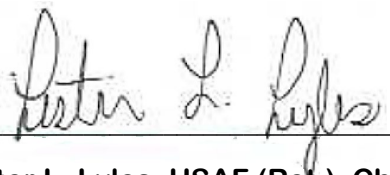
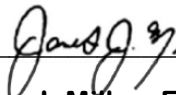
National Space Council
Users' Advisory Group
February 23, 2023, Public Meeting

MEETING MINUTES



Gen. Lester L. Lyles, USAF (Ret.), Chair



Mr. James J. Miller, Executive Secretary

Executive Summary

The National Space Council (NSpC) Users' Advisory Group (UAG) held a public meeting on February 23, 2023, at the JW Marriott in Washington, DC. This was the first UAG meeting under the Biden-Harris Administration. The meeting included the following presentations:

- Dr. Buzz Aldrin, Apollo 11 Astronaut, "Essential American Space Enterprise (Virtual Address)."
- Gen. David D. Thompson, Vice Chief of Space Operations, U.S Space Force (USSF), "Military Space Priorities."
- Col Pamela Melroy (USAF, ret.), Deputy Administrator, NASA, "Civil Space Priorities."
- Dr. Richard DalBello, Director, Office of Space Commerce, NOAA, "Commercial Space Priorities."
- Dr. Thomas Zurbuchen, Former Associate Administrator, Science Mission Directorate, NASA, "Space Science Priorities."

These presentations were followed by updates from the UAG's six subcommittees. The UAG is chaired by Gen. Lester L. Lyles (USAF, ret.). and Mr. James J. Miller is the Executive Secretary.

Table of Contents

Meeting Notes

Call of Order, Announcements
James J. Miller, Executive Secretary / Primary Designated Federal Officer, UAG

Mr. James Joseph Miller, Executive Secretary, National Space Council Users' Advisory Group, called public meeting of the UAG to order at 9:00 a.m. Eastern Time.

Good morning, everyone. This is our "Call-to-Order" of the National Space Council (NSpC) Users' Advisory Group (UAG). Because the UAG controls space, we have provided for a very warm February day to thank you for coming out today! This advisory committee is comprised of experts from outside of the Federal government, to serve the National Space Council, which is chaired by the Vice President (VP). And so today, we are gathered to learn, to exchange information, and to further develop Recommendations, that contribute towards meeting NSpC goals of strengthening our nation. In this forum, this is done from the perspective of Users, or our constituents. The UAG is a committee established under the Federal Advisory Committee Act, or FACA. And as such, all our deliberations are open to the public. All UAG members were selected by the Vice President and appointed by the National Aeronautics and Space Administration (NASA) Administrator. They are each volunteering their valuable time and expertise, and for that we are very grateful. They are serving based on their individual expertise such as Special Government Employees (SGEs), or to represent specific sectors of the American space industry, as Representatives. We remind everyone that if a potential conflict-of-interest arises during our deliberations today, especially for SGEs, that you recuse yourself from that discussion for the record, and do not engage in that matter. The UAG is intended to be balanced, and comprehensive. Such citizen-based committees have supported our nation since its founding, and the contributions made by citizen members have served our nation very well ever since. A key goal of the UAG, is to utilize space -- to help everyone on Earth. This cannot be overstated. However, one perfect example of a space sector that most may take for granted now is the Global Positioning System, or GPS. You have it in your car, and you may have it beside you now, in your phone or wristwatch. But don't forget -- GPS signals are a national space asset that has become an invaluable worldwide utility. Because now it does way more than telling us where we are. It is a dual use capability that now supports weather forecasting, environmental monitoring, and disaster mitigation, among many other things that protect and produce for us all. But we have taken it for granted! Just like the Apollo program, the GPS program operated by General Thompson's Space Force, will celebrate it's 50-year anniversary before the end of the year. Nothing is more symbolic of a single system so capable of helping all of humankind, and which sets the stage for continued growth of applications for decades to come, and it does come under the purview of the NSpC, as overseen by Space Policy Directive 7 (SPD-7). On behalf of the GPS user community then, the Chair of the National Positioning, Navigation, and Timing (PNT) Advisory Board, Admiral Thad Allen (USCG, ret.), offers to join with Gen Lyles and the UAG to celebrate such a magnificent American achievement. And let me please start this process by thanking UAG members Lockheed Martin and Boeing for their commitment and success in actually building the GPS satellites we now all use. Finally, for additional public input based on the deliberations of today or previous meetings, the UAG website does allow for additional ideas and feedback to be provided, as seen in the handbook you picked up coming in this morning. Also, in compliance with FACA, our deliberations will become part of the public record, with formal meeting minutes posted within 90 days of our meeting. So, in closing, please remember that we are broadcasting online right now, so when members comment please remember to turn on your microphone, speak clearly, and turn it off when you are finished. Thank you very much. It is now my honor to turn the meeting over to UAG Chair General Lester Lyles, and to our White House Sponsor, Mr. Chirag Parikh.

***

Welcome and Opening Remarks
Mr. Chirag Parikh, Deputy Assistant to the President & Executive Secretary of the NSpC

Mr. Parikh noted that the Council is not just for those who use and operate space systems, it's also for the public. We need to continue to articulate the value of space to our society. What would happen if we didn't have a particular element of space? The Council is very important to receive perspectives because the impact of one circle often effects another circle.

Nothing is more visible than the commercial crew program. VP Harris has awarded the Medal of Honor to two former NASA astronauts for their contribution in designing the Crew Dragon Capsule and piloting it in 2020 to the International Space Station (ISS). How does space enable leadership, opportunity, innovation, and strength in our Nation? How do we use space to be able to inspire the next generation for our Science, Technology, Engineering and Mathematics (STEM) workforce, and our skilled labor workforce?

We are building large-scale, long-term projects that bolster our credibility with our international partners around the world. There is a world-wide interest in space. Space is often one of the topics that is discussed when President Biden and VP Harris meet with leaders around the world.

Space underpins our national security. We currently have the largest national security space budget in history. Threats are waiting for us, so we are looking for recommendations of current and future practices.

Thus, as we move forward, we need to identify other programs that we can bring space into (i.e., STEM programs at the Department of Education, Department of Agriculture programs, State and local governments, etc.).

***

Meeting Objectives & Member Introductions
Gen. Lester Lyles (USAF ret.), Chair, UAG

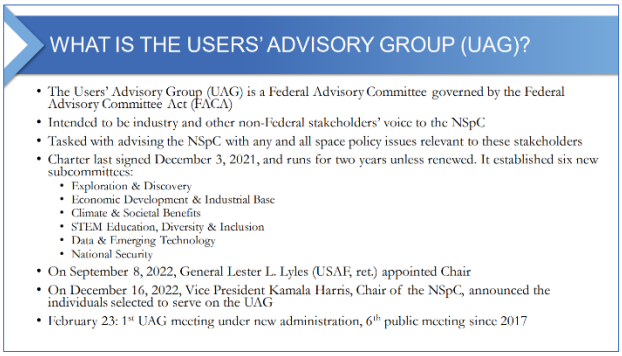
(Briefing slides: https://www.nasa.gov/sites/default/files/atoms/files/uag_introduction_2023-02-23.pdf)

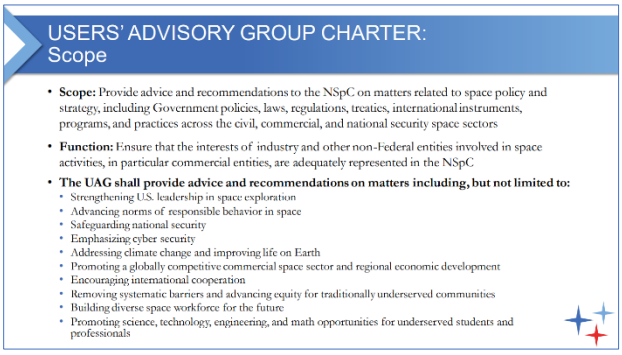
Gen. Lyles started by setting the stage for the remainder of the meeting. This meeting will be divided into two sections:

First, the Group will hear from the leaders in the space enterprise regarding focus areas for the UAG and the NSpC. Of these speakers are General David "DT" Thompson, the Vice Chief of Space Operations for the U.S. Space Force; Colonel Pamela Melroy, retired astronaut and Deputy Administrator for NASA; Dr. Rich DalBello, the Director of the Office of Space Commerce; and lastly, Dr. Thomas Zurbuchen, the former Associate Director for the Science Mission Directorate at NASA.

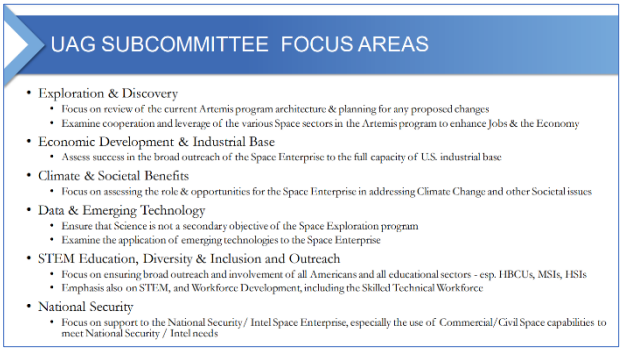
After the lunch break, each of the six Subcommittee Chairs will present on their respective focus areas, as well as their potential challenges and opportunities. This is an opportunity for all the UAG Members to engage in conversation, not just the Subcommittee Chairs. After this, the UAG will conclude, and the Members will depart for "another event."

Gen. Lyles presented an overview of the UAGt, including its scope, organization, and focus areas (Slides 1-4)



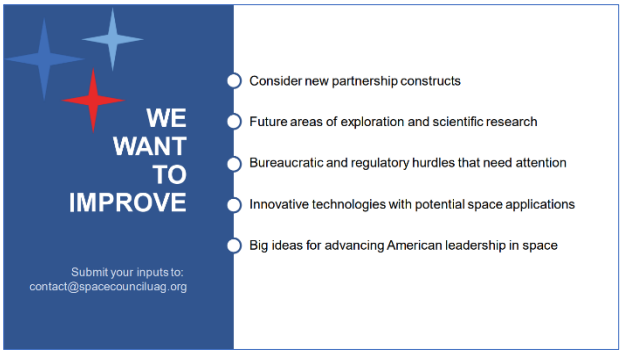


Slides 1-2



Slides 3-4

Gen. Lyles noted that the prior UAG had a subcommittee surrounding international involvement. There is no longer a subcommittee regarding that area is because international cooperation cuts across the jurisdiction of every subcommittee. Gen. Lyles asked each subcommittee to look at the international implications within each focus area.



