Hearing of the Senate Committee on Commerce, Science, and Transportation (CST)

"NASA at a Crossroads: Reasserting American Leadership in Space Exploration"

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Testimony of Mark N. Sirangelo

Corporate Vice President for Space Systems, Sierra Nevada Corporation

Thank you Chairman Cruz, Ranking Member Peters, distinguished Members of the Subcommittee as well as the Subcommittee Staff for this opportunity to address the Subcommittee.

My name is Mark Sirangelo from the Sierra Nevada Corporation and I am here today to speak with you about the importance of a competitive and diverse U.S. commercial space industry as a vital component of our broad national space enterprise. It is my honor to be here testifying along with these respected leaders of our space industry all of whom have contributed significantly to our Nation's space program and to what we are going to talk about today.

Congress and NASA have played pivotal leadership roles in stimulating, creating, sustaining, and expanding U.S. commercial exploration space missions, markets, and opportunities. I wanted to thank you for all the support that has been provided. The balanced and enabling positions taken to date by Congress have served us well should be maintained as a key strategic element of the NASA Authorization considerations. These policies have established the United States as a global leader in commercial space and have opened many new markets to American industry and ingenuity.

Sierra Nevada Corporation's Space Systems designs and manufactures advanced spacecraft, space vehicles, rocket motors and spacecraft subsystems and components for the U.S. Government, commercial customers, as well as for the international market. We have more than 25 years of space heritage and have participated in more than 450 successful space missions through the delivery of over

4,000 systems, subsystems and components. During our history we have concluded more than 70 programs for NASA. SNC has been honored as one of "The World's Top 10 Most Innovative Companies in Space," and one of America's fastest growing companies. Our diverse technologies are used in applications including telemedicine, navigation and guidance systems, threat detection and security, commercial aviation, scientific research and infrastructure protection. We have a corporate wide workforce of nearly 3,000 personnel in 34 locations in 19 U.S. states and three countries.

As the head of Sierra Nevada Corporation's Space Systems as well as a founder and Chairman Emeritus of the Commercial Spaceflight Federation, I hope to share with you some of my industry insight and perspective as you chart the course ahead. In my testimony today, I will provide comment on the recent growth of the commercial space industry and the policies that have helped enabled it, the need to sustain a US-led global commercial space market and the key future enabling elements that will provide ongoing success for America in this area. Finally, I will highlight the importance of continuity and stability for NASA and our National Space Policy as we move forward in these dynamic and challenging, yet exciting times ahead. Your continued visionary leadership in the development of NASA's next Authorization will be pivotal to unleashing the true potential of the U.S. commercial space industry at this unique point in history.

The Impact of U.S. Policy and Law

The current National Space Policy of the United States of America and the current NASA Authorization Act were both established in 2010, which I believe was a very pivotal year for the U.S. space industry. Several important foundational programs such as the Cargo Resupply Services effort began to take hold. Building on a strong bipartisan partnership between Congress and the White House, these enabling policies significantly advanced the strength and leadership of the United States, NASA, other key Departments and Agencies, and just as importantly, created jobs and expanded our U.S. industrial base. The imperative is clear, as stated in the current National Space Policy: "The utilization of space has created new markets; helped save lives by warning us of natural disasters, expediting search and rescue operations making recovery efforts faster and more effective; made agriculture and natural

resource management more efficient and sustainable; expanded our frontiers; and provided global access to advanced medicine, weather forecasting, geospatial information, financial operations, broadband and other communications, and scores of other activities worldwide."

More than anything a growing space program also provides excitement for our young people. I am sure that every one of us here can remember some element of our space program which fascinated us. My own childhood awe about space led me to this room today. Out of the many things that may divide us, one thing we can all agree upon in this room, in our country and indeed throughout the world is that we want the future for our children to be better than our lives are today. We want to remember the wonder as a child of dreaming about the stars and wanting to fly there. We never want to lose that inner child nor the importance of it to exploration. Dreams do not have an expiration date and do sometimes, as they have for me, come true with the help of the creative thinking that both NASA and Congress have demonstrated.

Our space program provides amazing technical achievements but equally as important, it provides hope for the next generation enabling them to do something remarkable perhaps like building a new space company, becoming a respected leader at NASA or maybe even becoming a member of Congress who gets to go to space. These dreams are started, in part, through the thousands of internships and entry level jobs that my company and those of my colleagues provide. These job opportunities fuel the demand and drive for education and careers in Science, Technology, Engineering, Art and Mathematics, which in turn has helped enable the continued U.S. global leadership in technology and other key fields. Bold moves, like our country's commercial space program, excite students, fuel these lifelong dreams and uplift all elements of society. Isaac Asimov, one of our most famous science writers, once said, "If I were in heaven I would be doing what I am doing now forever." For many, including me, space is not just a job but it is also human instinct, art and passion.

