

**A REVIEW OF THE SPACE LEADERSHIP  
PRESERVATION ACT**

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**HEARING**  
BEFORE THE  
SUBCOMMITTEE ON SPACE  
COMMITTEE ON SCIENCE, SPACE, AND  
TECHNOLOGY  
HOUSE OF REPRESENTATIVES  
ONE HUNDRED THIRTEENTH CONGRESS

FIRST SESSION

WEDNESDAY, FEBRUARY 27, 2013

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# CONTENTS

Wednesday, February 27, 2013

Witness List .....	Page 2
Hearing Charter .....	3

## Opening Statements

Statement by Representative Steven M. Palazzo, Chairman, Subcommittee on Space, Committee on Science, Space, and Technology, U.S. House of Representatives .....	5
Written Statement .....	6
Statement by Representative Donna F. Edwards, Ranking Minority Member, Subcommittee on Space, Committee on Science, Space, and Technology, U.S. House of Representatives .....	6
Written Statement .....	8
Statement by Representative Lamar S. Smith, Chairman, Committee on Science, Space, and Technology, U.S. House of Representatives .....	9
Written Statement .....	10

## Witnesses

### PANEL I

The Honorable John Culberson, Member, House Appropriations Committee, U.S. House of Representatives	
Oral Statement .....	11
Written Statement .....	14
The Honorable Frank R. Wolf, Chairman, Subcommittee on Commerce, Justice, Science, and Related Agencies, House Appropriations Committee, U.S. House of Representatives	
Oral Statement .....	17
Written Statement .....	19

### PANEL II

Mr. A. Thomas Young, Executive Vice President (Ret.) Lockheed Martin Corporation	
Oral Statement .....	24
Written Statement .....	27
Mr. Elliot Pulham, Chief Executive Officer, The Space Foundation	
Oral Statement .....	35
Written Statement .....	38
Discussion .....	45

## Appendix I: Answers to Post-Hearing Questions

Mr. A. Thomas Young, Executive Vice President (Ret.) Lockheed Martin Corporation .....	58
Mr. Elliot Pulham, Chief Executive Officer, The Space Foundation .....	60

IV

**Appendix II: Additional Material for the Record**

Page

Space Foundation report Submitted by Mr. Elliot Pulham .....	66
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**A REVIEW OF THE SPACE LEADERSHIP  
PRESERVATION ACT**

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**WEDNESDAY, FEBRUARY 27, 2013**

HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON RESEARCH  
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,  
*Washington, D.C.*

The Subcommittee met, pursuant to call, at 10:05 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Steven Palazzo [Chairman of the Subcommittee] presiding.

LAMAR S. SMITH, Texas  
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas  
RANKING MEMBER

**Congress of the United States  
House of Representatives**

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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Subcommittee on Space

*A Review of the Space Leadership Preservation Act*

Wednesday, February 27, 2013  
10:00 a.m. to 12:00 p.m.  
2318 Rayburn House Office Building

Witnesses

Panel 1

**The Honorable Frank Wolf (VA-10)**

**The Honorable John Culberson (TX-07)**

Panel 2

**Mr. A. Thomas Young**, Chair of the Board for SAIC (testifying on his own behalf)

**Mr. Elliot Pulham**, Chief Executive Officer, The Space Foundation



**SUBCOMMITTEE ON SPACE  
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY  
U.S. HOUSE OF REPRESENTATIVES**

*A Review of the Space Leadership Preservation Act*

February 27, 2013  
10 a.m. – 12 p.m.  
2318 Rayburn House Office Building

**Purpose**

At 10:00 a.m. on February 28, 2013, the Subcommittee on Space will hold a hearing titled “*A Review of the Space Leadership Preservation Act*” to receive testimony on legislation (H.R. 6491) first introduced in the last Congress and to be re-introduced this week for the 113<sup>th</sup> Congress. This hearing will inform the Science, Space, and Technology Committee’s consideration of the policies, organization, programs, and budget in re-authorizing the National Aeronautics and Space Administration in this Congress.

**Witnesses**

**Panel 1**

- **The Honorable Frank R. Wolf**
- **The Honorable John Culberson**

**Panel 2**

- **Mr. A. Thomas Young, Chair of the Board for SAIC (testifying on his own behalf)**
- **Mr. Elliot Pulham, Chief Executive Officer, The Space Foundation**

**Overarching Questions**

- What are the key challenges facing NASA today?
- What organizational changes might be made to ensure more stability for our nation’s civil space program?
- Should NASA’s management structure be modeled after other agencies, such as the National Science Foundation, to provide more consistency in goals and constancy of purpose?

**Background**

Due to the over-riding concerns about a lack of stability in the vision and purpose of NASA’s human spaceflight program over many decades as well as so many human spaceflight programs

being canceled at a cost of an estimated \$20 billion,<sup>1</sup> the Space Leadership Preservation Act seeks to:

- Institute a 6-year term for the NASA Administrator, similar to the Director of the National Science Foundation.
- Create a Board of Directors chosen by the Administration as well as House and Senate leadership made up of former astronauts and eminent scientists. The Board would be responsible for:
  - Preparing a budget submission approved by the Administrator and submitted concurrently to House and Senate Appropriations and the president.
  - Recommending three candidates for NASA Administrator, Deputy Administrator and Chief Financial Officer to be considered by the President when submitting a nominee to the Senate for confirmation.
  - Preparing a quadrennial review of space programs and other reports, to include annual reports assessing the status of NASA infrastructure and workforce.
- Allow for long term contracting for rocket propulsion systems and manned and unmanned space transportation vehicles and payloads, including expendable launch vehicles, and related services. This authority is currently provided to the Air Force for Evolvable Expendable Launch Vehicles (EELV) and is modeled after current U.S. Navy practices for designing and building new submarines and ships.

There are several current reports that similarly point to the need for changes to NASA's management structure and overall agency mission objectives. In December 2012, the Space Foundation issued a report, *Pioneering: Sustaining U.S. Leadership in Space*.<sup>2</sup> This report called attention to the need for a clearly defined purpose for NASA and offered recommendations that would stabilize NASA leadership and planning, streamline the national civil space enterprise and stabilize NASA funding.

As the Science Committee begins the process of reauthorizing NASA, this hearing will take a comprehensive look at how the Agency functions, and considering possible legislative proposals, such as the *Space Leadership Preservation Act*, to improve NASA's management structure and accountability.

<sup>1</sup> <http://culberson.house.gov/reps-culberson-wolf-posey-and-olson-introduce-the-space-leadership-act/>

<sup>2</sup> [http://www.spacefoundation.org/sites/default/files/downloads/PIONEERING\\_Exec%20Sum.pdf](http://www.spacefoundation.org/sites/default/files/downloads/PIONEERING_Exec%20Sum.pdf)

Chairman PALAZZO. The Subcommittee on Space will come to order.

Good morning. Welcome to today's hearing entitled "A Review of the Space Leadership Preservation Act." In front of you are packets containing the written testimony, biographies and required Truth-in-Testimony disclosures for today's witnesses. I recognize myself for five minutes for an opening statement.

I would like to welcome everyone to the Space Subcommittee's first hearing of the 113th Congress. I am honored to chair this Subcommittee, and although our name has been abbreviated, our focus and commitment to providing leadership and oversight over our Nation's aerospace, aeronautics, science and human spaceflight programs remain as strong as ever.

I am more than pleased to be partnering on the Subcommittee with Representative Donna Edwards of Maryland as our Ranking Member. Her voice on issues of critical importance to this Subcommittee is valued and respected by colleagues, industry and the space community, and certainly by me. I look forward to working with you, Ms. Edwards.

I would like to offer a welcome to all our new and returning Members to this Committee. I am proud to chair not only the Science Committee's largest Subcommittee but also one that addresses issues that reflect the interest and passion of so many Members of Congress.

And no issue we will discuss will garner more debate, nor should it, than our efforts to reauthorize the National Aeronautics and Space Administration. It is the mandate for this Subcommittee to be a critical player in writing and shaping that piece of legislation. I also want to thank full Committee Chairman Lamar Smith for his leadership and trust in doing so.

Working with the Chairman, with our full Committee Vice Chair Dana Rohrabacher, and with our Subcommittee Vice Chair Mo Brooks, who I had the privilege of spending time with last week in Huntsville visiting the Marshall Space Flight Center, we are ready for the critical work ahead. That work begins with today's hearing as we consider the principles proposed by Congressmen John Culberson of Texas and Frank Wolf of Virginia in their legislation entitled "The Space Leadership Preservation Act." They have offered us a proposal for many of the challenges facing our Nation's space agency. Through the authorization process, we look forward to working together to implement those ideas which will or may benefit the agency in the long term.

The missions that NASA should be focused on are complex, they are expensive, and they are long term. Too often, decisions made, whether by Congress, by the Administration or within the agency itself, hamper and undermine the necessary commitment to programs and projects that require patience and stability instead of uncertainty and shortcuts.

Today's hearing begins a conversation about how we can work together as a Subcommittee, Democrats and Republicans, Members of the House and Senate, and with industry, academia and the next generation of aspiring space explorers to ensure our Nation remains firmly fixed on an ambitious and worthy space program. Even in these times of 11th-hour deals and manufactured crises,

we must look to provide leadership for a long-term goal for NASA and our Nation. In doing so, we will preserve America's hard-earned and well-deserved place as the global leader in space exploration.

Thanks again to our witnesses for appearing before us this morning.

[The prepared statement of Mr. Palazzo follows:]

PREPARED STATEMENT OF SUBCOMMITTEE ON SPACE CHAIRMAN STEVEN PALAZZO

Good morning. I'd like to welcome everyone to the Space Subcommittee's first hearing of the 113th Congress. I am honored to Chair this subcommittee and although our name has been abbreviated, our focus and commitment to providing leadership and oversight over our nation's aerospace, aeronautics, science and human spaceflight programs remain as strong as ever.

And if you are speaking of strength in leadership, I am more than pleased to be partnering on the subcommittee with Representative Donna Edwards of Maryland as our Ranking Member. Her voice on issues of critical importance to this subcommittee is valued and respected by colleagues, within industry and the space community, and certainly by me. I look forward to working with you Ms. Edwards.

I'd like to offer a welcome to all our new and returning members to this committee. We should take it as a point of pride that our subcommittee, the largest of the subcommittees of the Science, Space, and Technology Committee, reflects the interest and passion of many members of Congress in the issues we will be addressing.

And no issue we will discuss will garner more debate, nor should it, than our efforts to reauthorize the National Aeronautics and Space Administration (NASA). It is the mandate for this subcommittee to be a critical player in writing and shaping that piece of legislation. And for his leadership and trust in doing so, I thank full committee Chairman Lamar Smith, whose dedication to putting NASA on a path toward success is without compare.

Working with the Chairman, with our Full Committee Vice Chair Dana Rohrabacher, and with our subcommittee Vice Chair Mo Brooks, who I had the privilege of spending time with last week in Huntsville visiting the Marshall Space Flight Center, we are ready for the critical work ahead.

That work begins with today's hearing as we consider the principles proposed by Congressmen John Culberson of Texas and Frank Wolf of Virginia in their legislation entitled, "The Space Leadership Preservation Act." They have offered us a proposal for many of the challenges facing our nation's space agency. Through the authorization process, we look forward to working together to implement those ideas which will benefit the agency long term.

The missions that NASA should be focused on are complex, they are expensive, and they are long term. Too often decisions made, whether by Congress, by the Administration or within the Agency itself, hamper and undermine the necessary commitment to programs and projects that require patience and stability instead of uncertainty and shortcuts.

Today's hearing begins a conversation about how we can work together—as a subcommittee, Democrats and Republicans, members of the House and Senate, and with industry, academia, and the next generation of aspiring space explorers—to ensure our nation remains firmly fixed on an ambitious and worthy space program. Even in these times of deadlines and cliffs, we must look to provide leadership for a long term goal for NASA and our nation. In doing so we will preserve America's hard earned place as the global leader in space exploration.

Thanks again to our witnesses for appearing before us this morning. I now recognize Ranking Member Edwards for her opening statement.

Chairman PALAZZO. I now recognize the Ranking Member, the gentlewoman from Maryland, Ms. Edwards, for an opening statement.

Ms. EDWARDS. Thank you, Chairman Palazzo, as we begin our first Subcommittee hearing of the 113th Congress, and I just want to say how much I am looking forward to working with you and with the Members of our Subcommittee. We do share a deep pas-

sion together for the work of the agencies we have responsibility for overseeing, and I am looking forward to the prospects of this Congress and us working together as I know we will.

We do have a lot on our plate during this Congress, including helping to set the future direction of the Nation's civilian space program through the upcoming NASA reauthorization, and like you, I consider NASA's space and aeronautics programs an integral part of America's innovation agenda, and I want to work to ensure that they remain strong and they are fit for the challenges of the 21st century.

This brings us to today's hearing. I want to start by joining you in welcoming all of our witnesses, including my good friend Chairman Wolf and Representative Culberson, the original sponsors of the Space Leadership Preservation Act of 2013, to give us their perspectives on what it will take for America's space program to remain preeminent and vital. I want to thank Chairman Wolf for your support and help also with the resources that are required for the James Webb Space Telescope, really important to both our districts.

The stated purpose of the bill would put it this way: "To ensure that the American space program will always be the best in the world, and to ensure that America will always be able to preserve and protect our leadership in the exploration of outer space and the high ground of the future." That is a sentiment that I want you to know that I share wholeheartedly and endorse, and I look forward to hearing your views, as I do the views of the witnesses on our second panel.

Very specifically, the bill seeks to set in statute the term of the NASA Administrator, to create a board of directors for the agency, and direct that board, among other functions, to create a budget for NASA that would be transmitted to the Congress each year in advance of the President's Fiscal Year budget request.

Now, it has been said that this bill attempts to model NASA's management on that of the National Science Foundation but I would note that there are differences between NASA and NSF. They are very different agencies. One of the NSF's main functions is to issue grants for research. NASA, on the other hand, is an R&D agency. It has multiple missions and development programs, and it has operational responsibilities for, among other things, the International Space Station. The National Science Board, which governs the NSF jointly with the Director, doesn't provide a budget to the Congress independently of the Director, as is proposed in this legislation. I would also note that a statutory term for the Administrator doesn't necessarily ensure stability at an agency but I am concerned about the stability of NASA, and I think it would be helpful to consider a term that spans Administrations and that does create the kind of management stability that is needed at the agency. Nonetheless, for example, the current NSF Director has announced his intentions to leave the NSF only two and a half years into his six-year statutory term. So that alone doesn't ensure that you have the kind of stability that all of us are seeking.

We have to also remember that NASA is not a business and can't operate as a business. It has different functions. Even though we want to see efficiency of taxpayer resources and we value those effi-

ciencies, we have to be clear about the distinctions between NASA and the work that it does in promoting our civilian space program and operating it and the work that a conventional corporation or business would do. So it is not a direct transferable model.

I also have questions about the implications of the proposals for the implementation of Congressional direction that is spelled out in legislation as well as potential unintended consequences, so I hope that we have an opportunity to explore those, and I do have some concerns right now for NASA, for the rest of the Federal Government and for the Nation as a whole as we try to figure out resources in what I believe is an already strapped resource environment for the space agency. Those questions are looming on us even as this week comes to a close.

And so while today's hearing will consider legislation that would stabilize NASA's direction, the sad truth is that we are in a Congress and we have to continually contribute to the agency's funding but we also contribute right now in this environment to its instability and to the mismatch of resources with expectations. If we expect NASA to do great things, and I know that all of us want NASA to do great things, want it to inspire this next generation, we know that its employees have to have the kind of stability that they need to do the oversight that is important, and my experience working out at Goddard Space Flight Center is that whether you are a contractor or whether you are a civilian employee, you work in the same environment, and all of us used to just say we work at NASA. We never made those distinctions, and I think that the way that we need to think about the agency has to reflect that.

Just a few months ago, as we all watched the Curiosity land on Mars, along with dozens, really, actually hundreds of young people over at Goddard Space Flight Center, their enthusiasm was electrifying. They are the Nation's future. Our agency has to reflect that future.

And with that, I would close. Thank you.