Slides 5

Gen. Lyles asked each UAG Member to introduce themself. (*Note: Prof. Harold Lee Martin and Ms. Gwynne Shotwell participated in this meeting virtually).*

In-person participants in order of introduction:

- Dr. Lance Bush, President and CEO of Challenger Center
- Mr. Theodore "Ted" Colbert, President and CEO of Boeing Defense, Space, and Security
- The Hon. Charlie Colden, Former NASA Administrator
- Mr. Jim Taiclet, CEO and Chairman of Lockheed Martin
- Dr. Kate Marvel, Senior Climate Scientist at Project Drawdown
- Dr. Robert "Bob" Smith, CEO of Blue Origin
- Mr. Dave Kaufman, President of Ball Aerospace
- Mr. Rajeev Badyal, Head of Project Kuiper at Amazon
- Astronaut Sian Proctor, Astronaut and Geoscientist representing Maricopa Community District
- Mrs. Katrina Harden Williams, Mathematics Educator and Founder of the Aims Middle School Space Club
- Mr. Robbie Schingler, Co-Founder and Chief Strategy Officer at Planet
- Ms. Melanie "Mel" Stricklan, Co-Founder and CEO of Slingshot Aerospace
- Ms. Karina Drees, President of the Commercial Spaceflight Federation
- Dr. Jeremy Williams, Member of the Bayer Crop Sciences Team and Head of Digital Farming Solutions
- Maj. Gen. Theodore "Ted" Mercer, CEO and Executive Director of the Virginia Commercial Spaceflight Authority
- Dr. Marla Perez-Davis, Former Director of the NASA Glenn Research Center
- Mr. Ron Lopez, President and Managing Director of Astroscale U.S.
- Dr. Patrick Lin, Professor of Philosophy and Technology Ethics at Cal Poly, San Louis Obispo, CA.
- Ms. Nancy Colleton, President of the Institute for Global Environmental Strategies
- Dr. Daniel Hastings, Head of the Department of Aeronautics and Astronautics at MIT
- Ms. Bridget Chatman, Chair of Women in Aerospace
- Dr. Daniel "Dan" Jablonsky, President and CEO of Maxar Technologies
- Ms. Kathy Warden, Chair and President of Northrop Grumman
- The Hon. Eric Fanning, President and CEO of the Aerospace Industries Association
- Ms. Dawne Hickton, Chair and CEO of Cumberland Additive
- Mr. Salvatore "Tory" Bruno, CEO of United Launch Alliance
- Dr. Mandy Vaughn, Founder and CEO of GXO, Inc.

Gen. Lyles noted that Mr. Buzz Aldrin could not attend the meeting today but would be addressing the UAG virtually.

***

Space Enterprise Expert Presentations

The Essential American Space Enterprise (Virtual Address)
Dr. Buzz Aldrin, Apollo 11 Astronaut

(Link to virtual address: https://www.youtube.com/watch?v=ohy98ykAqhg)

Dr. Aldrin noted it was his extraordinary privilege to have played a key part in one of the epic dramas of our age: America's race to the Moon and back. President Biden, and Vice President Harris (also the chair of the National Space Council) have now joined a distinguished train of visionary leaders. As President Kennedy said at Rice University, "We choose to go to the Moon. We choose to the Moon in this decade, and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energy and skills, because that challenge is one that we are willing to accept, one that we are unwilling to postpone, and one which we intend to win, and others too." We planted the American flag on the Moon. We did soy not to lay an imperial claim to the Moon. As idealistic Americans, we came in peace for all mankind. Now let us salute the memories of those who so heroically sacrificed their lives for the achievement of an impossible dream. On behalf of all the early space pioneers let us now tip our helmets to our heroic and worthy successors: President Biden and Vice President Harris; the NASA Administrator, U.S. senator, and fellow astronaut Bill Nelson; Deputy Administrator Pam Melroy; and Associate Administrator Robert Cabana. We also recognize the work of General Lester Lyles and James J. Miller, Executive Secretary of the UAG. Let me also salute the achievements of human exploration of space by private enterprise with the support of the U.S. government, especially those who aspire to send people past the Karman line[1], and especially we salute the young men and women astronauts, scientists, and technicians now picking up the torch of deep space exploration. The return to the Moon via the inspiring Artemis project laying the groundwork for the colonization of the Moon, a giant leap towards Mars and if the imagination, intrepidness, and courage of the American people for space continues apace onto the exoplanets of our stars. Thank you and God bless America, Earth, our galaxy, universe, and the celestial metaverse it is our mutual high privilege to explore.

***

[1] Ed. Note: The Kármán line is a proposed conventional boundary between Earth's atmosphere and outer space set by the international record-keeping body FAI (Fédération Aéronautique Internationale) at an altitude of 100 kilometres above mean sea level.

Military Space Priorities
Gen David D. Thompson, Vice Chief of Space Operations, USSF

(There were no slides for this presentation)

Gen Lyles introduced Gen David Thompson, Vice Chief of Space Operations for the U.S. Space Force, who would provide an update on military space priorities.

Gen Thompson said he would brief on some of the priorities and initiatives in the USSF. He thanked J.J. Miller for the shoutout regarding a celebration for the 50th anniversary of GPS. In 1973 the foundation and fundamentals of the GPS program were established, and then we embarked on that journey. In 1995 GPS reached full operational capability, and since then its performance has increased. Today GPS provides PNT services that are three times more accurate and precise than the original requirement for GPS, both for military and civil users. In fact, now we're even talking about potentially using GPS for navigation in Lunar Space.

The USSF's job is to protect U.S. interests in space and everything that entails. Today that primarily means ensuring our armed forces, and our partners and allies, have the services and capabilities they need from space to operate globally and in all phases of conflict. In this presentation we are also going to talk about how military space insects with civil space and the commercial sector. It was nice to see that one of the focus areas in the UAG National Security subcommittee is that of using commercial space to support national security space. This will also be the focus of this briefing. There are three areas in this. First is how we use commercial space today, which is an expansion of how we've been doing this traditionally. Second is the way we are seeing what is truly an explosion of commercial services, and how we can try to leverage these capabilities as quickly as possible. Third is what we see as potential opportunities for the future and how we might use them.

Our prosperity and economic security are as vital as national defense. It is also clear that we can use commercial space capabilities directly in support of the nation's security. Over the last 60 years the U.S. government has invested in space capabilities for national security and civil purposes. These commercial capabilities have primarily grown in communication capabilities, closely followed by remote sensing. In the past few years there has also been an explosion in other services being offered, and this has driven a change in our perspective on how we can use commercial space to support national security space. Use of commercial services can make our own missions more resilient against an advisory that may aim to do us harm. Commercial services can provide surge capacity and give us access to new and innovative technologies, and our ability to update those technologies. Finally, commercial space provides diversification and helps us in other areas. We have now adapted our approach to develop space systems that provide a wide range of capabilities to support specific mission sets. The USSF is currently looking at how they can partner with other agencies, both military and civil, as well as the commercial sector, on how we can best execute our mission sets.

The USSF uses commercial services for satellite communications, space domain awareness (by means of data purchases to help us look for threats), and space launch services. For years the Air Force was the primary provider of launches and partnered with NASA for the development of space launch services for the most important and sensitive national security payloads. We have also introduced other companies and rocket types to both use those services and to stimulate their development. The USSF is looking to expand upon space data relay. The Armed Forces has an increasing need to rely on low-orbit mesh satellites. USSF also operates its own satellite command and control network, and there is also a tremendous capacity for this in the commercial sector both in ground stations and satellites that the DoD could use to improve its resilience, and perhaps even give us access in areas that we currently don't cover. Finally, the USSF is looking to expand rapid, reliable, and reasonably cost-efficient launches. Finally, another area is that of in-space servicing of satellites, which we've made clear will be met by the commercial market. Further in the future, the USSF is looking at advanced technologies such as nuclear propulsion as well as space debris migration. We are also working to marry venture capital and innovators, such as looking for ways to clean up the space environment from Low Earth Orbit (LEO) to Geosynchronous Orbit (GEO).

Gen. Lyles thanked Gen. Thompson and stated that he looks forward to working with USSF and the Pentagon. The UAG can use its National Security subcommittee to further engage on this topic. Another key area of interest to the UAG is that of education, where he noted that the DoD has a brand-new university partnership program.

***

Civil Space Priorities

Colonel Pam Melroy (USAF, Ret.), NASA Deputy Administrator

(Briefing slides: https://www.nasa.gov/sites/default/files/atoms/files/nasa_deputy_administrator_pam_melroy-_uag_presentation_.pdf)

Colonel Pam Melroy thanked Gen. Lyles and Mr. James J. Miller for inviting her to speak on behalf of NASA Administrator Bill Nelson and Associate Administrator Bob Cabana. Col. Melroy also thanked all of the UAG Members for their dedication and commitment to "something that is so important to our country."

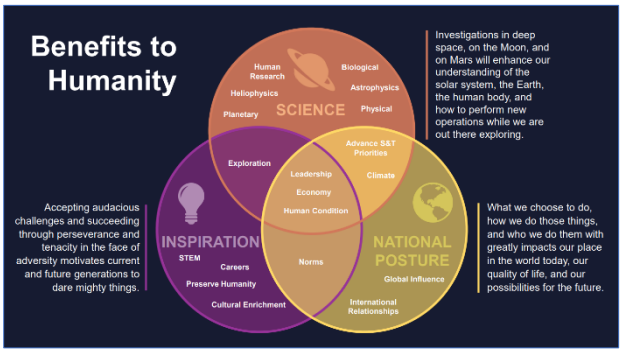
*Col. Melroy played a brief video.

Col. Melroy stated that her presentation today would be focused on the critical role that civil space plays in innovation in the areas of commercial activity, climate research, and our "Moon to Mars" strategy (Slide 1). Mr. Parikh previously discussed a Venn diagram between civil, commercial, and national security space. NASA has its own Venn diagram illustrating the benefits of civil space to humanity (Slide 2).

First, science is front and center for NASA. Investigations that can only be done in the space environment include understanding the human body during microgravity exposure, exploring our solar system, and viewing Earth and its changing climate from space. Science is the seed corn for our future capabilities.

Second, our national posture brings tremendous science and technical capability to our country that can be leveraged in other ways. An example of this is software engineering, which had to be created in order to achieve Apollo. There are many examples of the technologies we develop to go to space spinning off into other areas. Additionally, with the growth of our commercial space industry, this is having enormous economic impacts for our country.

Third, just as science is the seed corn for our future capabilities, our students are the seed corn for our country, as well. Inspiring our students to study STEM is critical for "future generations to dare mighty things."



Slides 1-2

Over two decades ago, NASA partnered with international entities to develop the ISS (Slides 3-4). This was an investment whose payoff is advancing technology, improving life on Earth, and ensuring our peaceful path further into the solar system. We have more than 22 years of continued human occupancy in orbit. We learned from the Space Shuttle Program that there is so much to learn about microgravity science, but this was not enough. The ISS provided a platform to do science 24/7 for 365 days a year. The ISS was also the first major civil space program in human space fight, that was, by design, an international partnership where we could share data and achieve more together than we would have been able to alone.

Much of the science that is performed on the ISS is going to help guide our exploration of the solar system. The Station has also been opened for research that enables commercial and marketing opportunities to expand its utilization and impact. Since making these opportunities available, there has been a growing demand from traditional and novel

industries, which demonstrated the benefits of the ISS to catalyze and expand space exploration markets in the LEO economy.

Operating the ISS through 2030 is absolutely critical. The ISS will not only prepare us for future exploration, but it will also continue to support a growing LEO economy. The ISS is a demonstration of what happens when the government invests in something "that seemed impossible more than two decades ago."

The ISS has had a transformation impact that nobody could have imagined thirty years ago when it was initially being formulated as a program. As NASA approached the retirement of the Space Shuttle, there was a need to continue to supply the ISS. The Commercial Cargo Program ignited a revolution in commercial space by: (1) Incentivizing low-cost access to space by promising and paying for a regular and sustained manifest of launches, and (2) Creating a lower cost destination for small satellites to launch from the ISS. The combination of these two things had spurred innovation and made our commercial space industry the envy of the world.

