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WILLIAM S. MCARTHUR, JR.
INTERVIEWED BY JENNIFER ROSS-NAZZAL
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ROSS-NAZZAL: Today is May 29, 2018. This interview with Bill McArthur is being conducted at the Johnson Space Center for the JSC Oral History Project. The interviewer is Jennifer Ross-Nazzal. Thanks again for stopping by, especially right after Memorial Day.

MCARTHUR: It's always nice to come by and visit, Jennifer.

ROSS-NAZZAL: I appreciate it. I know you're retired, and you have other things that you would like to be doing.

MCARTHUR: But I have plenty of time to do them. It's good, that's good.

ROSS-NAZZAL: We ended last time by talking about your [International Space Station (ISS)] Expedition. I wanted to know what your assignments were after you landed, but before you started working for the Space Shuttle S&MA [Safety and Mission Assurance] position.

MCARTHUR: When you come back from long-duration flight you spend a lot of time of course doing debriefings, and they really try to allow you time to decompress. I don't remember exactly why, but I didn't take full advantage of that time, which was okay.

They then wanted me to become the ISS branch chief and to curtail this decompression time. I was interested in doing that. My expectation was I would not be offered another flight opportunity, and I was in a good place with that. Gosh, I guess I was going to Russia on and off for four and a half years. When I came back my older daughter was expecting her first child, so for a number of reasons I was ready to continue with my professional life beyond flying.

They offered me, in the Astronaut Office, the ISS branch chief's job, and I accepted without fully realizing what the scope of the job was. It wasn't what I had hoped it would be. I had hoped it would be an opportunity to have some type of responsibility to the astronauts who were flying on ISS. Instead, I was just responsible for—within then FCOD [Flight Crew Operations Directorate] or [organizational code] CB, within the Astronaut Office—the nonastronaut engineers who supported ISS. These are really good people. But gosh, having been the DOR [director of operations Russia] and having spent so much time in Russia, I really wanted to be engaged with what was going on in Russia, and I wasn't. It was really not the job I was interested in.

I ran into Terry [Terrence W.] Wilcutt. We lived across the street from each other, but I ran into him in the supermarket at Randalls one day. He, at the time, was just transitioning from being the manager of the Space Shuttle Safety & Mission Assurance Office to being the S&MA deputy director for the Center.

He'd asked if I was interested in taking his job, and I thought it sounded like a good transitional opportunity. Shortly thereafter, I got a call from [N.] Wayne Hale [Jr.]'s secretary—Wayne was the Shuttle program manager—[who] asked me to come up to talk to Wayne. I went up, and Wayne said he would like me to consider taking Terry's place and be the manager of the S&MA Office for Shuttle Program.

Again, my preference would have been to stay involved with ISS things. I asked Wayne to let me think about it, and I then went and talked to—I'm trying to remember. I don't know if Ellen Ochoa was the director of FCOD then, but I went and talked to her. What I really was hoping is that this would be like free agency, and you get other people to offer you things.

She seemed fine with my leaving the Astronaut Office. I went and talked to Mike [Michael T.] Suffredini, thinking, "Hey, maybe Mike will be interested in bringing me onto the Station Program staff." His only comment was, "Don't stay in S&MA too long, or you'll never be able to leave." It's like okay, fine.

This is only a little bit tongue-in-cheek, or a little bit of humor in what I'm about to say, but there's an element of truth to it. One of the things I did after I talked to Wayne is I went down to see where my office would be, and it was going to be here. I think it was on the fifth floor in Building 1, a corner office that overlooked the pond and the green area in the middle.

ROSS-NAZZAL: Nice view.

MCARTHUR: It just struck me that my office back in Building 4 South was an interior office. It was an old converted storage space. I had a door but no windows. The other half of the space was where the deputy chief for the branch was. He didn't have a door, but he had the light switch that controlled the lights in both rooms. I didn't have enough space in this room to actually have a table or an area where I could sit and talk to people.

I thought, "Okay, this will be clearly a more pleasant place to hang my hat," if you will. I told Wayne, I said, "Yes, I would be interested in you considering me for this job."

He said, “Oh, no, no. I wasn’t asking you to apply for the job. I was offering you the job.” Okay, got it. I took the job, and I’m glad I did, because it required a different set of skills than being an astronaut.

Having flown on the Shuttle and having been on ISS, I clearly brought experiences into the job that—I mean [my astronaut experiences] weren’t unique. Nancy [J.] Currie-[Gregg] had had the job before Terry, and then Terry had the job before me, so it wasn’t that I brought—well, neither of them had been on ISS. With the exception of the last Hubble servicing mission, all of the Shuttle missions were going to ISS. So I did bring in probably more familiarity with ISS than certainly most of the managers in the Shuttle Program had.

I told Wayne, “Yes, I’d like the job.” What was really nice is, first, Bob [Robert C.] Doremus was the deputy manager, and Bob was much more qualified in S&MA than I was. I think, depending on your view of fairness, maybe he deserved this job more than I did. That wasn’t my decision to make. He was always just tremendously supportive. If I enjoyed any success in the job, he was the key reason.

