

**NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
COMMERCIAL CREW & CARGO PROGRAM OFFICE
ORAL HISTORY TRANSCRIPT**

BRUCE A. MANNERS
INTERVIEWED BY REBECCA HACKLER
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HACKLER: Today is December 5, 2012. This oral history interview is being conducted with Bruce Manners at the NASA Johnson Space Center in Houston, Texas for the Commercial Crew & Cargo Program Office [C3PO] History Project. Interviewer is Rebecca Hackler, assisted by Rebecca Wright.

We understand that your involvement with the COTS [Commercial Orbital Transportation Services] Program started in 2006 when you were chosen to participate on the Participant Evaluation Panel. Can you talk about why you were chosen for that role and how you first became involved with COTS?

MANNERS: Sure. I wasn't actually on the Participant Evaluation Panel at the top level, I was on the technical committee that reviewed the technical portions of the proposals. How I ended up getting involved with that—I was on a detail from the [NASA] Glenn Research Center [Cleveland, Ohio] down to the Johnson Space Center as a liaison between the two centers. It was a point in time where Glenn was struggling to try to maintain relevance in the Agency, so I was helping to bridge a gap between the two centers.

I had a lot of experience and history with the International Space Station [ISS] Program. I had worked from roughly 1990 through 2001 as the subsystem manager for the power system on the Space Station, so I'd built up a relationship with Valin [B.] Thorn, who was at that point

the [C3PO] Deputy Program Manager, and Alan [J. Lindenmoyer], who was the [C3PO] Program Manager, as knowledgeable about the Space Station. Then, my experiences at Glenn had broadened some of my experiences to include propulsion and things like that, so when they were looking for technical people to go review the proposals, I was a convenient body that was here already.

HACKLER: In your experience on the panel evaluating the technical proposals, did that differ a lot from what you might do in a Source Evaluation Board, or was the process fairly similar?

MANNERS: I'd say in a lot of ways it was similar. We read the proposals and wrote strengths and weaknesses, which is largely what you normally would do on a big proposal. The specifics of what had been asked for under the proposal guidelines given to the partners or the companies was significantly less and scaled back, but it still enabled us to differentiate between the companies and their proposals.

The typical proposal for a government FAR [Federal Acquisition Regulation] contract is thousands of pieces of paper, and the proposals under the Space Act [Agreement]—I don't remember the exact number, but in the 25 to 50 range. So the depth was a little different and the amount of information you had to get through was a little different. The process you went through of reading the proposals and writing strengths and weaknesses was very similar, but the pieces that you had were significantly scaled back in the amount of information, which I still think did give us an opportunity to differentiate between the companies.

I don't see a big drop there. If you wanted to get into really, really fine differentiation, pieces of subtleties of somebody's approach to some power system piece, you didn't get the kind

of depth you needed there, but at a gross, top-level architecture piece it still enabled us to differentiate between the companies.

HACKLER: Did you have to do any sort of training or orientations since this was going to be a different process than the usual Source Evaluation Board?

MANNERS: There wasn't very much formal training. We had some pre-meetings where we sat down at least individually—I think it was largely individual, but there may have been one group meeting—with Alan and Valin and they laid out the expectations and what the plans were. But there weren't any significant training efforts, which might be a lessons learned opportunity. The business side of it, there was some training I think some of those folks could have been through that might have helped smooth some of what was done.

HACKLER: You were on the technical committee, but did you also have some involvement with evaluating the business aspects?

MANNERS: Not for the original. When we first awarded RpK [Rocketplane Kistler] and SpaceX [Space Exploration Technologies Corp.], I really was just on the technical side. The later competition, after RpK had fallen off and we had to re-compete, I was part of the top-level PEP [Participant Evaluation] Panel, and then I was involved with reviewing both the business side and the technical side of it. The second round, when we picked Orbital [Sciences Corporation], I was much more involved with the broader spectrum.

HACKLER: After the original PEP, you became the project manager for RpK. Can you talk about how you moved into that role? Since you said you were originally on assignment from Glenn, how did you get chosen for that position?

MANNERS: Well, the PEP activity wrapped up through the summer of 2005, at least my involvement with it did. Then, through a number of different things, I had decided I was going to relocate from Glenn to JSC. So I relocated and came down into EP [Propulsion and Power Division] in the Engineering Directorate, and helped them get organized to support Constellation [Ares rocket and Orion Crew Exploration Vehicle]. My ties back to Glenn were helpful again there, because it was a partnership we were building between the two Centers to do some things on Constellation.

So really, this had fallen off my radar and I hadn't really paid much attention to it for a number of reasons. The initial reason I'd gotten involved with it—A), it was an interesting effort. But I was on that liaison piece from Glenn, so at that point I was looking if there was a role for Glenn in this program. When I got into the proposals and realized the management paradigm for the program, I realized no there's not, at least not at the level that we were hoping for. There were probably some piece-part tasks that they might have ended up picking up, and they did, but at the partner and be part of the program piece, it wasn't that kind of a program. So this whole program had fallen off my radar.

Then, as I understand it, when they selected the companies Alan and Valin needed to staff up their program office pretty quickly, so they went through the usual rigorous JSC selection process. "Well, who do we have at the right grade [General Schedule pay level] that's around, we know, we like, we want to work with?" Somewhere along the line they said, "Hey

Bruce, would you come over and do this?" So I came over and did it. It seemed like an interesting program, and I was no longer trying to figure out how to plug in Glenn Research Center; that was no longer my job.

At that point it was a real interesting program to get involved with, and I also viewed it as a stepping stone piece. I could come do this while Constellation was getting organized and getting structured, and get to the point where I considered the program fun, which is when they were going to be cutting hardware. So I came over here, did all this, and of course Constellation disappeared [cancelled in February 2010]. So it was a good step, it just wasn't the step I thought I was going to take.

HACKLER: I'd like to ask some more questions about RpK, but before we do that, in general, how did you work with both partners as a partner as opposed to a traditional contractor relationship, and what sort of background did you use from your previous experience to help you do that?

MANNERS: Probably the biggest piece that I have found in general—I feel like I have a huge amount of influence inside the projects. I'll roll back, way back. You said I was the project manager; technically I'm what we refer to as a project executive. That differentiation is important. The expected role of a project manager within NASA is not what we're doing. I am not trying to dictate and drive and own the design or the program. I'm trying to serve more as a facilitator to it. It's more akin to the [NASA] Headquarters [Washington, DC] role, which is why they picked the project executive versus the project manager.

What I've found—I feel I have a huge amount of influence, possibly more so than if I owned everything, because the companies are looking for guidance. They look for answers, and I actually find that I have to reel myself in and not give them the direction that they sometimes want, so that they can make a better business decision as opposed to what NASA wants and thinks. We're trying to do something that's broader, not to simply answer our requirements.

