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Thank you, Charlie, for that generous introduction. One of the pleasures of my current job is that I get to work with a lot of very talented and dedicated people. But few of those are genuine national heroes. You, Charlie, are an obvious exception, and I cannot imagine a more qualified leader, or a more decent human being, to be holding the reins of NASA at this pivotal time—a time when the agency itself is entering a new and historic trajectory.

So I commend you, Charlie, for all the hard work you have done and are doing—and for the good guidance and inspiration you are providing to all the dedicated women and men of NASA who you lead. It is truly an honor for me to be working with you.

I also want to thank the American Astronautical Society for the invitation to speak at this symposium honoring the memory and accomplishments of one of the great pioneers of space flight. In his high school valedictorian speech, the future Dr. Goddard made a profound and, for him, personally prescient observation. He said the *“dream of yesterday … is the hope of today … and the reality of tomorrow.”* I don’t think that even Goddard himself at that young age could have predicted just how important his own contributions would be to transforming the dream of space flight into the hope of his day and the reality of 21st century space travel.

But of course Goddard’s dreams of multi-stage and liquid rocketry ultimately did become real, and his insights remain central not only to the conceptual foundation of launch technology today but also to some of humankind’s most remarkable feats, including repeated visits to our Moon and the spectacular melding of brute force combustion and precision engineering that has sent probes to distant planets and to the farthest boundaries of the Solar System.

Now some of you may not know that my appreciation for Goddard’s achievements, and really for everything NASA stands for, is much more than just a part of my professional portfolio as science and technology advisor to the President. Space is, in fact, personal for me. I was making solid rockets out of my mother’s discarded lipstick tubes at age 10. I watched Sputnik pass overhead, with a mix of awe and concern, at 13. And at 17, I realized my dream of starting studies in aeronautics and astronautics at MIT, and shook the hand of C. Stark Draper at the department chairman’s reception for the incoming freshman class. Our senior class trip, also led

by Doc Draper, was to Cape Canaveral, where we saw the Saturn V Assembly Building and the enormous crawler that would carry the Saturn V to its launching pad. And our senior class project, of which I was co-leader, was to design a manned mission to Mars.

As we all know, I and my colleagues of the day did not exactly get everything figured out. There are, I confess, a few remaining problems relevant to a human mission to Mars that are still waiting to be satisfactorily solved. But I mention this to assure you that even as I work with Charlie and others to help with the revitalization of NASA and its space program, I do so knowing something about the excitement and the frustration that is so much a part of the fiber of all of you in this audience.

Eventually my career path branched out to other interests, but I have never forgotten where I first cut my teeth in science and technology—in the space community. And it is one of my pleasures in the White House to convey and nurture that enthusiasm—to be an evangelist of sorts for our continued efforts to reach for the stars.

And the case for space is an easy one to make, of course. For those Americans who remain inexplicably Earth-centric—the landlubbers of the 21st century—we can at least make the point that space provides a unique and indispensable platform from which to better understand our planetary home.

It is the only place from which we can realistically acquire many types of scientific data regarding our world, and the perspective space offers allows us to see things *on* Earth that we can't see *from* Earth. Whether it is about weather and climate, agricultural and land-use trends, urbanization and night-time illumination, or ocean and atmospheric chemistry, the data and measurements obtained from this vantage are central to the task of learning more about ourselves and our biologically, geologically, and anthropologically dynamic planet.

For others, space activities are justifiable because of their strategic importance. By strategic I am not referring only to the many national security capabilities that today rely upon space—though, to be sure, America's military prowess has never been more dependent on the capabilities offered by space. I am also referring to the various space technologies that have become integral to our economy and our quality of life. Whether we're talking about space-based positioning, navigation, and timing; or weather forecasting and disaster response; or telecommunications, urban planning, or other fields; space technologies have become key enablers of our way of life.

A third rationale is that the engineering challenges posed by the extreme environment of space fuel intensive innovation, and support the development of new technologies

that can benefit a wide range of unrelated endeavors. I will not give an exhaustive list here, but numerous examples exist including medical imaging technologies, advanced water purification equipment, smoke detector systems, and a variety of high-performance materials. This portfolio of products and activities not only helps chart a new path forward in space, it also helps us here on Earth by investing in the skilled jobs and industries of the future.

And then of course there is the rationale for reaching skyward that is perhaps least practical in terms of immediate payoffs but most compelling for many people both inside and outside the space community: the irrepressible human longing to venture into the unknown, to stretch beyond the comfort zone, to explore frontiers and, once we've explored them, to look further to the next horizon and strike out to see what lies beyond that one as well.

