

**NASA JOHNSON SPACE CENTER SPACE SHUTTLE PROGRAM  
TACIT KNOWLEDGE CAPTURE PROJECT  
ORAL HISTORY TRANSCRIPT**

RITA G. WILLCOXON  
INTERVIEWED BY REBECCA WRIGHT  
KENNEDY SPACE CENTER, FLORIDA – JUNE 10, 2008

*The questions in this transcript were asked during an oral history session with Rita G. Willcoxon. Ms. Willcoxon has amended the answers for clarification purposes. As a result, this transcript does not exactly match the audio recording.*

WRIGHT: Today is June 10, 2008. We're at the Kennedy Space Center [KSC] in Florida to talk with Rita Willcoxon, who is the Director for Launch Vehicle Processing. This interview is for the JSC Tacit Knowledge Capture Project for the Space Shuttle Program. Interviewer is Rebecca Wright, assisted by Jennifer Ross-Nazzal. Thanks for fitting us into your schedule. We know how busy you are, especially right now. Can you share with us, to begin with, how you first became part of the Space Shuttle Program and how you are into your position now?

WILLCOXON: I've served in numerous positions since I began working for NASA back in 1988. I was associated with the Shuttle Program in the 1990's working as an engineer in the Payload Processing organization at KSC then later as a manager of the Payload operations funding provided by the Shuttle Program. During that time, I worked with the Shuttle Processing organization at KSC to ensure the Payloads were properly tested before coming to the OPF [Orbiter Processing Facility] or the launch pad to be installed into the Orbiter. I worked on the Spacelab Program whose Payloads were installed in the Orbiter in the OPF and on planetary spacecraft that were installed in the Orbiter at the launch pad.

During that time, most of the Payload work was offline in the KSC industrial area. We built up experiments in the Spacelab or we processed spacecraft offline getting it in launch configuration. We tested the Payloads with what we called a Cargo Integrated Test Equipment [CITE] which simulated Orbiter interfaces. That test was conducted prior to installation into the Orbiter in order to protect the launch schedule by working out any Payload-to-Orbiter interface problems early. When you get into the integrated flow, doing everything you can offline to make sure that when it does get into the Orbiter, it's going to work, and you're not going to have a lot of downtime troubleshooting a problem.

My interaction with the Shuttle Program was twofold. First, as an engineer on the floor I worked closely with the Shuttle Processing team to ensure the Payload activities were incorporated into the Shuttle schedules and ensured that the Payload activities were properly coordinated and executed during the integrated flow in the OPF and pad. In another position as a project manager I interfaced with the Shuttle Program business office to justify the Payload Operations budget each year. Eventually, that funding was pulled out of the Shuttle Program and became a part of a Payload Carriers Program. The Agency decided after [Space Shuttle] *Challenger* [STS-51L accident] that they would launch satellites and planetary missions on an expendable launch vehicle transportation system where crew interaction was required to perform the mission.

While working in Payload processing, we had a lot of customers that were either international or from university systems with small teams of employees working the development and launch of their experiment or Payload. The biggest lesson learned was the difficulty that these small customer organizations had dealing with the SSP [Space Shuttle Program] which was a huge organization. It was a struggle for them to figure out how they fit in

to this large organization. So what we focused on in the Payload organization was making those customers feel like a customer when they came to KSC.

We had struggles with this when we moved from the offline facility in the KSC industrial area to the LC-39 area and the integrated flows. With the hundreds of tasks going on the OPF, we couldn't always count on performing the Payload tasks when the Shuttle Program had scheduled them. Oftentimes, Payload customers would come to perform their task per the published schedule, and would be delayed for hours, often with continuous rescheduled start times that didn't materialize for hours. The customer couldn't understand why the schedule was delayed and why they weren't treated as a customer. As the KSC customer representative and advocate, I would try to work out the scheduling and get priority for these customers but was often unsuccessful. Of course, now being in the job I'm in, I understand how hard it is to fit all the things you have to do to an Orbiter into a big schedule, and you've got several Orbiters that you're trying to get ready to launch multiple times. However, I do feel that there could have been more of an attitude toward pleasing the customer that didn't exist in the Shuttle organization. In my current role as Launch Vehicle Processing Director, I try to instill that customer focus and emphasis into the organization as part of the lessons I learned in my previous Payload experience.

In fact, in 2001, I led an Agency team called Station and Shuttle Utilization Reinvention, and that was a point in time where we were going to try to come up with a better end-to-end process of how you get a Payload from its inception on to orbit through the Shuttle and [International Space] Station [ISS] system in a more timely and user-friendly fashion. Researchers that would like to have used the Station platform, but it took too long to get manifested and launch that is was too expensive and spanned longer than graduate students'

tenure. In addition, the manifest would change multiple times after their Payload was selected. Our Agency team was focused on how we could best utilize those two capabilities—Shuttle as a transportation system and Station as a research platform—to get customers in the science community that wanted to use it and could get there in a timely manner. A lot of it was trying to get the Agency focused more on the research side and less on getting structure and capabilities built, because the tendency for the Agency is to be more focused on transportation and engineering capability than on science.

We did a complete study and a report that contains many lessons about how we could have done business differently to get stronger science community support for the ISS. And believe it or not, that subject was studied multiple times before the study I led, but few improvements were ever made.