We want to answer what might be helpful to fit our piece, but also give them an opportunity to do something commercial on the side, so that we would be an anchor tenant but not the exclusive tenant. NASA tends to focus too heavily on what do I want to do and I don't really care what the world wants to do, which is fine from a NASA perspective, but not necessarily what we wanted to do here. So I have to reel myself in from telling them exactly what they should do from a NASA perspective at points.

What I've found in general, the best background for me—the liaison piece and a lot of other places where I've been more of a facilitator and more of an influencer but not a driver have been very handy. I've looked at my career background even through the Space Station. At various times I was the subsystem manager, the deputy subsystem manager from the Glenn Research Center influencing what was happening at the Johnson Space Center with a big team that was largely at the Johnson Space Center.

I didn't have direct oversight, I couldn't tell people what to do. I had to influence them through other skills. That has been probably the most useful skill set that I had built up by accident in previous jobs that I've ended up using here. It's much more managing through influence than it is managing through force of position.

HACKLER: You mentioned that you didn't want their vehicles to be developed solely for NASA requirements, so they could also have commercial opportunities. But they did have to meet some NASA standards, for example ISS integration, working with the safety community. How did you manage those relationships between those different groups, and make sure the vehicles could integrate with those requirements?

MANNERS: That's where we did have the places that we did hit real hard with the NASA requirements: the IRD, the Interface Requirements Document for going to the Space Station. Those are places that we do take much more ownership of making sure the designs meet our intent and meet our requirements. But we were very exclusive and specific, "These are the places that we're going to touch, and the rest, we'll give you our opinions on but we won't own and we won't drive."

I think on the COTS program that presents a good opportunity because they still develop a rocket that we're not necessarily driving everything on. That rocket has a good useful purpose to them to go sell to the Department of Defense or commercial industries and commercial entities to launch commercial satellites. That is clearly a large piece that we don't necessarily drive the entire design on.

The spacecraft leverages a number of different kinds of systems that are common with a lot of different things. If you look at what the spacecraft that comes over to the Space Station is, it could be a commercial satellite that happens to have a big cargo trunk on the side of it. The piece that comes and directly interfaces with us, the cargo trunk piece that the astronauts have to go into, we get much more interested and specific on. The pieces that directly tie over into us—be it the power, the communication system, software—we get more specific on those things, but

the other parts we can let them decide how those designs ought to work, and they have leveraged their own satellite industry experience to go develop the systems. We've taken advantage of that and tried to help that.

They have also learned from what we've done and some of the rigor that we put into manned space and human spaceflight programs. The companies have learned from that, and I've actually seen them roll some of the design and the principles that we try to levy here into the commercial side. I believe they're seeing product improvement on that side as well, which is a benefit for the company that we've been able to afford to them.

HACKLER: The other groups that worked with you in the COTS program were the COTS Advisory Teams who provided some technical expertise. Can you talk about their contribution, and how you tapped into those resources to help the companies develop their vehicles?

MANNERS: Early we had a lot of design reviews, so we would go tap people from across the Agency and bring them involved. We did have to do some cultural education with some of those folks to make sure they understood that we're not trying to own and design these things, and that we're giving them our technical opinions on what their approach is.

We tapped people from across the Agency, from Marshall [Space Flight Center, Huntsville, Alabama], Kennedy [Space Center, Florida], Langley [Research Center, Hampton, Virginia], Glenn, Goddard [Space Flight Center, Greenbelt, Maryland], really all across the Agency. It was a broad spectrum. One benefit we had is the people we went and tapped for say the Orbital effort or the RpK effort were also the same set of folks that were tapped for the

SpaceX effort, which did give us an opportunity to do one set of education process and then have them look at two sets of designs.

We had to be careful with them to make sure they understood that we're not trying to move one guy's design to another guy's design, and keep that proprietary data line clear. But there were things we as a NASA entity have learned, lessons learned that we can spread to both partners that originated with us. That was one place where having an overlapped team was helpful. If we learned something on Gemini, there's no reason why they can't benefit from that in both sides of the program.

HACKLER: With you being the Project Executive for RpK and then Orbital, were you aware of SpaceX's design, or was that kept completely separate?

MANNERS: Generally aware, but I'm not intimately knowledgeable. I'm generally aware of what they've done. I'm generally aware of how Mike [Michael J. Horkachuck, NASA Project Executive for SpaceX] and Warren [P. Ruemmele, Assistant Project Executive for SpaceX] approached the partners. Very early on I was involved in reviewing some of their pieces, but the workload didn't enable us to really maintain any detailed cognizance of what they were doing.

When we were first starting up we were all still scrambling trying to get our teams put together, so I did review some of the early designs for them on the power system and places where my technical background fit. But as much as anything else, I then helped them build a team so that they didn't need me. So I was aware at the early stages, but I'm probably less familiar now with where they are.

HACKLER: You mentioned their proprietary data, not letting one company know the other company's and vice versa—what was different about the Space Act Agreements under COTS to keep that proprietary data separate, rather than a traditional contract agreement?

MANNERS: I think the difference is probably the amount of data that is proprietary versus traditional NASA contracts, where there is maybe some proprietary data you may worry about but not all of it. The biggest piece is the sheer volume of the amount of information that we had that was proprietary versus traditional companies. It was really levying the same set of rules and firewalling practices that we would normally use, but because of the volume we had to be a little more rigorous.

We had to push and make sure that the companies understood if they don't mark it proprietary, it's not going to be treated proprietary. Then they probably overmarked to help protect themselves. We've had to take very rigorous efforts to make sure that anybody that touched it on the government side—and when I say the government side, that included subcontractors. We had to be very, very careful to make sure that all those subcontractors had the appropriate clauses in their contracts, and that the folks that were coming in understood that this is data that they have to use exclusively here and not in other places.

One of the pieces that has been tricky is to make sure that people understand they're allowed to use the data only for this effort. Whereas traditionally when the government owns it all, I can use it here, I can use it there, I can use it in any other program. I can move that data or knowledge around. That's one place we've had to be very careful, especially when we tap into the CATs at the other centers, where they may have had synergistic efforts.

For instance, as an example, when we went to Marshall and were talking to them about the Antares rocket engines, they also had efforts looking at some of those same engines with Aerojet, but the data and the knowledge that we learned here they couldn't use in their other efforts. We had to be pretty rigid and specific with them that what you're doing here is what you're doing here, and while it might be helpful over there, you can't use that data.

