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ORAL HISTORY TRANSCRIPT

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[This oral history interview was conducted with Alan Lindenmoyer on November 7, 2013 at the NASA Johnson Space Center in Houston, Texas for the Commercial Crew & Cargo Program Office History Project. Interviewer was Rebecca Wright, assisted by Rebecca Hackler. This interview was a continuation of Lindenmoyer's first interview conducted on October 31, 2013.]

LINDENMOYER: We covered the background and the initial conditions, the context of where we were. Then we moved into the preparation of the competition and the Space Act [Agreement] itself.

We put our team together, and we focused into three committees: a technical, a business, and a cost team. We met off site. We were under time pressure because the [NASA] Administrator, Mike [Michael D.] Griffin, said by the fall of 2005 we would have an Announcement on the street for companies to bid on. Remember, he came in April of '05. We started talking about this in the summer, and in October we put our first planning team together.

Then we realized, "Well, fall—that's soon." He wanted action fast. We were not going to sit and think about this for very long, we were going to do. So we put it together as quickly as we could, but we had two very important products that were ahead of us. One was the Request for Proposal, and the other thing was the draft of the model Space Act Agreement. What are the

terms and conditions of this thing? Those were the two things we were putting together over in our offsite office.

Traditionally it's called an RFP, Request for Proposals. But the lawyers were very clear they wanted to separate the terms from a traditional contract procurement from a Space Act, so we said we're not going to call it an RFP. We would call it an Announcement, it's just an announcement. I coined the term AFP, or Announcement for Proposals, because nobody else knew what we were talking about.

Then we were working on the draft Space Act Agreement. That was intense activity for several weeks, daily interactions with [NASA] Headquarters [Washington, DC] and the legal community and procurement putting this all together. That's what I remember about that. But all our planning really paid off because everything ended up being executed as we had planned, which was really neat.

You have access to the Announcements [online]. You can read through that, you can see how it was structured. The key points about that is we kept it very short. We talked about goals and objectives instead of firm requirements, and tried to provide as much flexibility as possible so that companies could freely innovate and optimize their solutions. The outline of the proposal was given, and we paid a lot of attention to the business plan, which was new for us. You can read in there the elements of that plan, which was very important to us.

We put the draft Space Act together. In the Space Act there are very carefully tailored terms and conditions to make this as commercial friendly as possible in terms of intellectual property, liability and risk, termination provisions, responsibilities of both parties. When you read this, it's very carefully crafted to incentivize companies to do business with us, secure financing, and make this a profitable venture for them. Something they'd be interested in,

instead of just working for the government and us taking all the property. No, we wanted this to be turned around, sold and grow into a good, thriving industry.

Those were our guidelines. We put the draft together, then we put out the draft Announcement. We didn't get it finalized, but we had a really good draft put together, brought it up to Headquarters, and were granted the authority to proceed. We issued the AFP right before Christmas time. We gave companies several weeks to respond, and had great response.

We had an industry day over at the Hilton [hotel] over here where we brought in all the interested companies. I think we called it a preproposal conference. That's where we unveiled our approach. We went through the outline of the Announcement with the goals and objectives of the program, then we had one-on-one meetings with the companies. We allowed them to sign up for private sessions with us, and we got their feedback on the draft Announcement, which worked out very well.

We took all that feedback, collectively assessed all of that, and then put out the final Announcement in February of '06. Then we went into the evaluation mode. Finalized our teams, and went through the entire evaluation and selection process. All of that is outlined in the Source Selection Statements. There's really good information in there. It lays it all out, how we did it, what our criteria were, how we evaluated, how many proposals, who bid, their strengths and weaknesses. All that is in there, so I think that's really good for the record.

Then we came out with our two recommended partners, SpaceX [Space Exploration Technologies Corp.] and Rocketplane Kistler [RpK], and we entered the execution phase. We did this with very small teams. I think that's important to emphasize. You can look at org [organization] charts, and we had basically around ten people running this program. I selected a

Project Executive [PE] for each of the partners, they each had an Assistant PE, and that were it. Those were the two primary for each partner.

They were backed up by the engineering expertise across the Agency that we would pull in when needed [Commercial Orbital Transportation Systems (COTS) Advisory Team]. Or course we had our [Chief] Safety [Officer], and I had my Deputy and a Program Integration Manager. Also had matrix support from the procurement office and resources office. But that was it. Off we went, and learned how to interact with companies, become a real partner, and then how to evaluate the milestones that we laid out in the Agreement. It worked really well.

Then there's got to be a chapter on RpK. As you read the Selection Statement, you will see that we recognized the risk of investing in Rocketplane Kistler because they needed to raise a large amount of financing. Our investment was only $207 million, and they were to raise close to $500 million to make their program executable.