Also, if you look at the traditional SR&QA [Safety, Reliability, & Quality Assurance] disciplines, there was a safety manager in the office, there was a quality manager, there was a risk manager, there was a reliability manager. We had another gentleman who was almost a savant when it came to Shuttle requirements. There was just a plethora of really talented people who were experts in the various S&MA disciplines.

I needed to manage their efforts, which really negated the weakness I had, not having any formal safety experience up to that point. They very much were the reason that the office worked well. My job really was managing the office. There are decisions involved in doing that, but again, I could rely on being surrounded by really, really smart, experienced, talented people.

There were some interesting things. I really enjoyed working for Wayne, and I still enjoy the opportunities I have to spend time with Wayne. Just a brilliant man. Really smart about human spaceflight and set really high standards.

I remember one time we were trying to launch. It was close to December, and we had a problem with the engine cutoff sensors [ECO] in the system. It was just really bedeviling people. There was some suggestion, or a question was asked by [NASA Administrator] Mike [Michael D.] Griffin, whether or not we even needed these sensors. I'd had an accident, so I couldn't be at KSC [Kennedy Space Center, Florida]. I was back here, and we were having this big telecon [teleconference] connecting these large conference rooms. The Administrator is challenging us about whether we could just ignore these failed sensors and launch anyway, and I could tell it really caused a lot of stress in the workforce here.

I don't disagree with asking the question, because it really challenged the team to think about the rationale, about what we were doing, and what the implications were of these ECO sensors not functioning. I sent Wayne a note. I said, "If we fly without these sensors, the emotions here are running very strong. It will cause difficulties on the Shuttle team."

I don't remember how, but Wayne then forwarded that to someone, which was okay. My thought was, "This is my advice to him." I wanted to be careful, if I was putting on my S&MA manager hat, that I communicated first to him, and then it would be up to him. If he saw it first, then I was happy if he shared it with whomever he thought it would be valuable. My recollection is it somehow got into the public domain. We didn't launch. Wayne came back, and he apologized. I don't know if it hit *Aviation Week* [& *Space Technology* magazine], it got somewhere. I said, "I have no heartburn with that at all."

Then something interesting happened. When I took the job, it was a GS [General Schedule]-15 job. When I became a civil servant, I came right in as a GS-15, step 10.

ROSS-NAZZAL: Right at the top.

MCARTHUR: I became a civil service employee at the end of 2000. I went over to the Shuttle Program staff like in March of 2007, so it had been over six years. Over time, you look at what professional opportunities are there. There had been some discussion when I came in—I guess Wayne had had discussions with Terry that perhaps the job would be eventually elevated to be a senior executive [service] position. I came in knowing it wasn't, but that maybe there was an opportunity for that to happen.

The S&MA director in the Constellation Program was a senior executive. This must have been late 2007 I guess, or maybe early 2008. The ISS Program upgraded their S&MA manager's position to a senior executive position. Part of the strategy had been that there should be some parity between positions in the programs. I remember mentioning it to Wayne that ISS had elevated their S&MA manager's position. Wayne then, I think, took it as a personal challenge to do the same thing for the Shuttle Program, and that worked out well.

It was kind of a funny thing. I just had a lateral [transfer]. I went from a GS-15 position in the Astronaut Office to a GS-15 position in the Shuttle Program. Everything seemed fine. One day our HR [human resources] rep came in and she goes, "There's a problem with your appointment."

I go, "Tell me it wasn't legal."

She goes, "That's right, it wasn't legal."

I was, I think, an excepted employee is what it's called. When I became a civil servant I didn't compete for the position, I had a direct transfer. For that reason I could not then just do a lateral transfer into another position. I had to compete for that position. Here I had to compete for a job I'd already been selected for, and I'd been working in for some period of time. It was just pro forma. We made my position as manager of S&MA Office legal. When the position was upgraded to a senior executive position, I had to apply for it again. You're probably familiar with the process of being certified as a senior executive.

ROSS-NAZZAL: Why don't you talk about that?

MCARTHUR: It's very rigorous. There are five executive core qualifications. Things like business acumen, leading people. To become a member of the senior executive service, you essentially get nominated by your Agency, and then it goes to a panel in the Office of Personnel Management. There is no one on that panel from your Agency. There cannot be anyone from your Agency on that panel, which basically approves your appointment as a senior executive.

The NASA Shared Services Center at Stennis [Space Center, Mississippi] has ECQ writers, and you go through this iterative process in which they try to make a case that you meet the ECQs (executive core qualifications), using language that a non-NASA person can understand. You know, sanitizing your NASA experience, eliminating all NASA acronyms.

ROSS-NAZZAL: All the jargon.

MCARTHUR: Even NASA full expressions or nouns or terms—making them understandable was quite an experience. Wayne pulled that off.

I learned a lot in that job. Then I guess in 2009 Wayne was reassigned and John [P.] Shannon became the Shuttle program manager. Both Wayne and John had been flight directors, and I had worked for both of them as a CapCom [capsule communicator], so we had known each other for many, many, many years. That in fact is why Wayne asked me to come over to the Shuttle Program staff, because he remembered me from CapCom days and thought I would fit in that position.

One afternoon John Shannon comes in my office and closes the door. He said, “I would like for you to become the manager of the Orbiter Project Office.” I remember from my early days at NASA that, as a support engineer over in the Astronaut Office, a high-pressure place to be to try to make a contribution was in front of the Space Shuttle program manager.