NASA's partnership with American private industry is changing the arch of space flight history by opening access to more people, science, commercial opportunities. Now, we will enable a seamless transition of capabilities in LEO to one or more commercially owned and operated destinations in the late 2020s. Four companies are now studying and developing their own commercial space stations and nodes on the ISS to provide access to private and government customers. All of this expands access to space for industry, academia, students, and scientists worldwide.

The lack of a regulatory agency in this sector is a barrier to the future of LEO space stations. NASA is not a regulator. Although NASA provides technical assistance, it cannot be responsible for all activities that take place on a commercial space station.

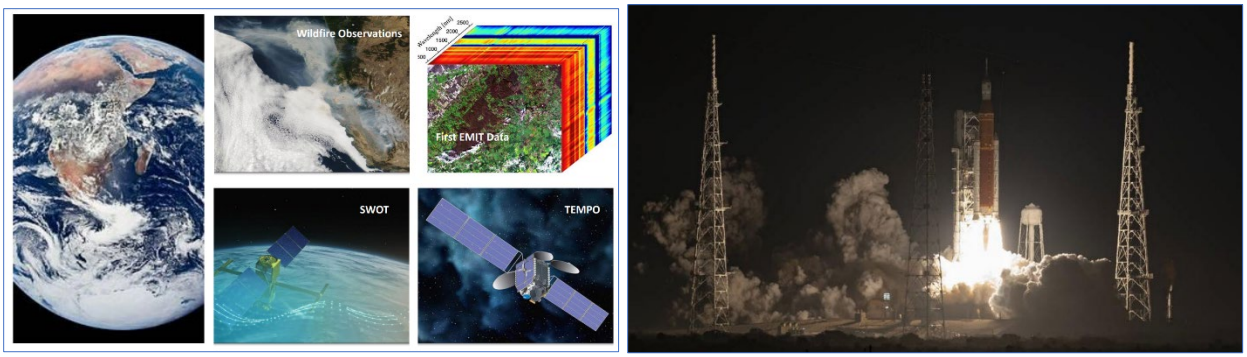
Slides 3-4

Climate change is the most pressing issue of our day (Slide 5). NASA is not just an air and space agency; it is also a climate agency. Satellites and instruments onboard the ISS collect information from the Poles, the deep seas, and the highest reaches of our atmosphere. NASA's Earth Science Fleet measures the height of oceans, clouds and precipitation, soil moisture, carbon dioxide, methane, and many more things. These observations drive our understanding of Earth as a system, and scientists worldwide have access to NASA data to tackle some of the biggest questions as to how our planet is changing.

NASA's expertise in space and scientific exploration contributed to the essential services provided to the American people by other federal agencies, such as weather forecasting and natural resource management. Earth Science enables policy makers and government stakeholders to make more informed decisions on critical issues that occur around the world. Administrator Nelson recently announced NASA's Earth Information Center to leverage data and modeling capabilities to work with other government and community partners most effected by climate change. This center will give the world access to our plate by providing resources and data that can be used immediately by everyday people and decision-makers.

NASA's next generation of remote sensing is the Earth System Observatory. This is a suite of missions designed to accelerate our ability to guide efforts related to climate change, disaster mitigation, managing wildland fires, and proving real-time agricultural processes. Each satellite mission will be designed to complement each other, working in tandem to create a 3D, holistic view of earth from bedrock to atmosphere.

NASA's Aeronautics Mission Directorate has worked to help the aviation industry achieve the International Civil Aviation Organization's (ICAO) long-term goal of net zero carbon dioxide emissions from aviation by 2050. Aviation is one of the hardest industries to decarbonize, and NASA's aeronautics portfolio is equipped to make a deep impact in this area.



Slides 5-6

The focus of the Administration is to craft a "Moon to Mars' strategy (Slides 6-8). The goal of this strategy is to "create a blueprint for sustained human presence and exploration throughout our solar system."

1. Science is front and center in what we are going with Artemis.

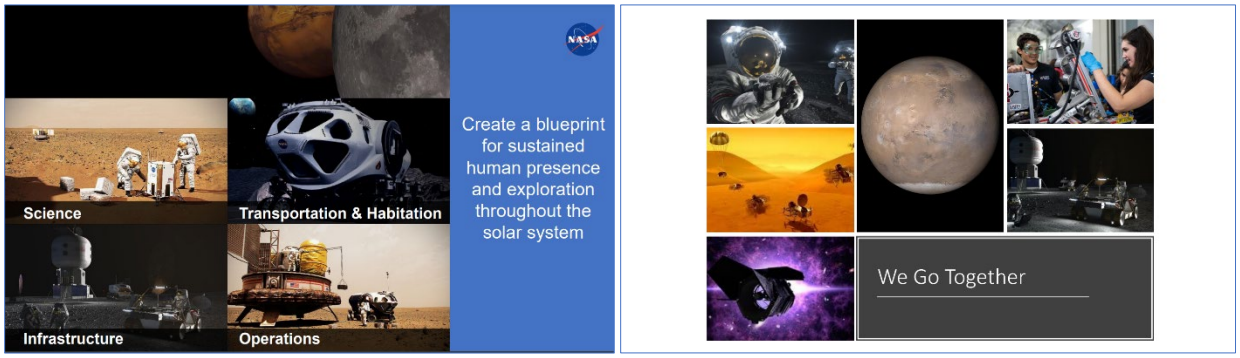
2. Transportation and habitation are unique areas of expertise for NASA that they will continue to leverage with the SLS Rocket and Orion Spacecraft.

3. If we are going to have a sustained presence in space, we need to have the infrastructure that enables humans to stay for longer periods of time.

4. NASA had to adjust operations for longer-term missions to the ISS, and operations will have to be revolutionized again as we look to Mars.

The lessons learned from the Moon will help us get to Mars and beyond. We must think about space exploration generationally. Human missions to the Moon, and Mars after that, will be taking place over the next 20 years. Similarly, our flagship science missions, such as the James Webb Space Telescope, encompass many years from development, to flight, to results.

As Administrator Nelson has said, we are at the golden age of space exploration. The element of commercial space and its ability impact society can be compared to the golden age of aviation, where the government made significant investments in "higher, faster, further," that had a profound effect on commercial capabilities and their ability to build commercial fleets that we now know and rely on.



Slides 7-8

Col. Melroy thanked the UAG for inviting her to speak, and Gen. Lyles gave the members an opportunity to ask questions.

Dr. Lance Bush appreciated that Pam discussed the relationship between commercial space and science, and that they will need to have a conversation in further detail at a later time.

Col. Melroy emphasized the role that previous Administrations have made in promoting the commercial industry. Civil space is bipartisan, and it is something that we must invest in similarly to defense and foreign policy.

Gen. Lyles mentioned that the Hon. Charlie Bolden is a founder of civil space.

Dr. Dan Hastings asked Col. Melroy, "the UAG will have role in reviewing the architectures, so how do you see that actually happening?"

Col. Melroy stated that there were benefits to having subcommittee meetings first when she chaired the Data and Emerging Technology Subcommittee. Communications is critical to our Moon to Mars strategy, and the UAG needs to consult with the industry, international partners, etc. Additionally, she has asked the Explorations System Directorate to provide White Papers regarding key trades and decisions. We need to ensure that we appropriately balancing National Security, Science, and Inspiration.

Gen. Lyles emphasized the need have an all-encompassing discussion in order to create the new lunar and Mars structure. He then thanked Col. Melroy for her presentation.

***

Commercial Space Priorities
Dr. Richard DalBello, Director, Office of Space Commerce, NOAA

(There were no slides to this briefing)

Dr. Richard DalBello thanked Gen. Lyles and stated that it is a pleasure to be at this UAG meeting.

The Office of Space Commerce, within the Department of Commerce (DOC), has three fundamental responsibilities: (1) Serve as an advocate for space policies, regulation, and support for the industry, (2) Act as a regulator, and (3) Implement space tracking systems to take responsibility from the Department of Defense. The Office of Space Commerce is currently creating a stand-alone Space Situational Awareness (SSA) system.

The Department of Commerce is tracking nearly 2,000 raising nearly $250 Billion in equity. In 2019 alone, there was nearly 350,000 private sector jobs associated with commercial space, contributing over $120 Billion to the national Gross Domestic Product (GDP). This activity has contributed to the tripling of spacecraft in orbit, which creates great opportunities and challenges.

The U.S. commercial space industry is widely admired. Fundamentally, the United States has stable laws that are backed up by predictable courts, nurtured a culture of entrepreneurship in technology, and most importantly, an education system that can produce a deep reservoir of talented engineers, scientists, and businesspeople. Additionally, the United States as had over 40 years of bipartisan support for the concept of commercial space.

Dr. DalBello highlighted five challenges facing the commercial space industry:

1. There are some fundamental things that the U.S. does not do very well. Today. SSA is pretty good, but it is not uniformly excellent. This means that the government is sending out several signals to the industry that get ignored. We need to be able to speak about SSA with the same confidence as we do Air Traffic Control, for example. Additionally, there are currently no great ideas to solve the issue of space debris. This does not mean that we should stop trying to solve the issue.

2. China is a major player in the space industry, and they are not participating in global information sharing on SSA. Our current way of communicating with China (email, for example) is very insufficient, so we need to be able to work with them to find a path forward. Also, the Europeans are creating a separate SSA system, and we may see several other countries follow suit. This means that operators will be able to choose who they get their information from. From the perspective of the Department of Commerce, this is "slightly terrifying" due to the technical and political challenges this will create. Although it is the right of every nation to create its own SSA system, we need to work together to find a way to communicate with one another.

3. Our current SSA system is providing several services to the commercial sector. When implementing a new SSA system, the Department of Commerce must ensure that they are not disrupting the marketplace created by the current system. They recently released an RFI on basic services that the new system could provide, as well as services that it may not provide. The Office of Space Commerce is also running pilots, including one in "geo" where the commercial sector has amazing capabilities.

4. There are several new activities happening in the space industry, including manufacturing in space, commercial LEO destinations, and mining on the moon, that our regulatory regime is not set up to handle. Our near-term problem is figuring out who will be responsible for managing these new technologies as they come along. To solve the long-term issue, the United States must reimagine regulation. Generations from now, will we be able to regulate better than we are today?

5. The United States need to improve on the "concept of operator responsibility." Our government is slowly implementing new rules regarding safety, debris mitigation, best manufacturing practices, etc. Although the Federal Communications Commission (FCC) has established important new rules regarding debris mitigation, for example, our we have not established a whole-of-government approach to handling new issues. Additionally, operators need to because more responsible with how they are using current, possibly

outdated, technologies. For example, launching a CubeSat without guidance or a way to effectively communicate may not be in best practice.

Dr. DalBello stated that he looks forward to working with the UAG on any/all of these topics.

Hon. Charlie Bolden noted that the United States "has the greatest democracy in the world that is… running space right now. We have opened it up to commercial entities that have brought [Dr. Dalbello] his 'five nightmares.' How much more 'democratic' can we make space? I think it is a useless term that confuses people and causes us not to work together."

Dr. DalBello stated that he is not democratizing anything. All of our domestic regulatory and technology development issues have an international dimension. Space is an international business. The government has and will continue to play the most fundamental role in leadership.

Dr. Lance Bush stated that he was relieved to hear Dr. Dalbello discuss the need for a regulatory body, and the Exploration and Discovery Subcommittee is ready to work with him on this issue.

