

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

JAMES A. M. MUNCY
INTERVIEWED BY REBECCA WRIGHT
ALEXANDRIA, VIRGINIA – 21 JUNE 2013

[This oral history with James A. M. Muncy was conducted via telephone from Houston, Texas to Alexandria, Virginia.]

WRIGHT: Today is June 21, 2013. This telephone interview for the NASA Commercial Crew & Cargo Program Office History Project is being conducted with Jim Muncy, who is in Alexandria, Virginia, and is a longtime advocate for commercial space. The interviewer is Rebecca Wright, who is in Houston, Texas at the Johnson Space Center History Office.

We thank you again for your time and the information you're about to provide. We'd like for you to share with us briefly your background, and the role that you have had in the advancement of commercial space ventures.

MUNCY: I have been working in space policy and politics for over 32 years. I've had jobs on Capitol Hill and in the [President Ronald W.] Reagan administration at the White House [Office of Science and Technology Policy]. I've consulted in industry and done some consulting for government agencies. I think of particular interest to the topic of the COTS [Commercial Orbital Transportation Services] Program, from 1995 through 2000 I was a professional staff member of the House [of Representatives] Science Committee, working on commercial space issues, particularly commercialization and privatization of activities relating to the International Space Station [ISS].

After leaving the Hill, I consulted for a company called Constellation Services International [CSI], which was engaged in trying to develop a number of commercial in-space services, the primary of which was commercial cargo delivery to the International Space Station. I was a vice president at CSI, working anywhere between half and nearly full time for about six or seven years. I think that's the key background point that informs our discussion today.

In addition to that, since I left government in 2000 I've also done a lot of consulting for the commercial space transportation industry, including large and small companies in both orbital and suborbital markets. I've worked to help write and enact legislation that provides for appropriate regulation of commercial space transportation, as well as appropriations and authorizations that fund and give guidance to the government in buying commercial space transportation services. So I work here in Washington, DC, to try to create the right framework of funding and regulations and policy to enable commercial space companies to be able to deliver goods and services for private and public customers. That's a summary of what I do.

WRIGHT: If we can, let's break it down and go back. Can you give some specifics of the work that you've done that helped formulate some of the legislation that helped move toward where we are now?

MUNCY: Let me give you an example that directly relates to COTS. In the late 1990s, I worked for Congressman Dana [T.] Rohrabacher from California, who was Chairman of the House Subcommittee on Space and Aeronautics in the late 1990s, and also with full Committee [on Science, Space, and Technology] Chairman [Robert S.] "Bob" Walker and full Committee Chairman [F. James] "Jim" Sensenbrenner, I wrote provisions that went into NASA

authorization or commercial space legislation that was enacted—signed by President [William J. “Bill”] Clinton—which directed NASA to start creating more commercial opportunities at the Space Station, and even begin to privatize some of the functions of operating the Space Station, including transportation to and from the Space Station.

This was a time in which the [Space Shuttle] *Challenger* [STS 51-L] accident was a decade behind us, and the Space Shuttle was operating on a regular basis. This was long before the *Columbia* [STS-107] tragedy. NASA was making investments in potential replacements to the Shuttle, but the Shuttle was clearly the workhorse that was servicing and supplying and, of course, at the end of the '90s, starting to assemble the International Space Station.

What I was arguing for and my bosses were arguing for was starting to figure out how to have the private sector play a role of doing the more pedestrian work, of delivering underwear and groceries and stuff like that to the Space Station. That we don't need to have the Space Shuttle do all of that; some of it could be privatized. In a world where you privatize those deliveries, you've created an additional market for the commercial launch industry, which can then increase their own private investments and their capabilities. You start to see the sort of innovation and lowering of prices, and hopefully generation of new markets and new opportunities, that would allow for a renaissance of commercial space activity.

I think what we've begun to see now, today, with SpaceX's [Space Exploration Technologies Corp.] success in delivering payloads to orbit for NASA, in the form of Dragon [capsule] delivering cargo to ISS, and the Falcon 9 [rocket] is competing aggressively in the commercial satellite launch market. It's winning market share back from foreign countries, and lowering the cost of access to space, and will, in fact, begin to impact the market, the prices, and

the costs of doing things in space, doing things at the Space Station. It will take time, but hopefully we will see a growing amount of commercial activity up there.

