NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
ORAL HISTORY TRANSCRIPT

WILLIAM H. GERSTENMAIER
INTERVIEWED BY REBECCA WRIGHT
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WRIGHT: Today is January 10th, 2008. We are at the NASA Johnson Space Center in Houston, Texas to speak with Bill Gerstenmaier for the NASA at 50 Oral History Project. Mr. Gerstenmaier serves as NASA's Associate Administrator for Space Operations. Interviewer is Rebecca Wright assisted by Sandra Johnson. In preparation for the space agency's 50th anniversary, the NASA Headquarters [Washington, D.C.] History Office commissioned this oral history project to gather thoughts, experience and reflections from NASA's top managers. Information recorded today will be transcribed and placed in the history archives at NASA Headquarters where it can be accessed for future projects. Thanks again for providing us time, especially since you're on travel to Houston and not in your normal office at Headquarters. If we could begin today by you briefly describing your background and how you came to your current position?

GERSTENMAIER: I guess I'll start at the very beginning, because it all somehow relates. I graduated from Purdue University [West Lafayette, Indiana] in 1977. I first went to work at the [NASA] Lewis Research Center, now the Glenn Research Center in Cleveland, Ohio. I worked in the Wind Tunnel and Flight Division up there. I did supersonic wind tunnel work in the wind tunnels, and as part of that job I had the privilege of working on a couple projects for the early [Space] Shuttle Program. They were the Air Data Probe Calibration Wind Tunnel Test, which is

the Shuttle has two air data probes that come out at Mach 3.5 and they're used to determine the air speed and angle of attack of the Shuttle as it comes down to land.

We provided the calibration for those. We took the data in Cleveland, along with data was taken at [NASA] Langley [Research Center, Hampton, Virginia] and at [NASA] Ames [Research Center, Moffett Field, California], and then that data went into a database that then became essentially the parameters that fly on the Shuttle today that determine altitude, air speed, and angle of attack from those probes. So that was my first experience in the Shuttle world. I didn't do much but take data for the Rockwell [International Corporation] engineers at the time.

I also worked on a project where we had about 760 pressure measurements all over the Shuttle. It was a Shuttle with an external tank and solid rocket boosters. We looked at all the different configurations and we ran from essentially about Mach 1 all the way up to Mach 3.5 in that configuration again in a tunnel, gaining pressure, temperature data for, again, Shuttle analysis.

Then I supported Shuttle Base Heating Test, where we put thermocouples on the back end of the Shuttle model in the wind tunnel and we actually fired two model rockets on the side that represented the solid rocket motors, and we looked at how those plumes would heat the bottom of the external tank. That data was again used by Rockwell to determine the thickness of the foam and the insulation that needed to be on the bottom of the tank. So that was my first exposure to the Shuttle Program, was essentially right out of school in 1977.

Also at the same I did other aerodynamic research, nozzle stuff, subsonically, and then some supersonic inlet stuff and some other stuff. But I had the experience then of getting the chance to see a little bit of the Shuttle Program at that point.

Then in 1980 I had the opportunity or was asked did I want to come to the Johnson Space Center, and again my propulsion background was what attracted the folks down here, and they asked me if I wanted to come down and be a flight controller in the Flight Control Division down here. Steve [Stephen G.] Bales was the Branch Chief at the time. I flew down and looked around the area and decided that if I really wanted to get into the space business this was the place to be. So I decided I'd come down here for two years and see if I would like it or not.

It turned out that I really loved it down here. I became a flight controller. I served on the first Shuttle mission, the *Columbia* flight. I was in the back room doing thermal analysis. On that flight some of the tile were damaged on the OMS pods and I was in the Orbital Maneuvering System/Reaction Control System [OMS/RCS] Section. We analyzed whether we thought it would be safe to return with that tile damage. Then what's curious about that is here in my recent career we had the blankets peel up here on the last Shuttle flight, and the analysis was almost identical to the analysis that I did back in 1981 at STS 1. So my career has started at the beginning and then still I get to go see that.