Dr. DalBello said that "regulation" is a very loaded word in Washington, DC. We need to keep in mind that any solution regarding this issue is going to involve the United States Congress. When we think of regulation, we must think "light touch." If we do not need regulation, then we should not be regulating because we do not want to discourage the industry due to overregulation.

Mrs. Katrina Harden Williams stated that the middle schoolers she teaches use the phrase "space junk" when referring to space debris. Additionally, she has questions that she would like to pass along to Dr. Dalbello regarding this issue, as well as possible solutions.

Gen. Lyles thanked Dr. DalBello for his presentation.

***

Space Science Priorities
Dr. Thomas Zurbuchen, Former Associate Administrator, Science Mission Directorate, NASA

Briefing slides: https://www.nasa.gov/sites/default/files/atoms/files/thomas_zurbuchen_uag_presentation.pdf

Gen Lyles introduced Dr. Zurbuchen, former Associate Administrator for the Science Mission Directorate at NASA.

Dr. Zurbuchen opened his presentation (Slide 1) by noting that NASA recently celebrated the two-year anniversary of the Perseverance Mars Rover, which has achieved three key goals: (1) Successfully deposited a set of Mars samples to be picked up and brought back to Earth; (2) Proven a number of technologies for future use, including generating oxygen from atmospheric carbon dioxide; and (3) Through the Ingenuity helicopter, proven that future exploration of Mars can be supported by flying drones providing reconnaissance capabilities. Dr. Zurbuchen also spoke about the latest images from the James Webb Telescope and other missions, and how these missions help us learn about nature and the universe. Also, missions such as the Mars Perseverance Rover and the DART mission (first mission to alter the orbit of an asteroid) have garnered the largest real-time public viewership ever. NASA's priorities for the Science Mission Directorate (Slide 2) are: (1) Climate science; (2) Science as a critical element driving Artemis; and (3) Maintaining U.S. leadership in innovation. In summary, science is at the core of NASA's Moon to Mars strategy.

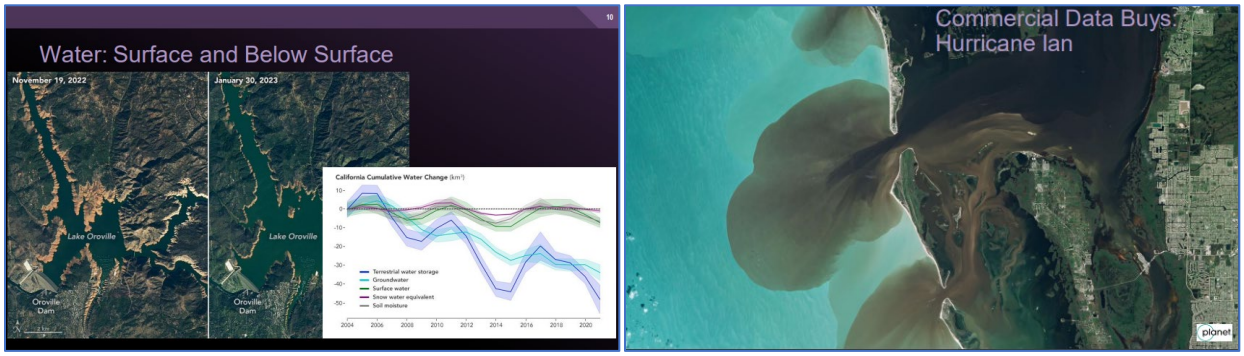
Slides 1-2

NASA is a pivotal leader in civil space and the understanding of our own planet, how it affects us, and building systems that have a huge impact on us. The ability to understand our planet has saved many lives by getting people out of the way of storms and warning them of other natural hazards. Slide 3 depicts the NASA-ISRO[2] Synthetic Aperture Radar (NISAR) satellite. At the time of this briefing, the payload was ready to be shipped to India. There are three principal "firsts" in this mission: (1) It is the first large-scale space partnership with India; (2) It is a mission that from the work-go has the user community directly involved and will save lives. The product that will go out from this mission will change lives, whether mapping ice, debris, landslides, etc.; and (3) It will have the largest data that to-date has come from a single mission. This is a good example of bringing "big data" from space. All this data will be open and freely available to users along with the code that generated it.

Slides 3-4

[2] Indian Space Research Organisation

Slide 4 (previous page) summarizes the principles of the Earth System Observatory, which includes NISAR and future missions. Slide 5 shows why this is important. On the left it shows two instances of a reservoir and on the right it shows the cumulative change of water on the surface and below the surface. This was measured with advanced telescopes and gravity measurements. This information would, for example, be useful to a water manager. It shows how even though this year we've had strong rains that have replenished the water on the surface, it remains to be seen if it is enough to alter the downwards trend in groundwater. This is just one of many examples. Slide 6 highlights the urgency of commercial imagery. In this case, it shows the outflow into the Gulf of Mexico after Hurricane Ian. The debris and organics released has implications for property owners, fisheries, and otherwise. Commercial imagery is having a huge impact not only for analyzing short term impacts but also long-term climate change trends. In summary, these images are very useful not just for science, but also in the applications domain.



Slides 5-6

In building this system we have encountered a number of challenges, such as getting sufficient support from the U.S. Congress. This has given me anxiety, in particular after the paper that came out in 2020 describing climate tipping points (Slide 7), which could have massive impacts and are not reversible on a short timescale. The presence of such tipping points used to be somewhat controversial, but I no longer think that's the case. Addressing this, in my view, requires large scale effort so data can be taken and made useful. As Jean Krantz said, "leadership is fragile." Slide 8 depicts the key ingredients to Leadership. Bipartisan support is needed in U.S. Congress, and we need to focus on entire stakeholder communities, not just within NASA but also commercial/international partners as well as the science and application communities. Each new mission should have at least one new technology, as innovation and iteration must always go together.

Slides 7-8

Gen. Lyles noted that this is a great segue into the next segment since we are running short on time, and he thanked Dr. Zurbuchen for the presentation.

***

Subcommittee Updates

The subcommittee briefing slides may be accessed at the following link:
https://www.nasa.gov/sites/default/files/atoms/files/uag_subcommittee_chair_presentations.pdf

Gen Lyles noted that the afternoon schedule has changed due to an event this afternoon (UAG member visit to meet with Vice President (Chair, National Space Council) at the White House), so the UAG will need to constrain its discussions. If needed, a follow-on UAG virtual meeting will be scheduled to complete the discussion. The following briefings will provide the subcommittee chairs with an opportunity to present their focus areas and for the UAG to provide comments. Also, the order of presentations will be modified, with the National Security Subcommittee presenting first.

***

National Security Subcommittee Report
Gen Lester Lyles, USAF ret., Subcommittee Chair

The National Security Subcommittee will conduct a meeting at the Pentagon with General Chance Saltzman, Chief of Space Operations, and General Thompson. During this meeting will be at the Sensitive Compartmented Information (SCI) security clearance level, where the subcommittee will specifically look for inputs from the Space Warfare Center.

Gen. Lyles is will also aim to have Mr. Christopher Scolese, the Director of the National Reconnaissance Office (NRO), at this meeting. If Mr. Scolese is not available to go to the Pentagon for this meeting, the subcommittee will schedule a meeting at the NRO for a later date.

After these meetings, Gen. Lyles will schedule a meeting specifically focused on top priorities and issues for the subcommittee.

Gen. Lyles asked the UAG members to provide any questions they may have for Gen. Saltzman prior to the meeting.

***

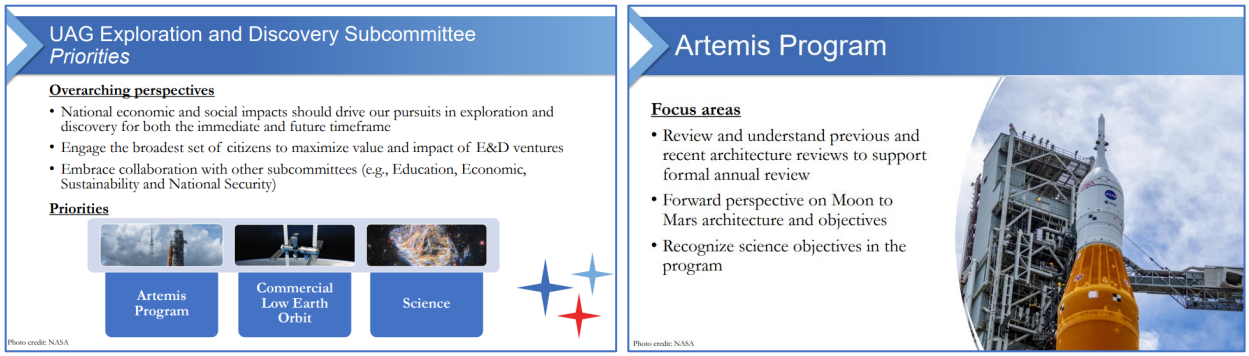
Exploration and Discovery Subcommittee Report
Dr. Lance Bush, Subcommittee Chair

Dr. Bush noted that the Exploration and Discovery Subcommittee has players to some of the largest members in the industry and thanked Dr. Ben Ashman (NASA) for supporting the subcommittee as DFO (Slides 1-2). Everyone in the subcommittee is very engaged in exploration and discovery and have career-long interest in these priorities.

Slides 1-2

The subcommittee crafted three overarching perspectives: (1) National economic and social impacts should drive our pursuits in exploration and discovery for both the immediate and future timeframe; (2) Engage the broadest set of citizens to maximize value and impact of E&D ventures; and (3) Embrace collaboration with other subcommittees. To support these overarching perspectives, the subcommittee identified three priority areas: Artemis Program, commercial LEO, and science (Slide 3). The first area of interest is the Artemis Program (Slide 4), where Dr. Bush recognized the work that was done by the previous UAG, which looked at the architecture during a very pivotal time. That work was critical in providing confidence moving forward. Given the importance of this project, the subcommittee wants to commit itself to an annual review of the Artemis Program and surrounding architectures. The subcommittee also wants to look deeper into future milestones and ensure that the scientific objectives are recognized.

General Lyles noted that, in reviewing the Lunar and Lunar-to-Mars architecture, Dr. Bush should talk to Ms. Kathy Lueders (Associate Administrator for Space Operations) and Mr. James Free (Associate Administrator for Exploration Systems Development). They are the leaders of two key elements in that program: operations and exploration, which used to be in a single Mission Directorate but have now been split into two. He also recommended that the subcommittee talk to previous NASA Administrators, which should be instructive from a history perspective.



Slides 3-4

The second area of interest is the commercial LEO (Slide 5) and commercial Cislunar. This is important to every subcommittee member. Commerce in LEO has existed for quite some time (communications, remote sensing, etc.), but it is now increasing exponentially. In fact, we're almost at the point of exceeding the capacity of the launch industry. We need regulations that will help industry, including but not limited to intellectual property protection.

Regulations can help commerce happens, but we need the right kind of regulations. We know we need to work with the government.

Hon. Charlie Bolden noted that he's not sure we are exceeding the capacity of the launch industry. There are small companies sitting around the table wanting to meet the demand, but it is a very difficult path to get into the system. His fear is that we make people think it's easy, and then we grow many launch providers and there is not enough business to sustain all these companies. We also need to get more LEO destinations [for commercial human spaceflight].

