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

JOHN J. TALONE
INTERVIEWED BY REBECCA WRIGHT
KENNEDY SPACE CENTER, FLORIDA – JUNE 11, 2008

The questions in this transcript were asked during an oral history session with John J. Talone. Mr. Talone has amended the answers for clarification purposes. As a result, this transcript does not exactly match the audio recording.

WRIGHT: Today is June 11, 2008. We are talking with John J. "Tip" Talone, who served in a number of leadership positions in the NASA Space Agency, especially here at the Kennedy Space Center in Florida. 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 coming into the Center today to talk to us. I know you've been enjoying retirement since January, so we're happy that you took time for us for this project. You were telling me about how you had been away from the office for a little while, but before we lose all your knowledge that's in your head, maybe you can share with us some of the duties that you had here and how you were involved with the Space Shuttle Program.

TALONE: I first got engaged with Shuttle back in 1974 or '75, right at the end of the Skylab Program. I was still working ASTP [Apollo Soyuz Test Project] as a launch vehicle guy here for NASA on Saturn. Then we started to evolve. I started working the requirements for transition of the launch pad from the Saturn Apollo vehicle to the Shuttle. I had been an operations guy all my life. I've been in ground operations. So I also began to work the ground operations planning for Space Lab, because they were coming along. We had Space Lab coming along, and we were

getting ready to change the facilities over for Shuttle, so I was doing some of each. I was the only Space Lab Ops [operations] guy, and I was actually the only guy working pad requirements for Shuttle when we were still in process to launch the ASTP mission. And that was in '75, '76. It came to a point where my boss at the time said, "You need to make up your mind what you're going to do here." I said, "I like that Space Lab stuff. Going back and forth to Holland and Germany and drinking beer." He said, "I think you need to go out to the pad and convert the pad." I said, "No, I really, really, really don't want to go." He said, "No, you're going out to pad." I said, "Well, why did you ask me?" He said, "Don't worry. I always take care of my boys." I'll never forget that line. "Always take care of my boys." I've used it a few times since.

Once the ASTP was launched and we were getting out of the Apollo/Saturn business, I went out and I started working the pad conversion, building requirements, and then we moved out to Pad A. We had a team of NASA and contractor folks, and I was the pad manager at that time, and we did the conversion while the Shuttle vehicle was evolving and showing up at KSC. I had this glorious experience of being out there at the pad converting all the systems, doing all that outside construction work, fun stuff, while being totally ignored by the Shuttle management because they were in such a to-do over the Orbiter. "How do we get it down there, and how do we get it launched on time?" Charging ahead without a flight vehicle, we were spared a lot of "help", so we managed to get our job done. Got it done ahead of time. Got it done with the least amount of supervision. But I had a good team, I had good guys—contractors and NASA guys as well. It came together very well. It came together ahead of time, as a matter of fact, but it was certainly helped a lot by the fact that [Space Shuttle] *Columbia* had its own problems between the tiles and other things. That stretched out the schedule. We had good contractors, and we had a lot of good teamwork out there, so we got it done.

I got moved out of that job, and got assigned to Integrated Operations for the vehicle. At that time, NASA was managing—here at KSC—was managing the integration and test of the tanks, SRBs [Solid Rocket Booster] and Orbiter from stacking through launch—we didn't manage the offline stage-unique work, we managed the online operations. So myself and one other guy were leading a team of the various contractors managing the integration of the vehicle from stacking all the way through launch and recovery. That was a lot of fun. I did that for a few flights. STS-1, 2, 3, 4, 5—I think through 7. Then I was asked to be what we call here a Flow Director, which was really an operations manager; the NASA Operations Manager for a specific Orbiter mission.

At the time, we had two vehicles; we had *Columbia* and *Challenger*. A decision was made to reorganize. They gave Bob [Robert B.] Sieck *Columbia*, and they gave Jim [James F.] Harrington [III] *Challenger*, and we were in the manufacturing process of *Discovery*. Management said, "You're going to be *Discovery* Flow Director. Part of your job is to go out to Palmdale [Palmdale Orbiter manufacturing plant in California] and be there through the last six months or so of the manufacturing process with the NASA/contractor team that performs the turnover/acceptance process from Rockwell [Rockwell International Corporation] to NASA." So went out there with a good team, again, and we participated in the final testing, examined the remaining open work that was recommended to be transferred to NASA at KSC, and we scoped it, planned it, packaged it, came back to KSC with the Orbiter, and executed the open work and the first *Discovery* test/checkout flow, and then the next ten flows of *Discovery*.

I then was *Columbia* Flow Director for one mission, STS-61C, because of a problem with the *Challenger* with the tiles, and since the *Challenger* mission was a DoD [Department of Defense] mission, Harrington and I exchanged. He had *Challenger*, but I ended up with

Columbia, and Sieck reassigned to a management position. *Columbia* was going into its first what we now call OMDP [Orbiter Maintenance Down Period] major modification period, where the Orbiter was sent back to the factory at Palmdale and all the major upgrade mods [modifications] are performed. It was the first OMDP and first time *Columbia* went back. It was coming back soon so I went out to Palmdale and did the tail end of the turnover/acceptance. And it was the first re-flight of *Columbia* after major mods, and the flight that immediately proceeded the *Challenger* [STS-51L] accident. I was *Columbia* Flow Director for that one mission, and was slated to go back to *Discovery*, and then of course we had the accident. I headed a team that was part of the accident investigation that looked at the ground processing of the Orbiter at KSC, up to the point until it was determined that it wasn't an Orbiter problem, and then the team stood down. However we provide our own recommendations for how we ought to do business in the future with the Orbiter.