That was to be done in three rounds, then they came back and said they wanted to raise it in two rounds, which we agreed to. We gave them a lot of time to do that. We were very patient with them, we worked very closely with them. We were together with them in New York [City, New York] on Wall Street [financial district] helping them discuss their business plan. We talked about what our program was doing, and how we were an investor in the program.

We did the best we could to help them. They did come very close to raising it, but they just could not close the deal for various reasons. Probably the most important was the market had taken a turn. What was a prime time for more venture investments took a downturn at the end of 2006. Then it was about a year later when we actually did the termination [in October 2007]. It was terminated because they didn't meet the milestone and we knew that it was not going to close at that point.

So the best thing we could do is wrap that up and take our loss, which was $32 million. We made three milestone payments. We knew the financial milestone up front was important because if they couldn't get it we were going to minimize our loss, and then we would walk. That's exactly what happened. So the program operated exactly as designed, where the termination was swift and executed as efficiently as possible. I think that's important for the program. Normally it's very hard to disengage with a contractor that has major financial considerations, but we were able to disengage quickly and as easily as we could because it was very clear what the criteria was for this agreement.

The best thing we could do was turn this around as quickly as we could, which we did. Within four months we not only had the second Announcement on the street, we completed the evaluation and selected another company, Orbital [Sciences Corporation], to invest the remainder of our funds. $170 million was available to Orbital.

I think that's a very important achievement in the program that we were able to turn that around so quickly and keep the momentum of our program. These are things not typically done in this timeframe. You just don't react that quickly usually. We needed to recompete because selecting a previous runner-up was not explicitly contemplated in Round 1.

I think there were some important points that distinguish what was so different about the program. You can read the Selection Statement about how that went, who proposed, and how they bid. By February of '08 we had Orbital on board, and we were off and running again with two good solid companies preparing to develop this new capability for resupplying the [International] Space Station.

Then the rest of this is going into how we executed the program. [Project Executives] Bruce [A. Manners] and Mike [Michael J. Horkachuck] were doing the day-to-day interfaces

with the partners. You can get a lot of insight from them on how that went and the partnerships that we developed with them. I kept it at a high level. My interfaces were with the president of the company and my counterparts, the program managers.

In SpaceX's case I dealt primarily with Gwynne [E.] Shotwell, who was the President [and Chief Operating Officer] of the company. She and I would basically be the leads of the meetings when we would meet together. Of course it was always a SpaceX meeting. It was their event, we were participants in their events. But I would be the senior NASA person, and she was the senior SpaceX person. Elon [Musk] was the CEO [Chief Executive Officer and founder] of the company. He joined in in the beginning, but in the end it was primarily Gwynne and I who were counterparts, and that's how we worked together.

With Orbital it was the Program Manager, who was Bob [Robert T.] Richards initially, and then Frank DeMauro. Frank [L.] Culbertson became the director of that group in Orbital and I would also deal directly with Frank. It was structured a little differently than SpaceX because they were a much larger company. We don't deal directly with the CEO, Dave [David W.] Thompson, but I interface primarily with Frank Culbertson and the program manager.

They have two programs. There's the launch vehicle and the Cygnus spacecraft, so when we would have meetings we would have senior reps [representatives] from both launch vehicle and spacecraft. Frank Culbertson was the most senior executive that we would deal with, that's the way we developed our relationships.

In SpaceX's case, there's one thing that I took responsibility for that I did not expect the project executives to handle. That was the insight into the financial performance of the company. This is something that companies don't usually share with the government at the

detailed level that we were, because typically in a contract you get your financial deliverables, and that's what you evaluate.

Well, we didn't have deliverables. But we did have an understanding that the company was to contribute a certain amount of financing to the project. We were contributing a certain amount at the time of the agreement, and we wanted to be sure they had a healthy future. What did their revenue look like, how were they building their customer base, what was the viability of the company, how healthy were they in their financial performance?

I felt it was my job to assess the financial health and stability of the company, because if they were going to go out of business I wanted to know early before we risked additional investments. Especially in the case where milestones were missed. Eventually there came a point where milestones were late, they were delayed. As soon as that happened, we shifted into an assessment mode.

We had the ability, under the terms of the Space Act, to actually terminate the agreement as soon as they missed a milestone for whatever reason, schedule or technical. It wasn't in our interest to terminate just because they missed schedule, but the point was we did an assessment. Did we believe they're making sufficient progress such that it was in the best interest to keep this partnership going? I felt it very important to make sure I had good insight into their financial performance.

Gwynne and I would end our quarterly meetings in a splinter session where we would narrow down to a smaller group, primarily myself and Mike Horkachuck, the PE. SpaceX would dismiss the rest of their technical managers. Then we would get very good insight into performance. That was very helpful to us. There were times where they were going through

some tough times in the company, and I questioned whether or not they really would survive month to month or the next year.

