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ORAL HISTORY TRANSCRIPT

MARK K. CRAIG
INTERVIEWED BY SANDRA JOHNSON
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The questions in this transcript were asked during an oral history session with Mark K. Craig. Mr. Craig has made minor modifications to several answers for clarification purposes. As a result, this transcript does not exactly match the audio recording.

JOHNSON: Today is April 11th, 2006. This oral history session with Mark Craig is a continuation from his earlier session on March 24th, and is being conducted for the Johnson Space Center Oral History Project in Houston, Texas. The interviewer is Sandra Johnson, assisted by Rebecca Wright.

I want to thank you again for joining us today. When we left off the last time, it was around the time period of 1987 after the [Space Shuttle] *Challenger* [STS 51-L] accident, and you became the Manager of the Lunar and Mars Exploration Office, which was later moved under the New Initiatives Office. If you can, explain the evolution of that position in that time period and some of your duties and experiences.

CRAIG: Okay. I had, within months, come off of the Space Station Program as the program management function was moved to Reston [Virginia]. Most of us who were in that decided not to go to Reston for various reasons, so we remained at the Johnson Space Center [JSC]. My immediate assignment after Space Station was as the Assistant to the Director of Engineering here at JSC, where I represented the Directorate on the both the Shuttle and the Orbiter control boards, the PRCB [Program Requirements Control Board] and its equivalent for the Orbiter. That lasted, I think, six months or so, not very long.

In that period of time Aaron Cohen, who was the Center Director, had been looking ahead beyond Space Station and had been doing some things around lunar activity, working with Wendell [W.] Mendell and Dave [David S.] McKay, in the Science Group. Mike [Michael B.] Duke played very prominently in that, as I recall, that had been doing lunar kinds of work. What kind of manned activities could be done on the Moon, would be done, should be done, etc., in a study sense, and Aaron was very interested in those. Also, he and Dr. Lew Allen, [Jr.,] who was the Director of JPL [NASA Jet Propulsion Laboratory, Pasadena, California], had gotten together and decided that JSC and JPL should work together on Mars missions, robotic Mars missions. Dr. Allen liked to tap into JSC's expertise in various things related to planetary work, and Dr. Cohen liked it to expand our horizons and help us gain experience from the robotic exploration community at JPL.

Both of those things came together in that time frame, [19]'87, '88 time frame. John [W.] Aaron, who had been the last Program Manager on Space Station, was working on those while I was in Engineering in the position I had mentioned, working on Shuttle, and I knew John very well. We were good friends, so I was aware of what was happening and what John was doing in those areas, and had some interest. He asked me as a side task to look at some of the engineering studies that were being done at that time on some Martian trajectories and other things, which I was glad to do. So I did that.

That was about the time that an organization was being formed at [NASA] Headquarters [Washington, DC] looking at lunar and Mars exploration that Frank Martin headed. I may have this sequence wrong. Frank headed it at one point, because I ended up taking his place later. But Frank was involved at Headquarters for Admiral [Richard H.] Truly, the NASA Administrator. John Aaron was spending more and more of his time at Headquarters doing that, so as John

began to take over that function of Moon-Mars activity at Headquarters, I was asked to take over John's position here, and a Lunar and Mars Office was established.

Most of what we were doing in that office were technical studies for the Mars Rover Sample Return Project, MRSR, which was in a phase A—prephase A—that JPL was running. A man named Don Rea was the Project Manager of MRSR at JPL, and as the JSC lead for our activities, I was the Deputy Project Manager for JPL, along with a fellow named Glenn [E.] Cunningham. We were the management team of the Mars Rover Sample Return.

It was functioning as a project management team, as it had a lot of very interesting work going on, both here and at JPL, technical work, laying out how one would do a Mars. It was a combined rover and sample return mission, which I personally found fascinating—the concept of roving over the surface, the concept of developing the technology to do scientific work in a roving environment, collecting samples, and then bringing them back to Earth. Pretty compelling stuff, so I thought that was fascinating.

I really enjoyed the technical work, and I really enjoyed working with JPL, both their managers and their team. I was very proud of the team we had, the JSC-JPL team. To my knowledge that was really the first time JSC and JPL had ever worked together on something of that magnitude, and it was very clear we had the mandate of both Dr. Cohen and Dr. Allen in doing that, because they were regularly asking us how it was going. It was really a great effort, and it lasted for several years. That was one activity in this Moon-Mars Office.

That ended up being eclipsed, actually, by a much larger activity, as it turned out. That was when the first President [George H. W.] Bush, in that time frame, came into office. He, as it was told to me, approached, or his administration approached NASA and said, "The President

would like to make some kind of a statement, create a space initiative of some kind, and would like to make the Moon the centerpiece of that."

That began a dialogue, I was told, with, of course, the [NASA] Administrator and his top advisors, working with the administration. They advised the administration, "No. If you really want to create an initiative and create a path for human space flight, you should include Mars. It should be bigger than the Moon."