Then I was told, "We're going to build *Endeavor*. Since you've done all this acceptance/turnover stuff before, you get to go do *Endeavor*." I went out to Palmdale, again did the final test/acceptance/turnover with a NASA/contractor team, brought the vehicle back, got it through the remaining open (transferred) work and test/checkout for first flight. Following that mission I was Endeavour Flow Director for ten or twelve flights. Then got called by Mr. [Jay F.] Honeycutt [former KSC Center Director] and told that I was now a [International] Space Station [ISS] guy. I said, "I wouldn't know one if it fell out of the sky." He said, "That's even better, because we're looking for new ideas." I said, "Well, exactly what is it?" He says, "Well, you need to go see George." [former JSC Center Director] Mr. Abbey to most people, including me. I said, "Well, what's he got to do with it?" He said, "He wants you to put together a team that goes out to the manufacturing sites and get the Space Station hardware down here like we did the

Orbiter's. Go to the factory, understand the processes, understand the vehicle, bring it back here, and then prepare it for launch." So that was the end of my Shuttle career.

Went down to see George [Mr. Abbey]. George draped the flag on me—important to NASA, the Nation, etc. I said, "What do you want us to do?" He said essentially what Jay said earlier, and that Randy would give me the details. So I go downstairs to see Randy [H.] Brinkley, the ISS Program Manager. Luckily I knew Randy from before, when he was Hubble Mission Director and I was Flow Director. He and I were pretty good friends. Randy says, "Hey, great to see you, what's going on?" I said, "I'm here." He said, "What are you doing?" I said, "I'm working for you." He says, "Yeah? What are you doing?" George apparently hadn't talked to him, or Randy was fishing. So I said, "Well, here's what George said, Randy" and gave him what little I knew. He said, "Hey, that sounds great, I like it." He said, "Why don't you go back home, write up what you think it ought to be, send it back down here, and I'll sign it." I said, "That's a lot of guidance." He said, "Well, you know better how to do this than I do."

That was the end of my Shuttle experience. In fact, like I said, I've had relatively little to do with the way they do business since that time, because we got buried in that, and our primary job actually for a long time was out in the field at the factories, before the hardware got here. We did two things. We tried to bring KSC Shuttle and Shuttle Payloads processes in that would make life easier for us and the contractors, and ensure safe and successful flight, such as cleanliness and FOD [Foreign Object Debris] and documenting and tracking test requirements successful completion and all the other KSC process things we knew they'd have to do when they got here.

We didn't want them to learn these lessons very late in the process (on our ticket), so we went out and tried to instill positive lessons learned and value-added processes at all the factories

that were delivering ISS hardware, including the internationals. We had some really good teams. Had teams at all those places. We were really facing out rather than this direction. There was a lot going on here at KSC, a lot of flights and other operations, and I was almost totally disconnected from that. Then we got flight hardware here to KSC, and then started getting it ready to fly. Pieces of all the elements. We only interacted with Shuttle during final integration into the Orbiter at the pad. It was a matter of, "Are you ready?" "Yeah." "Here we come." And it goes in, and they were all very benign—they had very little interface active with the Orbiter. So it was just a delivery of an object that'd be delivered in space and activated on orbit.

Then, of course, I again got pulled up by the roots and told, "Hey, we're going to start this Constellation thing. You need to go over there and help figure how to do it." I said, "I'm too old for this. I've done enough of this startup stuff." "No, no, you've got to go do it." So I did that for the last couple years or so. I figured 43 years was enough. I said, "I'm healthy, there's places I want to go, things I want to do while I can." So I retired. Besides, this is a great team over here right now. I said, "I have no problem leaving it in their hands. I won't even look over my shoulder, because they'll do better than I was doing." So I never really dealt with Shuttle much over the last 12 years or so. I'd go to Senior Staff meetings, and I'd hear what was going on with Shuttle, but I was an interested observer. I didn't know how they got into some of the fixes they found themselves in because I wasn't there, I wasn't engaged in it. I would just marvel at the recoveries and say, "That sounds like I've been there before." But that's the way it goes.

Anyway, that's how I got to where I am. Again, always in operations in one form or another, even with Space Station, even over here with the Constellation, because our job here at Constellation was to define the ground operation processes, pass on lessons learned, and to build or remodel all the facilities to get ready for Constellation when the flight hardware arrives. So

that's where I'm coming from when you hear the stories. Keep that in mind. My experience with JSC, with Marshall [Marshall Space Flight Center, Huntsville, Alabama], with the flight guys, has been positive, and we've interacted a lot. Our collective intelligence crosses the bounds. But they do things their way, we do things our way down here, and by organizational mission-driven necessity, they're different.

WRIGHT: You've made an interesting comment about you started up a lot of different types of projects. Tell us about the first steps that you take in your mind of putting these projects together and these teams. What are you looking for from personnel, and then how do you start planning to get the stuff done?

TALONE: The first thing that guarantees your success is to get the right people. That trumps any other thing you can do. You get the right people, you're three quarters of the way there, because you can't do it yourself, and if you have good people, it can get done. With the right people— people that have a sufficient amount of experience, enough initiative, are able to work with other folks to obtain the goals, that understand what you're trying to do. You can give them a simple vision of what we're trying to get done here, and what the boundaries are, and what we can do, what we can't do, what our ultimate end goal is, and they take off and literally drag you with them. Without a doubt, every time and everywhere I've been successful has been because the team I had was superior. In most cases I was given the luxury of doing that. Even out at the launch pad, I pretty much got to pick, at least influence who I felt the right team leader ought to be for each of the contractors. We had four of them out there. Then I was able to depend on great folks out there, and it made a huge difference.

I learned a lesson there. That was the first time I got stuck with a startup deal. Before that I'd been a test conductor in a firing room, so I'd worked teams, but they weren't of my selection—but with the firing room teams we had, they were already so good. When I got into that business, I was really amazed. Maybe I learned it there. I'm looking at these guys, I'm thinking, "These people are superior, and they are self-actuating and smart enough that they need very little guidance other than policy and goals." You don't need to tell them how to do the job, what you need to tell them is what the job is and what's the most important thing—not because you're smarter than them, but because you're getting it down from the top and you have to integrate them together. You're getting the focus, you share the focus and the goal, and then they take off. Those people were my heroes for years.