This is the human legacy of the world's sailors, whether it's the Argonauts of Greek mythology, or their real-life brethren who for centuries risked their lives at sea, or their cosmic heirs who are today riding on ships of carbon-fiber and steel, our astronauts, cosmonauts, and taikonauts.

And though I just conceded a moment ago that this urge to surge into the great unknown may be as much a matter of restlessness as rationality, I want to temper that sentiment with a recognition that, in fact, there is something further and very practical emerging from our repeated efforts to break free of Earth—a level of international cooperation and collegiality that just might not have happened had we kept our gazes to the ground, where borders and fences keep our vision small. I am talking of course about the marvel of the International Space Station (ISS), orbiting a few hundred miles above us, which last year celebrated 10 years of continuous habitation by brave men and women representing far-flung regions of our planet.

The ISS may be one of the most complex engineering feats ever undertaken by humankind, yet it was, in a sense, inevitable if we or any nation were to succeed in the dramatic act of setting up shop in near-Earth orbit. Sure there are great voyages of discovery being sponsored by individual nations all the time—to the depths of the oceans and the interiors of barely explored jungles and ice sheets, where new species continue to be tallied every year and new phenomena uncovered. But none of these environments is as physically unforgiving or as economically daunting to explore as space, and so none has served as a crucible for international collaboration as much as space has.

And look what has been created in that crucible. The central conceit of the early episodes of *Star Trek*—that exaggeratedly internationalized crew, almost more

fantastical than space travel itself in the 1960s—has become a reality on the ISS, with residents from the United States, Russia, Europe, Japan, and Canada serving aboard this orbiting outpost at various times. Similarly, the beauty of a free-wheeling complex of well-appointed living quarters so playfully imagined by Stanley Kubrick's *2001: A Space Odyssey* is, a decade after that no-longer-futuristic date, something of a reality, floating above us as a tribute to the remarkable things nations can achieve when united in common purpose.

So in the course of satisfying that arguably non-strategic goal of simply going further out than we've ever gone before—of, in effect, running away from home—we have made genuine progress toward achieving the ultimate domestic strategic goal of learning to live and work together with our brothers and sisters around the world. Overcoming differences in language, culture, and even national systems of measurement, we built something that rivals the greatest engineering feats of civilization.

And remarkably enough, as *Discovery*'s final commander, Colonel Steve Lindsay, summed up on a phone call to the President earlier this month from orbit: "...you know what? Everything fit the first time..."

Now I can tell you that, as much as he enjoyed it, the President did not need that phone call to appreciate what a remarkable achievement the space station is, or to appreciate the value of the space program more generally. And I want to take a few minutes here to convey to you what I have the privilege of seeing first hand on a regular basis: the degree to which the President not only understands the importance of this endeavor but genuinely revels in all that NASA does.

One obvious indicator of the President's commitment is his National Space Policy, which was released last June and which contains several re-calibrated objectives and themes aimed at buttressing our activities in space while also seeking to preserve the space environment and increase international cooperation. Work will continue this year to further review and update Administration space policies in the specific sectors of space transportation, commercial remote sensing, and space-based positioning, navigation, and timing.

But equally important is the President's commitment to NASA itself. NASA is central to this Nation's stance on space, and that agency continues to be a very high priority for this Administration as it has been since Day One—for all the reasons I stated earlier, including the economically compelling rationale that NASA is a time-tested generator and testbed for innovation and discovery.

Now some may think that the best way to show an agency you love it is to leave it alone to keep doing what it's been doing, but obviously that was not how the President and this Administration showed their affections. What I believe the space community has begun to realize by now, however, is that the shifts in emphasis and direction that have been rippling through NASA and the Nation's space program over the past couple of years represent important, necessary, and positive changes.

President Obama, Charlie Bolden, and many others—including myself—invested a great deal of time and thought before settling on a path forward for NASA last year—a path important enough that the President chose to describe it personally to the men and women of NASA and many members of the space community in an historic speech he delivered at the Kennedy Space Center last year. I can tell you from my many meetings with the President leading up to that day and in the weeks and months since, these changes are a reflection not of frustration or retreat, but rather of just how much he and others in this Administration care about our future in space.

Too much of NASA's spectacular potential has been squandered in the past due to poor planning or unrealistic scenarios. This Administration's commitment has been to look hard at the evidence, including a realistic assessment of technical and financial challenges, and then to make rational decisions that we, as scientists and engineers, can be proud of. This is the only way to put NASA on a stable and sustainable path going forward – one that can nurture the very best of NASA, her engineering prowess, imagination, and agility—and achieve meaningful goals in an affordable way.