That was ultimately accepted by the administration, and NASA was directed, "Okay, start putting together this initiative." At that point Frank Martin was the focal point at Headquarters. We had begun doing studies, as I mentioned, with the Moon and with Mars, laying out architectures. How would you send people to the Moon and Mars, to do what? What technology would have to be developed? What science would you do? How would you shape it programmatically, etc.? Really laying out a campaign—in language we'd use today—of how one would go to the Moon and Mars.

So we'd already begun that kind of planning, and we were doing that while we were doing the MRSR, the Mars Rover Sample Return. As the White House began to get interested in this, obviously that picked up steam. We were, as we were doing this planning, we were doing it in the model that JSC was the level two, the program manager. We were involving most of the other Centers, as in breaking the work up into pieces and having the other Centers do work. We had a program office structure in place and were running that here for the Agency. Had regular meetings with all the Centers; were putting together this campaign, in all these different dimensions, of lunar and Mars activity.

As the White House got more engaged, things heated up. Frank Martin was the head of exploration at Headquarters at that time. It was called Code Z. I was basically the Program

Manager here. That was the genesis of the program at this Center. As it became clear the White House really wanted to turn this into something, I personally ended up spending much more time in Washington. We let the program engine run, that is, doing the studies, laying out how you pick, how you do a lunar and Mars campaign, and I spent more and more time with Frank in Washington working with the White House on really setting up what they ended up calling the Space Exploration Initiative, SEI.

At some point not too long into that, Frank Martin decided to leave NASA, and I was asked to come to Headquarters to take his place. I went on detail to Headquarters, heading up for NASA the Space Exploration Initiative, and left Doug [Douglas R.] Cooke (who had been my deputy here) running the development of the campaign, which we knew we were going to need as we brought the politics to bear on this Space Exploration Initiative.

I had a small office in Washington, about eight or ten people, as I say, mostly working with the White House. Spent a lot of time at the White House working with the National Space Council, which President Bush had reestablished, whose staff was led by Mark [J.] Albrecht, who was a staffer for the Vice President, and basically Dan [J. Danforth] Quayle, the Vice President, was in charge of space for the administration. We had a number of meetings with the Space Council and the people on it to try to figure out what is this and how do we get going here.

There were several fronts in that effort. One was figuring out what *this* is and how to get going. Another was supporting the political dimension of it; how do we get review at the highest level of what this is, and through that, buy-in. There was one set of activities, which was mainly with the Space Council, looking at how we do the technical stuff and how that gets going, which involved other agencies, because it was very clear from the beginning that the Administration wanted the Department of Defense, the Department of Health, NSF [National Science

Foundation], involved in this. They also wanted to get ideas on how this should be done from all over the place. We had a lot of discussions with them, with the Space Council staff, about how to do that. Let me deal with that piece first, and then we'll come back to the broader how we get reviews at high levels in the country, etc.

The Space Council staff, at least ostensibly, was very interested in making sure we got the best ideas for what this is, things that would shape a campaign—maybe new ways to get things to the Moon or Mars, new technologies, new this, new that, whatever. They felt it was very important that—and the phrase at the time was "the net be cast widely" to get ideas, which we were certainly open to. There was a subtext, I came to conclude, in this. This was at the time of Star Wars [missile defense system], and it was in a very dynamic state at that time. It became apparent to me that this was really, at least to a large extent, an effort to get the Star Wars community involved in the Space Exploration Initiative. Never explicitly said, but clear by the people that would show up to be involved.

One of the people that was involved was a fellow named Lowell Wood, who was one of Dr. [Edward] Teller's protégés, and he began to insert himself very heavily into this process with ideas and other things. And there were other indicators much of this was really an effort to get Star Wars involved.

We ended up coming to an agreement on how we'd cast the net widely, that there would be this national announcement of opportunity, etc., and that a specific group would have to be created to deal with this. That is, it was not felt NASA would be appropriate to review all this, because it would be biased, basically.

We ended up making several proposals to them, and the one that they ended up accepting was creating a group called the Synthesis Group, which would be a group of people from across

the government, industry, universities, who would look at this plethora of ideas that showed up when we cast the net widely and make a determination about how they would be used. The Administrator, with Mark Albrecht, selected Tom [Thomas P.] Stafford to be the head of that group, and once that was done, they began to take on a life of their own. We ran the process of announcing, "We need ideas," then collecting ideas, but then we shoveled them over to the Synthesis Group, and they "synthesized." [Laughter]

I will say, with a smile, one of my perhaps most enduring claims to fame is I picked the name, the Synthesis Group, and the reason I did is I thought it was so unappealing as a name that it couldn't live forever, because we didn't think it should live forever. If you give it a mechanical name, it won't take on, hopefully, a life of its own. That's where the name Synthesis Group came from, trying to make it as unappealing sounding as possible.