Mr. Tory Bruno noted that 2022 was a huge change for the global launch market. Two things happened. First, the launch capacity fell dramatically because of the Russian invasion of Ukraine and the withdrawal of all Russian and Russian-related assets, while at the same time commercial mega constellations came onto the scene purchasing significant blocks of capacity. Second, many micro launcher companies have come into play, but there may not be a place in the market for more than one or two of those launchers. We are seeing this play out in the marketplace. This affects how the government purchases launchers to protect their own access to the launch manifest.

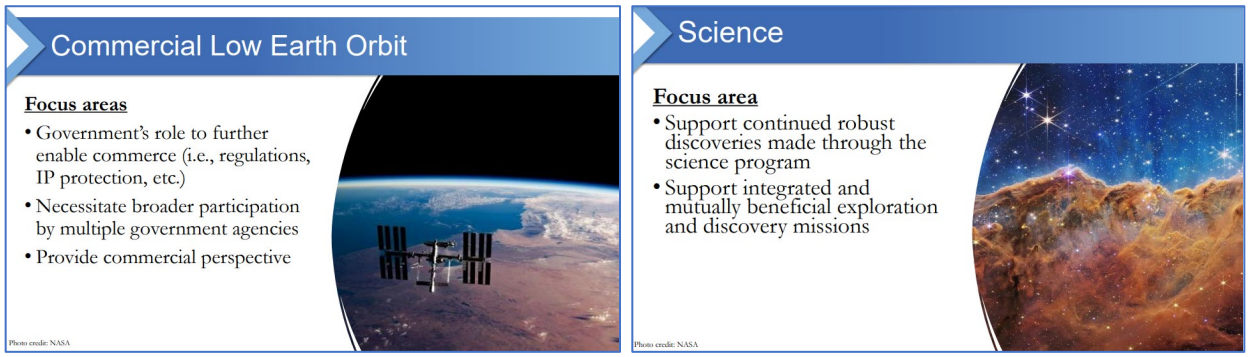
Gen Lyles asked Mr. Bruno if there is also concern regarding launch availability, as launch windows have been constrained significantly compared to what it used to be just two years ago.

Mr. Bruno responded yes. The development of small satellites has made it possible to have internet in the sky, which has provided monumental benefits to the country and the world. But this has created a traffic management problem in LEO. Many of these mega constellations live in thin shells, and other users cannot cohabitate within them. We also have to pass through these shells to go to higher orbits. This has complicated the conjunction analyses that need to be performed [to prevent collisions]. We are going to need better infrastructure to track the position of objects so that can maintain the number of launch opportunities.

Mr. Ted Mercer noted that, in terms of the launch capacity issue, there are two launch ports in the U.S. that are nowhere near capacity: Kodiak (Alaska) and Mars on Wallops Island (Virginia). In his view, the issue is to figure out how to use the launch capacity that we do have.

Mr. Bob Smith said that bring up the issue of regulations. This is not really a NASA problem, but it does put a spotlight on the regulatory role, that previously did not exist, of other U.S. Government agencies and what they can do to get these things into motion.

Dr. Bush continued with his presentation and noted that there is great enthusiasm for the progress made within the science program and the work that needs to be done in the near and far future (Slide 6). We are at a time of unprecedented discovery, where are searching for habitable exoplanets and those discoveries will in turn inform us about our own planet, and the immense resources out in the cosmos (in terms of energy and precious minerals) cannot be underestimated. These implications are not just important to science, but also to our economy and national security.

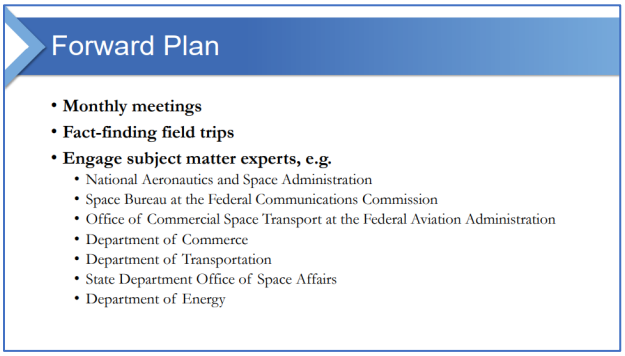


Slides 5-6

Gen Lyles noted that, on this topic, Dr. Bush needs to get in touch with as broad of an element as possible, including the National Academy of Engineering and the Space Studies Board[3], which is very concerned that the emphasis in human exploration and Artemis could end up overcoming the interest in science.

Mr. Bruno added that while we want to put people on Mars, we also need to preserve the ability to be able to discover life on other planets.

To close, the subcommittee is excited about the positive impact of exploration and discovery and is dedicated to help moving it forward (Slide 7). To this end, the subcommittee is establishing a cadence of monthly meetings, identifying subject matter experts as well as agencies we'd like to talk to.



Slides 7

***

[3] https://www.nationalacademies.org/ssb/space-studies-board

Economic Development and Industrial Base
The Hon. Eric Fanning Subcommittee Chair

Mr. Fanning noted the subcommittee met on Feb. 21 to discuss its initial focus areas (Slides 1-2). The subcommittee is still in its additive phase, pulling together the areas it might look at.

First, the subcommittee recognizes that the Vice President wants to focus on the use case across the government, industry, and communities in the U.S to make sure as many people as possible are benefiting from space, in particular those that haven't yet had that opportunity. Also, we want to make sure we are taking advantage of all aspects of the government.

Second, the subcommittee is also going to look at government-industry partnership models, and the lessons learned from some of these partnerships and look for opportunities to improve this approach.

Third, we will look at international trade, and where the U.S. is benefiting and where there may be gaps for further growth.

Fourth, we'll look at small business and new business, including new entrants to this market, and make sure we are as inclusive as possible. This will include looking at whole of government support mechanisms, how we can ensure regulatory certainty (and not just for small businesses), and how we can improve the entre and accessibility of new business.

Fifth, we'll look at is the space supply chain, where we want to tie-in as much as possible current Administration efforts (Infrastructure Bill, CHIPS, IRA, etc.). We also want to look at critical supplies and materials, and not just because of what happened with COVID-19 but also the current geopolitical situation and make sure we get ahead of where there may be any problems. Joint supply chain and "agnostic" suppliers is also important so that we are not artificially constraining ourselves as to what we define as the space supply chain, and to include companies that typically would not be considered as "space companies" but are nonetheless part of the broader ecosystem. We'll also look at infrastructure, including spaceports, to make sure we are investing in what we need.

Finally, well look at space sustainability, including maintaining global leadership in creating the policies and norms (standards, etc.). Another factor is the workforce, where there is a linkage between the work of the STEM subcommittee and industry.

Slides 1-2

Mr. Mercer commented that we also need to look how space is already benefiting all users, not just industry, and what its regional impact is in the community. For example, we need to know the impact that GPS brings into everyday life, not just its capabilities. We also need to give thought to how we can get what we used to consider critical supply chain back into the U.S. Lastly, we need to look at laws and regulatory policy/guidance that may have reached a point where they are now impeding impede what we are trying to do. We need to understand why they were put in place and address them if need be.

Dr. Kate Marvel noted the briefer mentioned space sustainability and asked how we may think about Earth sustainability given all these things are happening in an economy that is, hopefully, transitioning towards de-carbonization.

Mr. Fanning said he would add that to their list.

Mr. Bruno suggested that the subcommittee consider something that was started in the previous UAG, but was not finished, which is how we might enable or accelerate the Cislunar economy, and use of the resources that exist on the Moon.

Mr. Robert Schingler commented on the good work that the State of New Mexico and DIU has done on the space industrial base over the last three years, including the annual workshop they are doing. There's a good body of work there that the subcommittee could use. Also, under government-industry partnership models, we should include our procurement approach. The requirements process, and how we purchase, ends up creating the behavior in the market. The government has tremendous market power in setting up the quantity, quality, cost, innovation, speed, and adaptability of the product and services that we rely on.

Mr. Fanning concluded by saying that if UAG members have additional thoughts, please send him an e-mail.

***

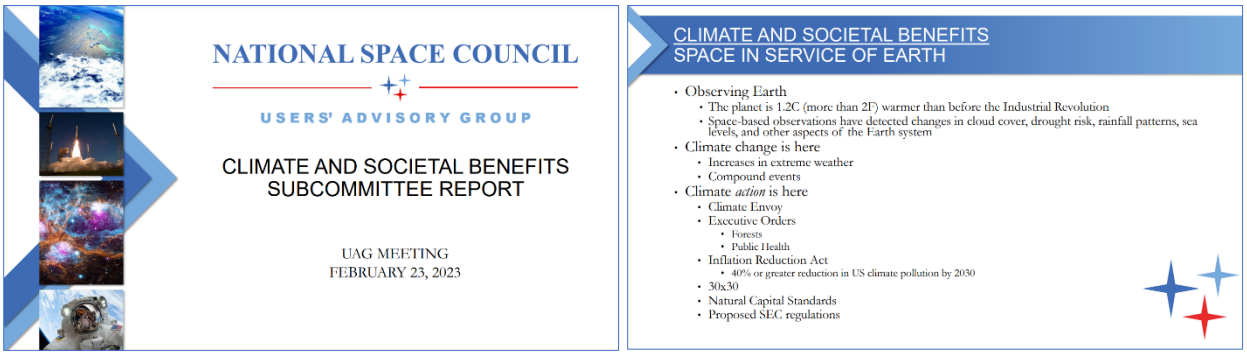
Climate and Societal Benefits
Dr. Kate Marvel, Subcommittee Chair

Dr. Kate Marvel started by thanking Ms. Misty Finical, the subcommittee's DFO.

This is a new subcommittee with the purpose of advancing space in service of the Earth (Slide 1). The more we explore the universe, the more we have an appreciation for where we live. Additionally, being able to look at the Earth from above, lets us know that the Earth is changing.

The subcommittee has identified four interrelated goals that they hope to pursue:

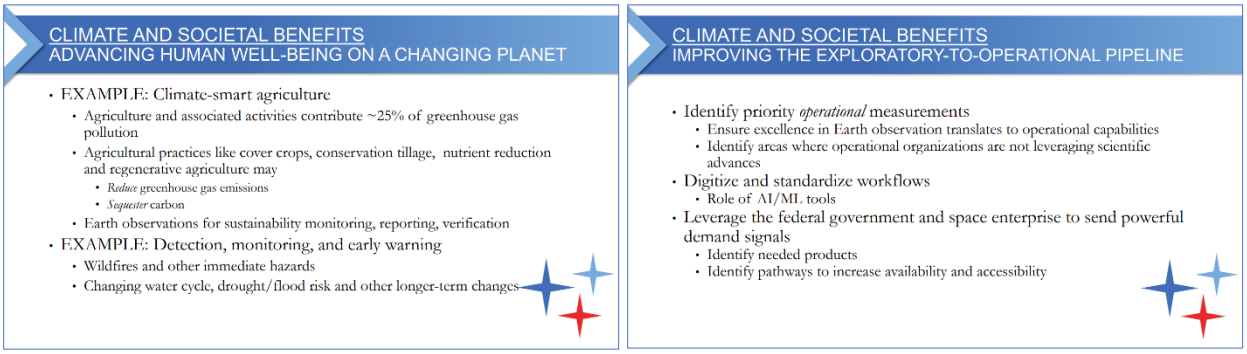
First, the subcommittee aims to get more specific about advancing human well-being on a changing planet. Dr. Marvel used climate-smart agriculture, and early detection and monitoring of natural disasters as examples of this (Slide 2).