So then from being a flight controller, I flew about the first 17 flights as an orbit flight controller in the OMS/RCS Section. I also did ascent entries towards the end of that. I then moved off and did payload activities in the Payload Branch. These were the payloads that fly on the Shuttle. I also worked on the Orbital Maneuvering Vehicle for a little while, ran that project office and systems division. Then I guess in 1992 I decided that I wanted to go back to school again.

When I was in Cleveland it was very important to have a PhD or have an advanced degree. So they brought professors in from the University of Toledo [Toledo, Ohio] to work on your master's. I got my master's degree from the University of Toledo with the teachers coming

down part-time. I actually completed it down here in Houston from the University of Houston. But I had that, and then I decided in '92 I wanted to go back and get retooled again technically. So I went back to Purdue University to pursue a PhD. I didn't get a PhD but I completed all the coursework and got through the qualifiers.

I was there for about two years, '92 through '94. Then I came back to the Johnson Space Center, worked in Flight Design and Dynamics Division again on the Shuttle side looking at the software that controls the Shuttle, the orbital mechanics, the ascent software. I did that for about a year, managed a branch over there. Then I went to Russia in 1995 and '96 when Shannon [W.] Lucid flew on the [Shuttle-] Mir [Space Station] Program. I got to go to Russia and support her and be her ground person while she was flying in space.

For me coming from the [Mission] Control Center here in Houston and then getting the privilege to go be in Russia and work in their Control Center and be pretty much accepted as a flight controller in Russia—at that point the team in Russia was very small. There was myself and maybe five or six contractor folks that were there supporting that mission. The Russians had not seen anybody really come for an extended period of time. I stayed for about a six to seven-month period of time over there. So they really adopted me as a flight controller. They sensed the love of space flight, the love of engineering that I have is the same that they have. We bonded really well, and I had a great experience, and I can't say enough about Shannon Lucid. She was a phenomenal astronaut to have on orbit. She was just super. She was a joy to work with every day. It was my privilege and pleasure to help her with her science program. Hopefully she had a good time because of what we did. But again that was very neat that I got to go do that in Russia.

Then I came back, worked in the Shuttle Program after that, in the Orbiter Project. Got to go out to Palmdale [California], got to see some Orbiter modifications out there. Then I don't remember exactly when, but about 1999 I came to the [International Space] Station Program as Tommy's [Tommy W. Holloway] deputy in the Station Program and worked there until I became Station Program Manager. I was Station Program Manager until I got my present job in Space Operations up at Headquarters.

So again if you look at my career I didn't really plan any of these moves. But from where I started to where I am now I have the privilege and luxury of having a tremendous background. I have a lot of firsthand international experience by working with the Russians firsthand. So then when I became Station Program Manager I was treated with a lot of respect. I was already a known quantity so the negotiations, although very difficult, like after the *Columbia* tragedy [STS-107], etc., the Russians had a tremendous respect for me because I had spent that time, and they knew who I was.

So I couldn't have planned it that way, but the way it worked out was just super. So again if I look back at my career I'm truly blessed. I've worked with phenomenal people throughout my career. It's all been in Shuttle Station human space flight activities, but it's just been amazing. It all fits together, and now my job where I lead both Shuttle and Station from Headquarters is fitting. So I know what [N.] Wayne [Hale, Jr.] does in the Shuttle Program. I know what Mike [Michael T. Seffredini] does in the Station Program. I know their problems. So then my primary job in Headquarters is to keep all the Congressional folks and other folks out of their hair and let them go do what they really need to go do.

WRIGHT: Let's talk a little more about what you are doing up there. You do have some challenges and some of course routine day-to-day aspects. If you could fill us in a little bit more about what all that your job does entail?

