

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

BRETTON ALEXANDER  
INTERVIEWED BY REBECCA WRIGHT  
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WRIGHT: Today is March 18, 2013. This oral history interview is being conducted with Brett Alexander in Washington, DC for the Commercial Crew & Cargo Program Office History Project. Interviewers are Rebecca Wright and Rebecca Hackler. Mr. Alexander is the former president of the Commercial Spaceflight Federation, a member of the Commercial Space Transportation Advisory Committee, and current Director of Business Development for Strategy at Blue Origin [LLC].

We thank you for stopping in today and visiting with us. If you would start by giving us the background of how you got involved in these commercial space activities and how that brought you to where you are today?

ALEXANDER: I started at the White House Office of Science and Technology Policy as a Senior Policy Analyst for Space Issues, which covered NASA, NOAA [National Oceanic and Atmospheric Administration], and some national security space activities. I was there from May of 2000 to January of 2005. While I was there, on February 1<sup>st</sup> of 2003, we had the *Columbia* [STS-107] accident, which led to a year-long process that arrived at the Vision for Space Exploration [VSE] that was announced by President [George W.] Bush on January 14<sup>th</sup>, 2004. Throughout that process, I was one of the primary authors of the Vision for Space Exploration and the different activities that led to its development.

One of the cornerstones of that Vision was that NASA needed to get back to exploration beyond low-Earth orbit [LEO], leaving low-Earth orbit to both international and commercial activities. From my perspective and from the perspective of many involved in the Vision, it really was about NASA going beyond LEO and commercial taking over the LEO activity. In the summer of 2004 was the Aldridge Commission on the implementation of the Vision [President's Commission on Implementation of United States Space Exploration Policy], which was much clearer on turning LEO over to the private sector.

I think a number of folks, looking back on the Vision, we would have written it a lot differently had we known how it would play out. We would have been much clearer on the commercial side of do this, or do that. We thought we had been fairly clear in putting implementation actions in there like retiring the [Space] Shuttle, completing the [International Space] Station, building a new crew launch vehicle and a Crew Exploration Vehicle [CEV]—those sorts of concrete actions which had been missing from the Space Exploration Initiative speech by President George H. W. Bush, 20 years earlier.

Those concrete implementations were light on the commercial side. One of the reasons for commercial being in that Vision the way it was—within the White House process of getting to a Vision, a number of the players at the table were internal White House offices. One of them was the Council of Economic Advisors. Everybody was told to come up with a vision that they thought was the right one, and the Council of Economic Advisors came in and their vision was to disband NASA except for the top few hundred folks and put the money out to the private sector.

Getting rid of centers, getting rid of those capabilities—what we took from that was the importance of commercial and the importance of industry, but we weren't willing to go as far as disbanding NASA. That was not what survived, but what did survive from that was that core of

commercial is ready and should have been brought along in the human spaceflight arena. Of that 40 years of human spaceflight that we'd had—42 years by that point—where the government had done it but nobody had ever come behind.

One of the things in President Bush's Vision speech over here at NASA Headquarters [Washington, DC]—he was alluding back to Lewis and Clark, and he said that government sent Lewis and Clark to explore so that other people could follow. The problem with human spaceflight is nobody had ever followed because it was so expensive. From the government perspective, it was getting more expensive per mission or per person in space, as opposed to getting less expensive. It wasn't getting safer, it was getting less safe.

Those trends are typical of government-controlled institutions, the opposite of private sectors, where you have competition and you have increased productivity and lower cost over time. The goal was let NASA do the exploration, the pointy-end-of-the-spear type of real cutting-edge exploration, then turn the more routine—certainly not routine, and certainly not mundane—human spaceflight and low-Earth orbit activities over to the private sector.

That was the vision in January of 2004. For the next 18 months or so, you had Sean O'Keefe as NASA Administrator, and you had someone he brought in named [Rear] Admiral Craig [E.] Steidle as the Associate Administrator for Exploration [Systems]. Admiral Steidle had been at the Pentagon with the Navy, doing the Joint Strike Fighter [F-35 Lightning II]. They'd had two major contractors develop their aircraft independently, and then there was a fly-off, and eventually they selected one winner.

That was the model that he brought to Exploration. He wanted to have a fly-off of two vehicles by 2008, and he was on that path to do so. One of the things that he did in the summer of 2004 was put out a program called Concept Exploration and Refinement. It was known as the

CE&R contracts, and he awarded I believe six contracts, for \$3 million each, to a number of companies both big and small, for each company to say, “Here’s how we would go back to the Moon. Here’s the architecture we would use to get back to the Moon and how we would do it and what the vehicles would look like.” Sizing and that sort of thing.

I later joined one of those companies in January of 2005, which was called Transformational Space Corp., or t/Space. t/Space was actually formed just to respond to those CE&R contracts, and actually won one of the \$3 million contracts. It was later awarded another \$3 million extension. The other winners were Lockheed Martin, [The] Boeing [Company], Northrop Grumman, Orbital [Sciences Corp.], companies like that.

t/Space was a new startup with just a couple of people, but the idea that they put forth was a very different architecture. It was an architecture where astronauts would fly Earth to orbit on a commercial taxi, and I think that’s really the predecessor of Commercial Crew [Program] and COTS [Commercial Orbital Transportation Systems]. Astronauts would then go into a vehicle that’s already in orbit, that would go from low-Earth orbit all the way to the Moon, down to the surface, and all the way back to low-Earth orbit. One vehicle.