Then, I went to JPL [Jet Propulsion Laboratory, Pasadena, California] on a diverse assignment. JPL missions were all launching on expendable vehicles, however, they had me do launch vehicle trade studies for a set of three missions, Europa [Orbiter], Pluto [-Kuiper Express], and Solar Probe. There was an opportunity for them to be able to use the Shuttle again, because an Inertial Upper Stage was available that was going to be given to JPL, and all they had to pay for was the integration cost.

So I conducted trades between various new Evolved Expendable Launch Vehicles [EELV] configurations and Shuttle. The sentiments at JPL, now that they had flown on both shuttle and ELV, was it cost so much more, and it was so much easier to fly on an expendable. They really didn't want to go the Shuttle route, for some of the same reasons that we found during the Station and Shuttle Reinvention team mentioned above. The safety processes, all the different organizations that you have to interface with in order to get a spacecraft to actually

interface with the Orbiter, processed through the launch site and launched. We really didn't have a user-friendly system in Shuttle available to those Payload customers. So given a choice, they would rather fly on an expendable—easier, cheaper, et cetera. So one of lessons learned for me was—I wish we could have found a way early on in the Shuttle Program to figure out how to make it easy for a Payload customer to use the Shuttle as a transportation system which would have left them with a better satisfaction of Shuttle as a user friendly transportation system.

Of course, now for years we've been doing Station, and it's NASA servicing NASA. So we're taking a transportation system, and we're building a new engineering capability in orbit. Most of it's been along that line, so there's not many issues there, because everybody's had the same priorities, which is taking that structure up and building an engineering marvel. Of course there's a science side of that, and again, that's been what's been put on the back burner, the science part of utilization of Station. But you had to build it first. Now that we've built it, because we're now going to spend our dollars on building transportation systems to go back to Moon and Mars, we're still not really focusing on the science community and the research. Since the ISS is now been named a National Lab, the Agency is focusing on the concepts for that and what it means to NASA and the science community. If some of the commercial transportation systems, the thing called COTS [Commercial Off-the-Shelf], are successful then the National Lab could be utilized by more of the science community. If they can get that going, maybe there's a way to get more science up there commercially, since NASA's going to really invest most of their resources on going back to the Moon and then to Mars.

That would be in the category of lessons learned of what would have been nice to maybe have been a little bit better in the Shuttle Program. But on the reverse side, a lot of things have gone into orbit on the Shuttle. In the Payload community, we had what we called horizontal and

vertical Payloads. Horizontal were the Space Lab ones that were in the laboratory, and there were racks. We worked with a lot of university systems, and those were the scientists behind a lot of the research. They launched a lot of Space Lab missions—I don't know the exact number—but got a lot of really good science on laboratories that went up for 14, 15-day missions and came back. Researchers across the United States got their data back and had findings and science reports from many different areas, from human life sciences areas as well as physical science.

We put DoD [Department of Defense] Payloads in orbit using the Shuttle until the *Challenger* happened, and that's when the Agency went to the expendables and stopped flying on Shuttle. We had a really good relationship with the Department of Defense when we were doing satellites on the Shuttle. I worked Magellan and Galileo and Ulysses—all of those were planetary missions that launched on the Shuttle before we started moving those spacecraft off of the Shuttle and onto expendable launch vehicles.

On some of those spacecraft, we had what they called RTGs [Radioisotope Thermoelectric Generators]. These required special attention from the EPA [Environmental Protection Agency] because they were radioactive sources that produced the power on some of these spacecraft. We had to get involved in those EPA processes and a thing called NEPA [National Environmental Policy Act] which went up to the office of the President of the United States to gain launch approval. We worked detailed procedures and conducted pathfinder on how to handle the RTGs after arrival at Kennedy Space Center. We had to have special buildings and security measures to protect the workforce and the radioactive sources. All that was very interesting and required a lot of special safety panels. All of the Shuttle missions were very good experiences, and were high-profile missions that have gained a lot of science. It was

really just the process of getting the Payloads ready for flight and launched that was more difficult than it needed to be. For me, it was a very good and productive part of my career.

But once I came back from Jet Propulsion Laboratory, I went into the development organization. The main reason I did that is because when I left JPL, they actually gave me a project called the Mars Ascent Vehicle to bring to KSC to manage for them. It was going to be a little five-foot rocket that was going to launch from the surface of Mars and take samples of rock and dirt back to Earth to analyze for signs that life might have existed on Mars as some point.

That project didn't pan out because they had the two Mars failures, and the Agency decided to redo the entire Mars program architecture. I then was assigned in that same development organization as the Director of the Project Management group which did development work for the Shuttle and Station Program as well as the ELV Services Program and the Institution. The group developed new tools, new technologies that helped solve problems for those programs. For example, we developed a tool to get moisture out of the Shuttle tiles. We also developed upgraded systems that replaced old Shuttle system with obsolescence issues. For example, we developed a new MSBLS [Microwave Scanning Beam Landing System] to support Shuttle landings.

I had no interactions with the Shuttle Program in that role. My interfaces were with the local KSC representatives in the Shuttle and ISS Processing organizations. Although there was some interaction with Shuttle processing, I had no day-to-day processing involvement in Shuttle.

Then in 2005 I was assigned as Shuttle Processing Deputy, an assignment that I was very excited about and requested. As Deputy, I was now very involved in all aspects of the project, cost, schedule, and technical. This project is the largest dollar value amount project element of the Shuttle Program. We're about 4,500 United Space Alliance [USA] contractor workforce and

about 550 civil servants. That has been as high as 5,000 contractors and 600 civil servants, but it's starting to get smaller because the Shuttle Program is near its end. So it's a very large project. And there's a lot of aspects of this project element that is different than a lot of the other ones because of the large amount of infrastructure that is associated with it, launch pads, MLPs [Mobile Launch Platforms], VAB [Vehicle Assembly Building], special Information Technology systems.