I was out in the firing room a couple launches ago, when Mike Griffin [Michael Griffin, NASA Administrator] gave me a NASA award. He asked me if I wanted to say anything, and I said something out there just spontaneously, but I meant it from the heart. I said, "When I started back in Apollo," because I was in Apollo from '65 to '76, "I worked in the firing room all through all those years, up until I went out to do the pad job. I thought those people were absolutely giants, that there would never be another set of people that were as good as, smart as, as effective as these people. I was totally in awe of them all the time I worked with them. I didn't think there'd ever be a set of giants like that. But every time I've looked at this changing sea of faces out in the firing room, I've felt the same thing."

I said, "Giants are here. You put them in place, and you pick the right ones, and you find out they really are giants. They're every bit as good as the ones that came before." Frankly, when I'm being honest with myself, these days they're actually better. For a lot of reasons, but they're better. They're better and more effective, and I'm really proud of them. I told the folks,

"I got over that, 'We'll never have this kind of folks.' You guys are those kind of folks." I said, "More importantly, you have to stay those kind of folks, or Mike Griffin's Constellation dream is never going to come true. So we've got to keep on that level if we're going to bring this whole thing off," and I meant it. So the people, people by far, are most important.

Then the guidance that you get, that you filter, that you give them clearly, so that they aren't running around trying to figure out what the hell needs to be done, the goals. You've got to be pretty straightforward with it. It's not that hard, and the simpler you can make it, the better. Like I said, the boundaries that you give them. People are going to go as far as you let them, because they want to do everything they can. People automatically feel like, "I could do this and that and that, too, all at once." Well, you say, "Yeah, but that's not our job. Our job is here. You can help people, but your job is focused here." You've got to give them some boundaries. Give them the goals.

Then you've got to let them get their own people that they feel like will make them successful. Because you're only going to be able to pick a certain level of management. You can't go all the way down. First of all, you shouldn't. You shouldn't feel like you hire a guy to be your—say he's your fluids manager. He knows better than you what he needs people-wise to go do the job. If you pick the right guy, he'll pick the right people. So you don't meddle with that, because he's got to live with them, so you don't want to send him a bunch of people. Let him pick them. Later, if one of them turns out to be a dud, you say, "Well, it wasn't my fault. Why don't you do something about it? I can't do anything about it. You've got him in, now you get him out." It's a building block thing. You pick good people, encourage them to pick good people, and when they meet resistance, you have to block for them to get good people in.

Then the third thing is just that—blocking for your folks. The tough job in these startup things—my job, our job—was to block for those people so that they don't get tackled before they get to the goal line, because there's always interference going on. There's always issues, there's always people that are trying to steal the ball or tug them offline or divert them over to something else, making success difficult for them. Part of your job is to make sure that you do those things, anything you can, to make sure they have every chance of being successful. That means blocking and tackling for them when they've got the ball and for where they're going. Because it's very important that you not only get good people and you send them in the right direction, but that you make sure you don't leave them alone. Make sure, without meddling with them, that they don't get defeated by forces they can't deal with that you can. So you've got to support them, you've got to be there for them.

Startup things, that's it. If there was one more I would add, it would be you've got to ensure that you have firm backing of management, that you have the same thing you're giving your folks, you're getting from your management. That you have the authority and ability and you're going to be allowed to do what needs to be done. And whenever there's a scrum, that they're there helping you out, blocking for you. That's going to be very important as well, because you can't support your guys if you're always looking back and there's nobody there to support you, and you're out there on an island. Maybe you're going in the wrong direction and nobody's telling you. So to me, that's key.

Then after people, I'd say the next thing is you need to make sure that—and one of the things I would tell you that I found over the years is—you need to define the requirements precisely enough for what you're doing that they're understandable and executable, and that there's not too many of them. That you only have as many requirements as you absolutely need.

Because too many requirements kills the program, kills what you're doing, kills momentum, and confuses people. People feel like it's just a burden instead of something that really makes sense. But you've got to have a really good set of basic requirements that everybody has to understand and try to meet, and that puts everybody on the same page. It also sets the goal for everybody the same way.

Over all of the years, what I did learn in Shuttle from that original startup out at the pad was if we get these requirements right, executing it is going to be a whole lot easier. But if we're still flying around trying to figure out what we really want to happen or what we really need, we're going to be taking one step forward, two steps back, changing direction. And we can't afford it, nor do we have time to do that. So I learned that. You get everybody engaged, get everybody to buy in, and you get the management to buy in, and then you've got something you execute.

Then from then on, you try to add as little and few requirements as you possibly can. Be very resistant to new requirements, and at the same time you should be avidly pursuing, "How can I whittle these requirements down? How can I get some of these off the books? How can I compile them in such a way as to make them more efficient?" Allow people the efficiency—you don't want your requirements to be too binding. You want to start expanding limits in the sense of giving more latitude as you collectively get smarter. More latitude, more latitude, maybe even relieving the requirements altogether, maybe change them into a goal. The one thing you can't allow requirements to do is stifle efficiency or figuring out a new way of doing things.

At the startup, hard requirements are absolutely necessary, and everybody needs to get there in understanding, and we all need to get there and get going. Once you get running, you need to step back and say, "Now, are my requirements too hidebound?"—which they had to be in

the startup, you've got limited money, you've got a schedule you've got to meet—but at the same time, you know exactly what you want. Now you got what you want. You need to back off and say, "Now we got there, now we've gotten through the development phase of this thing. Now we're really operating, and how do we do this much more efficiently? Are our requirements a hindrance or are they a help in innovation and new ideas? Are people using our requirements against us to keep doing things the old way, or can our requirements be tailored now to encourage people to think of a better way to do it?"

