

Speaker 1: [00:01:34](#) [inaudible] it's going to fall out. [inaudible] [inaudible]  
[inaudible]

Nick Burns: [00:02:11](#) good evening everyone. Good evening everybody. Thank you very much for being here with us this evening. Again, I know we have a lot of people have been here the last few nights. I'm Nick Burns, the executive director of the Aspen Security Forum. I'm going to introduce Kyle Griffin, vice president of Lockheed Martin in a minute. I just want to take a moment to thank Kyle on behalf of his great company. They're one of our corporate sponsors. They're one of our most important corporate sponsors. And if you know much about American defense and all of us do this company as well as other defense firms are critical for the United States and for our military. And so Kyle, we thank you and the men and women of Lockheed Martin. Thanks for supporting uh, the Aspen security forum and yes, appropriately [inaudible]

Nick Burns: [00:03:02](#) Kyle is going to introduce Brian Bender, a politico who is a real expert on space. And this panel's entitled the competition for space, which is relatively unsighted and the American media outside of political of course, and relatively not a big issue in our society. It should be. It's one of the great challenges to the United States. And here to talk with Brian will be the CEO of, uh, of Ula. Uh, Tory Bruno who's here and also secretary Heather Wilson. I just wanted to take a minute to say something about her. Uh, Secretary Heather Wilson is just stepping down to secretary of the air force. She has been, uh, one of those, one of the very best appointments I think of president Trump and secretary Mattis when he was secretary of defense. I say this because we don't give thanks to our public servants enough. And here's someone who served the Trump administration and our country very ably before that she represented her district in New Mexico, in the United States House of Representatives. And in an earlier life when she and I were just a little bit younger, uh, both of us served a great American president, President George h w Bush in the White House. We were members of the NSC staff, very young members at the time. But we're so proud to serve President Bush. But I just ask you, please congratulate a great American Public Servant Secretary, Heather Wilson.

Speaker 1: [00:04:30](#) [inaudible]

Kyle Griffin: [00:04:53](#) again, welcome. My name is Kyle Griffin. I am vice president of special programs within Lockheed Martin space. I got to tell you, I am certainly delighted to actually be up here and introduce this session. Uh, the competition for space. It's

certainly a topic that's been near and dear to my heart. I spent my entire life in the, in the, in the space world. Uh, you know, I, I reflect back in the early days and I'll go back 50 years. And of course with the anniversary of, of Apollo 11 coming up, uh, I was a young boy, a very young boy by the way. Uh, and I remember it used to, it used to be an event that would interrupt your lives. It would actually be one of those things. They'd roll in monitors and you'd actually stop plas and you'd be able to watch launches and all the things that we were doing in space.

Kyle Griffin:

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And it wasn't just in the classroom, it was everywhere. I remember my parents would say, hey, they're getting ready for a launch. And it didn't matter what time of day or night it was. You got up and you actually interrupted your life and you watched that. And from that, that moment, very young, very young boy in my life, it set me on a course that said spaces for me. And that's something that I want to concentrate on. And it's a career field that I've been in for the last 35 years. So it's been, it's been, it's, it's been exciting. It's been evolving and I will tell you there is still intrigue and mystery in space. Um, you know, as, as, as we look at today, space is a very exciting time. Uh, things are moving quickly. You see a lot of new competitors. Uh, you see a lot of new countries.

Kyle Griffin:

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They're heading to space. Uh, we compete. We, we continue to be on the forefront of delivering all kinds of things to, to our nation, to our allies as far as communication, reconnaissance point, uh, position timing and navigation PNT. And then exploration and of course, exploration really gets you excited. Uh, we're going back to the moon of course, if he didn't know. And Ana and of course I hope and it's my, my sincere hope that we actually, um, get the next generation as excited as I was as a young boy sitting in front of those monitors, watching a launch, watching man step on the moon, that we actually inspire that next group that says, you know, what spaces for me in space is something that I want to, I want to be a part of. Um, you know what, there's no doubt right now that there's a number of companies and countries that are going into the, in, into space. Uh, you know, it can be measured in the hundreds, you know, it could be up to a thousand. There's a lot of new competitors in space. So if you don't think competitions for spaces and real, I'm here to tell you it's real. So with that, I'm pleased to introduce our moderator for this important discussion. Uh, he's the defense in space editor for Political Brian Bender. So what I'm going to say is it Brian Bemis up?

Bryan Bender: [00:07:54](#) That will be the first star trek analogy. Can everybody hear me? Yes. Well thank you all. Thanks to the Aspen Institute. Um, thank you secretary Wilson. Thank you Tori. Uh, I'm looking forward to a exciting, interesting, hopefully illuminating discussion and we'll get right to it. And maybe the best way to start is to sort of lay the, maybe landscape isn't the right word in this case, but you know what I mean. How was the United States so reliant? Why is the United States so reliant on space both for national security but also for our civilian everyday life? If you can quickly just lay out for us, why is this so important? Anyway, let me start and I will leave launched you sir, as well as some other things, but um, but uh, it has, the United States is the best in the world, its space and our adversaries know it and they were seeking to develop the capability to deny us the use of space in crisis

Heather Wilson: [00:08:56](#) or in war. So maybe it's best to start out with what the heck do we do up there anyway? Um, and uh, and particularly in the national security realm. So the airports has about 80 satellites. Uh, the navy has 13 more, although the, the secretary and I, one of my last things that we agreed on was that the follow on to the navy satellites will be built by the air force. So we will take care of that mission. Um, the national reconnaissance office, which was kind of a joint venture between the CIA and the air force when it was initially started, uh, it has maybe 40 or so more. So we're talking about about 150 pieces of equipment total. Its smallest one is like a toaster and the biggest one is a school bus. Um, what do they do well up those 150 or so pieces of equipment, about 33 of them are gps position, navigation and timing.

