

**UNITED STATES SENATE**  
**Committee on Commerce, Science, and Transportation**  
**Science and Space Subcommittee**  
**Statement of Robert “Hoot” Gibson**  
**February 24, 2010**

Mr. Chairman, good afternoon. Thank you for inviting me to address this distinguished committee, and I have to say I believe you really have your work cut out for you! In the letter from Senator Rockefeller I was asked to address the Administration’s new overall direction for NASA including the following areas:

- The proposal to cancel the Constellation program
- The reliance on commercial spacecraft for access to low earth orbit
- Testing an Ares 1-like rocket en route to building a heavy lift vehicle
- Astronaut safety issues associated with both the Space Shuttle and commercial spaceflight

The Administration’s proposal opens more questions than it answers. What is the vision? Where are we going? The abrupt change in NASA’s exploration approach has no clear path, no destination, no milestones, and no program focus, hence none of the Technology Pull so important to real innovation. With no specific programs, the budget cutters in future years will likely be able to reduce and eliminate funding for “Technology Development” as simply unfocused and unaffordable. This will take NASA down a path which will quickly end its Human Spaceflight endeavor.

I would like to state that it is imperative that NASA must maintain global leadership in Human Space Flight! With the International Space Station (ISS) in low earth orbit (LEO), NASA has established a frontier in space. The Administration has directed NASA to turn over ISS transportation to the commercial/ private sector, which I will say more about in a moment.

To maintain global leadership and core competencies in Human Space Flight, NASA must now focus on establishing the next frontier beyond LEO. In fact, the Summary report of the Augustine Panel stated:

“There is now a strong consensus in the United States that the next step in human spaceflight is to travel beyond low-Earth orbit.”

“The Committee concluded that the ultimate goal of human exploration is to chart a path for human expansion into the solar system. This is an ambitious goal, but one worthy of U.S. leadership in concert with a broad range of international partners.”

Establishing this new frontier is inherently governmental due to the risks that must be accepted by professional Astronauts and the large investments required. The commercial and private sector will then follow. International partnerships should be fully leveraged to reduce the burden on any one nation- but NASA must lead!

This means:

NASA needs a destination- a goal. Whether it is Mars, Lagrange Points, Near Earth Asteroids, or whatever.

NASA must define the roadmap and technological achievements required to achieve the goal. This becomes the “Flexible Path”, provides the Technology Pull, and focuses investment.

NASA needs a heavy lift vehicle to achieve these beyond LEO goals.

A Human Spacecraft that goes beyond LEO is very different from a Spacecraft that only transports crew to and from ISS. NASA needs to start working on that vehicle right now.

As to the specific points that Senator Rockefeller asked that I address, I want to start with “Astronaut Safety Issues associated with both the Space Shuttle and commercial spacecraft” because crew safety has always been extremely high on my list. In fact, Mr. Chairman, in her letter to you, Senator Mikulski listed as her first principle:

“**Astronaut Safety**- The safety of our astronauts is my number one priority. This means whatever transportation system is chosen, it must protect astronauts during launch, mission execution and re-entry, including long duration space flight”.

As far as the Space Shuttle part of this question, there are several other statements from the Augustine report I want to mention:

“Space operations are among the most complex and unforgiving pursuits ever undertaken by humans. It really *is* rocket science.”

“New human-rated launch vehicles will likely be more reliable once they reach maturity, but in the meantime, the Shuttle is in the enviable position of being through its infant mortality phase. Its flight experience and demonstrated reliability should not be discounted.”

I think it is important to consider how successful the Space Shuttle has actually been. I want to add that no one feels the losses of “Challenger” and “Columbia” any more than I do- I knew both of those crews. But it is also very revealing to look at how many missions we have successfully accomplished and the great steps forward we have made with the Shuttle. We have just completed the 130<sup>th</sup> Space Shuttle mission. We have launched dozens of satellites, docked with the Russian Space Station and built the ISS. The entire United States Space Program prior to Shuttle had amounted to 31 total launches! This includes all of Mercury, Gemini, Apollo including all the moon landings, Apollo-Soyuz, as well as Skylab. We have therefore flown more than 4 times as many flights with the Space Shuttle than our entire previous space program, which I feel has been a great accomplishment. Our tragic losses in the program both occurred when we let our guard down in applying the necessary rigor that space Flight demands. It truly is “Rocket Science”.

As for the commercial sector, they may very well ultimately achieve the success rate and reliability that we demand for Human endeavors, but it makes no sense to just turn over the entire operation to an unproven vehicle or company. We need to allow them to establish a “track record” with cargo before we turn over the Human portion of launches. At the same time, NASA needs to help the commercial service providers to be successful. For this to happen, the commercial providers need to be incentivized to take advantage of the operational, safety, and technical expertise of the NASA Human Space Flight Centers. Don’t lose the lessons learned over 50 years of Human Spaceflight- some of those lessons very costly.