There were two people that really were influential at the Johnson Space Center, the Center Director and the Space Shuttle program manager. Only one step removed from the program manager was the Orbiter project manager. I thought there were few jobs at NASA that I was less qualified for than to be the Orbiter project manager, and I told John. I said, “I can’t see that.”

When I came back from ISS, shortly after I came back, JSC started this program. It was Program and Project Management Development [PPMD]. It really was to take folks and prepare them to manage major programs and projects. I got selected for PPMD. At one of our first meetings we were introducing ourselves, and one guy, Steve [M. Poulos]—I haven’t seen Steve for a long time—stood up and said, “I’m the Orbiter project manager.”

I’m going, “If you’re the Orbiter project manager already, why are you in this course?” I’m looking around and I’m going, “Okay, if the Orbiter project manager is going through this

course, then clearly this is another place in which I am not qualified to be.” You could have knocked me over with a feather, “[I] want you to be the Orbiter project manager.”

We discussed it, and he said two things. He said, “I’m not asking you to come in and do this job because there’s a problem with managing technical issues. The Orbiter Project Office has no shortage of highly qualified technical people. What I’m looking for is someone who is a team builder.” He felt that there were problems in the Shuttle Program with the various projects working together, that there were conflicts, and that’s what he wanted me to address.

Second best job I ever had. It was so much fun and just like John said, a tremendous team, just talented, highly motivated, dynamic. We were flying three, four, five times a year, and it was just so much fun being required to be at every launch. Then, while the mission was ongoing, having to come in every day, go over to Mission Control, meet with my team in my Mission Evaluation Room. Golly, how arrogant can I be?

Chairing a meeting every day in which we discussed any problems, we discussed the status of the vehicle. Then sitting on the Mission Management Team down in what we called the “sports bar.” It’s this secure room on the first floor of Building 30, and it’s got all these TVs on the wall, so it kind of looks like a sports bar. We were in a round setting of tables so that we all faced each other. Needing to do that every day, it was just extremely, extremely rewarding. Had more travel money than we could possibly spend; had enough money to solve problems that could be solved. That was just a lot of fun.

Of course, all good things come to an end. When the Shuttle Program ended, [Center Director] Mike [Michael L.] Coats called me. Bryan [D.] O’Connor was leaving NASA, so Terry had been selected to become the chief of the Office of Safety & Mission Assurance at [NASA]

Headquarters [Washington, DC]. So Mike Coats called and asked if I would take over the job as S&MA director here.

I consider Mike having been a good friend and a patron from when I was trying to become an astronaut. As a matter of fact, I was the lead support engineer on his first post-*Challenger* [STS-51L disaster] mission. He convinced me. I mean he asked, it didn't take much convincing. It was interesting. In some respects, I considered the Orbiter project manager job to be, in a hierarchical sense, a maybe more prestigious job. Although in the grand scheme of civil service bureaucracy being the S&MA director is technically a higher-level position.

I muddled through that, gosh, for six years. I don't think I ever had any other job that lasted six years. In the military, you would physically move every three years or less. And even if you were in a location for three years, your duties might change within that three-year time span. Although I was in the Astronaut Office for seventeen years, it would be CapCom or be a branch chief in between training for flights. The duties would change. I was S&MA Director for six years, so again that was the longest I ever had the same job. Even though I may have been in an organization that long, I never had the same set of duties for that long. Probably why I finally decided to retire.

As I was starting to consider retirement, I looked back. That was one of the things that I felt was important, that I'd been there for a certain period of time. I began to see these cyclical events. The nice thing about being in a position like that is you have the ability to change things to be the way you think they ought to be. So there's a certain sense of satisfaction in having made things that you believe to be positive changes.

Then also, at a certain point you start to become frustrated because there are other things that you wanted to change and you've been unable to do so. You come to the realization that either

you don't have the skill set to effect those changes, or maybe they just can't be changed. But regardless, you reach a point where I think you recognize that there is benefit to the organization in having a change in leadership. So I think I reached that point.

ROSS-NAZZAL: When you came in as head of S&MA here, did you have any goals for the organization?

MCARTHUR: I had a few. I wanted to enhance the reputation of the organization. I wanted the organization to be effectively engaged in what I knew were going to be upcoming challenges. There was a lot of focus on finishing the Shuttle Program and not having another mishap. When that was done, there was this collective—not sigh of relief so much as I think this sense of loss of purpose in a lot of the organizations here at the Space Center.

One was to try to reinstill that sense of purpose in people. It was also to make sure that we were effectively engaged in areas that either didn't exist before or were lower priority. Another goal was to try to drive the organization to be more efficient—to a certain degree for each individual to be more capable, because the organization was much smaller. Civil service size actually may have grown a little bit, but our contractor workforce was about half of what it had been during the Shuttle Program. We had significantly fewer people, and so we were trying to make the organization more integrated. Instead of having four divisions which essentially didn't have much overlap, to ensure that the divisions were starting to be very collaborative, to really work issues with an integrated approach.

ROSS-NAZZAL: Did that require any reorgs [reorganizations] when you came in?