It was much more of a cultural education than anything else, to make sure that people understood you can't bleed that data around. Certainly in Windchill [Product Lifecycle Management software] and other places where we put together all the data, we've been very specific about access to that. We have a process inside the office about reviewing any new contractors that come and get involved, in the Station side or imagery-wise or anybody else across the Agency. We have our agreements officer get with the contracting officers for the new contract and make sure they've got all that data protection pieces in place. That's an extra bit of rigor you had to add to the program.

HACKLER: Did you get any special instruction from the legal community on those provisions of the SAA [Space Act Agreement] on keeping that data secret?

MANNERS: Not really. That probably is a lesson learned. We could have done a little better on some practices at the beginning. We didn't have any major problems, but it might have been helpful to have a little bit more training in that, or at least discussions about it early on. But no, we didn't really. In general we've all been accustomed to dealing with proprietary data. It was really just the volume that was larger here versus in a normal contract.

HACKLER: Speaking of proprietary data, I'd like to ask you about the first commercial partner that you worked with, Rocketplane Kistler. As much as you can, talk about your relationship and experience with them. First when you served on the PEP and then were the Project Executive, what was your first impression of their technological capability? What was unique about their proposal, why it was chosen? Then, what about their management structure and how they worked may have been different?

MANNERS: It was a very interesting set of pieces. Technically what they were trying to do—they wanted to build a reusable rocket that would fly multiple times with virtually little refurb [refurbishment] or changes made up between each flight. It was actually probably more akin to the original concepts for what [the Space] Shuttle ultimately would have been like, which shouldn't be a surprise to anybody when you consider the people and the partners that were involved with it.

The people who really originated the design of the Rocketplane Kistler effort were George [E.] Mueller, who was largely the father of the Space Shuttle, and Joe [Joseph W.] Cuzzupoli was heavily involved. He was the Rockwell [International] Orbiter Program Manager for Shuttle. If you looked into the team that he had built, it was a lot of the same people that he had used while at Rockwell developing the orbiter.

What they were really trying to build—they didn't have the cross range capabilities of a Space Shuttle because it didn't have wings, but they wanted to build a reusable vehicle akin to what they originally wanted to do under Shuttle but just never could, both from a technical perspective and they never got the money.

I talked to George and Joe and said, “What happened at the beginning? You wanted to build a vehicle that did exactly what you’re doing here with more cross range”—i.e., the wings—“Why didn’t you do that?” They said, “Well, frankly they never let us.” You can probably go back and interview some of those folks about why Shuttle ended up like it was versus what it was supposed to be. I think there have been books written on that topic.

But I think they wanted to go finish the job that they originally had started back in the early ’70s. To a large extent they wanted to build that reusable vehicle and then use that in a commercial setting. That had been the aim of that company for a long time under a number of different manifestations of the company. That was largely their goal, go build the reusable vehicle.

The team that they had put together was a lot of the same players that they had used for Shuttle. One of the pieces that I always found very interesting is you had a management team that was largely former NASA guys, building an interesting reusable vehicle that, except for Shuttle, was a very different vehicle. You had all these traditional NASA guys behind it, being Randy [Randolph H.] Brinkley and George Mueller and Joe Cuzzupoli.

Then when you went over and looked at SpaceX, you had them building a rocket and a capsule that looked hauntingly like you might have found under Apollo or Gemini. But you were doing it with a dot-com team, a team of people that was approaching it from a significantly different management perspective. So you had a weird little dichotomy of a traditional NASA team building an untraditional rocket, and an untraditional team building a traditional NASA rocket.

HACKLER: When you were evaluating it, seeing that they had all this NASA management experience—did you view that as a strength, that they might be able to better integrate the vehicle? Or did you want something new?

MANNERS: What was generally felt on Rocketplane Kistler is that they had a very strong design for their rocket. It was very well thought out at a very high fidelity. I think they had already been through a CDR [Critical Design Review] before we even got to them for the rocket. Then management-wise I don't think you could have picked a better top-level management team than Randy and Joe and the people they had put together.

George [D.] French was a bit of a new guy to the whole game. He had had a different sort of experience base and was now the owner of that company, so he was a little different experience base into the mix. But clearly having people with the experience of Joe Cuzzupoli and Randy Brinkley was a huge benefit to them.

Randy was the International Space Station Program Manager through the formulation of that program. Cuzzupoli had been the [Shuttle] Orbiter Manager for Rockwell through its development, and he had also been the Assistant Program Manager for Rockwell for Apollo. His experience went back and was just huge. This was clearly a guy that knew how to go build hardware if given the money and the time to go do it. So it was definitely viewed that these guys could go build this thing if they had all the resources.

The biggest risk with them was the resources. That ultimately was their undoing, that they weren't able to secure all the financing that they needed. So seeing that they had a very technologically mature system and a very strong technical team, but a weak prospect, or at least a perceived weakness on their ability to pull this together businesswise—it was really crafted

before I was directly involved, but they had laid in some financing milestones to go flesh out whether or not they had really the business piece put together or not. That's where they failed.

HACKLER: In doing the selection, as I understand it, the Participant Evaluation Panel gave their recommendations to Headquarters to evaluate. How much influence did Headquarters have over the final decision? Did they generally go with what you said, or have their own input to it?

MANNERS: From the initial PEP when they picked RpK and SpaceX, I don't have that insight because I wasn't part of the final PEP. I don't actually know what they went up and told them. I know that from the proposal technical piece of it I had insight as to what I thought, but that was part of a much larger picture. I don't really know what went on to them, so I don't know what sort of influence they did ultimately have. That's really a better question for Alan or Valin or Dennis [A. Stone] or somebody else that was part of those pieces.

HACKLER: As we know now in retrospect, the SAA with RpK was terminated in October 2007 because they couldn't raise enough funding. Can you talk a little bit about what sort of efforts both they and NASA undertook to try to get that financing in order? What was the reason when you eventually decided this agreement could not be completed and it was time to terminate?

MANNERS: We gave them as much time as we possibly could. They certainly had contracted with organizations at a Wall Street [New York City, New York financial district] company, investment banking organizations there, to try to help put together their solicitations to go look for investors. We had consulted that, and we actually had a meeting where Alan and I and a

legal person—it was important to take our legal person with us—went up and met with their banking institution and their team to look at what they were putting together proposal-wise. We gave them our inputs and thoughts and said, “Looking at what you presented, and how you’re representing NASA in that, these are the comments that we have.”

But we could clearly not go off and advocate to anybody, “Give these guys money and great things will happen.” That’s not really an appropriate role for the government. There were limits to how far we could go to help them, other than to help make sure that they were adequately representing the government position in the situation. In general we’re all smart people, we were able to serve as a sounding board of did the story that they have put together seem to hold water? But it was up to them to go off and make that story to the industry and to the financial world to solicit the money.

