

THE ECONOMIC CLUB

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Virtual Signature Event

Gregory J. Hayes
Chief Executive Officer
Raytheon Technologies Corporation

David M. Rubenstein
President
The Economic Club of Washington, D.C.

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ANNOUNCER: Please welcome David Rubenstein, president of The Economic Club of Washington, D.C.

DAVID M. RUBENSTEIN: Thank you very much and welcome to all of our members today. I'd also like to let you know about our special guest today. I will be having a conversation with Greg Hayes, who's the chief executive officer of Raytheon Technologies Corporation. And I hope we have a very interesting conversation about space, aerospace, and many things that are quite interesting that are now going on at Raytheon Technologies.

So, let me just give you a brief overview of Raytheon Technologies before we begin this conversation with Greg. Greg is a person who's graduated from Perdue. He has been the predecessor of Raytheon Technologies, United Technologies, for quite some time, about 21 years. In 2014, he became the CEO of United Technologies. Became the chair in 2016. And when the merger occurred, that we'll talk about in a moment, between United Technologies and Raytheon, he became the CEO of Raytheon Technologies in April of last year. And Raytheon technologies is a company with about \$118 billion market cap, about 195,000 employees, and an annualized run right now of about \$70 billion in revenue.

So, Greg, thank you very much for taking the time. So let me ask you at the very beginning, United Technologies seemed to be a pretty good company and Raytheon seemed to be a pretty good company. What was wrong with just staying as independent companies? What was the theory behind the merger?

GREGORY J. HAYES: Yeah, the theory behind the merger was – actually, you need to step back because part of the – what really precipitated the discussions between myself and Dr. Kennedy¹ from Raytheon was United Technologies was in the process of splitting itself into three different businesses. We had an aerospace and defense business, which was about \$40 billion in sales. And then we had the Carrier Air Conditioning business, and we had Otis Elevator business. Not a lot of synergy between those businesses. They all came together back in the '70s when the conglomerate was in vogue.

I decided when I became CEO that the best way to unlock the value of the company was to be more focused. So you have a focused elevator business, a focused HVAC business and a focused aerospace and defense business. So we were right in the middle of that whole process of – I call it the big divorce – trying to separate out the three companies that had been together for a long time. When lo and behold Dr. Kennedy called me from Raytheon. He says: Greg, we need to merge. And I said, Dr. Kennedy, that sounds like a wonderful idea. We had talked to Raytheon over the years about becoming UTC but it never worked out. But I said, I'm a little busy.

He says no, no, no. We need to do this. And he said: The technology that you have and the technology that we have can change the world forever. And when someone says that to you, you kind of are like, hmm, OK. Maybe. But the more we talked about it and the more we understood the technologies that Raytheon has, and the technologies that UTC's aerospace and

¹ Thomas Kennedy is the executive chairman of the Raytheon Technologies Board of Directors.

defense business had, the more sense it made to bring the businesses together. And at the end of the day, in aerospace and defense scale matters.

And the fact is, you know, Raytheon was a \$25 billion business. It would have been a \$42 billion aerospace and defense business on our own. Bringing the two businesses together made sense because it gave us the ability to invest, it gave us the ability to share technology, and most importantly the ability to use the talent that we had to come up with very unique solutions for our customers.

MR. RUBENSTEIN: All right. So you decided to do this merger, but then COVID showed up. And how did you actually get through the merger? Have you actually moved your headquarters or anything like that yet? Or how is that going?

MR. HAYES: So, interestingly, we announced the deal to merge in June of 2019, probably at the apex of the commercial aero market. By the following March, we were preparing to close. And we actually closed on the 3rd of April, just one – just celebrated our one-year anniversary this past Saturday. And we were all working remotely. And the commercial aerospace business was in a tailspin. And we had to figure out how to do work remotely while keeping our people safe for those people that had to come into the factories, had to come into the offices.

And so it was – it was a learning experience. On a typical day, of our roughly almost 200,000 employees, we'd have a couple of thousand people working from home. Today – well, within actually two weeks of the lockdown, we had over 100,000 working from home, working remotely. And it was an incredible experience to see how people adopted – adapted, rather – to these new surroundings. And it's like we never missed a beat. We were able to close on the spins of Otis and Carrier. We were able to complete the merger. We were able to run the business remotely.

I was actually joking last summer since I'd been working remotely for so long I'm the only Fortune 500 CEO who runs his company in his gym shorts, because here we were, working remotely. And you know, you put the nice shirt and ties on. And, you know, it was a learning experience.

MR. RUBENSTEIN: So if you stand up now are you in gym shorts now?

MR. HAYES: No, I got a full suit on today, David. [Laughs.]

MR. RUBENSTEIN: OK. All right. So let me ask you about two parts of your previous company that I've always been interested in. One is the elevator business. And in the elevator business in the old days you'd go in the elevator, you'd push a button and your floor, and you'd go up and so forth. Now they have these smart elevators. Do they really save energy? Is that really – you know, is that what the point of a smart elevator is, saving energy?

MR. HAYES: So energy saving in elevators is not a new concept, but if you think about the building in and of itself elevators account for less than 3 percent of energy usage. About 15 years ago, Otis actually developed something called the ReGen drive where, as the elevator

descends from the top floor, the generator runs in reverse and actually stores electricity as it goes down and then uses that same electricity as it goes up. So we've reduced the energy you needed to run an elevator by about half by these ReGen drives. It's not a huge savings, but every little bit helps as we think about how to get to a net zero economy.