That was exactly the result we had hoped for when we were writing provisions of the law back in the late '90s. Saying that if we can start to privatize this, if we can start to move towards commercially-owned-and-operated launch vehicles doing more of the pedestrian, workaday space transportation stuff, while NASA focuses on its more challenging missions of going, perhaps, beyond Earth orbit—we didn't talk about that specifically at the time, but the idea was that we wanted NASA focused on technology and on science and on exploration. Certainly now, everyone talks about focusing NASA on exploration beyond Earth orbit.

The idea was, let's see if we can't apply normal capitalistic principles and normal market forces to low-Earth orbit space transportation. That's what we pushed for, and lo and behold, 15 years later, we're starting to see it.

WRIGHT: How has the political environment changed to allow these doors to open? Or has it?

MUNCY: I would actually argue that it's changed, but it hasn't necessarily changed in a good way. Back then, Congress was fairly enthusiastic about the idea of turning more responsibilities over to the private sector. Maybe because the Shuttle was there and everyone was happy because the Shuttle was operating—so while we were starting to push these ideas, there wasn't a tremendous resistance to that in Congress. Of course, there was obviously some resistance inside NASA. It took a long time for NASA to really get behind the idea of turning over regular cargo resupply of the Space Station to the private sector.

[The White House] OMB [Office of Management and Budget] created a program in 2000 called Alternate Access to [Space] Station to begin buying services, but NASA didn't ask for it, and it took a lot of work to force NASA to even do studies of what was possible. Frankly, it actually took a new NASA Administrator, Mike [Michael D.] Griffin coming in and saying, "We're not going to just do studies. We're actually going to fund demonstration flights and start buying services." It took a combination of continuing pressure from Congress and new leadership in the executive branch to actually make something happen.

But, more recently, there have been political issues associated with carrying that to its next logical step, which is for the private sector to start transporting humans to and from low-Earth orbit for NASA. There's been a strong resistance to this idea for the past few years, largely because the Shuttle was retiring and there was doubt and confusion about what NASA would be doing in terms of human exploration beyond Earth orbit. Today, in 2013 there's still controversy about the idea of commercial crew, although that's starting to change because of the success of commercial cargo.

SpaceX has successfully delivered cargo to Station three times now, and now Orbital [Sciences Corporation] has succeeded in launching their Antares rocket once. It's ironic—you can have changing tides or trends of opinion in different parts of the government, different players in the process. Congress has become more resistant to change, while NASA has become more supportive. Of course, OMB has remained very strongly supportive throughout because they know it will save money.

Some of the same people in Congress have stayed consistent. Rohrabacher is still there, and is now Vice Chairman of the full Committee [on Science, Space, and Technology] and still champions this. Others, who are more concerned about the loss of Shuttle-related jobs or loss of

funding for other human spaceflight programs are saying, “We shouldn’t be doing this commercial thing. We should just be funding the government program.” This even comes from conservative Republicans, who you would think would be more supportive of privatization.

It’s strange, and this is not unique to space that you’ll have ebbs and flows of policy and attitudes in the government and in Washington. But in the aggregate, I would say the progress has been steadily positive. Sometimes it’s two steps forward and one step back, but it’s plugged away for 15 years now and we’re really starting to see results.

WRIGHT: Tell me what you believe the results of the implementation and the success of the COTS program at NASA has shown Congress and has shown the private companies. What is the reaction from the outside of the COTS program and what its benefit has been?

MUNCY: Obviously, different audiences have different views of what the results are and what the benefits are. What I think COTS has shown, fairly conclusively—although SpaceX only has a few flights under their belt so far—is that if you form a partnership between NASA’s in-house experts and NASA acting as a customer, you can free up the private sector team to innovate more, to be more creative, to find ways of doing things more cheaply than are done by traditional cost-plus, government-managing-the-contractor arrangements. There are times in which those more traditional approaches are appropriate, but I think this has been a strong demonstration that a partnership model, a more commercial-style approach can really work.

You generally don’t see in the private sector, even a company like General Motors [Company, Inc. (GM)], go to a supplier of an automobile part and tell them exactly how they should do their job of making the part. They will give them very strong and clear standards for

what the part has to be able to do, what it has to look like, what its strength or weight or other characteristics have to be, but they won't tell the part maker how to make the part. Unless nobody knows how to make the part.