The one thing I notice about my job that's a little different than some of the other project elements is theirs is one specific piece, and it doesn't have all these tentacles that touch every other element the way Shuttle Process does. This project element is more comprehensive because it has all that infrastructure and it's where all the flight hardware and the people come together. What I've learned here is that as a leader of the organization you have to be very customer-oriented because a lot of organizations are giving you requirements to implement. A lot of people are throwing things your way, so you've really got to be able to have a lot of patience, and you've got to be able to work really well with other people. You've got to work hard to understand what they need you to do with their hardware that they're bringing here, and that now you're responsible for integrating it all together and getting it ready for launch. So there's a lot of communication, and a lot of forums.

One thing that I think is a good practice is that we have extensive upper communication. Federal Government Survey-wide we're considered a model organization across all federal agencies for upward communication. I think it really is a best practice because when you are the ones that are pulling all the hardware together and integrating it and getting ready to launch, and you've got Marshall [Spaceflight Center, Huntsville, Alabama] and Johnson [Space Center, Houston, Texas] and Stennis [Space Center, Mississippi], and all the contractors from Utah and



California, et cetera—they're all playing into the process of getting the vehicles ready for flight. You have to have a really strong communication system.

We start every morning—it is a regimen. Every morning you start quarter till seven, and you're talking about the status of the vehicles. “What issues are we working? What is it going to take to get the issue resolved?” Then that rolls up to a 7:10 meeting where we go over it again. We talk about more long-term issues. Then there's another meeting that ties in the Payload guys that are going to be bringing the Station hardware over. There's Shuttle stand-ups every Monday and Thursday. There's engineering tag-ups that talk about just the technical issues, and what other Centers are needed to resolve these things. So a best practice is really talking about these things over and over again to really get everybody on the same page, because it is so massive. Like I said, we have the 4,500 contractors here, plus the 550 NASA people, plus all the other Centers playing a role in how we do work, and how we disposition problems.

So it's really important that there's a ton of communication. It's interesting because years ago, I was an intern for the Center Director, and at the time it was Bob [Robert L.] Crippen. So I got to, for six months, kind of see how management worked at the Center. I remember following Bob [Robert B.] Sieck around for a day, and he got me involved in all that upward communication. I remember thinking, "A lot of overkill. Why in the world do you have to talk the same things over and over again in the various meetings?" Now that I'm in the job, and I realize the complexity and the multiple interfaces required to pull everything together, I see how necessary it is, and what a good practice it is. But it's interesting having a perspective from the outside looking in, and then now being involved in it, understanding and realizing why that is such a good practice, and why it's so important to do in that way.

WRIGHT: Those meetings that you were just talking about, are they with people, as in you sit down together, or is it telecons [teleconferences]? How do you get folks together to do those?

WILLCOXON: There are pockets of people that group together in their locations, and then it's teleconned around the Center and then around the Agency to get everybody tied in. The meeting I was just in—which is an Engineering Review Board—that's where we talk about and resolve technical issues. People will telecon in from Boeing [The Boeing Company] in California, and from Houston, and from Huntsville, and from Utah, depending on what element of the Shuttle that we're working a particular problem on. In this one, there's a lot of people interested in making sure that when the pad repairs are done, that we don't have debris that can lift up and hit the Orbiter, which would be an issue. Just about everything we do touches some other piece of the program, and so we have to be extremely good at making sure all the people are pulled in that have a say in how things are resolved and how we can get to flight rationale for the next flight if we have a problem.

WRIGHT: Do you have a process in place, or what is the process to make sure that all those people are identified? How do you approach that?

WILLCOXON: The Certificate of Flight Readiness really is the formal process that ensures that everything we do to the vehicle, how problems are dispositioned, is close-looped, and verified complete. It's a continuous process throughout the entire flow to get the vehicle ready, integrate the vehicle with the SRBs [Solid Rocket Boosters] and the ET [External Tank], how you test it out, and you get ready for launch. All of that rolls up into checks and balances on all the

requirements, and how all the problems are resolved. Then at each different milestone that we have—there are multiple milestones throughout the course of that flow—you are ensuring that everything's closed out at each milestone until you eventually get to the Certificate of Flight Readiness. My review is called the Launch Readiness Review. That's when my team certifies that all the systems are ready to go and that we don't have any issues. Or if we do have an issue, and there's a COFR exception—Certificate of Flight Readiness exception—it's been fully briefed and everybody understands why we have an exception to that particular requirement.

WRIGHT: Tell us about a time that—when you are getting all these facts and you're sharing all this information—that you've had contradictory opinions, and how those are resolved. What process is in place to move that further where you can resolve an issue?

WILLCOXON: There's different levels of review. The first level of review is really at the discipline engineering area. They work their issue, let's say it's a particular system, a ground system that interacts with the Orbiter. So they work it within their community of discipline experts. Then the next step that's integrated brings it to the Engineering Review Board. That's where everybody comes together, and the other elements of the Shuttle Program are involved, and they listen to how we are solving a particular problem. Then let's say that in that, the technical community comes up with a position.