The NASA Exploration Office had a good relationship with the Synthesis Group. Tom Stafford and I had known each other before and, I think, worked well together in that endeavor to look at lots of different ideas on how to do exploration. Once the Synthesis Group was up and running, we, NASA, backed away from that. We were still doing architecture work, but under Doug Cooke, we were then inputting it into the Synthesis Group, as were many other people.

Let me talk about two other activities we in NASA had going at that time. One was that —and a very important one—the White House was trying to cast and define what the Space Exploration Initiative was and then get reviews of it by very senior people in this country, both to get their ideas and, probably more importantly, to get their ownership and their endorsement. "Yeah, this really is a good idea. Yeah, this really is what the country ought to do."

Various groups were put together: an academic group, a commercial group (from captains of industry kind of group), the space hierarchy group. And we, NASA, working for the

Vice President, put together presentations to them. We spent a lot of time working with the Space Council staff, and also we made several presentations to the Vice President himself saying, "Here's what this is. Here are the graphics," one of which is on the wall there that we used [indicating a design on his office wall], first with the Vice President and then with these various groups, saying what this was.

Each one of these meetings with these obviously very senior people was led by the Vice President. He would announce the reason for the meeting. Admiral Truly would give the bulk of the presentation of what this is, here's what we're thinking about doing with the Moon, in very high level terms. Here's what we're thinking about doing with Mars. Then the Vice President led—orchestrated, led—facilitated is probably the best word—the discussion with all the people there in his office, because these were held in the Indian Treaty Room in his office in the old Executive Office Building.

Those were very interesting, both the process of putting together that material, of honing it down to its essence that's compelling and not just something an engineer would love, and then working with the political people to shape it, and then being present to hear the discussion. It was fascinating, and I really enjoyed that opportunity.

A lot of feedback was gotten, as one would expect. Then the White House staff went off, trying to digest that and figure out how to cast SEI in a political sense to take off.

JOHNSON: The feedback that you got back, what were some of the reactions during some of those meetings to what you were presenting? And did what you presented change after each one of these meetings? Did you hone it as you went along, for each group?

CRAIG: It, to a certain extent, was tailored to the group, but these were done fairly quickly, so it wasn't like there was one and then months and then another one and then months. They were all done within, as I recall, a month or two. So there was not an effort to take what was learned from the previous one and then recast it with that learning. We just thought we wouldn't be able to incorporate it properly, and that really wasn't the goal.

It was "paint the big picture" and elicit comments. And then thoughtfully—I think the administration wanted to thoughtfully then capture those and put them in. And obviously, marry them at some point with what the Synthesis Group was doing, and with their own political efforts to get this thing started. The material was honed, like the scientists saw a little different set of material than the captains of industry, not drastically different, but a little different. It was honed with each group, but it wasn't then modified for the next group based on what any group told us.

But there was a very careful record of what each group said, and a note of that made both for technical considerations with Synthesis, and politically shaping this thing as the administration was putting it together to take to Congress. One of the groups was Congressional staffers, so they had a certain perspective. The captains of industry group is the one that sticks out in my—I mean, the Congressional staffer group (the staffers, not Stafford) staffers group was predictable. "You haven't even built the Space Station yet. What are you talking about this kind of stuff for?" Fairly predictable, and some staffers supportive around that theme, other staffers not supportive around that theme.

The captains of industry group, which I found interesting—and this is a little bit of a generalization, but I guess that's inevitable, because it's what stuck in my mind after twenty years—was "Why would we do this?" It was said in a way, it wasn't just Moon-Mars, it was, "Well, you know, space activity really doesn't do much. I'm the CEO [Chief Executive Officer]

of Ford Motor Company." This is one I remember. "Space activity really doesn't do much for me, my company." I was very surprised at that. I did not believe that to be the case, because of the technology and other things, some of which I was directly aware of. And the fact he would conclude that or have that belief and be at that level really surprised me. That was an eye-opener, among many eye-openers in this time frame. That was very interesting.

There were other people. Tom Clancy [best-selling author of espionage and military science fiction] was on one of the groups. The White House tried to get what we used to call "purveyors of culture," which I thought was a great idea. Clancy loved what we presented. He came out of the classified world and what can be done with that, so he loved it. It was a really interesting group of, obviously, very senior people in the nation. That material I have kept, each of the presentations to these groups.

JOHNSON: Were you discussing money at that time, as far as a budget?

CRAIG: Yes, in very general terms. These presentations did have a budget profile. They showed "here's NASA today, and here's NASA with this in it." And it was an increase, obviously. One of the hallmarks at that time was to show that, at a very high level, there was phasing. You would do the Moon to learn certain things—to learn how to move on to Mars. Then you would ramp it down and go to Mars. So you didn't have a double peak, Moon, then Mars on top of it. You had Moon, then Moon falling off some, and Mars picking up.