Now, if nobody knows how to make the part GM may tell some prospective part makers, "Here's what we want and here's some ideas for how to do it. Let's see you guys bid against each other to see who can do it best and do it for a reasonable price." But there isn't the sort of presumption like in the government, where the government thinks it's their job to tell the private company not just what to do, but how to do it. And not just once—up front—but continuously throughout the life of the program.

Hopefully with the COTS program there's been enough of a demonstration—as well as by the way some other major programs like the EELV [Evolved Expendable Launch Vehicle] program in the Air Force from 12 or 14 years ago—that the private sector really can do quite a lot in the space field when given the opportunity. Even in human spaceflight, even in systems that are going to touch the Space Station and safely rendezvous with the Space Station, and therefore need to operate reliably enough so that you don't threaten the lives of the people on the Space Station. Then of course later, vehicles that can actually carry astronauts safely to and from the Space Station. Hopefully this has shown that the private sector really can produce excellent results in a different way at much less cost.

If I were to indulge my cynical side, I would say that not only do commercial partnerships do a better job, or a more efficient job, or a more affordable job than the traditional approach, I could argue that the traditional approach really hasn't worked at all inside NASA on major human spaceflight programs for the last 10 or 20 years. I mean, there's been lots of attempts at NASA to do big, new human spaceflight projects, and probably the singular success,

if I can call it that, has been that after about seven or eight years a variant of Orion [Multi-Purpose Crew Vehicle] is going to be flight-tested next year.

And it's going to be flight tested on a commercial launch vehicle, the Delta IV Heavy, that was developed commercially by The Boeing [Company] and is now operated by the United Launch Alliance. It was developed on a fixed-price basis with an Other Transaction Authority partnership between the Air Force and Boeing, for a total federal government investment upfront of \$500 billion, where Boeing put in \$3 billion to develop the launch vehicle. Delta IV Heavies are very expensive to buy, but the fact is that it was developed fairly cheaply and it did produce results, and they've all succeeded in their mission goals. They regularly deliver multi-billion-dollar satellites to orbit. And it's going to deliver Orion into a high orbit to test out Orion's heat shield.

I guess my point is that hopefully this message that commercial partnerships work for human spaceflight is starting to get across. There are a lot of people that are resistant to it because the rice bowls that people want to keep full don't necessarily get full that way. There's always pain in transition, there's always pain in change, there's always pain in adjustment to a new paradigm, and this is one of those cases.

WRIGHT: Do you believe that there will be an acceleration of involvement with more public-private partnerships for space transportation, let's say in the next 15 years?

MUNCY: I do believe that. I'm going to be optimistic. I'm not going to be optimistic in saying that the progress we've made over the last 15 years will accelerate because it's a good thing to accelerate it and it's a good thing to have more of it. That is all true, and I would like that to

happen. I would like it to accelerate so that we have a lot more commercial space activity, and a lot more leveraging of public dollars with private dollars. A lot more private investment, a lot more innovation, a lot more competition, a lot more lowering of prices and increasing of capability. More innovation, and more dynamism in the marketplace.

Those are all good things that I believe in that we need to have, but I'm going to be optimistic in a different way, and say that the United States government will still have a human spaceflight program in 15 years. We will not have an active human spaceflight program in the government in 15 years if it does not embrace this new model, because the old model is simply withering and dying. There's simply not enough money in the federal treasury at a high enough priority to do everything that NASA and other people would like NASA to do, in the same ways that NASA has always done things, and actually produce much results.

I'm going to be optimistic and say that NASA and the human spaceflight community will choose to adapt and to pursue this new way of doing things more frequently, and therefore will succeed, and therefore will grow again, and therefore will actually be flying astronauts into space. As opposed to failing to adapt and, like the dinosaurs, dying off.

WRIGHT: What about other markets? I know that part of the COTS program was to help stimulate new markets for these companies that were their partners. Do you see that also happening?

MUNCY: Well, the COTS program had multiple purposes. There were the three formal goals of the program that were in the procurements that awarded the Space Act Agreements, but there were really a bunch of expectations and demands on the program from various constituencies

and various policymakers. The number one demand, that some people thought was the priority, was let's fly something as soon as possible that can deliver cargo to the Space Station.

The company I worked for, Constellation Services International, took an innovative but very fairly low-risk approach of using Russian technology to satisfy the last mile, i.e., the safe transport of cargo from low-Earth orbit to the Space Station. It would use existing proven launch vehicles, in particular the Atlas V, for the delivery of a cargo container to low-Earth orbit. The goal there was to show that it was possible to deliver cargo to the Space Station in as little as two years from the award of a demonstration Space Act Agreement.