If it's an integrated-type problem that involves multiple elements that's eventually got to go to the Program, it'll go to a Risk Review Board, and they'll assess the risk tradeoffs associated with that particular thing. Maybe they looked at a couple different options, and they'll assess the risk associated with each of those options. If the decision is technical only, it may be made there.

However, if it involves a tradeoff between cost or schedule and technical, then it comes to my Level Three Configuration Control Board. That's where we decide and we look at the balance between the technical solution, what it might cost, or what schedule impacts it may have.

Let's say that I decide that I think we can defer that particular technical fix for one flight, and that we have flight rationale for that, and the reason I'm doing that is because it protects the manifest. Then we go forward to the program, and we recommend a solution, and maybe we recommend that we defer the fix for a flight. If the technical community doesn't like that answer because they really want to fix it this flight, we prepare a dissenting opinion, and that goes forward with the package. So I go and present at the PRCB [Program Requirements Control Board], which is with John [P.] Shannon and/or LeRoy [E. Cain], our position on a particular topic, and then we'll say that there's a dissenting opinion. If there's one strong person or spokesperson, they can actually present that dissenting opinion, or we present it and they're there to answer questions.

But we have had very few of those at KSC. We tend to be able to, through the different processes, always come to the same recommendation. We've had a couple of things that we disagreed with the Orbiter Project on, that our Safety and Mission Assurance organization community brought forth as a dissenting opinion up to the program, but it wasn't really disagreement by the KSC Shuttle Processing team. We tend to work it out here for the most part. That doesn't mean there never will be, and we have a process for it if it ever comes about. But we usually talk. We spend a lot of time talking it out, and the pros and cons, and understanding why we, in the end, recommend a certain position. And most of the time—or all the time so far—people have been able to understand that and can concur with it, even though they might

rather do a technical fix that time. They can understand the bigger implications and why maybe for this time it's okay to defer it one flight.

WRIGHT: You have so many aspects, as you said, that you're responsible for, and of course so many people that feed information up to you. What are some of the elements that you like to instill with your management system that helps people know that they can come to you and share this information? What are those types of practices or just things that you tell people—"please do this" so that we have this kind of communication effort that you need to have to make your decisions?

WILLCOXON: I try really hard to make sure people know that I'm approachable. I have some techniques, if you will, that help me be more approachable. Every time a new employee comes in, I send them a welcome letter, and I talk to them about my expectations, about the organization, and open communication, and open door policy. I have a job-shadowing program where every new employee comes and spends a day with me. They get to know me, I get to know their first name. The employee can then leave knowing that if they ever have an issue, they can call me or e-mail me. It's how I express to people and prove to them that I am approachable and that not just somebody sitting in another building that they barely know but rather a leader that is there to help them if they need it.

I have somebody that I put in place called my Communication Lead. It's an extra duty for her, but she makes sure that I go out in the field once a month, and I have small group meetings with people to talk one-on-one about what their issues are. Again, it's just another way to make sure that they know that I'm always there for them, and that my focus is on the people.

Then of course all those other processes. I think they see that I'm a manager that listens to everybody's point of view. I try to make sure that I go around the room and check people to see. You look at their body language and see—you think they might have something to say, but they're hesitant. So I try to use those type of techniques.

In the contractor workforce, they're huge, so it's a little bit harder for me. I try to do a lot of getting out in the field and just shaking people's hands, seeing how things are going, but it's really hard because there's so many of them. USA's management, my counterpart, I think he and his deputy are excellent at getting out and doing the same thing with their workforce that I'm doing with the civil servants, so I ask them about that. How are they getting out? Especially now, with the program ending, they're conducting employees sessions, and I'm with them.

Just today, I've asked throughout my organization, and they've asked throughout theirs, "What are some things we can do to celebrate the ten launches we have left? What are some employee morale-building things that we can do? What are things that we can do for communication?" So we've both come up with a list, and now we're honing in on a set of about a dozen things that we can go do with the workforce that treats them special, and lets them know we appreciate them. Things like, we're going to come up with a database that we can all input into about what are the "above-and-beyond things" that people have done. Then we're going to have managers and crew members write personal notes or drop by their desk and say, "Hey, we really appreciate what you did on that particular topic."

We're going to try to figure out how we can work with the Center to see if they'll let us do some more open houses so employees can bring their family out and see the hardware and learn more about what they do. So we're going to focus on the people and show our appreciation towards what they do everyday. Those are some things that I do as a leader to make sure that

people know that we're all about them and we're here for them, and if they have an opinion that's different from the group, they should be comfortable expressing it, and that there won't be any retribution for any of that. It's an open communication environment.

WRIGHT: When you were sharing with us the areas that you've worked, I heard a lot of what you've been encountering through these years is that you'll be given a task, and then you just have to approach it full force and come up with a resolution, whether it was coming up with trade studies or if it was coming up with development. When you've got that type of an open-ended answer to a question that's not really quite defined, what is your approach for tackling those types of situations? How have you been able to move through all these different types of projects, and what goes through your mind of, "I've got to do this and do this?" What's your planning or your process that seems to have worked in all those different types of areas that you've done successfully?

WILLCOXON: Again, it's all about the people. When you have a tough problem to tackle you have to make sure you have the right people with the right knowledge involved in solving it. So if you have that from the get-go—then you provide a vision for that group about where you're trying to go. I led a group of 14 teams—and each of the teams had industry, academia, other government agencies, and NASA on it—to try to figure out what are the different technologies we need to go back to Moon and Mars and to lay out a 30-year plan in each of those different areas. That was the biggest thing I ever did.