[The prepared statement of Ms. Edwards follows:]

PREPARED STATEMENT OF RANKING MINORITY MEMBER DONNA EDWARDS

Chairman Palazzo, as we start our first Subcommittee hearing of the 113th Congress, I'd just like to say how much I am looking forward to working with you.

We have a lot on our plate this Congress, including helping to set the future direction of our nation's civil space program through the upcoming NASA reauthorization.

Like you, I consider NASA's space and aeronautics programs an integral part of America's innovation agenda, and I want to work to ensure that they remain strong and fitted for the challenges of the 21st century.

Which brings us to today's hearing. And I'd like to start by joining you in welcoming all of our witnesses, including Chairman Wolf and Rep. Culberson, the original sponsors of the Space Leadership Preservation Act of 2013, to give us their perspectives on what it will take for America's space program to remain preeminent and vital.

Or as the stated purpose of the bill would put it: "To ensure that the American space program will always be the best in the world, and to ensure that America will always be able to preserve and protect our leadership in the exploration of outer space, the high ground of the future."

That's a sentiment I whole-heartedly endorse, and I look forward to hearing your views, as I do to the views of the witnesses on our second panel.

Specifically, this bill seeks to set in statute the term of the NASA Administrator, create a Board of Directors for the Agency, and direct that Board, among other func-

tions, to create a budget for NASA that would be transmitted to the Congress each year in advance of the President's fiscal year budget request.

It has been said that this bill attempts to model NASA's management on that of the National Science Foundation. However, NASA and NSF are very different agencies.

One of NSF's main functions is issuing grants for research; NASA, on the other hand is an R&D agency with multiple missions and development programs, as well as operational responsibilities for the International Space Station.

And the National Science Board, which governs NSF jointly with its Director, does not provide a budget to the Congress independently of the Director, as is proposed in this legislation. I would also note that a statutory term for the Administrator doesn't necessarily ensure stability at an agency. For example, the current NSF Director has announced his intention to leave NSF only two and a half years into his six-year statutory term.

Yet these proposals don't suggest to me improvement or models of agency administration, they suggest a desire to mimic how businesses are run, and I don't see the value in turning NASA into a business.

And while I also have questions about the implications of these proposals for the implementation of Congressional direction spelled out in legislation, as well as potential unintended consequences, I have a bigger concern right now for NASA, the rest of the Federal Government, and the Nation as a whole.

We are now days away from the possibility of drastic cuts caused by sequestration.

So while today's hearing will consider legislation that seeks to stabilize NASA's direction, the sad truth is, we in the Congress have and are continuing to contribute to the agency's funding instability and a mismatch of resources with expectations.

Year after year, NASA has had to redirect scarce resources and time to replan programs and projects, not because of instability at the top of the agency, but because of the uncertainties caused by flat or decreased funding for the agency, continuing resolutions, and, now the threat of sequestration.

If we expect NASA to do great things, as I know its employees can because they do so each and every day, then let's give it the resources it needs and when it needs them.

A few months ago, I watched Curiosity land on Mars, along with dozens of young people at the Goddard Space Flight Center. Their enthusiasm was electrifying; they are this Nation's future.

We can't let the passion and dreams of those young people evaporate due to our inability to adequately fund NASA.

And in that regard, Mr. Chairman, I think we need a challenging and compelling goal for our human space program, one that will allow our young people to know where we are aiming and when we want to get there. We need a goal that will bring out the best in us as a Nation, as great national challenges have done in the past.

NASA's future and its value both to our Nation and to the next generation are where I hope to focus this subcommittee's attention as we go forward in the 113th Congress.

I yield back the balance of my time

Chairman PALAZZO. Thank you, Ms. Edwards.

If there are Members who wish to submit additional opening statements, your statements will be added to the record at this point.

Okay. The Chairman does want to be recognized. I yield him as much time as he may need.

Chairman SMITH. Mr. Chairman, thank you for holding this hearing today, the Space Subcommittee's first of the 113th Congress. The work that you, Ranking Member Edwards and the Members of this Subcommittee do will have a lasting impact on our Nation's continued leadership in spaceflight. Every time we convene in this room, the phrase, "Where there is no vision, the people perish" should guide us, for those words from Proverbs are forever true.

Today, a question exists about NASA's vision, namely, whether there is one. But we must also recognize that even a vision, without a means to achieve it, can be fruitless and frustrating.

So today I would like to thank two of our colleagues who, in introducing the Space Leadership Act, continue to show leadership on behalf of our Nation's space program. My colleague from Texas, Congressman John Culberson, has been an advocate for exploration for many years and I look forward to working with him to see that many of the missions and priorities we share are accomplished. And a long-time personal friend, Representative Frank Wolf, holds a key position as chairman of the Commerce, Justice, Science Subcommittee on the House Appropriations Committee. Our working together will be critical to put NASA on the right track for long-term success. They come here today to offer suggestions and solutions to many of the challenges that NASA faces. We welcome their thoughts on this discussion.

NASA too often is hampered by short-term decisions that have a long-term negative impact. We must step back, look at the agency as a whole, and help put it on a path to achieve worthy goals on behalf of our Nation. I hope our work in this Congress will result in a vision we can all work toward to inspire future generations.

Thank you, Mr. Chairman. I yield back.

[The prepared statement of Mr. Smith follows:]

PREPARED STATEMENT OF CHAIRMAN LAMAR SMITH

Chairman Smith: Mr. Chairman, thank you for holding this hearing today, the Space Subcommittee's first of the 113th Congress.

The work you, Ranking Member Edwards, and the members of this subcommittee will do will have a lasting impact and ensure our nation's continued leadership in spaceflight.

Every time we convene in this room, the phrase, "Where there is no vision, the people perish" should guide us, for those words from Proverbs are forever true.

Today, a question exists about NASA's vision, namely, whether there is one. But we must also recognize that even a vision, without a means to achieve it, can be fruitless and frustrating.

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And a long time friend, Rep. Frank Wolf, holds a key position as Chairman of the Commerce, Justice, Science Subcommittee on the House Appropriations Committee. Our working together will be critical to put NASA on the right track for long term success.

They come here today to offer suggestions and solutions to many of the challenges that NASA faces. We welcome their thoughts and this discussion.

NASA too often is hampered by short term decisions that have a long term negative impact. We must step back, look at the Agency as a whole, and work to put it on the long term path to achieve worthy and inspirational goals on behalf of our nation.

I hope our work in this Congress will help clarify a vision we all can agree upon and work toward to inspire future generations.

Chairman PALAZZO. Thank you, Mr. Chairman.

Now, if there are any Members who wish to submit additional opening statements, your statements will be added to the record at this point.

At this time I would like to introduce our first panel of witnesses, which includes the two sponsors of the bill, the Hon. Frank Wolf, the Congressman from the 10th District of Virginia and chairman

of the House Committee on Appropriations Subcommittee on Commerce, Justice, Science, and Related Agencies, and the Hon. John Culberson, the Congressman from the 7th District of Texas and a Member of the House Committee on Appropriations.

I now recognize Chairman Wolf to present his testimony—okay then. Congressman Culberson, you are now recognized.

**STATEMENT OF THE HONORABLE JOHN CULBERSON,  
MEMBER, HOUSE APPROPRIATIONS COMMITTEE,  
U.S. HOUSE OF REPRESENTATIVES**

Mr. CULBERSON. Chairman Wolf, as always, is very gracious for this has been a team effort, and I want to thank you, Chairman Wolf, for all your hard work and support in this legislation and for NASA and the sciences. Thank you, Chairman Palazzo and Ranking Member Edwards, Chairman Smith, Chairman Hall, Mr. Rohrabacher, all the Members of the Subcommittee. It is a privilege to be here with you.

We are particularly honored that this is the first hearing that you had this year and to start off with what has truly been a labor of love for Chairman Wolf and I. We are all here in this room because we love NASA. We are devoted to space exploration and scientific discovery. We want to make sure America preserves its leadership role in the world as the best space program on Earth, and it is a strategic—it is absolutely essential for our strategic security that America be able to preserve and protect the high ground.

As you said, Ms. Edwards, this legislation is designed to achieve those goals, and by focusing on NASA governance, on trying to make the agency more professional and less political by giving them greater stability, as you said, by doing everything that we can as policymakers to encourage the professionals, the scientists, the engineers, the astronauts at that agency to do what they do best, and as much as we can do so, to get out of the way and help them achieve what they have done so well for all our lives.

I am a native Houstonian. Some of my earliest and best memories are of the space program. I don't really have any memory of Mercury but I certainly remember some of the early Gemini missions and the excitement of the Apollo missions. I got my first telescope when I was 12. I mean, this has been an important part of my life, and there is no other agency other than the Pentagon, the Defense Department, the Marine Corps, our wonderful men and women in uniform, there is nothing else the Federal Government does can really inspire the human heart, can lift people up and truly inspire whole generations of young people to be their best and to achieve beyond what they ever thought possible than NASA.

They have done a magnificent job for so long, but they have been hamstrung, as we all know, by pillar-to-post funding, the budget cycle that forces them as part of the Executive Branch to honor the budget request put forward by the President, and yet they know in the back of their mind that what they are really going to finally be able to spend is the money that Congress appropriates that we all agree to with Chairman Wolf's leadership and his generosity not only for the Webb Space Telescope, of course, but Frank has been an extraordinary friend of the National Science Foundation and NASA. In tough budget times, Chairman Wolf has protected the

funding that this Nation needs to invest in critical scientific research and NASA, and then the agency when we finally get the appropriations bill done is safe for another few months and another year.

We have watched this—I got here in 2001, and as I learned about the budget process, the appropriations process, the funding cycle and the pillar-to-post way that NASA has to operate, it just became increasingly unacceptable, and I provided you with a chart that I actually got from—I learned from Mike Coats, the Director at the Johnson Space Center, wonderful, good man, who has been with NASA about 25 years, recently retired, and Mike told me that in the 20 years he had been at NASA, he has seen, I think—I don't have it here in my testimony—I think it was about 25 programs created and canceled over that 20-year period that cost NASA about \$20 billion, and it is just unacceptable. You can imagine these people, these rocket scientists and engineers and astronauts that devoted their life to exploring space and they are given a chance to do it, and then the Congress or the budget rips it away from them. It is destructive to the morale of the space program, destructive to the psyche of the agency, destructive to the psyche of the country, and frankly, destructive to them achieving their mission and terrifically expensive in terms of dollars and cents wasted.

In analyzing this with Chairman Wolf's help, we came up with this concept based on the way—there is a couple of key pieces to this, Members, and I want to thank the Subcommittee staff for helping through this. But one of the most—a couple of the most critical pieces are that we need to give NASA the ability to design and build spacecraft and rockets in the same way that the Navy, for example, designs and builds submarines and aircraft carriers with stability and predictability. Not only will that obviously save money but allow the agency to focus those engineers and scientists on what they do best. The model for that, I think, is naval reactors. They are the gold standard as we have discovered, that when it comes to designing a nuclear reactor, paying for it and then building it under budget and right on target, naval reactors is the gold standard. And so we are looking to do that as well. I have eight seconds left. That is why you see the budget recommendation come from the professionals at NASA directly to Congress so that you and Chairman Wolf can actually see the honest numbers. What does the agency really think they need to achieve their goals? That is critical.

The other critical piece is you allow multiyear procurement on the solid rocket boosters. NASA can buy those over several years in the same way as the Navy when they buy engines or parts for aircraft carriers or submarines, there is multiyear procurement. That is critical. The term of the Director, certainly fluid. The idea is to model that after the FBI Director to overlap Administrations. The idea for the board of directors, modeled after the National Science Foundation so they would operate like the board of directors, for example, the policymakers at a school board or the National Science Foundation, for example. Here is the broad, general guidelines we think the agency needs to follow, leave that up to the agency Director, and obviously Congress would have the final say in where NASA is going. But again, leave it up to the professionals.

And the model there—and finally, I will quit with this and pass it to Chairman Wolf, that we are really—I really encourage the Committee to follow is the Decadal Survey for the Planetary Sciences. You get all the best scientists together in a room and they hash it out—where should America—where should the priorities be when it comes to the next space telescope or planetary exploration or Earth exploration or terrestrial outer gaseous, the giant planets, and they produce a list and we should follow that as policymakers where we have got the best and the brightest telling the Congress, telling the country here is what NASA's vision is and what we think, here is an honest budget submission, here is our goals as in the Decadal Survey, and here is an honest budget submission that we believe is necessary to achieve those goals that doesn't go through OMB, that doesn't go through the bean counters at the Office of Management and Budget, that is given directly to you, given directly to Chairman Wolf so we actually know what is necessary to keep America's space program the best in the world.

Thank you very much.

[The prepared statement of Mr. Culberson follows:]

**Congressman John Culberson**  
**Testimony before the Science Space and Technology Committee's Space Subcommittee**  
**Space Leadership Preservation Act**  
**10:00AM February 27, 2013**

Thank you Chairman Smith, Chairman Palazzo, and Ranking Member Edwards for scheduling this hearing to review the *Space Leadership Preservation Act* (H.R. 823). I am especially thankful to your staff for working with me on this legislation as we seek to make NASA more professional and less political.

It is unacceptable to allow our space program to atrophy because the vision, or lack thereof, changes with political whims from year to year. I have provided each of you with a chart that reveals we have spent over \$20 billion dollars in the last 20 years, more than an entire year of NASA's budget, on programs that have been started and then cancelled. That is unconscionable. Switching missions and vehicles every few years is a deadly cycle for our space program.

As Commander Neil Armstrong said during his last testimony to this Committee, "NASA itself, driven with conflicting forces and the dashed hopes of canceled programs, must find ways of restoring hope and confidence to a confused and disconsolate workforce. The reality that there is no requirement for a NASA spacecraft commander for the foreseeable future is obvious and painful to all who have, justifiably, taken great pride in NASA's wondrous space flight achievements of the past half century."

This legislation will make NASA more stable, accountable and responsive to the needs of the scientific community by creating a board of experts empowered to propose long term goals for space exploration. The board will submit a quadrennial review of all space programs and a vision for space exploration that ensures that we set reasonable goals and diligently work toward them. The board will not supplant the constitutional authority of Congress or the Administration, but it will add critical insight to the true needs of the agency. The board will prepare NASA's budget, and then administrator will concurrently submit the budget to Congress and the Administration. By doing so, we get a more transparent view of what funding NASA requires to stay on schedule.

This legislation also sets the term for administrator at 6 years. Having a set term for an administrator allows that individual to lead more boldly and lessens the likelihood that an administrator would be pressured politically.

Finally, this legislation extends the long range contracting statute to other spacecraft, a practice that currently applies to expendable launch vehicles, hopefully removing these large investments from the cycle of pillar to post funding. Allowing NASA to build spacecraft the way the Navy builds nuclear reactors would be a game changer. Naval Reactors have become the gold standard for procurement in terms of schedule and budget. Having the ability to plan for multiple years would allow NASA to save money and attain long term goals.

As you know, the United States currently depends upon the Russians to access the International Space Station (ISS) for our astronauts to the tune of \$63M per seat. While commercial providers

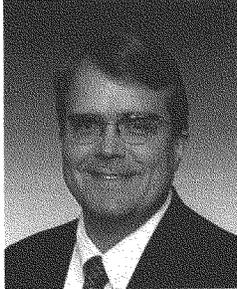
are now beginning to service the ISS with cargo, crew access is still years away. We are without access to space while other nations are investing heavily in their space programs with the goal to overtake us. China has already declared their intention to establish a base on the moon and is scheduled to do a "soft landing" on the moon later this year. They will likely have a manned mission by the end of the decade.

We cannot continue down this path. The *Space Leadership Preservation Act* will restore the NASA we knew when America landed the first man on the moon. Visionary NASA scientists, engineers, and astronauts will be able to inspire future generations by their continuing mission: to explore strange new worlds, to seek out new life, and to boldly go where no one has gone before.

I am honored to be here with you today and appreciate your time and attention to this legislation.

Thank you. Mr. Chairman, I yield back.

## Biography



John Culberson was elected in 2000 to represent the 7th District, a seat formerly held by President George H. W. Bush and House Ways and Means Committee Chairman Bill Archer. In Congress, John's priorities include strengthening the economy by cutting taxes, creating jobs, and balancing the budget; securing the border, advancing medical and scientific research; and improving Houston transportation.