To me there's a transition there, and it's all based on requirements. Because requirements exist in the Shuttle, and in Station, and even over here—particularly over here with this startup thing—requirements either make you or break you. They can either bring the whole thing down because they're just too labyrinthine and overdone that you don't have a chance to get there from here and afford it, or they're so sloppy that everybody goes in their own direction and interprets whatever they want, and you end up with things that don't even look alike trying to work together. But you must get through that phase. You've got to be ready when you get through that phase to transition into a much less confining environment so that you can encourage innovation and efficiency.

One of the things I observed, particularly when I got into Station, was that the contractors, particularly in a competitive situation, have some terrific ideas about better ways of doing business that probably never even occurred to you. Because you're so busy doing today's business, you don't really spend enough time trying to figure out what's a better way to do the whole business. You do some along the way. You find things that are obvious. But when you work with contractors, and when we went through a competition over in Space Station, we learned so much about what we could be doing differently because we set the competitors at each

other to get efficiencies. We wrote the proposal such that efficiency was a major goal. We realized that had to become much more efficient.

When we had two big guys competing with each other, some terrific ideas came out of that, stuff that we should have—had we set back and had think tanks and stuff—would have thought of half of them, maybe. But the other half were things they learned through their business experiences. They're primarily business operations, they can't survive inefficiency. They can't stand it, because they're usually living on a thin margin. So they use a lot of stuff they've learned in the past in other aircraft or another business they're in and they folded those in. We saw terrific savings over there once we competed that thing. It was a close race, but the same guy won it that won it before. I wasn't on the selection team, but I was the manager of the project and the contract.

But there was a dramatic difference in the cost, dramatic difference in the cost, from before to after. And it got better because of the way the request for proposal was written, and their responses. They had to get better all the time, over the life of the contract. They set their own milestones. As a part of the proposal, they had to say, "We'll be this much better, then this much better, then this much better," as the years went on, based on factual analysis and based on systems they'd proven before. They had to prove it to the contract award team. We bought in and thought, "This would be great if they do it." Well, they've done it. It hasn't been without a lot of pain. Like always, they made some promises that are now causing them to say, "What the hell have we done to ourselves?" But we were the winners, the government was the winners, because we got not only efficiencies, we got some tremendous cost savings.

I would say that as you get into the operational era, your big goal is to try to find better ways of doing business, and you need to go to all your partners and ask them for ideas and get

them engaged. Over here, when we're trying to come to grips with how to do Constellation ground operations, given that the vehicle was changing and moving around and acting differently and had different things—as we learned, as we knew about the vehicle. So we thought we had a nice ground operations plan and a way to do things. We were encouraged to be innovative, and that was a good idea, and so we put out what we called an RFI [Request for Information] to the major contractors. What we literally did was went out to the four major aerospace contractors and said, "What do you guys think? How would you do this if you were going to be doing it? Just tell us your best thoughts. And if they're proprietary, we won't share them with anybody. If not, we'd like to share them, just so we can get the best of all worlds."

So we went to USA [United Space Alliance], Boeing, Lockheed [Lockheed Martin Corporation], and ATK [Alliant Techsystems]. And they came in and they all gave us a pitch— we didn't give them our baseline. We said, "We're not going to tell you what we think we ought to do because we want you not to try to guess our answer." A contractor when he sees what you want to do, a most of the time he'll say, "I'll just make theirs a little better because I bet you they're already in love with their own, so I'm not going to torpedo it. Might come in with something they think is totally off the wall." So we said, "We're not going to show him that." We kept it locked up in our drawer and said, "Given a clean sheet of paper, what would you guys do? Here's what the vehicle looks like and how often we want to fly it and there's not much money." We gave him what we knew coming out of the project—the program, about the SRBs and the tank and the engines and the *Orion* and the whole bit—and said, "Here's the requirements we've been given for the ground." They were pretty broad back then. It was early on.

We got some tremendous ideas, I mean, some tremendous ideas. We altered our plan. It turns out most of our plan was pretty good as a skeleton, but they did some refinements and some things that really made a lot of sense that we've since incorporated, and they were very generous in allowing us to use their ideas—knowing that one of these days soon, they're going to have to compete on this ground ops contract. But they really did not, any of them, pull the, "You can't use my data," because they were all in the spirit of, "Let's get this thing done the best way we can."

And actually, we followed it on with several sessions after that where they all four came together with us and sat around a table, and we brainstormed the variety of ideas of the collective group. "What are the pros and cons of all of them, and then what should we incorporate?" They were, in fact, very fair. It was amazing how little parochialism we found. We found some, but it wasn't company parochial, it turned out to be individual. Somebody would be in love with their idea; you couldn't get them off of it. But it was individual, it wasn't company—it was that guy just could not be gotten off of dead center about the way to do something, when everybody else was saying, "Come on, we can't afford it." Or, "it takes too long to get there", or other solid rationale.

When we go down the road to the new ground operations contract for Constellation and they then bid this contract, we're going to incorporate a lot of that kind of stuff in there, and ask them again for efficiencies. We're going to do the same kind of thing we did over in Space Station. We're going to say, "We need efficiency. Assume this is an operational thing, and we'll work backward to DDT&E [Design, Development, Test and Engineering]. We'll do DDT&E right, and it's going to be more expensive, more time-consuming, more intervention by NASA." But we need to say, "The goal here is for you to tell us what is the end operational state? How

do we want to run this program in a streamlined fashion where we're flying routinely—and we get out of the model we've gotten in with Shuttle—where every day has a crisis? We've got to assume this hardware is going to be a lot better to us—cross your fingers—or we can't afford it. That it's simpler design, it has fewer moving parts. I can't speak for *Orion*, but the rest of the vehicle—even *Orion* has got to be such that we can afford not to have a swarm of people swarming over it all the time. So give us the end state, and then we'll work back to DDT&E." We'll get a lot of good ideas from them. We'll get a lot of the same ones from each and maybe even some better ones individually because they'll think differently and get smarter as they go along.