NASA decided that it had these broader goals for the COTS program, including the stimulation of new markets. The primary way they were going to do that was to stimulate the development of new launch vehicles that would lower the cost of access to space, and therefore both generate competitive orders for satellite launches in the U.S. instead of in Europe or Russia or the Ukraine, but also generate new applications that would make sense doing in space if you lowered the cost of access. NASA chose to go for that brass ring.

It took companies a total of six years from contract award to finally deliver cargo to the Space Station, but there's no question that the transformative effect of the Falcon 9 launch vehicle, having already won significant international geosynchronous communication satellite launch orders—SpaceX is definitely changing the market. It's discontinuous and it's disruptive, and it's a really great thing for the economy and it's a really great thing for the space program and for NASA.

I think that the creation of new markets is already starting to happen in the case of what SpaceX is doing. I'm hoping that as Orbital continues, and perhaps as the Commercial Crew Program enables another company to enter the marketplace with a different spacecraft and

probably an existing launch vehicle, the Atlas V, you'll have multiple ways of getting people or goods to the Space Station. You'll see competition and you'll really start to see a flowering of new applications at the Space Station.

Some of those could be traditional, like biological and physical research, commercial processes, crystal growth, medicine, and research into combustion and physical processes. Other things may be assembling satellites at the Space Station—launching components, assembling them at the Space Station, and launching CubeSats, or small satellites, out the side of the Space Station. One company has already demonstrated the launch of CubeSats for the Space Station, called NanoRacks.

Exactly what it's going to look like—that's the great thing about the private marketplace, that people are incentivised to go out, come up with cool ideas, keep them secret, raise money, develop it, and then sort of spring it on the world. We'll see over the next five years whether this increase in access to the Space Station starts making the Space Station not only a scientific and research success, which hopefully it will be, but also a commercial success. It will be a hub of commercial activity. That's why Congress funded it for all these years, so it would be really good for NASA's credibility if it actually happens.

WRIGHT: What's been the most challenging aspect of your role as an advocate over these last 15 years?

MUNCY: I guess I have two thoughts about that. One is that when you are proposing new ways of doing things that dramatically change current circumstances, that change the environment within which people do their jobs, you can get some fairly spirited resistance to those changes.

One of the difficult things for me has been the fact that it can get very personal. It can get fairly malicious, and even malevolent, in terms of how aggressively people will fight to stop a new idea simply because it threatens the current way of doing things.

I'm sure there were companies that raised horses and made saddles and made buggies and other tools of the trade associated with horse-based transportation that really hated Henry Ford [founder of the Ford Motor Company], and really hated the other early entrepreneurs of the automobile industry. But I'm not sure they engaged in the same level of personal attack, and even government efforts to try to stop things that I've witnessed over the last 30 years, and certainly over the last 15 years. It's important to keep reminding yourself that you're not just doing this for yourself.

There are less confrontational ways to make a living than trying to open the space frontier to human civilization, because apparently there are people who really don't want that to happen. These are people who are actually in charge of space organizations and space agencies and space companies. They don't want the disruptive level of change that goes with opening up the space economy to all comers. That's been hard to reconcile with these people's insistence that they are the ones who are "pro space."

Personally, of course the fact that CSI didn't succeed in its primary goals as a business was hard for me. It was hard for me that NASA chose to take an effort that was primarily focused on simply showing that the private sector could take cargo to and remove trash from the International Space Station, and turned it into a launch vehicle development program. I understand why they did it, but I think it delayed the result of proving that you could deliver cargo. That early demonstration that the private sector could do what only governments had

done up until then—it made it harder, for example, for companies to convince people that they could deliver people to the Space Station because we hadn’t succeeded at delivering cargo yet.

When President [Barack] Obama proposed his budget in early 2010 and proposed to spend upwards of \$5 to \$6 billion over several years to enable the develop of commercial crew capabilities, people were up in arms. Partly because he was also canceling the current human spaceflight project, Constellation, but also because, “Why would you put so much money into something when they haven’t even done what they were supposed to do starting back in the 2000s?”