John is a member of the House Appropriations Committee, which is responsible for funding the federal government. His position on the committee allows him to promote his vision for effective government – lower taxes, less regulation, and more local control. In 2011, John was selected to chair the

Subcommittee on Military Construction and Veterans Affairs. With the third largest subcommittee budget on the Appropriations Committee, John is committed to providing our military and veterans with the very best care and resources while eliminating inefficient programs.

In 2011, John was also selected to be the Vice Chair of the Homeland Security Subcommittee. John believes the lawlessness on the border requires immediate action, and in close cooperation with the Texas Border Sheriffs' Coalition, he continues to secure federal funding for the sheriffs to enforce existing law and provide the necessary support for our Border Patrol agents.

In addition to his leadership roles on two Subcommittees, John also serves on the Commerce, Justice and Science Subcommittee, where he's a tireless advocate for law enforcement and NASA.

John is also a zealous advocate for increasing our national investment in medical and scientific research. He recognizes that breakthroughs in these areas are vital to meeting the economic and technological challenges we face in the 21st century.

A life-long Texan, John Culberson earned his Bachelor of Arts degree in History from Southern Methodist University in Dallas in 1981. After college, he worked for his father's political consulting and advertising agency before earning a Juris Doctorate degree from South Texas College of Law in Houston. Before his election to Congress, he practiced law as a civil defense attorney with the Houston firm Lorange and Thompson.

In 1986, John was elected to the Texas House of Representatives while he was a law student. He spent 14 years in the Texas House and in his last term in 1999, he was selected by his peers to serve as Minority Whip.

He is best remembered in Austin for his successful effort to restore state control of the Texas prison system from a federal judge. After introducing and passing legislation in the Texas House, and drafting key pieces of federal law, John fought in court on behalf of his legislation and the ruling returned full authority over state prisons to the Texas Legislature.

Chairman PALAZZO. I now recognize Chairman Wolf for his testimony.

**STATEMENT OF THE HONORABLE FRANK R. WOLF,  
CHAIRMAN, SUBCOMMITTEE ON COMMERCE,  
JUSTICE, SCIENCE, AND RELATED AGENCIES  
HOUSE APPROPRIATIONS COMMITTEE,  
U.S. HOUSE OF REPRESENTATIVES**

Mr. WOLF. Well, thank you, Mr. Chairman, and thank you for the hearing.

This is not a partisan issue. The problem has been under both Republican and Democratic Administrations, and the original model too was also Director Mueller of the FBI, who has continued now and I think ends this August.

In the ten years since the tragic space shuttle Columbia accident and the decision was made to transition to a new human spaceflight system, NASA has had three different administrators and two completely different shuttle replacement programs. Because NASA's human spaceflight plans were yet again abruptly altered at the start of the Administration, the United States will now be without a shuttle replacement until 2017, more than six years after the retirement of the space shuttle, and that is just for this last decade.

When we first introduced the bill last fall, and it was really Mr. Culberson's idea, the National Research Council Committee charged with reviewing NASA's strategic direction, we asked them to look in a nonpartisan—I am not even sure who they were exactly but they were the top people. They were directed for the creation to come up with these recommendations. They think this fits in precisely with what they are looking at.

It does not surprise anyone on the Committee to know that the NRC Committee's final report, released late last year, found that NASA currently has no strategic direction. The problem has been significantly exacerbated with the cancellation of the Constellation program, which would have returned American astronauts to the moon. If you were to ask any NASA employee, astronaut, scientific or engineer or contractor, what the agency's top mission or goal is, you would get a confused look and you would get several answers. Some would say the moon, some an asteroid, others Mars, or as some would say, we are just really a technology development group.

I think we can all agree, it is hard to make progress toward any goal if we don't know where we are going, much less when and how we are to get there. This has plagued NASA. Again, this is not an attack on any Democrat or Republican or anyone. It has just plagued them really for the last 20 years.

By the time each Administration terminates the last program and gets its favored new strategy in place, years are lost and billions of dollars of tax dollars have been wasted, and each time it happens, the American people are no closer to having a world-class space exploration program that they have been promised. I expect that this decade will be the make-or-break moment for the U.S. leadership. Maintaining our leadership in space is critical because space remains the ultimate high ground for our national security.

It also has significant impact on the economy and on our competitiveness.

Notably, the NRC Committee found that no country shares the current Administration's interest in going to an asteroid. Instead, they all want to join an effort to go to the Moon. So the United States can either lead the effort or another country will step in in our absence, which I think would be very unfortunate, and that country is China, which is a direct threat to the national security of our country.

The reforms in the bill draw on the best practices of other agencies, Mr. Culberson said National Science Foundation, also the director of the FBI. It will ensure an administrator's term spans two Administrations, maybe two Republican Administrations, two Democratic Administrations, a Republican and Democrat, but that person will be in office long enough to be held accountable for long-term projects.

The board of directors concept is based on the National Science Board and there are similar boards in the FBI that kind of look at these things the same way. They are not given the notoriety but they are there. The direct budget submission to Congress is based on other agencies. Legal Services sends a budget directly to the Congress after they go to OMB. I think if we make these changes, the odds of American maintaining its preeminence in space for the 21st century will dramatically improve.

In closing, I know that NASA workforce and contractors are capable but you can't keep changing back and forth concepts, ideas and administrators, and so by having the six-year term and doing the other things, I think it would really be good for the country.

[The prepared statement of Mr. Wolf follows:]

**The Hon. Frank R. Wolf**  
**Testimony to the House Science, Space and Technology Committee on the**  
**Space Leadership Preservation Act**  
**February 27, 2013**

Mr. Chairman, thank you for the opportunity to discuss our bipartisan legislation, the Space Leadership Preservation Act.

In the 10 years since the tragic Space Shuttle Columbia accident and the decision was made to transition to a new human spaceflight system, NASA has had 3 different administrators and 2 completely different shuttle replacement programs.

And that's just in *the last decade* at NASA.

Because NASA's human spaceflight plans were, yet again, abruptly altered at the start of the Obama Administration, the United States will now be without a shuttle replacement until at least 2017 – more than 6 years after the retirement of the space shuttle.

Recognizing that we have a serious problem at NASA, I included language in the FY 2012 Commerce-Justice-Science Appropriations bill that required the creation of an independent panel to review NASA's strategic direction. The National Research Council was selected for this task and formed a committee last year charged with reviewing NASA's strategic direction. They produced a good report and hope this committee will keep their recommendations in mind as it develops the authorization bill this year.

It doesn't think it will surprise anyone on this committee, or the American people, to know that the NRC report released late last year found that NASA currently has no strategic direction -- a problem that has been significantly exacerbated with the cancellation of the Constellation Program, which would have returned American astronauts to the Moon.

Unfortunately, it's now abundantly clear that this abrupt termination has thrown the U.S. space program and industry into turmoil -- and made NASA an agency and workforce adrift.

If you were to ask any NASA employee -- astronaut, scientist or engineer -- what the agency's top mission or goal is, you would get a confused look and dozens of possible answers.

The Moon?

An asteroid?

Mars?

Or is NASA now simply a “technology development” funder, as this administration sometimes suggests?

I think we can all agree that it’s hard to make progress towards *any* goal if we don’t know where we’re going -- much less when and how we’re supposed to get there.

The American people deserve better.

And that’s why we have reintroduced this bill. I believe the reforms contained in this legislation represent an important step to fix the chronic political and programmatic instability that has plagued NASA over the last 20 years.

It’s clear that the cycle of program cancelations following the start of each new administration come at great cost to the taxpayers and grinds any progress made towards one human spaceflight system and mission to a halt.

By the time each administration terminates the last program and gets its favored new strategy in place, years are lost and billions of tax dollars have been wasted.

And each time this happens the American people are no closer to having the world-class space exploration program they deserve.

Over the last several decades, we may have had the luxury of idling in this cycle as each new administration scrapped and replaced programs. However, in the 21<sup>st</sup> Century, we face new challengers in space for the first time since the Apollo program in the 1970s.

For example, over the last 15 years the Chinese military has embarked on a steady and successful effort to build a human spaceflight program, rivaling steps only the U.S. and Russia have accomplished during the latter half of the 20<sup>th</sup> Century.

Some may scoff and proclaim that the Chinese will never catch up with us. And this might be true if we hadn’t squandered so many years scrapping and replacing exploration programs. But here we are.

I would also add that the Chinese haven’t been shy about stealing our sensitive technologies to help themselves jump the line even faster.

So today, while the U.S. still maintains a clear lead in space, we can no longer take that lead for granted.

In fact, I expect that this decade will be the “make or break” moment for American leadership in space.

Maintaining our leadership in space is critical because space remains the ultimate “high ground” for our national security. It also has significant impact on our economy and competitiveness.

But equally important -- when you are the leader in a field, you help set the norms and standards for that field.

Given the profound security implications of space, I believe we all want to make sure the U.S. remains the leader in space so we can lead the international community in setting responsible norms and standards for the use of space.

The international community will also seek to join with the perceived leader in space for the exciting exploration programs it may not be able to afford or accomplish by itself.

While we have the resources to go it alone on many exploration programs, we can better strengthen our alliances with responsible countries that share our values by leading exploration missions.

Notably, the NRC committee found that no country shares the current administration’s interest in going to an asteroid. Instead, they all want to join an effort to go to the Moon.

So the U.S. can either lead that effort, or another country will step up in our absence -- which would be very unfortunate.

The first step is admitting we have a problem with “business as usual” at NASA. That much is clear.

The next step is identifying reasonable solutions, which we have tried to do in this bill.

The reforms in this legislation draw on the “best practices” of other federal agencies:

- The six-year term for the administrator is based on the six-year term of the director of the National Science Foundation. It will ensure an administrator’s term spans two administrations and will make sure that the person is in office long enough to be held accountable for long-term projects and programs.
- The board of directors is based on the National Science Board, which provides leadership and some political insulation for the National Science Foundation.
- The direct budget submission to Congress is based on other independent agencies, like the Legal Services Corporation, to provide a more complete picture than OMB may want to share.

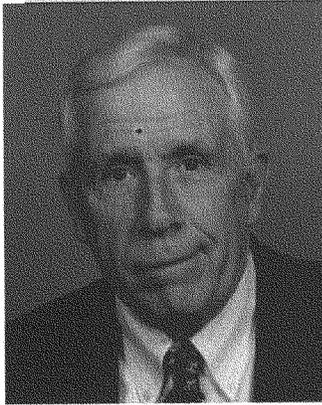
And if we make these changes, I believe the odds of American maintaining its preeminence in space for the 21<sup>st</sup> Century will dramatically improve.

There is no question that NASA is in need of a stable, independent and strategic leadership structure that can ensure the long-term, strategic planning necessary while still remaining accountable to the Congress and the President.

I know the NASA workforce and contractors are capable of doing great things and delivering an exceptional space program for the American people -- but they need sustained and stable leadership.

Thank you again for your consideration and I urge the committee to advance this legislation.

## Rep. Frank Wolf Biography



Congressman Wolf, the most senior of the 11 members of the House of Representatives from Virginia, is serving in his 17th term in Congress. He represents the 10th District, which stretches from McLean to Winchester.

Congressman Wolf sits on the powerful House Appropriations Committee, where he is the chairman of the Commerce-Justice-Science subcommittee. He also serves on the Transportation and Housing and Urban Development and State and Foreign Operations subcommittees. In addition, he is the co-chairman of the Tom Lantos Human Rights Commission, a bipartisan organization which works to raise awareness about international human rights issues.

His committee assignments provide him with an ideal position to address the varying needs of the 10th District, which is home to some of the world's leading defense, aerospace, cybersecurity and high-tech companies, thousands of federal employees and other professionals. Agriculture and manufacturing also are an important part of the 10th District's economy. Up to half of the Commonwealth's apples, peaches and grapes are grown in the 10th District; Kraft Foods and Hood Milk have large manufacturing plants in the district. Tourism is important, too. Winchester played an important role in George Washington's early adult life; his military and political career began there. Oak Hill plantation in Loudoun County was the residence of President James Monroe. The country home of Richard Bland, Northern Virginia's first Representative to Congress is in Fairfax County. Civil War battlefields, including Manassas National Battlefield Park, dot the 10th District. The Journey Through Hallowed Ground, which follows Route 15 from Charlottesville to Gettysburg also runs through the 10th District.

Chairman PALAZZO. I thank the panel for their valuable testimony. The witnesses are now excused, and we will move to our second panel.

At this time I would like to introduce our second panel of witnesses. Our first witness is Mr. Thomas Young, who is a former Chairman of the Board of SAIC and the former Executive Vice President of Lockheed Martin Corporation. Prior to joining then-Martin Marietta, Mr. Young was Director of the National Aeronautics and Space Administration's Goddard Space Flight Center in Maryland from 1980 to 1982. During a 12-year career with NASA, he served as Deputy Director of the Ames Research Center in California, Director of the Planetary Program in the Office of Space Science at NASA headquarters in Washington, D.C., and as Mission Director of the Project Viking Mars Landing program at Langley Research Center in Virginia. Mr. Young received his bachelor of aeronautical engineering degree and a bachelor of mechanical engineering degree from the University of Virginia and a master of management degree from the Massachusetts Institute of Technology.

Our final witness today is Mr. Elliot Pulham, the Chief Executive Officer of the Space Foundation, where he served in that role since 2001. Before joining the Space Foundation, he was Senior Manager of Public Relations, Employee Communication and Advertising for all space programs at Boeing, serving as spokesperson at the Kennedy Space Center for the Magellan, Galileo and Ulysses interplanetary missions, among others. Mr. Pulham is Chairman of the Hawaii Aerospace Advisory Committee, a former Air Force Civic Leader and Advisor to the Chief of Staff and Secretary of the Air Force and a recipient of the U.S. Air Force Distinguished Public Service Medal.

As our witnesses should know, spoken testimony is limited to five minutes each, after which the Members of the Committee will have five minutes each to ask questions.

I now recognize Mr. Young to present his testimony.

**TESTIMONY OF MR. A. THOMAS YOUNG,  
EXECUTIVE VICE PRESIDENT (RET.)  
LOCKHEED MARTIN CORPORATION**

Mr. YOUNG. I am pleased to have the opportunity to present my views on the challenges and opportunities facing NASA today. I also recognize the importance of identifying actions that will mitigate some of these concerns.

It is appropriate to note that there are many positive accomplishments of the civil space program and NASA that should be recognized. These include the completion of the International Space Station, which is a technological marvel, the development of a library of planets by Kepler in other solar systems, the landing of the Curiosity rover on Mars, and the incorporation of weather satellite data in models that accurately predicted the unusual left turn of Hurricane Sandy. These are but a few of the many recent accomplishments.

There are concerns about the future of the civil space program that must be addressed in the upcoming NASA Authorization Act.

I recognize that this hearing is one of many that will address these concerns.

Before addressing the specific questions you cited for this hearing, I would like to offer my opinion as to some of the more significant issues facing NASA. I have been associated with the civil space program and NASA for more than five decades. I am more concerned today about its future than at any time during my involvement.

Issues requiring attention include maintaining NASA as the premier space organization; maintaining the capabilities of the U.S. industry to be NASA's partner in implementing challenging space projects; achieving balance between the NASA program and the budget; establishing a credible human exploration program; recognizing the importance of projects focused upon understanding dark energy and dark matter, searching for Earth-like planets in other solar systems, returning samples from the surface of Mars, expanding our climate knowledge, et cetera as identified in Decadal Surveys; realizing the science and research potential of the International Space Station—while ISS is clearly an engineering and diplomatic success, it is in danger of being a science and research failure; assuring sustainability of strategy and programs over many years and political cycles. Resources in terms of money and, maybe even more important, political—excuse me—human talent have been wasted on canceled projects and aborted strategy to the degree that it is a national embarrassment. Depoliticizing NASA must be addressed. NASA has been politicized to the extent that the capabilities of NASA and the success of the civil space program are being adversely impacted.

While others can add important concerns to my list, I believe it is adequate to begin the discussion of mitigation. I am a strong believer that a foundation of the many successes of the civil space program is the continuity of expertise maintained by NASA and the implementation expertise of industry. These capabilities are maintained and enhanced by undertaking challenging projects. Examples include Curiosity, the James Webb Space Telescope, SLS and Orion. Studies, technology pursuits and overseeing others are important but will not maintain NASA and industry as world class.

