.

WRIGHT: Well, as we close out this afternoon's session, is there anything you'd like to add, or any other thoughts that have come to mind?

WORDEN: No. Again this has been the coolest job I ever had, and I hope I don't get fired, and continue to be able to make progress.

WRIGHT: Well, we wish you the best of luck in the next years.

WORDEN: Thank you.

WRIGHT: Thank you.

[End of interview]