Where I started in all this thing was—you need to be able to get out and find the best of all the ideas to make your operation more efficient, including going out to competitors and whoever else it takes. To continue to look at, "How do they do business? What do they do? What do we do differently? What are the systems that the corporations use to drive efficiency into their operations—whether they be manufacturing or their standard process operations?" Or if an airline—"How do they successfully manage to do the way they do business?" Whoever. You've got to gather all that up, and you can't do it once. You've got to continually be doing that because they get smarter and smarter out there everyday, because they are driven by cost as well as protecting the Brand Name—through safety. It's just driving them hard.

We pretend we're driven by cost, but we're not. We're driven by risk, we're driven by success. We have got to be 100% successful. We've got to be 100%—almost—risk-free. We have an entirely different set of goals. They're driven by, "How can I do this thing better— without the disaster? I've got to do it better. I don't have any choice, or I'm going to go out of business. So you take that and you adapt it to what you need to do. Things like the "lean"

processes. NASA never really engaged in that very much, if at all, really. It's called different things by different companies, and the reason I say "lean" is because Boeing, who was our contractor in ISS, uses a "lean" technique. They call it the lean process. Others all have their own name. They are all basically the same thing.

That was part of their proposal in ISS. There had been a little bit of that done in Shuttle in the depot, offline stuff. But not hardly anything online and very little in payloads, other places in NASA, because NASA's big about, "We've got a good thing going, let's don't screw with it." That's one of our good things, and it's also one of our worst enemies because it really blinds us to new and innovative things. But in ISS, they said, "We're going to bring in this lean thing, and we're going to show you that we can take big steps efficiency-wise by applying those principles. And we can tell you that we've made tremendous strides in airplane manufacturing and operations doing exactly the same thing." We said, of course, "Well, we'll see."

They applied it, and they brought us (NASA) in. In fact, taught a bunch of our people to become part of these lean teams and get engaged in what they did. The basis of lean is you ask the people that are performing, "What would you do differently if we weren't telling you what to do?" I'm oversimplifying it, but that really is it. They pick the people that are out in the warehouse and say, "You have a free hand to redo this thing the way you see fit. But you've got to come brief us every week. We're not going to interfere with you, but you have to tell us. We're not going to implement anything until you show us expected results and a plan to get them, and part of what you show us is you've got to show us the savings. It's got to have meat to it. It can't be just a bunch of ideas, let's go try. You've got to be able to define it."

It was amazing to hear what the people said: "Man, we've been waiting for this. We've been doing these stupid things all this time because you had it in your operations manual, and it

was just dumber than a box of rocks. Do this instead: move these people together, change this label, do this twice a day rather than five times a day, etc." All kinds of just subtle things. A bunch of us management guys sitting up here in the offices, we don't see all that stuff. Those guys see that stuff. They know where you're wasting effort and where you're wasting time and material and everything else, and they love to get into it. I mean, they just love it. It's like it's now theirs. It's not yours anymore and they're just out there doing what you want. It's theirs, they're doing what they think they ought to do, and it has remarkable results.

The same principles are used at all the other manufacturers. We saw that when we put out those RFIs, and the companies came in and said, "Here's some things we do differently that you guys ought to think about doing." And they're great ideas. The short of it is you need to be able to go out and continue to find out who's doing what to make things better, and can we apply it to what we're doing? Let's don't pretend that we're smarter than everybody else in the world and know how to get this thing done. We're the only ones that do this, but everybody does some piece of that, one way or the other. Hazardous fuels handling is done a million places, but it's a little piece. We've got all these building blocks of things that we do. Nobody does the big thing we do, but somebody does almost all the little things we do. Whether it be command and control—even that. There's all kinds of people out there that do stuff.

You go down to Harris [Corporation] down here in Melbourne [Florida], and they do a tremendous amount of the command and control stuff for the DoD, particularly for the "Black" Programs. And they have all kinds of exotic stuff they do that we found. We sent our guys down to talk to them and what they could show us and what we could do, and said, "There's just an easier way to do things." An easier way to do things turns out to be you don't build and design your own custom stuff. You go get all these state of the art things and make them adapt

into what you want to do so that you don't have a huge front end cost, and you've got this reach back into—these guys are doing this for a lot of other people, so you're not their only customer. You can keep the cost down. Whenever something's new, everybody shares part of the cost when it comes to doing upgrades and stuff. There were a lot of great ideas, and it turns out they just did things so simply down there to do these huge jobs, it's just very attractive.

But we had to be driven there by the fact that we had to go start something new. We were trying to figure out "What's another way to do it?" People wanted to do it just like always, wanted to have LPS [Launch Processing System], wanted to have these things and cranks and switches—I'm over simplifying—but we're going to get away from that over here. It's basically going to be what they call open architecture, and it's going to utilize state of the art, essentially commercial applications converted to do what we want to do.

Maybe we add some redundancy, maybe they add a couple of things that make it a little safer, considering what we're doing, but the basic system's not going to be that much different. There's all kinds of things out there like that, and we at NASA have got to find a way to continually force ourselves from the top down to encourage, figure out some better way to do what you're doing today—no matter what you're doing today and how successful it is. Keep looking at, "What's a better way to do that?" That's the only way you drive efficiencies into the system.