But they did, and they had a plan. They brought customers on board, secured lines of credit and rounds of financing and whatever they needed to do to stay viable. I give SpaceX a lot of credit for that, because a startup is very hard. We were doing everything we could do, but they got through that. That is something I felt very strongly about, that I wanted to take on personally.

The same with Orbital. Orbital was even less inclined to share their information with us. They're a large company, and they know how we typically do business in the government, but I provided them an outline of the type of information I wanted to see. This was primarily to verify that each party was putting in and contributing at least the amount that we agreed to. Orbital settled into that reporting format, and we do that quarterly too.

I should say a word about the outcome of that information. Since we've finished with SpaceX, I think the financial performance is an important factor in the success of the program. We paid every dollar of our agreement, $396 million, to SpaceX. Their contribution to complete the program from beginning to end—that is the development of the Falcon 9 [rocket] and the Dragon spacecraft, including the maiden flight and the demonstration missions, and including the Falcon 1 which was precursor to the Falcon 9—ended up costing SpaceX about $850 million.

So you can do the math. Our portion was $396 million, theirs was $850 million. They contributed over 50 percent of the development cost. And a lot of that represents cost growth in the agreement, because it certainly took longer than was expected, and of course with the schedule slip they were carrying the cost of the entire company for that period. But they did it.

That was important, could the company cover the overrun? That's a big risk factor for us, because we were clear we were not going to pay the overrun. We did not. That's a metric that I think is very important to the program; $850 million was the total cost. Over half was covered by SpaceX, and a lot of that was overrun.

I also have [financial information] for Orbital. I had permission from SpaceX to discuss the numbers I gave you, but I don't have that from Orbital yet. Probably won't get that until they're done, but I can say they are contributing a very significant amount of the project. I even believe they've said in public over half of the cost is being financed by Orbital.

We're talking hundreds of millions of dollars here, not a small amount of money. This is hundreds of millions of dollars of skin in the game with these companies. I think that's turned out to be quite a successful approach for the taxpayer and the U.S. government to achieve this type of development at such a high rate of return on investment.

As I look back now in the execution, there was a variation of the plan. By the end of 2008, the Space Station Program had decided to compete for the follow-on services phase. That was earlier than we had originally planned. We had originally planned to get all the way through a demonstration phase, and then if it was successful we would turn around and issue the contract for service.

Well, Bill [William H.] Gerstenmaier [Associate Administrator for Space Operations Mission Directorate] recognized that there's a long lead time in rockets and spaceflight, and the Shuttle was going away, and he had a need. He had to put faith in the companies and said, "I think we need to do this earlier so that at least they have a chance to get the vehicles developed and ready to go in some reasonable timeframe after the Shuttle is retired." I think that was a very bold move on Bill Gerstenmaier's part.

There was a big shift at that point, because our stakeholders in Congress then directed us to use commercial partners as the primary resupply. We were not going to pursue our backup anymore. We were not pursuing the International Partners, and we were not pursuing NASA's capability. We were going to count on these commercial partners. Now the stakes had changed. That decision was made, ISS [International Space Station] brought them on board, and they were moving in that direction to not only do the demo [demonstration] but the services.

At that time, I teamed up with the [Space Station] Program Office. Kathy [Kathryn L.] Lueders is the Manager of the [ISS Transportation Integration] office. We decided we're not going to double duty with these partners of ours. I wanted to make sure we were efficient in the government insight and oversight that we needed to conduct, so we would do joint meetings, and we would get the information we needed together. That was the decision I made early on, primarily for the benefit of the partner, but I think in the end it worked out being to our benefit as well.

That was a change in plan, and it worked out. I think that's about all I have to say for the top-level discussion. Mike and Bruce can give you stories about how we went through some of the major design reviews and the learning that was taking place. There was certainly learning on both sides. They were learning from us, and we were learning from them how decision making can be made quickly with a streamlined decision process, and how agile the company can be to respond to issues and changes.

One other thing that I think is important for the record is that our Space Act Agreement was very stable over the years. We did not have a lot of changes. In fact I think maybe there were seven or eight changes throughout the entire period. Most of them were administrative

changes, just to realign milestone performance because of a different approach that they proposed to us that made sense to us.

Nothing significant, except in the case of Orbital. They had originally proposed to do an unpressurized demonstration, and then as soon as they were awarded the contract from Station which was for pressurized services only, they proposed they change the demonstration to a pressurized carrier instead of unpressurized. We agreed to that, and we made the change in the Space Act and realigned the milestones to match that.

