

# ‘Shoot for the Moon; Even if You Miss, You’ll Land Among the Stars.’

*The House Committee on Science, Space and Technology held hearings Sept. 22, 2011, entitled, “NASA Human Spaceflight Past, Present, and Future: Where Do We Go From Here?” The Committee is chaired by Ralph M. Hall (R-Tex.); Eddie Bernice Johnson (D-Tex.) is the Ranking Member.*

*The witnesses were: Neil Armstrong, Commander, Apollo 11; Eugene Cernan, Commander, Apollo 17; Michael Griffin, former NASA Administrator, Professor of Mechanical and Aerospace Engineering, University of Alabama, Huntsville; and Maria Zuber, Professor of Geophysics, head of the Department of Earth, Atmospheric and Planetary Sciences, MIT.*

*Here are excerpts from their testimony (subheads have been added):*

**Hall:** . . . For the agency with a budget that consumes less than one-half of one percent of federal spending—and human space exploration is about a 20 percent of that—NASA is renowned at home and around the world as certainly an American enterprise whose feats no one has been able to duplicate. . . .

And we’re now at a crossroad. The 30-year-old shuttle program has been retired; the International Space Station is built; and for the next several years our country is without any domestic capability of getting American astronauts to and from our own space station. . . .

America needs leadership with a compelling vision, and the strength of commitment. Our bright young engineers about to enter our workforce will likely look to disciplines other than aerospace if faced with such a protracted development cycle. . . .

**Johnson:** . . . I know that there will be some who will say, “The space race is over. We won it more than forty years ago, and supporters of human space exploration are just as capable to nostalgia.” Well, I was proud of what this country had accomplished in the Apollo pro-

gram, but I’m not nostalgic about that time. Instead, I support space exploration because it is about the future, not the past. . . .

There will also be those who will say, “It’s time to get the government out of space exploration—let the private sector do it.” Such a statement ignores the fact that our nation’s space flight program—and NASA in total—represents one of the most effective public-private partnerships in pursuit of challenging goals that this country has ever seen. The facts are clear—almost 85% of NASA’s budget already goes to the private sector to provide the hardware, software, intellectual energy, and services that help NASA push back the space frontier.

And of course there are those who say that we should pause our human space flight program until we have a clear exploration policy, so that NASA doesn’t wind up building a “rocket to nowhere.”. . .

And finally, there will be those who say, “Times are tough. We can’t afford it right now.”

I would respond to that—we can’t afford not to pursue a meaningful human space program. The amount of funding that would be cut will have no significant positive impact on our fiscal situation, but it will result in the loss of tens of thousands of good-paying jobs, skilled jobs in the aerospace industry.

It will slow the development of advanced technologies that could wind up creating new jobs in the future, will forfeit American leadership in space, and will inevitably lead some of our best and brightest young minds to turn away from studying science and engineering. I don’t think that makes sense, and I don’t think most Americans will either, if presented with the facts. . . .

## Substantial Erosions Throughout Aerospace

**Armstrong:** This past year has been frustrating for NASA observers, as they tried to understand NASA’s plans and progress. The NASA leadership enthusiasti-



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*Eugene Cernan, Commander of Apollo 17, the final mission to the Moon, speaks on the panel with (left to right) Neil Armstrong (Commander, Apollo 11), MIT Prof. Maria Zuber, and former NASA Administrator Dr. Michael Griffin.*

cally assured the American people that the agency was indeed embarking on an exciting new age of discovery in the cosmos.

But the realities of the termination of the shuttle program, the cancellation of existing launching rocket and spacecraft programs, the layoffs of thousands of aerospace workers, the outlook for American space activity throughout the next decade was difficult to reconcile with the agency assertions. . . .

We will have no American access to, nor return from, low Earth orbit and the International Space Station for an unpredictable length of time in the future. For a country that has invested so much for so long to achieve a leadership position in space exploration and exploitation, this condition is viewed by many as lamentably embarrassing and unacceptable.