People have to be incentivized that way. That has to be their goal. They all have to buy into the fact that what we're doing today isn't necessarily the best way to do it, and that's tough. It's tough because they see success and they don't want to meddle with it. And they're afraid to add risk if they change anything, so they're very reluctant to do stuff. So you've got to find a way to incentivize it and protect them against being a pariah in case it didn't turn out to be the

best thing in the world. But you can put a lot of checks and balances in place to keep that from happening. They've done a lot of that. I'll be frank with you. I don't think the Shuttle folks have done as much as they could, but they also have a really good reason, that is they're not going to be around much longer. "Why fool around with it?" I understand that completely. [N.] Wayne Hale, Jr.] and I had this discussion several times. I'd say, "Wayne, we found that if we did wireless and some other things—" "Guys, we don't want to invest the money. We've got to retrain, you got to do this. Because we only got X number of flights, and we don't have the investment dollars."

There were always good reasons not to change where the Shuttle is today, and I understand them completely. But if somebody were to say, "We're going to put ten more years on the Shuttle," from my recent background, I would say, "Then it's time to have a revolution." It's time to step back and say, "We got to fix a lot of things. We got to do things a lot better. We got to ask USA, we got to ask Boeing, Lockheed Martin, ATK, and our own people. "Where can we be doing things better that are based on what we do, we've seen done other places, or what we know can be done better here? Is there better work control systems?" And there are. There's all kinds of things that are available that say, "We ought to go do that. Can we streamline all of this? Do we need all this overhead?   Is there a way to do this without having so much backup support X-deep? Can we figure out a way to do that better and differently? Is that really efficient, or are there inefficiencies?"

There's a lot of ways to go at it, but where they are today, it probably doesn't make any sense, and I'm not in a position to judge it one way or the other. I just know that USA has a lot of very good ideas, along with the other contractors. In fact, because of their depth of involvement in the Shuttle Ops—here and at JSC, human space flight today, they probably have

some of the best ideas. Boeing then right there with them, because they're doing business every day over in ISS. Lockheed Martin, ATK are not in the everyday business, so their answers and their proposals—and there's some great ones in there—don't have necessarily all the depth because they don't face it every day like these guys have. But they have other contracts which are very similar, which gives them standing. We saw that with a little bit of imagination, a lot of things could be done differently everywhere in NASA, not just in this and that and maybe even out there.

WRIGHT: Talking about the future and all the stuff that you were just talking about, if you were here starting up another team, how would you best train and equip the next group of people coming in to be able to meet some of those expectations or some of the areas that you feel really need to be met?

TALONE: It's actually experienced-based, and it's putting people in positions where they've got to learn new and better stuff. I was talking to a guy coming in, a friend of mine. I pushed him into applying for a job completely out of his field but well within his capabilities somewhere else because it's time for a change for him. He's really good at what he does. He's done really well. I told him, "You're never going to know how much better you can be or how much more refreshing life can be until you pull yourself up by the boots and go do something entirely different than what you've been doing." I said, "If nothing else you get out of this thing, if it's financially attractive, that's just part of it. The rest of it is you need to go out and run your brain through a dishwasher because you'll be surprised."

That's what happened to me when I got sent over to ISS. I said afterward, "I never realized what I didn't know or how much I was in a rut." And I was doing great in Shuttle. I loved that job when I was out there, and every day was a great experience. But I didn't realize it wasn't pushing me anymore. I wasn't required to think differently because I'd been working in that so long, I was comfortable in it. Once you get comfortable, you're no longer imaginative, and you're no longer even doing yourself any good because you're probably not growing anymore either. If you're not growing, you're not helping your people grow.

The people that are going to be engaged in the future need to see a lot of different aspects of things so when they get engaged in the future as it comes, they have a broader set of ideas and experience base, so they're not locked in. We, NASA—and I used to be a proponent and now I'm an opponent, and I learned it the hard way—but we are really bad about putting people in programs and they're locked in there for the duration because they're the best we got and we can't spare them. You just stultify them. You turn them into glorified Maytag repairmen. They know the Maytag, and they don't know much else, and they don't ever get a chance to know much else.

So you need to take people and get them in a position where they're doing things completely different from what they've been doing, with a different set of needs and requirements and bosses and people to work with them, and give them that experience to kind of step back and say, "Gosh, I didn't know this was going on. I didn't realize you could do this," or, "Man, they do pretty good things over here I never even thought about. We should have been doing that." That's what happens.

To prepare people for the future—particularly when you're making a quantum leap, you're going from Shuttle to Constellation, or back when we went from Apollo/Saturn to

Shuttle—when you're going to make a quantum leap, you need to get people as much experience in all the pieces of the future so they can somehow in their mind really contribute from a less narrow viewpoint. Our problem is we have many terrific people that are very narrow in their viewpoint because of their very narrow background, and we've done it to them. They didn't do it themselves. We've done it to them by continually bringing them along in this track that's totally tunnelized.

I used to hate that idea. Even in Shuttle when I was out there, and we would talk about having to move people around—"No, we can't give him up. No, he's the best we've got. We got too much to do. You're compromising us." I was maybe the worst. Fought tooth and nail. I got moved to ISS—Honeycutt was running the Center by that time, had been a friend of mine for years—but his thing was "We've got to move people around. You've got to keep people moving." I said, "That's baloney." His mandate when he and George sentenced me to the ISS startup deal was that I couldn't take my pals with me. I could take some of them, but I could not get comfortable enough to say, "I'm just going to take the same old bunch. We're going to keep doing things the same old way." He said, "Your mandate is you have to take at least 50% of people from payloads, as well as 50% from Shuttle, and they've got to be commingled, and you've got to listen to everybody's ideas. Because we're not going to do this thing the way we did Shuttle or payloads, or even the way it's being done already on Station, because we don't want to do business going forward that way." I thought, "Well, that's the dumbest thing I've ever heard of." That was my tunnel thinking.