By the way, this kind of transformation is happening across the board in the Obama Administration. The President has committed to reforming the way government works by increasing efficiencies, rethinking the way the government does business, and being smarter about our use of technology, procurement methods, and best practices. NASA can be a leader in this transformation, and I encourage all of you in the space community to support this goal.

You all know better than most that this is exactly the kind of challenge that the space community has faced, and overcome, before—dating all the way back to the Space Race and up to the second Return to Flight for the Space Shuttle program. But it is important that we come together and tackle these challenges in a united way, with common purpose and dedication to common goals. We must be able to put differences aside and push toward our national goals.

Now let me take a few minutes here to discuss another way to appreciate the Administration's commitment to NASA and to space: by checking out the President's proposed budget for 2012, which funds the key themes and elements of the NASA Authorization Act of 2010 within the context of Administration priorities. I know that many of you have studied the budget request in detail already. But to quickly summarize, these priorities include:

- Extending the ISS effort until at least 2020 and supporting the goal of using this research outpost effectively. As the President proposed, the ISS can be a platform to further science and technology innovation, foster the creation of new industries, and help advance human exploration;
- Initiating a heavy-lift vehicle development effort to support exploration missions
- Reinforcing an approach to human space exploration that will enable us to reach a range of destinations including Lagrange points, near-Earth asteroids, the moons of Mars, and eventually Mars itself;
- Initiating a new space technology program to increase the capability and decrease the cost of NASA, other US government, and commercial space programs. Critical to deep space exploration will be the development of breakthrough propulsion systems and other advanced technologies that can only be developed through a reinvigorated NASA space technology portfolio.
- Continuing to fund robust programs in Earth and space science, as well as aeronautics research, as part of a balanced investment approach across all NASA mission areas;
- And lastly I'll mention that we are helping to advance a U.S. commercial crew transportation industry that can become the primary means of access to the ISS, thus harnessing our Nation's entrepreneurial energies in more effective ways and creating new jobs while also meeting an important national need.

Early on, I know, some doubted this approach. Some, I know, remain skeptical, which is the prerogative of evidence-demanding creatures. But again, let's live up to our standards as rational scientists and engineers and recognize that a growing body of evidence indicates that these firms are proving themselves remarkably capable, as

indicated by the ever-increasing number of successful commercial launches and also recent test launches of new capabilities.

Of course, space launch remains challenging and we can not take safety or reliability for granted. Failures can and will happen, and this is why appropriate oversight by NASA will be important in achieving these goals.

In closing, I want to reiterate how optimistic I am about the future. Now, after all my talk about evidence-based thinking, this may seem like a break from sanity. Financial constraints are ominous, I know. We have just two more Shuttle launches ahead of us, after which we will enter a period of dependency upon others for access to low-Earth orbit and the ISS. Clearly, we are at a point of inflection in our space exploration and science activities.

And yet, we have found ourselves at such crossroads before. And upon reflection and analysis, we have inevitably found new and meaningful directions to pursue, and we have achieved ever greater goals. If we stick together, if we put our heads together, if we remember the higher aspirations that we share, I am confident this community can do so again. We will build on the space program's singular capacity to advance scientific discovery, stimulate technological innovation, enhance international leadership, buttress our economic vitality and strength, and inspire future generations of scientist and engineers.

In fact, let's not forget that even as we work together toward this future, we are accomplishing great things every day. Just last week, a 1,000-pound spacecraft launched six-and-a-half years ago became the first ever to enter orbit around Mercury. We have multiple spacecraft operating on and around Mars. The Mars Exploration Rover "Opportunity," designed to operate for 90 days, is still functioning and sending back data after seven years. And a robotic spacecraft has traveled over half the distance to Pluto and will be the first to study that body and its moons in detail.

Meanwhile, earlier probes are heading toward interstellar space, having passed the planets and become the most distant human-made objects from Earth – all while still sending data streams that further science. The Hubble Space Telescope continues to return images that astound us and help advance our understanding of the universe. And the path-breaking ISS is coming to full utilization. All indications are that America's presence and reach in space will only grow in the years ahead.

The President and I stand with you in the pursuit of that future. As the President said in his speech at the Kennedy Space Center:

I am 100 percent committed to the mission of NASA and its future. Because broadening our capabilities in space will continue to serve our society in ways that we can scarcely imagine. Because exploration will once more inspire wonder in a new generation -- sparking passions and launching careers. And because, ultimately, if we fail to press forward in the pursuit of discovery, we are ceding our future and we are ceding that essential element of the American character.

So I thank you all for devoting yourselves to the cause of space exploration. It really is an honor to be a part of this devout group of forward-thinking individuals, and I thank you for the opportunity to speak here. I look forward to your questions.