It might have been a good idea for NASA to have done something lower risk first, and then done something else more aggressive and then done something else even more advanced, and brought in new launch vehicles and new spacecraft as new generations of innovation. I can’t tell you that my thinking about that isn’t partly biased by the fact that I was part of a company that was pursuing a simpler, lower-risk strategy. It’s taken a long time, but NASA’s investments have more than paid off by showing that private companies can develop new launch vehicles. They are affordable and they do seem to be reliable, and they will dramatically bring launch revenue back to the United States. That’s a great result for the country.

WRIGHT: Do you think at some point in these last years there was a tipping point that gave you hope that where we are now is where you wanted to be? When there was a ray of hope, and you didn’t want to stop working towards this venture?

MUNCY: Nine years ago today, SpaceShipOne flew to space for the first time. Literally, nine years ago today. [Elbert L.] “Burt” Rutan’s SpaceShipOne was carried to altitude, to roughly

50,000 feet, by the White Knight One aircraft. It was dropped, its hybrid rocket motor was ignited, and it burned to full duration and the spaceship flew to over 60 miles high.

That was a feat equivalent to what Alan [B.] Shepard did in May of 1961, when our first Mercury flight took place on the Redstone rocket. That was a suborbital flight. [Freedom 7] was actually a little longer, a little faster, a little higher, but the point is, it was a suborbital flight of a human being. The government spent a lot of money developing that Mercury capability, and Mercury went on to take John [H.] Glenn to orbit.

Burt Rutan spent, in 2004 dollars, about \$21 to 24 million to develop his capability. That capability demonstrated a potential way of doing this that could make money for Richard [C.N.] Branson, and therefore ignited a new industry. The industry already existed, but it really heralded the industry because it showed people, “Oh, the private sector could do things we didn’t think they could do.”

There have been a lot of moments like that. That’s one I picked out because today is June the 21st, but there have been a lot of moments like that where it’s not just a ray of hope, it’s a thunderclap of change. You have to revel in those moments. All I had to do with that flight was that I was arguing in Washington that they should be allowed to do it, and that we needed to set up the right regulatory regime for companies when they actually got into business. But when that happened, I took tremendous comfort that it was happening.

The company I worked for, which is a competitor to Virgin Galactic [LLC], XCOR Aerospace, is building their SpaceShipTwo-class vehicle right now, to carry people on a regular basis to 65 or 70 miles, and they will be flying it early next year. Then I will feel even better because then it won’t be a fluke. It’ll be more than one company doing it, it’ll be a competitive

industry. And of course, I'll have the benefit of my company that I work in actually having the accomplishment itself.

When new things are being birthed, you have to take some pride in the community's advances, and use that to spur yourself on your own personal challenges to move forward. I'm sure this is true in traditional aerospace, where a company that makes a Mars rover of course is proud when their Mars rover lands on Mars successfully, but the other company that wanted to build the Mars rover still is happy that America's on Mars.

WRIGHT: I'm going to go back to some notes that I took when you first started talking about your involvement overall. You mentioned working to help draft legislation, and you also just mentioned helping set up the regulatory regime for these commercial ventures. Could you share some details about how that came to be, and working with the FAA [Federal Aviation Administration] to do that?

MUNCY: Sure. In 2003, I had been a consultant for about three years, and I was approached by friends at XCOR and by Dennis [A.] Tito, who was the first space tourist to the ISS—who I had worked for after his flight back in 2001—and by another company I'd done some work for, Space Adventures [Ltd.]. They said, "We want to try to reduce the regulatory risk that a new space vehicle would face in entering the marketplace."

Let me take a minute to explain what that means. In early 2003, no one knew that SpaceShipOne existed. Well, obviously people at Scaled Composites knew, and a few other people knew, but it was not publicly known that this was being worked on. There was the Ansari X Prize going on, and there were companies out there talking about pursuing it, but there wasn't

any clearly-leading candidate. Companies were trying to raise money, and people weren't clear whether or not it was going to happen. But there was also a risk facing companies that were going to be operating these vehicles after the X Prize was won, particularly because some of these vehicles had wings and some of these vehicles took off and landed horizontally, they could be regulated as airplanes rather than as spaceships.