It turned out to be the best thing that could have been done for ISS at that point. I don't know which of those two guys' idea it was, but it was a terrific idea because when we got the variety of folks into the office, we meshed them together and great things happened. They did

business differently in their former organizations, very differently in a lot of ways. Thought differently, had a different whole aspect about things. We had folks that were pretty evenly divided because I ended up giving the managers the same mandate I'd gotten. That they can't bring into their office their cronies and the people they're comfortable with, you've got to bring some of those and some of these. And they've all got to be first round draft picks—that part was mine, I added that piece. Honeycutt didn't find out about that until later, and he started screaming at me because all the managers started running to him saying, "They're looting and pillaging and taking all our best people." I told him, "Jay, you said I could have who I wanted." He said, "Well, you got to back off. You've got to start taking some second round picks at least."

Anyway, the bottom line was they got intermingled, and they started exchanging ideas, and in the meantime they started looking for new ideas, which was our mandate. We said, "Bring all of what you know that works well. Leave all the stuff you don't like or doesn't work." What we're looking for is how do we want to do it differently going forward to get this job done best? Now, we need to take out to the contractors the best practices that we know. Both Shuttle and payloads/spacecraft guys had some great ones—they had some great ones—but we don't want to burden contractors or ourselves with a lot of things that are just non-value-added. They only look good, and they look like you're only defending yourself from post-event attack in the future. We don't want all that stuff. We'll take the chance that we can't defend ourselves later. Let's just put the very few best practices in place with these guys that we can defend and say clearly, "Here's why."

You go out to a contractor's factory, he doesn't have to listen to you because it's not the government's hardware yet. We'd go out there and we'd say, "You really ought to do this." But

you need to say why they ought to do this, and you need to show what the benefit is and then what the government's expectations are, and even more so what kind of hell is going to hit when they get down to KSC and they find out stuff's garfed up because they didn't do it upstream and now the agency's spotlight's shining on them. They're at KSC, the world's staring at them, the world of the NASA management now sees what they're doing. And if they look like stumblebums with bad processes, it's going to be hell to pay—they listen to that part. But if you had merit with all these other things, they would put them in place. So that generally worked out.

The beauty of all this was we were able to get the best folks of both worlds, and at the same time challenge them because they were the right folks to think even differently. "Is there a better way to do what we've done over there?" Maybe take that and improve it, or do it differently and get more efficiency out of it, or get a better result. It was spectacularly successful. Had nothing to do with me other than I picked the right people. Key people would always say, "How'd you pull that off? Because it really was a great, great thing." I said, "It was great because I had great people. Anybody can win with all-Americans. If you had a whole team of all-Americans, you can win every game. I don't even have to be a very good coach. Now, if I'd had a bunch of dogs, I probably would have failed, and it'd have been my fault for sure because I allowed the wrong folks to come aboard." My talent was picking the right folks.

What you really want are people that are going to be valuable for what you're trying to do, and to be valuable they've got to understand the broad spectrum of what you're getting into and not just the very narrow piece that they've had to experience. Or you end up with a whole bunch of people squabbling over, "This is the way I did it, and I don't want to do it your way," because they haven't had that mind-expanding experience to be forced to go out and do

something different. And find out that different turns out generally better. Change is usually

better if done correctly. Different may not be better, but the change and the way it makes you

look at things is really good for everybody. It's really good for your folks because you get a

much better set of ideas around the table. When you finally get the future state, you get them

around the table and say, "We've got this problem." You're looking at people that have done a

lot of different things and have a lot of good ideas based on their experiences, not just a bunch of

individuals that you're refereeing in a little bit of a narrow thought dog fight.

WRIGHT: What was the hardest lesson or maybe the best lesson that you learned during your 43

years?

TALONE: There are so many. The thing that I learned that always stood me good stead is you

can't go wrong with the right people. It's not one person better than another person—it's the

right person for that job. I've had bosses that act—whether they think it or not—as if

everybody's interchangeable. And everybody's not interchangeable. You can move people

around, but within their capability. Because you're not doing somebody a favor to put them in a

position that's outside their either experience base or their capability in one way or the other. It

doesn't mean a shortage of brainpower, it could just be that they don't give a damn about that

stuff. If you don't care about that stuff, you're never going to be successful. I don't care how

smart you are. So moving people just to move people doesn't make any sense. Or putting

people in jobs just because, "Hey, he's a hero, let's put him in this hero job." Well, he may not

be a hero when he gets in there if we didn't think about who he is and what made him successful,

and what he does best and what can you expect out of him in that situation. Not specific technical skills, but performance skills.

So you have to put people where they belong, because the other half of what I learned was you're not going change anybody. You're not going to change anybody. We spend a lot of money around here trying to change people and their habits. You can tweak them around the edges, but by the time they get to us, they are who they are. That is true in life, it isn't just true in this [NASA] world. You're not going to change your husband. A little bit—you can get him to pick up his socks, but basically you're not going to change who he is as a person. He is going to think and act and do as who he is, and it's the same way out here.

When you say put the right people in the right jobs—you pick really good people that really fit what you're trying to get done. Then you fix it so they're allowed to be successful. Your goal then is to allow them to be successful with whatever you have to do to allow them to be successful. But putting the right people in the right places—that doesn't mean that one person only fits one kind of thing. Everybody can do lots of different things, but there's also lots of things they have no business being involved in. And if you put them where they don't belong (one size fits all), you're killing their career and you're killing them. They'll first of all lose their own self belief. They begin to doubt themselves because you put them in a position where they're doomed to failure, and they think it's their own fault because they're generally going to be self-examining, high-achieving, high-expectations people and now they're not doing well, they can't figure it out, so it must be their own fault. Now you're putting them in a psychologically bad place where they're no longer worth as much to you, much less themselves. But worse than that, the job doesn't get done and nobody knows why, and this poor guy takes the blame, and it's because you put him in the wrong place.

