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ORAL HISTORY TRANSCRIPT

ROBERT T. RICHARDS
INTERVIEWED BY REBECCA HACKLER
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HACKLER: Today is June 4, 2013. This oral history interview is being conducted with Robert "Bob" Richards at the Headquarters of the Orbital Sciences Corporation in Dulles, Virginia, for the Commercial Crew & Cargo Program Office History Project. The interviewer is Rebecca Hackler, assisted by Rebecca Wright.

Mr. Richards serves as the company's Vice President of Human Spaceflight Systems and has been with the company since 1988, involved with numerous programs including the Pegasus launch team that was awarded the National Air and Space Museum Trophy in 1990. Thank you very much for taking the time to talk to us today, and we'd like to begin by asking you to give us a brief overview of your background and how you came to be involved at Orbital.

RICHARDS: Thank you. I have certainly had an exciting career at Orbital. As you mentioned, I joined in 1988 to work on the Pegasus air-launched booster. Orbital was about 60 or 70 people in the earliest days and has grown to around 3,600 or 3,700 people now. During my career there have really been large changes at Orbital, but my focus has been commercial space, civil space, and trying to field innovative products that met some customer need. More often than not, that customer was NASA.

Pegasus has become one of the most important boosters for small NASA scientific missions, and we've flown many, many NASA missions. Pegasus missions also provided the

first experience with commercial contract terms with NASA. For example, NASA Kennedy Space Center [Florida] procures launch vehicles using a commercial approach, which means commercial practices are applied.

It means that the ownership of the actual space hardware is maintained by the industry contractor, and certainly it allows us a partnership-type of relationship with NASA as well. That type of contract and procurement strategy was later applied to the COTS [Commercial Orbital Transportation Services] program, and I'm sure we'll spend a lot of time talking about that in particular.

I've had many different jobs at Orbital, starting with launch vehicles but then moving more into the human spaceflight side. I was the Capture Manager for a variety of our bids, including the COTS bid that we won and the [International Space Station (ISS)] cargo resupply contract [Commercial Resupply Services (CRS)] that we also won. I then became the first Program Manager for COTS and CRS, and basically ran the program through about the PDR [Preliminary Design Review] timeframe. So it's been a lot of fun.

HACKLER: Can you talk a little bit more about Orbital's involvement in some of NASA's earlier commercial initiatives like SLI [Space Launch Initiative] and Alternate Access to [Space] Station?

RICHARDS: We actually started, even before Alternate Access to Station, with a concept called Orb Express. That was Orbital's first foray into trying to support the International Space Station with cargo. We were also trying to leverage what we had within the company, which were small launch vehicles. Using a small launcher, regular cargo would be unaffordable. And also the

Space Shuttle was also up and running and doing all the assembly missions, so the need for an independent cargo vehicle was less in those early days.

We focused in on contingency cargo. The scenario is there's an emergency on the Space Station, you need something up there, some critical spare, and you need it now. We looked at a few day call-up, where one of our vehicles, for example a Pegasus, could essentially be on alert and could take a few hundred kilograms up to the Space Station. It used a similar concept of operation that we ultimately put into the Cygnus, where it would fly up next to the Space Station, be grappled by the Space Station robotic arm, and then the cargo would be separated off. This vehicle was so small, the cargo could actually come through the JEM [Japanese Experiment Module] airlock as opposed to the approach we use today with the Cygnus that involves berthing to one of the nodes of the Station. Nonetheless, it was similar in concept from that perspective.

The focus was a few day call-up, rapid rendezvous, small emergency cargo. We thought that was a pretty slick concept, and we extended some of that work into Alternate Access to Station. Although the main focus for Alternate Access to Station, which is now in the 2002 timeframe, was review of the entire logistics systems for Space Station: what types of cargo were needed, what types of vehicles could meet those needs. It was a much bigger look at cargo as a whole.

Orbital has been interested in Space Station cargo resupply since 2000, with the Orb Express concept, and 2002 through about 2004, with the Alternate Access to Station concepts. We also contributed to Space Launch Initiative in several areas. We performed a series of studies for crew and cargo transfer under Space Launch Initiative as part of the OSP, Orbital Space Plane Program. We also ran an on-orbit demonstration of rendezvous technology called DART, Demonstration of Autonomous Rendezvous Technology.