They’d actually travel in pairs of vehicles so that you had redundancy and you could transfer from one to the other if something happened. The idea was you had an Earth-to-Orbit part of the architecture, and then you had an in-space part of the architecture, all the way to the lunar surface and back. That was fundamentally very different, radical if you will, and I think that’s obviously what won them that contract. They were able to, with that \$3 million, explore that idea further.

Back along the timeline, that was the summer of ’04 that [the CE&R contracts] started. In December of ’04 Sean O’Keefe resigned, and I left the White House in January of ’05. A new

NASA Administrator wasn't appointed until Mike [Michael D.] Griffin came in of April of that year. Then, he started up the ESAS study, which was the Exploration Systems Architecture Study, which led to Constellation [Ares rocket and Orion Crew Exploration Vehicle].

Constellation got in place about 18 months after the Vision, and after Admiral Steidle and Sean O'Keefe were well on a path to do something that was very different. One of the things late in that Steidle-O'Keefe period was that the folks at t/Space started to explore—Gary [C.] Hudson and David Gump mainly, with Admiral Steidle and other folks in that office, maybe [Michael F.] Lembeck and maybe Steve Isakowitz. He had been the [NASA] comptroller and became Admiral Steidle's deputy.

They started exploring an idea of what was then called “nontraditional crew.” That would have been, as it was conceived, a \$400 million demonstration program to give funding to I think one company, but there was some talk of leader-followers who might have other companies in it. Really to take one company through a demonstration of flying people in space, to do that demonstration of that commercial taxi, Earth-to-orbit commercial crew. Not to go to the Station, not to levy any requirements on it, but just to simply show the fact that it could be done. That would change the paradigm of everything, if you could show that the private sector was capable of doing human spaceflight.

That idea had gathered significant ground. When I moved to t/Space, when I left government, I chose not to go to another government agency. I chose to go into the commercial human spaceflight arena because I thought that was the only thing that was ever going to change NASA, change spaceflight, and change what a lot of us had been working towards, which was a robust space program that was both exploration and expanding the number of people that could fly in space, which had not really changed for a long time.

With Admiral Steidle still there after Sean O’Keefe left, when Mike Griffin came in, they did not see eye to eye on any of this. As you know, the ESAS study recommended a large Shuttle-derived vehicle. Two vehicles, Ares I, Ares V, Altair [lunar lander], and the other pieces of Constellation, and Admiral Steidle then left shortly after that. It was clear that they were not compatible. With that being said, Mike Griffin was interested in doing something with commercial that would grow out of Alt [Alternate] Access [to the International Space Station] in the 2001 to ’02 timeframe. The Orbital Space Plane idea that was in that same rough timeframe was about a sort of a space taxi.

He had interest in doing something, and I met with him a couple of times. We talked about it, we talked about Steidle’s nontraditional crew activity, and really discussed the concept of Other Transaction Authority agreements. They use the term Space Act Agreements. Space Act Agreements have always been in place, but funded Space Act Agreements were very different. The use of Other Transaction Authority, to do it that way was very revolutionary, I think, and very critical to setting up COTS the way it became.

The other thing was the milestone payments, the retention of IP, intellectual property, by the companies, and the fixed dollar amounts rather than a cost-plus type activity. The limited requirements from the government side, where they would just put out a statement of objectives, like, “We want you to do these things, see how close you can come,” as opposed to a traditional government program that says, “We’ll pay you and you have to do exactly these things,” where NASA retains the oversight authority. They have the power to direct the contractor to do things, to make design changes.

In this other transactions world, where it’s insight, not oversight, the government doesn’t have the ability to direct any of those changes. In the end, they don’t have to buy the capability

either, if it doesn't meet their requirements. They can terminate somewhere along the way if they're seeing, "Hey, our paths are diverging too far."

Mike and I talked about that quite a bit, and then he announced the COTS program at a Space Transportation Association breakfast in June of 2005. What came out of that then became a program office, the C3PO [Commercial Crew and Cargo Program] Office, that then put together a draft RFP [Request for Proposal] that came out in December of '05. The formulation of the program was really in the middle of the summer, with Mike Griffin saying, "Yes, I want to do something commercial. What should it be, how should it be done?"

Where he and I would differ on the setup of COTS—and ultimately, I think, the success of COTS—is that his view was, and it's enshrined in the way it came out in the program, was cargo first, people later. From my perspective, and from the perspective of a number of other people, there is no market beyond NASA for cargo to a space station. That is a confined government market, and you can't really develop commercial capabilities if they're only going to serve the government market.