Heather Wilson: [00:09:45](#) So the blue dot on your phone is not provided by your cell phone company. It comes from the United States air force and a squadron of airman stationed at Trevor Air Force base outside of Colorado Springs, Colorado. Eight of 'em on a shift that run the GPS satellite constellation for the world that gives gps coordinates to a billion people every day and enables about an \$80 billion piece of our economy with gps for the world. So position, navigation and timing. We take pictures, we do intelligence from space, we do communications from space, we do weather from space, we do missile warning from space. So, so when you see some something on the news about a launch from North Korea and there was a arch on the, on the, on the television, there are, there are satellites that stare at the earth and look with infrared sensors for those hot plumes of gas coming across, coming off the end of rockets and then do the math to calculate where that rocket is going.

Heather Wilson: [00:10:46](#) And within minutes warn the National Command Authority and it shows up and there's a call. So what's happening and where. So those are the missions that we, that we do in space, largely an uncontested domain from the very beginning. Um, uh, and uh, but it's not that way anymore. Um, r because space is so important for enabling military operations, our adversaries have studied us and figured out that it is one of our vulnerabilities because these are very fragile pieces of equipment that are generally undefended. And uh, and so both China and Russia have been developing the capability to either interfere with satellites or to destroy satellites on orbit in order to influence military operations on the ground. That's become an issue really over the last 10 years in a major way. Although the Russians had developed some capability before that. Um, and our responsibility is to develop, to look at the threat, to develop the strategies and the programs to be able to prevail. Should war extend to space. It will be a bad day if war extends to space. And our first responsibility is to deter that happening. But if deterrence fails, our responsibility is to prevail and to have the strategies and programs to do so. Let me ask you, Tori, are are we losing in this race to defend these assets that we have up there that for so long we thought we're a totally safe?

Tory Bruno: [00:12:18](#) Sure. Within sort of the narrow band of the question, which is really about spaces, a contested environment or a warfighting domain, we are behind. We have the most capable space assets in the world. We have the most capable and powerful military in the world, not the largest. It is the most powerful because it is the most capable because it is enabled by space. That is why China and Russia have brought weaponization to space to take that away from us because they know they cannot contend with us on the surface of the earth conventionally as we are currently capable of proceeding. And so they have ventured into this asymmetry of what will go take space away from them. Cause that's far easier than taking an aircraft carrier or other conventional assets. We have not recognized that threat until recently and so we are far behind countering that threat. We will catch up. This country has the most capable technological workforce and military on this planet, we absolutely will prevail, but right now we're behind in the race and it's going to take some serious and hard work to fix that.

Heather Wilson: [00:13:34](#) Well, let me bore into that a little bit. So we're behind, in your opinion, the Chinese, the Russians, I assume other countries that you're talking about have developed capabilities means to deny us the use of that space. Yes. Without getting into the classified world, can you be more specific? What do they have? What have they developed? What technologies, what skills,

what capabilities that, uh, sort of fill out a little bit this threat picture. I mean, it's easy to say we're under threat. We're a little bit behind and catching up, but, but what's the civically are we talking about? The Chinese in 2008 launched a telephone pole and destroyed one of their dead weather satellites. District blasted it into 3000 pieces of debris, which then created a lot of problems for other people's satellites. And the Indians have that same capability. The Russians, two summers ago, there was a public article in there.

Heather Wilson:

[00:14:29](#)

Their news media about that. They had launched a maintenance satellite with a grappling arm. My question was who is satellites where they maintain it? There's are ours. So satellites are very fragile things and if you bump one, it tends to kind of close up, turn towards the sun and say somebody bumped me and phone, they have the ability to uh, they have the ability to um, uh, dazzle satellites with, with lasers or jams satellites. GPS is, you know, it's, we think it's, it's a pretty cool technology. It's not just on your phone, it's the timing signal for the New York Stock Exchange. It's the timing signal for every ATM in America comes off the GPS satellites. And what it really is is three. If you can see three at that satellites or four at a time, they have very weak radio signals with a timing signal on it and you rally listen to a train and you hear the doppler signal when it goes by, it goes [inaudible].

Heather Wilson:

[00:15:28](#)

Same thing happens with radio waves. So you do the math and you can figure out where you are. If you can see four of those signals, but it's just a really weak radio signal. So if you stand next to it and you play something really loud, you can jam those signals so they can jam, they can dazzle. They've developed the capability to knock down satellites from the earth or to snuggle up against them and, and uh, and cause problems. And we haven't developed similar capabilities. Um, I won't go there as to I, let me talk a little bit about the threat and the strategy. Now let's talk about the strategy because the first piece of the of effective strategy in space is protecting defend, which is if somebody's shooting at you to move, which means you have to have more fool or to have chaff and flares, shall we say, you know, so you, uh, you deceive a seeker that's coming in.