All through that timeframe, we were certainly interested in the technology associated with cargo resupply, as well as trying to take steps towards collaboration with NASA. Those early steps then led to the COTS program, which is Commercial Orbital Transportation Services. There were multiple procurements of the COTS contract. The first procurement, as I recall, was in the early 2006 timeframe, and the second procurement, which we were selected on, was in late 2007 through early 2008.

COTS was similar to some of the work that NASA had done with launch vehicle procurements in the sense that it was a commercial service contract. It had some unique elements to it which allowed it to leverage private industry investment with government investment to develop a new capability. Had the nation not used that type of procurement approach, developing cargo systems for NASA use would have been more expensive.

For industry to put money towards the development of COTS, we're looking for a long-term business relationship to amortize and get a return on our investment. That long term business was the Cargo Resupply Services contract, or CRS. I think it was very smart for NASA to their ongoing cargo needs to attract investment from private industry. We bid on CRS and were awarded that in early 2008. I was actively involved in the bids and then, as I said, ran these programs about through PDR.

Our designs changed over time as we got deeper into product development. For example, our COTS demonstration mission was originally conceptualized as a demonstration of unpressurized cargo, cargo that goes to the outside of Space Station. We, in concert with NASA, determined that the most effective use of the system would be for pressurized cargo, or things that are going inside the Space Station, like food, clothing, equipment that the astronauts use, etc.

We reached an agreement with NASA, at no cost to NASA, in early 2009 that we would change our COTS demonstration objectives from unpressurized cargo to a full pressurized cargo system. It was always the intent to demonstrate that pressurized cargo capability, but the original intent was to demonstrate it on a later mission. The overall service has changed, morphed over time, and I think in all cases it's really been to NASA's advantage to get a more cost-effective system and a capability that more closely matched their needs.

HACKLER: If I can go back and ask you a few questions about your earliest involvement with NASA—you were talking about Alternate Access to Station, Space Launch Initiative, Orbital Space Plane—it's kind of a chicken and egg, which came first question. Do you remember if you were proposing those ideas to NASA, or if NASA was soliciting those ideas and studies?

RICHARDS: Concerning Alternate Access to Station or SLI?

HACKLER: For both.

RICHARDS: I think in that timeframe, basically industry was saying, "Here's what we've got," and NASA was also doing a kind of demand pull. Certainly also in that timeframe, "NewSpace"—I put that in quotes—was really starting to pop up, and there were some very small companies that were very vocal. This was a chance for small companies to get involved in NewSpace activities, that NASA should utilize these companies to perform cargo resupply and other types of things. That was particularly the case in Alternate Access to Station.

I think Space Launch Initiative was more mainline, if you will, trying to develop a capability that NASA had a strong interest in. That's not to say that NASA didn't have an interest in Alternate Access to Station, because that was also very important to NASA, but the context was that they also had this extremely capable vehicle called the Space Shuttle flying at the time, and limited budgets.

Orbital sort of fell in the middle of that. I don't think we were as vocal on Alternate Access to Station as some of the really small NewSpace companies. In fact, we were trying to develop capabilities that would maybe be more of an augmentation to the Space Shuttle, as opposed to a replacement of the Space Shuttle.

HACKLER: It took a few years for NASA to be able to make those type of commercial relationships possible, where they were actually developing and soliciting the capabilities for commercial access to Station, especially after the Shuttle's retirement [in 2011]. Can you go back and talk a little bit more about your role in the Round 1 and 2 COTS competitions?

RICHARDS: There were two rounds, the first around early 2006. Orbital bid on that and we were not selected. The selectees were Kistler Aerospace [Rocketplane Kistler] and SpaceX [Space Exploration Technologies Corp.]. Then, between early 2006 and late 2007, there was a series of milestones which Kistler had to achieve to stay in the game, and they did not achieve those milestones. In October of 2007, NASA put out a Request for Proposal [RFP] to find a replacement for Kistler Aerospace.

The idea of recompeting nonperforming contracts was built in to the original procurement strategy of NASA. They wanted competition; they didn't want a single provider. And if a

provider was not meeting milestones, was not performing, there was a way to move that provider off and have a new competition, and bring a new system online. While the exact timing of that was somewhat of a surprise to us, and was kept within NASA, the broad capability of switching out one provider for another was something that was understood from day one. When the RFP came out we jumped on it, and I was the Capture Manager for that procurement as well, and we were selected.