The market that exists is for people. NASA has a market for people and other people have a market for people, based on the tourists that have flown on the [Russian] Soyuz, the idea of doing a Bigelow [Aerospace space habitat] module, other foreign governments that want to put people in space. There are other markets for people besides NASA, but by turning it into a program that was cargo first and people later, they ended up with a more complex solution, I think. Some of us believe that automated rendezvous and docking is harder than piloted rendezvous and docking, but also that the first market really is people, and until you get there it's just a government infrastructure.

That was one big disagreement that we had. The other disagreement, I would say, with the program was Mike had this absolute insistence that you had to develop a new launch vehicle. That was never written down, but that was very clear to everybody. He would not allow the existing Atlas and Delta vehicles to be any part of a winning solution. That, everybody thought, was because it was a direct threat, in his mind, to needing to develop the Ares I for Orion. If you had existing launch vehicles that you could put people on top, then why did you need to build Ares I? The whole program would fall apart.

Whether that is his view or not—I'm sure he would dispute that—it was very clear within C3PO, within the COTS program, and very clear within the contracting community, and very openly discussed. We all knew that, talked about that. There was quite a bit of frustration on the part of the ULA [United Launch Alliance] folks. I think they may not have been ULA yet, they may have still been Boeing and Lockheed, but there was quite a bit of frustration on their part about that. I think the subsequent COTS awards, the two selections that they made, bore that out. I think, from the administrative perspective, whether you believed it would deliver cargo or not, it was useful to get new commercial launch vehicles started to lower the cost of satellite launches later on, while putting off any threat to the Constellation activities.

In my mind, when you distort the playing field in that way, you end up with different winners than you otherwise would. If the goal is cargo to the Space Station, I think the program has worked out very successfully. When you compare metrics of capability that they got—how much did it cost, how long did it take, what was the schedule growth and cost growth—when you compare those to a traditional government program, in terms of scheduled growth and cost growth, clearly what so far SpaceX [Space Exploration Technologies Corp.] has done and hopefully Orbital will as well—what they've done has been very cost-effective and schedule-



wise not terrible. Hasn't been perfect, but it certainly was better than, I think, the Constellation Program exhibited on its own.

WRIGHT: You mentioned Alternate Access to [Space] Station—those concepts compared to what actually came out as the final COTS program, how much is similar, how much do you feel is different?

ALEXANDER: I don't have a good memory of what came out of the Alt Access program. If I recall, Alt Access was one budget year, and it was only \$10 million. They spread that money between four to six companies to do thought activities. Much the way the CE&R contracts happened in the summer of '04, which was six contracts, \$3 million each. So that was \$18 million, and then more money for some options for a couple of companies. Alt Access was sort of seed money. That \$10 million led to a lot of thinking that then came out in COTS. There's probably a direct trace to some of them.

There was a company called Constellation Services [International], CSI, that wanted to do a Russian-based system. It was basically a Progress [resupply vehicle] that would undock from the Station, go down to pick up a can full of stuff that had been launched into orbit, and then take it back. I think they started that concept with Alt Access money. But they weren't awarded anything under COTS, which said "no Russian content"—except for the engines that [Orbital's] Antares [rocket] is using—"no Russian content, no existing launch vehicles." There may have been other things that came out of Alt Access that were more directly traceable.

WRIGHT: Based on your experiences through this evolution, back to the early 2000s, do you feel those were stepping stones to get to where COTS could be?

ALEXANDER: Yes, absolutely. COTS was able to be a success because of where the commercial market, commercial companies, where industry had gotten to. Both in technological process, but also the ability to think commercially. There were many, many stepping stones along the way. Alt Access certainly was part of that. Orbital Space Plane was part of that.

In the late '90s there was something called STAS, the Space Transportation Architecture Studies. When I was at the FAA [Federal Aviation Administration], I was on the government advisory group for that. There were a whole bunch of commercial companies then—Kistler [Aerospace], Kelly Space [and Technology], Orbital, and others—that were pitching new launch systems. New ways of getting satellites into orbit, not people. That was driven by the Iridiums [Iridium Communications, Inc.], Teledesics [Teledesic, LLC], Globalstars [Globalstar, Inc.] that were starting to drive commercial launch demand.

That commercial launch demand for geostationary COMSATS [communications satellites], which has been relatively steady between 15 and 30 satellites a year—all of a sudden you had all these low-Earth orbiting satellites of Iridium and Globalstar, and then possibly Teledesic that were proposed. They spent real money on them, and they bought real launches, and they launched them on Delta IIs, Soyuzes, and Protons.

For example, Iridium spent about \$1 billion on launching their first satellites in the [Iridium satellite] constellation. Globalstar probably spent about the same amount, and Teledesic was supposed to be many many more satellites, and then the Iridium and Globalstar constellations were going to be replenished seven years out. Both of those ventures, Globalstar

and Iridium, went bankrupt and lost all that money. They're still around, they're still functioning. Iridium was sold for \$50 million after putting in \$5.5 billion. You can probably make a going business out of a \$50 million investment, but not out of \$5.5 billion.

They wanted to sell cell phone time basically, worldwide handheld satellite phones, for \$8.00 a minute. Very simple data and very choppy voice capability that only worked outside, not inside. And as you know, in the 10 years it took them to put their system up, the cell phone market went from something that you would see in a TV show or a movie to something that everybody had in their pocket by the turn of 2000. They totally missed that market. All of those companies, Kistler, Kelly Space, and the others, essentially went bankrupt because they had no customers, and therefore they had no investors. Kistler had already spent \$600 million, but in the end, they had no money and no investors.