What ultimately caused us to realize it was not going to work was frankly they ran out of money. When they got to a point where they didn’t have any money and they could no longer make forward progress even on the technical side because of their lack of financing, that was the point where I didn’t think we could continue this. As long as they were able to make continued forward progress and had the likelihood and it appeared that they could go and get the financing, we were willing to stick it out with them.

I think we were very patient with them. They clearly went a number of months where forward progress on the technical side was getting fairly small, but they still had some likelihood that they were going to be able to put the financing together. They would consult with us, they sat down and talked to us. We kept laying out, “Okay, this is where we are,” almost like a tote board. They were supposed to raise \$500 million and they said, “We think we have X number and we have a real good line on an investor.”

We would ask them as much as we could to share with us, “When you say you have a good line on this investor, who is it, and what sort of money do they have?” Then we could do our own due diligence. They say they’ve got “Bob down the road” who’s going to give them \$500 million. Well, if “Bob down the road” didn’t appear to have \$500 million, then we didn’t really want to believe them. But they did in fact have companies, and appeared to have a good likelihood and tentative commitments from organizations that appeared to have the kind of money that they needed to put this together.

We had brought in a [venture capitalist] consultant, Alan Marty, that helped us understand what sort of information can you expect from a company as they’re putting together this stuff. He would always say, “You’re not there until the check is signed.” We kept asking him, “What does it look like as you’re getting close?” He would help us understand the sort of machinations, the amount of commitment that someone would make when they’re still thinking about it. He helped us understand the context of what they were trying to do, because it was a different realm we’d never had experience with on the government side.

He helped give us some insight into what that looks like and the expectations we could have from them as to what sort of commitment a company would make as they’re still thinking about it. Those are pretty definitive. When people say no they tend to say no. They walk away and you don’t hear from them again. But as long as there’s still discussions going on, he helped us to realize as long as they’re still talking that means there’s still an opportunity.

We kept with them as long as we could while they still had discussions going with organizations that appeared to have the financial wherewithal to put it all together. When we finally got their final no and they had stopped making technical progress, we said that we’ve gone as far as we can.

HACKLER: Your experience was primarily technical. Was it a difficult transition for you to learn the business aspects of financing and investment?

MANNERS: Yes, it was. That was one place I did go off and get some training. I took a NASA class called Business Education Program. In my mind, for somebody that's going to do a similar effort—and I don't know, commercial crew is at this point the closest thing that NASA has to it. It's morphed, it's different now. But if you're going to get into and look at the business side of these things, taking some sort of class like that is critical.

As part of the training class, they gave us financial reports from companies. Read this, tell me what you think at the end of it. Then they explained, "Well, as a financial person, this is what it means to me." It had a hauntingly similar experience base to what I'd been going through looking at their finances, so there was a lot of synergy. It was an excellent class to help somebody try to do what we did. I wish I had taken it before I got into it, but certainly taking it while I was doing it was very helpful.

HACKLER: I'm curious, because so much energy was expended on trying to get their finances in order, was there still some sort of technical development that you were also helping them with? Or did it just turn primarily into an economic focus?

MANNERS: No, they had a rocket that was at a CDR level. They started to pull together the pieces, they had hardware that was out of there. They did pull that hardware together under their earlier incarnation. They had built pressurized tanks that would be part of their first vehicle, they

had a lot of structure pieces. So we had meetings and discussions. They were starting to put all that stuff together, to actually start to build their first rocket at [NASA] Michoud [Assembly Facility, New Orleans, Louisiana]. That was where they were planning on doing their assembly.

In addition, they needed to design their cargo delivery vehicle configuration, the piece that would actually come and berth with Station and hold the cargo. They needed to start doing that design, so they started to put together their preliminary designs on those systems. Andrews Space was a major subcontractor and partner for doing that design. They were on the Board of Directors of the company as well. They started to work those pieces, and it wasn't really until they started to lose the ability to pay for these companies to put the design together and make real progress that we realized they had lost forward progress. There was no real effort going on at the end.

I would bet there may even still be stuff sitting in Michoud that was RpK's. I don't know where that all ended up. Last I heard, I think they packed it all up and put into a warehouse someplace in Florida. But there was real technical progress being made at the beginning. Always at the beginning of a program the technical progress is much more paper focused, but they were putting together their initial designs of what the vehicle would look like when it would come to Station. They already had critical design level stuff on the rocket itself. They were starting to put those pieces together and starting even to get manufacturers and technicians on the floor welding and pulling stuff together.

HACKLER: I understand from what I read that they had also planned to launch from Australia.

MANNERS: Woomera, Australia, yes.

HACKLER: Were there any concerns with that being outside the U.S.? Does the FAA [Federal Aviation Administration] have jurisdiction there?

MANNERS: The FAA would still have some jurisdiction because it would be a U.S. company. Exactly how that works you probably need to talk to the FAA, but when a U.S. company launches something from a foreign entity they still get involved to make sure that they're not going to land it someplace the government would end up indemnifying them for. Those indemnification laws and how that all works, I'm not as familiar with that as I maybe should be, but through the indemnification piece the FAA and other U.S. government entities still get involved.

There's also a large ITAR [International Traffic in Arms Regulations] piece that never got clearly solved as to how you would build this rocket in the United States, export it to Australia, and then launch it. I think it was workable. They do launch U.S. satellites from different places, and they clearly have managed to do that. That was something that was going to have to get sorted out, and they were starting to lay the groundwork for how they would do that.

They hired some guys to go work with the State Department to sort those pieces out. They had made progress in previous incarnations of the company too, so a lot of it was trying to recobble together what they had done previously. That was a piece that would have been a tricky thing. They were going to build a rocket in Louisiana and then ship it to Australia. At least they're a friendly country. It would have been worse if they were trying to ship it to China and launch it from there, but that was something that was going to need to be sorted out.

The FAA still would have had a role because of the indemnification laws, and the FCC [Federal Communications Commission] would have been involved because they still would have been broadcasting with radios as a U.S. company. So there still would have been a lot of involvement of various government agencies even though they're launching from there. It did further complicate it because when you're launching things from Australia, they have their own version of FAA, air traffic folks. There's concern, "When you launch this thing out of here, is it going to land on Sydney?" People frown on that kind of thing.

HACKLER: I'm curious if you have any insight as to why they chose that location. Was it something to do with the launch inclination? Obviously the government restrictions were complicated.

MANNERS: No, I don't have a real good feel for why they did that. I know they looked at launching from Florida as well. I suspect—and I don't know this for a fact—one of the big factors was that they had this reusable launch vehicle which returned to the launch pad. If you envision that the rocket goes, the first stage finishes its job, it turns around and lands back at your launch site. So you needed to have a launch pad that would get you the right orbital inclination that also had a big honking field nearby that this thing could come land in.