MR. RUBENSTEIN: I've always been afraid you'd go in an elevator and sometime when it's going down maybe something will snap and it goes all the way down too quickly. The chance of that is zero, right?

MR. HAYES: Well, nothing's zero. But if you think about it, Elisha Graves Otis back in the 1860s invented the safety elevator. And the safety elevator, how he demonstrated it was they used the rope and pulley system. He had his assistant cut the rope above him and the elevator stopped. And that safety brake is the same design we've been using really for the last 150 years or so, 160 years. And it's simply a mechanical device that is held out away from the hoistway. But if power's lost or if it goes too fast it simply snaps down and it stops the elevator. So probably safer than driving home tonight.

MR. RUBENSTEIN: OK. Well, let's talk about the other part of the company you spun out, which was Carrier. During the – I think it was the campaign that President Trump was running for election the first time. He – I think Carrier was either moving some facility somewhere or another and he didn't seem too happy. What was that all about?

MR. HAYES: Yeah, that was – I would call that a huge miscalculation on my part. We had been having difficulties with our facility in Indianapolis for a number of years. Very inefficient, very old, and not terribly productive. High absenteeism, right, all those – all the things that – problems that we should have been able to solve. But we also saw the need to have a lower-cost manufacturing site. And so we had years ago started moving some work down to Mexico. And back in 2018 [*recte* 2016] we made a decision to close down the Indianapolis facility, or at least the manufacturing piece, and move that down to Monterey, Mexico, with the rest of our operations.

Of course, that became a cause célèbre for Trump as – during his campaign. He said, I'm going to call up the president of Carrier and we're going to stop that, and all that. Interestingly, about a week after he won the election he – President-elect Trump then called me and said: I want to thank you. You helped me win the election. And I said, well, sir it was never my intention. And he said, no, the Carrier issue was great. And he said, but you can't close the factory. And I'm like, well, we're moving the factory. We can keep some work there. And ultimately, we were able to work out a deal with Vice President Pence, who was still the governor of Indiana at the time, to keep a number of jobs there. About 1,300 out of the 2,400 remain.

But it was a lesson for me in realpolitik, I would say, in terms of – you know, we typically make these decisions understanding there's going to be some political ramifications. But I've never had a presidential candidate call me up and say: Don't do something. That was a learning for me.

MR. RUBENSTEIN: OK. So let's talk about Raytheon Technologies now. You have four parts to it, as I understand it. Let's go through what they actually do. What is Collins Aerospace? What do they do?

MR. HAYES: Well, if you think about Collins Aerospace, it's really a combination of a number of different companies we've acquired over the years. But they do almost every system on an aircraft. There is the Rockwell Collins, which does the avionics up in the cockpit. We do electric power generation. We do auxiliary power units. We do wheels and brakes. We do – there are roughly 52 systems on an aircraft. We make 48 of them within Collins. We got about 600,000 different part numbers. They are – if you think about a 787 today, we make about \$10 million of content on each aircraft all comes from Collins.

MR. RUBENSTEIN: OK. So people aren't flying as much as they used to. Does that mean you're not making as many of those parts as you used to?

MR. HAYES: That would be a mild understatement, David. [Laughs.] We saw the OEM business drop by about 50 percent that year. That is, Boeing and Airbus's production rates. But more importantly, we also saw, as you all know, 70, 80, 90 percent decline in commercial air traffic, which means people weren't flying, which means we weren't servicing the aircraft and selling spare parts.

And just like the elevator business, the aerospace business goes on the model where you don't make money selling to the OEMs, to the Boeings and Airbus. You make money by servicing your equipment over the 30-year life of the aircraft. And that model got stood on its head last year.

MR. RUBENSTEIN: OK. So when do you think commercial air travel will come back? Anytime in the next year, or two, or three? What is your projection?

MR. HAYES: Well, I think you really need to think about commercial air travel in the two segments that – really, three segments, I would say. There is the domestic in the U.S., which accounts for a big chunk of worldwide traffic. And about 70 percent of that is personal travel, 30 percent is business. We have already seen personal travel start to rebound significantly. You know, pre-pandemic you got about 2.2 million people a day in the U.S. traveling, going through the TSA checkpoints. Last week it was about a million and a half people. So that's coming back relatively quickly as vaccines are rolled out.

The business side of the travel equation has been much slower. And as most of us are working remotely we found that we don't need to travel as much. The problem for the airlines is that the 70 percent of the market that's come back is the least profitable. And so the business traveler has to come back before the airlines will really get back to where they were in 2019 domestically. The other part of the problem, of course, is international, which represents, again, a big chunk of travel. You know, today international travel is still down about 80 percent from pre-pandemic levels. It's, again, because of the difference in vaccine rollout it's going to be some time. And we think international travel doesn't fully recovery probably until 2023, 2024.

MR. RUBENSTEIN: So another part of your business is also connected to the airplane world, which is Pratt & Whitney. And as I understand it, Pratt & Whitney is one of the three big engine manufacturers. There's Pratt & Whitney, there's General Electric, and then there's Rolls Royce. Is that basically it?

MR. HAYES: Yeah. You know, Safran² also has a joint venture with GE where they sell an engine called the CFM56. But yeah, there's three big – there's the three big ones. GE, of course, is the absolute dominant player in terms of the installed base. They've got over 30,000 engines out there. Pratt would probably be number two with about 12,000 engines, and then Rolls Royce somewhat less than that.