So the first thing was get the right experts on it and we did, the most knowledgeable experts from the Agency, industry, academia, and other Government agencies. Then I laid out a

vision of the end products we needed to develop and the process we were going to use to complete. You've got to spend a lot of time as a leader envisioning where that end state is, and then you've got to lay out a plan, help them help you lay out a plan of how do you get from a zero piece of paper to a solution set? Once you've done that, then you're going to move a little bit, and you've got to be flexible. You can't just formulate this plan, and then when new ideas come up along the way, you can't say, "Well, that's not on our plan so you can't do it." So you've got to be flexible and let the team move a little bit, but you can't get them off on a rabbit trail so that you never get back to the end state that you're trying to accomplish.

So I think it is the right people, laying out a vision, really thinking through what it is you're trying to achieve, laying out a really good plan to get you there, and then delegating to team members and empowering them for different pieces of it to help lay it out. So just about every team I've led has broken into, "You give the person with this expertise the lead to go do this little piece of it, and another person the lead for another piece," and then everybody knows what the path is to get back to the main goal. Then they go off and do their piece, and then it all starts coming together. All of a sudden, you have this beautiful product or right solution. That's how most large things get worked off and seem to be quite successful.

In everything you do, the people are key. That's why my number one priority is the people. Because I feel like if I take care of them, they take care of everything else, and so I really emphasize that more than anything. I was the first female that's ever had this job. It's always been a line of men. I am not sure they focused one of people as much as they could have. What kept the organization going was the mission's so exciting and the work's so important, so everybody focused on it. But they didn't really do a lot of succession planning, and they didn't really do a lot of caring and feeding for the individuals' careers and laying out a map where they



could actually develop themselves. I took over as the Director a year and four or five months ago. I was the Deputy for that for a year and a half, and I started working on some human capital initiatives as the Deputy, and as Director now I've been able to do even more.

We have formalized succession planning now. Our management team has identified potential replacement candidates for all positions at the GS-14s [General Schedule, pay grade scale] up to SES [Senior Executive Service]. We've had formal sessions where we've talked about each of those individuals' strengths and their improvement areas. We then provide that feedback to those individuals. In addition to that, I've developed a leadership expectation model for every grade level in my organization, for [GS-] 13, 14, 15. The models show expectations for 13, 14, and 15 team leads, and then 15, Branch and Division Chief. It's a set of expectations that includes diverse experiences, behavioral characteristics that we're looking for in people, training, and discipline knowledge. So if an individual is a GS-13 and they aspire to be a 15, they can get that 15-level plan, and they can see everything that their management team expects of them to get to that grade level. So they can work to develop themselves and put themselves in a posture to better compete for promotion opportunities.

If they have behavioral issues—which some people do and they do not realize it. That's a lesson I've learned in every job I've had, not just Shuttle Program. I've seen people who can go only so far. They're good, they've got great work ethic, they're smart technically, but they are lacking teaming and relationship skills. Their leadership is limited because they can't get people to follow them, and they absolutely do not see it about themselves. Management avoids it because it's a very difficult thing to talk about. So that individual finally hits the brick wall, and then they start believing that people are getting promoted because it's the "good ol' boy" system or they're the favorites, because they don't see that they have shortcomings.

I'm hoping in this model that we've developed, with its expectations on personal attributes, it will serve as a good tool for the supervisors to provide constructive feedback with their employees. I'm also doing a lot with coaching and mentoring. So if we have an individual that's a really high potential, but they're really struggling with those behavioral traits, and we know that its holding them back this tool as well as coaching and mentoring will help them. Also, the leadership model lists classes that are suggested to help with some of these things. We are also looking at developing our own 360 feedback tool, which is more applicable to leaders at the GS-13 and GS-14 level since most of the products that are available are for more senior leaders.

We worked on the model for a year and have rolled it out to the employees for this upcoming performance year. Career development of my employees is very important. I think that people know that even though the program is ending, their management has a very strong, vested interest in their development and where they fit into the future.

We are called Launch Vehicle Processing because we are doing Constellation as well as Shuttle. We changed the name and got involved in the Constellation work so the workforce saw a path to the future after Shuttle. So we have that going for us. So most of my civil servants don't really worry about what their job's going to be after Shuttle is over because they already see that we're doing this other Constellation work.

WRIGHT: That was one of the topics that we had for discussion, was how would you suggest to better equip and train the next group of Agency leaders? It sounds like you've got those pieces already in place to do that.

WILLCOXON: Yes, we're working really hard at it. It's very important. In fact, our biggest challenge right now, from a civil service standpoint, is getting both jobs done. Because now an organization that's really only had to do Shuttle for years is now having to juggle between two programs, and set more priorities, and make decisions about what they do each day. It's a good problem to have; it's certainly a better problem to have than worrying about what you're going to do in two years, or if you're going to have a job in two years. And my group really doesn't worry about that too much.

WRIGHT: It sounds like the things that you've done in the past have all come together. Studying, development, leadership—it's all of those pieces that you've done. Now you're needing all that experience because you've got all this new avenue in front of you.

WILLCOXON: Yes. One of the things that probably would be worth mentioning—and I don't really know the background of all the Project Managers—but what I've typically found is that people are put into some of these Project Management jobs and they really have had very little background in the business side, with budget and contract experience. It works okay if you're a real quick study and you pick it up and you can put somebody in your organization that does that for you. When I did an internship early in my career with the KSC Center Director, Bob Crippen, I realized as a GS-13 that most of the issues discussed by the KSC Center leaders revolved around budgets and contracts and business-related topics. I was all technical, and I did not have any of that background. So I said, "If I ever want to be in senior management later on in my career, this is missing out of my toolbox."