MCARTHUR: I really thought that it might benefit from a reorganization, but I could never force myself to address the way we budgeted. In particular, we had an Exploration Division and an ISS Division. Those divisions got their money, still do get their money—a significant amount of their money—from the programs they support. There were advantages to doing that. So if we did a reorg, I was always concerned that we would then lose the leverage with the programs to get the funding that we needed to provide their support. That was another reason I thought it was probably time to turn over the reins, to let someone come in and address that challenge.

ROSS-NAZZAL: You mentioned budget. One of the things that happened while you were in that position was a sequestration, and then also there was a cut in 2013, 2014 midyear, where NASA had to take a pretty large cut to its budget. I wondered what impact that had on Safety.

MCARTHUR: Not a lot. I don't think it had a big impact on the organization. Did it have a big impact on safety as a state of human spaceflight? It always does. Quantifying it, or even describing it is very, very difficult, because people go and they do as much work as they can. It's less that questions or issues aren't addressed. The thing is that there are issues that are never identified.

You may have answered all the questions that you saw, but there are questions that you never hear. When I say questions, that's a surrogate for issues or problems. You solve the problems of which you're aware. The danger is there must be problems of which you're unaware.

ROSS-NAZZAL: I can see that being a major issue.

MCARTHUR: It's the unknown unknowns.

ROSS-NAZZAL: That get you. Would you talk about your staff for Safety, your deputy, and some of the people who worked for you and their contributions?

MCARTHUR: Sure. It was interesting—when I came in, Vincent [D.] Watkins was the deputy, and he had been the Quality and Flight Equipment Division chief. Talking about quality, he was one of the highest quality human beings I've ever worked with, just a real gentleman. Good with people, an S&MA professional, so he really had been in the organization for a long time. Actually started out at FOD [Flight Operations Directorate] or FCOD out at Ellington [Field, Houston, Texas], but then came into S&MA and had been there for a number of years. Really, people adore Vincent. It was interesting, I like to put a positive spin on it. When I first came in, he mentioned that he was considering maybe spending another year in and then retiring. I had thoughts of, "Who do I put in a position that I want to groom to replace him as the deputy?"

After we'd worked together for a while, it was clear that he really wasn't interested in retiring soon. Indulging in a little bit of hubris maybe, I like to think that he enjoyed being my partner because he enjoyed our working together, so that motivated him to stay longer. Maybe, maybe not.

Nigel [J. Packham] was the associate director for technical. He actually was associate director when we came in. When the Shuttle Program ended, when I left as the Shuttle S&MA manager—oh golly, I forgot this.

ROSS-NAZZAL: You can add it now or we can go back.

MCARTHUR: I'm trying to decide if I even want to go down this path. When I became the Orbiter project manager, as it turned out, the Shuttle Program had more senior executives than—well, actually all the senior executive positions were filled. When I was reassigned from the S&MA Office to the Orbiter Project Office—when I moved, on paper my assignment didn't change. Bob Doremus became the manager of the S&MA Office in reality but not on paper, because the program did not have the SES head count to promote him to senior executive.

For twenty-three months I was in reality the manager of the Orbiter Project Office, but on paper I was not. My performance appraisal said “manager, Orbiter Project Office.” But again if you look in the employee management system, I was still manager of the S&MA Office. For the last month of the Shuttle Program I was now finally, officially—it was more humorous for me, but the downside is Bob was doing the work but he couldn't get the promotion.

ROSS-NAZZAL: He didn't get that pay.

MCARTHUR: Right. When the Shuttle Program ended Bob also needed a new position. Thinking there were going to be some positions opening in the S&MA Directorate, I brought Bob over, made him the associate director, and then changed Nigel's position from associate director to associate director, technical. The personnel movement just never happened for those things to work out. Nigel was the associate director, then the associate director, technical. When Bob went over to the Commercial Crew Program, Nigel became the sole associate director again. We started having some interesting things happen.

Let's see, who else was there? It was the three of us, then we had some interesting opportunities. Gail [A.] Skowron was in Procurement. She came and wanted to do a rotation with us, and she really does have a technical background. She'd worked for the Tennessee Valley Authority as an engineer. Even though she came to us from Procurement, and technically NASA doesn't list her as an engineer, we started bringing people onto the staff who didn't have strong S&MA backgrounds, but brought in some talents that contributed a lot of value. Gail always—she just would ask great questions. She could really draw out, could inspire a discussion of the right topics when we would be dealing with various issues.

We got Jim [James A.] Rostohar in from the External Relations Office to run the Knowledge Management Office, the quality systems and knowledge management. It was kind of fun doing that.

When I first came in, Karen [S.] Nett was my secretary. She told me she was retired Navy; she was a senior chief petty officer. Well senior chief petty officer, the pay grade is E [Enlisted]-8. For all the [armed] services, the E's are the enlisted grades. The highest is an E-9 and it goes down to E-1. A raw recruit, a brand-new enlistee, comes in as an E-1. An E-8 in the Army is either a master sergeant or a first sergeant, and traditionally the first organization of some significant capability and employed tactically as a unit is a company.