But other than that, that was it, there were not a lot of changes. That's an example of how instead of performing to a firm set of requirements that weren't very well defined, it was a more general approach with goals and objectives that gave the flexibility we needed. So it was very easy to administer the agreement, not a lot of overhead. We weren't constantly reviewing proposals and analyses of basis of estimate. In fact, none of the changes involved a change in cost or financial amount. Except when we came to the [fiscal year 2011] augmentation budget, then we augmented with additional milestones. But for the baseline content, no, we never changed the dollars.

The other thing I set as a ground rule was to not change the agreement for a slip in schedule. Just because they slipped schedule was not the reason to change the date in the agreement. No, we were constantly assessing performance. Was this the right thing to do, do we continue or do we cut it off? We were not changing because of change in projected dates. The only time we changed the Space Act was with a content change. Then at that point we realigned the milestones, and we only did that once or twice.

When you read those [milestone] charts, it's important to understand how to interpret them. These charts are important because they represent the performance of the program. The

milestones are a real hallmark of the program. This is what we're about, these 22 milestones. That constituted the $278 million total [to SpaceX]. This is how we allocated the payments, and this was the running total of the payments we made. That's how you read that.

The legend here goes like this. The dotted line is the initial plan. The day we signed that agreement—all the dotted blue triangles were the initial schedule for these milestones. When they completed it, we filled it in as solid blue. So everything solid means that's the day it was completed. If it's just one triangle that means they completed it on plan.

In this case [demonstrates] this was original, here's where they completed, and that was the delay. In this case we rebaselined the plan. You can go to our Space Act and you'll see the change that rebaselined the plan, and why we did it. The rebaseline is the solid blue line, which I call the current plan, and then the actual.

We would also track projected [completion dates]. This is what the company is telling us they're projecting the performance to be. In the case of Orbital, here we had the original, the rebaseline, projected, not yet completed. That's how you read it. So at a glance you can see the original plan, how they performed, and our rebaseline. That gives you a feel for the challenges and the delays they saw.

The other thing I want to say about that is we knew this was a very aggressive schedule [for SpaceX]. We knew from the beginning that from 2006 to what was to be September of '09—in just three years they were planning to complete the demonstration to the Space Station. We knew that was very aggressive, so what were we to do? Were we going to convince them that that was too early? Or do you give them a shot at it and let them work as effectively as they could to meet it? That's what we decided to do, and it was not a surprise to us that there was a delay.

Our target timeframe was the end of 2010. That's when we had hoped that this would be done, so that come 2011 we would enter in the service phase. It did take a little longer than that, but it was not a surprise. Rocket business is tough. You can look in the history of any new development program like this and you will find that there are challenges, unknown challenges that have to be overcome.

There was a lot of criticism from skeptics for the delay. But we reminded everybody to look at NASA's history. The average time to field a new launch vehicle is at least 27 months longer than initially projected. That's the average if you look at the statistics. Well, it turns out that's almost exactly the delay that SpaceX experienced from the predicted original launch date of the first demonstration flight to the actual. It's almost exactly, to the month, that period of delay. I thought that was interesting.

WRIGHT: It is interesting.

LINDENMOYER: The other thing to keep in mind is we weren't paying the cost for this delay. There was not one extra dollar going to that company for the delay. We did have to extend our program operations, but we did it on the budget that was given to us. I never asked for additional funding to accommodate that extension. We carefully metered the expenses that we were accruing here in the program office by staff, travel, and other expenses. We would carry our underrun over from year to year. Instead of spending per plan, we had to conserve our resources. We would cut back and roll it over to the next year to keep us going year to year.

Never did we ask for additional new obligation authority. I'm very proud of that. Managing our program operations to stay within budget in the extended period is something I'm

very proud of. We were getting to the end. Those resources were running out and we were stretched very very thin, but when we received the augmentation budget in 2011, that took care of us for the last couple years. We were able to carve out a small amount to keep the program operating again.

Even in this period now as we're finishing up, the last funding we received from 2011 was carried over into 2012, and we are carrying it over again into 2013. That took an extraordinary effort, because the way the appropriations work for our program is you have two years to spend it. We received it in '11 and in '12 it expired, so to roll that over into '13 required extra action on our part. Our resources management office did a tremendous job preparing the rationale and authorization, which required approval of Congress through what they call an op plan, an operations plan change.

That was prepared, submitted, and approved through Congress to allow the extension. Well, it was mechanically done by swapping funds with the Commercial Crew Program, who had 2012 funding. They were able to accrue our 2011 funding under their program, we did a swap, and therefore we had 2012 funding that we used from their program and extended to '13. That's the way we did it. We didn't get a new appropriation; we just swapped the funding with our sister program, the crew program. Nevertheless, that required full insight and approval at the highest levels, and we did obtain that.

What an achievement. We never overran. We carefully managed, conserved our resources, and were able to execute the program, even with the extended duration. So I'm proud. I think that's about it for the top-level stuff, but you had some other questions?