MR. RUBENSTEIN: So looks like to be in the engine business you have to have two names – Pratt & Whitney, General Electric, or Rolls Royce. You can't have just one name, right? So in Pratt & Whitney's case, you manufacture engines – how long does it take to manufacture an actual engine that I see on a big 737 or 777? Does that take a month, or a day, or half a year?

MR. HAYES: Well, if you want to start – the lead time on an engine is roughly 18 months. And the long lead time, if you could imagine, the heart of the engine is the turbine, which is the hot section of the engine. And we actually we take – we make a metal powder at a facility in New York state, ship it down to a forge that we own down in Georgia, and we make turbine disks. That process alone is about six months. Again, everything else – by the time we get all the parts together in our final assembly facility, it's about a week to put it together. It's about 8,000 parts. But it's about an 18-month process from start to finish.

MR. RUBENSTEIN: Now, recently I think it was a Boeing 777 had a(n) engine cover fall off, fell down and fortunately didn't kill anybody or injure anybody, but it obviously could have. And I think some of those planes have been grounded. Do you make the engine cover for the 777 Pratt & Whitney engine or you don't make that?

MR. HAYES: We do not make the – it's called the cowling – or the – yeah, the aerostructure. We actually don't make that for the 777. We do make it for certain aircraft, but that's not our design. I think people should understand that when we lost the cell or the cover, the cowling, that is not supposed to happen if you have an engine that fails for whatever reason. We actually have inside the engine a Kevlar belt that goes around all of the hot sector, the parts that are likely to break off. And they are supposed to contain that energy. Unfortunately, the cell, the cowling, didn't work as planned. And so we're working with Boeing now to come up with some redesigns to ensure that doesn't happen again.

MR. RUBENSTEIN: Well, since none of your cells have fallen off have you suggested that maybe you could make the new cell for the 777? Has that occurred to you?

MR. HAYES: Unfortunately, the process to build a new cell is there or four years and half a billion dollars. This is for an airplane that is, you know, 30 years old. It probably doesn't make a lot of sense. We'll figure out a way with Boeing. Boeing's got some great engineering talent. They'll figure out a way to get this thing –

² Safran S.A. is a French multinational aircraft engine, rocket engine, aerospace-component and defense company.

MR. RUBENSTEIN: A third part of your company is Raytheon Intelligence & Space. Now is the space business a great business to be in? It seems like a lot of things are happening in space these days. But is that going to be a great growth business?

MR. HAYES: It is – it's probably our fastest-growing segment within all of Raytheon Technologies. Space is multifaceted. There is, of course, communications satellites that go up every day. There is the sensing or radar satellites that track weather. There are satellites that we use for national security. We play in every aspect of the space business. And it is continuing to grow. Keep in mind, though, the Chinese are there, the Russians are there. Space is a crowded place today.

MR. RUBENSTEIN: And right now it is expected that – or, concerned that there's a new – something called a Space Force – the U.S. Space Force. What will they do, and how will that relate to what you do in space?

MR. HAYES: So the single greatest threat to national security would be a loss of satellite connectivity during a war. If you think about the reliance that you and I and everybody else has on GPS, for instance – and it's not just us. It's airlines, but it's also the Army, the Navy, the Air Force. Everyone relies on GPS for global positioning. We also, of course, rely on it for surveillance. The fear, of course, is in the early days of a war we would lose all of that – all of our sensing capability, all of our GPS assets. It would all go away. And so the question is, how do you protect those assets or how do you make them replenishable on a very, very short-term basis. And that's what we're working with the space – the new national space agencies. How do you defend your space assets?

MR. RUBENSTEIN: Now, to do all this you have to have security clearances so you know what is going on. So how many people have to have those security clearances? A very limited number of people could get their security clearances in your company, or how do you get that?

MR. HAYES: Well, we've got about 5,000 programs that we're working on every day, and about half of those require clearances. And clearances are very difficult to obtain. But it's all on a need-to-know basis. And so there's only a few of us within the company that have access to all of the different programs. Typically, what people do is they'll get cleared on an individual program but they'll have no idea what their neighbor might be working on. But it is the biggest bottleneck in terms of bringing people on is getting people clearance. And it's hard to do.

MR. RUBENSTEIN: Now, there's a lot of discussion about going back to the Moon. Are you involved with any effort to get back to the Moon or go to Mars? Is that part of what Raytheon does?

MR. HAYES: So we're involved in a lot of different things. The space station, for instance. We've been involved in the Apollo missions. We've done – we built – Collins business actually did the radio communications from Apollo 11 back to Earth. So we have – again we're a systems – a sub-system supplier to all of the various space programs that are out there. The idea of getting back to the Moon by 2024, interesting but, again, the key there is not necessarily to go

to the Moon for going to the Moon's sake. It is to use the Moon as a launching point for a final mission to Mars.

And the idea is you would mine minerals and extract water, use the water as the basis for fuel to make the journey to Mars. So this is not just a simple science experiment, like I would say Apollo 11 and all that was, to see can we do it. This is really a thought of how are we – are we going to position ourselves to do long-range exploration in space. And the Moon is the perfect place for that.

MR. RUBENSTEIN: It's often said, I don't know if it's true maybe you can tell us, that when Apollo 11 and Apollo 13, they went to the Moon, or tried to go to the Moon, the amount of computing power was less than the power that you have in your own cellphone today. Is that really true?

