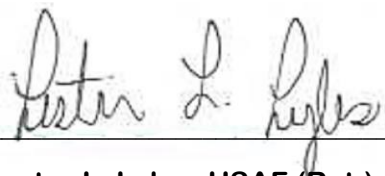
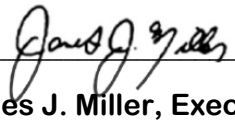
National Space Council
Users' Advisory Group
December 1, 2023, Public Meeting

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 virtual public meeting on December 1, 2023. This was the second UAG meeting under the Biden-Harris Administration.

Ms. Valda M. Vikmanis Keller (Director, Office of Space Affairs, Bureau of Oceans and International Environmental and Scientific Affairs, Department of State) provided a briefing on the topic of Strengthening International Engagement and Partnerships in Space. Key topics discussed included the responsibilities of her office and the challenges and opportunities for international engagement.

Following this briefing, the Chairs of the six UAG Subcommittees presented their observations, findings, and proposed recommendations. Thirty recommendations were deliberated on. They have been included at the end of this Executive Summary. What follows is a summary of the key topics addressed.

First, on the topic of space exploration and discovery, the Exploration and Discovery Subcommittee developed a number of key recommendations.

- The UAG is unanimous in its support for the Artemis program concept, and the importance of international partnerships to achieve the exploration objectives of returning to the lunar surface; establishing a permanent presence on the Moon; and using this as a vital stepping-stone to travel to Mars.

- However, UAG members also have specific recommendations on how cooperation, communication, and partnerships among the National Aeronautics Space Administration (NASA), the commercial space industry, and international partners could be improved. This includes creating a more inclusive role for industry in NASA's annual Lunar / Exploration Architecture (LEA) assessments and updates in real-time.

Second, on the topic of space traffic coordination and space sustainability, the Economic Development and Industrial Base Subcommittee and the Data and Emerging Technology Subcommittee have developed recommendations to ensure the continued expansion and exploration of space while safeguarding the orbital environment for future generations. Some of the steps required to achieve this include:

- Developing a collision avoidance maneuverability requirement.

- Determining agencies responsible for U.S. government orbital debris object remediation in the context of a larger strategy on space sustainability.

- Developing, in concert with other countries, international best practices and norms of behavior.

- Developing an international mechanism for Space Traffic Coordination (STC).

- Developing technical systems for active removal of space debris in a public/private partnership.

Third, on the topic of climate monitoring, the Climate and Societal Benefits Subcommittee has developed recommendations to advance the benefits of space activities to serve humanity. It found that "Earth-sensing" satellite systems are significant and the data resulting from these vast sources is critically valuable for numerous applications; however, the harmonization and dissemination of data to the user community needs to be improved. Some of the recommendations to address this include:

- Establishing an overarching leadership role within the National Security Council to assess, prioritize, and guide the Nation's multi agency Earth Observation (EO) effort, along with consideration of private sector capabilities for the purpose of accelerating and improving environmental information and action promoting greater resiliency.

- Streamlining applications of EO by establishing an Earth Information and Action Lead to leverage existing authorities and appropriations to create partnerships that enable public, nonprofit, and commercial applications of EO for climate action and societal benefit.

Fourth, on the topic of having a capable future workforce to address our growing challenges of operating in space, the STEM Education, Diversity, and Inclusion Subcommittee, and the National Security Subcommittee have developed recommendations such as:

- Releasing a new U.S. STEM Strategic Vision that also specifically addresses our future needs in the space sector.
- Expanding space economic sector pilot programs.
- Updating contractual language such that supporting diversity and inclusion rewards our defense and industrial base.
- Taking steps to increase the pipeline of future cleared personnel for national security space community, especially regarding our younger generation.

Fifth, on the topic of international engagement, the National Security Subcommittee finds that collaboration with both allies and adversaries is key to national security space. Therefore, the UAG recommends:

- Closing gaps between U.S. declaratory policy on international security space policy and actual implementation.
- This includes modifying existing agreements, establishing mechanisms for data sharing, streamlining export reviews and approval processes, and assigning additional resources within the U.S. Space Force.

The UAG is chaired by Gen. Lester L. Lyles (USAF, ret.). and Mr. James J. Miller is the Executive Secretary.