Our U.S. Space Policy highlights "A robust and competitive commercial space sector is vital to continued progress in space. The United States is committed to encouraging and facilitating the growth of a U.S. commercial space sector that supports U.S. needs, is globally competitive, and

advances U.S. leadership in the generation of new markets and innovation-driven entrepreneurship." The NASA Authorization Act of 2010 and subsequent NASA Appropriations by Congress have begun to bring this to reality and have created a broad portfolio of NASA commercial space initiatives. Most prominent and positive amongst them have been the NASA Commercial Cargo and Crew Transportation Services programs. Using both NASA Space Act Agreements in the beginning and now Federal Acquisition Regulation Firm Fixed Price contracts, NASA has awarded Commercial Cargo Resupply contracts and Commercial Crew Transportation Capabilities contracts that have succeeded in stimulating a globally-exceptional and truly extraordinary renaissance of space launch, spacecraft, space operations, and space commerce capabilities. These successes, funded and supported by Congress, have incurred less cost and time to the government than historical traditional programs and have forever changed the space landscape for the better while providing the needed incentives for companies like ours to invest and take risk.

In the span of just a few years, the United States has imagined and defined the next phase of the global commercial space environment, a market valued at over $300 billion annually by the most recent Space Foundation Space Report. This success has not gone unnoticed and has spurred committed competitive efforts around the world to try and catch up or keep pace with the U.S. The benefits of commercial space are widespread and countries and organizations around the world are all putting time, money and effort into increasing their positions. Today, because of our rapid early advances, we have a position of leadership. We need, however, to continue our joint government, academia and industry efforts if we want to further extend this bold path and continue to hold this leadership in the future. Beyond the money, the impact of your decisions importantly effects how the U.S. is viewed around the world. Even though it's been 47 years, there is a reason why U.S. space leadership, the moon landings and our Space Shuttle program are still talked about with admiration. And there is a reason why our landings on Mars and our flights to Pluto and Jupiter are covered by the media in detail in virtually every country. And, in a personal connection, I believe that there is a direct connection to how these enabling policies have supported SNC in developing and signing a ground breaking agreement with the United Nations to explore utilizing Dream Chaser for global research missions.

America is a world leader in this area and it is critical to our country that we remain that way. Space achievements take years to fully realize but the extraordinary is worth waiting for.

A truly self-sustaining commercial market in low Earth orbit does not yet fully exist. I believe that it can, should and will be led by the United States. Collaborative future action by Congress, the White House, NASA, industry, and academia are needed to bring this to reality. At SNC in particular, we know the value of this collaboration firsthand. Our journey with Dream Chaser, which is the only reusable commercial lifting body and runway-landing capable spacecraft in the world, has taken over a decade. We have lived the American Dream of believing in the impossible. As was so famously said, "Some look at the world and say why. Others look at the world and say why not?" We were a handful of people in a garage who said "why not?" and believed that we could build the next generation Space Shuttle when few others did. Dream Chaser is now in test flight as a true multi-mission Space Utility Vehicle that can safely and affordably execute new and expanded earth orbit missions. NASA's strategic investments and our very successful Public Private Partnership have brought this 21st Century spaceplane to flight. The confidence we had in NASA provided the basis for our ownership to invest and risk hundreds of millions of dollars alongside the critical investment of time, talent and money made by NASA.

But there is more. Now that we are in test flight, we see ourselves carrying the torch that was passed on to us by the Space Shuttle program and the thousands of people throughout America who made it successful. Space is multi-generational. One must respect and embrace the past as a key to the future. As my generation seeks to honor those who came before us by taking their achievements to the next level we must, at the same time, create the path forward for the next generation who, I am certain, will do amazing things that I can only imagine.

Creating "Real" Markets and Missions

A core element of NASA's charter is to create and transfer knowledge and technology to the nation. SNC's Dream Chaser is an excellent example of this technology transfer as it started its life as a

continuation of NASA Langley's HL-20 Lifting body program from the 1990's. Years of tests and significant design and aerodynamic work by NASA paved the way for development of the current Dream Chaser spacecraft and, without which, we could not have been successful. This broadly applicable research and development, collaborative public-private work and applied technology transition should remain a core aspect of NASA's mission. NASA's role as a facilitator and as a foundational launch customer should be used strategically to enable nascent American science and technology to be developed to market. But, from my perspective, a competitive and diverse commercial space industrial base pursuing multiple opportunities is fundamentally important to a self-sustaining market ecosystem that exists beyond government support alone.