In 1984, Congress passed the original Commercial Space Launch Act, which authorized and directed the Secretary of Transportation to create a licensing regime for commercial space launches in this country, which would put all of the safety focus on protecting people who were not involved in the activity itself. If you're a rocket engineer working on the rocket right there at the launch pad, it's not the Secretary of Transportation's job to keep you from blowing yourself up with your rocket. It's the Secretary of Transportation's job to make sure that if the rocket blows up it doesn't hurt anyone who isn't part of the process. If a rocket takes off and goes off course, the government doesn't want it to land on someone's house or someone's school or someone's office building. They weren't involved, they weren't part of it, they didn't choose to participate in a risky activity, so they should be protected.

Now, flash forward two decades to 2003, and you're now talking about vehicles that are going to fly and carry people in them. These will not be people who have an expectation of safety like when they get on Southwest Airlines [Company]. These are people who understand that they are doing something risky, but they would like to have the experience of flying through space.

Because some of these vehicles have wings and some of them take off and land horizontally, and they kind of look like airplanes, there's the question, "Well, could these things be regulated like airplanes?" Unlike the launch regime, which is to protect uninvolved persons

but let people take risks flying rockets or people into space, aviation is a common carrier industry. By that I mean it is an industry that holds itself out to the public and offers a transportation service to everyone. Customers are not expected to be experts in how the service is carried out.

When you buy a cell phone, you're not expected to know how the cell towers operate or the switching system operates, so the Federal Communications Commission regulates Verizon [Wireless] and AT&T [Inc.] and other companies and makes sure that how they sell to you is appropriate. In the aviation industry, the FAA strongly regulates how United Airlines operates its [Boeing] 737s [aircraft], how Southwest Airlines operates its 737s, and how Delta [Air Lines, Inc.] operates its 737s and Airbus [SA aircraft]. Exactly how they have to keep them maintained, exactly how many staff they have to have aboard the plane, and exactly the processes they have to go through in instructing everyone who boards the plane on how to be safe during the flight, etc.

That regulatory regime for aviation was built up over 100 years of powered flight! The Wright brothers [Orville and Wilbur Wright] flew in 1903. Here we were in 2003, and we had a huge history, a century of aviation in this country. We'd had regulation of airplane safety since the mid-1920s, and the FAA itself has existed since 1958. The question was, if it's a launch vehicle, then it will be lightly regulated, primarily to protect uninvolved persons. But if it's an airplane, it's going to face the same burden of regulation as United Airlines and Boeing. We were very clear which side of that dividing line we wanted to be on. We wanted to be on the space side, not on the airplane side, but that outcome was not clear in 2003.

What we went about doing was asking the Congress to enact legislation which would define in the law what a suborbital rocket was—because a suborbital rocket had never been

defined in law or in regulation—and to create an affirmative, positive regime that says that people could fly at their own risk. The government isn't certifying the launch vehicles to be safe to fly on. Initially we wanted the bill to be silent on the issue of the safety of the spaceflight participants, that is, the people who fly on these vehicles and pay to fly.

What we ended up with was a limitation on how the FAA could regulate for safety, and any regulating for safety was entirely based on a need to promote the health of the industry, so there was no separate mandate to regulate for passenger safety on these space vehicles. And it took a year and two-thirds, from April or May of 2003 to the very last moment of that Congress to create, in law, an affirmative regime to promote and allow commercial human spaceflight. The Commercial Space Launch Amendments Act of 2004 was actually the very last piece of business that the Senate passed. That sets you up with a picture of what happened.

WRIGHT: Quite an accomplishment, yes. Thank you for that background because it gives a little more context to just how long it takes to get some things done, so we appreciate that. What about your thoughts about the contributions you had setting up the actual parameters of the public-private partnerships? Did you give some guidance on what should be involved?

MUNCY: Sure. I mean, as a congressional staff member back in the '90s, long before CSI was set up, I was advocating for privatization of transportation to and from the Space Station. I had meetings with people at OMB and meetings with people at NASA, and we secured legislation to try to press them to do that. I think as a result of, in part, my encouragement, and encouragement coming from the Hill from the majority Republican side, people who were working in OMB at the time said, "Let's go try to create a program by which NASA will actually start to buy

services.” That idea did not come from NASA. It is very hard to get NASA or any large institution to do something it didn’t think of doing. The Alternate Access to Station program, which was what OMB created in the budget that came out in February of 2000, was precisely the kind of market opportunity that I had wanted as a legislator.