The severe reductions in space activity have caused substantial erosion in many critical technical areas and are creating negative economies of scale cost increases throughout the aerospace industry. . . . Our choices are to lead, try to keep up, or get out of the way. A lead, however earnestly and expensively won, once lost, is very difficult and expensive to regain.

The key to the success of American investment in space is a clearly articulated plan and strategy supported by the Administration and Congress, and imple-

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—Gene Cernan

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mented with all the consistency of the vagaries of the budget will allow. Such a program will motivate the young toward excellence, support a vital interest industry, and earn the respect of the world. . . .

**Cernan:** Lest we forget, Mr. Chairman, it was a bold and courageous President over a half century ago who started us on a journey to the stars—a journey from which America never looked back and a journey that challenged the American people at every crossroad to do what most, at the time, thought impossible. . . .

JFK did not just challenge us to go to the Moon—he believed it was time to take a leading role in space—a role he thought might well hold to the future of us—of our nation on Earth. . . .

We need an Administration that believes in and understands the importance of America’s commitment to regaining its preeminence in space—an Administration, which provides us with a leader who will once again be bold—just as JFK was—and challenge our people to do what history has now told us is possible. . . .

**Zuber:** . . . Job one in the next phase of human spaceflight is to develop reliable, routine access to low Earth orbit, but NASA should be doing the technically challenging task—transporting humans to unexplored destinations. . . .

The ultimate destination for our human spaceflight program should be astronauts on the surface of Mars. . . .

The American public, and by extension NASA, grows ever more risk averse. Today, I cannot imagine that we would send a mission to the Moon if lightning



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Mike Griffin asked the Committee: “Do we want a real space program, or not?”

struck the launch vehicle, as happened with Apollo 12....

My mission, GRAIL [Gravity Recovery and Interior Laboratory], was selected solely on the basis of its scientific goal of understanding the structure and evolution of the Moon and its ability to advance similar understanding of the rocky planets, including Earth. However, the new understanding of gravity it will enable also provides distinct benefits for future robotic and human exploration....

A forward-looking endeavor that would be particularly suited to humans on the surface of another planet would be deep drilling. Imagine exploring below the surface of Mars to search where life retreated there when the planet lost its atmosphere early in its history. Imagine drilling deep into the Moon to understand the role of solar heating over the past several hundred years, an activity that would elucidate the role of the Sun in Earth’s climate history....

### A Real Space Program, or Not?

**Griffin:** At this point, I feel a little bit like Zsa Zsa Gabor’s eighth husband. I know what to do, I’m not sure how to make it interesting....

...[I]n my opinion, the principal issue before us has not yet been addressed.

The central issue to be decided by our nation’s leaders, at this time, is simply this—do we want to have a real space program or not? Based upon our behavior lately, I believe that most people would be forced to conclude that the answer is not.

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—Mike Griffin

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What is a real space program? Well, let’s return to NASA’s chartering legislation, the Space Act of 1958.

In that seminal work, we find among other things that, quote, “The aeronautical and space activities of the United States shall be conducted so as to contribute materially to the preservation of the role of the United States as a leader in aeronautical and space science and technology, and in the application thereof.” End quote.

Today, the United States is dependent upon a foreign power for the most important of those applications—human spaceflight—and our recovery plan, if that is the word for it, is to depend upon certain companies, which have yet to show that they can deliver the laundry to the International Space Station, never mind the crew that would wear it. This does not seem like leadership to me....

**Armstrong:** Well, I think the key is—is having to plan—a master plan that everyone—everyone supports. And with the plan, then there can be various design reference missions established to which the industry can respond and NASA can select the most valuable....

And in both Gemini and Apollo programs—we changed the mission almost every time. I think that will continue in the future, because you have to be flexible and ready to incorporate whatever new changes in the environment and the needs are....

**Cernan:** The real risk, the real challenge of going forward are those young men and women whose talents we cannot afford to lose. The dreamers whose generation wants to take us back where we belong and they truly believe that.

We did not join NASA to build—design windmills and rebuild brake pedals for some other country. They joined NASA to do something unique and different that

their parents, and grandparents, and aunts, and uncles did.

This is the key to the future—those young people. . . .