Heather Wilson:

[00:16:15](#)

So defend what we have on orbit. The second piece of an effective strategy is to stop the attacker. How do you prevent them from being able to destroy your highest value assets? Um, so those, those pieces of a strategy, the third piece of a strategy, an effective strategy. And we've done quite a bit of work on this is to proliferate, but it isn't for some missions. There are some people and some people in industry who

honestly or want to sell low earth orbit satellites. Um, lower earth orbit is three minutes from launch on the surface of the earth to where that satellite is. So when India just recently tested an anti-satellite weapon, three minutes detect that launch and where it's going, you have very little time. And if those are unprotected satellites in a network, well for communications and our other kinds of things that may not have to really survive through the first phases of a conflict, that's probably okay for some of our no fail 99.99, nine, nine, nine, 9% missions like command and control for the nuclear deterrent, that's not okay. So, so proliferation of systems in some areas can help on communications in particular. And the final piece of an effective strategy is to create doubt in the mind of the attacker that he really knows everything we can do. It is a to deceive, um, and uh, and to create doubt. Um, so those, those pieces of that strategy implemented in programs are the way in which we intend to dominate in space. I would add a fourth,

Tory Bruno: [00:17:50](#) maybe so you know absolutely right. You need to absorb a blow. You need to get out of the way and you need to shoot back and make them stop shooting. [inaudible] you also need to have technical term situational awareness. Yeah. You need to know what is in space with you, whether it is threatening you, what its intent is in space is enormously vast. It's worth appreciating the technical challenge. This will be like going back to the war in the Pacific in World War II where there was a vast hemisphere of ocean in the American and Japanese fleet spent a great deal of time just trying to find each other in the the seminal battles at the beginning of that conflict, Pearl Harbor Japanese were running where the carriers were gone. The Battle of midway, where are the United States finally prevailed? By pure luck, we found them incorrectly, identified their fleet an hour or so before they found us at a moment of vulnerability.

Tory Bruno: [00:18:45](#) Space is like that we have, just to defend Leo, we have to contend with a sphere or on orbit threats could exist that is 30% larger than the entire surface of the earth. When we go to Geo where our command and control satellites are, we're our missile warning satellites are that by the way, are protecting you right now in the event that they were launched from North Korea in GMD, our system and based in Alaska were to defend you. It depends on a detection and a queuing from Sivers sitting at Geo that is eight times the surface area of the sphere that must be monitored than we even have in Leo. Yeah.

Heather Wilson: [00:19:28](#) So it sounds like, uh, what makes us, uh, even more difficult challenge is that the old construct of they build a big weapon.

We build one too and we determine hurt each other doesn't really apply at least yet because we have far more assets up there that are vulnerable than even the Chinese or the Russians to do. Um, maybe we could pivot a little bit. One more thing with respect to this and [inaudible] is absolutely right with respect to, you need to know, you need to in any kind of conflict, you need to be able to know what's going on and have command and control. But it is cross domain. So when we say that, uh, that we need to prevent them from attacking us, um, that may not happen in space. That may happen on the ground. So this is a cross domain fight. I, and the other piece that we didn't mention, and you, and you can talk a little about launch, but with the air force has acknowledged that we own a space plane. You X 37. It looks like a small version of the shuttle, but it's, it's unmanned. One of the things that's fascinating about that space plane is that it can, it comes, it can, it can do an orbit that looks like an egg. And when it's close to the earth, it, uh, is close enough to the atmosphere to turn. It is,

Tory Bruno: [00:20:48](#) which means our adversaries don't know. And that happens on the far side of the earth from our adversaries. They don't know where it's going to come up next. And, uh, we know that that drives me nuts and I'm really glad about that. Yeah.

Bryan Bender: [00:21:02](#) Well, let me, um, so I'll see what solutions though. I'll say a word about launch. Um, just even, thank you. Um,

Tory Bruno: [00:21:10](#) it's a narrow highway to space. So all of those critical assets have to get there on top of the space launch vehicle, which is in itself a technological marvel, right? Hey, 30 story building that blasts itself into space within incredibly delicate spacecraft on top. We are fortunate at this moment in time that we have doubled the industrial base that America has available. There are now two companies.

Bryan Bender: [00:21:37](#) We'll get that launch. Don't worry. Um, if we have time and I think we will, but let, uh, let's pivot to solutions. So the policy solution on the table to give more focus to space to ensure that these vulnerabilities are addressed, that we're doing all the right things is the proposal from the Trump administration to create a new branch of the military. The Space Force, uh, which it looks like we'll get approval. The congress, uh, the Democratic House has its own tweaks, if you will, uh, that are a little different from the Senate, the Republican controlled Senate, but it looks like that will come into being. Um, and before we talk about the space force and what it will look like, what it will do. Uh, I wanted to quote General John Raymond, who now in the air force, uh, oversees the Air Force Space Command. He

will soon oversee a u s Space Command Unified Space Command here.

Bryan Bender:

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But we'll also, uh, it looks like run the space force at least for some period of time. And he said recently quote spaces, a war fighting domain, just like air, land and sea. We have to be prepared to fight a full range of operations. So let me ask you, um, the first military branch in 70 plus years, since the air force was split off from the army, they still want us back by the way, on, um, the space force will be part of the air force. It looks like a much like the Marine Corps is, is technically part of the navy, but it will have its own leadership, its own training system. Um, but if you listen to General Raymond's quote and a lot of your talking points in recent months, it's almost exclusively about fighting, dominating, winning warfighting. And there's a lot of people in the air force, not very public, who think that we're getting it wrong as a country, that we're too focused on the military part of it and not enough on this commerce and space economy that everyone seems to think is going to take place. Um, whether it's the billionaires like Musk and B Zos or many others around the world and that by making it too much a military force and not something maybe more akin to the coast guard, it's military, but also civilian will be a mistake. So I'd like to get the secretary to talk about a little bit how the space force proposal was burst and was there a broader conversation about what this should look like because it's not just military assets up there, it's a lot of commercialize.