MR. HAYES: [Laughs.] Amazingly, yes. It is – even the thing about the space shuttle that was designed 20 years later, your laptop computer today has more computing power than the first space shuttle had. So, you know, and space travel will never be perfectly safe, but the technology that we can bring to bear today – I mean, orders of magnitude compared to what we had back in the '60s.

MR. RUBENSTEIN: Now, people for \$50 million they can go up in the space station, or something like that. Is that something that you highly recommend that people spend their \$50 million on, and going up in the space station for a couple weeks, or whatever it is?

MR. HAYES: Well, I guess there's a few people I can think of I'd like a one-way ticket into space, and I'm willing to pay \$50 million for. But for a joyride, it seems like you'd get more money out of buying a Ferrari.

MR. RUBENSTEIN: OK. So the last part of your business, the fourth one, is something called Raytheon Missiles and Defense, which is obviously part of your defense business. And let me ask you about one of the things that – during the, I think, the first Kuwait War and maybe later the Iraq invasion war, Israel had SCUD missiles shot at it, and they seemed to be shot down a lot pretty successfully by the Raytheon – I think it was called the Patriot system. So do you still have that Patriot system, if you can say, and is it better than it was before? It was pretty good then, but is it even better, or not?

MR. HAYES: It's certainly become much, much more effective. It's a franchise that's about 35 years old. And we're in the process of actually upgrading it one more time for a product that we just actually delivered to the government last year. And the new capability is phenomenal. The old Patriot system was a great system. What it does is it looks for low-altitude threats through a radar array, tracks them, sends the signal to a missile battery which then intercepts the incoming missile. The problem with the original Patriot system was that it looked out straight across the horizon, but did not have a 360-degree view of the battlespace.

We have developed something called gallium nitride chips. So if you think about silicon chips, that are the basis of all computers today, we are now using gallium nitride chips in the

latest version of the Patriot. This gives us about 10X the power of the previous Patriot system, allows us to get a 360-degree view of the battlefield, allows us to run much, much faster and come up with these firing solutions much faster. So it's an incredible product. Still in service today, will be probably for the next 35 years. But absolutely essential to the nation's defense.

MR. RUBENSTEIN: So, but if I understand it, there's no defense yet – maybe the Patriot system is – but I thought for intercontinental ballistic nuclear missiles that might be shot from Russia or from outer space, nobody can really intercept them yet. The Star Wars kind of concept that Reagan talked about. There's still no ability to kind of stop those missiles, is that right?

MR. HAYES: No, we actually – I'll give you a couple of examples. There's something called the THAAD System, which is Thermal High Altitude Area Defense System, which has been demonstrated to be able to intercept a ballistic missile in space. This past December we were working with the Missile Defense Agency and we actually demonstrated an intercept of an ICBM in space by a ship-based missile that we built.

What was interesting is this dummy ICBM took off from an atoll outside of Australia, it was flying towards the West Coast of the U.S. There was a destroyer positioned near Hawaii. There were sensors in space that we were able to use our system to track the launch, identify the trajectory, fed that information down to the ship, fed that information then into our – what's called the SM-3 missile system, and actually took off from the ship, intercepted the missile in space, and destroyed it.

It was – you know, amazing technology that we can do that today. And that was the first time ever that a ship-based missile intercepted an ICBM coming in from outer space. And again, if you think about the threat from a rogue state like Korea, this gives us unprecedented ability to protect not just the homeland but our allies as well.

MR. RUBENSTEIN: But is that in – that doesn't exist today. In other words, if North Korea sent a nuclear missile, if they could, to California, we don't – we can't use that system yet. It's not perfected, is that right?

MR. HAYES: No, well, it's in existence today. I can't really comment in terms of where or what –

MR. RUBENSTEIN: OK.

MR. HAYES: But we also have land-based systems that could intercept it too.

MR. RUBENSTEIN: OK. Let me ask you about aircraft engines. I forgot to ask you my favorite question. Aircraft engines are very noisy. And now when airplanes are flying over, I can always hear them and so forth. And why can't you have mufflers on these engines the way they do in cars? Cars muffle the engine noise. Why can't you do that?

MR. HAYES: So it's – you know, noise has been a continuous issue since the dawn of the jet age. Again, if you think about the basis of what a jet engine does, you're combusting fuel –

you're compressing air, combusting it with fuel, putting it through a turbine, and using that exhaust to create thrust. That's really loud. And if you ever were at a military air show, you know that is deafeningly loud – like 110 dB.

So the – we actually came up with a solution. For our latest version of our commercial engines, call them the geared turbo fan, we put a very large diameter fan on the front of a very small engine. And by having that fan do most of the work, provide most of the propulsion, you eliminate the noise associated with the turbine. So we've actually been able to reduce the noise footprint of our current commercial airplanes – this is the A320 family – by about 50 percent. We've also been able to eliminate about 50 percent of the emissions and reduce fuel burn by 16-17 percent. So there are solutions out there, but the older the engine the louder it's going to be.

MR. RUBENSTEIN: So I think I've read recently that you are involved with – or, Raytheon's involved with a – I guess it's called a hypersonic airplane, or a plane that goes three times the speed of sound, or something like that. Is there anything you can say about that? And will that ever be commercially viable in my expected lifetime?