GERSTENMAIER: I think that the current job, what probably some of the biggest challenges are as we're retiring the Shuttle is how do we fly out the Shuttle safely, in other words make sure that each Shuttle flight is just as safe as the last Shuttle flight and we keep our focus on what we're doing. It's very difficult if you look at other programs as they phased out to keep them strong until the end. So that's one of my challenges, is to do that. My other challenge is to take each Shuttle flight and make sure we get maximum advantage out of it so we can get the Space Station completed or at least get the major elements launched, as well as put up a large number of spares to be prepared until the next vehicle comes online that can start providing routine cargo transportation to Space Station.

So the big challenge strategically is how do I lay out a plan that supports this but then I need to lay that out with the constraints that I'm given from the environment in Washington. I get some guidance from the Office of Management and Budget. I get some guidance from the Executive Office of the President. I sometimes get conflicting guidance from the Congressional side. So then how do I make sense of the two conflicting things but yet craft it into a plan that meets their constraints but yet is still technically reasonable and we can then go move forward.

Then the challenge is to then convince the folks down here in Houston that do the real work why this plan really makes sense and why even though in the real world I wouldn't necessarily pick this plan but with the constraints we've got, with the budget limitations we've got, where we sit, this is the best we can do with the parameters we're given. So then to explain

that to them and get them to not only understand it but then to embrace it and be ready to move forward and make continued sacrifices to do that, those are my challenges.

It's very hard in the Washington environment. I'm trained as an engineer. I'm trained as a manager. It's hard to convey sometimes to folks not in our business how difficult our business is, what the challenges are. They don't understand the motivation of my workforce. They don't understand the love that the folks really have of this business. For me to try to convey that to someone that doesn't understand either the technical piece or the managerial piece is sometimes very very difficult. I spend a lot of time with them trying to explain and get them to understand how we think and what we think and why we're doing what we're doing, because they sometimes see it as being very confusing. As engineers we sometimes get so much into minutiae that we're talking all the fine details and they don't really care about the details, they want to understand the big picture and how it fits together.

So I have to avoid the engineer tendency and try to craft it in a language and in a motivation that they can understand, and that's been a big challenge for me. The challenge is to find out what motivates them and then to cast what we want to go do in terms that they can respond to, and then I know when I talk to my engineers I cannot use that same language or that same motivation, because they will not understand that. So then I have to recraft that same direction back into a language that the engineers can understand and the managers can understand down here. So that's my job, is to have the split personality of dealing with the extreme technical to the extreme lawyer political side and figure out how to make sure that as the interface between those two groups is clear. The communication from the politician lawyer to the engineer technician on the floor must be clear and understandable to each..

WRIGHT: As the one responsible for directing the space exploration operations of the agency, you have a vital role in helping to make the Vision for Space Exploration a success. So tell us how the impact of the announcement from President [George W.] Bush had an impact on the future of the agency and the things that you were doing.

GERSTENMAIER: Again I think the clear thing is that we really have a Vision now that takes us beyond low-Earth orbit. I think if you ask most folks in the human space flight world, they really want to get beyond low-Earth orbit. We're meant to explore. We're meant to go out. We're meant to go do things. So having a plan where we go to the Moon and then we have extended stay times on the Moon is great. Then that yields right next to Mars, which is even more demanding.

I think for a long time we talked about going to Mars first. I don't think we're technically ready to go to Mars. To go to Mars would require a spacecraft about the size of the Space Station. The Space Station when it's completed will weigh about 900,000 pounds. So we would have to construct in orbit a spacecraft about the size of Space Station and then have the three-, six-month journey to Mars and then for about a week's stay, and then return back. So we're not really quite ready from a technology standpoint to make that big leap to Mars. But we can use the Space Station to learn about long-duration space flight.

We can learn how to operate and live and work in space. We can do that with Space Station. Then we can take that knowledge, apply that to the Moon, permanently stay on the Moon for a period of time, learn what it takes to operate on the Moon, and then get ready to go to Mars. The way I look at it is in Space Station if you mess something up you're hours away from

returning back to the surface of the Earth. So it's a bad day but it's not all that bad a day. You can still get back in hours.