That restricts you at the Cape [Cape Canaveral, Florida] because they wanted to land on the ground and not in the water. At the Cape, if you wanted to dump the thing in the water, probably gives you that opportunity. But you now needed to have a big large landmass that's empty right near your launch vehicle. I suspect—and it's not really my area of expertise—that was one of

the reasons they went to Australia is there's a whole lot of nothing in a lot of the places. Coastal areas are pretty busy, but you get internal, the country, there's not an awful lot of stuff going on.

So I think that that was one of the pieces. It gave them the launch inclination that they needed, and it gave them whole acres and miles of empty land. On your first time coming back you would have designed it to say I'm going to have it land on my great big X marks the spot, but there's always going to be some uncertainty on that. Trying to land that in Florida would have been complicated.

They did have a lot of discussions with them, but I think that the Cape was not anxious to have that large ballistic-looking missile turn around and come back without having a lot more government control over that. They did look at things like that in the Shuttle too, flyback boosters and whatnot, but have it land right there, sitting there unmanned, uncrewed, unflown—that was probably a daunting thing for Florida or Cape or [NASA] KSC [Kennedy Space Center] to try to buy off on without having seen it demonstrated.

I think they probably had a little more freedom to do that because of the geography there [in Australia], but I don't have a clue. That's more anecdotal than it is deeply thought out.

HACKLER: As the Project Executive working with RpK, were you the person who had to make the final decision for their termination, or did input also come from Headquarters?

MANNERS: No, the final decision was really made at Headquarters. The signatory on the Space Act [Agreement] was [Scott J. "Doc" Horowitz, Associate Administrator for the Exploration Systems Mission Directorate], and it was at the Horowitz level that it was made. It was certainly briefed to the [NASA] Administrator, as high as that. I think even the initial selections were

picked at the Headquarters level by the selecting official, and I'm sure they were briefed to the Administrator as well.

But the final decisions were coming out of Headquarters. That's really where that power probably needed to sit, because you're getting a little too close to it here. We gave them a recommendation. We came and told them, "We don't think they're making progress anymore, so we as an Agency need to decide what we want to do." That final decision was made at Headquarters.

HACKLER: Was that a difficult relationship to terminate? Did you feel that you were that close to them and that you really wanted them to succeed? Or was it just more of a look at the business/technical side, it's not viable anymore?

MANNERS: Any time you're in a project, you have some sense of ownership of that piece. I still have a strong relationship with Joe Cuzzupoli and Randy Brinkley, and many of the lower-level engineering team. I feel still they were my friends and are my friends. So yes, it was difficult. It was very difficult to terminate that.

Any time you have a project that you shut down you'll take some sense of, "I failed, where did I go wrong in this?" I don't know what blame I had, but I certainly felt that I had some responsibility for their non-success. So yes, it was difficult all around. I think everybody—it was an admission at Headquarters, "Obviously we picked the wrong guy." It was difficult on the company side because they dumped a bunch of money into it. It was difficult on the NASA side because we dumped some money into it as well. It was difficult all around to

terminate them, but ultimately it was the right thing to do. They were not going to make forward progress anymore.

HACKLER: What was RpK's reaction to the termination? Did they try to contest it at all?

MANNERS: I don't recall exactly. Certainly they were not happy about it. I think there were some lawsuits that went back and forth, but I don't remember the specifics of them. They didn't really have a real strong leg to stand on, but I do think that they tried to protest somehow. I think it didn't go very far.

HACKLER: Did that go to Headquarters instead of through you?

MANNERS: It was really worked from a legal side, the legal folks. Once we wrote the termination, wrote the determination, "This is what we're going to go do"—and when I say "we," I'm speaking at an Agency level, because most of that was really handled at the AA [associate administrator] level. Certainly he was the signatory, and then our legal folks were involved, much like you would when you write a selection statement. The decision is written from the selecting official, and the legal folks are heavily involved with that selection statement. The termination went the same way. Then any protests, complaints, lawsuits were all handled on the legal side.

HACKLER: Shortly after the final termination with RpK, the COTS office was able to quickly turn around and do the Round 2 selection. Can you talk about why you chose to do a second-round selection instead of maybe choosing one of the runner-up partners from the first selection?

MANNERS: We laid down, what are our options? We had folks, like [K.] Lee Pagel from our procurement office, who had been involved in the initial selections, then we pulled them in and involved them for the next round. We had legal, we had our office, and we all said, "Okay, what is the appropriate thing to do?" We did lay out what the options are. We could recompetete, or look at whether or not we could go back and look at the previous proposals from the original competition.

But it had been a year at that point, so the general feeling was if we can do a competition relatively quickly, it gives industry the opportunity to update and decide what they want to do. Maybe they want to do something different than what they had originally proposed. All around, we just felt it was more fair to the industry and to ourselves to run another competition. I guess we probably could have gone back, and it was glanced at as to whether or not we could do that legally or not, but I think the general belief was we would get a better product and a better chance of success if we could start again.

We had the benefit that only a year before we had been through virtually the exact same process already, so we largely already had an advertisement and all of the pre-work that you would normally do to write your statement of works and all the stuff that goes into your solicitation. It had only been a little over year, so pretty quickly we were able to rewrite and re-update with lessons learned from what we'd learned from RpK and adjust what we were trying to do.

The speed of the process was heavily leveraged on the fact that we'd already done it once. We didn't have to invent a new program, we didn't have to invent a new process. We already had the existing process, we just needed to update the documentation for a new solicitation—or a new announcement really. It's one of those terms, announcement versus solicitation, that were changed and tailored for what we were doing because we weren't buying something. The new Announcement was the term we ultimately used, and it was leveraged heavily off the one that had been used for the previous competition.

HACKLER: You mentioned lessons learned from RpK. Can you talk a little bit more about what some of those were and how you applied them in the Round 2 selection?

MANNERS: Not surprisingly, in the Round 2 selection we ultimately ended up selecting somebody who had a pretty low business risk. I think one of the biggest things that we came away from this is that NASA does a really good job at understanding what technical risks are. But since we had gotten our hands burnt on what was always RpK's biggest risk on the business side, which was outside of our realm, I think it wasn't surprising that we picked somebody that had a low business risk.

I think that was one of the biggest lessons. I don't know that it was a documented "let's stay away from the big business risk," but clearly our experience painted what we were willing—our risk tolerance in an area that we weren't as experienced. So we picked somebody that was a fairly low business risk, who already had the money in-house and the ability to put this together. It shouldn't surprise anybody we went that route.