A company is commanded by a captain, but the senior noncommissioned officer is a first sergeant or an E-8. The right title for a senior chief petty officer in the Navy is just senior, the nickname is "senior." I thought "So now 'senior' is my secretary. She's the equivalent in rank of the first sergeant I had when I was a young twenty-some-year-old company commander. That's pretty darn cool. I have a first sergeant again." I said, "That's really nice." The E-9 grade is a sergeant major or a command sergeant major. The command sergeant major of the Army, the

senior ranking noncommissioned officer in the Army, is an E-9. The senior noncommissioned officer working for a lieutenant colonel or above is an E-9. Jim Rostohar comes in, and he's a retired Navy master chief petty officer. So now I have a command sergeant major and a first sergeant, "I sort of like that."

One of the things we really looked at were for opportunities for people on the staff to advance, so Karen went from being a secretary to being, I think, data analyst. Now she's the admin [administrative] officer for the directorate. Rosalind [E.] Johnson, who was the secretary for a while—and there's a problem with the admins here that are civil servants in that their real professional path generally is to either go into HR or become an admin officer, particularly if they can do it at the directorate level. There are some divisions, like the big divisions in Engineering have admin officers. That's their promotion path. Well, with trying to have more and more of the administrative staff being on a contract instead of being civil servants, that was getting to be a problem. Rosalind asked if she could go through our OJT [on-the-job training] program to become a quality assurance specialist. Of course that has worked out for her.

Lisa [E.] Gaines, the current secretary now—there's an interesting story there. When I was the S&MA manager in Shuttle, Lisa was my secretary. I don't know who had the contract at the time, I don't know if it was REDE or it was some other company. They asked if Lisa could go up to the Orbiter Project Office on a temporary basis because they were short a secretary. We knew once she went up there we weren't going to get her back, so that happened. What I've always said is when John asked me to become the Orbiter project manager, the real reason I did that is so I could have Lisa as a secretary again.

When I came here to S&MA the secretary was a civil servant, so there was no opportunity. I always said, "If I can ever figure out a way, we'll try to bring Lisa up here." At some point, we

finally did. As the number of civil servants who were available to fill that position—as that pool began to dry up, eventually we had the opportunity to offer that position to Lisa. Of course then I decided to retire.

So I've talked a lot about staff now. And then part of the leadership team, of course, are the division chiefs. I think [S&MA Director] Trish [Patrica A. Petete] may have replaced all the division chiefs by now, except Mike [Michael P.] Fodroci might still be—I could go up and ask if she's going to replace Mike.

ROSS-NAZZAL: There has been a lot of reorg, you're right.

MCARTHUR: It's a good thing. I talked to the division chiefs. One of the problems is they're all senior GS-15's. It's hard to move a GS-15, it really is. That was one of the things I would counsel them about in their performance appraisals, would discuss. "Not asking you to retire, but if you want your people to have upward mobility, there has to be someplace to move upwardly to."

ROSS-NAZZAL: That's a challenge. I wanted to ask you about COTS [Commercial Orbital Transportation Services] and Commercial Crew [Program]. We had been working on Shuttle for so many years. That was the bread and butter [of the Agency], but then things started to shift more into the commercial sector. How did Safety wrap its arms around those programs?

MCARTHUR: I would say Safety never has, and I'm not sure it ever will. If you believe that during the Shuttle or maybe ISS you're able to actually get your arms around it, I think for Commercial Crew you can never quite get your fingertips to touch.

There's a political dimension to that. It's politically very attractive when you say, "The government is going to turn it over to the private sector," for a couple reasons. One is there are jobs. Well, the jobs issue is a wash. Somebody's going to do the work. The other argument is private industry is motivated to be more efficient.

Of course that motivation—are you more efficient, or are you cutting corners—it's not black-and-white. My guess is, in the drive to be more efficient, people may try to avoid cutting corners, but undoubtedly some of that will creep in because you may not always recognize the value of the [NASA] way. If the temptation to cut corners is less, that may drive up cost to some degree.

I think there is a strong desire—whether it's Commercial Crew, whether it's noncommercial—there's a strong desire to do the right thing. But the right thing is not always obvious. And what do you mean by the right thing? We've got to accept some risk, we really do. If you're not willing to accept risk, you just don't launch rockets. It's hard to do. So no it is not safe, it is dangerous. Is it safe enough? It's that defining what is safe enough that's the real difficult thing.

If you don't have the same skin in the game—depending what your motivations are, you may be risk-averse to the point that you become paralyzed, or you become so risk-tolerant that you fail to take advantage of ways to improve safety. My guess is, just because it's the way the real world works—I don't think most of the Agency workforce is what I would call risk-aware. I would say they're very risk-sensitive. That's where the challenge is on the Agency's leadership.

One of my little cute expressions when I'm giving talks is, "Consensus is desirable, but decisions are mandatory." When we accuse the Agency of being risk-averse, what I worry happens is the people who are responsible for making decisions about risk acceptance—based on criticisms

the Agency had after *Challenger* and after *Columbia* [STS-107 disaster]—value consensus to an extent that it sometimes makes it difficult to make hard decisions.

I believe absolutely program managers, Agency leaders—I think they have an obligation to do the best they can to understand the risks associated with options they’re considering. But, at some point, it does not help anyone to send the team back to sharpen their pencils one more time because there is disagreement about whether a certain level of risk is acceptable or not. At some point, the person who has the authority to accept risk must make a decision to do so.