Or you put him there too soon, because there's two things. One is it just doesn't fit for maybe just one reason or the other. There's jobs for people that are extroverts, there's jobs for people that are introverts. That's an extreme case, but that's a fact. You don't want to put a guy in a job where he has to go out and make a luncheon speech every other day if it just drives him crazy, he can't stand it. He ain't going to be good at it to start with. If you do not want to go do it, you're not going to do it very well. Sooner or later, it isn't going to work out. That's an extreme, but that's still the point. The other is that you can put them there too soon. If a person is not ready, and that's a very difficult analysis, because some very good people require you to push them into a position because they never aspire to move up, because they like what they're doing, and they're comfortable.

Sometimes you've got to understand and decide they're much better than that, and you've got to put them in a challenging position, and then all of a sudden, they just blossom. They find out and you find out they were capable of so much more. You're always amazed. I mean, that's been my experience. You finally get somebody in a position you think, "I think that guy can be a lot better, and I'm going to put him in here because that really is a challenge and I need his kind of help," and all of a sudden this guy grows into a five star hero, and you think, "Wow." Even he's thinking, "Wow, look at this."   But if you do it too soon, before they're capability/experience ready, it has the opposite effect. So you've got to be careful. That's a really tough call. If you are right, they turn out to be world-beaters that nobody would have reasonably expected, and if you are wrong, you certainly didn't do them a favor.

I recently read a book on management and the guy had a great analogy. When you climb Mount Everest, you stop for several days at each base camp to acclimatize yourself to the atmosphere. It's not necessarily the cold, it's the oxygen content. Your body has to become

acclimatized to the lower level of oxygen and stress before you can move on to the next upper camp, and timing is different for everybody. I don't know whether they do it scientifically or whether they just say, "Hey, we're all going to stay until we're sure." But if you go too soon, you get altitude sickness, and it's very bad. If you wait long enough, do the right thing, you might make it all the way to the top and back without ever getting sick. Also, some just can't go to the next level, and usually then spare the other climbers the risk of failure en route. It's the same kind of analogy. His analogy about pushing people too far and too soon. Make sure they're acclimatized before you push them to the next level, and that they actually can go forward, otherwise they'll get sick and die career-wise in that position.

I ended up being pushed into managing people, which was not what I wanted to do. The lessons I learned all turned out to be mainly oriented around people rather than systems. I learned a lot about systems, brought a lot along as I went, and worked with all kinds of NASA systems, and a lot of them are world class. But the primary thing—the systems aren't the success, the people are the success. It doesn't matter about your system if you don't have the right people, and if you have the right people, the systems don't always matter either because it will get done. So everything I learned was you've got to make your people successful, and you've got to be careful who you pick and how you take care of them from that point forward. Then they'll come up with great systems, and you'll say, "Yeah, that's a good thing. Yeah, let's fix this, do that." That helps everybody. Systems help everybody, but the core of it is the people. Always will be.

WRIGHT: Speaking of that, did you have some ideas for us to other people to talk to as far as this project?

TALONE: Yes. I'm sure you thought of guys like Arnie [Arnold D.] Aldridge. And Dick [Richard H.] Kohrs. He's the best manager NASA ever had. Ever. Far and away. Dan [Daniel M.] Germany. He has some very distinct beliefs—not that I agree with all of them—but he does. I know you've talked to Jay [H.] Green. Or if you haven't, you should, and be prepared for a lot of frankness. He's forthright. Norm [Norman] Carlson. Norm ran the Shuttle Ops for a long time. He was my boss back on Apollo, and he was one of my bosses in Shuttle. He was really good technically and managing people.

A couple of guys that work out there for USA that really had a lot of experiences over the years that are really good—Gene [R.] Nurnberg. To get Nurnberg to play, you're going to have to tell him I sent you because he tends to be a curmudgeon. But he's got a lot of great ideas, and I think he'd be glad to talk to you, because he loves the human space program. Eric Clanton [phonetic], he works in USA at KSC, and he has got a lot of very good ideas. He's been very instrumental in implementing a lot of good stuff within USA, improvements in efficiency, just because that's his game. He always was driven to do that kind of stuff. Artificial intelligence. A lot of what you guys are doing, he wanted to do in a system basis out there for, "Why don't we learn this stuff so we don't keep doing it over and over again. Let's plug it in. Let's see if a machine—" And he had a project going to capture that. John Tribe worked for Rockwell, and over a long period of time worked on Apollo spacecraft. He's a really, really terrific guy, a lot of great ideas. He lives on Meritt Island.

Tom [Thomas E.] Utsman. Lives on Cocoa Beach. He was the Shuttle Project Manager here for a while, then he went to D.C. before he retired—NASA guy. But he has kept his hand in over the years. He's stayed current. Matter of fact, when I was doing this job next door, he was out once [here] a week. He's come out and sit around and talk, and he'd say, "I've got some

ideas," and Tom's really good. So he's not totally out of the loop, and he also is very frank, although not as pointedly frank as Jay is.

The recovery piece of Shuttle—Al [Alfred F.] Harley and Denny [Dennis] Gagen. Denny's still doing Recovery for NASA, managing the landing site operations. He's worked recovery, spacecraft, the Shuttle at Edwards and all overseas, he's managed that for years and years and years, and so if you need to get some insights on that end of the thing, he's really good. He knows that stuff. Pepper [Philip E.] Phillips—worked out in Shuttle a long time with me, and then he stayed when I left, and he did a lot of different jobs over there. Operations, and he was in different places, he even ran the business office for a while. He's now the Constellation Project Manager here at KSC, took my place. He was my Deputy. He's overrun; you're going to have a hard time cornering him for an hour. But if you can, he's fresh out of Shuttle. He's only been over here a couple years, so he did Shuttle all his life until he came over here, and he knows those systems and people in and out. I hoped I helped you.

WRIGHT: You did. Thank you.

[End of interview]