When you're at the Moon you're now days away. So you have a little more of a constraint but it's still manageable in the big scheme of things. If you don't have the right spares or the simple things such as food or water are not what they need to be or there's contamination in the water supply, you've still got several days, and you can get back. But then when you go to Mars, it's now months. So the criticality is now kicked up where it's not a forgiving environment. So you better learn from Space Station, learn from the Moon to enable you to go be successful on Mars. So there's a natural nice progression that sits and goes forward as we go do that.

The problem for us in Shuttle and Station a little bit is that in a sense we're transients. Shuttle's going to retire, but we're retiring Shuttle because we need another vehicle that can take us beyond low Earth orbit. So we would ideally like to be able to fly both the Shuttle and the new vehicle, but we're not given funds to go do that. So we have to end one to pick up the next to go where we want to go. That's what I try to convey to folks. I think it makes sense if you look at it and then you look at that natural progression of stepping stones from Station to Moon to Mars. Again the plan is there. We're ready to go execute that.

Now as we sit here today and we look at the election coming up, what we need to do now is figure out how we can keep this Vision that we've got through the election. Now we know it's going to change. We know when the new administration comes in, just like when we got the new Congress, they're going to want to put their fingerprints and change what's going on, and that's fine. So our job at Headquarters is to figure out—this is probably not politically correct—

but to figure out what we can let them change that doesn't destroy the entire Vision, but yet lets them have ownership in this Vision and make it their plan.

So we're consciously now trying to figure out which things can be changed or, conversely, which things shouldn't we change that would so disrupt the Vision that we lose this momentum that we've got as we go beyond low-Earth orbit. So that's our challenge now, is to look to the new administration and try to determine what things strategically they're nice to have but they're not critical to the overall Vision. So for example, how we use the international community on the surface of the Moon, how we develop new hardware, how we put things together, some of those things it's not as critical to us as other areas. So again, we're starting to lay all that out. So again, I look at my job in Shuttle and Station as how do we take Shuttle hardware and use it to advance the Constellation [Program] .

For example in Florida Firing Room 1, which used to be a Shuttle firing room, has now been given to Constellation, and they're going to go ahead and use that firing room. The A1 Test Stand at [NASA] Stennis Space Flight Center [Mississippi], that's been turned over, and they're testing J2X engines down at Stennis now in that test stand. We're going to fly a demonstration flight for Constellation in April of 2009. It's going to launch off one of our mobile launch platforms with our four-segment SRB [solid rocket booster] underneath. Our flight control team that does Shuttle and Station will be the flight control team that will oversee that launch and see that suborbital flight that's going to occur for Constellation. So that natural transition is there.

The way I see my Directorate interface with the Exploration Directorate is the Exploration Directorate is building the hardware, they're designing the new hardware, but then when it comes time to operate it it comes back to the Mission Operations Directorate, and we

will go operate that hardware. So in the big scheme of things I think it all fits in that world, and it works fairly well.

WRIGHT: It's exciting times.

GERSTENMAIER: It's a great time.

WRIGHT: What do you feel NASA's role is for society or its impact on society? How would you explain that, that NASA has this purpose that we can have for the future?

GERSTENMAIER: I think NASA gives us a chance to think about things in ways that we don't normally think about things. As a kid growing up, probably my most compelling memory was I think from the Apollo era when the picture of the Earth or the Earthrise from the Moon. That gave us as a species a whole new perspective on what the Earth was. Here's this little blue ball. As a kid I used to look at that and say all of us are in that picture. Then today if I look at say I think it's Cassini [spacecraft] that's there with the Saturn rings and that little tiny dot that is the Earth, that's us. So NASA has allowed us to rise above our day-to-day problems and our day-to-day crisis and look at our world and our lives in a whole new perspective that we would never be able to imagine any other way. We realize how small we are in the big scheme of things, how precious the Earth is in a sense.