Slides 1-2

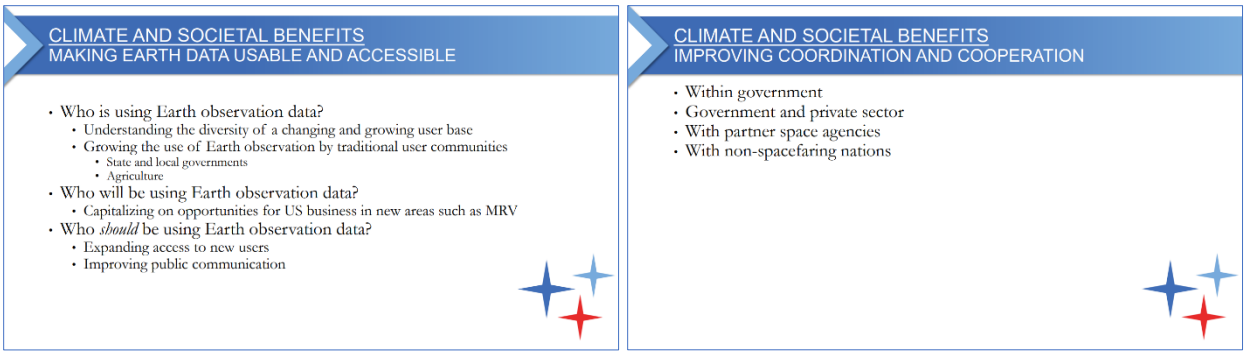
Second, the subcommittee hopes to improve the exploratory-to-operational pipeline. Dr. Marvel noted that the word "pipeline" may not be a good metaphor because, ideally, the dialog should be circular (Slide 3).

Third, this subcommittee will work with the Data and Emerging Technologies Subcommittee to make sure that Earth data is usable and accessible (Slide 4).



Slides 3-4

Fourth, the subcommittee will address and improve coordination and cooperation within the government, between the government and the private sector, with partner space agencies, and with non-spacefaring nations (Slide 5).



Slides 5-6

Dr. Marvel asked the UAG for feedback on these goals.

Mr. Tory Bruno mentioned that they should be looking at international treaties and agreements because the United States is not the only industrialized nation in the world. Every day, GPS saves almost a half billion gallons of fossil fuel and feeds approximately 800,000 people. Space is already playing a tremendous role in helping us adapt to a changing world.

Hon. Charlie Bolden stated this is a nonpartisan Advisory Committee. We need to be mindful that Earth science is a "hot-button area" on Capitol Hill. The UAG should not only advise the Administration but become an instrument to advise Congress because we can do things that NASA cannot. It is also important to understand that the planet is not in trouble, we are. The planet will be here for billions more years, we will not be if we cannot get something done. We need to advise both the Administration and Congress.

Gen. Lyles commented agreed with this comment.

Dr. Marla Davis-Perez stated that there are benefits with working with the Department of Transportation on technologies that effect climate change, such as electric systems.

Gen. Lyles commented at there is an issue behind data analytics. He said that there is an abundance of data collected on F-22s and F-35, and only about 20% of the data have been analyzed. Relating back to climate change, we have several Earth-sensing and climate satellites that are gathering data. The question is, how much of this data are we actually analyzing? There may be answers in the 70-80% of data that we have not looked at.

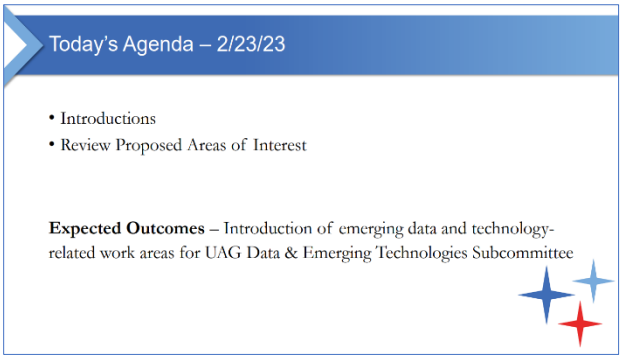
Gen. Lyles thanked Dr. Marvel.

***

Data and Emerging Technology
Dr. Dan Hastings, Subcommittee Chair

The subcommittee has identified five areas of focus:

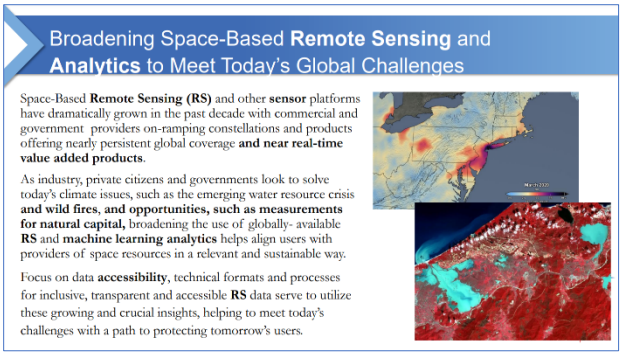
The first area of focus is to broaden space-based remote sensing and analytics to meet today's global challenges. There is an abundance of information coming down from space. The subcommittee aims to address is the accessibility and transparency of the data to meet the needs of the groups that currently use and will use the information in the future (Slide 2).

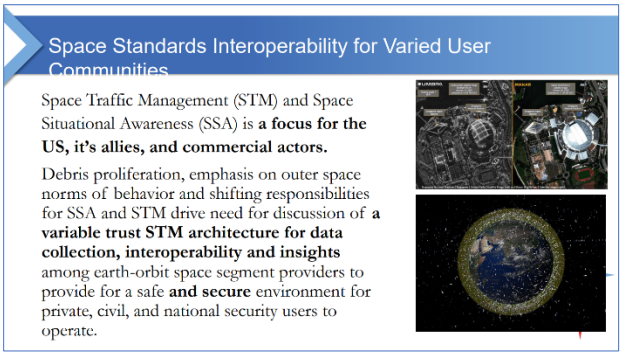


Slides 1-2

Second, the subcommittee will address issues surrounding space traffic management and space situational awareness. The subcommittee will focus on data sharing methods to address issues such as debris. We need a way to bring the data together to ensure secure, interoperable, upgradable architecture while considering what the commercial sector is currently doing Slide 3).

Third, the subcommittee will look at space-based communication computing for real-time connection, and a connected planet. Among the UAG, there are members that are in the business of developing a satellite-based, worldwide internet capability. The subcommittee hopes to look at terrestrial broadband capability with this emerging infrastructure, as well as look into the work of the International Telecommunication Union (ITU) and FCC (Slide 4).

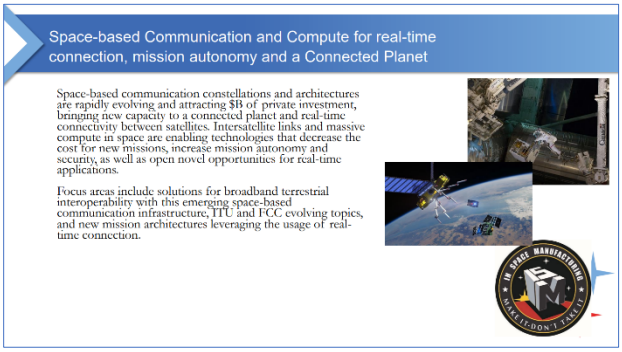


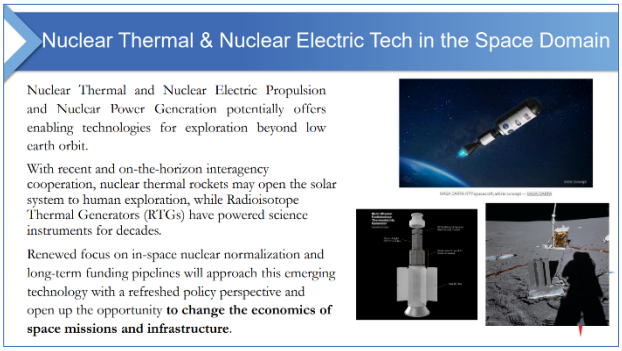


Slides 3-4

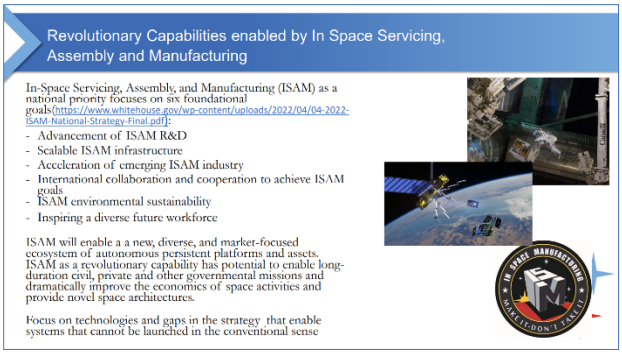
Fourth, the subcommittee will address Nuclear Thermal and Nuclear Electric Technologies. NASA and Defense Advanced Research Projects Agency (DARPA) aim to launch a nuclear thermal system by 2027. Developing nuclear technologies is essential to enable us to move quickly around the solar system (we cannot use solar power alone). The subcommittee will look at in-space nuclear normalization, which is how the public thinks about the safety of nuclear technology. Additionally, once these capabilities are developed, how will the economics and infrastructure of space missions? The United States needs to sustainably fund these efforts over several years (Slide 5).

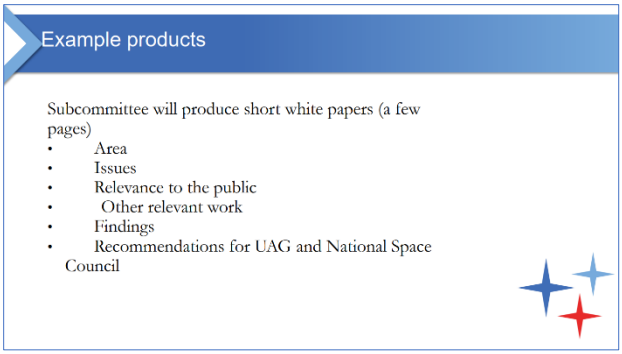
The final focus area is revolutionary capabilities enabled by In-Space Servicing, Assembly, and Manufacturing (ISAM). OSTP has released a policy statement that addresses the need to develop these capabilities. The subcommittee will be evaluating the R&D and technologies necessary to push ISAM (Slides 6-7).





Slides 5-6





Slides 7-8

The goal of the subcommittee is to eventually narrow these topics down to a smaller set and produce short White Papers (Slide 8).

Gen. Lyles stated that the UAG should evaluate the need to connect the space community with the manufacturers and engineers of the emerging/new technologies. For example, the National Academy of Technology does not have engineers equipped to handle some of the emerging technologies because they are not currently listed at the Academy. We need a way to understand these new technologies and their capabilities.

Dr. Sian Proctor asked how we can leverage the climate issue associated with the data being collected, instead of just computing more data. How can we push industry to think about this?

Dr. Patrick Lin stated that Artificial Intelligence (AI), especially machine learning, requires an enormous amount of energy. We need to keep in mind that some of the plans that we have in the space industry may come at a cost to life on Earth, and therefore be counterproductive to some of the goals we have in space.

Dr. Proctor said that we can be thoughtful with taking on the challenges regarding data crunching and storage with assets that we're building.

Mr. Robbie Schingler agreed with Dr. Lin and stated that the UAG should be considering the unintended consequences of these grand programs.