Alt Access came about before that had all collapsed completely to say, "Okay, if people are doing all these commercial things, how can we use that capability? How could we help that capability?" It didn't work out, but by 2004 and 2005 people were starting to say, "Yes, but they still have the technology, and companies have the ability to do these things. They don't have the money. What if we gave them the money to demonstrate it?"

That \$400 million that Steidle was thinking about for a nontraditional crew activity, Orbital Space Plane, which would be a similar capability they were talking about doing for \$5 to \$10 billion. You're talking about an order of magnitude less, in dollars, saying, "If we could demonstrate something like that with that kind of money, then it would be worthwhile to do it."

At the same time, you had Scaled Composites [LLC] win the [Ansari] X Prize with SpaceShipOne in 2004. You had three flights of that SpaceShipOne, which was the first private spacecraft to put people in space. It was suborbital, but it showed that you could do it for very

limited funding. [Elbert L.] “Burt” Rutan and Scaled Composites spent \$26 to \$27 million on SpaceShipOne and the carrier aircraft, and they flew it into space three times in 2004.

That had a large impact on NASA’s thinking as well. That said, “Okay, if you can do that for \$27 million, then orbital you might be able to do for an order of magnitude more, \$300 or \$400 million.” It wouldn’t have the safety and everything that was needed to do the transfer to the Station, but let’s demonstrate that first, and then let’s go do the real activity after that. I think that had a lot of impact on the O’Keefe-Steidle part of NASA, and then Mike Griffin picked up on that later.

WRIGHT: When you were working on the Vision for Space Exploration, were the commercial efforts to support that Vision of going to the Moon, to Mars, and beyond?

ALEXANDER: I’ll give you a different paradigm. It was a stepping stone mentality, and I think the Vision document, NSPD [National Security Presidential Directive]-31 [U.S. Space Exploration Policy], actually says “stepping stone.” The Moon is a stepping stone elsewhere, and LEO was the stepping stone to get to the Moon. We’ve been in LEO with Shuttle, we’ve been in LEO now with Station, we know how to do that.

The idea was that NASA would only be doing the exploration activities. They’d finish the Station and use it to develop capabilities for exploration, but eventually they would only be doing exploration. All of low-Earth orbit activities, which were more routine, would become private sector and international activities. The private sector, the commercial activities, would definitely support exploration, but it wasn’t about the act of exploration necessarily.

If the Station was used for developing exploration capabilities, then support of the Station with people and cargo would be supporting that. But it wasn't, "Let's take the commercial sector and get people to the Moon to support exploration, or get cargo to the Moon to support exploration, or put the elements of the exploration architecture in low-Earth orbit." The CEV and other things, that's what I mean by support.

It was also specifically to drive other activities in low-Earth orbit, meaning non-government space activities. People flying in space that weren't the few select chosen by the government and paid for by the government. Other people flying. Once you have other people in space, people do lots of things, and a larger economy of people flying in space will make NASA's activities more cost effective and let them do the actual real exploration activities. That's safer.

WRIGHT: You mentioned that when the Council of Economic Advisors got involved in some of the communications, people felt that the commercial sector was ready to move into this level of operation. Can you give us an example of why the framers believed that was a true statement?

ALEXANDER: I think there's probably three things for that. Number one was the private sector was the one always building space systems for the U.S. From the Mercury, Gemini, and Apollo [Programs], it was always a contractor-built system. The government acted as the integrator, or the owner and the operator, but even with the Shuttle the operations were turned over to the private sector. There's no doubt that the industrial capability existed, and the intellectual capability existed in the private sector. It was always a question of, certainly at the price point that government did it, there was no commercial activity to be done. Nobody was going to be

building and operating a Space Shuttle to fly people in space on a completely full-cost accounting basis, because it was just too expensive.

SpaceShipOne was big, but the late-'90s space companies, those activities were also important in showing that. The Iridiums and Globalstars, even them, what they showed was that space did not have to cost what it cost the government. While the 30 years of Shuttle history was the cost per seat and per pound going up, and safety wasn't really improving, the opposite would be true if you brought the private sector in because that was true in every other sphere of the economy, historically. Productivity benefits from competition, and quality benefits from competition. Safety and cost for human spaceflight should benefit from competition as well. Those were really the big things out there.

Frankly, this is going to sound harsh—as a lot of things I say sound harsh—but everything the government had tried with NASA, the White House, elsewhere—everything that had been tried in terms of replacing the Shuttle had failed. Not necessarily because of technology, although technology was a big part of it, but the government never saw it through. National Aero-Space Plane [Rockwell X-30] in the '80s, [Lockheed] X-33, Orbital Space Plane, SLI [Space Launch Initiative]—SLI and Orbital Space Plane were about the same time as *Columbia* and then the Vision.