HACKLER: Were there any other technical lessons learned, or about the process?

MANNERS: I think largely we felt that from a technical perspective we'd done a really good job. I think from the business perspective, even on the RpK competition, we knew what the risk was. We made a conscious decision this was something we were willing to do at that point.

I think if you look at where the program was when it started, the risk tolerance was probably higher to begin with. At that stage of the game we had Constellation and there were a lot of discussions as to who is the prime plan, the first line plan for how we're going to resupply Space Station. When we first started out, Orion was going to do cargo and crew. The thought was if the commercial cargo stuff, COTS, works out, we will no longer do that for Orion and the government systems; we will just use the commercial. But by the time we came to the second round, Orion had started to fall away from that. They were already moving on to other paradigms. NASA already recognized we were going to be more reliant on the commercial route, that was the path we were going to go down.

So I think the fact that we picked a lower business risk piece made a lot of sense, because we were less risk tolerant. We were less risk tolerant, so then we picked a company that had experience with launch vehicles, experience with satellites. You could make arguments that they didn't have experience in liquid launch vehicles, but they clearly hired people that did. They definitely had a lot of experience in launch vehicles, and they definitely had a lot of experience in satellites. There were very few other companies that could say they had both sides of that problem in-house.

HACKLER: Since the SAA with RpK has been terminated, are you still keeping that information under lock and key? Is that still proprietary?

MANNERS: It is still considered proprietary. The government did have some rights to civil use of some of that data, but we're not trying to build a reusable launch vehicle, so I don't know that anybody really needs to or wants to go into that data. I don't believe there has ever been a declarative definitive legal determination of what we can do with that data, so we still have a lot of it. We still have it all under lock and key. Principally I have it all in Windchill. I do probably have something in here [my office] that's under lock and key, but I plan ultimately to burn that. My repository is electronic.

That was all archived, and we have it there, and it's marked proprietary. I don't think there's ever been a really formal determination that we could open the books up and what do we want with that data. I don't know that we need to make a determination on that, I don't think anyone's ever really raised the question. At some point it's locked away, it's put away. If we needed to, somebody would go look at the Space Act and determine what rights we have given the fact they're not using it. Some of the legal pieces were we won't use it as long as you're using it. Clearly they're not, so maybe we could, but I don't know that anybody's made that legal determination. I don't want to go down that road. Nobody's asked me for it, and I'm fine with that.

HACKLER: At this point I'd like to ask Rebecca Wright if she has any questions.

WRIGHT: I have a couple. One is the safety aspect and how that was weaved into the new commercial effort, and how that levied on what the partners can do or not based on requirements coming from the NASA side.

MANNERS: One of the pieces in the IRD, Interface Requirements Document, that we do levy as hard requirements on the partners—there’s a lot of discussions with the commercial crew folks as to what you can levy as a hard requirement, what you can’t levy as a hard requirement. Where we were when we went through our competition—and I don’t know whether this is accurate or not for the commercial crew folks—but we were told that they don’t have to come to the Space Station. We had proposals that said they wouldn’t go to the Space Station. The way we laid out the Announcement was if you want to come to the Space Station, you have to meet these requirements. We had the IRD listed as this is what you have to do, no fuzz, and that enabled us to levy the IRD as a hard requirement with “shall statements,” that they “shall do this.”

One of the requirements in the IRD is they have to go through our Safety Review Panel process, and there’s another document that explains what that process is. They have to bring all their vehicle designs that show how they’re meeting our requirements. They have to go through our Safety Review Panel process with phase one, two, and three steps. They have to pass each of those steps and ultimately get signed off that they designed their vehicle to meet our requirements, and that they’ve identified their hazards and they’ve mitigated those hazards appropriately. Those are hard requirements they have to do under the IRD and the Safety Review Panel process.

What enabled us, in my view, to do that is the fact that they opted into it under the initial Announcement. They could have chosen to do a demonstration—there were companies that were going to demonstrate they could rendezvous with something like a Space Station in the same way that Gemini did, they rendezvoused with a spacecraft. I think they even did a rendezvous with their own first stage, or another first stage or some other thing that was flying around up there.

We had companies that said, “We’re not going to go to the Space Station. We’re not going to try to buy into all that. We can demonstrate that we could rendezvous and berth with another thing. That would be a demonstration of our capability to resupply the Space Station. We’ll take up some cargo and we will show that we can in fact rendezvous with this other thing.” That’s a big step and would clearly show that they had a capability.

It wouldn’t meet all of our NASA requirements. We wouldn’t have ever levied that they had to meet those NASA requirements, but if you want to come to the Space Station you are then opting into our requirements and processes where applicable. So the company decided to meet our requirements, it wasn’t something we levied on them. Then we got the IRD and that levied the Safety Review Panel process. I know that the commercial crew folks had an awful lot of discussions that they can’t levy requirements, and what the exact legal determinations on those was I don’t know. I’m not tied into that, so I couldn’t tell you definitively what the nuanced differences are.

The joke that I always use is that in the creation of the bacon and eggs meal, the chicken is interested, the pig is committed. When you’re launching our cargo we’re interested. When you put our people on it, we’re committed. There are differences between things you do on commercial crew and things you do under COTS cargo. Those differences are meaningful. How

they levied the requirements and whether they could have done other things, I probably shouldn't get into all that.

WRIGHT: Were you involved with putting some of those requirements together for the IRD?

MANNERS: I wasn't initially. The initial IRD was worked by Mike Horkachuck and some other folks. At that point when the program was initially formulated, Alan and Valin and Mike and others were all inside the Space Station Program. My understanding is that Alan was asked by Bill [William H.] Gerstenmaier to put that together, so the initial draft of the IRD was worked by a number of folks that were all inside the Space Station Program. They put together what that initial IRD would look like.

By the time I came around it already existed in one fashion or another. We did refine it once we got really serious into the program and were actually having people use that IRD. The Space Station Program [SSP] took it over as an owned document [SSP 50808], then it was a negotiated process with the partner as to what those final requirements were going to look like.

WRIGHT: Was RpK involved?

MANNERS: RpK was actually involved once they were awarded their SAA and prior to it being terminated. The initial, first version of the piece was really negotiated with SpaceX and RpK. Then when Orbital came around there's the book, they didn't get as much negotiation process on that. The book existed at that point, so they got the book they were handed. Now in the verification pieces of it they got the opportunity to negotiate and work some of those

requirements piece. There have been updates to the IRD that they clearly had an opportunity to influence.

WRIGHT: The other safety elements—anyone working in the NASA culture for years knows emphasizing safety is number one. So as the COTS program began to evolve and really take off, were there recommendations, suggestions, or just aspects of the NASA safety culture that you were emphasizing? How did the commercial partners meet some of those expectations of the NASA culture?