Although the idea on the Moon was—and it was a hallmark of SEI, because the President had actually said this in his speech announcing it, "Back to the Moon, this time to stay." It was a permanent presence on the Moon that we envisioned and that we had conceptualized. "Back to

the Moon, this time to stay, and then on to Mars." That's a very simple statement, a policy statement, but it's very powerful. "This time to stay" has a lot of implications—transportation implications, technology implications, infrastructure implications, all kinds of things.

JOHNSON: What are your memories of the announcement itself and how that was received at JSC? Was it something that people knew was coming, or was this announcement somewhat of a surprise to the general population at JSC?

CRAIG: I think it was a surprise to the general population. It was not generally known. We knew about it, of course, because we had been helping put it together, but it was generally not known. It was meant to be—and it was on the [twentieth] anniversary of Apollo 11, I think.

So it was not generally known. What I thought of it was colored by the fact I knew it and I'd been living it, so I knew exactly what it was going to be. My memory of it is also colored by how it played out. Well, like Apollo, here we go. Step one, President makes a speech. Step two, we get a trillion dollars. Step three, we go off and do great things. Well, we got to step one. We never quite got to step two, and I don't think our culture ever really dealt with that, which I'll talk about later in some things.

About the specific time, those are my two recollections, the impressions.

JOHNSON: After that speech, and you were at JSC at that time—had you come back to JSC?

CRAIG: I was back at JSC, that's right. I'd been shuttling back and forth working on the White House stuff in preparation for this speech. I then, as things began to mature, in March of 1990,

went back to Headquarters to head up the Space Exploration organization. The decision had been made that the Code Z—all the original exploration work that John Aaron and Frank Martin had done at Headquarters and that I'd done was out of Code Z, which was an Exploration code—the decision was then made, once the speech had been delivered, that NASA's response would be, at least at first, to create an exploration organization not as a freestanding code, but in Code R, which was the Aeronautics and Technology code that Arnie [Arnold D.] Aldrich headed up. I went back up to assume the position I had had of running the Exploration organization, but now it was the Space Exploration Directorate in the Office of Aeronautics and Space Technology, Code R, headed by Arnie.

JOHNSON: Can you talk about that position and some of what you did while you were there during that?

CRAIG: Well, that's when we, NASA, and the government got more formal about this. The speech had been made.

[Interruption]

We, NASA, got formal about it; set up the Space Exploration Directorate in Code R. In that time frame the Synthesis Group was set up and it really began running, so the whole government was getting more formal about this. In Code R and in that group, we had several responsibilities. One was to make all the NASA input into the Synthesis Group, so we led all the studies here and elsewhere being done of Moon-Mars, but then input it into the Synthesis Group.

We also had responsibility for coordinating with other federal agencies and negotiating their involvement in SEI for the Space Council. So I started a number of negotiations with the Department of Defense, National Science Foundation, National Institutes of Health, etc., writing MOUs [memoranda of understanding] for how they would participate in SEI. This was done under the mandate of the Space Council, but we were the operational head to make it happen.

I also ended up at that time writing the first national policy on SEI. We, NASA, were given the job of doing that—drafting the government's policy on SEI—drafting both the government's framework policy and then the individual MOUs with the different agencies. Only one of those really went any—it was hard work, but people were really serious about doing it, so it was very interesting, and I learned a lot about the other agencies. DOE [Department of Energy] was a big one, of course, with the nuclear activities.

I think many of those MOUs set a good framework and led later to many of the things that NASA did with other agencies, they were very beneficial from that standpoint. One of which was, and one probably I'm the most proud of, was an MOU with the National Science Foundation to set up and have planet habitation analog activity in Antarctica, which we are now doing. So those—although SEI dissolved in not too long after all this—a lot of the foundation that was laid in that, in these MOUs with other agencies, I think has really paid off. And as well a lot of the technical work done by all the different agencies is the foundation for much of what's happening today. It really was, in hindsight, a very good foundation for Moon-Mars activity, and governmental activities across the board. That was the second area where we had responsibility in this Space Exploration Directorate.

The third area that I was very intent on—and it's a little bit of an overstatement, but it was fed by the CEO of Ford—was that we really need to figure out how could we make this SEI

happen and sustainable. It started out as what's the rationale, other than just a speech. If this thing is going to be the size we hope it is and think it is—if it's the kind of commitment it has out of the government, not just NASA, but other agencies—how does one really make this sustainable? So we started an effort to try to figure that out, independently. Nobody else seemed interested in that, for good reason; I mean, they were trying to get it started.

Those were the main areas. We managed all of NASA's inputs into the Synthesis Group. We led the development of MOUs between NASA and all the other agencies, and policy statements in the Space Council. And then we worked at figuring out the rationale and how to make it sustainable. Those were our three main thrusts in the year and a half or so I was there doing these things.