We had been trying to replace the Shuttle for a long time, and you couldn't have two things at the same time. You couldn't have the Shuttle and have the funding to replace it. In the development of the Vision, that's what led to the gap between the Shuttle and what would come after it, the Crew Exploration Vehicle. That was a presidential decision; that decision went all the way up to President Bush.

Sean O’Keefe made a last-minute request for additional funds so that there would be no gap, but the amount of money that he was requesting to eliminate that gap, which then was a four-year gap, 2010 to 2014, was \$27 billion. That was \$5 to \$6 billion a year over the development period, which at that time was about a 30 percent to 40 percent budget increase for NASA. It just wasn’t going to happen, ever.

The magnitude of the problem is framed by that issue. You can’t do two things at once. The Vision had to say, “End the Shuttle and then build something new.” That led to the gap, which then, consequently, led to the need for something like COTS.

WRIGHT: Rebecca, you want to switch?

HACKLER: Yes, I did jot down a couple of thoughts. First, I was wondering if you could talk a little bit more about your background. Specifically, how you first became interested and involved in commercial space and its potential to do space travel more cost-effectively than the government?

ALEXANDER: I went to the first Shuttle launch [STS-1] when I was a kid. I grew up in Florida, so I’ve been a space geek since I was 13. Fortunately, I also got to see the last Shuttle launch and the last Shuttle landing [STS-135]. I got the first launch and the last landing, which was a nice pair of bookends on the program.

When you’re inside the government—and I wasn’t inside the government for a long, long time, from ’97 to 2005, but a formative part of my career—what I saw was a program that, again, hadn’t made any improvements in safety. Being at the White House when *Columbia* happened

was—I mean, everybody that was involved with the program has their own experience with that accident.

It was really a profound experience, having to explain to people that day, in the White House situation room—like the National Security Advisor, Condoleeza Rice, who became Secretary of State, Governor [Thomas J.] Ridge, who was Homeland Security Advisor, the Science Advisor [John H. Marburger]—simple questions about the astronauts on the Station. Were they stranded there, could they get home, what do we think the cause was, what does this mean for the space program? All those things. It was a very clarifying moment in time.

One of the things that had bedeviled the program for a long time was the cost of the Shuttle, balanced by safety. There had just been wiring issues with the Shuttle, it was suffering from age, the program had tried to become more operational to lower cost. Cost was always an issue. What the *Columbia* Accident Investigation Board [CAIB] showed—they said, “You’ve got to recertify it, will cost you about \$10 billion. Or you have to retire it after a certain amount because it’s just not going to be operational.” They also said, “It’s just a flawed system the way it is.”

There was a moment in time that said, “We have to do something different.” If you don’t do something different, the next time there’s an accident it’ll reflect back on that President. The CAIB said to the President, “This is not your fault. It’s the fault of 30 years of administrations at both ends of Pennsylvania Avenue [White House and U.S. Capitol] and lack of a vision, but if you don’t fix it now it’ll be your fault ten years from now, long after you’re gone.” That was clarifying for the political environment.

From a commercial standpoint, I went to the [FAA] Office of Commercial Space Transportation in the late '90s. I went not really as a huge pro-commercial advocate, but because



I was a Russian and foreign launch systems expert. I had been to Russia a bunch in the '93 to '96 timeframe. I was there before the NASA office got there and everything, and had watched that develop. At the Office of Commercial Space Transportation, I was involved in the policy debates around launch and saw the impact of NASA's human spaceflight activities and science mission activities on that.

When I ended up at the White House, there were lots of discussions about how do we change this paradigm, what is the vision? Those discussions happened before *Columbia* happened. In fact, when *Columbia* happened we were in the final stages of putting together the U.S. Space Transportation Policy, which came out as NSPD-40 in December of '04. Flashback to January of 2003, two years earlier, we were almost done with that policy. We'd worked on it for a couple of years, and it said all the right things about commercial is good, and do commercial, and buy commercial services. There was one open issue, and we had a meeting on the Wednesday before the *Columbia* accident with the National Security Council Staff and Sean O'Keefe.

The open issue was Sean O'Keefe's insistence that the language in there prohibiting commercialization of the Shuttle be taken out. It was still a law, by Congress, that you couldn't sell off a Shuttle and commercialize it. There was a real effort by NASA and by Sean O'Keefe to commercialize a Shuttle. There had been a RAND [Research And Development Corporation] study to look at the full-cost accounting of Shuttle. In fact, from OSTP [Office of Science and Technology Policy], I was the COTR [Contracting Officer Technical Representative] of the contract that NASA had funded it through, through the Science and Technology Policy Institute, which is a federally-funded research and development center. It's operated by IDA [World Bank

International Development Association] now, but it was RAND at the time, for OSTP. There had been a real push to commercialize Shuttle.

That had been discussed pre-*Challenger* [STS-51L accident] and then it had been sort of lingering for a while, and Sean O’Keefe was making a big push. This idea of commercial had come back to the fore, and there was a lot of debate about how to do something commercial. Obviously, with the *Columbia* accident a few days later, the idea of commercializing Shuttles was over forever.