When you look at the pictures from Space Station, if you look at it you'll see Space Station, especially at the fly-arounds, and you'll see that thin little blue line, and that's our atmosphere, and that's all. So I was at a conference once and they were complaining that the

space budget was so much more than the aeronautics budget. So I had a picture, my first picture on my slide was Space Station. So I showed them that little blue line, and I said well see all that little blue stuff, that's aeronautics, that's why your budget is so small, you see all that vast darkness out there, that's space, that's why my space budget is so big. So again in a simple way, our job allows us to see a different perspective.

What's hard is it's hard for us to explain our jobs to folks. When I was Station Program Manager I used to challenge my people all the time to try to explain to their neighbors why they worked all these ridiculous hours and why we did all this hard work. They really can't explain it. But they're part of a bigger thing that is bigger than them, and there's a spirit of it's so complex and it requires everyone to work together as a team or it can't be successful. In a sense that really is an unbelievably great way to motivate a team and to move forward. If I look back through my career, the hardware's neat and cool, and as an engineer I like that, but I think I carry more memories of people that I've worked with, and in very difficult times.

After the [Space Shuttle] *Challenger* [STS 51-L] disaster and the *Columbia* disaster, those were really hard times, because you lost your friends who were astronauts that you really knew as friends, not as astronauts, and then it also took an impact on your work. You in a sense had failed in your job. So then the double problem or double calamity was just hard to take. So we have a great business. There's tremendous highs when things are happening and years of work come together as we start seeing Space Station assembled and we see the international partner modules get launched probably next month. That's exciting, to see that thing that you've worked on for 10 years, 15 years come to fruition is a huge plus.

But then the other side is sometimes we have tremendous downs, when we have a *Columbia* or a *Challenger* tragedy. So that's part of our business. It has both extremes. But I

think the people in this business are the thing that I carry as the most memorable thing, to have the privilege and pleasure of working with all these folks throughout these years has just been great.

WRIGHT: Those years equal to about 30. You've spent 30 years so far with NASA. Tell us how NASA's changed through this time period.

GERSTENMAIER: Yeah, boy, it's definitely changed. It's hard to reflect on the change, because I've seen it come so incrementally to myself, right. I've seen this change in the way we do business. I've had a tremendous privilege of working with some great folks. I worked directly with Gene [Eugene F.] Kranz, I've worked with Chris [Christopher C.] Kraft, Bob [Robert F.] Thompson in the Shuttle Program, Leonard [S.] Nicholson in the Engineering Directorate and the Shuttle Program on the payload side. The list goes on and on, Arnie [Arnold D.] Aldrich, George [W. S.] Abbey, all the folks.

So throughout my career I've had a chance to work with all these folks and to see how today's management style is a little bit different than then. So NASA has changed. In the earlier days it was a pretty hard environment, you were challenged very up front. You either knew your stuff or you weren't even permitted to give presentations and you were done, whereas in today's world we're probably more forgiving. We're not as hard as we were back then. But

The other thing that's changed a lot is the technology. In the Control Center today the new computer systems and the new software they have for the Space Station Flight Control Team is dramatically different than what I had as a flight controller. If you looked at what I had

as a flight controller, it was really rudimentary, very simple compared to the complex software and complex operation that the new flight controllers have.

That's another thing I really enjoy is occasionally I'll sneak over and sit next to the flight controllers in the Space Station Program and just watch what they're doing and just talk to them about their job and they don't quite know who I am, but it works out just great, to see that the same joy, the same excitement, the same really love of their job is there that I've shared throughout my life. So it's neat that that same spirit, that same deep internal motivation that was there in my beginning days at NASA even in the aeronautics side is still within NASA today. So that aspect of NASA has remained consistent.

Now the technology and some of the meeting styles and some of the management controls, those things have changed over time. But that underlying drive, that underlying spirit has been there since throughout my career.

WRIGHT: Well, what are some of the lessons that you've learned through this career that you've taken to your current position?