Heather Wilson:

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Just start out by saying the most important thing this administration has done with respect to space has put forward a budget that has double digit percentage increases in space for the last three years in a row. And, and having been a former member of Congress, I know that when you, you know, there's a, and I used to do this to first you simplify and then you exaggerate and that's how you get attention to get stuff done. Um, I used to do it. Um, and, and uh, and then usually the solution is usually, you know, it's about an org chart. That's not the most important thing and it's not the most important thing that this administration has done with respect to space. I think that the shift in strategy, the A, the programmatic changes, the increases in budget, which were not possible in the wake of sequester have really made a significant difference.

Heather Wilson:

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Now is there more to do? You Bet, particularly when it comes to changing the culture of the institution of space warfighters from providing a service and being a, you know, operating a utility to being and thinking like warfighters and I think we have to, I think it's, you know, if, if you had a secretary of the air force

that was up here talking about, you know, commerce and Coast Guard, I'd be in the wrong place. Do I care about those things yet? And I think that space is becoming a common domain for human endeavor in ways that we imagined in the 1960s. But that didn't happen at that time and that are now happening. And that's very exciting. But my responsibility is secretary of the air force and the Defense Department is possibility, is to ensure the security and the vital national interests of this country and, and those assets that enable general or Admiral Davidson or, uh, or a general Walters to accomplish their missions here on earth. So I make no apologies for being an advocate for national security studies.

Bryan Bender: [00:26:33](#) Tory made a maritime analogy and I can move was talking about space. Yeah. The navy talks a lot about guaranteeing commerce and so is a military role at least in the navy. So you're saying the air force just needs to be concerned about warfighting and not playing any role in sort of insuring peaceful uses of space.

Heather Wilson: [00:26:55](#) There is, there are commercial assets that honestly we buy, you know, we buy a, and we're even moving more towards this buying communications capability the same way that that a Verizon does or whoever your sad com provider is. So, so we buy those services. The question becomes what are the capabilities that we need to have in crisis or war? How do, how will we think about interference with commercial assets on orbit in particular? Um, and uh, I have to say that one of the things that creates some, some doubt in my mind is these are all unmanned assets. We need a clearer policy discussion about what we would do in the, if we, if we seek to deter, we have to have the capability to take action. And we also have to let our adversaries know that, that, uh, that there will be consequences for interfering with our satellites, um, in time of, in time of crisis. And so there is a policy issue there too. Yeah, I would argue,

Tory Bruno: [00:27:55](#) do you that we have already been to this movie turn of the 19th century. There was a vast explosion in international commerce that occurred across the high seas. And together with that, the United States navy grew with that economic activity to both protect our military interests around the globe, but also to ensure freedom of navigation of the seas and our commercial interests in the commerce of the free world. This is no different space is the ultimate blue water ocean.

Bryan Bender: [00:28:28](#) Uh, well let's talk a little bit more parochially maybe about some, a different kind of competition. You alluded to it earlier, uh, Ula, which I think many of us know, but maybe not all of us

as a joint venture between Boeing and Lockheed Martin for a long time did not really have much competition in the market of space launch, particularly for government satellites or government spacecraft. You now have some pretty ambitious competition, uh, not just in space x, but pretty soon blue origin. Jeff Bezos has company. Um, tell us a little bit about how your company, which sort of was in the driver's seat, uh, [inaudible] maybe not in its ula version, but sort of the legacy, uh, was in the driver's seat for so long is trying to react to that, trying to be more competitive so that, uh, you can compete with some of these upstarts. Sure.

Tory Bruno:

[00:29:25](#)

That's why I'm at UCLA. So for the first probably 10, 11 years of UCLAs existence, it was the only u s company capable of launching the kind of satellites that Heather has described. And so that was our mission were almost an extension of the air force. And then I, the commercial industry matured around us and we were able to have a second player. And so my job was to transform us from a company that had been set up to avoid a crisis in space that is rarely talked about all the assets on orbit. We're running out of design life. All the replacements were late and we were looking at big capability gaps, parts of the globe that we would not be able to watch areas without gps communication gaps. Our job was to be part of the team that made sure that didn't happen and we did it then all of a sudden, okay, problem solved.

Tory Bruno:

[00:30:22](#)

Peace dividend time. Let's see if we can take advantage of a matured industry to introduce competition to lower costs. So my job was to transform Ula, to be a company that could be viable in that environment and continue to solve the national need. And so what we did was we restructured our company. We were able to shed the burden of having to have two redundant rocket systems to provide assured access because now we could have two redundant companies doing that mission. We restructured, we streamlined and people are often surprised when I say this, but I, I am happy to have competition in this field. It's healthy for the industry, it's good for the government. And it enabled me to have a case to develop a whole new class of heavy launch vehicle, which I am deep into right now just starting the fabrication of the first flight vehicle of our new Vulcan rocket. And so we will have access to spaces, so much more agile, so much more flexible. Even before our new rocket, our costs are down 36, 37% for the existing platforms and it goes much lower when we begin flying in 2021 and fortuitously for our nation, that brief window of Oh look, no problems, no threats. We can take some chances and develop a bigger industry. Gives us a bigger industry just at the moment

that we have to contend with this tremendous strategic challenge of a contended contested environment in space. You talked about competition. Um,