That was, ironically, the last open issue for that policy. The policy came out two years later looked, obviously, completely different. There was a palpable sense that commercial was ready, and I think we saw that even before *Columbia*. I gave you an example of SpaceShipOne before, but that commercial Shuttle effort was another big one.

HACKLER: Can you describe the FAA Office of Commercial Space Transportation’s role in some of these commercial endeavors, from your perspective when you were there?

ALEXANDER: Sure, let’s see. I have a lot of respect for the office. I think they do a good job, but I think they are not a heavyweight, if you will, in terms of the interagency discussions. They are a constant advocate for commercial. At the time Patti [Patricia] Gray Smith was the head of that office, and full disclosure, she was a good friend and remains so. Having someone like her constantly saying, “What about this, what about commercial?” was helpful. It forced everybody to really think about why or why not.

Most people would start with “No, we’re not doing that,” but it forced them to at least think about it. Some of those, in that thought process, ended up changing their minds. Certainly

*Columbia* and the process that came out of *Columbia* ended up changing people's minds. SpaceShipOne and those sorts of things changed people's minds.

When it came down to the last four months of development of a Vision for Space Exploration, from mid-August to January when it was announced, there was a series of White House meetings led by the National Security Council, called deputies meetings. The deputy secretary of each of the departments, led by the Deputy of the National Security Council, which was Steve [Stephen J.] Hadley at the time, who later became the National Security Advisor.

The Deputy Secretary of Transportation would come to those, and represented the Office of Commercial Space Transportation through that. You also had the Deputy Defense Secretary or one of his designees. The Deputy Secretary of State was Richard [L.] Armitage, who was a big advocate for finishing the Space Station and meeting our international obligations. You had members of the Council of Economic Advisors, the Office of Science and Technology Policy, White House National Economic Council, Domestic Policy Council, and all these others that normally don't play with space issues.

At that level, it had a lot of fresh thought on it because most people around the table were not the ones that had been doing it forever. When you look at NASA and you look at space from the outside, it's a much different view than those of us from the inside. Somebody would say, "Well, why is government the only one that's been putting people in space for 50 years?" If you look at the Navy he'd say, "Why is the Navy the only one that has aircraft carriers?" Well, they're pretty much the only ones who need an aircraft carrier, and if the private sector wanted to develop a huge platform to put planes on, they might go off and do that. Human spaceflight sort of begged that question because everybody wants to go to space.

The people sitting around that table grew up thinking, “I watched a man walk on the Moon, and when I get to be that age, I get to fly in space,” but nobody ever got that. There was a huge disconnect, like, why is that? “Well, it’s really complicated.” That didn’t wash. You had these fresh questions coming at it and saying, “Isn’t it time?” Usually it’s, “No, the capability doesn’t exist out there.” Now it was, “Well, wait a minute, the capability could be out there.” That was a big part of that.

HACKLER: You were also involved in the Commercial Space Transportation Advisory Committee. Can you talk about your role in that capacity?

ALEXANDER: COMSTAC [Commercial Space Transportation Advisory Committee] is an advisory committee for the FAA administrator and the Secretary of Transportation, so it’s appointed by the Secretary but really reports to the FAA administrator. It is about, let’s say, 20 people from the private sector as a FACA [Federal Advisory Committee Act] advisory committee to the FAA and to AST, the Associate Administrator for [Commercial] Space Transportation.

I’ve been on it since 2008. At one point I served as the head of the RLV, or Reusable Launch Vehicle working group for two or three years. It seemed like a long time. They’ve recently changed the working group structure, but I was there for a lot of COTS and for a lot of the commercial crew development.

In that capacity, I would say I was a strong advocate for commercial human spaceflight and for NASA to help enable that, and to set it up the right way. To do it with FAA licensing, to do it with funding that was not cost-plus type contracting but actual commercial-type funding,

contractual arrangements, and those sorts of things. I think that there was probably 90 percent agreement on COMSTAC for those sorts of things, so my position was certainly not out of sync with the rest of the members, but more to actually put our voice on record as supporting what NASA and the administration were trying to do, and then to improve that.

I was also on the NASA Advisory Council. Administrator [Charles F.] Bolden [Jr.] appointed me to the council in October of '09 I think, and I was on it for two years, until October of '11. That was when I was the head of the Commercial Spaceflight Federation. I was also a consultant for a number of companies. I left the Commercial Spaceflight Federation in June of '11, and then went full time with Blue Origin in October of '11, after I left the NASA Advisory Council.

HACKLER: Since you have worked for many years on helping develop commercial space capabilities, what do you see as the barriers to that progress? Both barriers that may have existed that the COTS program helped to break down, and those that still need to be addressed?

ALEXANDER: The biggest barrier and the biggest enabler is NASA. It is a very double-edged sword because while NASA can bring money, and almost all of the companies that are out there need the government money. I would take exception for two companies. One is Blue Origin, where I am, which is funded by Jeff [Jeffrey P.] Bezos from Amazon[.com], and the other is Virgin Galactic, which is funded by Richard [C.N.] Branson and other private investors. Maybe XCOR [Aerospace], which is doing suborbital [tourism] as well.