GERSTENMAIER: Boy, I think I've learned a couple things. One definitely is that everyone's position really has merit. So early on I was doing a project and one of the guys in the Avionics Division was thought of as not very productive within the division and he was assigned not very good jobs to go do. I didn't know that. Then I came in from the operations side and he explained to me how some things ought to be wired and put together in the avionics system. I would take what he told me and then I would feed it back to his own division and they thought I was some

kind of genius because I could do all this electronic stuff. Well, it wasn't really me, it was actually this person within their own division that they had written off as not being valuable.

So what I learned out of that was that some folks don't present very well, and they get branded as not being a strong contributor, and they may not in all areas, but they still have something that they can really contribute. So I learned to listen extra hard. So then when my initial reaction is maybe not to listen to a comment from somebody or to dismiss something, I want to make sure the little red flag goes off in my head and says okay listen extra hard, because this person really is trying to tell you something and you need to value what they're trying to tell you. It may not be exactly what you want to hear, or it may not be exactly on target, but it has meaning and it can help you do a better job. So I've learned to really value and pull data and information from a whole variety of different sources. So I think that's one thing that I've learned.

I've also learned that you have to balance your life a little bit. You can do so much work stuff that you don't have another life. So occasionally you need to find things where you get grounded and you get back to being a real person. Whenever I start thinking that I am somewhat smart or gifted, then I go talk to my family and they definitely put me back in the right perspective. I think that's really good, because we're not all that great, but you get this inflated attitude where people are nice to you, and they're treating you well because of your position, and that doesn't really matter. Go back to your family and let them chew at you for a little while, and then you get regrounded back to where you need to be.

So I think there's a balance between the home life and the work life that has to occur. Especially in today's world I think it's tough for some of the new folks coming in to find that right balance because the work can be very addictive, because you're getting very strong positive

feedback from what you're doing. You can read about what you do in the paper. That tends to make you get a big head and you start thinking that you're better and you're more gifted than somebody else, and in reality you're not, and you need some chance when you can get back in more of an equal surroundings and be with other folks and see what's really going on. So I think I've learned that also.

I've also learned that people will really rise to the challenge if you can put the challenge in front of them in the right way. Again there's really nothing I don't think that this team can't do if you put the challenge in front of them in the right way and you give them a little bit of resources to go do it and you help enable them, and you're consistent in walking the talk, that when you ask somebody to do something you need to be willing to do it yourself or to show it. Folks look a lot at your actions. You can have all these great platitudes and all these great words about how you ought to do something, but the simple things that you do every day that they're watching and they see happening are stronger motivators than all the right words that you talk about.

I didn't realize until one day here in Building 1 at JSC somebody had spilled some coffee. So then I got a paper towel and got down on my knees and wiped it up and threw it in the trashcan. I didn't think anything about it. Then we're having safety day, and somebody brought up the fact that they saw me get down and wipe up this spill on the floor, and they said, "Holy cow, he is really concerned about safety and is really doing the right thing." I didn't think anything about it. But that carried a stronger motivation for my folks than anything I could have ever said in terms of motivational lectures or speeches or emails or writings. So again we're always being looked at as managers and leaders. It needs to be natural, but you need to really walk the talk and not just pontificate on how things ought to be.

WRIGHT: Part of the Vision for Exploration has a balance or a cooperation between human and robotic space flight. Tell us about the important relevance between them.

GERSTENMAIER: I think it's unfortunate, because a lot of times in the media we get pitted robotic against human space flight. That's really not the case. The motivation that they have in the robotic side, and I say they, and that's probably not right, but the robotic folks, they have the same motivation that we do. If you look at the Rover activity or the Mars team at JPL [NASA Jet Propulsion Laboratory, Pasadena, California] or you look at those folks, they had that same drive and motivation that we do on the human side. So I think we get characterized as either it needs to be robotic or it needs to be human. I don't think that's right. I think it's really the combination of both makes a much stronger team.