I think that’s where teams really get stressed, when a decision maker is unwilling to tell one of the groups of stakeholders, “I am accepting this recommendation. I am not accepting your recommendation. I’m not going to implement your recommendation. This is why.” My experience has been that the people who have a concern, who believe that the risk associated with a given decision is too high—they will accept that course of action as long as they believe their concerns have been heard.

ROSS-NAZZAL: You said that the Agency values consensus, and that makes it difficult to make hard decisions. Can you give an example of that? I think that’s an interesting statement.

MCARTHUR: You look at Orion [Multi-Purpose Crew Vehicle]—the service module, it is zero fault-tolerant in the prop [propulsion] system. The crew office thinks that’s an unacceptable feature of the design. Well, at some point the program needs to decide whether it’s going to accept [the design or] tell people to go back and study it more, “Look at other options.” If you do that enough, eventually the tension between the ESA [European Space Agency] engineers who think it’s okay and the NASA engineers who think it isn’t—that tension really hurts team cohesion.

The Boeing design for the CST [Crew Space Transportation]-100 [Starliner spacecraft], the SureSep separation [ring] has single pyrotechnic cords in it. So, under certain circumstances, it is zero fault-tolerant for failure for the crew vehicle to separate from the launch vehicle. Is that okay? I kind of think, maybe.

It has redundant initiators, but the actual pyrotechnic cord itself is just a single—well, it's three sections, but in theory, if something happens and it's broken here [demonstrates], and it doesn't propagate all the way through, maybe you have a failed separation. Ultimate bad day. But it's a pyrotechnic; they tend to be very reliable.

There are probably ways to ensure that in fact the system has good integrity. Maybe that's one where, once all the data is in—and I'm pretty sure that design is going to fly—but the [Commercial Crew] Program basically said, "We're not going to tell Boeing that that's okay or it's not okay." You put off a decision until you finally reach a point where that's the design you have, because it's now too late to change it.

Once you get there, now there's an erosion of trust between the program and the people who were concerned about this design and raised their concern two years ago. And the program never stepped up to the plate and said, "We're going to accept this design," or, "We're going to make Boeing change it." Wasn't going to be easy to change. I probably at the time would have been okay if they'd just said, "We're going to accept the risk associated with this design."

Because I think now the team puts that behind them and they look ahead, they look at the next issue. There's always the next issue.

ROSS-NAZZAL: You had shared with us today that you were interested in working in some way for ISS but moved in a different direction. What was your role with ISS in this position, as being head of safety here at JSC?

MCARTHUR: I think mostly it was blessing the recommendations that came out from either the ISS chief S&MA officer or the ISS Division. [Organizational code] NE, the ISS Division and the ISS Program—in particular the ISS Safety and Risk Management Office, [code] OE—that was a very mature relationship, so really there were just very few issues related to risk management or risk acceptance that required me to make decisions about a particular recommendation or not.

Good news is I knew how to spell ISS. It was always funny to have some safety engineer come in to brief, like before a flight readiness review or before a safety and mission success review, who maybe did not realize I'd been an ISS crew member and that I really did know a lot about ISS.

ROSS-NAZZAL: Oops.

MCARTHUR: No, it was never bad, but it could be humorous. They'd be talking about something and I might ask, "Who installed that?"

"Oh, I don't know."

"You know what Expedition it was installed in? Do you know what Shuttle mission that antenna was installed on?"

ROSS-NAZZAL: Did you ever get a chance to go over as head of S&MA to Russia again?

MCARTHUR: No.

ROSS-NAZZAL: Nothing like that.

MCARTHUR: That was interesting because the interface with the Russians was through the ISS Program. That was really the ISS Safety and Risk Management Office owned that interaction.

ROSS-NAZZAL: Orion had a big launch, the EFT [Exploration Flight Test]-1. Were you involved in those events or moments?

MCARTHUR: No. We would do the normal risk reviews and flight readiness review-type things but that really was—I guess comes down to a Lockheed Martin contracted event. And not having crew members on it, the requirements were significantly different.

ROSS-NAZZAL: I wasn't sure about that, if you'd had a chance to go down there and see the launch.

MCARTHUR: If I remember correctly, we were down there for some kind of meeting and then the launch got delayed or something, so I wasn't there when the launch actually happened.

ROSS-NAZZAL: There were a couple of things that obviously were part of Safety. I wrote down a couple things that I remember since we've been here. One I wanted to get you to talk about was bringing the History Office [onboard].

MCARTHUR: Yes, that was another one of those really neat opportunities. I'm trying to remember who—was Trish the deputy when we did that, or was Vincent still the deputy?

ROSS-NAZZAL: The first time we came up to interview Trish was here, but I want to say it was maybe nine months after we had started. Trying to remember when we did that first interview.

MCARTHUR: Maybe Trish was the one that carried the water buckets on that one, but I just remember it was an interesting situation that clearly the ninth floor [Center management] felt they had a problem. Who were you guys under before?

ROSS-NAZZAL: IRD [Information Resources Directorate].

MCARTHUR: IRD. We didn't have insight, but there was some [issue]. I don't want to call it political, but there was something going on that IRD didn't want to have the responsibility or the funding any longer. [They] didn't want to be your parent. But there was something bad if the office went away. I'm not sure exactly what bad was. I don't know whose idea it was, but they asked would S&MA agree to embrace the History Office.