There began to be some interesting phenomena in NASA. Elements of NASA came to see SEI as a threat, mainly Space Station. The view, I believe, was as Moon-Mars got resource, Space Station wouldn't. In effect, I guess, and in the limit, if Moon-Mars really took off, Space Station wouldn't be needed, would go away. So there began to be some real challenge within NASA, mainly at Headquarters, about what this is. That was very disconcerting to me.

There were many big challenges. In this, I began really trying to think through what this SEI is. The initial response to me, of NASA and its leadership, was SEI is a program. The more one really looked, I thought, looked at this carefully and what it was and what it could really be and how it could be sustainable, it's a strategy. It's not a program. It's a framework against which you make all your decisions—technology decisions, robotic mission decisions, space transportation decisions, Space Station decisions. It's a strategy. It leads you eventually to the Moon and Mars, but its real power in 1990 was as a strategy.

I could not sell that to the Administrator, and, for reasons I've never been quite sure about, the Comptroller of NASA at that time was virulently opposed to this. I have come to believe that it's because at that time, from its history, NASA had learned, rightly or wrongly, that you don't have a strategy, because if you do have a strategy, the political process will figure out how to unzip it, so it makes you vulnerable. So even though someone may have a strategy, like the Comptroller, who clearly had a strategy, you'd never articulate it and you'd never say you have one. So that undermined a lot.

So there was some interesting internal NASA dynamics around this thing, which looked like manna from heaven, at least superficially when it showed up, but very quickly came to be a real challenge within NASA. That was a very interesting experience. I went up there in March of '90 and was acting head of the Space Exploration Directorate. In the summer of '91 the Administrator, after much delay, finally filled the position that I had been acting in with Mike [Michael D.] Griffin, the current NASA Administrator. So Mike was brought in. He had been doing a lot in DARPA [Defense Advanced Research Projects Agency]—maybe not DARPA, but Star Wars kind of things, military high-tech stuff. Was very well thought of by the Space Council, so was brought in to lead SEI for NASA. That was in mid-'91; summer, maybe, of '91.

The handwriting, to me, was already on the wall. SEI did not last long. And it wasn't because of Mike. It was internal NASA. It was the external system. The political process saw this, and Congress saw this, as, again, "You haven't finished Space Station yet. What are you talking about this for?" So I think that was the beginning of its end politically in Congress. There was, I believe, a fair amount of tension within the administration between NASA and Star Wars and other elements of the government; that was creating some challenges, and then within

NASA there were challenges. All of those conspired together to bring SEI to a pretty quick demise.

JOHNSON: In those meetings earlier with the Ford CEO, which you mentioned, and his response, at that point in those meetings, was someone answering back to him and explaining to him?

CRAIG: No, and it was not meant to be a "let's make sure you understand" meeting. It was meant to be a "I'm going to get your ideas." I think the Vice President, in leading the meeting, was gently trying to persuade people, but he was not there to be the apologist for the space program. He was genuinely, I think, trying to have a dialogue and get people's thoughts and ideas, and not be confronting and disagreeing with people. He did, though, on that one, he did say, "Really?" or something to that effect. [Laughs] It caught him by surprise, too; it was, "Really?" But then he rightly didn't push back on it.

JOHNSON: Do you think that sort of feeling led to part of the demise, too, that people weren't buying into how it would affect them?

CRAIG: I think so. It was, yes. I probably shouldn't generalize this fully, but I think there was not, in those meetings, other than in the space leadership meeting, not surprisingly—people didn't just exhibit great enthusiasm; I'll put it that way. I mean, they were nice. These are very sophisticated and very smart people. But they did not exhibit great enthusiasm. Several, but not many, just outright said, "You shouldn't do this." But the tone of the meetings was more, "That's interesting," and I think the White House picked up on that.

JOHNSON: I read that [Dr.] Carl [Edward] Sagan [astronomer] was one of the people that was in one of those meetings.

CRAIG: Yes, he was. It's an interesting list of people, when you look at the folks in all those different meetings, very interesting.

JOHNSON: After you were replaced at NASA Headquarters and you came back to JSC as the Manager for Technical Projects in the Space Station Projects Office, how did that change come about? Obviously, you said Mike Griffin had replaced you at Headquarters, but how did you come back to that position and what were your duties?

CRAIG: This is one of those cases I'm sure you've never encountered before, where one's job description and job title are completely different. [Laughter] You're shocked, I can tell.

JOHNSON: Not at NASA. [Laughs]

CRAIG: That was a very dynamic environment. Mike was up there really struggling to get SEI going down the road. The Administrator, Admiral Truly, was starting to have some problems with the administration, and the Space Station was really struggling. That was a tough time to be in NASA leadership, and it was not long after that that Admiral Truly was replaced, which was a tremendous shock to him, tremendous shock to him, personally.