We're starting to see some of that in the new Exploration Vision. There's going to be some Lunar Landers potentially here. There's going to be some mapping experiments done on the Moon. Those will provide information that are needed for the human, and then the human can come and expand on those findings. We're learning that a little bit on Space Station as we have new Special-Purpose Dexterous Manipulators, the two-armed robot from Canada that'll be launched in March, and that will allow us to do tasks that we could only do EVA [extravehicular activity], now we'll be able to do robotically. I think at first the crews and the flight controllers will not want to accept that new robotic device, they'll want to continue to do it the way we've done it before, but then I think they'll learn how advantageous that can be to them, and how it can actually augment and help them do their job.

You see the same thing in some of the undersea repair activities. They have little remotely operated vehicles, and at first the divers didn't really want those things around. Then when they figured out they could actually help them by providing tools and being a camera platform and a light platform and it actually made their job easier, then they started accepting those robotic vehicles next to them. I think we'll see the same thing in space. I think you'll start seeing a natural blending between robotic and human. I think it's unfortunate that we get pitted against each other, because it's not right. There's a place for both, and there's a place where they can both cooperate together, and I think the real strength is when we work together.

WRIGHT: You mentioned earlier about aeronautics. How do you feel aeronautics will be utilized or the research for aeronautics will be utilized in the next years with NASA?

GERSTENMAIER: I think aeronautics again has a pretty strong future. I think we didn't use the Shuttle quite as much as we should have throughout its history. We declared it an operational vehicle, and we didn't continue to use it for research. Recently on the Shuttle we've had some problems where we had some gap-fillers, the little pieces of material that sit between the tiles that keep them from chattering together, those have popped out, and when they come out then the flow over the bottom of the Shuttle, it trips or gets interrupted by that little device that's sticking out, that little piece of felt or plastic that's sticking out. Then the flow behind that becomes turbulent, and when the flow becomes turbulent the heat transfer increases, and it can actually melt or damage the tile.

But we don't really know exactly at hypersonic speeds like Mach 25 when that transition occurs or how it occurs, because there's not very much air when we're flying Mach 25. We

should have probably throughout the Shuttle career done some more tests of aerodynamic capability. We looked at things such as how the Shuttle flies. We did Detailed Test Objectives where we looked at the stability in terms of roll maneuvers and pitch maneuvers and how the Shuttle flies, but we didn't look at the fundamental aeronautics things that we could have done on the Shuttle. I think we should have figured out some way to stick some of those in. We're going to try on these last couple Shuttle flights to actually do some of this. We're going to try to put a little known trip indicator in and then some instrumentation behind. The problem is the instrumentation isn't quite as good as the aeronautics guys want. But I think it'll still give us some good information.

We're going to also try to take the new tile material that's going to fly on the Ares vehicle, the PICA [Phenolic Impregnated Carbon Ablator] tile, we're going to replace a Shuttle tile with a tile of the new Ares design to see how it performs. So I think we're going to use the Shuttle over these remaining number of flights to try to do a couple of these things, but I think it's a shame that throughout the Shuttle history we didn't have a chance to do more of that, because I think again there's a natural tie between the Aeronautics Directorate and what we do.

We need their aerodynamic code, their software to analyze things on the Shuttle or space flight. They need us to essentially provide some experimental data back for them to improve the codes and understandings. Things have changed a lot from when the Shuttle was first designed. We had the recent failure where we had a piece of foam hit the bottom of the Shuttle and it dinged out or removed a piece of the tile. We were able to use aerodynamic code to really analyze that cavity and how hot it would get. When we did the first Shuttle designs, we couldn't do it with near the fidelity that we're able to now. So again technology has gotten better. We need to apply that technology to the Shuttle again and then take some of that data from the

Shuttle experience and feed that back into the technology, and then both of those move in parallel, they leapfrog each other, and we continue to improve both in the basic technology as well as in the applied technology.

WRIGHT: We're nearing the end of time for us to be here today, but we wanted to ask you before we closed out, that we mentioned you spent 30 years with NASA, why would you encourage someone to join NASA as a career for the future?