So when I left that, I went back to the Payload organization that I came from, but I asked to go into a Project Control Office to learn budgets and contracts. I did that for three years. It has been invaluable. I've been able to move into a lot of different positions at the Center and even some of these studies I've done with the Agency, and because I had that three-year background I think it equipped me to better perform those leadership roles. A lot of people get promoted up to these jobs because they're good technically, and they've never performed the business side of project management. The Shuttle Processing Budget is \$740 million a year. That's a big budget with contract technical management responsibility and award fee determination responsibility. I would bet if you looked at the experience of many of the leaders and project managers, few of them actually performed a business function at a lower level before managing millions of dollars.

WRIGHT: Do you have any thoughts on how best to balance the efficiency on your programs compared to cost elements? Because the cost of everything's going up, or your budget's being reduced—how best have you been able to look at those and balance that out?

WILLCOXON: You've just got to look at it in terms of risk. In our case, one of the things that we're reducing as the end of the program nears is the amount of modifications and upgrades to our ground systems. So the budget for that used to be \$40 million a year, it's now down to about \$4. Now you've got \$4 million dollars versus \$40. So you've got to look at what are your highest risks across all the different ground systems, and where you need to make investments. It's all a risk assessment, and so you need to put your dollars where things could cost you a launch or cost you weeks in the schedule. As your budgets go down, you have to do more of

those risk assessments, and really do those tradeoffs, and make sure you know where your vulnerabilities are.

WRIGHT: You are making so many enhancements to your area here, and I remember when you were talking about the Agency-wide study that you did for the Station and Shuttle, these had been things that had been talked about before but never got resolved. Did you have any thoughts on why those had never been resolved until after that?

WILLCOXON: Since the topic had been studied several times, one of the first things our team did was talk to members of the other team to ask why their recommendations weren't implemented. What we found was there was no follow up from Agency management to ensure the recommendations were implemented. So our goal was to figure out a way to institutionalize some of the recommendations that we were putting in place. From the onset, that was really our focus. Then sure enough, at the end of that study, a major thing happened. [Space Shuttle] *Columbia* [STS-107] accident happened. The President [George W. Bush] came out with a new Vision for [Space] Exploration. The purpose of the Station had totally changed. So basically everything in our study didn't matter anymore. We had a new Vision.

But it was interesting because we had all the right steps in place. This time, I think it really would have worked, because we had a way to go back to get it approved at the Agency level by the Administrator and to make sure that all the recommendations had to get implemented through the Agency management. In other words, they were going to have to go back and status each of the recommendations and how they were implemented until they all got

done. That's how it was going to stick. We had that commitment, all the way up to Fred [Frederick D.] Gregory when he was the Deputy Administrator. Then when all that happened—

We spent nine months and a lot of travel time because we went all around the Agency, we talked to everybody that was involved in the process. We laid the whole process out. Nobody had ever done that before. All the things that they had done wrong in some of the other studies, we talked about them. “Why did this study not work? Why did nothing get changed because of it?” When we gave an outbrief to the Deputy Administrator our team told him, “Don't study this anymore if you're not going to do something this time.” We also gave Agency management the background of how many times this subject had been studied and all the recommendations that had not been implemented.

WRIGHT: So I guess that would be a management process that you'd like to see improvement. If you're not going to implement, don't study?

WILLCOXON: Definitely. I mean, when are you going to learn? Either you're going to do something about it, or you're not. Then it just got overcome by events. That happens sometimes in government. Policy changes, presidential change-outs occur, and it's okay. It's interesting now, because with the National Lab concept—there's some people who are looking at utilization right now as a part of that National Lab, and they wanted copies of the study.

WRIGHT: It's still useful.

WILLCOXON: Yes. Somewhat. The best part of it was the relationships we built on the team. It was a really good team. We're all really close friends. We still keep up with each other. It was one of the best teams I was ever on.

WRIGHT: Any other thoughts on, as Constellation comes into play or this National Lab, things that you see that really need to take place in order to keep the confusion down and to keep the processes flowing? Any other basic principles that you want to share?

WILLCOXON: Yes. We talk about this a lot because history seems to tend to repeat itself, and so one of the big things at Kennedy Space Center is we operate the vehicles, we turn them around, and we launch them. We do that over long periods of time. So when a new program starts up, you try to influence the design of the vehicle so that you can operate it easier with less people on the ground. Each generation that works on a new program like this says, "It's going to be different this time. We're going to infuse operability into the design, and we're not going to have the same situation as Shuttle or as Apollo."

Most of it doesn't get documented as to why decisions were made the way they were. So what we're finding now on Constellation is—we're trying to do that. We're trying to put requirements in place for operability, and as some of our ancestors that worked Shuttle told us, "You can try to infuse operability, but every time the tradeoff's going to be flight performance over how you operate it." Traditionally, what we do is—because we don't have enough money at the beginning of a program to invest in new technologies or methods—we use a lot of the same infrastructure to save money. We make the tradeoff of the flight design versus the ground, and

so we get the same thing. The same thing is happening on Constellation. The majority of things operability items are getting traded for vehicle performance.