WRIGHT: Yes, if we can. If you don't mind going back to those first days, I was curious—because you talked about how the people involved had to basically accept that this was a new approach—how did you become the person in charge? Why did Bill Gerstenmaier select you? And tell us about what you were looking for when you pulled your small team together, how you chose those people to do the job.

LINDENMOYER: Well, I believe the way that came about is I've been a career NASA employee right out of college, and I think all those previous experiences led to where I am today. In 1982, I started at NASA as a co-op [cooperative education student] from Embry-Riddle Aeronautical University [Daytona Beach, Florida] with the [NASA] Goddard Space Flight Center [Greenbelt, Maryland]. That was my first term as an engineering co-op.

I became a flight structures engineer at Goddard in 1983. I was hired and worked there for five years on SPARTAN [Shuttle Pointed Autonomous Research Tool for Astronomy] payloads, which is that little deployable payload out of the Space Shuttle on the end of the arm [Canadarm, Shuttle Remote Manipulator System]. Our office managed the entire thing in house. Designed it, tested and analyzed it, built it, integrated it, everything. I had the fortunate circumstance of being the lead engineer for that payload.

So I had a lot of hands-on experience in dealing with spacecraft that flies in a human vehicle, and that was very special at NASA. To fly on the Space Shuttle with astronauts required a great deal of discipline. High safety factors, high margins of safety, and the rigor required to assure the safety of the Shuttle and our astronauts. I grew up in human spaceflight. Those first five years were really really important and enjoyable to me, hands on right in the middle of human spaceflight.

Then, in 1987, NASA started the Space Station [Freedom] Program. It wasn't international at the time. I loved my job at Goddard, but I also knew the Space Station was going to be huge. This was NASA's next big adventure. I was approached to join the program as the lead manager for structures in the program office. That was hard to pass up, so I accepted that in 1987 and moved to Headquarters.

The program was to be managed out of Headquarters, then we moved to Reston, Virginia. For those three years, '87 to '90, I became the structural dynamics manager for the Space Station. So now I was able to take all the experience that I had just gained at Goddard, and then apply it to our new Space Station design. I had a team under me of support contractors who were doing a lot of the work. That was my first management job, moving to the program. Still a lot of good hands-on analytical computer work, I loved that.

In 1990 I moved here to JSC because I knew the program was transitioning out of Headquarters, and it was going to move to the Center. I expected it would be here at JSC, so I moved here to get prepared for that. Again was the structural dynamics manager here at the Johnson Space Center project office, and then moved over to the International [Space Station] Program in 1993 as the program was restructured.

I eventually became the Assistant Manager for the Vehicle Office, which was the core engineering office for the Space Station at the time. In 1993, I was on the first team over to visit Russia as we began our international partnership. I was the senior engineer responsible for structural dynamics and microgravity, and we worked with the Russians to get them on board. Great experience, and I became the Assistant Manager for the Vehicle Office over that time.

In 1993 we brought a new contractor, [The] Boeing [Company], on board to be the prime contractor for the Station. We were working so fast that the contract changes were building up.

We would make a change, give direction, give authority to proceed, but the negotiation and definitization of those contract changes were backing up. They backed up, and in a matter of two years we had several hundred changes backlogged with the prime contractor.

So I was given a special assignment to go negotiate those changes with the contractor. I pulled together the technical valuation, the technical team, and got those changes negotiated. I did that for a year. Well, at that point I became known as the change expert and the contract expert. Not the mechanics of the contract, but the technical management of the contract and changes.

Then, when I finished that assignment, I was asked to be the Assistant to the Deputy Technical Program Manager [for Technical Development] for the Station. His job as the deputy was to manage the performance of the contractor, performance evaluation. That's when I became Jay [H.] Greene's technical assistant manager. I became essentially the Contract Technical Representative for the program, and I gained a lot of experience on managing large contracts.

Now I had all this contract technical management experience. Well, shortly after that, there was a problem with the program. They didn't want these changes backing up, because they were taking too long to process. Station had a lot of turnover, a lot of activity. I was asked to become the Configuration Management [Office] Manager in 1998. That was a job not a lot of people wanted to do, because CM didn't have a very good reputation. It was known as a bureaucratic, top-heavy, slow-performing organization that caused a lot of problems in the program. That was its reputation.

I was asked to go in and get it straightened out, so I did. Came in, got trained and certified. I'm very proud of that work because we did turn around the performance of the CM

group in Space Station. Then I learned what it really meant to do configuration management of the Space Station of that complexity. Most people think of the change paper that we have to track, but the real art of configuration management is managing the configuration of the hardware and software on the Station. Part numbers, serial numbers, lot numbers, configuration, engineering release. Is it built in accordance with the design, is the design in accordance with the requirements? These are very very formal processes that I had to learn.