Bryan Bender: [00:32:02](#) there's a debate going on right now. Um, the air force is fairly well along in a sort of high stakes competition for the next generation of space launch vehicles to launch all of these assets that you both been talking about. Um, you said you're in favor of competition but there are some members of Congress who would like to see more competition in that more players have a shot at fulfilling some of these needs for the air force players and their against players with those. Maybe Brian that would be space x I think is the main one. But you're opposed that? No

Tory Bruno: [00:32:40](#) I am not. And let me jump in here a little bit for you because there's, we need to be clear about, one of the things we're talking about here is there is there are more companies looking at launching things to lower earth orbit. As I said, that's you know, that's 20 minutes away from the surface of the earth. You can do that a lot of different ways with small rockets and we've, there are a number of different companies and that do small rockets in a variety of ways to get them there. The real hard part is the hard part that ula is space x and blue origin are in, which is 30 story, high heavy rockets that get things out to geostationary orbit. And how many of those do we need? There's no commercial company really that needs that. It's only national security launches. So how many are there going to be and how many companies can close a business case?

Tory Bruno: [00:33:30](#) So that's really the question. And now over user. Yeah. So I want to, so in this case, you don't think competition really gets the government more bang for its buck because there just isn't enough a market there for it to make sense. I'm not saying that either. No. So here's what I am saying. I am saying that uh, don't tell the air force, but they put together one of the most thoughtful, disciplined and careful acquisitions I've ever seen in my 35 years of building rockets, nuclear weapons and directed energy systems. This is an excellent procurement. It is completely available to competition. It came in two pieces. The first piece was a development part where the government would co-invest with industry to develop new rockets with capabilities to serve this need, public private partnership. What a deal for the government and my rocket, they're only covering about a third of the cost.

Tory Bruno: [00:34:27](#) I suspect that's true for the others as well. Anyone could bid. There are four domestic companies that want to be in launch. Two that are in two. The want to be there. All four offered

proposals. Their plan was to select three and then co-invest in development. While those all four again could offer proposals, which by the way are due on the first of this August for the actual block of missions that would follow that whereupon they would select two. Why Two? Because that's all the market. There is more than two and there isn't enough business. Everybody gets to bid on the first try. Not Everybody won. Everybody will get to try again for the block of missions. They'll pick to when this is over, after that block, then it's back to the races again. There's what they call a phase three of missions where everybody gets to bid again and gets to keep trying. So there was free and open competition. Everybody bid one, one company lost. That's what happens when we have competition. It's not of everybody gets an award.

Tory Bruno: [00:35:41](#) Everybody gets to try again for the missions too. We'll be picked and we'll see where we go from there. In your proposal is you mentioned that the Vulcan rocket, yes. Um, talk to us a little bit about how that's going. Uh, I think most people who don't cover space or don't follow it that closely, uh, but are interested in it, are familiar with space x and it's reusable rockets. This marvel that we can fire this thing up there and yeah, it could come back. Is there a reusable rocket in Ula is future? Yeah. So reusability is a great topic. I worked on the x 33 venture star. You probably remember that one. That was a really cool single stage to orbit, glide back, fully reusable vehicle. We couldn't get the damn liquid oxygen tanks not to leak. So that program never happened. But we have basically three ways to try this.

Tory Bruno: [00:36:34](#) We can do glide back like shuttle. We can do propulsive flying back like SpaceX and we can do component reuse. Uli Component, you mean just smaller parts of the Rock and get that so in propulsive reuse you bring the whole booster back in component reuse you might look at the booster as we have done and said well you know two thirds of the cost of that thing is just one piece, just the engine without the engine. A booster is an empty aluminum gas tank so you get innovation with different people trying different things. We plan to do component reuse after we are flying Vulcan and have it well characterized. We move on to something we call modular reuse where we will separate off the engine section and we'll capture it in recover that. The reason we're starting there is because that is the least challenging economic hurdle.

Tory Bruno: [00:37:28](#) I have no need to land on Mars vertically and take back off. The only thing I want to do is save money. My competitor has a broader mission in mind and that's fine, but it drives you to the a technique that is very, very difficult. You have to hyper

sonically reenter back in first you got to fly into your own plume. You get temperatures over 6,000 degrees Fahrenheit, which you'll melt steel in a, in a heartbeat. You have to refurbish. And then because of all the additional costs involved, we think you've got a probably average in your fleet, 10 reuses per booster to make this pay. Um, they're doing under two now as a fleet average. And so I guess they're on their way to, well, I'll just say I encourage them to keep going. We're going to start with an easier challenge. Sometimes you want to be the first to do something. Sometimes you want to be a second. Uh, one more question about your rockets. Uh, you've had some problems with the atlas. The current one, uh, reports ranged

Bryan Bender: [00:38:36](#) between a battery problem to an engine problem. Sure. And that there could potentially be an impact on the Vulcan if, oh, no kind of technology you would use for that.

Tory Bruno: [00:38:44](#) This is a routine thing that happens. So let me just point out because I've seen the stories too. All my gosh, they're not, they're not on time anymore. They're late. You order, at least in our world, we are customers order the rocket a hundred to 200 weeks in advance. We set the date at that time and then we get to the end. Now what's visible to people is the last few weeks and what you're talking about right now is we have delayed our advanced EHF launch by several weeks to work through what we call a sibling issue. So this is one of the ways you get a perfect mission success record 133 in a row. No one in the world has done this. Pretend that's what we've got a part on our rocket. It's functioning fine, it passed all his tests. There's probably not a darn thing wrong with it.