MR. HAYES: [Laughs.] I'm sure you'll live a long time, David. But I think if you think about hypersonics, back in the – in 1958, Pratt & Whitney working with Lockheed Martin – or, Lockheed at the time, or Skunk Works – actually developed the SR-71, which was an aircraft used for aerial surveillance that could fly at three times the speed of sound – Mach 3. So the technology has been there to fly very fast. The problem, of course, is it consumes a lot of fuel and it's very expensive.

You know, fast forward to today we do not have a commercial supersonic aircraft in production anywhere. There is a demand – I'm not sure how big it is – for business jets to have supersonic capability. There's still the problem with the sonic boom and the inability to fly those supersonic airplanes over land. We think – we're working with some customers. We think that there are some solutions in terms of the way the fuselage is shaped. But I would say we are 10 years away from supersonic commercial travel.

Hypersonic, now you're talking about speeds of five to six times the speed of sound – so think about 3,500 to 4,000 miles per hour. We do not have an aircraft capable of those speeds today, but we do have weapons systems that are capable of reaching hypersonic velocities. And that is, again, if you think about the challenge from the Chinese and the Russians today – because they are actually ahead of us in hypersonics. They have fielded hypersonic weapons that not only can they go very, very fast, but they're also maneuverable, which makes it more difficult to intercept.

So our goal is to focus on how do we defend the homeland against hypersonic vehicles? Hypersonic commercial flight? You'd be better off spending the \$50 million and getting the joyride on the rocket, because that's probably the only time you're going to go hypersonic.

MR. RUBENSTEIN: Well, Vladimir Putin has said publicly a couple times he has some super new weapon that is going to be better than anything that anybody's ever seen and we can't defend against it. What is he talking about? Do you know?

MR. HAYES: It is a hypersonic missile. And they have claimed that that can travel roughly 6,000 miles an hour, which means it can get around the Earth, well, completely in four hours, but almost any target on Earth in less than two. Now, it's still not as fast as an intercontinental ballistic missile, which of course goes into outer space and then reenters. But again, it gives you the ability to maneuver on targets and is much less predictable than this ballistic missile. Is it defensible? Absolutely. I think – again, things that we're working on today with directed energy, taking a high-powered microwave energy burst and destroying the electronics in these things, is probably the way we're going to have to solve that.

MR. RUBENSTEIN: Now, when Sputnik was launched, I think in 1957, it was roughly the size of a basketball, more or less. It got a lot of attention and so forth, but it was relatively small. And that was the only thing in outer space, in terms of manmade. Now we have all these satellites all the time. Should I be worrying that the sky is going to be filled with too many satellites and that one day they're going to kind of start falling out of the sky and fall on me? Or is that a problem?

MR. HAYES: Well, today there are over 6,000 objects that are orbiting the Earth. In fact, we have a contract with NASA where one of our – some of our folks down in the D.C. area actually track 24/7 all of the objects that are in space, down to the size of a basketball. This includes anything – space junk – anything that's up there. And every day there is something that is decaying enough in orbit that it's coming back into the Earth's atmosphere. Generally, all of this is small and it all burns up before it hits the Earth. If you were to be so unlucky to get hit by a piece of space junk, I think you'd probably had better odds of winning Powerball.

MR. RUBENSTEIN: OK. So let me ask you this. Under President Trump the defense budget seemed to go up a fair bit. He seemed to like to increase it, and Congress went along with it, and the Pentagon was happy to accommodate everybody's interest in increasing the budget. Now President Biden, is he likely to increase the defense budget that much? And so if you're an aerospace defense company, are you likely to be able to grow as much as you did under Trump?

MR. HAYES: I've been asked that question a lot. And I think the key towards, you know, where the defense dollars goes is really tied to something called the National Defense Strategy. That is, where are we going to allocate our precious resources, in terms of technology, R&D, and procurement. We have tried to align our business such that we are well-positioned within the National Defense Strategy. The key, of course, is some programs will not survive.

I think – I don't think the Biden administration will be increasing defense spending, nor do I think they will decrease defense spending because the threat from China is real. And we have to maintain peer capability with the Chinese. But that also means that we're going to have to invest in new technologies to meet the Chinese and their technological – the technological advances. And we're going to have to sacrifice some other programs.

General Mattis³ – I’m sure you know Mattis – when he was sec defense he called us all – the defense contractors – in and he said: Quit selling me things that I can’t defend. He said, you know, right now we can’t defend many of our assets that are out there. They’re obsolete because of new technologies. And he said, you need to come up with new solutions to fight the next war, not what we won the last war with.

The problem with that statement, of course, is we all make our money selling the equipment that won the last war. So the defense industry itself has to rethink, I think, how procurement works and how we’re going to work with the Department of Defense to reallocate dollars from older technology to newer technology that we can defend and can be successful against the Chinese.

MR. RUBENSTEIN: So some people would say we only have a limited number of aerospace defense companies – Lockheed Martin, Northrop Grumman, General Dynamics, Boeing, and Raytheon Technologies, I guess, would be the main ones. Is that enough to really ensure competitive prices for the government? And do you think further consolidation is going to occur, or we’ve had enough consolidation?

MR. HAYES: I think we probably won’t see more consolidation. I think, again, there is competition. Every system that we bid for the Department of Defense or anything in the government, there is competition – be it from Boeing, be it from Lockheed, be it from Northrop, GE. L3Harris is also out there. There is robust competition. And again, it’s competition because the dollars are limited. We know what the defense budget is and we’re all going after that, trying to make sure that we get an opportunity to provide that next-generation solution.