Having more program than budget is wasteful, leads to program cancellations and encourages taking excessive risk. All programs need to be budgeted to their most probable cost, and when the aggregate cost of all activities exceeds the budget, the lowest priority activities need to be terminated.

Leadership has failed to establish a credible human exploration strategy. A starting point is to recognize that the only practical destinations are the Moon, the two moons of Mars, and Mars. A major effort is needed to establish a consensus as to the United States strategy for human exploration. This must be followed by funding the strategy. A strategy that is not funded is not a strategy.

There are a small number of profound questions for which the civil space program is on the cusp of greatly increasing our knowledge. These include: Are we alone? What is dark energy and dark matter? What is the future of our climate? Decadal Surveys have identified projects focused upon these profound questions. The ex-

ploration of these questions should be treated as unique opportunities. I appreciate the economic challenges our country faces. However, this does not mean we should not pursue knowledge in extraordinarily important areas for which we have a leadership position.

ISS is in danger of becoming a science and research failure. A significant portion of the NASA budget is spent on the International Space Station and its supporting activities. This concern requires urgent attention. A senior review should be established near the end of this decade to determine if the return justifies the continuation of ISS beyond 2020. This will put the ISS community on notice as to what must be done with a prudent deadline.

The last two concerns on my list are the most challenging. They require leadership and a seat at the table when national issues are being discussed. The proposed Space Leadership Act is in response to these concerns and the sponsors are to be applauded for their dedication to finding solutions. If the Act could be implemented as intended and all involved participants agreed to abide by its principals, it could have a significant positive impact. I worry that approval will be difficult and implementation is subject to too many unintended consequences.

If I were king for a day, I would require that the NASA Administrator be someone with demonstrated superior executive leadership credentials. The Deputy Administrator would be recommended by the Administrator and be someone with demonstrated extraordinary technical and space project implementation skills. I would establish a National Space Council to oversee strategy implementation, assure program continuity, assure that the program and budget are in balance and be an advocate for a strong NASA and space industry. I would limit the OMB responsibility to funding the approved strategy and not be responsible for the strategy or the tactics of implementation.

I believe NASA and the civil space program are on a declining trajectory. The next NASA Authorization Act must continue what was begun by the current Act of reversing this downward trend.

Great nations do great things. The United States is a great Nation, and the civil space program fits the definition of great things. Thank you.

[The prepared statement of Mr. Young follows:]

TESTIMONY  
TO THE  
SUBCOMMITTEE ON SPACE AND AERONAUTICS  
FEBRUARY 27, 2013

A. THOMAS YOUNG

Chairman Palazzo, Ms. Edwards and Committee members, I am pleased to have the opportunity to present my views on the challenges and opportunities facing NASA today. I recognize the importance of identifying actions that will mitigate some of these concerns.

It is appropriate to note there are many positive accomplishments of the civil space program and NASA that should be recognized. These include the completion of the International Space Station (ISS), which is a technological marvel, Kepler's library of planets in other solar systems, the landing of the Curiosity rover on Mars and the incorporation of weather satellite data in models that accurately predicted the unusual left turn of hurricane Sandy. These are but a few of the many recent accomplishments.

There are concerns about the future of the civil space program that must be addressed in the upcoming NASA Authorization Act. I recognize that this hearing is one of many that will address these concerns.

Before addressing the specific questions you cited for this hearing, I would like to offer my opinion as to some of the more significant issues facing NASA. I have been associated with the civil space program and NASA for more than five decades. I am more concerned today about its future than at any time during my involvement.

Issues requiring attention include:

- 1) Maintaining NASA as the premier space organization.
- 2) Maintaining the capabilities of the U. S. industry to be NASA's partner in implementing challenging space projects.
- 3) Achieving balance between the NASA program and the budget.
- 4) Establishing a credible human exploration program.
- 5) Recognizing the importance of projects focused upon understanding dark energy and dark matter, searching for earth-like planets in other solar systems, returning samples from the surface of Mars, expanding our climate knowledge, etc. as identified in Decadal Surveys.
- 6) Realizing the science and research potential of the ISS. While ISS is clearly an engineering and diplomatic success, it is in danger of being a science and research failure.
- 7) Assuring sustainability of strategy and programs over

many years and political cycles. Resources in terms of money and human talent that have been wasted on cancelled projects and aborted strategy is a national embarrassment.

- 8) "De-politicizing NASA" must be addressed. NASA has been politicized to the extent that the capabilities of NASA and the success of the civil space program are being adversely impacted.

While others can add important concerns to my list, I believe it is adequate to begin discussion of mitigation.

I am a strong believer that a foundation of the many successes of the civil space program is the continuity of expertise maintained by NASA and the implementation expertise of industry. These capabilities are maintained and enhanced by undertaking challenging projects. Examples include Curiosity, the James Webb Space Telescope, SLS and Orion. Studies, technology pursuits and overseeing others are important but will not maintain NASA and industry as world class.

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when the aggregate cost of all activities exceeds the budget, the lowest priority activities need to be terminated.

Leadership has failed to establish a credible human exploration strategy. A starting point is to recognize that the only practical destinations are the moon, the two moons of Mars and Mars. A major effort is needed to establish a "consensus" as to the U. S. strategy for human exploration. This must be followed by funding the strategy. A strategy that is not funded is not a strategy.

There are a small number of profound questions for which the civil space program is on the cusp of greatly increasing our knowledge. These include:

Are we alone?

What is dark energy and dark matter?

What is the future of our climate?

Decadal Surveys have identified projects focused upon these profound questions. The exploration of these questions should be treated as unique opportunities. I appreciate the economic challenges our country faces; however, this does not mean we should not pursue knowledge in extraordinarily important areas for which we have a leadership position.

ISS is in danger of becoming a science and research failure. A significant portion of the NASA budget is spent on ISS and its

supporting activities. This concern requires urgent attention. A Senior Review should be established near the end of this decade to determine if the return justifies the continuation of ISS beyond 2020. This will put the ISS community on notice as to what must be done with a prudent deadline.

The last two concerns on my list are the most challenging. They require leadership and a seat at the table when national issues are being discussed.

The proposed Space Leadership Act is in response to these concerns and the sponsors are to be applauded for their dedication to finding solutions. If the Act could be implemented as intended and all involved participants agreed to abide by its principals, it could have a significant positive impact. I worry that approval will be difficult and implementation is subject to too many unintended consequences.

If I were "King for a day," I would require that the NASA Administrator be someone with demonstrated superior executive leadership credentials. The Deputy Administrator would be recommended by the Administrator and be someone with demonstrated extraordinary technical and space project implementation skills. I would establish a National Space Council to oversee strategy implementation, assure program continuity, assure that the program and budget are in balance

and be an advocate for a strong NASA and space industry. I would limit the OMB responsibility to funding the approved strategy and not be responsible for the strategy or the tactics of implementation.

I believe NASA and the civil space program are on a declining trajectory. The next NASA Authorization Act must continue what was begun by the current Act of reversing this downward trend.

Great nations do great things. The U. S. is a great nation and the civil space program fits the definition of great things

Thank you.

A. Thomas Young

A. Thomas Young joined NASA in 1961. He was Mission Director for the Viking Project, Director of the Planetary Program, Deputy Director of the Ames Research Center and Director of the Goddard Space Flight Center.

Mr. Young joined the Martin Marietta Corporation in 1982. He is the former President and COO of Martin Marietta. He retired from Lockheed Martin in 1995.

Following retirement, he has been on Corporate Boards and lead numerous Committees and Review Teams associated with national security and civil space.

Mr. Young is the former Chairman of SAIC and is a current member of the Board.

Mr. Young is a member of the National Academy of Engineering.

Chairman PALAZZO. Thank you, Mr. Young.  
I now recognize Mr. Pulham for five minutes to present his testimony.

**TESTIMONY OF MR. ELLIOT PULHAM,  
CHIEF EXECUTIVE OFFICER,  
THE SPACE FOUNDATION**

Mr. PULHAM. Chairman Palazzo, Ranking Member Edwards, Subcommittee Members and staff, thank you for your service to our Nation and thank you for the opportunity to testify here today. The Space Foundation is a 501(c) 3 nonprofit, non-governmental organization and our mission is to advance space-related endeavors to inspire, enable and propel humanity. Implicit in this mission is our belief that the exploration, development and use of space inspire our Nation and the world, enables us to dare and dream greatly, and propels us confidently into the future.

On December 4, 2012, the Space Foundation released its report on the future of NASA, entitled *Pioneering: Sustaining U.S. Leadership in Space*. All of you have received a copy of this report, and I will just speak briefly about it today while also talking about the “connective tissue” between this report and the contents of the Act.

America’s civil space enterprise has had to deal with many challenges over the decades, often technical, but even more often the super-heated challenges of politics and the mundane obstacles caused by public administration. NASA isn’t the only organization to have to deal with these issues, but we feel that NASA’s very special nature has made these challenges more painful and difficult than perhaps they are for other Federal agencies. NASA is, without a doubt, the highest profile and largest entity in America’s civil space enterprise. All of us in this industry, and the Members and staff of this Subcommittee, share a passion for NASA and the amazing work done by the dedicated men and women who are part of the American space exploration enterprise whether they wear a NASA badge, or are part of the crucial industrial base that underpins everything NASA does. We want them to succeed. That is why we are all here today.

Over the decades, there have been many reports from many groups, commissions and committees that looked for ways to help the agency succeed in its various missions. The Space Foundation found that many of these focused on fixing a single pressing problem or failure, on giving NASA a single, targeted destination to work towards, or asking NASA to commit itself to developing some sort of a new technology, all of which are interesting, all of which are meritorious ideas. But, in our view, most of these reports and commissions arose at specific points in time, to address specific concerns of the day. In a larger sense, dissatisfaction over our Nation’s inability to deliver another Apollo moment has persisted for 40 years since Apollo 17 returned to Earth. When we contrast the almost visceral drive that we all have to see NASA succeed, with the reality of a space program that has retreated to the point where America’s space agency can no longer even launch a crew to the International Space Station, the Space Foundation concluded that there must be some pervasive, systemic problems for NASA to have experienced all the challenges it has since the end of Apollo.

We believed we could discover and articulate those and engage in a process that was self-funded, self-directed, over a year long, and serving no master except our mission to inspire, enable and propel humanity.

Thus, from the very beginning, no data was off limits to us, our conclusions were not constricted or pre-ordained, and we made it a point to be inclusive in our efforts. We reviewed and incorporated data from all the many varied reports as well as lots of data on what other agencies do, what other government tools are out there for us, and very important to us is, we were able to conduct our report operating under a Chatham House Rules approach, which allowed us to have candid, productive, no-holds-barred, off-the-record discussions with experts that we could then synthesize to deliver a view that ranges not only from space experts across the United States but indeed from around the world.

Our research delivered us to one conclusion, and that was that our fundamental conclusion has been that the plethora of competing and sometimes conflicting missions that have crept into the agency's portfolio over the years need to be sorted and rationalized against a single organizational purpose. Not a benefit, or an array of constituencies, or a destination, but a single, clear purpose—call it a purpose, call it a mission but something that consistently and clearly guides decision-making process.

In short, what might call this management 101. Put NASA on a strategic pathway, establish a clear and unwavering purpose, establish the management structure that allows you to pursue that purpose, and then put in place the resourcing plans that assure success. We believe this purpose to be what we call pioneering. We define pioneering as being among the first to enter a region to open it for use and development by others, and being of a group that builds and prepares infrastructure precursors in advance of others. What we are talking about is a solid, sustainable, repeatable process that stimulates jobs, technology and innovation, strengthens our industrial base, projects soft power abroad and delivers all of the inspiration that we need so that our Nation once again values science, technology, engineering and mathematics.

We concluded many of the same things that are in the SLPA. Among our key recommendations were depoliticizing the agency by establishing a renewable term for the Administrator, establishing formal short- and long-term planning and guidance framework, similar to the board of directors that has been discussed, deploying financing, appropriation and procurement tools found in other parts of government to permit NASA the flexibility it needs to succeed. We did not want to try and invent something out of whole cloth. We felt that there were plenty of successful models elsewhere in government.

Our Pioneering report is 70 pages long. I won't go into the recommendations any more than that other than I would like to just comment on a couple of the similarities with the SLPA.

We agree with the changes that are needed to get to the heart of this incompetence, indecision and waste, and we did look at the FBI Director's term but the term that we thought was most interesting and applicable was that of the Director of Naval Nuclear Propulsion. We suggest a five-year renewable term for the NASA

Administrator along the lines of this position because we thought it is a good example. It is a very technical enterprise. It is the gold standard, as has already been said, and it requires a person very similar to the kind of person that we need heading NASA. We also share the view that many of NASA problems are compounded by the mechanics of the budgeting process. We argue that many of the most effective mechanisms for addressing this issue already exist in the form of funding mechanisms used elsewhere in government, for example, the revolving fund used in the National Defense Sealift Fund.

The two documents, both ours and the Act, agree that Decadal Surveys are good ways to order priorities within disciplines and provide a model for arbitrating technical disputes, and we specifically propose that NASA employ a regular and consistent planning process to produce short-, medium-, and long-term plans. In particular, we recommend that the establishment of oversight and appropriations activities that the Constitution requires of Congress can be supplemented by this detailed examination by this board of directors and by reviews every five and ten years. Whereas the Act would propose essentially a quadrennial review, we have proposed a five-year review.

So like the sponsors of the Space Leadership Act, we agree that there is no single, obvious, point solution, but we as a Nation need to have a clear recognition of NASA's purpose going forward.

Thank you very much for your attention and for this opportunity.  
[The prepared statement of Mr. Pulham follows:]

February 27, 2013

The United States House of Representatives  
Committee on Science, Space and Technology  
Subcommittee on Space

Testimony of Elliot Holokauahi Pulham  
Chief Executive Officer, the Space Foundation

**Opening**

Chairman Palazzo, Ranking Member Edwards, Members of the Subcommittee, and Subcommittee staff, thank you for your service to our nation, and thank you for the opportunity to offer testimony today. The Space Foundation is a 501(c) 3 non-profit, non-governmental organization and our mission is “to advance space-related endeavors to inspire, enable and propel humanity.” Implicit in this mission is our belief that the exploration, development, and use of space inspire our nation and the world, enables us to dare and dream greatly, and propels us confidently into the future.

On Dec. 4, 2012 the Space Foundation released its report on the future of NASA, entitled *PIONEERING: Sustaining U.S. Leadership in Space*. Today I’ll speak briefly on the origins and processes associated with PIONEERING, and our findings and recommendations. I’ll conclude by talking about the “connective tissue” between our report and the *Space Leadership Preservation Act of 2013*.

**Origins**

America's civil space enterprise has had to deal with many challenges over the decades, often technical, but even more often the super-heated challenges of politics and the mundane obstacles caused by public administration. NASA isn't the only organization to have to deal with these issues, but we feel NASA's very special nature has made these challenges more painful and difficult than perhaps they are for other federal agencies. NASA is, without a doubt, the highest profile and largest entity in America's civil space enterprise. All of us in this industry, and the members and staff of this subcommittee, share a passion for NASA and the amazing work done by the dedicated men and women who are part of the

American space exploration enterprise – whether they wear a NASA badge, or are part of the crucial industrial base that underpins everything NASA does. We want them to succeed. That's why we are all here today.

Over the decades, there have been many reports from many groups, commissions and committees that looked for ways to help the agency succeed in accomplishing its various missions. The Space Foundation found that many of these focused on fixing a single pressing problem or failure; on giving NASA a single, targeted destination to work towards; or asking NASA to commit itself to developing some sort of technology that would at some point in the future enable new capabilities for the nation.

All of which are interesting, and meritorious ideas. But, in our view, most of these reports and commissions arose at specific points in time, to address specific concerns of the day. In a larger sense, dissatisfaction over our nation's inability to deliver another "Apollo moment" has persisted for 40 years since Apollo 17 returned to Earth. When we contrast the almost visceral drive that we all have to see NASA succeed, with the reality of a space program that has retreated to the point where America's space agency can no longer even launch cargo or crew to the International Space Station, the Space Foundation concluded that there must be pervasive, systemic problems for NASA to have experienced all the challenges it has since the end of Apollo.