Tory Bruno: [00:39:35](#) Meanwhile, way back in a lower level, sub tier a piece, the same part is being fabricated. It goes through its normal testing in the factory and it fails. Our process is to immediately declare all parts in the world that haven't been flown yet, to be suspect they're all guilty until proven innocent. And then we take the time that is required to show that either the part on the rocket is fine or we remove it, examine it and replace it. That's what we're doing right now. This is routine. We do this all the time. Uh, it's one of the ways that you get this kind of success record. We remain the world's most on time launch provider. Our average is to be within about two weeks of the date. We set 200 weeks earlier when we fly. The industry average is three and a half months in. There are unnamed players who are around three years. I won't mention their name.

Bryan Bender: [00:40:33](#) Uh, before we get to audience questions, let's talk a little bit about the future. Uh, we talked a little bit about the space for

us. Uh, and correct me if I'm wrong, but the space force, at least initially, it's sort of baby steps if you will, is going to better organize, perhaps better fund some of the things. A lot of the things we're already doing in space, but I think there's this public perception when you hear about the space force of Luke Skywalker flying and an ex mean fighter around the earth and I want that job and um, you know, fighting the next clone war. Um, obviously we're not there yet. Uh, and, but there is talk about doing in some other countries like China are already doing this, moving a generation ahead and refueling spacecraft in space so you don't have to worry about bringing something back. Um, or just in most cases throwing it away or letting it just

Heather Wilson:

[00:41:34](#)

go into deep space as junk. I'm so refueling in space. You mentioned a little bit fixing satellites in orbit, so things getting old, you can go up there, you could repair it. Um, the commercial side of the space industry is looking at a lot of these things, but you don't get the sense that the government is, that the air force is really investing in these kinds of things. Why is that? And or, or is that changing? Are we gonna start seeing some of these really new ways of operating in space that would help the military but also might also help, uh, the civil side. Say a couple of things about organization and then about acquisition on the organization side, probably the most important thing and y w [inaudible] something there's wide consensus on was the need to reestablish a combatant command for space. And J Raymond as the first commander there, we had one until nine 11 and then they reorganize the commands and we no longer had a combatant commander for space.

Heather Wilson:

[00:42:27](#)

I think that there's, that that was done in the last defense. Bill j Raymond is the first commander. Um, and, and that's, that's moving forward with respect to, to priorities for acquisition and some of these new technologies we will leverage off of, uh, what's going on in commercial industry. And in fact, I think the air force has been the most aggressive at using new authorities that we have to, uh, to buy things and setting up consortia. The space missile system center does almost all of the space procurement out of loss Angeles. We set up a consortium of new companies, um, and, and, uh, put out, we had, we wanted to do things in different ways. We put out solicitations, uh, the companies putting proposals, they tended to be short proposals. Um, average time between solicitation and contract award was 91 days, which is unprecedented and 75%.

Heather Wilson:

[00:43:19](#)

So there's over 250 companies now in this consortium, this space consortium for space innovation, uh, supplying the air

force. Now 75% of them had never done business with the government before. We also set up a pitch day and the next pitch day in October, we'll be focused on space. The first one we took some of our other harder problems on software and some other things and we said, look, we want to change the way we work with small business and innovative business and, and you know, take away that sign that like at the, like at the roller coaster that says you have to be this tall to play, um, take that away. And we, we changed our systems quite a bit to get the time down to get from RFP to contract award, but it still wasn't good enough. And so we worked with the lawyers and we got away to pay progress payments with a government credit card. And then we set up a pitch day and we had, um, over 400 companies put in proposals that pitch deck no longer than five page summary on some hard problems. We narrowed that down to 50 companies or so. They came to New York, we had our prime contractors were welcome to come as well. They pitch their ideas and we made commitments there for over \$8 million on that day,

Tory Bruno:

[00:44:32](#)

swipe the government credit card. And thank goodness for this guy at Bank of America who was on the, he thought we were laundering money with a credit card. You know, they're, we're not dealing drugs. And, and um, so we showed that the air force can change the way it does business to engage these small and innovative companies. The final thing I would say is there is a proposal that I think will die, um, uh, call the space development agency. The air force is doing more aggressive in space and taking, we've stripped 21 years just in our space programs out of procurement timelines in the last 18 months. So 21 years. And the space development agency, I'm not sure what their mission was. It's changed several times. They're having trouble hiring people. Um, there's, there's no need for yet another entity to buy space stuff. Um, uh, the, the United States air force is doing pretty well at that.

Tory Bruno:

[00:45:21](#)

So what you're saying is that unlike in the past, there isn't as much of a need for the government to make these investments in some of these future technologies because the commercial sector is already doing. I think we're doing it, you know, we're trying to leverage off of what's going on in the commercial sector and get those companies to work with the air force so that we can innovate quickly and, and just, and speed matters now. And so I think, I think a give a lot of credit to will roper, the assistant secretary for acquisition who is, who is a wicked smart and very aggressive. And my job was to try to keep people out of his way. Um, and uh, and and General Thompson out of space and missile systems command has done a fantastic job

with reorganizing for speed and moving across pipeline, uh, stove pipes and really, uh, really, really doing some innovative things.