At the same time, we're getting ready to fly the very first element of the Space Station, which was the node. It was like baptism by fire, it was dive right in. Not only get changes straightened out, but I had to learn all the technical elements of how to certify that this vehicle was in configuration and ready to fly. That was a great experience, I loved it. I got to see the first elements fly, and worked through the entire certification process for four years.

So a lot of good hands-on technical and management experience with the Space Station. Well, once again we got ourselves in a situation where we weren't operating as efficiently as we could. We had way too many contracts on the Space Station. We needed to streamline our operations. We did another special team, back into the bunker, to consolidate the contracts of the Space Station into four prime contracts instead of one big one and many many little ones. We wanted to restructure the entire Space Station to three or four prime contracts.

I was assigned to be the Technical [Integration] Manager for that job. I was a change expert, contract management expert. "Go get this straightened out." So we did. I was the Technical Integration Manager for that work to consolidate and restructure all the contracts into four prime [contracts]. Did that for a year or so, and in 2003 we completed that work, recompeted, and awarded all of the prime contracts.

Now I was in charge of not only structuring the entire technical approach, but I was the Source [Evaluation] Board chair for the program integration contract, which was one of the four prime contracts that were awarding. So I took on a dual role, technical integration and then the source board chair for that contract. That gave me a great deal of experience on how to deal with negotiating and evaluating.

Now I had all that behind me, and I actually became the COTR [Contracting Officer Technical Representative] for that contract too. I was managing the technical performance of the program integration contract. Then they gave me a second contract, mission integration, because the COTR had left. Instead of hiring a new COTR, I took on that contract too, so now I was managing two prime contracts.

It was at that point, when it became clear that we wanted to put a program together for commercial partner opportunities, that Bill Gerstenmaier suggested this would be something that would be good for me. I think my background and very strong experience with the Station Program was important. Understanding contracts, understanding technical management—those were the characteristics of a good fit. This was going to involve putting together a new form of contract to support the Station.

It needed somebody that knew the ins and outs of how the Station worked, and how it was managed, and how we operate. I think that was a logical fit. Then, at the same time, Gerstenmaier was promoted to the Associate Administrator and Mike [Michael T.] Suffredini became the Space Station Program Manager. I was actually working for Mike at the time, and Mike and Bill both agreed that this would be a good assignment.

WRIGHT: What were your first thoughts when you heard about this new concept, being so entrenched and so experienced in what had worked and hadn't worked [with Station]?

LINDENMOYER: I was apprehensive. There had been previous attempts at [commercialization] that had not worked. Alternate Access to [Space] Station was an activity that didn't work out, and earlier in the year 2005 there was a group at the [NASA] Kennedy Space Center [Florida] that was trying to do something [ISS Commercial Cargo Services]. The Agency knew there were opportunities, but we didn't know exactly how to go about taking advantage of those opportunities, so that didn't really take off.

I knew immediately this was an amazing opportunity. This was really going to be fun, because I could put it together the way I wanted. I knew I was responsible for my own destiny and that if this didn't work, well, no one to blame but me. So I saw a great opportunity. I knew it would take every skill I had learned to do this, and it did. Every skill—engineering, program management, interpersonal skills, team building, political, partnering and communicating—everything I learned, I had to put to use on formulating this program.

So I was excited about it. I was thrilled that I was given the full responsibility for it—probably because people didn't want to deal with it. It was pestering the [Space Station] Program, because we had such important critical work to do. We had our prime contracts, who were doing a good job doing what we needed done, but this was a bigger purpose. This was a much broader public purpose than just serving the needs of Station. That was important.

It became clear in my mind this was a much bigger purpose than Space Station. This was about national goals, and building a national capability and national leadership, and economic growth. It became very clear to me that this was so closely linked to higher-level national goals

and objectives and policies that this was going to be really important. I was excited. I knew right away this was going to be a tough job and a lot of opportunity, so I was happy and full of energy.

We were under a lot of schedule pressure, so there wasn't a lot of time to think about this. We had to move quickly. The first thing I did was a visit to Headquarters. I talked to the Program Executive that was working with this concept up there, Brant Sponberg. James [W.] Bailey was the contracting officer who had been working on these previous attempts at commercial opportunities. I got the lay of the land, what they're thinking about, how they were structured. Then talked to some of the lawyers up there and researched what they were doing.

I came back and knew I had to put a team together that was similar to a contract source board. When I ran the previous source board I had to lead everything. I had to put all the requirements together, the statements of work, the terms and conditions, the deliverables. I had that entire end-to-end experience. I learned how to put the team together, evaluate, negotiate, award, execute. I had all that, I knew the mechanics of how to do this. There was no question in my mind that I could do this. It's just that it was going to have a lot of variations, a lot of tailoring that we had to do.