We looked at it, and we thought "Why wasn't it here?" If we have Knowledge Management, isn't there something common there, if you look at trying to collect a body of knowledge about what the Agency has done in the past? It certainly informs us about things we ought to do, or we ought to avoid in the future. I'd known [History Office Manager] John [J. Uri] before, and thought "Goodness, it makes a lot of sense."

It may have been [JSC Associate Director] Melanie [W. Saunders], but there was this subtle message that this was a problem that needed to be solved, and we could be part of the solution. Again, I talked about bringing people into the organization who you wouldn't look at and say, "Aha, safety person." Y'all seemed like a nice group of folks. We like nice people, we all like to be surrounded with nice people.

ROSS-NAZZAL: Yes, we definitely appreciated it. It was a nice change. One of the other things I had written down was that there was a new logo patch design for Safety I thought you might want to talk about.

MCARTHUR: Right, right. That was all part of this process where we were trying to do this really deep-down strategic planning. Really assess what our values were, what we were doing. We also looked, and we'd been saying for a number of years—there was a Space Shuttle [on the old patch], and the old S&MA logo really no longer reflected what Safety and Mission Assurance was doing.

There was a communications team. Stacey [A.] Menard was one of the key players in it. We really turned it over to the members of the directorate. The eighth floor [S&MA leaders] didn't drive that design. Vincent and I, and then Trish, really wanted this to be something that the rank and file in the Directorate owned. Then our mission statement or whatever it is, "safe spaceflight for life," those were all part of this effort. Again, really wanted it to be something that everyone in S&MA felt that they had some ownership of.

ROSS-NAZZAL: I do remember voting on it at the first all-hands [meeting] that we went to, that stood out as a memory to me. There were a couple of SAAs [Space Act Agreements] that I thought

you might want to talk about because they seemed very unique. One was a Space Act Agreement with Deloitte [Touche Tohmatsu Limited].

MCARTHUR: Yes. This was part of the concerns that we all had when the Shuttle Program ended, and that was we had a workforce that at least for a brief period of time—first, a number of people were losing that thing that got them to come into work every day. The Space Shuttle Program was inspirational. We were looking at what were nontraditional areas in which we could engage that would help maintain the skills that we felt were either unique to NASA, or areas in which we had a lot of strength.

So we had this Space Act Agreement with Deloitte, and this was when oil prices were really high and the oil and gas could spend a lot of money on safety and not worry about the bottom line. We partnered with Deloitte. They were trying to market risk management techniques to the oil and gas industry and they felt that partnering with us, there'd be a certain value that they could get out of that. It might give them a little bit of an edge on marketing these types of services.

We thought that it would be an opportunity for us to A, do something of value to the country, and then B—we tried to be very careful. We didn't want to go to the oil and gas industry and say, "We can show you how to do it." Our real message was, "We have some expertise in this area. We know you do as well. We would like to collaborate with you. Perhaps you will learn some things from us, and we know we will learn some things from you."

I like traveling with Deloitte. They do it differently. The gentleman who was working this was one of the Deloitte principals. I don't know how you become a Deloitte principal. If we traveled with them, the travel would be in-kind [donation], so it wouldn't go through NASA travel. They travel differently than NASA does, oh gosh. [Business class all the way!]

ROSS-NAZZAL: Nice company planes?

MCARTHUR: This was commercial. We went to Rio [de Janeiro, Brazil]. That was quite a little business trip. Went down there with Petrobras [Petróleo Brasileiro S.A.], the Brazilian oil and gas company, and gave them a presentation on risk management. Of course I know why they really enjoyed having me along, because I would show them pictures from space, “Here we are doing an EVA [extravehicular activity].” It was entertaining.

Also as part of that—it wasn’t going with Deloitte, but in 2015 I went to Paris [France] and spoke to the Total [S.A., French oil and gas company] senior managers group. That was a bit of an adventure. Then I went back and talked to them again last year, like just a week after I retired.

That’s really been the process in which I’ve evolved one of my stock presentations, which is really safety leadership. It’s what is a safety culture and how do you create a safety culture, and in particular how easy it is to destroy a safety culture.

ROSS-NAZZAL: Yes, using some of the examples from NASA. You also had another SAA with VASIMR [Variable Specific Impulse Magnetoplasma Rocket] on payload safety. Was that something you were involved with?

MCARTHUR: I didn’t do a lot hands-on on that. Mike Fodroci really was working with Ad Astra [Rocket Company]. What they were really trying to do was give them—and this was a nonreimbursable one. It was to help them negotiate the safety protocols to put VASIMR on ISS.

ROSS-NAZZAL: I did want to go back and ask about the Orbiter Project Office, because there were a couple things that I thought might be interesting for people to know about. At that time, things were starting to shift. We were starting to process vehicles, getting them ready for museums. I wanted to know what your involvement was in that.

MCARTHUR: The Shuttle Transition Office was headed by Dorothy [S.] Rasco, and they handled all of that. Our focus up until the Shuttle Program ended was the next mission; it was the next mission. I guess it would have been August [2011] when the Shuttle Program really was done. I became the S&MA director for the Center, and then the Shuttle Transition Office assumed responsibility. We just basically walked away from everything and left it to Dorothy and her gang of thieves.