- Tory Bruno: [00:46:12](#) Before we get to questions real quick, the future, give us a sense of one or two technologies capabilities that we don't see yet but aren't that far away. I'm going to come back to your, to your earlier question, part of that was a purely commercial activity. What an amazing time to be alive. We now understand that between here in the moon and nearby is over a thousand years of this planet's entire industrial production of metals, more precious metals that have ever been mined in the history of humankind right there within our reach a week away from where you're sitting in this very room, what is the one thing that would enable that? Why that would be a transportation system that could only be practical if only there were rocket fuel distributed throughout cis lunar space and on the moon. Well, the other great discovery of our time with this gun, largely unheralded is that water is virtually everywhere we look in.
- Tory Bruno: [00:47:11](#) It doesn't take much to turn water into liquid oxygen and liquid hydrogen, the most energetic propulsion fuels that we know of. So gas stations in spaces at stations in space in the universe has provided that infrastructure will go into place over the next two or three decades. You will begin to see this type of commercial activity in space. We have a vision that I call the cis lunar 1000 we call cis lunar being a space between here and the moon. There'll be a thousand people living and working in space over the next three decades developing these resources. You know, some of you, certainly many of our children could be a part of those thousand people. This is a new era in human history and you are sitting on the very threshold of it. Yep.
- Heather Wilson: [00:47:58](#) With that, let's go to the audience. We still have about 10 or 12 minutes. Um, young lady right here. Yes. Can you wait for the mic? Yes ma'am. I think somebody's going to come around.
- Speaker 1: [00:48:11](#) Okay.
- Audience Member: [00:48:13](#) Thank you so much. And thank you all for being here. I have a question. I'm gonna follow on the, the technology question that you brought up Brian on in the future, uh, that we have in space. And last week in the Wall Street Journal they talked about their China had a used quantum teleportation to transport particles to their satellite. And I was wondering, uh, where we are with teleportation and how you feel about that

- Heather Wilson: [00:48:41](#) you guys go forward. I obviously should have read the paper last thing instead of being on vacation. Um, I, uh, I think on, on quantum, we're probably far behind on, in, on basic r and d investments in quantum, uh, from what quantum is one of the 10 big technologies that China has identified that it's investing very heavily in. And, uh, and if you combine what's going on in commerce as well as what the government is sponsoring in the United States, uh, it doesn't, it's not even close. So
- Tory Bruno: [00:49:13](#) I would say that, um, we understand the principle of quantum entanglement is having the potential to transmit information instantly across great distances. The transmission of actual matter is a whole nother issue. And I didn't see the story either, but it, it, uh, I'm a little skeptical.
- Speaker 1: [00:49:35](#) A gentleman back there. You want to wait? Pick a mic is coming.
- Audience Member: [00:49:39](#) Thank you very much. Steve Shapiro from a Benz and the Atlantic Council. I know it's not a good idea to look backwards, but in the lessons learned category, if I might, how is it that we put up all those satellites without ever thinking of their defense? How is it that we laid all that transatlantic cable without ever thinking of its defense? I know that's not our subject, but it's the same area. Is it, was it Hubris that nobody else will get to space? Was it negligence? Was it who knows what? And Are we making the same mistake about the moon itself?
- Heather Wilson: [00:50:14](#) What a tough question, Heather, would you tell one, let me start out by saying, you know, this isn't something like you put it up there and it's there forever. Satellites have a lifetime and you look at what is the mission that you're trying to, what it is they're a threat. You need to, you need to think about. And if there really isn't at that time, you know, our strategy shift over time, our aircraft have shifted over time in terms of what we're, how we design them and how we, how we, um, how we, uh, we look at the threat and the, the way in which we design equipment for a new age. So, so no, I don't, that doesn't particularly surprise me that you wouldn't spend a lot of time trying to defend something when the threat had not yet emerged. Doesn't surprise me at all.
- Tory Bruno: [00:50:58](#) America is an optimistic country and we have long thought of space as a sort of higher domain, a peaceful environment where we could have diplomacy even during the Cold War. Now we do and we have had a very strong idea and a great resistance to weaponizing space. Unfortunately we've woke up today and

realize someone else's already done that and we will now respond.

Speaker 1: [00:51:24](#) I'm just to follow up the moon side of that. We're making the same mistake. [inaudible]

Tory Bruno: [00:51:31](#) I would, yeah. So I would say without speaking for, um, you know, our colleagues in the government that we do appreciate the resources on the moon and the value of the Poles in particular, the moon has over 20 billion metric tons of water in the poles of the moon or where the highest concentrations are. That is the Middle East of the future of space. That fact is appreciated, especially in this administration. So no, I don't think we are taking that for granted

Audience Member: [00:52:03](#) right here way. Hi Ellen. Sabin, you've spoken a lot about how we're behind in the technology and I'm wondering if our government, if our corporations, um, if our school systems are doing enough to educate the next generation, um, going down to elementary school age to really get a, uh, the next generation of thinkers and problem solvers and what you guys are doing about that. Uh, fortunate we have a university president.

Heather Wilson: [00:52:34](#) Let me just take a, uh, first of all, let me repeat that. We are the best in the world at space. We are much better than China and Russia. When it comes to space, where we, what we have not done is develop the attack capabilities that they have developed. So, so, so, um, and the ability and the strategies to respond to that threat, uh, until really the most, the last decade. So, so let's be careful about, you know, saying behind the night we had this conversation this morning, somebody mentioned that, Gosh, you know, the Chinese landed on the far side of the moon and they must be ahead of us. And it's like, well, we just landed on Mars for the second time. Right. So, so, um, in perspective, um, I do think that there is the opportunity now to inspire a whole nother generation that, uh, you, you know, tomorrow's a pretty, pretty important day or this weekend is a pretty important weekend in the history of, of, uh, of manned exploration of, of the universe. And I think there's an opportunity to inspire and engage the next generation and develop the next generation of engineers and scientists. I, I was a college president before I became secretary of the air force, the best engineering and science school. You have never heard of the, uh, South Dakota School of Mines and technology in rapid city. And, and in August I will be the next president of the University of Texas in El Paso. And so I will go back to, to inflicting calculus on 18 year olds.