Once I left Congress and joined CSI, it was precisely the sort of market opportunity that we were interested in because it would help stimulate on-orbit services, and we could then also provide services for the private sector as well. We were interested in satellite servicing, using a human spaceflight vehicle based at the ISS, basically a derivative of the [Russian Federal Space Agency] Soyuz [spacecraft], that would serve as a space tug that could go service satellites that were being launched into orbits near the ISS.

When I say “near,” I don’t mean physically near the ISS itself, I mean in inclinations and altitudes that were within reach, in terms of orbital mechanics, from the ISS. The ISS is at 51.6 degrees. Because a lot of communication satellite constellations were planned to be launched to 53 degrees or 55 degrees, back in 2000, on Russian launch vehicles from Kazakhstan, it turned out that ISS was a good orbit to be at with the human spaceflight vehicle to do satellite servicing.

Our idea was kind of interesting. The idea was to say, “NASA has already demonstrated that what works in terms of satellite servicing is humans.” The problem is it’s really expensive to launch the Shuttle to rescue a satellite. What if you could use people that are already in space and just basically rent them for a period of time to do satellite servicing? That’s where CSI came from. That’s why it was called Constellation Services International, because the idea was to service satellite constellations from ISS.

Now, the simpler version of what we were talking about was to simply use an existing spacecraft, the [Russian Federal Space Agency] Progress, as a tug, to simply bring cargo

containers to and from ISS itself. That way you could launch a cargo container on any launch vehicle, and then the Progress would come get the cargo container and take it back to ISS, just as a tugboat brings a large container ship into port. The large container ship is not designed or built to negotiate its way into a harbor and all the way to the dock where it gets unloaded. They have tugboats for that. That last mile is done differently than the efficiency of moving all those containers across the ocean, and that was exactly what we were proposing to do at ISS.

It was a very cool idea, and I, having helped—not the parameters, and didn't set up the program when I was in Congress, but arguing for the idea and working with OMB in 2000, 2001, 2002. We tried to encourage NASA to actually do it. They did some of it, they did some studies, but they weren't really going to actually fund demonstrations or flights. It wasn't until Mike Griffin came in, who testified to the Congress, in part with my instigation, "Why can't we do this? Why can't we do Alternate Access? Why can't we take that piece away from the Shuttle, and therefore make it easier to do whatever the Shuttle has left to do? Let's go ahead and take the low-hanging fruit."

When Mike came in he said, "Listen, we're not going to do it this way that NASA was thinking about doing it." It was taking forever for them to get their act together. Griffin said, "We're going to go do this COTS program." I was working for other companies at the time as well, and I was encouraging them to use Space Act Agreements for demonstrating crew capabilities, and they wrapped it all up into one program. Which turned out to not be great for CSI, but it was good for other companies. They ended up using Space Act Agreements, and proving that Space Act Agreements are a great way to manage innovative programs, because when Rocketplane Kistler failed to do what it was promised to do, NASA cut them off. They used the remaining money and gave an award to Orbital.

There were many aspects of COTS. It was competitive, you used Space Act Agreements, it was pay for milestones instead of paying for cost and for labor hours, which is what traditional contracts are. All of that has worked, all of that has demonstrated success. I don't like, as I said before, everything about how NASA structured the program or all of NASA's selections, but we are where we are and the world moves on. There are still people who don't view COTS as a great success, but I think it was, and I think it validated a whole bunch of different ideas.

I don't relate to it as my victory or my accomplishment, but I'm glad to have been part of pushing this idea. I have on my credenza here a SpaceX COTS patch that was flown with Dragon on that first flight to the Space Station [C2+ demonstration mission]. The reason I have something like that instead of a vanity wall with autographed pictures of politicians is because that was the first time a private company delivered something to a Space Station with a privately-developed vehicle. That's what COTS made possible. It's a big deal.

We all watched *2001 [A Space Odyssey]*, and watched a Pan American [World Airways] shuttle deliver Heywood [R.] Floyd to this big space station in the sky. We just automatically assumed that of course the private sector would handle regular [space] transportation, just like it did on the Earth. Somehow, NASA didn't evolve that way and space didn't evolve that way, and it took active effort—a lot of active effort—over decades, by a lot of people, to force the system to actually embrace such a fairly basic concept! Yes, the government doesn't have to operate its own delivery van. It sounds silly when you say that, but that's what we literally had to fight for decades to make happen.

WRIGHT: Thank you. You've covered so much. Are there any other thoughts that you'd like to add before we close? Or anything else that you'd like to mention? Maybe even possibly what you feel are the next steps forward?