When I got back, Aaron Cohen, who had been my mentor in all this and had launched me into this career in planetary exploration, and Aaron is such a wonderful man in many ways. He said, "I know this has really been hard on you and your family. How about if you finish your Ph.D.? I mean, just do something different."

I had been working on my Ph.D. at Rice [University, Houston, Texas] for quite a while, and I said, "You know, I really appreciate that, but I would really like to go to some academic institution and learn about the business environment."

So many things had happened which caused me to be concerned for human space flight, about how to make it sustainable politically. We clearly had not done that for SEI; it had other challenges, too. It had really begun to sink in on me—Apollo, human space flight in this country, in the government, was just kicked off by President [John F.] Kennedy in the space race, and what a tremendous gift that was. But what a tremendous curse, because it led us to believe, well, that's just how things happen. And frankly, in the language of today, we're an entitlement program. I found that very disturbing, because I actually concluded at that time that we actually act that way. We build space systems, and the nation is just supposed to love them. Are they supposed to actually do anything for people? That's your problem. We just tell you how wonderful they are.

I just found that very disturbing, because I didn't think we, NASA, had thought through that very well. We'd been living off the energy of Apollo. That had certainly gotten us Shuttle, and now it had just gotten us Space Station, and that was probably about as far as that one was going to run. What do we, NASA, need to do to really understand the source of sustainability, for human space flight, not robotic. Robotic is a low enough level of funding, it doesn't harm

people when missions fail, and it's scientific in nature, which has its own external constituency. The scientific stuff we do, robotic stuff, is sustainable. Human space flight is not.

So I looked around and found a program at MIT [Massachusetts Institute of Technology, Cambridge, Massachusetts] called the Sloan Program for Senior Executives, which was a three-month, 24/7, you live it, with the best that MIT and Harvard [University, Cambridge, Massachusetts], it turned out, have to offer, and you live it with about thirty other senior executives from around the world. I asked Aaron if I could go to that, and he very generously agreed that I could.

I did go to that, and that was a real eye-opener to see how businesses make decisions. Businesses live to be sustainable, so, really, to live with them and see how they make decisions, what they do, what technologies—in our language—they use to be sustainable, was a real eye-opener. I have always been very appreciative of that. It made quite a difference to me.

I needed a place to be assigned at JSC to go off and do that. Space Station was the big program. I think I'd been in it before. [Laughs] John Aaron was now the—John and I followed each other, spiraled through this thing. John Aaron was now the Project Manager. Aaron arranged for me to be in that, in the Space Station Project Office. So I went to MIT.

I actually did several things in the Project Office. One of the things was that there was an effort—I'm not sure where it came from, but looking at how you could use some kind—the concern was that they didn't think they'd have enough early capability on Space Station to be able to do much science, so efforts were being expended to look at how could you get more science early on Space Station. There had been an idea around for a long time called a Long Duration Orbiter, where you'd put more cryotanks on it so it could stay up longer. The idea was—is there some way we can marry this idea of a Long Duration Orbiter with the early phases

of Space Station to get more capability up there? Aaron Cohen asked me to lead the effort to look at that so-called Long Duration Orbiter study, which I did, and that was several months. Good study.

At that time Space Station was having a lot of problems with the overruns, and JSC was getting some very bad press; JSC specifically was getting very bad press. So Aaron Cohen also asked me to lead a study looking at the Center's program control capability, which I did. Assembled a team of very—Dan [M.] Germany—very capable people that had been involved in projects and programs at the Center. We looked at the Center's program control capability and came up with some very good recommendations there.

Those were the two specific things I did from that platform of the Space Station Project Office after I went to MIT. That was also the time Mr. [Daniel S.] Goldin showed up, and he kicked off the Red Team, Blue Team activities. One of the teams that was put together as a Red Team was led by Steve [Dr. Steven A.] Hawley on human space flight. Steve asked me to be on that Red Team, and that then led to a whole other path, because that became a full-time job, really. That was the Red Team on human space flight—what shall we do with Shuttle, and mainly what should we do with Space Station? And that's when we were looking at should we do away with Space Station Freedom; I mean big questions. Should the whole thing just end? Should we go to some completely different management structure, some completely different Space Station configuration? The Russians; at that time the big question, should they be brought in? On Steve's Red Team, we got into all that stuff, and that became a full-time job.

From that other things happened. Goldin liked setting up this dichotomy of teams that would let the internal system fight itself out. Then there was a Blue Team, and then from that I got on a team led by Roy [S.] Estess that was looking at Center roles and missions. It just was

this evolving environment for the Administrator of teams. It started for me with the Red Team on human space flight and then led into Center roles and missions and other things. That went on for about a year, a year and a half, full-time, so I really wasn't even here very much.

JOHNSON: You mentioned about working with the Russians, and President Bush and Mikhail [S.] Gorbachev came to an agreement in '91 to start working together, and then in '92, I think, the Russian Space Agency and NASA signed an agreement, and the work was beginning to work toward the Shuttle-*Mir* and the phase one of that. Did you have anything to do with that when you were on the Red Team?