We believed we could discover and articulate something new and different to better inform the ongoing space policy dialogue, and to help put NASA on a glide slope toward greatness once again.

### **Process**

The Space Foundation self-funded and self-directed our year-long study, serving no master except our mission to Inspire, Enable and Propel humanity. Thus, from the very beginning, no data was off limits, and our conclusions were not constricted or pre-ordained. We made it a point to be inclusive in our efforts. We reviewed and incorporated data from the many and varied reports and commissions - whether we agreed with them or not. Operating under a Chatham House Rules approach, we were able to have candid, productive, no-holds-barred discussions

with a broad and diverse community of respected space experts from across the U.S. space enterprise, and, indeed, around the world.

Our research included extensive literature review of space policy, public administration, political science, management, history and both governance and management philosophy.

The Space Foundation is fiercely committed to our independence, believing that our authority to speak on space issues must be rooted in knowledge, experience, genuine expertise and the autonomy to speak what we believe to be the truth. Therefore, no underwriters or interviewees were allowed to see the report prior to release. No one outside our report team was allowed to have influence over the content or conclusions of the report.

#### **A Clear, Unambiguous Purpose**

Our fundamental conclusion has been that the plethora of competing and sometimes conflicting missions that have crept into the agency's portfolio over the past four decades need to be sorted and rationalized against a single organizational purpose. Not a benefit, or an array of constituencies, or a destination -- but a single, clear purpose that can consistently and clearly guide decision-making about America's civil space program.

In short, what we prescribe is a "Management 101" overhaul that would place NASA on a strategic pathway no different than what any world-class organization would follow: establish a clear and unwavering purpose, establish the management structure to allow you to fiercely pursue that purpose, and put in place a resourcing plan that assures success.

The Space Foundation believes that first and foremost, NASA needs to embrace a singular, unambiguous purpose that leverages its core strengths and provides a clear direction for prioritizing tasks and assigning resources. We describe this purpose as "Pioneering." We define "Pioneering" as:

1. Being among those who first enter a region to open it for use and development by others; and

2. Being one of a group that builds and prepares infrastructure precursors, in advance of others.

What we're talking about is a solid, sustainable, repeatable process that stimulates jobs, technology and innovation, strengthens our industrial base, and projects soft power abroad while stimulating a culture at home that once again values science, technology, engineering and mathematics.

The Pioneering process can be broken into four steps designed to open up new places and new knowledge:

- **Access** - developing the ability to identify important destinations within our solar system, and to get to and from those destinations.
- **Exploration** - learning about those destinations in order to plan for subsequent missions.
- **Utilization** - turning theoretical and practical knowledge into technology and systems that enable continued, longer-term activity at the destinations.
- **Transition** - handing off the knowledge and capabilities NASA has developed to other government organizations, academia, or the private sector, for further long-term exploration, utilization, and, in the best sense of the word, exploitation.

Expanding the U.S. national civil space enterprise is a matter of expanding human reach and activity in space. This is not limited to supporting human spaceflight for its own sake, or supporting only government activities, but includes the many different means by which human reach is extended. Our report does not advocate for any particular space destination or settlement; rather, it is focused on expanding the human sphere of influence throughout our solar system.

#### ***PIONEERING* Recommendations**

We see the recommendations we offer in *PIONEERING* as transformational, powerful and far-reaching. Key among our recommendations are:

- De-politicizing NASA by establishing a renewable term for the administrator.

- Establishing a formal short- and long-term planning and guidance framework for the agency.
- Deploying financing, appropriation and procurement tools found in other parts of government to permit NASA the flexibility it needs to succeed.
- Conducting a bottoms-up review of NASA infrastructure with an eye toward maximizing capability around the Pioneering Doctrine.
- Streamlining the Space Act to focus NASA on its pioneering purpose and eliminate the cornucopia of non-mission-essential responsibilities that have been heaped upon the agency over the years.

Our *PIONEERING* report is 70 pages long, and we've provided copies and individual briefings for committee members and staff. We're committed to supporting your efforts going forward.

Finally, a few words about PIONEERING in the context of the Space Leadership Preservation Act:

#### **Similarities**

Our report, and the proposed legislation, agrees that, due to continuously shifting direction to NASA leadership, programmatic changes have occurred so often that NASA is seldom able to see major initiatives through to completion. This turbulence causes frequent cancellation, redirection, and re-scoping of projects, leading to waste and the perception of incompetence or indecision. It leads to demoralization of a highly technical, highly motivated workforce.

- For example, borrowing from the precedent of the director of naval nuclear propulsion, we suggest a five-year renewable term for the NASA Administrator. We felt this was a good example because it is a position that reaches across government, demands significant management skills, and is a very technical position. Similarly, the SLPA of 2013 proposes a 6-year term for the NASA Administrator.

We also share the view that many NASA problems are compounded by the mechanics of the budgeting process. In our report we argue that many of the most effective mechanisms for addressing this issue already exist in the form of funding

mechanisms used elsewhere in government, for example the revolving fund used in the National Defense Sealift Fund. The SLPA of 2013 addresses this concern through the broader use of long-term contracting.

The two documents agree that Decadal Surveys are good ways to order priorities within disciplines and provide a model for arbitrating technical disputes without undue political influence. The Space Foundation specifically proposes that NASA employ a regular and consistent planning process to produce short-, medium-, and long-term plans. In particular, we recommend that the established oversight and appropriations activities that the Constitution requires of Congress can be supplemented by a detailed examination of NASA's plans every five years. The SLPA of 2013, in a similar fashion, proposes a quadrennial review, analogous to the process employed by the Department of Defense.

Finally, like the sponsors of the Space Leadership Act, we agree that there is no single, obvious, point solution, but that we, as a nation, need to have a clear recognition of NASA's purpose going forward.

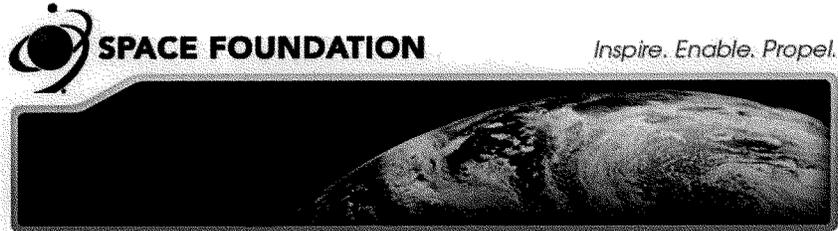
#### **Differences**

While the Space Leadership Act seems to suggest that instability, caused by excessively political processes, is the principal barrier to an effective space program, *PIONEERING* takes the approach that this instability is related to a larger, underlying problem: the lack of a clear, singular purpose, upon which we all agree. Along these lines, the Space Leadership Act appears to presume that the purpose or role of NASA is known and understood -- a perspective not shared by our report, which argues that the lack of consensus about NASA's core purpose causes many of the problems the agency faces.

#### **Conclusion**

In conclusion, it is our desire at the Space Foundation to see a strong, vibrant NASA so current and future generations can take those next "giant leaps." It is our hope that *PIONEERING: Sustaining U.S. Leadership in Space* can help contribute to that future.

# # #



### **Elliot Holokauahi Pulham**

*Space Foundation Chief Executive Officer*

Named chief executive officer of the Space Foundation in 2001, Elliot Pulham leads a premier team of space and education professionals providing services to educators and students, government officials, news media and the space industry around the world. He is widely quoted by national, international and trade media in their coverage of space activities and space-related issues.

Before joining the Space Foundation, he was senior manager of public relations, employee communication and advertising for all space programs of Boeing, serving as spokesperson at the Kennedy Space Center for the Magellan, Galileo and Ulysses interplanetary missions, among others.

He is a recipient of the coveted Silver Anvil Award from the Public Relations Society of America - the profession's highest honor. In 2003, the Rotary National Awards for Space Achievement Foundation presented him with the coveted Space Communicator Award, an honor he shares with the late legendary CBS News Anchor Walter Cronkite and former CNN News Anchor Miles O'Brien.

Pulham is chairman of the Hawaii Aerospace Advisory Committee, a former Air Force Civic Leader and advisor to the Chief of Staff and Secretary of the Air Force and a recipient of the U.S. Air Force Distinguished Public Service Medal. He serves on the editorial board of *New Space Journal*.

Chairman PALAZZO. I thank the witnesses for being available for questioning today, reminding Members that Committee rules limit questioning to five minutes. The Chair will at this point open the round of questions. The Chair recognizes himself for five minutes.

This is for both of you. What do you understand NASA's mission to be currently, and what do you think it should be?

Mr. PULHAM. Mr. Chairman, I think that is one of the problems is that we don't understand what NASA's current mission is. If you look in the Space Act, there are 26 different strategic priorities. I would submit that if you have 26 priorities, you have no priorities. We therefore have come up with this Pioneering Doctrine as to what we think should be the underlying purpose. It establishes a four-step process for accessing, exploring, utilizing and then very importantly transitioning so that NASA can get on to the next exploration.

Mr. YOUNG. I think important to your question is to kind of reflect on why do we have a NASA, and I personally think that we have a NASA because we need an organization who is capable of carrying out spaceflight operations or activities. Most of the other stuff that NASA does—and I am only talking about space, not the aeronautics part—but other activities are in support of that function. Except for the spaceflight uniqueness, most other things could be done some other way. So I think that the country established a NASA because it needed someone to be the leader and to have the excellence in executing spaceflight missions.

Now, if you say what is the purpose of NASA, I think NASA's fundamental purpose is aimed towards, one, expanding our knowledge that we can acquire through space projects, to secondly provide leadership for our country and the execution of space projects, and I think thirdly, to be an inspiration to our people and particularly our young people as to what really are the factors that make this a great country and a great opportunity for them to personally pursue as they go through a process of education and deciding on career paths.

Chairman PALAZZO. Now I would like to ask this pretty broad question but it is an important question. What advice would you like us to consider as we begin the process of reauthorizing NASA? Mr. Young?

Mr. YOUNG. I tried to touch on that, you know, identifying eight items. There are probably more. But I think as you go about this process, each of those need to be taken into consideration, and I don't want to go back through it but let me hit a couple.

I personally am not as—I am not as focused on any particular project as much as I am on the need of having an extraordinary NASA and an extraordinary industry, so I think we need to be more long term as opposed to short term in our views. I do—I talked about International Space Station. I chaired the Advisory Committee for many years. I chaired an independent review of its management structure. I am advocate of the International Space Station. As I said, it gets a check in diplomatic success, a check in engineering success. We have a long ways to go in the science and the research, and we are spending a lot of money on it and we need to be sure that we do everything we can to maximize its return, and if we can't, that we go in another direction.

I have got one other item. I touched on things like, are we alone and dark energy. I don't know quite how to say this in today's environment but I think there are times to be bold and there are times to be austere, and you need to be bold when the returns are special, and in my view pursuing the question of are alone is such an incredible question and Earth-like planets and bringing samples back, and, you know, looking at some of the moons of Jupiter. I mean, we are on the cusp of really learning a lot in this regard. Dark energy and dark matter, most of what it is out there, we don't know what it is, and I really tried to phrase it that way, it is always hard to do, but I think for profound issues, being bold is to be applauded. On the other hand, there is time to be austere. So I don't mean that you open the checkbook, so to speak, but I do think that it is critical with the resources that we invest in this area that we invest it in those areas that have the highest return to the country and knowledge in these areas stacks up high, in my regard, as things to be pursued.

So I guess what I am really trying to say is, I actually think that the Authorization Act, the last one I thought had a measurable impact. It didn't complete the story. I don't want to imply that at all. But it had a measurable impact of worrying about having things that are constructive to be done by NASA and by the industry and looking at some of the items. I think this Act is absolutely critical to responding to the concern I have about being on a trajectory that is negative as opposed to positive. Thank you.

Chairman PALAZZO. Mr. Pulham, briefly, if you would like to add some comments?

Mr. PULHAM. Yeah, Mr. Chairman, just two different ways to come at this, with the heart and with the head. In our report, we have outlined at great length right down to a line-by-line rewrite of the Space Act, what all the technical things are that need to be done. But I think that what is more important here is that the space enterprise uniquely has demonstrated in the past and I believe can demonstrate again an ability to lift our Nation as nothing else that we do. It inspires our children. It encourages us. It demands of us that we be the best that we can be as a country, and I think a visible, strong, exciting space program that ignites our interest, that gets us interested in questions of our existence, that gets us interested in studying the hard courses and doing the hard things and demonstrating the American character, those are the things we should be looking for in our space program.

Chairman PALAZZO. Thank you. I now recognize Ms. Edwards for five minutes.

Ms. EDWARDS. Thank you, Mr. Chairman, and thank you both for your testimony and for your passion.

In light of Mr. Pulham's comments that he just made, Mr. Young, I wonder if you could talk about the idea of a destination because I think that is some of the push and pull. Should NASA have a big goal that is a destination or more broadly as the Space Foundation report suggests, to carry out the multiple kinds of functions that you need for a robust space program? I would like to hear your thoughts about that.

Mr. YOUNG. I think it depends on which part of the program you are talking about. I think that for the science program, you know,

our basic thrust is to understand our solar system and the universe in which we live, and there are tactics that are identified in the Decadal Surveys as to how to go about that. Human spaceflight, in my view, is different, and human spaceflight can't be just about building rockets or building spacecraft. It has to be about defining how they are going to be used. And so I am—I have heard this discussion a lot. I am an advocate in human spaceflight for destination. I don't see how this is ridiculous but Apollo had a destination. So human spaceflight I think is a different kind of an exploration than the robotic. The robotic is more of a program. The human is more focused on an activity.

So I believe that a destination is critical, and as I said, after having thought about it quite a lot—I know this goes beyond what you are asking—but I originally thought an asteroid really was a pretty good idea. It didn't have any gravity. It was probably pretty easy. That is not really true. An asteroid mission is a hard mission. It is long duration. There are not many of these things. They are small. You don't walk around on them. You kind of swim up to them. And so that has caused me to rethink this destination, and that is why I really touched on my comments. I think that for human spaceflight exploration, there is a small set of destinations in our lifetime. It is the Moon, it is Phobos, it is Deimos and Mars. They are significantly different. An asteroid, Lagrange Point can all be steps in pursuing something such as that, but they are not destinations that are either, in my view, practical nor are they destinations which inspire.

Ms. EDWARDS. Let me just ask both of you, in order to get someplace and to do these big programs, one of my big frustrations with NASA is that it is tough to do science on a year-to-year, what's my budget going to be, and I think many of us share that frustration. I think certainly within the agency and the industry that is true. And I have long been curious about what it would mean for the big programs to construct a budget or a process that would allow for that kind of multiyear, you know, don't have to ask every single year "what's my budget going to be," so that I can manipulate the program and the work to fit that budget but to work toward the science.

Can you share with me, especially from an industry standpoint, Mr. Young, what that would mean both for the agencies and for the contractors to have a little bit more certainty when it comes to the science and whether you think that would also contribute to more realism in the budgets that are presented for these big flagship programs?

Mr. YOUNG. Well, I think the answer is yes. Let me comment a little bit. We actually had that, and whether or not we have gotten off with Mars. Mars was really a program, not a project. And we recognized that Mars was one of the really challenging scientific pursuits of our era, and we learned that every step along the way we built on what we learned from one mission to what we did with another mission. And I think that through the Decadal Surveys and others, we had a program that was laid out pretty much into the future and maybe not funded into the future but I think the stability was pretty good. I must admit that some of the actions in the last year have at least interrupted that process, whether we

are back on it or not, I don't really know, but leading up ultimately to a sample return.

So I think Decadal Surveys, which are over ten-year time frames, they provide the basis of that. I had the privilege of being both on the Astronomy and Physics Decadal Survey and the Planetary Decadal Survey, so I was able to observe firsthand incredible debates that go on in that process, and the results really are roadmaps and they are well thought out, well supported roadmaps, so I am with you. I think a science program, I can't see any advantage to juggling it every year, so to speak. It is clearly a benefit from stability. And back to industry. I mean, the key to a success in industry is a stable strategy and a stable implementation plan that responds to new information but doesn't respond to gee, I would like to rethink it again.