Almost all other companies that are trying to put people into space need the government to fund them to do that, certainly in the near term. I think a company like SpaceX would get

there eventually, but everything it's building is predicated on government investment. They put in \$100 to \$200 billion of private investment, and they've gotten \$1 billion-plus from NASA. Even the old EELV [Evolved Expendable Launch Vehicle] program was about 80 percent private funding and 20 percent government funding at the time.

The biggest enabler there is funding coming from the government, and the reason I say NASA is the biggest block as well is because what comes with that money is two things. It's requirements that the commercial sector may or may not need, such as, "You're going to be a lifeboat on the Space Station for six months. You're going to have one vehicle and it's going to have to stay on the Station for six months." Well, if I'm trying to build a space tourism vehicle that takes people up and down, or is a taxi that takes them somewhere up and down, I don't need the capability to spend six months up there, micro-meteoroid [debris protection] and all that other stuff.

That is a capability that only NASA needs and that the private sector wouldn't do. That one, in and of itself, is not a huge driver, but you add up all the capabilities that NASA wants, and its [Crew Transportation and Services] Requirements Document that they've narrowed down to only 250 requirements instead of the 2,000 requirements—granted, they've come a long way, but those 250 requirements, or whatever the number really is, have a significant impact.

You cannot build a Gemini [capsule] today that had two seats, went up and did the docking, did all the things that NASA really needs. You cannot do that because NASA's mandated that it must seat four people. A Gemini would not work. NASA, by definition, when it's bringing the money, the requirements it's bringing change what the commercial sector can do. It's probably more cost effective or easier to develop a vehicle that seats two people, like a

Gemini, than it is something that seats four people, but NASA's already said, "You need not apply."

Their requirements for suits—Boeing and the Commercial Crew Program had a very intense dialogue over the need for spacesuits. Boeing and Bigelow said, "We don't need them." NASA said, "You must have them." The requirement wasn't in there. The Aerospace Safety Advisory Panel has said things like, "That's why we need to go to a cost-plus, requirements-based contracting method, so that we know what we're buying and we can tell them what we want to do." Now you've changed the whole program and it's no longer commercial.

With NASA, those requirements drive it, and then the contracting, the oversight and insight—so far with the Commercial Crew Program, they've stuck to Space Act Agreements. They've put requirements out there, but they're not able to do that beyond this phase. They might do it a little bit beyond this phase, but you can see the Aerospace Safety Advisory Panel weigh in and say, "You must have cost-plus contracts." NASA won't be able to afford that, and they'll end up with one company instead of the two. It won't have competition and it's what I would refer to as contractor crew, not commercial crew.

In the end, that per-seat price for a contractor crew is going to be much higher than the per-seat price would be from a real commercial crew activity. If we're paying \$65 to 70 million for the Russians now—when tourists paid the Russians \$20 million—when commercial industry says, "Hey, we can do this for \$20 million a seat," and I know certain company leaders have guaranteed \$20 million a seat—that won't be the case in the end when they can say, "Well, you gave us all these requirements and you made it take so much longer because of the cost-plus nature of it. It took three years longer, cost is three times as much, we're going to have to charge \$60 million not \$20 million," or whatever the math works out to be.

Those requirements and the oversight process end up driving the cost per seat much higher and probably eliminating competition. You end up with NASA being the biggest enabler of commercial, because it puts the money in, but then it drives the requirements such that it's not useful for anybody other than the government, and it's no longer a commercial capability that gets other people into space beyond the government.

If that's the case, it does still represent a victory on the path towards commercial because it changes the paradigm of NASA-owned-and-operated vehicles, like the Shuttle and Saturn [rocket] and elsewhere, to something where they're buying, in the end, a commercial service. If that stays part of the program, they're buying a commercial service, then that means someone later, like Blue Origin or anybody else, can come along with a better mousetrap that's cheaper and safer and say, "You should be buying services from us, not them," and there's a contractual mechanism already in place to do that.

The cultural shift inside NASA will have been 75 percent complete, even if you end up with one contractor crew vehicle versus a real commercial activity. To get to fully commercial, the full paradigm shift, to get 100 percent over, you need multiple providers and real services, and NASA being one customer among many.

WRIGHT: I know we're at our time limit, but I wanted to ask you if you would—it's been about ten years since the time you started on the VSE and a lot has happened in that ten years. Can you share with us what you think, where we are in the environment today, how it's impacting the commercial sector? Especially what you just mentioned about the cultural shift, because I remember reading through the Aldridge Commission report that a cultural shift has to change within NASA to allow this to happen.



ALEXANDER: It is a very mixed environment. It has come a long way since the CAIB Report and the Aldridge Commission Report, but I would say that there is a huge cultural war going on still inside NASA. It's not clear where that will come out. I think you see that not just within NASA, but in the political leadership as well. The Obama administration came in and said, "Constellation is broken," put the Augustine Commission [Review of United States Human Spaceflight Plans Committee] in place.

Norm [Norman R.] Augustine is one of the most well-respected people in the aerospace business, and he said the program was broken. It could be fixed, but with so much more money that it didn't make sense, and that what should be done was a combination of commercial and exploration, or a different path for exploration. The so-called "Flexible Path."