MANNERS: With respect to the IRD they clearly had to meet all of our requirements and they had to go through all that process. We've certainly tried to stress and emphasize with Orbital what our culture is, what our beliefs are, and what our approaches are. If you look at Orbital as a company, they clearly do have a commercial customer base. But most of their launch vehicle pieces and most of their own development for complex vehicles has been working with NASA or the Department of Defense. Not necessarily human spaceflight, but sometimes with [NASA] JPL [Jet Propulsion Laboratory, Pasadena, California,] and sometimes with KSC and the Department of Defense and other aspects of the government. So they already had a fairly good safety culture built into it.

I think people forget that commercial industry—while we like to think that they're out willing to make all sorts of risk tolerance, if you build a bad product, people don't tend to buy your product. That will in fact put rigor into what you're doing right there. In a lot of cases I wonder—and this is Bruce Manners—whether that rigor isn't in fact just as valuable, if not more valuable, than what NASA is willing to do. It doesn't do Toyota or Ford any good to put a car

out that kills people. They build thousands of cars, that the car's fault for killing people, their risk tolerance is in the one to twos. We tend to build one of something and our risk tolerance is still in the one to twos.

WRIGHT: It's an interesting analogy. So much you shared with us this morning is a very technical response to a lot of the questions, but could you share with us for a few minutes about your personal feelings about working on this type of a new project? You spent a year as Project Executive with RpK. Can you give us some ideas of what those days were like, what were some of your responsibilities? Or maybe some examples of some of the discussions that you had with them. Not crossing the line of proprietary information, but just give us an idea of what your job involved.

MANNERS: In the early days what we were all trying to learn how to do was understand what the Space Act says and how you actually executed that. A lot of what we were trying to do in those days—and I still find myself at this point still involved with these things—is understanding what the success criteria are and then translating that into meaningful language for the partner. It may say in the Space Act Agreement to have a PDR [Preliminary Design Review] or a CDR. What does that really mean?

We had differentiated stuff where it's spelled out, listed a lot from the NASA systems engineering requirements as to what a PDR and CDR would mean, but that still puts things at a fairly high level. So we then had to sit down with them and work with them, negotiate or tell them this is what our typical expectations are as to what that really means. It was to expand on

the Space Act, sit down with the partners, and really come to a mutual understanding of exactly what those words mean.

In the RpK realm, they had financial milestone pieces where I had to work with our independent consultant we brought in to help us understand what these words mean and what the companies were going to come into. I had to work closely with Alan Marty to understand what I could expect from the company, and to levy some expectations on them as to what I'm looking to get from a financial piece.

Then also on the technical side of it, one of the milestones we discussed early on with RpK was the LAP [Launch Assisted Platform] midbody assembly complete, the middle of the rocket "assembly complete." That sounds clear, "This is what it's going to look like." You'd be amazed the amount of discussions we had as to what complete really meant.

In those early days they were cash strapped so they were trying to make complete be as minimal as they could possibly make complete being. To the point where they were saying that, "Well, we have it all up in the stand. We would be ready to start putting other pieces onto it, but it wouldn't actually be bolted together." Well, I had to cry foul and throw a flag on that. That's not going to work. To me complete means you've bolted it together. So we had to refine and sit down and talk with them as to okay, what exactly is the midbody of the vehicle, how do you define that? Levy the expectations on them as to what that really meant.

That painted a lot of what we did with Orbital. The experience and understanding that while the Space Act may have said something that you could say everyone understands, there's still a lot of room for interpretation on what complete really means. Right now that we have a milestone for Orbital that says "first stage assembly complete." That sounds great, but since they

put together that milestone they've changed their manufacturing process so that they actually build the first stage with part of the second stage attached to it.

Well, do I pay them early? The bottom end of the first stage isn't complete, but they've already got half the second stage attached. So we have to sit down and figure out what does that really mean and what makes sense? Does it make sense for me to have them take that second stage off, put the first stage pieces on there, and take it back off so they can attach the first?

When you lay out the plan at the beginning, you think you know how you're going to build your vehicle. When you get to the end and the guys actually have got their hands on the tools, they discover that it's more handy to run this test cable up the side and attach the second stage on before I put my first stage rocket engines on, which clearly would be required for the first stage complete. But now I've got half the second stage built onto the thing. Do I penalize them for that? Do I give them more money? There's still a lot of what does it really mean and what makes sense.

WRIGHT: The simple became the complex all of a sudden.

MANNERS: They make jokes about rocket science for a reason.

WRIGHT: That's pretty interesting, thanks for sharing that. When they were talking about their launch sites, did you travel to Australia? Were you traveling with them to check out things?

MANNERS: Never got to Australia. That was something I really was looking forward to doing. They invited me a couple times, but they weren't to a point where we really felt that it was clear

that yes they're going to go do this and NASA needs to go over seas to see what was happening. Had they gotten to a point where they had put the financing together, I would have gotten to Australia. I envision we would have helped talk with them about how they were laying out their infrastructure there. On a consultant basis really, because it would have been their infrastructure and their stuff, but we would have certainly given them our opinions as to what we think works and what doesn't work. I looked forward to doing that but I never got the opportunity.

WRIGHT: You mentioned that they were down in Michoud. Were you down there as well?

MANNERS: I went to Michoud several times, yes.

WRIGHT: Earlier you mentioned they would ask you sometimes for guidance, and you had to decide at what point you pull back. Did they offer you some input on how better to manage what you were doing, in the sense of "it would be helpful if you could do such and such" to move them closer?

MANNERS: Yes and no. Certainly they offered a lot of opinions. Working with Joe Cuzzupoli I think was very very helpful to me for my career. He had so much experience, so many guidelines. If you look, now that RpK is gone Joe sits on all sorts of government panels and government oversight groups. In a lot of ways he had the government's best interest in mind as well. Even when we worked out some of these milestones, there were times when he would go, "Bruce, I don't think you're there yet." So it was just a real career highlight to have the opportunity to meet and work with somebody of his caliber and his background.

That helped me when we got to the Orbital side, making sure that I put together good products and solid expectations, built a good relationship with them. All this stuff is ultimately relationship driven. Any project you're ever going to go do, I don't care what anybody says, ultimately if you have a crummy relationship with the guy across the table, you're going to end up having a rough time for a long time. None of these projects are short. You're better off if you can figure out a way to get along for four or five years than to fight them from day one. That certainly was one of the lessons that I learned very quickly with Joe.

WRIGHT: What do you consider to be the most challenging aspect of working on this project?