Ms. EDWARDS. Thank you, and my time has run out, but eventually I look forward to hearing from Mr. Pulham on this too.

Chairman PALAZZO. I now recognize Mr. Rohrabacher from California for five minutes.

Mr. ROHRABACHER. Thank you very much, Mr. Chairman, and I would just like to be on record as thanking my colleagues, Mr. Culberson and Wolf, for taking into consideration some of the concerns that I had toward their legislation as they were developing it, and I just want to thank them very much for taking those concerns seriously.

A couple things that I would just like to focus on here for a moment. Mr. Young, you are talking about the depoliticizing NASA, and you seem to be blaming politics for some of the failures that NASA has had over the years. Do you consider, for example, the X-33 program to have been a failure for political reasons? Was that a political failure?

Mr. YOUNG. It is a great question, and I had great fear you would ask that question. I have been trying in my mind to find something this politicized, and I am not sure I can do it but I will offer at least some of my thoughts on it. I think what has happened over my involvement with this activity is that an ambiguity as to direction allows a lot of people to be experts as to what it is that should be done, and what I mean by that is that I think that NASA—and not only NASA but I have recently led a review of the Nation's weather satellite programs and I find a similar circumstances—I think what happens is that perceived direction kind of comes from a lot of different areas because different people have kind of—different organizations, different levels have a latitude of interpretation in the lack of a crisp, firm strategy or a direction. Now, I don't know whether that is what politicizing really means or not but that is what I see as the difficulty that exists.

Mr. ROHRABACHER. We have had some situations where NASA just was involved in a program that couldn't be done or where they were spending money in a way that was not effective and thus expanded the need for a higher budget, which we couldn't afford. Do you think those type of programs should—do you think we should just continue these programs?

Mr. YOUNG. No. In fact, we should not. You know, possibly maybe even should not have started them in some instances that we could go into it. No, I am not an advocate for continuing some-

thing that is determined to be either too difficult or without sufficient merit, and I really talk about the prioritization, but I do think that there are other examples where it has been this environment that I have talked about that has caused change in direction.

Mr. ROHRABACHER. Well, let us take a look, when you are talking about destination and purpose, which we just heard a little discussion on here, it is as if there are not destination in some way is so inspiring but certain purposes may not be inspiring. Just for example, I happen to find it very inspiring that NASA might have a mission to help us identify near-Earth objects and create some sort of a system that can defend us against that. I think that might be exciting to the public. It might be exciting to the public that NASA is doing something to help us create a program that would clear space debris. Now, these are not exploration and things that we can talk about in dramatic language and words pushing back the universe, but these are really necessary jobs that need to be done if we are going to protect our space-based assets, which our lifestyle is dependent upon. Our standard of living is dependent on GPS and weather satellites and all these. If we are going to have those space-based assets, we have to start worrying about the debris that is up there. Now, these are important projects that NASA could be doing, and it seems to me that while we are trying to put some pizzazz and things and make things look magnificent in keeping with the exploration of past Americans, and we have got some hard work to do as well as some of the more glamorous work to do.

Mr. YOUNG. I would agree. The only caution I would make is that I think they are important functions but they are—if that is the ultimate goal, not very inspiring.

Mr. ROHRABACHER. Well, I think—let me just state for the record, I know I have run out of time here, I think it is really inspiring that people who collect trash in my neighborhood are inspiring to me because I know what it would look like if they weren't doing their job. People who clear up space debris and permit us to have these assets up there are doing a—and it is a very tough job. I think that is inspiring. I think our young people would think it was inspiring just as much as trying to spend maybe hundreds of billions of dollars to go to Mars and maybe not being able to finish the mission because it was too costly to begin in the first place. Just a thought. Thank you very much.

Chairman PALAZZO. I now recognize Ms. Bonamici from Oregon for five minutes.

Ms. BONAMICI. Thank you very much, Chairman Palazzo, and thank you also, Ranking Member Edwards, for holding this hearing, and especially thank you to the witnesses.

When we are here today talking about the mission and the management structure and the goals of NASA, an issue that I know is important to many of the Members on this Committee, as well as you who have testified, is the importance of STEM education, and I really want to talk about two different kinds of education here, and one of them that is important as we have this discussion is the education of the public about the benefits of space science and space exploration, and I have an example that I will share briefly, and this is from the Oregon State University, and it is just a folder

about the NASA impact just through this one university system, how NASA funds make a difference: coastal imaging, ocean and wind dynamics, ocean productivity, phytoplankton health, long-term forest trends, education and mentoring, carbon exchange, protection of endangered whales—who would have thought—and leadership. And so just in this one university, there are all these impacts from NASA funding and a NASA partnership, and I think it is important that the public know how much space exploration and space science impacts our everyday lives.

And I also want to talk a little bit about STEM education and the importance of inspiring young people. Mr. Pulham, did you in your report consider—I know you briefly mentioned STEM education. Did you consider the sort of knowledge gap that is developing with fewer students going into STEM fields and how a strong, vibrant space system will encourage young people to study in the STEM fields and go on beyond an undergraduate level?

Mr. PULHAM. Yes, Congresswoman. Thank you very much. We are in fact—a big part of what we do at the Space Foundation is involved in STEM education across the country and I do things like this, I do things like meetings, but there is nothing I do that is more energizing and rewarding than walking into a classroom or bringing a classroom of students into the Space Foundation where we have special, unique laboratories where they can drive robots, where they can see what is going on in real time in the cosmos. The implications of a program that excites the imagination are tremendous, and our young people have not become cynical yet like some of us who have been around for the political battles. If you stick them in a room with an astronaut, by golly, they are there with an astronaut. We sent a group of people to Fairbanks, Alaska, two weeks ago and the pictures and the stories that came back from the experience of having astronaut Leroy Chiao visit Fairbanks is just phenomenal.

In fact, I will send you a copy of an article I have written that is going to be published in the next couple days that talks about this and it talks about the context of the recent meteor strike and my frustration with the fact that most of the news coverage started with a reporter asking an expert, now, what is a meteor. We should have all learned that in grade school. We should know what meteors are. We shouldn't have talking heads explaining it to us. And so the data behind how we have trailed off in education—and it is interesting, I know statistically correlation does not prove causation but you can track NASA spending and enrollment in higher education programs and higher degrees in science and technology fields. If you look at the Apollo ramp up and then look at the enrollment ramp up, then you see Apollo trail off and the enrollment trail off and then you see the space shuttle development and the enrollment goes up, this is really important to our competitiveness as a country.

Ms. BONAMICI. Thank you, and that wouldn't be surprising.

Mr. Young, do you have comments about that?

Mr. YOUNG. I think that his comments were really quite appropriate. I did stumble across an item very, very recently to add to your list, which was quite striking to me. As I said, I have been leading a review of our Nation's weather satellite program. I am

told that for Sandy, had we not had satellite data, it would not have—the models would not have forecasted the left-hand turn. The forecast would have been that Sandy would have gone up a normal path up the coast and there would have been no warnings to New Jersey and New York. So that is an interesting item to add to your list.

Ms. BONAMICI. That is significant. It does seem that NASA is uniquely positioned to inspire by actually showing the fruits of the labor and the programs that have worked inspiring our young people to go into STEM fields.

And in my remaining few seconds, I just want to encourage all of my colleagues to keep those broad goals and impacts in mind as we consider this and other legislation in the Subcommittee. Thank you again, and I yield back.

Chairman PALAZZO. I now recognize Chairman Hall for five minutes.

Mr. HALL. I thank you, and of course, I thank you for having this hearing and I thank Chairman Smith for giving us this new leadership. And I want to recognize Bill Smith, a long-time employee here that gave us good advice and was part of the family, Republicans and Democrats, as we pursued saving NASA and making some plans for NASA back when you could plan for NASA. And how valuable NASA is to us, to the youngsters, the people.

And Mr. Young, well, Tom, you hit on it for almost these studies that they almost gave us the guidance. They really—well, I think probably Norm Augustine is one of the really great people and a giant for this Committee and for giving us advice. He gave us the advice. He just said it was going to cost money and that was up to us to find the money, and that is exactly right. We have so many things to inspire us: the moon walks, Sputnik, medical gains, and great people, some that lost their lives trying to make this thing work. But the real problem is, the last several Presidents just haven't given us the money or helped us support the funds or have blocked the money that should have gone to NASA to carry out some programs that we had. And there was times when—and NASA is important as it is and how dangerous it would be if we lost this space station. What a national threat it would be to us. I just—it makes me sick when we don't have half of one percent of the budget for the thrust and it is outrageous that they couldn't find that money. The last three or four Presidents just didn't find the money that they could have found somewhere then, I think, or if we found it, they turned it down.

And then my question to you is going to be, the President is presumably the chief policy setter for the direction of NASA but his direction early when he first got here, and I don't know who told him that, to run a line through Constellation, but that was devastating. It is not devastating to run the line through it. He had the right to do that, but he had the duty to give us a way to go if he was going to run a line through it, and he threw away \$8 billion that Democrats and Republicans together had put together to spend at that time, and we just never recovered from that one line through there.

You know, my dad was in World War I. I asked him who he remembered more than anybody else during that war, and I thought

he would say General Pershing or Adolph Hitler, somebody like that. He said no, he remembered the bugler. They wanted to kill the bugler because he woke them up every morning, and even Broadway had a play on "Someday I'm going to murder the bugler, some day they are going to find him dead and then I'll get that other pup, the one that wakes the bugler up and spend the rest of my life in bed." That was very popular at that time. Well, I would like to know who that other pup is that told the President to run the line through it at that time and not give us any guidance there after.

So those are—I guess that gets me to my question. It is the general consensus that NASA has no overall direction at the moment, and my question is, the creation of an independent body like these two fine Congressmen have suggested as to whether or not that is the best way to ensure a solid direction for the space program. That doesn't solve the money. That would be harder to get now than it ever was. But we had so many great people that were leading us in, not just guys like Norm Augustine but Dr. DeBakey came and walked these halls when we came in one vote of losing the NASA program overall for us, came in one vote of it, and that old fellow walked every step out here and then we won the next vote by over 100 votes. We got back on the right track. But how do get on the right track? The Buzz Aldrins, the Neil Armstrongs, the late Neil Armstrong, General Tom Stafford, Gene Cernan and those that walked this way and gave so much.

I guess how is the best way to ensure some kind of solid direction for the space program or something that Congress ought to demand from the President and as we demand to help him find the funds? I think I have used my question asking the question but—

Mr. PULHAM. Yes, Congressman, I agree with your observations. I think one of the things that troubled us and really tickled us into doing our report was the damage that occurs to NASA between Administrations and even from election to election as different people on committee memberships and so forth change, and the need therefore to have essentially a board of directors, if you will, that functions like a board of directors but it reports to Congress and it reports to the Administration but it is this board that provides that independent outside analysis that sets the strategy and ensures that all the activities of the agency are appropriate to that strategy so that we are actually accomplishing something.

Mr. HALL. I think my time is up. If I have any to yield back, I yield it back to you, Mr. Chairman.

Mr. YOUNG. If I could just make—

Chairman PALAZZO. Mr. Young, go ahead.

Mr. YOUNG. —two comments. First off, Mr. Hall is my hero, so I sat and listened with great interest, and I worked five years for Mr. Augustine so my comment is the following. I think the Authorization Act that you are embarking upon is extraordinarily valuable. I think over time, they haven't had the impact that the last one had. The last one, in my view, fundamentally didn't solve all the problems but it put in place some of the tools that are necessary. I think the SLS and the Orion are a product of the last Authorization Act, to tell you the truth. I think it was impressive. It was rather bipartisan. So I personally believe that as this Author-

ization Act comes forward, I think that a lot of thought needs to go into it but a demand for a human exploration strategy needs to be a critical part of it and a recognition, as I tried to say in my comments, a strategy without funding is not a strategy. So I think the country needs to decide, and I don't think—I don't know of any better mechanism than the Authorization Act that is upcoming to get that subject out on the table and to get it properly debated and to get some constructive decisions made as to where we go in that regard. So that would be kind of my—response is not the right word but my helping with the items that you were raising so effectively.

Mr. HALL. Thank you, and thank you, Mr. Chairman.

Chairman PALAZZO. I now recognize Mr. Stewart from Utah for five minutes.

Mr. STEWART. Okay. Thank you, Mr. Chairman. Thank you for the hearing. To the witnesses, you know, NASA and this Committee is of great interest to me. There is a couple of reasons for that. One of them is personal. I am a former Air Force pilot, had a chance to do some cool stuff in that regard. Now, it is not going into space, I recognize that, but it was still kind of fun.

There are a number of contractors in my district, both large and small, that build engines and avionics and, you know, significant parts of contributions to this program, and that is true of many districts around the country. But a third reason I think it is most important is that it is just important to our Nation. It is important in regards to research, it is important in regards to, you know, product development, and frankly, it is important to our morale, and I don't think we can minimize the importance of that. It is important to how we think about ourselves as a Nation, as leaders around the world.

And look, I know that the political and culture and environment is different now than it was, say, in 1969, which I remember. You know, I think there is a couple of reasons for that. You know, Apollo received a lot of public support and economic support not just because we were going to the moon but because we had to beat the Russians there. There was an element of competition to it. There was an element of perceived national security to it. And that is just not true anymore. I mean, it is hard to recreate that sense of urgency when things have changed like they have.

I have had the opportunity to spend quite a lot of time with the Director and with other members of the leadership there, and my concern is this—and it has been stated a number of times here but I am going to ask you a specific question regarding that. We don't—I don't feel like we understand the vision. That is, again, restating what you have said and others. I don't think there is many Americans who could tell you do we even have an American on the space lab right now. I don't know they know that. Do they even know that it is up there any longer? Do they know the space shuttle has been grounded?

So my question now is this: How do we recapture that vision? I think it has got to be one thing. We used to say we are going to the moon and now we say well, we are doing this and this and this. And my question is this. It has been proposed that we go to Mars. Is that viable? I mean, is that a realistic goal? And if it is a real-

istic goal, is that something that you think the Nation would coalesce around and when could we do it?

Mr. PULHAM. Thank you, Congressman Stewart. Interestingly enough, after this hearing I am going to be go over to the National Press Club where a private group is about to announce a private mission to Mars. So is Mars doable? You bet it is. What it takes is, it takes will and it takes direction and focus, and focus and understanding your purpose as an agency is what this report is all about, and I will share one anecdote with you.

As we went around interviewing people, several people brought up the story of a CBS news reporter who was at the vehicle assemble building to interview an astronaut, and the astronaut was late, and the reporter engaged with a janitor who was mopping up an area, and asked the janitor, said what is your job, and the janitor said well, sir, my job is to help put a man on the moon, and if you went to 100 different offices in different NASA locations in this country today and asked that question, you would get 100 different answers, and that is the problem that has to be fixed.

Mr. STEWART. That is the key to it, isn't it?

Mr. PULHAM. Yes, sir.

Mr. STEWART. Very quickly, how—this private enterprise to Mars, it is funded with private money, I am sure, obviously. How are they paying for that and when is their schedule? Do you know?

Mr. PULHAM. I am not at liberty to discuss the details of what they are about to announce because it is their announcement, but it is something that they are going to look for some collaboration and relationships and expertise with NASA, but the funding is going to be privately provided.

Mr. STEWART. It is going to be disappointing for some of us if Google goes to Mars before the United States government can.

Mr. PULHAM. Yes, sir.

Mr. YOUNG. You raised some interesting questions. I think to rekindle the excitement is an important item. I personally am a Mars advocate. I was Mission Director on Viking when we landed a couple spacecraft on Mars and put a couple spacecraft in orbit about Mars. The one thing that is important to recognize is a Mars mission is not easy. Landing a few tens of megatons of stuff on the surface of a planet is extraordinarily hard. The planet is complicated and it has a little bit of atmosphere but not a whole bunch of atmosphere, and all of that makes that process difficult. Long-duration human spaceflight is not something we understand very well and it is also difficult.