HACKLER: What sort of changes did you make to the proposal from the first round to the second round, when you were successfully selected?

RICHARDS: The second round more utilized our geostationary satellite technology, and it was more of a clean sheet design. The first bid was a big focus on lowest risk possible, lowest cost possible, so we had bid certain foreign electronics and foreign elements that were very flight-proven and very low cost. After not being selected, we had more of a focus on U.S. technology. We were just a couple of years smarter and had some stronger technology in certain areas, so we bid that. Our second bid had some really significant changes compared to our first bid.

HACKLER: What kind of discussions and negotiations do you recall going through with the NASA representatives when they came to do their due diligence sessions and meet with company representatives?

RICHARDS: It was an interesting process, because not only did it focus on the technology—is this a good design and does it meet the contract needs—but there was a pretty rigorous look at the business case and overall economics of the system.

More than that, NASA asked for and we provided a lot of ideas on how you could take that basic technology and utilize it in adjacent markets. Could you modify the hardware and make it do a different mission besides cargo resupply? In particular, something that would help facilitate the return on investment and the overall business case. We spent a lot of time discussing the concept of adjacent markets and commercial markets.

I think there was also a fairly detailed look by NASA into the overall health of the companies because a lot of the bids were by really small companies. There were, I'm sure, question marks in NASA's mind about, "Well, this is a great design, but can this company generate the capital and stay in business and implement it?" I guess the results of the first procurement highlighted the importance of corporate financial strength and stability when developing a cargo resupply system.

I've been in an early phase company and seen it mature to a later phase company. A lot of companies don't make that transition. It's difficult to make profit year after year, and some fall by the wayside. I recall there was quite a lot of looking by NASA on these topics.

HACKLER: You mentioned the adjacent markets. Can you explain a little bit more about which markets you were looking into then, and how those have changed? What sort of future you're looking at for these technologies that you developed for COTS and CRS.

RICHARDS: First of all, COTS and CRS were full service. So they included a launch, they included a cargo vehicle, and they included a mission ops [operations] piece. When you think about it, each one of those elements has adjacent technologies, adjacent markets. The easiest to understand would be the launcher. We did extensive market studies on how the Antares launch vehicle—we called it the Taurus II during development—could not only support COTS and CRS, but could launch a lot of NASA scientific satellites in the medium class.

That was of great interest to NASA because their primary medium-class launcher, the Delta II, was in phased-out mode. They were running into a lot of obsolescence issues, and NASA was interested in alternatives for the medium-class. I think the adjacent markets for the launch were really satellite launches and other things like that.

On the cargo system piece, we conceptualized ways to use the basic rendezvous technology and the rendezvous sensors, and some of the technology in the Cygnus vehicle for other missions. Satellite servicing would be one example. There's a case where if you want to send up a servicer to fix an on-orbit satellite, you have to be able to rendezvous with it, you've got to be able to attach yourself to it and then you need to do whatever the servicing is—refuel it, swap out a bad electronics box, or something like that.

While that particular market I haven't really seen come to fruition, certainly we looked into it, and that was part of our proposal on how some of these adjacent markets could be addressed by Orbital products. That further emphasized the overall business case argument that was so important to NASA.

HACKLER: We also understand that the Round 2 COTS competition and the CRS competition took place almost contemporaneously. Can you talk to us about the CRS competition and how you maintained those two separate efforts?

RICHARDS: It was somewhat of a management challenge, but let me say right off the bat, I think NASA did the right thing there by overlapping those two contracts. The reason they did the right thing is had they selected CRS only after COTS was completed, which of course is the most intellectually pure way to do it, they would significantly delay the introduction of an operational system. My sense is that probably, hindsight being 20/20, NASA wishes they had started COTS earlier.

The original plan was to implement CRS after the COTS demonstrations were complete. That would have just added years to the implementation of the service, and so NASA was clearly smart to overlap those two procurements. It also really helped out within our management structure of keeping the company focused on this project, because we could see a clear longer-term business [ISS resupply] that was essentially in place. We could see objective evidence of NASA moving towards that longer-term business and putting that out to private industry.

As far as the operational aspects of managing that, we had a large extended team. We had a lot of good people, and so we had some people writing the CRS proposal at the same time we were doing requirements reviews on the demonstration mission. Basically, the overall team, including the management team, worked both contracts at the same time.

HACKLER: Were you involved at all in the GAO [Government Accountability Office] protest of that CRS contract? Can you share with us a little about that?