Tory Bruno: [00:54:04](#) Uh, what is Ula doing in this world of stem as it's called in? In, yeah. Helping to invest in this future generation. So higher education specifically stem has been one of my personal goals for a very long time. Even before I came to Ula. So we encourage outreach in all of our k through 12. We have great relationships with universities. Tomorrow we will be large in one or launching one of the largest sport rockets in the world that is built by our interns, which are all college students that we bring in every summer and give them real rocketry to do. And uh, I can't say enough about it. I will say that again. I agree completely with Dr. Wilson. The technology is there. What we have not done is apply that technology to war fighting and space. That's what we're behind on. That's what we need to do. Now. We do not have nearly enough stem graduates. Our engineering and science workforce is far too small for this challenge, and we need to do significant material things to increase the size of that workforce. Thank God she's going to this university to crank out more engineers to come and work at Ula. Let's go to Julian.

Speaker 1: [00:55:20](#) Right.

Audience Member: [00:55:25](#) Thank you very much. Uh, Julian Barnes, New York Times. I wonder if you could talk a little bit more about how to create deterrence in space. A Uranian shot down a drone and that was not considered, uh, something that required a kinetic response. Would a future administration think that the shooting down of a satellite is something that required a military, uh, response if no one was hurt? Um, how do you create deterrence in space?

Heather Wilson: [00:55:59](#) Well, there's a couple of things. Certainly you create the capability. I talked about the ability to protect and defend the ability to hold your adverts. There is systems to stop them from doing what they're trying to do, the ability to create doubt in the mind of an adversary that, uh, that they know, uh, everything that they need to know about attacking any kind of as a satellite. I do think that there is a declaratory policy that we really haven't developed yet. When I went up for confirmation two years ago, I had a sentence in my, my opening statement that I drafted that said, space and war fighting in the same sentence. And someone who was, uh, who was, uh, still there in an acting capacity from their previous administration struck that out because they didn't want to talk about space. More fighting the same sentence.

Heather Wilson: [00:56:45](#) My, my aunt, my response to that was, you'll have to get somebody more senior to tell me to take it out. But think about this. Two years ago, Dave [inaudible], chief staff of the air force,

Dave Goldfien could not say space in war publicly in the same sentence. We've come a long way in talking about the threats that are there and the things that we need to do about them. I do think that there are some policy issues both declaratory that you have to have the capability to act and you have to have the declared in. You have to demonstrate that capability sometimes and then you have to have a declaratory policy that says we will take appropriate action if, um, if, uh, our assets are interfered with. So I think those are policy decisions. There's one other piece and that is delegating authorities to the appropriate level.

Heather Wilson:

[00:57:34](#)

A staff sergeant in Afghanistan has more guidance on rules of engagements to be able to kill someone. Then the secretary of the air force or the secretary of Defense has on flying close to another satellite. Those authorities are kept at the presidential level. So you've got to get the authorities at the appropriate level as well, which are policy decisions. Before we, let's write on just to adequately, yeah, I spent a career in deterrence. This is right on. You must credibly hold at risk assets that, that fo values so highly that it's not worth it to change the status quo. You must have a declarative policy. You must have the technical capability and they must believe that you have the will to act as subtlety. That is also important I think to appreciate is you must have a well understood ladder of escalation because people will test you. So you need

Bryan Bender:

[00:58:29](#)

to be able to start down this road, show them your resolve so that they can back down. Secretary Wilson, before we close, you mentioned tomorrow's anniversary 50 years since Neil Armstrong and Buzz Aldrin walked on the moon. Um, we're going to go back. That's the plan by 2024. Um, but I want to throw you for a loop here a little bit and it's a yes or no question and try your best, okay to say yes or no. Okay. The deputy administrator, former deputy administrator of NASA, Lori Garver wrote a piece that I think was published yesterday in the Washington Post that basically said we are getting it wrong. NASA should be focused on earth science and climate change. It is such a leader in that area. Why are we focusing on going back to the moon and going to all these other places? Secretary of defense, former Secretary of Defense, William Cohen, former Republican senator for Maine, told me this week, the greater challenge is not going to be whether we go to Mars, but whether we save this planet from becoming Mars. Are we whistling past the graveyard here? Yes or no? No. We need to go back to space. No. Why did I think you were going to say that?

Tory Bruno: [00:59:45](#) You asked. You asked me for a one word answer. I mean, we could go on about these things. [inaudible] nation.

Bryan Bender: [00:59:51](#) Uh, but so you don't see it as either or?

Tory Bruno: [00:59:54](#) It's both. There are limitless resources in space for virtually limitless what's going on here on earth. Competition over ever diminishing resources. Sadly, often in conflict when right there is an abundance that defies human imagination. You want to save earth, go there for your industrial capacity so that you don't have to do it here.

Bryan Bender: [01:00:18](#) And with that, I want to thank both of you

Speaker 1: [01:00:21](#) being here today. And

Bryan Bender: [01:00:31](#) with that, everybody enjoy the night. And I think we're off.