The old, wise, or smart, or more mature men and women are now retiring. People who have spent 50 years learning what they didn't know they didn't know, and they're turning that experience over to this new enthusiastic young group. And the question you ask is how do we keep them. We're losing them in droves.

**Rep. Jerry F. Costello (D-Ill.):** I would repeat Captain Cernan's question, how can we afford not to do it? What is the value of U.S. leadership? That's the question to be answered—not what the cost is.

If U.S. fails to lead in space, it is unimaginable to me that we will remain a leader on Earth, and I submit that the cost of that is far higher than the NASA budget many times over.

#### 'A JFK Moment'

**Rep. James R. Sensenbrenner, Jr. (R-Wisc.):** I agree with the priorities that have been sent out, but how do we rekindle the imagination of the American public on space in a very, very tight budget time after 15 years of letting the imagination, if not the appropriations, [drown] in Lake Fallow.

And I'd like to specifically ask Mr. Armstrong and Captain Cernan on how to do it, because what we hear now from the President on down as well, [is] we shouldn't go back to the Moon because we've "been there and done that."

You've been there and done that.

Gene, you've been there and done it twice. So, you know, the first thing we've got to do is, we've got to have a John F. Kennedy moment, because the public backed what Kennedy called for in his address. And NASA got the Apollo program done on time—actually early and under budget. So how do we do this?

...What can we do to rekindle the American spirit and make this a can-do kind of thing, because the money will follow if the public supports it?

**Armstrong:** ...The reality is that people can be highly motivated if there is hope. And right now, the



John F. Kennedy Library

*"JFK did not just challenge us to go to the Moon," Cernan said. "He believed it was time to take a leading role in space—a role he thought might well hold the future of us—of our nation on Earth. . . ." President Kennedy is shown here with Col. John Glenn at Cape Canaveral, Fla., Feb. 23, 1962.*

sense that I have is too many young people have the view that there is too little going on in American space effort in the next decade, which they are preparing for, so they turn to other directions. And so having something in the pipeline that gives hope to the young people is key. And it's important not only to the young people, but to the existing people of NASA.

I note that in yesterday's *Aviation Week*, there's a quote from the Johnson Space Center director that says his greatest challenge is the retention of the installation's human spaceflight expertise in the face of falling budgets and significant personnel issues and losses. . . .

**Cernan:** You know, all young kids—all of us [were] growing up with a dream to be something we didn't think we could be, to do something we didn't think was possible.

Neil [Armstrong] had a dream. I'm sure I had a dream—a dream of flying airplanes. Little did I know that that dream, many, many years later would lead me to the Moon. . . .



Committee on Science, Space and Technology

*In his testimony, Neil Armstrong (left) told the panel, “Right now, we find ourselves in a box where we’re not able to fully man the [International Space] Station,” because of lack of funding.*

...Let me tell you, it’s not good enough for these kids to say, “Oh, when I grow up ... I can solve the problems of global warming,” which is where some people want to take NASA quite frankly. That’s not going to do it. ... We need a mission to somewhere we can put our fingers on, touch, and say, in the year 2022 or 2042—quite frankly, I don’t care. ... It’s a direction that counts, not the time we get there. We can give these kids and these young people something that they can make happen in their generation. ...

There’s an old saying, “Technology makes it possible. People make it happen.” It’s the only way—the only reason Neil and I are sitting here today. The technology was going to come. It’s the people who gave us the opportunity to do what we did. And those are the people we have to stimulate and get excited about doing something today. ...

**Armstrong:** ...Right now, we find ourselves in a box where we’re not able to fully man the [International Space] Station. And consequently, we are unable to get very much productivity out of it, because with the few people that are there, they have to spend most of their time just keeping the station operating, and there’s little time for the necessary research that is the productive output of the station. That’s unfortunate but true.

**Cernan:** We’ve got to prove to the rest of the world we’re for real. We’ve got to first get our tails off the ground, and get back into Earth orbit and service a space station that we committed to and service the people who we committed access to that space too. Get

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*The reality is that people can be highly motivated if there is hope. And right now, the sense that I have is too many young people have the view that there is too little going on in the American space effort in the next decade, which they are preparing for, so they turn to other directions.*

—Neil Armstrong

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the shuttle out of the garage down there at Kennedy, crank up the motors, put it back and service.