RICHARDS: We certainly felt like the protest was without merit, and the fact that we were allowed to continue the CRS contract throughout the whole protest period I thought was very telling, because that required NASA to get a dispensation to continue the contract while the protest was underway. Ultimately, we prevailed.

HACKLER: You talked about the change on the demo [demonstration] flight from the unpressurized to the internal, pressurized cargo. In what other ways did your agreement with NASA evolve over the years of its enactment?

RICHARDS: The overall visiting vehicle requirements have evolved some. NASA was starting with a pretty good set of visiting vehicle requirements because they had run the [Russian] Progress [cargo delivery spacecraft], the European [Space Agency] ATV [Automated Transfer Vehicle], and the Japanese [Japan Aerospace Exploration Agency] HTV [H-II Transfer Vehicle], and all three vehicles were operational or nearly operational when we started.

The Safety Review Panel, which I think is a very competent organization and very good to work with, already had a lot of experience on what does it take to integrate a visiting vehicle into the Station, and NASA had a clear vision of what they wanted as far as cargo. That said, deep in the details, there have been some changes in the visiting vehicle requirements, and those were more or less worked out as we went along.

HACKLER: Can you talk about your relationship with the ISS Program Office and how you negotiated those changes?

RICHARDS: First of all, we've had a very good relationship with the ISS Program Office. I am very impressed with Mike [Michael T.] Suffredini's leadership, and it's overall been a very good experience. I'd say a lot of the negotiation of really detailed requirements came in after I had moved from being program manager, so it's probably a good question to ask Frank DeMauro when you interview him later. In general, both sides came together to get the best overall result.

HACKLER: Another significant change to the program was the addition of some augmentation money for fiscal year '11. Can you talk to us about how you found out about that augmentation, and then how you implemented it in your development program?

RICHARDS: Sure. I think NASA was becoming more and more concerned about how many eggs they'd put in this COTS and CRS basket. CRS was very lightly funded because cost effectiveness was a big part of the initial goal of CRS. Over time, CRS moved from being an augmentation of basic cargo capability, to becoming really the prime cargo capability. I think that NASA looked at that scenario rightly and said, "Boy, CRS is so important to our extremely expensive Space Station. Are we spending our money in the best manner to drive down risks associated with the development of these new vehicles like the Cygnus?"

I was part of the discussions, as well as other people on the management team, as far as what are the risks, what is the best place to spend money to drive down risk? We concluded that an Antares test flight was really the primary element that we thought that we and NASA together should focus on. I think that was, still looking back, the correct answer. We've had that test flight, and it was very successful. We got lots of useful data. Overall, launch is a very high risk

part of an overall system. That's one of the riskiest phases of going to Space Station, so putting funding into that was, I think, the right thing to do.

HACKLER: Can you tell us about your experience on the launch day in April [2013], when that test flight went off successfully?

RICHARDS: We'd had several countdowns and the final one, I really felt the professionalism of the team. I think it went very smoothly and I was just excited to see it fly after so many years. Taking a few countdowns to get to launch is not unusual in this business at all. The amount of work that goes into these missions is really very large, particularly a development flight. The team did a really fantastic job, and by "the team," I count both NASA and Orbital working together. It's just a great sense of satisfaction when everything works so flawlessly and we obtain such a good result. Now on to the next thing, because as much fun as it is to accomplish these things, we've got a lot more still ahead.

HACKLER: The last thing I'll ask before we conclude this morning's session and let you get to your other meetings—how has your relationship evolved with NASA? Not only your current work on the COTS project, but also your previous interactions with the space agency.

RICHARDS: Personally, the interaction with NASA has always been very, very good, and I see a lot of parallels when working with one NASA center versus another. There's a lot of the same types of challenges, and generally a positive type of relationship. My sense is that space, being

difficult, and the bringing together of experts with this really specific and narrow skill set, is what helps bring everyone together.

In fact, I've worked with foreign space agencies and have been surprised at how positive that can be, and how people, even with fairly diverse backgrounds, end up solving the problems in the same way, and can immediately resonate with difficult problems and how to solve them. I think our interaction with NASA, in my whole career—not counting just COTS and CRS, but other parts of NASA—has been a very positive experience, and it's just a great feeling to accomplish something so difficult with the extended team.

HACKLER: All right, thank you very much for your time this morning.

[End of Interview]