I took the liberty in my testimony to be king for a day so I will expand on that. If I were king for a day, I would have the ultimate destination Mars. I wouldn't just kind of say it, you know, I mean, I would say that that is our orientation. I mean, we really intend to send humans to Mars, but then what I would do is, I would build my program around that. So that would be—if I could say it, that would be my beacon, but then that would tell me that one of the things I had to do was a Mars sample return because I have got to have a sample back on Earth and understand it before humans go to Mars, in my view. That would tell me I need a major research program, a technology program, not a scattergun technology program, if you allow me to say so, but a focused technology

program to understand how do I land a few tens of megatons of stuff on the surface of the planet. That would be a project that an organization like the Langley Research Center could get its teeth in, you know.

Back to what Ms. Edwards said, you have got to have stability. You can't decide I am going to do that this year and the next year say I didn't really mean that. So I would be an advocate of Mars as the ultimate destination, being serious about it, not just giving speeches about it, having it as a structure but then everything fits into that. So each step along the way—now, I don't know what is going to happen this afternoon but I don't know exactly when that happens or when it takes place but what we are doing is building to that. That would be my strategy for human exploration.

I go back to what you said, not to take over a lot of time, but I am a product of the 1960s, 1970s, 1980s at NASA, and there are a few things I remember. I remember never worrying about what we were doing. I mean the dedication and watching it was there, and I don't just mean Apollo. We were doing Viking and other stuff.

The other thing is a little bit what Mr. Rohrabacher was kind of touching on. Throughout my NASA career, I never remember anybody telling me at a press conference what to say. I never recall ever being given a script. I never recall much interaction with anybody other than the NASA leadership exercising our mission, and what I am really trying to say about this politicizing question, I am a big believer, if you have good people who have a clear definition of what it is they are trying to do, the rest of us are not dumb. You know what I mean? We are able to understand that very, very well. So that is the NASA I recognize, not the NASA where when you have a press conference you get a script as to what you are supposed to say. You get an input as to what you are supposed to do. If you come to Congressional testimony, it is reviewed multiple times. I never had a press conference, a briefing, a talk pre-reviewed of anything I ever did in almost 20 years at NASA.

Mr. STEWART. Thank you.

Chairman PALAZZO. I now recognize Mr. Posey from Florida for five minutes.

Mr. POSEY. Thank you, Mr. Chairman.

It is very clear that almost everyone believes that NASA lacks direction, and we need to somehow find a way to establish that direction and continue that direction, and it is my sense that the Space Leadership Preservation Act is the best shot we have at that. I mean, it sure beats continuing to flog the troops hoping to improve morale, you know, the beatings will continue until morale improves. I mean, this is the first thing I see proposed that will kind of give us some continuity and it is kind of positive, and I like your vision and I like everything both of you have said.

In your written testimony, Mr. Young, you said "I worry that approval will be difficult and implementation is subject to too many unintended consequences," and that is one of the first things we worry about. You know, we try not to do any harm. We want to do good but the first thought is do no harm. I am just wondering what kind of unintended consequences you might envision so that we might also be alert to that.

Mr. YOUNG. I suspect the top of my list is the members of the board, and you know, I looked at the process by which they are identified and, you know, three here and three there and one here and one there, and I have watched committees be put together and I have watched committees that can really have an influence, sometimes the lobbying that takes place to become a member of the committee. So if I could pick the board of directors, I would be totally satisfied. And what I mean by that is, one unintended consequence is that the board becomes a board with an agenda, a defined agenda as opposed to being the statespersons that I think is really necessary. Now, I think there are people out there who can be statespersons in that regard but I think again the unintended consequence would be, the wrong board would be a disaster, just as an example.

So as I tried to say, I think if it could be implemented exactly as it is intended, you know, no question it would have a positive impact, but that would be one of my unintended consequences.

Mr. POSEY. I think we all wonder about that too, and sometimes, as you have learned over the years, perfection is the enemy of good, and it may take a little more effort for the people with different agendas coming from different places to change the program. I mean, I am from the Kennedy Space Center. I heard the President campaigning saying he was going to close the gap between the shuttle and Constellation program, and nobody in the world was more shocked than I when, as the Chairman said, he redlined the Constellation program. That is not closing the gap, that is making the gap eternal. So I am a little bit less worried about what damage the board could do right now.

I appreciate your input on that, and well taken, and again, Mr. Chairman, I thank you for holding this hearing and I thank both of you witnesses for your input. I yield back.

Chairman PALAZZO. I want to thank the witnesses for their valuable testimony and the Members for their great questions and comments. The Members of the Committee may have additional questions for you, and we will ask you to respond to those in writing. The record will remain open for two weeks for additional comments and written questions from Members.

The witnesses are excused and this hearing is adjourned.

[Whereupon, at 11:13 a.m., the Subcommittee was adjourned.]

## Appendix I

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ANSWERS TO POST-HEARING QUESTIONS

## ANSWERS TO POST-HEARING QUESTIONS

Responses by Mr. A. Thomas Young

**Questions submitted by Ranking Member Donna Edwards**

*Q1. Your statement notes that if the cost of programs exceeds the budget, lower priorities should be terminated. In an agency with as diverse a portfolio as NASA, what process would you use to determine which of NASA's priorities for facilities, science, aeronautics, human exploration and spaceflight, and maintaining the vitality of the workforce and industrial base should be eliminated? That said, in your opinion, should we be cutting NASA's budget or increasing our investment? Why?*

A1. The first step in assuring program content is in balance with available budget is to establish credible most probable cost for all projects. This requires a strong and experienced independent cost estimating capability. NASA has a policy that the cost for projects that can be managed as a portfolio be at 70/30 and large, unique projects such as JWST be at 80/20. Experience supports this policy. Completion of this first step will identify the macro balance between program content and the budget.

Recognizing the difficulty of prioritizing an aeronautics project with an astrophysics project, a practical initial approach is to prioritize within disciplines and at current budget levels. A most important next step is to examine the lower priority endeavors within each discipline that are within the current budget and those that fall outside the budget. Criteria can be science, policy, workforce, industrial base, etc. This review should highlight disciplines that are underfunded and those that are overfunded at the current NASA budget level. Adjustments can be made to assure that the NASA budget is focused upon endeavors that collectively result in the most competent and productive NASA program. This process will also identify areas within the NASA program where enhancements are justified.

A critical conclusion of the suggested process is that the program content be in balance with the NASA budget. Achieving balance will most likely require augmentation of the budget and/or deletion of program content.

My opinion is that an increase in the NASA investment is justified. The process discussed will show where increases are in the national interest.

*Q2. Your prepared statement indicates that you are concerned about the absence of a credible human exploration strategy. How do you propose we establish the consensus needed for a U.S. strategy for human exploration and secure the funding for that strategy? In this environment of tight fiscal constraints, is that realistic?*

A2. The U. S. does not have a credible human exploration strategy. The U. S. does have a human exploration budget for SLS, Orion, etc. Additionally, there are enormous "sunk cost" for cancelled human space projects. A strategy without a most probable cost budget is an exercise in false hope. A budget without a strategy and a grave yard of cancelled endeavors is a failure of leadership.

As a country, we must decide if we want and can afford a human exploration program. It is difficult to imagine a great nation not pursuing such an exciting, rewarding and inspiring program. Currently a considerable percentage of the NASA budget is spent on human space flight. Included are ISS, commercial crew, technology, SLS, Orion, etc. Is this the most exciting, rewarding and inspiring program?

There are two realistic destinations for a human exploration program—the moon and Mars. Other intermediate steps can be part of a competent Moon, Mars or Moon/Mars program.

Substantial effort is needed to define human exploration options. This can be done by NASA and/or the National Academies. Option must be defined and documented in significant detail. Options must also include most probable cost. Only then can the U. S. make a choice and decide what direction the country wishes to take.

This will not be easy, but "muddling along" is not an acceptable way to continue.

*Q3. In your prepared statement, you voice concern about the ISS being in danger of becoming a science and research failure and argue that a Senior Review is needed to determine if the return justifies the continuation of ISS beyond 2020. What is the nature of the "Senior Review"? What key information is needed to evaluate the return that justifies continuation beyond 2020 and who should be involved as senior review participants?*

A3. ISS is a technological marvel and a diplomatic success. ISS is now operational focusing upon science and research. "Senior Review" is an established concept used

by NASA and NSF to evaluate operational systems to determine the value of the science and research versus the cost of operations. Result of the Senior Review can be a recommendation to continue at the current funding level, increase or reduce funding, or terminate operations. The evaluation is based upon the value and merit of the science and research. Participants are knowledgeable and independent experts. Now that ISS is operational, this is an established process that can be used to determine the merit of future funding.

*Q4. NASA can choose among several contracting alternatives. Greater use of one of them, long-term contracting, has been advanced by some and is identified in the Space Leadership Preservation Bill. For contracts such as those for the development of the Space Launch System and Orion spacecraft, would long-term contracting, as DOD uses for buying some fighter jets, make sense for NASA? If so why; if not, why not?*

*A4.* I have not studied the current characteristics of long-term contracting versus alternatives to offer constructive comments.

Responses by Mr. Elliot Pulham

**Questions from Ranking Member Donna Edwards to Mr. Pulham**

*“A Review of the Space Leadership Preservation Act”*

1. Your report states that *“It is also possible to include a requirement that any prospective Administrator adhere to the role set forth in the Space Act. Language can also be added to specify that the Administrator could be dismissed if some critical number or percentage of projects breach Nunn-McCurdy-like limits.”* While I endorse effective management, I am left to ponder whether it would have been wise to require the threat of dismissal for previous Administrators under whose watch cost overruns on the Hubble Space Telescope and the Mars Science Laboratory (MSL) took place. I am certain that the threat of a Nunn-McCurdy-like breach would flow down to workers on the floor. Cost and schedule would then be the only priority. Are you concerned that such a requirement would create unintended consequences for mission success, and more importantly, safety? Isn't that a lesson we learned painfully with Challenger?

The tragedy of Challenger, history has taught us the painful results of chasing blindly after aggressive cost and schedule performance. The Space Foundation understands that there are many difficult trade-offs and choices involved with guiding a national enterprise of the size and importance of NASA. PIONEERING: Sustaining US Leadership in Space offers a variety of recommendations to help NASA manage cost and schedule without repeating mistakes of the past; dismissing the NASA Administrator is absolutely a measure of last resort. The most important element is giving the NASA Administrator a singular, clear mandate, such as Pioneering. This should help clarify management dilemmas and give the Administrator more leverage to bring about change within NASA. Other more specific recommendations include changes in budgeting which will dampen the effects of cost overruns in one program by allowing for better cross-year allocation of funds. Another recommendation recognizes NASA's advances over the last few years in cost-estimation, and encourages further efforts along those lines. Finally, the report recommends the wider use of smaller, less-expensive, faster-turnaround missions to help manage overall budgets.

2. Your report suggests that the establishment of a standing commission would “*provide a mechanism for securing congressional consensus and buy-in for NASA’s long-term planning, while avoiding the problems associated with trying to develop complex architectures in very short periods.*” What is the nature of that “consensus and buy-in” and how do you envision reconciling the normal 2-year window of an elected Congress with the longer term commitment being sought that may span across several future Congresses?

The report proposes creating a standing commission to work with the short-, medium-, and long-term planning process recommended elsewhere in the report. The role of the standing commission is to examine NASA’s planning and act as a trusted, independent go-between to assure Congress that NASA’s plans are solid, and that NASA is staying on track. Because members of the Congressional committees of jurisdiction will be nominating their trusted representatives to sit on the commission, the commission will help create a consensus. Even as Congresses do change, the report expects that members of each party in each committee will be able to work together and select acceptable representatives. Even if committee leadership changes, there should be limited reason to find a new representative to the standing commission.

3. NASA has been a multi-mission agency with programs in space science, exploration, aeronautics, and human spaceflight. Successive NASA Authorization Acts have directed that NASA include a balanced portfolio of programs in these areas. Although your report advocates focusing on pioneering, it is not clear what would happen to this congressionally-mandated balance between space science, exploration, human spaceflight, and aeronautics. Can you identify examples of where major functions of an existing agency have been successfully moved to another agency in the federal government? If so, was the budget and scope of the functions taken on by the recipient agency mostly unchanged?

There are several examples of major functions of an existing agency being successfully transferred to another agency in the federal government. For example in 2003, 22 different agencies from across the U.S. government with different cultures, management practices and philosophies were merged together to create the Department of Homeland Security (DHS). These different functions came from many different parts of the federal government including: the Department of Treasury, the Department of Justice, the Department of Transportation, the Department of Agriculture, the Department of Energy, and the Department of Defense. While the merge was not easy and the resulting structure is being improved upon, the Government Accountability Office recently noted that “DHS has made considerable progress in transforming its original component agencies into a single cabinet-level department and positioning itself to achieve its full potential.” In addition, on average the budget and scope of these agencies were relatively unchanged when moved to DHS, although a few did get budget increases to match their increased responsibilities.

4. The National Research Council recently released a report on NASA's Strategic Direction. In that report, NRC called for the administration to take the lead in forging a new consensus on NASA's future that is stated in terms of a set of clearly defined strategic goals and objectives. Can you contrast your recommendation for NASA to embrace a singular, unambiguous purpose with NRC's recommendation?

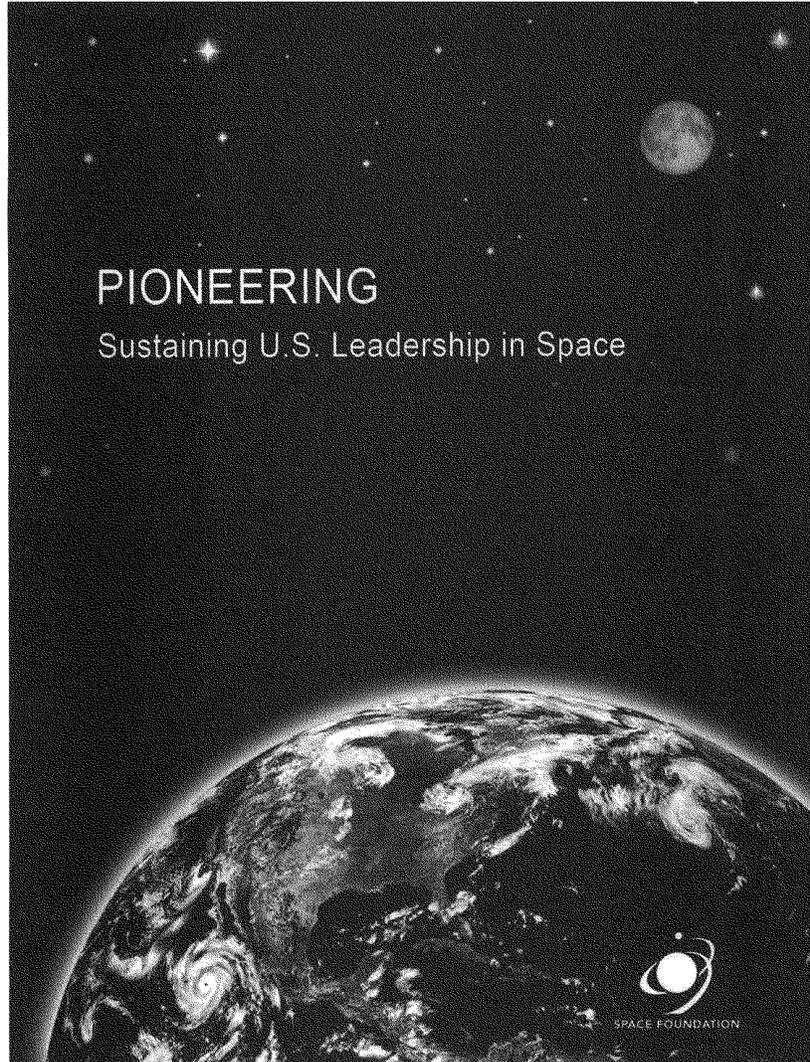
The NRC report on NASA's Strategic Direction and the Space Foundation's report on Pioneering agree on most of their conclusions. The NRC report calls for the Administration to forge a new national consensus defined by a set of goals and objectives. By contrast, PIONEERING: Sustaining US Leadership in Space argues that it will be much easier to build a new national consensus around a clear, singular mandate. Once NASA has a new mandate and national consensus behind it, it will then be able to generate a coherent, logical set of strategic goals and objectives.