However, the vehicle is going to be less complex, so we probably will have fewer people at Kennedy Space Center processing the vehicle. But it won't be because of lessons learned associated with operability and design. You've got to learn that the reason it was done that way was because—it was done for good reasons. But we keep doing it to ourselves over and over again, and a lot of it is because when you start new programs, you don't have a lot of money. So it's like a vicious cycle that keeps occurring over and over again.

You try your best, and we've had a few successes. We are developing a business system architecture to process the Constellation vehicle using paperless systems, where everything's linked together, which will require fewer people to process a vehicle. We're actually starting it in Shuttle so that we have two years to try it out before using it for the Constellation Program. That's good. We're thinking a little bit different about how we do business on the ground and taking advantage of technology. That'll be some savings, so we've learned from that. But a lot of the stuff, like systems on the vehicle that cost a lot of time on the ground—we've tried to make those requirements, to design that stuff out. Most of them have come back into the design space and we've not had a lot of luck there. But we keep trying.

One of the things that we don't do well is to justify the business case for doing that. We don't have a lot of good data that shows if you make the tradeoff of the flight vehicle versus the ground, what will your life cycle cost be? So decision makers can think more about, "Maybe I do want to take a hit on flight performance if it's going to cost me billions of dollars more over the life of the program." We tend to just tell them why it's a bad choice from an operability standpoint, but we don't do as great a job as we could of backing it up with cost data. Because



sometimes it's hard to quantify. That would be a lesson learned on our part, is to have better breakouts of cost.

WRIGHT: What kind of advice would you give someone who wants to come into the Space Agency at this point in time? Someone that would like to start their career at NASA?

WILLCOXON: It's been a great experience for me. There are opportunities everywhere. If you want to do something different, they are there for you to do. The other advice I would give is just get involved and work hard. Always continue to learn. If you're not learning in a job, then move. Don't get yourself to where you're stagnant and you're just comfortable with what you're doing. I typically move every three to five years because usually by that point in time—I don't know everything about that position, but I know enough about it that I'm not challenged as much as I need to be I would say come in, learn as much as you can, don't box yourself into one area. Look for opportunities outside that. When I was younger, I would do my job, but I would be look for things that were going on, maybe a team at the Center, so that I could get to know other people and know other areas, get a bigger picture of where my job fit in to the rest of the Center. I found time—even though it might cause me to work 50 hours a week—to get involved in some of that activity so I could expand my knowledge and expand my contacts.

Also you should take opportunities even if you are not comfortable with them. Don't be scared of a challenge. When Agency management asked me to lead the capability roadmap development, it was outside my comfort zone. I've hadn't developed technology in my previous position so why were they asking me to lead this? But it really wasn't about technology. It was about, "Can you take a large number of people and a huge task and actually bring it to a product?"

Do you have the leadership ability to do that?" I was a little intimidated about it, and thought, "Well, you know, I can give it a shot."

You can't be afraid to ask for help. Don't get yourself in a situation where you think you have to do it yourself or you're going to be a failure. I know when I'm in trouble, I'm not afraid to go ask for help. I don't try to do everything myself; I try to delegate it out. I've gotten better at that over the years. When you're younger, you think you've got to prove yourself more, and then as you get more mature and you understand that you can accomplish so much more with the team. I think you've got to learn that as a leader. How important it is, and how much people want to work with you and for you if they know that it's not about you.

It's about the team, and that they know that you're going to give them opportunities to grow and expand in their knowledge base, and some visibility and recognition for their contribution. I've learned over every year that I'm out here that the more you delegate, the better leader you are. It seems like the more that you expand out and try to get other people engaged and develop them, then it naturally develops you as a leader so much more than if you're focusing on yourself. So for years now—I don't focus on myself at all. My number one goal, again, is to take care of the people, make sure they've got everything they need, and then they take care of the mission. So that's what I'm all about.

WRIGHT: Earlier you mentioned that you're the first female that's been in this job, and as I just asked that question about the next group of people coming in, do you feel like the opportunities are different now, or did you always feel like there was opportunities for you as a female to move up?

WILLCOXON: Always. I always did. In NASA, managers are just looking for who's willing to step up and lead and get things done. I've really not felt that there's been any holdback at all. Maybe it's just my personality. I'm never going to back off of an opportunity. If somebody thinks I can do something, I'm going to step up and try to do it. Of course, this organization for a long time was mostly men. If you look at my direct reports right now, we have over 50% female.

WRIGHT: So that's a change?

WILLCOXON: It's a big change. In fact, we just did a Standing Review Board that the Shuttle Program is undergoing, and I wanted my org [organization] chart with pictures on it. How many Division Chiefs do I have? I think I have seven or eight, and four of them are women. So 50% or more. I just know there was a lot of female faces on that org chart. I thought, "No, it's not just because I'm a female that I hired a bunch of women," they were the best for the job. So I think it's just changing. I think KSC in general—even the Payload organization I was in—there was a lot of up and coming females as I was growing up, about in my age category, that now are in leadership positions. You're seeing more at the top than you did when I first got here. However, KSC has never had a female Center Director.

WRIGHT: Yet.

WILLCOXON: Yet. We have a Deputy now, though. This is the first time we've had a Deputy female.

WRIGHT: Do you feel like there's a hardest lesson or the best lesson that you've learned through your experiences, something that you try not to forget on a daily basis or a routine basis?