Dr. Marvel asked, "what counts as space data?" A satellite sending data about the Earth is worthless without a model to interpret the data. For example, NOAA puts its weather data through models to create forecasts. This compounds the data problem that Gen. Lyles mentioned. We are not just talking about observational data; we are talking about model data that we are using to interpret the observational data.

Mr. Bruno commented, “nuclear thermal is a game changer.”

Ms. Melanie Stricklan emphasized that space and Earth sustainability are diverging in at a pace we have never seen before due to the vulnerabilities that the exponential growth of the launch industry is creating, congestion of spectrum, and the aggressive geopolitical behavior that is adding to the debris problem. These issues out everything that we’ve discussed today at risk. Space sustainability enhances earth sustainability.

***

STEM Education, Diversity & Inclusion and Outreach
Ms. Mandy Vaughn, Subcommittee Chair

Ms. Vaughn stated that the underlying element between commercial, civil, and national security space is people. Without the satellites, launch vehicles, and ground stations, we do not have access to data and the algorithms that we can operate and leverage to create anything that we have talked about here today. From every angle, we can see that we have looming talent shortage in various critical technology sectors surrounding space. This shortage extends from college graduates to manufacturing and skilled technical workforce. An estimated 2 million jobs in the aerospace sector could remain unfilled by 2030.

China graduated six times more engineers than the United States annually, and approximately one-third of China graduates are in engineering fields.

Between 13 and 22 percent of the engineering workforce is comprised of women. We also see a district trend in K-12 education system where students fall out of the funnel that would have led them to a STEM or space-related career.

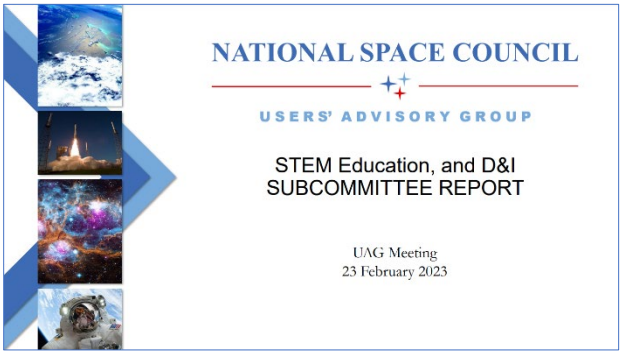
The subcommittee has identified key elements that will help the UAG identify, sustain, and grow the next generation of the space community:

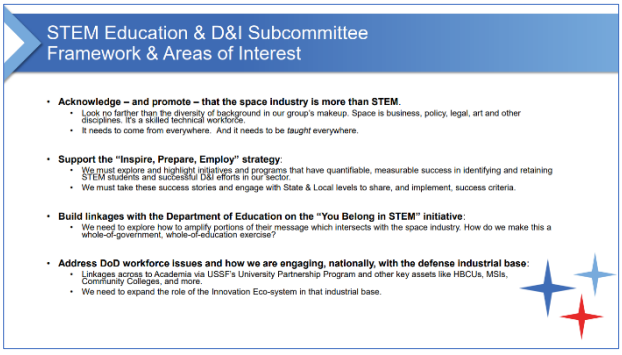
First, acknowledge and promote that the space industry is more than STEM (Slide 2). We must be looking beyond the usual places of colleges and universities to community colleges, trade schools, workforce development programs, etc.

Second, support the "Inspire, Prepare, and Deploy" strategy. We must take success stories and engage at state and local levels to share and implement success stories where there are alike circumstances. How can we help the next program succeed like another one has?

Third, build linkages with the Department of Education on the "You Belong in STEM: initiative (Slide 4). We must find the intersections of STEM and space. How can we make this a whole of government and a whole of education exercise?

Fourth, address DoD workforce issues and how we are engaging, nationally, with the defense industrial base. We must increase the reach of programs such as the US Space Force's university partnership program. How do we get national security space issues into more classrooms?





Slides 1-2

Ms. Vaughn opened up the floor for discussion.

Mrs. Katrina Harden Williams commented that the STEM education effort needs to start at the toddler age so that students are invested in STEM by the time they hit middle and high school.

Ms. Dawne Hickton asked where the teachers are that are supposed to be teaching STEM. It is critical to have teachers that can teach STEM courses with expertise. Inspiring students may not matter if we do not have teachers who can teach the material.

Ms. Vaughn stated that this has been a repeated discussion topic at the local and federal levels.

Gen. Lyles commented that the Wolf Trap Pre-K STEM Arts Program is "first class," and the Department of Education gave them a grant to expand nationally. Particularly, Raytheon Technologies has Wolf Trap teach the teachers, so teachers are ready to start the initiation with students at a young age. This is an example so the UAG can consider answering these questions.

Dr. Proctor commented that re-careering into the space and STEM sector is overlooked. How can we encourage this?

Dr. Lin mentioned that Hollywood has the power to influence the world. There is opportunity of new methodology due to the influence of the entertainment sector.

Dr. Marvel asked how we can persuade student to realize that they do not have to choose between art and space. Currently, "there is a perception that if you are an artist, you can't touch STEM."

Dr. Proctor agreed with Dr. Marvel, saying that she is a geoscientist that won her seat to space as an artist and a poet. We need to widen the message that you can be a scientist, an artist, and contribute to human space flight. We need to champion the examples that we have of this occurring.

Ms. Bridget Chatman asked, regarding military transitioning, "should we uncouple… STEM [into] 'workforce development' or 'future workforce' as another bullet under our charter?"

Ms. Vaughn thanked the UAG for feedback. We are trying to create a unified message regarding policy and public outreach.

Dr. Proctor added that it's "about people finding their place in space."

***

Next Steps and Closing Remarks
Gen Lester L. Lyles (USAF, Ret.) Chair, UAG

As far as next steps, within the next week the Executive Subcommittee will meet to discuss all of the Subcommittee plans moving forward. This discussion will include any potential changes or modifications to their intended focus areas.

Mr. Chirag Parikh thanked the UAG and stated that this is an investment in the nation and our future.

Gen. Lyles thanked all of the members and adjourned the meeting.

The meeting was adjourned at 1:30 PM.

***

Appendix A: Agenda

Thursday, February 23, 2023

U.S. Eastern Time Shown – Session Times Subject to Change at Chair's Discretion

9:00-9:05 (5 min)	**Users' Advisory Group Convenes**	Mr. James J. Miller, *Executive Secretary, UAG, NASA HQ*
9:05-9:20 (15 min)	Welcome and Opening Remarks	Mr. Chirag Parikh, *Deputy Assistant to the President & Executive Secretary of the NSpC*
9:20-9:35 (15 min)	Meeting Objectives & Member Introductions	Gen Lester Lyles (USAF ret.), *Chair, UAG*
9:35-11:00 (1 hrs 25 min)	**Space Enterprise Expert Presentations**	**Guest Speakers**
9:35-9:40 (5 min)	The Essential American Space Enterprise *(Virtual Address)*	Dr. Buzz Aldrin, *Apollo 11 Astronaut*
9:40-10:00 (20 min)	Military Space Priorities	Gen. David D. Thompson, *Vice Chief of Space Operations, USSF*
10:00-10:20 (20 min)	Civil Space Priorities	Col. Pamela Melroy (USAF, ret.), *Deputy Administrator, NASA*
10:20-10:40 (20 min)	Commercial Space Priorities	Dr. Richard DalBello, *Director, Office of Space Commerce, NOAA*
10:40-11:00 (20 min)	Space Science Priorities	Dr. Thomas Zurbuchen, *Former Associate Administrator, Science Mission Directorate, NASA*
11:00-11:30 (30 min)	**Lunch Break**	
11:30-13:00 (1 hr 30 min)	**Subcommittee Updates** (15 min each)	Subcommittee Chairs
11:30-11:45 (15 min)	Exploration and Discovery	Dr. Lance Bush
11:45-12:00 (15 min)	Economic Development and Industrial Base	The Hon. Eric Fanning
12:00-12:15 (15 min)	Climate and Societal Benefits	Dr. Kate Marvel
12:15-12:30 (15 min)	Data and Emerging Technology	Dr. Dan Hastings
12:30-12:45 (15 min)	STEM Education, Diversity & Inclusion and Outreach	Ms. Mandy Vaughn
12:45-13:00 (15 min)	National Security	Gen. Lester Lyles, USAF ret.
13:00-13:15 (15 min)	**Next Steps and Closing Remarks**	**All members, led by Chair**
13:15	**Adjourn**	

Appendix B: Membership

General Lester L. Lyles, USAF Ret.
Users' Advisory Group Chair

Mr. Rajeev Badyal,
Head of Project Kuiper at Amazon

The Hon. Charlie Bolden,
Former NASA Administrator

Dr. Lance Bush,
President and CEO of Challenger Center

Mr. Salvatore “Tory” Bruno,
CEO of United Launch Alliance

Ms. Bridget Chatman,
Chair of Women in Aerospace

Mr. Theodore “Ted” Colbert,
President and CEO of Boeing Defense, Space, and Security

Ms. Nancy Colleton,
President of the Institute for Global Environmental Strategies

Ms. Karina Drees,
President of the Commercial Spaceflight Federation

The Hon. Eric Fanning,
President and CEO of the Aerospace Industries Association

Dr. Daniel Hastings,
Head of the Department of Aeronautics and Astronautics at MIT

Ms. Dawne Hickton,
Chair and CEO of Cumberland Additive

Dr. Daniel “Dan” Jablonsky,
President and CEO of Maxar Technologies

Dr. Patrick Lin,
Professor of Philosophy and Technology Ethics at Cal Poly, San Louis Obispo

Mr. Dave Kaufman,
President of Ball Aerospace

Mr. Ron Lopez,
President and Managing Director of Astroscale U.S.

Prof. Harold Lee Martin
Chancellor, North Carolina Agricultural and Technical State University (A&T)

Dr. Kate Marvel,
Senior Climate Scientist at Project Drawdown

Maj. Gen. (USAF, ret.) Theodore “Ted” Mercer,
CEO and Executive Director of the Virginia Commercial Spaceflight Authority

Dr. Marla Perez-Davis,
Former Director of the NASA Glenn Research Center

Astronaut Sian Proctor,
Astronaut and Geoscientist representing Maricopa Community District

Mr. Robbie Schingler,
Co-Founder and Chief Strategy Officer at Planet

Ms. Gwynne Shotwell
President and COO, SpaceX

Dr. Robert “Bob” Smith,
CEO of Blue Origin

Ms. Melanie “Mel” Stricklan,
Co-Founder and CEO of Slingshot Aerospace

Mr. Jim Taiclet,
CEO and Chairman of Lockheed Martin

Dr. Mandy Vaughn,
Founder and CEO of GXO, Inc.