Testing an Ares 1-like rocket en route to building a heavy lift vehicle. We should most definitely continue with the testing of an Ares 1 vehicle in support of a heavy lift launcher. We have an opportunity at this time to capitalize on a significant investment in time and money that has gone into the development of the 5 segment solid rocket motor, the J-2 rocket engine, and the Orion vehicle as the quickest and most economical way to a heavy lift and crew capability. The launch pad has had the modifications, the launch tower is in place, the team is in place, and it makes all the sense in the world to complete this program.

This also ties into the question of The proposal to cancel the Constellation program and continuing the Ares 1 testing, and has a significant bearing on what we derive from the nearly \$10 billion investment that went into Constellation. The need for the heavy lift vehicle has already been discussed, and the cancellation costs in these contracts would add significantly to the overall price of this program, with nothing to show for it. For no more cost, the completion of the Ares 1 testing would support the heavy lift launcher with the technology needed such as the 5 segment booster, and the J-2 engines. To launch and fly this spacecraft will not cost any more than actually canceling it. In addition, it would maintain the skilled team in place necessary for any future space endeavor. With the ending of the Space Shuttle program and the proposed cancellation of the Constellation program, and with no specific program to replace them, more than a third of NASA's workforce of experienced space professionals is at risk of being lost. This will result in a major disruption to our industrial base and loss of core expertise for exploration and Human Spaceflight within both industry and government. At least one of the commercial developers has stated that they can not succeed in Human Spaceflight without this core of expertise within NASA to rely on. Maintaining this knowledge base is critical to our future in Space as well as preserving our place in global competitiveness. Senator Mikulski mentions this as well in her letter stating:

**“Workforce Transition-** The retirement of the Space Shuttle should proceed as planned in 2011 after ISS assembly is complete, and any future direction must include a plan to maintain critical skills and incorporate lessons learned from our previous efforts to replace the Shuttle, and to soften any job dislocation impacts”.

The reliance on commercial spacecraft for access to low earth orbit. I have already touched on this subject in several other places, but there is still more to be said. As much as we all want to see the commercial sector succeed in space, there is a large learning curve that lies ahead of any such efforts, particularly in the area of Human rated vehicles. The Augustine Panel said:

“If we craft the space architecture to provide opportunities to this industry, there is the potential—not without risk—that the costs to the government would be reduced”. (emphasis added).

It is the very risk inherent in this approach that demands that NASA remain vitally involved in this effort, and that we do not turn this over completely to the commercial sector until they have proven their capabilities.

It is additionally important to realize what the commercial segment would accomplish for the overall space program. Estimates of the length of time required for the commercial sector to develop this capability range from 3 to 5 years, and even assuming that they proceeded with no setbacks whatsoever, it only accomplishes a capability to LEO. It does not begin to achieve any of the more desirable goals mentioned in the Augustine Report; that is beyond LEO. It is not unimaginable that with failures or problems, this time could extend well into 10 years for the commercial sector.

It is relevant to consider how long it took to develop the Space Shuttle System. The propulsion system was based on rocket engine technology that was already developed, and consisted of Liquid Hydrogen/ Liquid Oxygen Engines, Solid Rocket Boosters, and Hypergolic rocket motors. The airframe of the Shuttle would be of mainly aluminum construction as would the External Tank, and it would employ avionics that were largely representative of what had been done before. The new developments would be in the realm of the Thermal Protection System (Tiles, Blankets and Reinforced Carbon-Carbon), and the fact that the Shuttle would be a reusable vehicle. Development started in 1972 and the estimate for the first space flight was originally 1976. In actuality, it required until 1981 for the Shuttle to fly, in spite of the significant amount of developed technology that was utilized in the vehicle. For all these considerations, it is incredibly premature and naïve to simply turn over all efforts towards LEO to the commercial sector.

We also need a backup to the Russian Soyuz for transporting our astronauts to the ISS. The present cost of \$51 Million per crewmember will change when we no longer have a way to access space on our own. The head of the Russian Space Agency, Anatoly Perminov, has already stated: "We have an agreement until 2012 that Russia will be responsible for this," about ferrying astronauts from other countries into low earth orbit. "But after that? Excuse me, but the prices should be absolutely different then!" His statement "*Absolutely different then*" is frightening to me! The Russians are new to capitalism, but they know how it works, and when you have a monopoly, you charge monopoly prices. To knowingly commit our Space Program to this for years on end, without a truly viable solution in work, is irresponsible and fiscally dangerous, not to mention the National Security implications as well!

In summary, I want to state that with the retirement of the Space Shuttle later this year, and if the Administration's proposal is followed, the United States will no longer be a space-faring nation. We will have placed the future of our Space Program in the hands of the Russians and the unproven commercial sector, and with no program on the drawing boards we will have ceased exploration beyond low earth orbit and will be many years away from any hope of regaining what we once had:

***An exciting and vibrant Space Program that was the envy of the world, and literally lit up the eyes of thousands of school children that I have spoken to around the world over the last 30 plus years.***

Mr. Chairman, I am hopeful that you and your colleagues can alter the course we appear to be on. Thank you for allowing me to address this distinguished group.