MUNCY: I think commercial crew is the next step. There is an argument that some people make, and I understand the argument, that we should have the commercial sector handle more of the responsibilities in low-Earth orbit while NASA focuses beyond Earth orbit. I definitely agree that NASA should focus on activities beyond Earth orbit. I still think NASA has a role in low-Earth orbit at the Space Station, but I also think that the private sector can make a huge contribution beyond Earth orbit. In other words, I don't want to see some sort of celestial zoning where low-Earth orbit is a business district, but beyond Earth orbit is a strictly government district.

The fact is, we will never have enough money in the NASA budget to replicate the Apollo model, ever. People who want to replicate the Apollo model keep forgetting that Apollo ended. It collapsed! It ran out of steam in four years. We abandoned the Moon. People who today believe that we have to have a heavy-lift launch vehicle using the capabilities that NASA has had in its hand—i.e., Space Shuttle main engines and Space Shuttle solid rocket boosters and big tanks and cores made at [NASA] Michoud [Assembly Facility, New Orleans, Louisiana], where the external tank was made because that's what we did for Apollo—are arguing for form over substance.

They are trying to replicate the appearance of Apollo, which if we had all the money in the world and Congress supported NASA sufficiently to let them do that, they could do. For a little while. But we don't have that money, Congress isn't providing that much support, and

therefore it's not going to work. It's going to be like Constellation, except that we're starting from an even lower base than 2005 and we're facing the certainty of more cuts, instead of Constellation's false hope of huge increases.

Doing "Constellation Lite" is going to fail, and we have to adopt an approach for beyond Earth orbit that shares more of the responsibility with the private sector, that shares more of the responsibility with the private companies that are launching things for the government—for other parts of the government, like the Defense Department, and for NASA's science programs. This is heresy, but NASA isn't going to be able to have its own launch vehicle that is totally its launch vehicle that no one else has, that NASA is comfortable with because NASA designed it from scratch and NASA totally controls it.

One of my concerns for the Johnson Space Center is, what happens if SLS [Space Launch System] doesn't fly? What are the lessons that we should be learning from COTS toward developing launch capabilities that we need to send humans to the Moon and eventually to asteroids, and the moons and surface of Mars?

What it turns out we need isn't so much a big launch vehicle as a really efficient mass-produced upper stage that could serve in multiple roles, like a tanker or a depot. Maybe that could be done as a COTS-style partnership, and then you could buy first stages from ULA [United Launch Alliance] or SpaceX. Whoever can launch that efficient upper stage that a government-private partnership provides, and then the government adds special things onto it to turn it into a planetary lander or turn it into a propellant depot, or turn it into other things.

Just as when the Air Force wants to move people or cargo, they don't just use [Boeing] C-17s [Globemaster III aircraft]. Mostly they use American Airlines or Delta, and they fly people and they fly cargo using Civil Reserve Air Fleet contracts. Just like COTS and CRS

[Commercial Resupply Services] are doing for the Space Station. Maybe we should be doing that even for transportation to low-Earth orbit in support of exploration beyond Earth orbit.

As long as we try to replicate the form of Apollo and preserve the same old way of doing things, I'm afraid that SLS will never fly and the Johnson Space Center—whose heart and soul is the operations of running spaceflight missions, and the engineering capability to solve the problems that come up when you're doing spaceflight—won't have anything to do.

Johnson's engineering directorate is really amazing. They not only help do early initial design, but they're the folks who come up with a solution to a problem so we can launch on time, or get the astronauts home alive, or what have you. All of that intellectual muscle, without real spaceflight missions to practice on, will atrophy. That would be a bigger crime than throwing away the Saturn V.

So if some politicians and bureaucrats insist that we keep trying the old way and it keeps failing, hopefully someone like me will be around to will say, "Look at this new way of doing things. Maybe we should try that." I will probably spend the rest of my career trying to convince people that that's what they should do.

WRIGHT: I was just going to add, it sounds like you're going to be busy for the next 15 to 30 years as well.

MUNCY: Hopefully I won't be working another 30 years, but I'll probably never stop. I'll probably never stop fighting to actually try to apply the genius of America to spaceflight.

WRIGHT: It doesn't sound like it. It's a passion of yours, and we sure appreciate you sharing the information with us this morning.

[End of Interview]