I pulled in Valin [B.] Thorn, who was the manager in charge of vehicle performance for the Station. I knew I needed a technical manager that could communicate what the interfaces with the Space Station were going to be. We needed to consolidate this into something that was understandable and easy to interpret for a commercial partner. So I asked Valin to join me and he did. I needed that very strong technical element of performance from the Station.

Then I immediately linked up with legal here at JSC—Amy Voigt, now Amy Xenofos. This was clearly going to be a very tough legal challenge to pull this together, so I knew I had to

bring them on quickly. The procurement community too, so I asked James Bailey to come down and help because he had been working this at Headquarters. So I had procurement, legal, and technical on board. Then I needed someone to look at the business end of this. That's when I brought Dennis [A.] Stone over, because I knew he had a very strong interest in commercial space. I'd known him for years and I knew that was his interest, and I brought him over to help with that. Marc [G.] Timm also came down from Headquarters to help start up the effort.

That was my core team, then they all assigned their appropriate support. We were thinking like source board, putting our team together and putting these products together. That's how we built the bigger team and expanded on their knowledge of people who would be good team members. Definitely my relationships with the Station Office and legal and procurement were important in building a high-performing team.

WRIGHT: One of the first steps that you took to get outside help was that you put together an RFP for a venture capitalist. Can you share with us why you chose that route and how all of that happened?

LINDENMOYER: It became clear that since we were asking for cost sharing and rounds of financing, the business side of this was going to be equally, if not more important, than the technical aspect. This is one of the big variations from what I had done in the past and what NASA was accustomed to, becoming a partner and investor. I knew we needed help.

We also had a member of the team, Dan [Daniel J.] Rasky, from the [NASA] Ames Research Center [Moffett Field, California]. I really wanted this to be a NASA-wide effort, not just JSC, so we had good support from across the Agency. Ames was known to be a leader in

partnerships with industry. They're in Silicon Valley [high-technology region around San Francisco, California], and they were the leader for non-traditional business with NASA. They had a portal set up for partnerships with NASA. They're a really strong leader for that.

I was made aware of that and had Dan join our team. Dan knew of this particular consultant who was helping him out there with some of these aspects, and that's when I knew that's what we needed. We did a procurement, an open competition, and the guy we were working with ended up being awarded the job. Then you know from there how much we learned. That was a really good outcome.

WRIGHT: Part of what we understand is that you and your whole team had to think with an investor mentality, not just technical. Was that a bit of a learning curve to move into that?

LINDENMOYER: Very very much. You've got to understand, me and my team thought we knew everything we needed to know about NASA. How to execute a contract—we were very strong headed about how to do it. When Alan Marty [venture capitalist] came on, initially he gave us some ideas that we didn't trust. We said, "You don't know NASA as well as we do." It was a definite culture change. It was definitely a learning curve, and it was a trust building too. I had to trust that what he was saying was really relevant and important to us.

It took a while, even during the evaluation phase, because Alan was on the business team. He would give us findings and his comments, and we would have to evaluate how significant that was and how it would affect the rating of what we were evaluating. There were times where we just didn't believe it. We thought we were smarter than him, but we weren't.

It turns out that the observations that Alan gave us came true. He predicted what would happen in the case of RpK, and some of the risk areas that we really needed to watch out for. It was all a learning curve. All this due diligence into the business end of the company was all new. We had a lot of learning to do, and we did.

WRIGHT: You mentioned that you had a pressurized schedule because Mike Griffin wanted this done. Were you having to, as you had done in the past traditionally, give up-to-date reports to your management? Were they curious about what was going on, maybe demanding that you were making progress? Or did they leave you alone to figure this out and report back to them when you had updates?

LINDENMOYER: I was left alone pretty much, but I was in constant communication with Headquarters. Scott [J. "Doc"] Horowitz was the Associate Administrator [for the Explorations Systems Mission Directorate]. He came on board the same time I did, so we're all starting this together. Horowitz, me, Mike [Michael L.] Coats as the Center Director here, we were all starting together.

Doc certainly had his hands full getting Constellation [Ares rocket and Orion Crew Exploration Vehicle] started, but Doc had very strong opinions on how this could be done. He ended up being the Selection Authority. He had a primary role in understanding the ins and outs, how we were going to do all this. He had to approve our evaluation plan and then ultimately the selections, so we kept in pretty good touch with him.

Mike Griffin made it very clear he wanted this out on the street as soon as we could. So they gave us the latitude to do what we needed to do, but I certainly had regular and frequent

communications with Doc, who would relay to Mike Griffin how we were doing, but they let us do what we needed to do. When we needed to have a delay to finish up a task or whatever we needed to do, well, we were given latitude to do that.