... You want a launch vehicle today that will service the ISS? We got it sitting down there. So before we put it in a museum, let’s make use. It’s in its prime of its life. How can we just put it away?

### **Are We Losing Our Lead in Space?**

**Rep. Lamar Smith (R-Tex.):** Dr. Griffin, two questions for you. You’ve written in the past and, I think, expressed concerns about the Chinese-manned space-flight program. Are we in danger of losing our lead? Are the Chinese going ahead of us?

**Griffin:** Well, in my opinion, China understands what it takes to be a great power. We have written a script for them. We were not a great power prior to World War II, and since then we have been the world’s great power. They understand that, because we showed them how to do it.

They are a near peer competitor of ours. And I would worry very much about the future of this nation if we were not seen by all to be a world leader. And I do not understand how a nation which, when the Chinese can reach the Moon and we cannot—I don’t see why any other nation would regard us as a world leader.

### **Manned or Unmanned?**

**Rep. Randy Neugebauer (R-Tex.):** ...There are people that say, do we really need the manned portion that was the technology that we have today? Can we do space exploration without using [the] manned portion of it? ...

**Armstrong:** [There] is enormous value in our unmanned programs. Many of them can go places where humans will never be able to go. So there’s information

to be gained. And these knowledge gaining probes are imperative for our continued exploration of space. But the human program is designed with goals to give our future generations options of how to expand, where to expand, where to survive, how to survive—very big questions of the destiny of our human race.

And so I think those kind of questions must be investigated by humans, and they cannot be done by unmanned spacecraft.

**Cernan:** Well, you know, there's a lot of things we don't know about what's out there about the universe in which we live, and the unmanned program is vital. The Rover is on Mars. The Hubble itself, that's our imagination stretched out.

Neil [Armstrong]'s name is the most known name in the universe, you said that—the world, the universe—for a reason. He's a human being. He can come back and tell you what it feels like, what it looks like, what it was like to be there. Lewis and Clark didn't send an empty canoe up the river.

...Human beings have to follow in the footsteps of everything we can send before them. We send unmanned spacecraft to make it safer, to make sure we're going to get back so we can share these feelings and thoughts with you. . . .

When Kennedy said we're going to go to the Moon, he said that three weeks after Alan Shepard went up and came down—16 minutes of spaceflight experience—we didn't know beans about going to the Moon.

The technology didn't exist, but all the people who were working on this program knew that's where we were going to go; and American ingenuity was going to find a way to get there. And a testimonial to that ingenuity, to American enterprise, is the fact that everyone who went to the Moon, including Apollo 13, came back home to talk about it. . . .

### **The President Has No Vision**

**Rep. Michael McCaul (R-Tex.):** . . . I'm concerned [about] this Administration, whose President has no vision. I'm also concerned that the next flags that possibly land on the Moon will not be an American flag, but rather a Chinese or a Russian flag. And let's not forget the national security implications that are at stake here, as Dr. Griffin talked about.

So many people asked me. . . . We landed on the Moon in 1969. Why is it taking so long to go back? Why is it taking so long? And why is it important today that we go back to the Moon? . . .

**Cernan:** After I came back from the Moon on the Apollo 17, I got on a soapbox at Kennedy [Space Center], talking to the people at a homecoming. And I said, you know, the Apollo 17 was the end.

How does it feel to be the tail of a dog, the last one over the fence. And I got up on my soapbox [and said] that it's not the end, it's just the beginning of a whole new era in the history of mankind. And I truly did believe it. I said we're not going to go back to the Moon, we will be on our way to Mars by the turn of the century.

Well, my glass was half-empty for a long time, until Constellation came along, and that became half-full. And it gave this country something I think to look forward to. Again, it re-inspired those young people to dream. And the dreamers of today are the doers of tomorrow, and if we don't inspire those young kids to dream, there ain't going to be any tomorrow. And that's what I was looking at, that's what it was—that's what it was all about.