CRAIG: No. No. Although, we included Shuttle-*Mir* in our considerations, but it really was the bigger consideration of is it a prelude to getting the Russians in the Space Station, and what is the Space Station. Should there be a Space Station? Ours was even a higher level consideration of what to do.

The Space Station piece of that especially was a very stressful activity. Reston was really struggling. Having been in the Space Station years before and so having some history in its origins, and then from a distance seeing it struggle at Reston, one of our big questions internally on that team was will it make it, technically, programmatically? Some of us concluded no, it wouldn't, that the structure and the process were so flawed, there was so far to go, that it wasn't going to make it.

JOHNSON: The process as far as the program was concerned?

CRAIG: Yes, and that was very distressing, (*a*) that we were to that point, and (*b*) because in making those kind of statements, I was telling people I'd grown up with, "This is not going to work." It was a very difficult environment of an honest disagreement between people that had come out of the same world and had known each other for a very long time, and that led to a lot of personal trauma.

JOHNSON: And that was separate from the whole budget issue?

CRAIG: Yes. Right. The program was so complicated, and the way it was structured was still so complicated. There are some things that just can't be managed to conclusion within any reasonable amount of money or time. Of course, I knew from my history in Space Station that a lot of that structure had come from political necessities and other things; that it wasn't the program's fault they were that way. They were very important to be set that way, but once they were, they just really minimized the chance of successfully completing it. At what point should NASA just say that's it? A huge political question, and Mr. Goldin just loved that kind of stuff. He loved huge political questions.

From all that he concluded, I think very rightly, although that got a lot of push-back from hearing my friends here, that if the station was to survive, it had to have the Russians in it. I think he was absolutely right about that. It would not have survived without the Russians. That caused a lot of controversy among my community of friends.

JOHNSON: They didn't want to see the Russians involved at all?

CRAIG: No. Again, not to generalize, because certainly not everyone. Because a lot of the leadership here wanted that to happen. But a lot of the people, many people, felt that that was a mistake. Too complicated, too costly, dealing with people that—who *are* those people? All the kind of things that happen when you have a collision of cultures. And it was very hard to do, but I think it was (*a)* the right thing to do for Space Station, because it survived, and (*b*) strategically, for the future, it's absolutely the right thing to do. But that was a hard time, and it took someone like Mr. Goldin who just—"Torpedoes be damned," and who was very politically attuned, to make that happen.

JOHNSON: Of course, there was that cooperation that eventually came out of it.

CRAIG: Yes, which we're all better for, and really has begun to create a human exploration of space enterprise, which is, I think, to the benefit of all of us.

JOHNSON: And it gets the attention of the entire world this way.

CRAIG: Yes, it does. It could get more attention if we'd do better at it, but we don't. We're engineers. Back to my earlier comment about really thinking through why we're here and shaping it to respond to that, not just build hardware, is a problem. It is in that, for sure.

JOHNSON: Well, from that position you were asked to go to Stennis Space Center [Mississippi] in 1995 as the Deputy Director.

CRAIG: Well, we missed a step here.

JOHNSON: Oh, did we? Okay, well, let's go back.

CRAIG: This was a very, very turbulent, roller coaster environment for my profession, my career. Red Teams, Blue Teams, Center Roles and Missions Teams. Also in that period I met Charlie [Dr. Charles J.] Pellerin, who was at Headquarters, was very close to Mr. Goldin at that time, and who had just been made the head of NASA strategy, developing a NASA strategic plan. I had, from my SEI experience—an attempt to do a strategic plan—some very definite ideas about a NASA strategic plan. I went to talk to Charlie while I was up there on Red Team stuff, and he and I really resonated, and he said, "Let's find a way for you to help me do this." So again in this environment where I just had my little platform over here in Space Station, sure; help him. I started working with Charlie on a strategic plan, how to do a real strategic plan. NASA in the past had had many, many plans which were called strategic, but which really were just pictures of a whole lot of spaceships. That's not a strategic plan, in my view.

Charlie and I began to work on that. That was about the time Jack [General John R.] Dailey came on board as the Associate Administrator for Mr. Goldin. He was very interested in this, too, from his background in the Marine Corps, and Jack's a very strategic thinker. We were starting to really lay out some things that could be done when, as often happened with Mr. Goldin, Charlie and Dan had a falling out overnight. So Charlie Pellerin decided to leave NASA the next day. It was just kind of a square wave, which happened often in Headquarters.

I was left there thinking through the strategic plan, and General Dailey and I had already developed a relationship, and he'd made it clear, "I really want to do this," because Mr. Goldin

was using him as the internal "down and in" guy. I continued working on strategy and working with General Dailey, and made recommendations to him on what a real strategic plan should look like. That's where I really drew on a lot of the stuff I'd done at MIT. He was, thankfully, very much in agreement with that, so he asked me to lay out, "Now, how do we get a process?" You don't just have a strategy. It's got to be developed by the management team, and they've got to own it. So how do we lay out a process for that to happen?