WILLCOXON: The hardest lesson is learning how to accept failure or defeat even after putting your heart and soul into an effort. I learned that leaders above you judge you by how you can recover from those let downs and move on to your next challenge. The best lesson I learned was that you have to treat people differently and according to their needs. I learned that as a young supervisor. After becoming a supervisor, I started out with the mentality that, "I have a certain work ethic, and it's made me successful, so everybody should be like that." I quickly realized that wasn't true. I learned that you've got to treat every individual that's on your team differently based on their needs—you've got to know them well enough to do things that personally motivate them. You've got to mentor them at different levels. Some need more mentoring and guidance than others. Some need to have full empowerment and know that you trust them to get the job done. You've got to be able to gauge that, and you've got to be smart enough to lead your teams so the individual members best utilize their talents. I think that is key.

The behavior of the managers was a lot different when I first started out here. We had some really gruff managers that were old style leadership which directed people much like a dictator. We had a lot more of those managers who cut people down, and screamed and yelled a lot, et cetera. The newer managers today "get people engaged." They treat people with respect and empower them to do their jobs. I've seen it evolve since I've been here. You have very few of those old style leaders at the Kennedy Space Center now, and even in the Agency, and it's because the newer generation of people do not respond to that. Earlier generations of people

were used to being told what to do: go to work, earn pay, et cetera. The new generation are motivated by many different things, and they won't accept that kind of leadership.

So I've seen it change drastically over the years. You really do have pretty strong leaders now that are really more about the people. I've seen some leaders that treat people poorly, and it'll go for a while, and then eventually you see those people disappearing. They've put them in some other job. The system won't tolerate it for very long anymore. Whereas in the past, the system thrived on that. That's how things got done, and it's just not that way anymore. That's a big change over the past 20 years.

WRIGHT: Sounds like a good one. Well, thank you. Is there anything else you can think of you'd like to add before we close? I don't want to take up too much more of your time. Certainly when you get it and have a chance to look at it, if there's some more things, feel free to add because there was a lot of good points. We appreciate everything.

WILLCOXON: Yes. The Shuttle Program is a great organization, and the group in total is so bright. One thing that I will offer is that—since I've been here, it has matured, the team as a group. There was a lot of long meetings and poorly held meetings, and a lot of emotional discussions. We've learned, as a team, over the last two and a half years since I've been associated with it, and we've matured immensely. It's a pretty drastic change, and it's fun to be a part of how it's evolved. Maybe, too, it's the times we're in. We've gone from a really rough time of trying to just get one flight off, to now we're launching four or five times a year, and so we're at a good state now. It's cool to be at a state like this. It's kind of bittersweet. Here you are, you're launching four or five times a year, the team's performing tremendously, the group

dynamics is excellent, we've got it down pat, and then it's going to end. So it is a little bittersweet that we're really at the top of our game.

WRIGHT: At least you're going to go out on the top, so that's the good news.

WILLCOXON: Yes, going out on the top of our game. Like I said, a lot of us—our organizations have a foot into the future, and so we're not going out of business. But the Shuttle Program was a great program, and there's a lot of camaraderie and a lot of shared success and passion and love for what we do. I get emotional every time we launch. My heart starts pounding when we get into the count and we're getting ready to liftoff. And everybody feels that way. There's these huge smiles, and there's hugs, and congratulations and all that after each launch, as if it were the very first one. Now times are good because we're moving, we've got fewer problems and all that, and it's just really neat to be a part of it. Then we have budget meetings and we see the budgets going to zero—that's the bitter part.

There is one other thing that I think probably should be captured—when we've gone from Shuttle to Station, and then now Shuttle Station to Constellation—every time a new group starts, the general attitude is, "We don't want to do things like we did in the Shuttle Program or the Station Program." The Station Program said that about the Shuttle. You get people in there, and their goal is to do it all different. Then the attitude towards the people working the new program is, "We don't want them involved because they're going to drag us down and do things they way we did it in the past." Then you get a little resentment from the people who are doing the present programs because they think, "We're doing a lot of things right and we know best how to change the things we didn't do so good." So the lessons learned from my perspective is when you're

starting a new program, the way you frame that, as the leaders of the new program, is that, "Hey, we've learned a lot from the program(s) we've done in the past. The technology has changed, things have changed, and so we're going to take all those lessons that from the programs that exist today or that we just completed, and we're going to make the next one better." Doesn't that sound a whole lot better than, "We don't want to do anything like they did it on those two programs, and we don't want those people involved." That has happened every time I have been involved in a new program start.

The leadership is what sets the tone for a new program. It's the tone and the perspective that they lay out that builds the culture from day one. The message should be, "We've done great on past programs but we've made some mistakes." Let's learn from those mistakes and make the next program better. To me, a big message that should be passed from one program to the next, is that great things have happened in the programs of the past. Let's take the good things and embrace it. Let's take the things that were not so good and let's change it on the next program. Let's appreciate and recognize that the people on the existing programs have a lot of experience and knowledge, and we'd be crazy not to use them and their lessons as we build the new program.

Frankly, I don't even think that the leaders that start the new programs mean it that way. They're really just trying to get a message across that, "Hey, we need to do things different and better." But the way they frame it is so huge, and then it permeates down. It's interesting. I saw it happen from Station to Shuttle. "We're not going to do Station like we did Shuttle." Then, funny enough, in both cases they end up doing things almost the same anyway, because we *do* do good. There's little things that you tweak—like I said, the work control, making things

paperless—but you don't throw everything out and start all over again. In the end, we don't do it anyway. The next program resembles the first one very closely.

WRIGHT: All right. Well, thank you.

[End of interview]