## Appendix II

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ADDITIONAL MATERIAL FOR THE RECORD



# PIONEERING

Sustaining U.S. Leadership in Space



SPACE FOUNDATION

**PIONEERING: Sustaining U.S. Leadership in Space**  
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**The full report is available for download at [www.spacefoundation.org/research/pioneering](http://www.spacefoundation.org/research/pioneering)**

## **PIONEERING: Sustaining U.S. Leadership in Space**

**A Space Foundation Report**



## CONTENTS

<b>Executive Summary</b> .....	1-5
<b>Chapter 1 – Introduction</b> .....	6-8
<b>Chapter 2 – Assessing Explanations for NASA's Performance</b> .....	9-15
An Ambitious Space Program is Too Expensive	
Space Activities Do Not Have Enough Support from the Public	
Presidential Leadership is Needed to Drive Space Activities	
Greater Congressional Support Can Drive Space Activities	
Underlying Issues of NASA	
<b>Chapter 3 – Cultural Issues at NASA</b> .....	16-21
NASA and Organizational Culture	
Technological Hubris	
Long-term Strategy	
Risk Aversion	
NASA Culture	
<b>Chapter 4 – The Benefits of a Focused Purpose for NASA</b> .....	22-29
The Creation of NASA	
Purpose, Organization, and Unity of Direction	
The Purpose of NASA	
<b>Chapter 5 – The Pioneering Doctrine</b> .....	30-39
Implementing the Pioneering Doctrine	
The Four Phases of the Pioneering Doctrine	
1. Access	
2. Exploration	
3. Utilization	
4. Transition	
<b>Chapter 6 – Strategic Recommendations</b> .....	40-55
1. Amend the Space Act	
2. Streamline the National Civil Space Enterprise	
3. Stabilize NASA Leadership and Planning	
4. Stabilize NASA Funding	
<b>Chapter 7 – Tactical Recommendations</b> .....	56-63
1. Set Clear, Concrete Goals for the ISS	
2. Realign Space within the Executive Branch	
3. Clarify NASA's Role in Developing Industrial Base Policy	
4. Strengthen Personnel Management	
5. Effectively Manage the Relationship among Centers and NASA Headquarters	
6. Set Common Standards and Promote Interoperability	
7. Justify Regulations and Manage Institutional Knowledge	
8. Improve Procurement and Cost Estimation	
9. Improve Professional Education in Project and Program Management	
10. Increase the Amount of In-house Technical Work	
<b>Chapter 8 – Conclusion</b> .....	64
<b>Works Cited</b> .....	65-67
<b>Acknowledgments</b> .....	68
<b>Underwriters</b> .....	69
<b>Space Foundation Editorial Team</b> .....	70

## EXECUTIVE SUMMARY

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NASA is an exceptional institution in a tremendous predicament. The agency's accomplishments go beyond inspiring billions of people to overcome human frailties or the limitations of our planet—they mark the transition of humanity from earthbound creatures into a spacefaring species. Yet, the last time any human set foot on the surface of another celestial body was in 1972. Many of NASA's advocates and supporters can only wonder why, in these past 40 years, we have seen the space program played backward in slow motion: going from a presence on the lunar surface, to operations only in low Earth orbit, to the final flight of the Space Shuttle in July 2011 with no capability to send astronauts into space aboard U.S. vehicles.

When NASA was created, it was given the lion's share of responsibility for building the entire U.S. national civil space enterprise. The agency was built from an amalgamation of different laboratories, offices, and programs, assembled in haste and immediately challenged with a high-risk, rapid-turnaround program to land an American on the Moon. NASA rose to the challenge, marking one of humanity's greatest achievements. Dramatic changes have occurred since that time. The space enterprise is now a \$290 billion global endeavor, with NASA accounting for just 6 percent of the total. NASA is no longer the sole creator and manager of the entire U.S. national civil space enterprise. As the space program has evolved, we have witnessed frequent redirection and constantly shifting priorities at NASA, mixed signals from Congress and the administration, organizational conflicts, and the lack of a singular purpose, resulting in a space agency without a clear, stable direction. It is from this perspective that the Space Foundation commissioned this report to undertake a sincere and earnest exploration of NASA's state and future.

At the most basic level, a successful organization needs a clear, well-defined purpose to generate unity of action, coordination of strengths, and focus of effort, as well as to establish a means by which to measure its success or failure. The Space Foundation believes that first and foremost, NASA needs to embrace a singular, unambiguous purpose that leverages its core strengths and provides a clear direction for prioritizing tasks and assigning resources. In addition, we believe that measures must be taken to remove or reduce factors that hamper NASA's ability to execute a more clearly defined program. These measures include divesting NASA of activities not related to its core purpose, providing for stability in senior NASA leadership, and establishing an ongoing planning process to lend continuity and framework to the development of its long-term plans. Additionally, the Space Foundation has identified other areas where NASA can improve performance and increase returns on taxpayer investment.

The Space Foundation has approached this study with rigor and impartiality, taking into account the diverse opinions obtained by interviewing nearly 100 senior leaders representing numerous disciplines that encompass a variety of perspectives on management, space exploration, and public administration. The product of more than a year of research, the report's findings are presented in the spirit of engagement and constructive counsel, with a sincere desire to catalyze change for the better.

## NASA's Purpose

To establish a clearly defined purpose, NASA must return to its roots and examine the very essence of its core competencies. While science and research play an important role in the agency's efforts, NASA's mission should be to increase and expand the U.S. national civil space enterprise. This capacity building involves creating physical infrastructure, cultivating human capital, and developing technology. Expanding the U.S. national civil space enterprise is a matter of expanding human reach and activity in space. This is not limited to questions of human spaceflight, but includes the many different means by which human reach is extended.

NASA must be a leader in good management, systems engineering, and logistics. The Space Foundation believes that one word can embody NASA's purpose and leverage its greatest core strengths to promote, expand, and develop a healthy national civil space enterprise: PIONEERING.

The Space Foundation defines "pioneering" as: 1. being among those who first enter a region to open it for use and development by others; and 2. being one of a group that builds and prepares infrastructure precursors, in advance of others. It is a term that is used throughout this report to describe the ideal focus for NASA. The Pioneering Doctrine has four phases: access, exploration, utilization, and transition.

**Access:** The ability to get to and from a destination. Improving access means increasing the ability to deliver more hardware, produce more power, or otherwise expand activity at a destination.

**Exploration:** Learning about the basic characteristics and features of a destination. By understanding the risks and opportunities associated with a destination, one can determine what activities are possible there. This phase is where much of the scientific research and investigation occurs within the Pioneering Doctrine.

**Utilization:** Turning theoretical knowledge into real technology to accomplish specific objectives. This phase involves acquiring practical knowledge essential to beginning, developing, and sustaining regular operations at some destination.

**Transition:** Handing off an activity or capability once it has become sufficiently mature to support itself either elsewhere in government or in the private sector. This phase commits NASA to hand off activities when it can, and formally introduces real commercial competition.

Defining a singular purpose provides the framework to better manage ambiguity in direction from Congress and the administration and minimize the impact of shifting political winds. In addition, requiring NASA to develop long-term plans to present to Congress for approval will result in better preparation and guidance for the agency, its contractors, and the nation's space workforce. The plan can be geared toward a very simple objective: NASA will say what it is going to do and then do it. These measures will increase NASA's accountability to Congress and the taxpayer.

## Strategic Recommendations for Sustaining U.S. Civil Space Activity

Along with a focused purpose, NASA must be assured that its budget and its management have the stability to ensure that its purpose can be fully and effectively pursued. NASA funding should involve mechanisms to eliminate unwarranted and destabilizing shifts in budgets and objectives that waste dollars on changed or cancelled programs. Likewise, a fixed term for NASA's top leader will discourage arbitrary changes in the direction of the agency and reinforce its commitment to pioneering.

The Space Foundation believes that the following strategic recommendations will ensure that NASA's primary responsibility is not to cover, manage, and coordinate all U.S. civil space activities, but to expand the national civil space enterprise.

1. **AMEND THE SPACE ACT:** Congress should amend the Space Act to officially assign pioneering as NASA's primary purpose. During the amendment process, Congress should also eliminate tasks that are no longer relevant or that distract NASA from its focus on implementing the Pioneering Doctrine.
2. **STREAMLINE THE NATIONAL CIVIL SPACE ENTERPRISE:** With a new focus codified in statute, NASA should assess its current activities and work to align them with its purpose.
  - a. **REALIGN THE NATIONAL CIVIL SPACE ENTERPRISE:** NASA should divest itself of portions of its activities that do not fall within its new statutory purpose. This will involve dispersing relevant activities to other public and private parts of the national civil space enterprise.
  - b. **RATIONALIZE EXISTING INFRASTRUCTURE:** NASA's existing infrastructure and facilities need to be consolidated, and excess capacity should be eliminated. Decision-makers must distinguish between supporting a space program versus archiving the infrastructure that could conceivably be used to support a space program. This would involve an agency-wide evaluation of infrastructure, facilities, and capabilities by independent auditors.
  - c. **PURSUE FURTHER COMMERCIALIZATION:** NASA should continue to pursue privatization and commercialization of activities where possible.
3. **STABILIZE NASA LEADERSHIP AND PLANNING:** To leverage the agency's new clarity of purpose, NASA leadership and planning should be stabilized to avoid wasteful disruption.
  - a. **CREATE STABILITY FOR NASA LEADERSHIP:** The NASA Administrator should be appointed for a five-year renewable term, ensuring continuity of leadership despite shifting political winds. Furthermore, the NASA Administrator should be responsible for nominating the Deputy Administrator, for appointment by the President with the advice and consent of the Senate, to ensure close cooperation and singularity of purpose at the highest levels of NASA management.
  - b. **REQUIRE NASA TO SUBMIT A LONG-TERM PLAN:** NASA should develop both a 10-year plan with specific dates, goals, and objectives and a 30-year plan that provides the broader strategic context in which the 10-year plan can be understood. These plans would be submitted for congressional approval every five years, at which point Congress would evaluate performance during the previous five years, following validation by a congressional commission (described below). This approach would ensure that Congress is kept apprised of NASA's direction and objectives, providing insight into the planning process while reducing the possibility of shifts in priorities that can come with each administration or new piece of legislation.
  - c. **CREATE A NASA COMMISSION:** Congress should authorize the creation of a 12-person commission, chaired by the NASA Administrator or his/her designee, comprising three presidential appointees, four members appointed jointly by the majority and minority leadership of the relevant committees of jurisdiction in the Senate, and four members appointed jointly by the majority and minority leadership of the relevant committees of jurisdiction in the House. The purpose of the commission is to ensure that any plan submitted by NASA to Congress has been validated by a group of qualified, trusted individuals.

4. **STABILIZE NASA FUNDING:** Along with leadership and planning stability, NASA will be able to better carry out its new purpose once it has access to more stable and reliable funding streams.
  - a. **CREATE A REVOLVING FUND FOR NASA PROJECTS:** Congress should create a revolving fund for NASA to draw upon to pay for its activities, which can be supplemented through annual appropriations. This will allow the agency to better match program spending with real-life funding profiles, rather than trying to compress and rearrange programs to maintain a particular top-line annual budget.
  - b. **EXPAND FUNDING OPTIONS:** Congressional appropriators should make use of the full range of appropriations options available to them in law. This includes multi-year appropriations, no-year appropriations, and advance appropriations. In multi-year appropriations, the agency has several years to spend appropriated funds before they must be returned to the U.S. Treasury. For no-year appropriations, the funding can be spent until the intended objective is met. Advance appropriations involve a pledge for funding from a future Congress.
  - c. **ESTABLISH ACCOUNTABILITY AND OVERSIGHT MEASURES:** Programs that exceed predefined limits in cost or schedule should be removed from special funding arrangements and returned to traditional year-by-year funding managed under the normal appropriations and oversight rules and procedures. The Space Act should stipulate that failure to keep NASA, as a whole, on schedule and within budget would be grounds for dismissal of the NASA Administrator.

### Tactical Recommendations to Help NASA Flourish

Giving NASA a purpose and holding the agency accountable for delivering on this purpose creates an environment in which NASA can succeed and provides NASA leadership with tools it can leverage to address long-standing issues of organizational culture and institutional performance. These issues require a host of administrative and bureaucratic changes, which have been discussed at length in previous reports by organizations such as the Government Accountability Office, the Congressional Budget Office, and NASA's Office of Inspector General.

The Space Foundation has identified key areas that NASA, Congress, and the President can address together to improve NASA's effectiveness:

- **Set concrete goals to measure the success of the International Space Station (ISS)** during the remainder of this decade. Since effective utilization of the ISS is of paramount concern to NASA and its ISS partners, management of the ISS will provide the most visible opportunity for NASA to demonstrate its capability to manage a large-scale space enterprise and successfully fulfill its new mandate.
- **Realign space within the Executive Branch** to manage and coordinate the growing national space enterprise, both civil and national security. NASA should keep a narrow focus on expanding the civil space enterprise but should not address coordination at the highest levels. This coordination will include developing cross-sector infrastructure, research and development, and industrial policies involving all stakeholders.
- **Clarify NASA's role in developing industrial base policy** to provide the private sector with clear and consistent guidance. Stability in NASA's long-term planning will provide the stable outlook needed for successful long-term technology investments throughout the private sector.
- **Strengthen personnel management** so that best practices are exchanged and disseminated throughout the agency, the national civil space enterprise, and private sector by:
  - Making greater use of Intergovernmental Personnel Act (IPA) assignments to host outside personnel at NASA and vice versa for extended periods, and
  - Overhauling the regulations affecting the transition of skilled personnel to and from NASA.

- **Improve relationships among the centers and headquarters** to address the operational dysfunction stemming from divergent cultures and goals by:
  - Strengthening management across enterprises,
  - Increasing promotion incentives for cross-center transfers, and
  - Retaining program management at headquarters and distributing project management throughout the centers.
- **Create a common body of standards** and library of best practices. Eliminate center-to-center variation in technical requirements and promote interoperability between systems.
- **Conduct a zero-baseline review of NASA regulations** to determine which ones remain essential and which ones need to be filed away, preserving the relevant institutional knowledge in either case. It is critical to redirect the agency's ad hoc practice of holding on to old rules and regulations as a means of accumulating institutional knowledge.
- **Conduct a zero-baseline review of NASA procurement processes** to shift its focus to mission assurance, cost management, and program management while simultaneously eliminating performance-driven mission creep and reducing problems with cost estimates and cost control.
- **Improve program management skills** by increasing professional development opportunities for NASA's workforce to include new and innovative initiatives. The result will be wider dissemination and institutionalization of best practices and attraction and retention of top talent.
- **Retain and strengthen in-house technical capabilities** to more effectively promote innovation by:
  - Increasing the in-house, hands-on work that helps maintain the technical proficiency needed to effectively manage contractors,
  - Directly allocating time for select science, technology, and engineering personnel to pursue their own areas of interest and innovation,
  - Increasing the number and frequency of simpler, lower-cost missions, and
  - Encouraging development of small "skunkworks" teams to address difficult challenges outside the main bureaucratic hierarchy.

### The Way Ahead

The recommendations presented in this report can make NASA a more successful agency. As a result, the benefits of scientific knowledge, inspiring the nation's youth, greater soft power, and economic rewards will once again accrue. This is much more effective than setting any of these benefits as the ultimate goal for the U.S. space program, which would distract the program from leveraging its core strengths. Most of all, this framework will give NASA the opportunity to apply its skills and expertise over the long time frames required to expand the human sphere of influence. It provides a clear and consistent means for measuring progress on that project, while equitably distributing penalties for failure and rewards for success.

Increased stability will help insulate NASA from shifts in political priorities and reduce the waste that results from the starts, stops, restarts, delays, and eventual cancellation of programs throughout NASA. The agency will be able to begin a mission with confidence that it can pursue that project as long as it is technically viable, without worrying about capricious changes in direction from one election to the next.

Although our recommendations go against the status quo, we believe them to be reasonable and straightforward. NASA is a unique agency within the U.S. federal government. Its mandate is one that results in discoveries that can shape history and significantly change humanity's place in the universe. It is the Space Foundation's sincere desire to assist all those who care about NASA and to provide helpful recommendations that will set NASA on a sustainable, long-term trajectory pioneering our place in the Solar System.