I began laying that out. How do we really do this? How do we get all the AAs [Associate Administrators] and Center Directors to really get on top of this and figure out what our strategy is, a real strategy. At that time Peggy [Margaret G.] Finarelli came into this in another Headquarters move. She'd just been moved out of the international office. She came over and worked for Jack on this, too, so it was Peggy, Jack, and I. We laid out for General Dailey how this could be done, and then he said, "Well, let's do it." We had a series of retreats against this process and plan starting in '92—maybe '93 maybe. Spring of '93. And we developed from that the first real NASA Strategic Plan.

What I'm most proud of in that, and what I really am most proud of probably in my whole career in NASA, was my recommendation to him, which he accepted and then the management accepted, of creating the Strategic Enterprises. The reason that those were so important—and that was learned from my experience at MIT, from what companies were finding—if you didn't know who your customers were, and you didn't know what your products were, you didn't know who you were, and you were not going to succeed. The commercial landscape was just filled with companies who were big, powerful companies, like IBM [International Business Machines], who at that time were really struggling because they had lost track of who

their customer was and what their product was, and they hadn't segmented themselves around customers and products. They were just continuing to do stuff. Sound familiar?

General Dailey bought into that, so we created the Strategic Enterprises to segregate NASA's customers and the lines of business we're in. It had two immediate impacts, one of which Mr. Goldin wanted for other reasons, and that is it split up space science and Earth science. My rationale for that was they have different customers. Space science, the customer is ultimately your space scientists. Earth science, we all live on this planet, so the customer is not scientists; the customer is us. Those are the kind of simple strategic distinctions you make when you really set up a strategy in a strategy framework. That was the main immediate impact, was to split the science, which caused a huge internal uproar, but it was the right thing to do.

The other thing it did, and my real intent in doing this, was to give a different name to human space flight. Names have strategic power. For years, in fact, unfortunately, we never could get the name of Code M changed. Code M was Office of Space Flight. Well, the trouble is that was actually a statement of who we saw ourselves as, space flight. Why? Where? Flight. We changed the name to the Human Exploration and Development of Space [HEDS], because that's a real statement, in my opinion, of why NASA is here, to explore and develop—not just explore, but explore and enable the development of space. We changed the name to reflect the real strategic intent.

We created the HEDS Enterprise, and that then caused certain things at Headquarters to change and shift to align with that, which is the whole point of having that kind of structure. I was very proud of that. It really didn't get as far as I had hoped, but it started to lay the framework against some real strategic decisions and how they could be made, especially with

respect to human space flight, where they really needed to be made. That was bought off, and we ended up developing the Strategic Plan and published it every year. It was very successful.

Now, one of the things—and that was all thanks to General Dailey and his leadership, because he really made that happen. Once we had a Strategic Plan, step two was, because this was also obvious, we didn't know how to manage a strategy. In fact, there was no particular way to manage Headquarters. People had just been doing things forever. So General Dailey agreed that we needed to create a strategic management document, a system handbook. That was our next step, to get together a team of AAs and Center Directors to write our Strategic Management Handbook. Here is how we're going to do strategy. Here is how we do funding. Here is how we do—that was the next big product that came out of all that activity.

That was a very important part of my career, and it's a part I'm very proud of, because it's touchy-feely-squishy. Engineers hate that kind of stuff, but we've really suffered because we've not had that kind of activity before. That was about a year, year and a half, working for General Dailey in Washington. Working for another exceptional mentor, General John R. Dailey.

As that time reached an end I was starting to get phone calls from JSC of "Who are you, and why have you been gone so long?" The Center Director had changed here twice, actually. I was approached by Dick [Richard] Wisniewski, who was the Deputy AA in Code M, and he said, "There is now an opening at Stennis. Do you have any interest in doing something at a Center, other than where you've been?"

I said, "Gee, that sounds great." I'd known the Stennis Center Director Roy Estess really well, because Roy and I had worked together on the Center Roles and Missions Team, and I really liked Roy a lot. So I went down and talked to Roy, and next thing you knew I was Deputy

Director at Stennis. I hadn't sought it, but I was really ready to do something different. I'd done everything I could do at Headquarters, and it wasn't clear what there was back here, so doing something completely different—I'd never done Center management stuff before. I'd done programs. I'd done political. I'd certainly done technical management, program management. It looked like a place to learn some new things, so I was very pleased to do that. That was in 1995.

JOHNSON: We're almost at eleven-thirty, so do you want to stop now?

CRAIG: That's probably a good place to stop, with Stennis.

JOHNSON: Yes, and we'll talk some more about Stennis when we start the next time.

CRAIG: Yes. Good.

[End of interview]