MR. RUBENSTEIN: So let me ask you about a question you no doubt get asked many times. The aerospace defense industry is considered to be, let’s say, a white male kind of industry. You don’t see as many women, though there are some female CEOs. Northrop Grumman and was at Lockheed Martin and General Dynamics as well. But as a general rule of thumb, you don’t see that many women and you don’t see that many minorities. How is your company dealing with that, the ability to try to recruit more minorities and women into your workforce?

MR. HAYES: Hey, David, it’s a huge challenge. If you think about historically the leadership within the A&D community came out of the engine room of the workforce. We had 60,000 engineers and only 20 percent of that workforce was female. You know, less than 10 percent are people of color, Hispanic or otherwise. People of color are diverse. And the problem really starts from the fact that colleges are not graduating women in the same numbers they are men. In fact, about 17 percent of engineering graduates in the U.S. are women.

And so we need to address the pipeline issue. And that’s really what our focus is on, is getting girls interested in the STEM sciences or the STEM fields early on. We do that through Girls who Code. We do that through INROADS, which is an internship program. We do it through the National Academy Foundation, which was Sandy Weill’s brainchild to invest in inner city youth to get them interested in STEM. But the only way we’re going to solve the

³ James Norman Mattis is a retired U.S. Marine Corps four-star general who served as the U.S. Secretary of Defense from January 2017 to January 2019.

problem is to solve it at the front end, which is the pipeline. And that's where we're investing dollars.

Now, again, we're – we got some big goals out there for diversity. We're going to double – by 2030, we signed up for Paradigm for Parity, where half of our executives will be female. We're going to – we made a goal to double the number of representation of African Americans, people of color, of Hispanics, Asian – all of that by 2030. And we actually for the first time this last year incentivized our senior executives to hit those specific goals by making that a part of their annual bonus. Never done that before.

But the only way we're going to get their attention is if we put our money where our mouth is. So we're focused on it. It's going to take us some time. We got to build the pipeline. The good news is we're getting there. Not fast enough, but if we focus on it for the next decade we will get here.

MR. RUBENSTEIN: Well, let me ask you a bit about your background. Somebody who's watching this says: I'd like to be the CEO of Raytheon Technologies. I wonder how you get that job? How did – did you start out saying: I want to run a big, Fortune 500 defense – aerospace defense company? Where did you grow up and what was your interest when you were in high school?

MR. HAYES: Interesting. So I came from a town in western New York, outside of Buffalo, but I grew up in Williamsville. You know, very middle class. My grandfather was a plumber. My other grandfather was a machinist at Bell Aerospace, a staunch union guy. And my father, he was – graduated from high school, became a draftsman in a furniture company, and later went on to run the company. And he was really the inspiration for, you know, what you can do with hard work and common sense.

And so I always tell people, you know, God gave us all innate talent to do a lot of things. But he doesn't give it to you on a silver platter. You got to be willing to work for it. You got to have the right capabilities. And you got to prepare yourself for it. And so –

MR. RUBENSTEIN: So you – go ahead.

MR. HAYES: I say, when I went off to Cornell, right, and I was playing football and I thought, this is great. I was going to be a lawyer. Now, not that there's anything wrong with lawyers, David, but I quickly realized after a year at Cornell that the law – the legal profession was not for me. And so I transferred to Purdue University and I got my degree in economics with a minor in history. Unfortunately, I graduated in 1982 and there were no jobs. Unemployment was double digits at the time.

But fortunately, I was able to land myself a job at a public accounting firm. I went to school at night. I got my – I took accounting classes. I got my CPA. And I worked at Arthur Andersen from 1982 to 1989. And that's, you know, pure happenstance. It was I needed a job. I was willing to learn. And I think, again, that's the lesson, is just take those opportunities when they're out there.

MR. RUBENSTEIN: So were you a football star in high school and at Cornell, or not so much?

MR. HAYES: Not so much at Cornell. [Laughs.] But you know, in high school, you know, it was a great time in everybody's life. And you're playing football and, you know, you're doing well in school. And you get a chance to go off to Cornell University. And it was great. But again, I think the path to this job was never straight. I went from public accounting to an aerospace and defense company in Rockford, Illinois called Sunstrand. Moved to San Diego. We moved to Michigan City, Indiana. We moved to Rockford again, and then finally to Hartford. And again, I've had a number of different jobs, a number of different locations. And it's really just luck at the end of the day that puts you in the position to take these big jobs.

MR. RUBENSTEIN: So when you're running a big company like this you must have some time for rest and relaxation. What – are you a hunter, a fisherman, a golfer, a tennis player? Do you have any outside interests that are – you can mention?

MR. HAYES: So I'm a lousy golfer, although I do enjoy golfing. And I think that's probably most of the CEOs out there – none of us have time to really perfect our game, which is the frustrating part about it. Other than that, though, I've got three grandchildren that we like to spend some time with. And my wife actually took up the game of golf about three years ago, and so she and I get out and play nine holes just about every week when we're – when we're –

MR. RUBENSTEIN: And who has a lower handicap?

MR. HAYES: Well, it used to be me by a long way. And she's recently taken the game to the point where she is almost the same score as I am for nine holes. So it's a little humbling.

MR. RUBENSTEIN: So when do you expect that you will be back to the world of business the way we used to know it? Will you ever go back and travel as much as you used to, and do the things? Or do you think you're going to change the way you run the company?