GERSTENMAIER: In my case, again as I described my career path, look at all the amazing and wonderful things I've had a chance to go do. As a new student out of college here I was at Lewis Research Center with the researchers that wrote my aerodynamics books. To sit with them in the same office and then have them teach me how the code works and how the analysis works, it was phenomenal. At that time we hadn't hired many folks within NASA for a while, so I was one of the first new employees in several years. So they adopted me as their son or kid. So then they gave me all kinds of experiences in the wind tunnel. I got to do tremendous things in terms of testing and analysis and building hardware and running computer codes and what a tremendous breadth of experience I got in that field.

Then I got to come to Houston and be in a flight control team to do the procedures for the Shuttle. The Shuttle's done amazing things. I participated in satellite retrieval, satellite repair, I've done refueling demonstrations, I worked hand-in-hand with the crews in the simulators, I've taught astronauts how to fly ascents and entries. This is stuff that people dream about. I got to do all that.

I got to go back to school, which was tremendously important, because again I had this engineering problem that I have to stay technically sharp. So then I was able to go do that. So NASA again allowed me to go do that. They told me it wasn't such a good thing to do, but they still let me go do it, because not many folks had done that. But it was still for me, that was a great thing to go do. Then to get a chance to go to Russia, experience that aspect, it's just been amazing. I've been able to really take everything I've done, I've just been lucky and been able to go do all this stuff. So as a new person coming in, to know that that opportunity is there within this agency is just great.

Then if you look at our future and you look at where we're going to go, if you want to be part of getting out of the planet, I would say in my career we used to go to space, but we never really stayed in space and we never really worked in space. I would say now that we've had a permanent crew presence on board Space Station for almost seven years or for over seven years, it'll be eight years this fall, we have now made that bridge where we can now work in space. We've assembled this phenomenal Space Station. It's amazing to see all this hardware from around the world come together.

So to have a chance to work in the next phase that will be to go beyond low Earth orbit, and that will be to start moving out to the Moon and then out to Mars. What a great, great, great opportunity that is for somebody new to come in to get a chance to experience that. Then even on the science side or in the robotic side, it's the same thing, to be able to be working on a probe that's going to Pluto or is going to fly to an asteroid, those things are once-in-a-lifetime kind of things that you can work on stuff that other folks dream about. I think that's what the beauty of working for NASA is.

WRIGHT: Is there anything you'd like to add as you reflect on the next 50 years for NASA?

GERSTENMAIER: I think again the Shuttle transition to exploration provides us with a tremendous opportunity. A lot of people see it as we call it transition, or the ending, maybe the Shuttle Program. I don't see it so much as that. I think it's a chance for us to reinvent and revitalize NASA a little bit. We are a government agency and we are a bureaucracy, and especially in my Washington world I see us as an aging bureaucracy. Therefore we've gotten maybe more sluggish and not quite as nimble as we were back in the Apollo days. But I think this new move from Shuttle and then eventually as Station retires in 2020 or some later date, I think you get a chance to reinvent NASA a little bit, to reinvigorate us a little bit, to do some things like we used to in the older days.

So I think this is a very unique opportunity within NASA at this time of change. So change is scary and change is tough, but it's going to allow us to not only transition but also in a sense allow us to reinvent ourselves and essentially reengage us or get us motivated again to do those things that are hard, as we were challenged in the beginning. We don't do this work because it's easy, we do it because it's hard. I think we get a chance to retool and revitalize.

So I think the Vision and this transition here at 50 years has given us a chance to essentially reinvigorate ourselves and move forward and be essentially maybe a new birth, not a midlife crisis for the agency, but a chance to really re-invent ourselves and get ready for the next 50 years. The next 50 years provide the agency with challenges even greater than the first 50 years.

WRIGHT: Well, thank you. I think we'll end for now and let you get on with the rest of your busy day. Thank you.

GERSTENMAIER: Thanks.

[End of interview]