But it was good to work under pressure. We needed to get things done, and we were not going to spend a lot of time doing this. We took pride in that, that we got it done quickly.

WRIGHT: That seems to be very helpful, that you all agreed up front that you were going to do whatever it took, as a team.

LINDENMOYER: Yes. I think that's another important point. It was clear from top down that this was a high priority so we got all the help we needed, especially here at JSC. Debra [L.] Johnson made sure that I had the top rate procurement team on this. Legal gave full attention. In fact, they even hired a new lawyer.

Jon [Jonathan A.] Arena became our primary lawyer, and he was dedicated to us. Jon ended up being very very instrumental in making this happen. There are a lot of stories about how Jon and I went through the negotiations with these companies. Interesting stories how that all worked out. And we had top-down support, that was important. Good priority too, everybody knew it was important.

WRIGHT: Which makes it interesting on the financial side, because normally in NASA people protect their funding and aren't so flexible sometimes in offering help because it takes away from their core projects. But Mike Coats was, as you mentioned, brand new to the center, and now this was something new for him to deal with as well. Did you have a lot of communications

with him, letting him know how you were using the staff and the resources here at JSC in building this program?

LINDENMOYER: I did, because they immediately put me on the senior staff at JSC. I immediately was hooked into Mike and his senior staff and his weekly meetings. Right at the beginning I began reporting to the entire senior staff weekly what's going on, how it was going, what's working well, where we needed help, and how to shift resources when necessary. So there was definitely direct communication with Mike and his staff, and I had periodic tagups with Mike too.

It was an interesting arrangement, because I didn't report to Mike. I reported to Headquarters, Scott Horowitz. That was the arrangement for Shuttle, Station, Constellation, and my program. Those four primary programs reported to Headquarters, but were hosted here by Mike. So yes, Mike was very much engaged, very supportive. He made sure if there were any problems, we got Center support. Everything was just really really well supported.

WRIGHT: Based on what you told us, you were so entrenched in how Station worked, and you were setting up this program that very definitely was going to impact the future of Station. Can you share with us some of the discussions, or if there were challenges in putting your new program into an already entrenched program? How were you able to mold the two programs to provide for this new way to get there?

LINDENMOYER: That's a good question. There was a lot of skepticism, and there was a shroud or mystery around this. "What is it that's important?" "What are you doing?" "How are you

going to let some private company deal with this big monster of an international magnitude we've never seen before in size, complexity, cost and international breadth?"

There was a lot of skepticism there, but I think there was a lot of trust too. I knew Mike Suffredini and Bill Gerstenmaier, and I had worked with all the managers of Space Station. So there was a lot of trust that we weren't going to do something stupid. We were not going to let that happen. I think that trust factor was really important. Valin had the technical knowledge about the Space Station and its details that we needed of the performance and interfaces, which helped our credibility.

At first it was very much hands off. They were very busy completing the assembly of the Station, and we're doing this. It was pretty much hands off, because everything I needed from them we had with our own experience on the team we built. Valin helped consolidate all of that information on how to approach Space Station, which was dozens of documents. Documents within documents within documents. It grew and grew. We never did do the final count, but it was many documents.

Our contractors knew how to deal with that, and our International Partners knew how to sort through all that, but it wasn't reasonable to expect new companies to be able to decipher all that. So one of Valin's first jobs was to put all that ISS information together into an Interface Requirements Document. That's when we started working much more closely with Station, because it was in both our interests to get that done. That's when we really started bridging between the original program and what we were doing, and knew this had to be a closer integrated joint effort.

In fact, my original idea when I built the team was to have a Program Integration Manager who would be responsible for interfacing with the Space Station. We wanted the

partners to interface once with NASA, and we would help facilitate all the other organizations around NASA so they didn't have to go to multiple front doors. My original idea was that our Program Integration Manager would help integrate our partner to the Space Station, do that technical integration.

Well, it turns out Station stepped right up to the job and said, "No, we will do that. We will take on the role of making sure this new partner [understands] the technical and safety integration of the new vehicle with the Station," just like they did with any other vehicle. They took that on and offloaded that from our program, so I knew I no longer had to do that job.

They took it on, and they did it without any additional funding from our program. They just did it. We were shoulder to shoulder at that point working the consolidated documentation, and them taking on the primary role of the ISS integration. They stood up an office with Kathy [Kathryn L.] Lueders to do the transportation integration. We worked very closely together after that, but we had to evolve into that. It definitely was two independent efforts that came together.

WRIGHT: It's nice when things work out, isn't it?

LINDENMOYER: Yes, it sure is.

WRIGHT: But it took a lot of work. Well, our time is almost up today and we don't want to encroach too much. So if we can, we'd like to leave it open and we'll reassess what we have, and then we'll let you know and set up another time.

[End of interview]