MR. HAYES: I suspect I will be traveling a lot more than I did last year, probably never as much as I used to do. And I think fundamentally the office has changed. As I said, you know, we brought these companies together a year ago. We have never had a board meeting in person. I've never had a staff meeting in person. Everything's been virtual. And we have 32 million square feet of office space out there. I think, you know, we'll eliminate 25 percent of that in the next couple years, and people will have a hybrid working environment. They'll be in the office a day or two a week, but they'll be working remotely. And the efficiency of that is phenomenal. No commute, right? Just the ability to focus on work and get things done.

Most people, I think, enjoy the remote work-life balance. It's not perfect, but I think it is the wave of the future. And it will change how we all do business. I was on a call yesterday morning – or a Zoom meeting yesterday morning with the head of the Economic Development Board of Singapore, Dr. Beh. And two years ago I would have gotten on a plane for 20 hours and flown to Singapore for that meeting. Yesterday we were able to do that meeting from my

home, he was in his home. And we accomplished just as much over Zoom as we would have done in person.

MR. RUBENSTEIN: So everybody who rises up, becomes a CEO, I guess probably had a mentor and also has some observations of what the leadership traits are that enables one to get to the top. So did you have a mentor that helped you get to the top? And if somebody's watching and says: I want to be the next CEO of something like Raytheon Technologies, what would you recommend as a leadership quality they kind of perfect?

MR. HAYES: So I would say I have had a number of mentors over my career – whether it was in public accounting, or when I first went to Sunstrand, when I came to UTC when Sunstrand was bought back in 1999. And I have been very fortunate to have people, you know, with great leadership qualities. Steve Page was the CFO of UTC who took me under his wing when I came to UTC. George David later in my career. George was the former CEO. And I again, I think each one of them had some different lessons.

You know, George had 17 keys to the kingdom, he used to call them. My favorite one was don't let your ambition exceed your energy. Steve Page was I think more nuanced. And he said: Look, you need to treat everybody the way you expect to be treated. He said, but you have to be a great communicator. You have to have empathy. And you have to act with integrity, even when nobody's looking. And you got to act with a sense of purpose.

So there's no one particular quality that sets a great leader apart, but it's the amalgamation of all of those things together and having an authentic leadership style and being honest with people. Tough to do. But I think people appreciate the fact that if a leader will tell them the truth no matter what it is, it goes a long way to establishing the right kind of team dynamic.

MR. RUBENSTEIN: What do you think the business community, CEO community's observation is or interest is in what's going on in Washington? For example, the infrastructure bill that President Biden has proposed proposes an increase in the corporate tax rate. Nobody loves to have higher taxes, I suppose. Maybe Warren Buffett does, but most people don't. So do you think that the corporate community will basically stay out of that, or they'll lobby for some lower rate than he's proposed? Or what do you think the corporate CEO community, to the extent that it has one voice, might say?

MR. HAYES: So, David, I'm actually the chairman of the Business Roundtable Tax and Fiscal Policy Commission. And we have a lot of interest from the BRT members to try and deal with this proposed corporate tax increase. If you think about taking the rate from 21 to 28 percent, that's a 33 percent increase in corporate taxes. Just as importantly, taking the international rate from 10 ½ percent to 21 percent also puts our companies at a competitive disadvantage vis-à-vis our foreign competitors.

In my mind, it's a pretty simple discussion. If you want U.S. companies to invest in technology and innovation, you have to have incentives to do that here in the United States. Now, nobody expected the 21 percent rate out of the last tax act. I think we were all expecting a

kind of low 22, 23, 24 percent. But what was amazing is it has driven cash back into the U.S. It has driven investment. I spend about \$5 billion a year – Raytheon Technologies – on capital and R&D that I self-fund – \$5 billion a year. If the tax act that Biden has proposed were to pass, it's going to cost us about a billion dollars a year in cash taxes. That's a billion less than I could otherwise invest. So it means I'm going to have to reduce my investment budget by 20 percent.

I'm not sure that that's exactly what the president wants to have us do. So I think – you know, I saw Jeff Bezos came out and said, yeah, we should raise the corporate taxes – tax rate. Everybody needs to pay their fair share. That's – you know, I guess if you have \$180 billion it's easy to say that. But my shareholders would tell you that, you know, we want to invest smartly, but we have to do it within the confines of what we have available.

MR. RUBENSTEIN: OK. Now as you look at the economy today, it's projected that we're going to grow at 5 or 6 percent a year this year, which is obviously from a lower base from last year. Are you optimistic about the economy in the next year or two? Or are you worried about the large level of debt we are incurring, or inflation coming along? What are your concerns and what makes you optimistic?

MR. HAYES: Well, I think, you know, with unprecedented levels of fiscal stimulus, along with unprecedented accommodative monetary policy that the Fed is promulgating, I think we're going to have growth until the party stops, and that is when we see inflation. And again, inflation's been kind of a boogeyman for the last four years. Everybody that grew up in the '70s is deathly afraid of inflation. A little inflation's not a bad thing, but with all this stimulus, very, very cheap money, I think we are inviting inflation at some point. And the question will be can we put the brakes on it fast enough with the fiscal and the money policy to keep inflation at a reasonable level.

And it's – everybody loves to spend. It's easy to do. It's easy to give money away. I think you're going to see great growth in the economy this year. I think that's going to continue into next year's spending. And the question will be, when does it stop? And remember that, you know, Chuck Prince⁴ during the financial crisis, and his comment about, hey, you know, you got to keep dancing until the music stops and hope you have a chair. Well, let's hope we don't get into that situation again, and then we can have enough common sense to slow things down before it gets out of hand.