Diversity and Innovation

Due to the current state of the industry, different approaches are necessary to ensure an innovative and self-sustaining marketplace. This diversity in our national space ecosystem right now leads to opportunity and creates an unbeatable combination for global competitiveness and national mission success. This includes continued and expanded use of appropriate contracting and procurement approaches, including: Space Act Agreements, Public Private Partnerships, Other Transactional Authorities, Firm Fixed Price contracts, Enhanced Use Lease Authorities and others. In addition to these proven approaches, the Congress and NASA should remain committed to acquisition reforms. Since government contracting and procurement remain barriers to some of our nation's most innovative and agile small businesses we must fully harness the power of all types of suppliers in our industrial base in a way that balances risk and benefit.

Embracing new and enabling technologies across a broad range of applications is essential to achieving our national space goals. NASA remains a major enabler to technology stimulation and spinoffs from both providing new technology to using it. Significant breakthroughs are occurring at the intersection of different fields or through the application of existing systems in new and creative ways. For example, the use of space robotics in the next generation of human prosthetics or space enabled agriculture to help grow food in challenged areas on Earth. Within SNC, we are harnessing the

technologies and capabilities across our portfolio of Mars robotic rovers, small satellites, innovative propulsion systems, environmental life support systems, space plant growth capabilities and diverse special mission aircraft experience to bring space technologies to many other industries and to enhance society. A successful space program is not a solo act. There is power in partnerships. Already we are working with large, small and disadvantaged organizations in 25 states and together we are expecting to hire hundreds of people this year. This would not be possible without that NASA catalyst and partnership.

Continuity, Stability, and Balance

With the upcoming elections this Fall, I believe it is necessary to re-affirm the importance of stability in the space enterprise at this critical time in history through a broadly supported NASA Authorization Act of 2016. For NASA and the United States, expanded utilization of the International Space Station through at least 2024 is fundamentally important. We have invested much into the creation of the Space Station and need to leverage this still valuable investment for the longest time possible. The development of real commercial markets and missions may wisely warrant extension of the ISS to 2028 as the International Space Station also serves as the cornerstone of exploration. During this period I fully expect new platforms and capabilities, both domestic and international, to emerge. In turn, these capabilities will accelerate the critically important beyond low Earth Orbit, or deep space, exploration activities of both NASA and industry. I strongly believe synergy between commercial low Earth orbit and deep space exploration activities are vitally important and essential to the Nation's success. All too often, some people would like to create conflict between commercial and government, low Earth orbit and deep space activities, crewed and robotic, science and exploration, public versus private, and domestic versus international where no conflict needs to exist. True mission success, sustained benefits, and broad achievement of all of our national goals related to space will only come from a balance and mutually-beneficial approach that includes all of these elements in a well-integrated, prioritized, and appropriately resourced plan. Building on this concept on an even broader level, I would like to drive home the importance of a U.S.-led low Earth orbit

commercialization initiative that creates and sustains diverse commercial markets and missions so that NASA can focus vital resources to the pursuit of beyond low Earth orbit human and robotic exploration.

As part of this very-achievable vision, I expect new breakthroughs in commercial communications, remote sensing, weather, on-orbit servicing, research and development, testing, production/manufacturing, tourism, resource extraction, energy production and many other real economic and value driving activities from our commercial space efforts. Our nation must continue to invest and stimulate the space commercialization business environment and in doing so it will realize a substantial return on investment. We also must do so in a timely manner as our global competition has firmly grasped the importance of this period in space history. Space opens new frontiers, new resources, new markets, and new opportunities for our youth and together we need to act strategically as this is a priceless investment in our future as a nation.

Summary

In closing, I want to sincerely thank Congress and the Committee for this opportunity to provide our thoughts and project the voice of the commercial space industry. The *stability, diversity, and continuity* of the current Authorization are the hallmarks that must form the core of NASA's next Authorization. Balance among human and robotic spaceflight, low Earth orbit commercial utilization and deep space exploration, science and technology development, and evolutionary development of a robust and diverse U.S. space industrial base will deliver revolutionary results that will launch the dreams of our nation both now and in the foreseeable future. We must be bold, we must be smart, and we must provide the resources necessary to deliver that value to fulfill the tremendous potential of space. At SNC, our dream is alive through the Dream Chaser and our broad portfolio of space but we are only one piece in a constellation of U.S.-developed capabilities that are poised and prepared. We look forward to serving the needs, ambitions, and worthy goals of the United States.

Thank you and I would be happy to answer any of the Committee's questions.

Mark N. Sirangelo

Sierra Nevada Corporation