MANNERS: For me, my background is as an electrical engineer. I'm now building rockets. I don't have a huge amount of background in traditional rocket aerospace, what rocket engines look like. One of the odd ironies—Orbital is trying to use what was originally the Russian-built NK-33, that then gets refurbished by Aerojet into an AJ-26. It was actually the same engine that Rocketplane Kistler was going to go use.

These are 40-year-old engines that were built for their lunar program that was intended to fly in the late '60s early '70s. One of the biggest challenges we have is these are 40-year-old engines. That was probably a risk we didn't really appreciate as much under the RpK realm. I think they could have made it work, but it would have been a big challenge for them because they wanted to reuse the engines. Now we're finding these 40-year-old engines, what a shock, they're 40 years old. Trying to make sure that the whole thing hasn't rusted and fallen to pieces, those are problems that we're trying to work our way through right now. That's a big challenge that we've been struggling with over the last year.

That's a big technical hurdle we've had to work with. Another piece that's been a challenge—they built up all this launch infrastructure at Wallops Island [Virginia]. [NASA] Wallops [Flight Facility] had a lot of history in launching small sounding rockets, all solid rocket motor based. This is their first liquid pad. This is an order of magnitude larger than anything they'd ever been involved with before.

It's also a commercial pad, it's not a Wallops pad. Technically it sits on Wallops Island at a NASA facility, but it's owned by the Mid-Atlantic Regional Spaceport, which is actually a Virginia state entity. The state of Virginia is putting money into this development, then Orbital is putting money into this, so we have a number of complex relationships there. Barbara [A.] Mikulski [U.S. Senator from Maryland] is really excited about having a launch infrastructure. While it's in Virginia, a lot of those people live in Maryland, and she has made sure through the political realm that they've gotten some things there.

I've got interests from Congress on that side of the House [of Representatives], and it ultimately sits at NASA Wallops, which is owned by the Goddard Space Flight Center, which is typically managed by the space science realm of NASA. So there's an interesting set of folks there. Then we have this commercial company, Orbital Sciences, who's putting money into the launch complex. That's complex as an organizational and cultural dynamic. That's a complex little relationship, that's been a challenge.

WRIGHT: When we come back to talk to you about Orbital we're definitely going to have to bring more tape.

MANNERS: Yes, that's a really big, challenging piece as to how to sort that all out. It's been exciting and been very interesting at various times. But it's a big political issue, and it's every kind of politics you can come up with: state, federal, local, NASA internal.

WRIGHT: Well, that's about all I had.

HACKLER: Before we come back and talk to you more about your experience as a project executive with Orbital, do you have any final thoughts you'd like to mention for today's session?

MANNERS: Back to the challenges realm, being involved with RpK, trying to figure out the financial piece and putting that together was certainly the challenge that ultimately tripped them up. From the personal side, it was very interesting watching that. I feel like I came away from that with some experience base that was unique within the Agency. I don't know of anybody else that's been involved or seen somebody try to pull together \$500 million independently financed on Wall Street. I ended up doing only one trip to Madison Avenue, but that's not something NASA is ever going to probably get involved with again, where people are going to have an opportunity to go with a NASA badge and have meetings on Madison Avenue with an investment bank. That was an interesting process. I'm glad I took my attorney with me.

WRIGHT: Your personal attorney or a NASA attorney?

MANNERS: No, it was a NASA attorney. That was a very interesting challenge to keep us on the straight and narrow. We took our attorney with us because we were very concerned with where

we were going and the type of business aspects that we were getting involved with. Our involvement was really as a consultant, but I think the investment community wanted NASA to say, “We endorse this, and we plan to buy this.” We couldn’t. All we could say was, “We think this is good. We’ve put money into it, let’s see if we can demonstrate this.” We needed our attorney to keep making sure that we didn’t say, “NASA commits to buying the next round.”

HACKLER: Was that attorney Amy [V.] Xenofos, or did you have someone else with you?

MANNERS: Actually at that stage it was somebody else. Early on we had an attorney that’s now back at Glenn, Jon [Jonathan A.] Arena. He was the local attorney here at JSC for the early beginning of the program and all the way through termination of RpK. It was shortly after that that he transferred and went to Glenn. By coincidence, Amy was at Headquarters through those days as the ESMD [Exploration Systems Mission Directorate] lead attorney. She was very involved, but she was much more at the Headquarters level, and can probably talk a lot more about the termination things that really happened out of Headquarters.

WRIGHT: I know you don’t want to get into the legalities of the investment banker stuff, but how long did this meeting last? Were you in there for hours talking with the investment bankers?

MANNERS: As I recall, I think we were there two and a half days. What we did the first day—there was a draft of what their presentation would look like. What they were trying to put together was essentially their “road show” pitch they were then going to take to investment bankers. They had their own investment banker that was helping to help craft what that

presentation would look like, and it looked and felt a lot like activities that I had been involved with as a government employee.

This was an interesting piece, because I'd been involved with writing proposals from Glenn to Headquarters to land missions for Glenn. It looked and felt an awful lot like what I did there, so I felt like I could contribute things. The people that went were Alan, me, Jon Arena. We had our financial guy that we'd hired as a consultant, Alan Marty. At the end of the day, I remember going out for a drink afterwards. I looked at Alan Marty and I said, "I've done that. I've been involved with that on the government side."

I had to assume all those people in that room were making a lot more money than I was, but they're doing something that I have fundamentally done. He said, "You're right. You guys were the only people in the room that probably make less than \$1 million. The difference between what you do and what they do is they all have this big Rolodex with people who have hundreds of millions of dollars they're going to invest. The difference between you and them is the fact they have that Rolodex and you don't."

It was interesting watching that process get put together. We helped craft this, and at the end of the first day they did a practice run with us, this is what it would look like. We gave them some comments, and the next day they had completely revamped the entire thing because they realized that the way they were putting it together—it had good information, but the people that were actually making the pitch were not necessarily the right people to make the pitch. It didn't come off as confidently as they felt was necessary. We gave them comments and said, "The way this is, the story is okay, but the people that are talking it are not the right people to be talking it."

So the next day they did it to us again as sample people. They brought in their own people inside of the investment banking company, which was called Jefferies Quarterdeck

[LLC]. It finally came to that. They had brought in their own red team reviewers that were people that hadn't been involved with formulating it, and they sat as sample investor potential people and they gave them comments on it too. A lot of our comments were consistent.

So it was interesting. Validated that we're not idiots, we actually do know what we're talking about. We can look at some of these things and decide what's real and what's not, we just don't have billion-dollar Rolodexes.

HACKLER: All right, thank you very much for your time today. There was a lot of really interesting information, and we'll be back for more.

[End of interview]