MR. RUBENSTEIN: So let's suppose the president of the United States called you and said: You're a great American. You're running a very good company. Why don't you come and serve my administration? Do you have any interest in ever going into government or being a Cabinet officer, or anything like that?

MR. HAYES: You know, David, I don't think I'm a very good politician because I tend to say exactly what's on my mind. And I'm not sure that that is conducive to a long life in the political arena. I would – of course, I think any of us, business executives, that was asked to serve would seriously consider it. But again, I think knowing your own limitations is also important in that regard.

⁴ Charles Owen "Chuck" Prince III is a former chairman and chief executive of Citigroup.

MR. RUBENSTEIN: So if somebody is watching this and they say: I'd like to, you know, invest in the aerospace defense industry, this seems like a good company, do you think your prospects are pretty good and the aerospace defense industry's prospects are pretty good for the next couple years for all the reasons you've discussed and things you know? Or would you say we should be more wary about the future for this industry?

MR. HAYES: Well, actually – well, look, if you were asking me this question a year ago when nobody was flying and there was no vaccine in sight, I would say we're in a tough spot. Today with the vaccine rollout as successful as it's been here in the U.S. and what's going on internationally, commercial aerospace is going to recover over the next couple of years. We've taken a lot of cost out of our business, a couple of billion dollars last year, about 20,000 people. That's going to make the business even more profitable as the business comes back. We've got a \$70 billion defense backlog. I actually feel great about the technology and the people that we've got. We've got a good hand here for the recovery that's coming. And even with the defense budget in flux, I still feel pretty good about the hand that we've got. So that's not what keeps me up at night.

MR. RUBENSTEIN: OK. And I would like to ask you as well about going forward. Employees want to come back to work but they're not vaccinated and they don't – for religious, or medical, or philosophical, or whatever reason – they don't want to be vaccinated, do you know yet how you're going to handle that? It's not an easy issue.

MR. HAYES: It's not. And I think it really – it will depend upon the individual. But we have highly encouraged all of our employees to get vaccinated. In fact, there is a small financial reward that people get for getting vaccinated. Kind of a – just a health-care benefit that they get some additional cash. So we're going to encourage people to get vaccinated. Some of our customers are actually requiring people to be vaccinated before our folks can visit. You know, those people will have to become vaccinated if they want to continue in their jobs.

But what we hope to do is to get at least 80 percent of our folks vaccinated. I think once we get to that level we'll have more or less herd immunity. And again, if someone chooses ultimately for religious reasons or medical reasons not to get vaccinated, we're going to have to respect that. But we're also going to have to make sure we can keep the rest of the employee base safe. So that could mean someone who's not vaccinated is never coming back to the office.

MR. RUBENSTEIN: So a final question I'd like to ask you is, you know, I've obviously been in the private equity world for a while, and it's a good world. But let's suppose somebody says I don't want to be in the private equity world. I want to be in the aerospace defense world. Do you think that's a good career path for people? And do you have children that went into that business, or your children didn't want to go into this business?

MR. HAYES: Well, I have – one of my sons is in the aerospace and defense business. He works a strategy job. My other son is at PricewaterhouseCoopers. And I would say, if you want to be in A&D, it is the most interesting place that you can work because we are literally changing

history with things that we're doing every day, coming up with solutions that nobody imagined were possible a generation ago.

I think this is the most – like, it's not biotechnology, but at the same time what I tell people is we are defending democracy around the world while connecting the world through commercial aerospace. Those are laudable goals. And I think people can wrap their minds around it. We have no troubling hiring. We hire thousands of people a year. People want to go do this stuff. It is interesting, stimulating. And it gives people a sense of purpose.

MR. RUBENSTEIN: OK. Greg, I want to thank you very much for giving us a look at your interesting company, and your background, your career. And I appreciate your giving us the time to do this. And I'm looking forward to those engines that are going to be quieter sometime in the near future, right?

MR. HAYES: They're out there already, David.

MR. RUBENSTEIN: OK. Thanks a lot.

MR. HAYES: Thank you so much.

MR. RUBENSTEIN: Thanks a lot. Bye.



Gregory J. Hayes
Chief Executive Officer
Raytheon Technologies Corporation

Gregory J. Hayes is the chief executive officer of Raytheon Technologies Corporation, responsible for leading an aerospace and defense company of 180,000 employees and \$64 billion in annual sales.

Also serving as a member of the company's board of directors, Hayes had a nearly 21-year career at United Technologies Corporation, holding several senior leadership roles across finance, corporate strategy and business development, culminating with his appointment to chief executive officer in 2014 and chairman in 2016.

As CEO, Hayes led the reshaping of UTC from industrial conglomerate to focused aerospace company. Beginning with the divestiture of Sikorsky Aircraft in 2015 and the acquisition of Rockwell Collins in 2018, Hayes continued to focus the business with the spinoffs of Otis

Elevator Company and Carrier Corporation in 2020. Hayes then led the merger of UTC's remaining aerospace businesses, Pratt & Whitney and Collins Aerospace Systems, with Raytheon Company, to form Raytheon Technologies in April 2020.

Hayes, who joined UTC in 1999 through its merger with the Sundstrand Corporation, also served as UTC's chief financial officer from 2008-2014.

Hayes holds a bachelor's degree in economics from Purdue University and is a Certified Public Accountant.