That set off a huge holy war, if you will, and that fought out on the [Capitol] Hill between the administration's FY [fiscal year] '11 budget proposal and the cancellation of Constellation, and culminated with the NASA 2010 Authorization Act, which was supposed to settle the religious war but didn't. That fight just continues. You see it now with folks on the Hill still wanting to have hearings about why Constellation was cancelled. That literally came out in the last couple of months. There was supposed to be that grand compromise with the 2010 Authorization Act, but it doesn't seem like that compromise has held.

In situations like that, the rank and file within an agency doesn't know how it's going to play out and isn't committed to one or the other. Whether they agree with one or the other, they need strong leadership to go in one direction. That was one thing that Mike Griffin was very good at, saying, "We're going in this direction, and you're either with me or you're against me,"

and everybody moved in that direction. That doesn't exist now, within the Agency or within the political structure.

From the administration's standpoint, I think they feel like they came in, they tried to do the right thing, even though it would be politically unpopular—just like the Bush administration with the Vision was just trying to do the right thing and they didn't think it was going to be politically popular. This administration now basically doesn't want anything else to do with space. Like, "Don't mention another problem with NASA, because it's not an easy solution." There just isn't political consensus, and I think that's holding the Agency back.

WRIGHT: Anything else you would like to add, or anything else you thought of?

ALEXANDER: I didn't mention about the Commercial Spaceflight Federation. We started as the Personal Spaceflight Federation in the 2005 to 2006 timeframe. It was really companies like Virgin Galactic and the X Prize Foundation and Scaled Composites, XCOR, Armadillo [Aerospace], folks like that that wanted to do human spaceflight, but it was really more suborbital focused. Then SpaceX was on board with an orbital system. It was the Personal Spaceflight Federation because it was about people getting into space. Like you have a personal computer, it's personal spaceflight.

We changed the name in 2008 to Commercial because that really had become the theme around which all of our activities—they're still about human spaceflight, but the word "spaceflight" to us in the community means people. You don't talk about spaceflight from a satellite. You talk about a spacecraft with a satellite, but when you say "spaceflight" to us, it

means humans. Commercial meant really private spaceflight, non-governmental spaceflight, so commercial was really the word.

That was the 2008 timeframe, when this whole debate over COTS [Capability] D [commercial crew option] and what became Commercial Crew [Program] was just starting. I didn't lose faith in the COTS program, but I thought it had sort of cut the baby in half by only doing cargo and not doing people. The Commercial Spaceflight Federation—which I did part-time, it was a 15 to 20 percent job for me and I worked X Prize during that time, I consulted a lot as well—for me, it was always about getting people in space.

COTS D, I remember pushing Mike Griffin to try and do commercial crew in the 2008 timeframe as a way of basically saying, “It's going to happen anyway, but if you want it to be your legacy, you should fund it while you're still here.” But he was convinced he was going to be here anyway, and he thought it was such a threat to Constellation that he couldn't do it. I think that that is a real shame because he did start the COTS program and put real money behind it. Commercial is his legacy, but commercial crew is definitely not his legacy because he fought it tooth and nail.

The Obama administration, in the transition, when those folks came in they picked up that idea and ran with it. It was much more of a Republican [political party], free trade, free market idea, and you wouldn't expect it coming from a Democratic administration, but these guys were on board.

There were a couple of people that were critical of that. One was a guy named Jim [James] Kohlenberger who became the Chief of Staff at OSTP in the Obama administration. The other was Lori [B.] Garver, who was the space person for the transition team and had worked the campaign. What's important about them is that both of them had prior experience at the high

levels of the space program. Lori as a policy person in the latter [President William J.] Clinton years, over here at NASA, and Jim Kohlenberger had been Vice President [Albert A.] Gore's science guy for all eight years in the Clinton-Gore administration.

Vice President Gore had the space portfolio, so he did all the work with negotiating with the Russians, was very involved in that. Saving the Space Station, reorienting NASA towards completing that, all the budget overruns that went through, the Hubble [Space Telescope] science missions and that sort of thing. They both came in with preconceived notions about what was not working with NASA, and then were presented with a Constellation Program that was so far over budget and was never going to get there. They said something had to be done, and I think, to their credit, they put it to a commission like the Augustine Commission, where they didn't stack the deck.

By putting someone like Norm Augustine at the top, I would have thought you were guaranteeing it to never say anything good about commercial, because he was not known for that. I think the chips fell where they did because of the magnitude of the problem. I think the legacy of commercial crew comes from them. The legacy of COTS comes from Mike Griffin, but crew wouldn't have happened without them. From a Commercial Spaceflight Federation standpoint, we worked very hard to support the Commercial Crew [Development] Programs, CCDev 1 and CCDev 2, and the whole Commercial Crew Program. Lobbying up on the Hill as well. Working with the Hill and working with the folks at NASA against very significant companies that were working as hard or harder to kill it. The fact that the program exists at all is kind of a miracle.

WRIGHT: A story for another time. I'll let you go, but we sure appreciate it.

HACKLER: Thank you very much.

ALEXANDER: Thanks.

WRIGHT: We learned a lot, thank you.

[End of interview]