I forgot the other half of your question, Congressman, but inspiration of these young kids, and a goal for them to put their hands on and look forward to, I think is what this country needs more than anything else. And I'll say it again: I'm at a point in my life where Neil and I aren't going to see those next young Americans walk on the Moon. And God help us if they're not Americans, and that if they're somebody else, or if it's a team of people that is not led by Americans.

We're not going to be here. We're going to take the last trip off to Ceres long before that happens. That's unfortunate. I never believed it would be that way. . . .

As long as I know—when I leave this planet, I want to know where we are headed as a nation—that's my big goal. I just feel so strongly about that, and I feel sometimes helpless other than to share those feelings with ladies and gentlemen like you because I'm not making a decision to make it happen. I can only try and get people enthused about pointing themselves in that direction.

### **The Moon: 'Been There, Done That'**

**Rep. Sandy Adams (R-Fla.):** Dr. Zuber, you know, some have argued, and the President specifically, that there is no need for the United States to return back to the Moon. The argument is basically, "been there, done that." And you've heard that here today from people questioning that logic. Do you agree with this assessment? Do you think there's anything more that landing on the Moon could teach us?

**Zuber:** . . . Let me give you an example of one of the

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—Maria Zuber

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NASA/Carla Cioffi

*Prof. Maria Zuber of MIT, told the Committee, “The ultimate destination for our human spaceflight program should be astronauts on the surface of Mars. . . .”*

many scientific questions that you could answer if you go back to the Moon. If you look at the Moon in a telescope, it’s heavily cratered. It was bombarded by all the material that was left over when the planet is formed.

Earth used to look like that, but the record isn’t preserved on Earth because it’s been eroded and subducted—it’s not there. The craters aren’t there. But Earth was that heavily cratered. And the age of the surface of the Moon at the time that that occurred is about the same time that the first single-celled organisms were arising on Earth.

And so by studying the Moon, we can learn about the Moon, but we can also learn about the conditions that must have also existed on Earth at the time.

**Adams:** So returning to the Moon is not useless then. . . .

And, Captain Cernan, Mr. Armstrong, how do we get NASA to move forward with a solid mission if the authorization bill passed last year—and we’re just now hearing of an SLS [Space Launch System]? Is there any way that we can encourage them to come forward with a solid mission—a vision, I guess, so that we can encourage our young people—our youth—to get more involved again?

**Cernan:** Well, that’s tough. You got to recreate John F. Kennedy. You got to have—whether he was a dreamer, a visionary or politically astute, we’ll never know. He was probably all three, quite frankly, considering their times.

I’d like to believe he was a dreamer or a visionary. I will leave the politically astute—go to history. . . .

You’ve got to have somebody, a Commander-in-Chief, who is giving the orders to move forward to believe and commit himself and understand that this is one of the most important thing this nation can do to maintain its leadership. . . .

No one understands what a half-percent of our budget is, but people understand that we’re spending more money to feed the cat and dog in this country, than it’s going to cost me to support the space program. . . .

### **Thousands of Jobs Have Been Lost**

**Rep. Mo Brooks (R-Ala.):** . . . I was reviewing the written testimony of Mr. Armstrong, and one paragraph really jumped off the page to me, and I’m going to quote it. “The uncertainties associated with the radical changes in space plans and policies of the last two years contributed to a substantial erosion of the United States’ historically highly regarded space industrial base.

“Thousands of jobs have been lost, and the space component of the industry is perceived as unstable, discouraging students from considering preparing themselves for entry into this exciting but demanding career path.” . . .

**Cernan:** Can I get personal for 20 more seconds?

These folks, you folks, and you’re here because you want to be. You’re inspired because of space and aviation.

Thousands and thousands of people out there were the strength behind the bull. Tell your kids and every other kid you ever see, tell them the guys who went to the Moon said, “Oh, we’ll shoot for the Moon, because even if you miss, you’re going to land somewhere among the stars.” That’s all they need. That’s all they need to foster their dreams.