Ms. Kathy Warden,
Chair and President of Northrop Grumman

Mrs. Katrina Harden Williams,
Mathematics Educator and Founder of the Aims Middle School Space Club

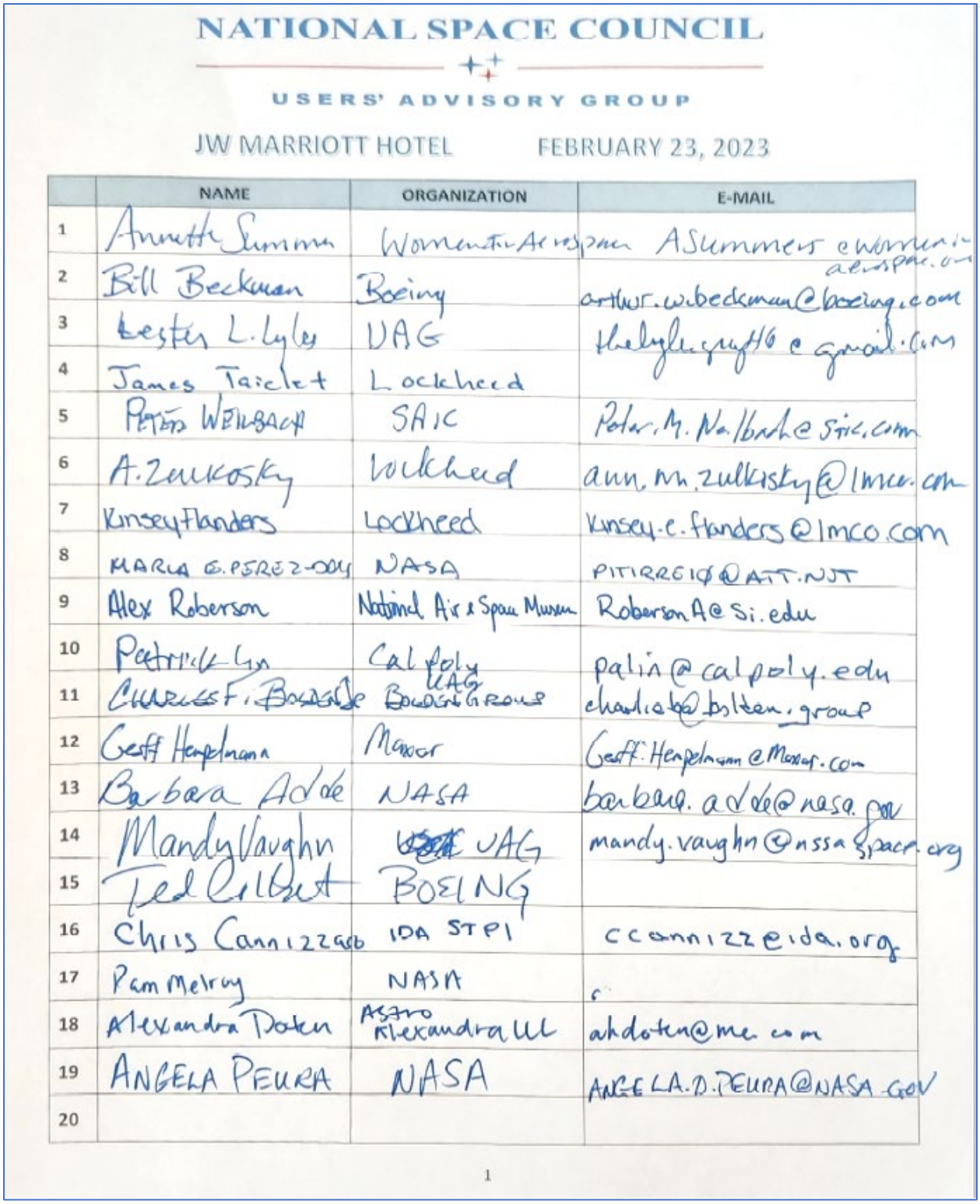
Dr. Jeremy Williams,
Member of the Bayer Crop Sciences Team and Head of Digital Farming Solutions

Appendix C: Pre-Registration & Sign-In List

Pre-Registration:

Last Name	First Name	Organization/Affiliation
Wang	Julie	NASA
Manning	Catherine	NASA
Deihl	Jessica	NASA
Benko	Ralph	Senior Counselor, Buzz Aldrin Enterprises
Summers	Annette	Women in Aerospace
Nickerson	Torrie	Women in Aerospace
Munroe	Sonnie	The GA Team
George	Jemin	NSF
Damphousse	Hope	Ball Aerospace
Browne	Hannah	Federal Aviation Administration
Dupree	Jaelyn	Partners in Air & Space
Kimbrell	Aubert	Airbus
Weilbach	Peter	Science Applications International Corporation (SAIC)
Marge	Michael	Advisory Board for the Implementation of the Human Research Program for Civilians in Spaceflight and Space Habitation
Gram	Original	Original Co.
Beckman	Arthur	Boeing
Doten	Alexandra	Astro Alexandra LLC
Volkwein	Shelley	L3Harris Technologies
Wagner	Brian	Maxar Technologies
Gore	Whitney	Maxar
Parry	Paul	Maxar
Zucker	Herbert	HR-ZTECH, LLC/Member
Pape	Oliver	German Aerospace Center (DLR)
Mealling	Michael	Starbridge Venture Capital
Alexander	Kenneth	Federal Aviation Administration
Roberson	Alex	Smithsonian Institution
Hourihan	Matt	Federation of American Scientists
French	Michael	Aerospace Industries Association (AIA)
McNitt	Matthew	National Security Space Association
Peura	Angela	NASA SCaN
Maubert	Nicolas	CNES-French Embassy
Mamou	Samuel	Embassy of France in the US - CNES
Cannizzaro	Chris	IDA Science and Technology Policy Institute
narita	shinichiro	Embassy of Japan
Malone	Ivy	Partners in Air and Space, Inc.
Ceperley	Daniel	LeoLabs
Silcox	Brett	Astroscale U.S.
Schwenke	Taylor	Partners in Air and Space inc
Uzo-Okoro	Ezinne	White House OSTP
Schwenke	Taylor	Partners in Air and Space
Prasad	Narasimha	NASA Langley Research Center
Pociask	Catherine	FAA
Guenther	Meredith	Commercial Spaceflight Federation
Prasad	Narasimha	NASA Langley Research Center
Hannaj	Browne	GWU - Student
Kronmiller	Kate	Jacobs
Park	Justin	Intergalactic Education
Trauberman	Jeffrey	Virgin Orbit National Systems
Atkins	Tiffany	Alphastarcorporation

Sign in List:



NATIONAL SPACE COUNCIL

USERS' ADVISORY GROUP

JW MARRIOTT HOTEL FEBRUARY 23, 2023

	NAME	ORGANIZATION	E-MAIL
1	Annette Summers	Momentus Aerospace	ASummers@momentus-aerospace.com
2	Bill Beckman	Boeing	arthur.w.beckman@boeing.com
3	Lester L. Lyles	VAG	thelylesgroup6@gmail.com
4	James Taiclet	Lockheed	
5	Peter Wehbacher	SAIC	Peter.M.Nalbone@saic.com
6	A. Zulkosky	Lockheed	ann.m.zulkosky@lmco.com
7	Kinsey Flanders	Lockheed	kinsey.e.flanders@lmco.com
8	MARIA G. PEREZ-DOLZ	NASA	PITIRREC@ATT.NET
9	Alex Roberson	National Air & Space Museum	RobersonA@si.edu
10	Patrick Lyn	Cal Poly	palin@calpoly.edu
11	Charles F. Bolden	VAG Bolden Group	charles.bolden.group
12	Geoff Hempleman	Maxar	Geoff.Hempleman@Maxar.com
13	Barbara Adde	NASA	barbara.adde@nasa.gov
14	Mandy Vaughn	VAG	mandy.vaughn@nssa.space.org
15	Ted Colbert	BOEING	
16	Chris Cannizzaro	IDA STPI	ccannizz@ida.org
17	Pam Melroy	NASA	
18	Alexandra Doten	Astro Alexandra LLC	ahdoten@me.com
19	ANGELA PEURA	NASA	ANGELA.D.PEURA@NASA.GOV
20			

1

NATIONAL SPACE COUNCIL

USERS' ADVISORY GROUP

JW MARRIOTT HOTEL FEBRUARY 23, 2023

	NAME	ORGANIZATION	E-MAIL
21	Taylor Schuler	Partners in Air and Space	taylor@pasparters.com
22	SHAN PROCTOR	MARICOPA Colleges	
23	Dan Jablonsky	Maxar	
24	RALPH BENKO	BUZZ ALDRIN	RALPHBENKO@GMAIL.COM
25	Lance Bush	Challenger Center	LBUSH@Challenger.org
26	Jeremy Williams	Boeing	jeremy.williams@boeing.com
27	Ken Alexander	FAA	Ken.Alexander@faa.gov
28	Daniel Hastings	MIT	hastings@mit.edu
29	NANCY COLLETON	/GES	
30	A.J. Oria	NASA	angel.oria-1@nasa.gov
31	Martin Frederick	Northrop Grumman	martin.frederick@ngc.com
32	Kathy Warden	Northrop Grumman	kathy.warden@ngc.com
33	Ron Lopez	Astroscale U.S.	
34	RJ Belanger	NASA	rj.belanger@nasa.gov
35	Eric Fanning		
36	[illegible]	[illegible]	
37	Oliver Pape	DLR	
38	Mel Stricklan	Stinger	melanie@stingertechspace
39	TORY BRUNO	ULA	TORY.BRUNO@ULALAUNCH.COM
40	Robbie Sabathier	ULA	robbie.sabathier@ulalaunch

2

NATIONAL SPACE COUNCIL

USERS' ADVISORY GROUP

JW MARRIOTT HOTEL FEBRUARY 23, 2023

	NAME	ORGANIZATION	E-MAIL
41	Cody Kelly	NASA	
42	Kate Marvel	Drawdown	
43	Diane Hoffman	NSpC	
44	[illegible]	VA Cobbs	
45	Mary Guenther	CSF	
46	Bridget Chaton	WIH / SAIC	
47	Brian Wagner	MAXAR	
48	Whitney Gore	Maxar	
49	Paul Parry	MAXAR	
50	Karina Drees	CSF	
51	Quincy Brown	Space Canada	
52	Samantha Gilder	"	
53	Matt Hourihan		
54	Frank Bauer	NASA/ANSS	frank.bauer@nasa.gov
55			
56			
57			
58			
59			
60			

3

Appendix D: Acronyms and Definitions

3D	Three Dimensional
AI	Artificial Intelligence
CEO	Chief Executive Officer
COVID-19	Coronavirus Disease 2019
DARPA	Defense Advanced Research Projects Agency
DART	Double Asteroid Redirection Test (DART) NASA Mission
DFO	Designated Federal Officer
DOC	Department of Commerce
DoD	Department of Defense
FACA	Federal Advisory Committee Act
FAI	Fédération Aéronautique Internationale
FCC	Federal Communications Commission
GDP	Gross Domestic Product
GEO	Geosynchronous Orbit
GPS	Global Positioning System
GSFC	NASA Goddard Space Flight Center
ICAO	International Civil Aviation Organization’
ISAM	In-Space Servicing, Assembly, and Manufacturing
ISRO	Indian Space Research Organisation
ISS	International Space Station
ITU	International Telecommunication Union
LEO	Low Earth Orbit
NASA	National Aeronautics and Space Administration
NISAR	NASA-ISRO Synthetic Aperture Radar
NOAA	National Oceanic and Atmospheric Administration
NRO	National Reconnaissance Office
NSpC	National Space Council
PNT	Positioning, Navigation, and Timing
R&D	Research and Development
RFI	Radiofrequency Interference
SCI	Sensitive Compartmentalized Information
SGE	Special Government Employee
SLS	Space Launch System
SPD	Space Policy Directive
SSA	Space Situational Awareness

STEM	Science, Technology, Engineering and Mathematics
U.S.	United States
UAG	Users’ Advisory Group
USAF	U.S. Air Force
USCG	U.S. Coast Guard
USG	U.S. Government
USSF	U.S. Space Force
VP	Vice President