ROSS-NAZZAL: I was wondering about that.

MCARTHUR: I would have liked to have held on and gone with each of the vehicles to its final home.

ROSS-NAZZAL: John Shannon had come to you and said he wanted you to focus on building those relationships with the other projects. Can you talk about that and give some examples?

MCARTHUR: There were hard feelings between Marshall [Space Flight Center, Huntsville, Alabama] and JSC. JSC really was the program, but it was also Orbiter Project. Then you had all the propulsion elements at Marshall. *Challenger*, the proximate cause was the SRB [solid rocket

booster] failure. SRB is managed at Marshall. The proximate cause of *Columbia* was foam came off the external tank, hit *Columbia*. External tank managed at Marshall.

So there was what I would call a very fundamental lack of trust on both sides. One of the things I insisted—as we were trying to resolve issues that involved the Orbiter and the Marshall elements—was that my guys would go to Marshall for meetings. They would know who their counterparts were at Marshall, that they actually would have a professional if not a personal relationship with those people. This idea that “My counterpart at Marshall doesn’t care” was just clearly not true, but it’s easy to fall into those types of things.

The Orbiter chief engineer was a woman named Joyce [M.] Seriale-Grush. Joyce was at my right hand, or at least maybe one chair away from my right hand, at every major Orbiter meeting. While she was out of the Engineering Directorate, she was also probably the most safety-conscious person I ever worked with. She had to be convinced a course of action was the right thing to do, or she would object.

What I sensed was that there had been situations in which in some of these meetings she was not afforded the respect that both her position as chief engineer, her expertise, and her sincerity dictated. One of the things I tried to insist is that when people disagreed with each other in these meetings they did so courteously. Of course, I didn’t always do it that way.

I always treated Joyce with [respect]. I may not have accepted her recommendation, but the only time I almost lost it in a meeting was when somebody from the Astronaut Office just refused to do the smart thing. “I can’t believe you’re doing this.” [Crew was concerned about how the software worked during landing. This wasn’t a software glitch, but the crew office wanted a software change. Could have been addressed via procedure and installing a switch marker (bootie). I] said, “No, we’re not going to change the software.” Of course I didn’t own the software anyway.

It was that kind—and plus, I had a very good working relationship with my counterparts in the other projects. In external tank, ground ops [operations], SRB, Space Shuttle main engines.

ROSS-NAZZAL: Do you feel like what you encouraged was actually fruitful? Or do you think that that tension was so hard to overcome?

MCARTHUR: Oh, I think so. I didn't just encourage it. It was, "I'm not asking you to collaborate with these people, I'm telling you that's what you're going to do."

ROSS-NAZZAL: Was a mandate.

MCARTHUR: Yes.

ROSS-NAZZAL: What are your memories of those last few missions and that final mission? Were you there for the final mission?

MCARTHUR: Yes. They are a bit of sadness that you knew that those were [the final flights]; it probably wasn't the last few missions, although we knew which was the last mission for each vehicle. There was a certain last part, but up until *Atlantis* flew in 2011—up until then, you always had one more mission that you knew that you could focus on, and you could look forward to. So it was that last one.

One of the people that supported our contract was a gentleman named Joe [Joseph E.] Michelet. Joe had been around a long time. He had been a senior, senior NASA manager, and

then I guess he was working for Boeing maybe. In the last pre-MMT (mission management team) meeting we had, I asked Joe to chair it. Just a tribute to the history of the program and the people who were involved there at the beginning, and that was kind of fun.

ROSS-NAZZAL: What are your memories of that day as wheels touched down?

MCARTHUR: It was business as usual. It's deorbit day. We were so engaged in executing the mission that I don't think we really thought that it's over until the vehicle stopped.

ROSS-NAZZAL: We normally like to ask folks a few things before they leave, one of which is what do you think is your greatest accomplishment, looking back over your NASA career. If you had to pick one, I know it's a very long career.

MCARTHUR: Gosh, I don't know. I would say just having hung around for 30 years. How do you define the word accomplishment?

I think the most exciting thing in my career was being on ISS for six months, and I think building a relationship with my Russian colleagues. And gosh, learning to speak Russian, and being able to just fly on a Russian vehicle and spend six months on ISS. We kept the Station running, and there were only two of us on board. There were several crews that way, but that was a physically and mentally challenging exercise. I just took a lot of satisfaction out of being the Orbiter project manager. I think maybe helping that team, helping Orbiter be a good team member.

ROSS-NAZZAL: What do you think was your biggest challenge?

MCARTHUR: Probably my biggest challenge was being accepted in the astronaut program. Seriously. In retrospect, not a lot of it seems that challenging. There was the next task, and so you finish one task and now there's another job in front of you. They were all doable. They seemed more exciting than they did challenging. Maybe they were exciting because they were challenging. I'm not sure there were any great challenges out there, it was just a lot of good things to do.

ROSS-NAZZAL: I think this might be a good stopping place. If you'd like to come back we can talk about Gary [H. Kitmacher's] questions.

MCARTHUR: Sure.

[End of interview]