List of Recommendations (30)

1. International collaboration with both allies and adversaries is key to national security space. Therefore, the UAG recommends closing the gaps between U.S. declaratory policy on international security space policy and actual implementation.
2. Ensure National Security considerations and objectives are addressed in the "National Cislunar Science and Technology Strategy" deliberations.
3. In support of the STEM eco-system model, the identified areas of Dept. of Defense (DoD) and Defense Industrial Base (DIB) collaboration should be broadened by leveraging the regional STEM / workforce development eco-system efforts.
4. DoD and Office of the Director of National Intelligence (DNI) leadership should include STEM Education, Diversity, and Inclusion as part of personnel incentives for time commitments.
5. Initiate interagency discussion to potential refinement of/addition to Federal Acquisition Regulation (FAR) and Defense Federal Acquisition Regulation (DFAR) language about Small Business, and diversity of supplier base as part of DIB.
6. DoD and ODNI should initiate discussion on personnel clearances for students and young professionals to establish guidelines and programs to increase awareness about and start processes for granting clearances.
7. Artemis and International Collaboration: NASA should continue international engagements to meet Artemis exploration objectives and communicate guidance regarding scope intended to be met by U.S. industry and opportunities for international partners.
8. Artemis and Industry Engagement: NASA should accelerate the update of this framework with the full, transparent integration of industry into the process.

9. Sustained Lunar Presence: The U.S. must maintain dissimilar redundancy of critical Artemis capabilities to establish a steady and predictable mission cadence.

10. Artemis Plan Coordination: The NSpC must lead development of a comprehensive plan across the whole of government, international partners, and commercial industry to identify specific areas where coordination of purpose and action can be improved.

11. Artemis Commercial Services: The commitment to the Artemis program must continue; as part of that, NASA must continue to identify and support investments in the commercial services and capabilities they need for a sustainable cislunar presence where NASA is one customer of many.

12. U.S. Civil Space Initiatives: The U.S. should continue to maintain its military space activities separate from civil space activities to foster trust in international relationships and maintain clean interfaces.

13. Talent Capture: The NSpC should lead coordination of relevant government agencies and industry to develop and implement a national strategy identifying current and future technical personnel needs within the federal government and immediately closing the workforce gaps that currently exist. Strategy must highlight specific bottlenecks to timely hiring and onboarding, identify specific expedited hiring authority that already exists across the federal government, and evaluate opportunities to leverage the extant talent pool residing within technical government agencies and industry.

14. Update and Release new STEM Strategic Vision to include Space: NSpC member agencies should seek Congressional approval to update and release another five-year U.S. STEM Strategic Vision that includes sections on space-related topics with specific goals, priorities, partnerships, and measurements for a space literate American society. This effort should include the U.S. Space Force (USSF), and other agency members of the NSpC.

15. Expand Space Economic Sector Pilot Programs: Engage with industry members (could begin with UAG representatives), state and local government and trade organizations. to understand and forecast workforce and professional requirements in terms of expertise and geography. Use this data to engage with the Departments of Commerce, Labor, and Education to prioritize future eco-system development beyond the three pilot programs.

16. Update U.S. Government (USG) contractual language about diversity within the Defense Industrial Base: Initiate interagency discussion to potential refinement of/addition to FAR/DFAR language about Small Business, and diversity of supplier base as part of DIB. Possible outcomes could be a FAR and FAR equivalent update, an Executive Order, or a National Defense Education Act -like framework.

17. Increase the pipeline of cleared personnel for national security space community: DoD and ODNI should initiate discussion on personnel clearances for students and young professionals to establish guidelines and program to increase awareness about; and start processes for granting clearances. Engage with DoD, ODNI, Dept of Labor to establish forecast for cleared workforce needs and create program whereby USG initiates clearances for students in feeder programs.

18. Talent Capture: To address ongoing personnel shortage, the NSpC should: (1) Lead coordination with the Department. of Commerce (DOC), Federal Aviation Administration (FAA), NASA, Federal Communications Commission (FCC), and industry to identify future technical personnel needs as well as highlight specific bottlenecks to timely and efficient hiring and onboarding; (2) encourage agencies tasked with regulating the commercial space industry (e.g., FAA, FCC, etc.) to maximize the use of existing authorized expedited hiring authorities; and (3) evaluate opportunities to leverage the talent pool residing within technical government agencies (e.g., NASA, DoD, etc.) and industry to create and establish opportunities for members of those workforces to transition, temporarily or permanently, to regulatory agencies to accelerate license and permit reviews and ensure regulatory frameworks are appropriately designed.

19. Earth Information and Action Lead (EIAL): Establish an over-arching leadership role within the National Security Council to assess, prioritize, and guide the Nation's multi-agency EO effort along with consideration

of private sector capabilities for the purpose of accelerating and improving environmental information and action.

20. Engagement with the private sector: (1) USG should work to streamline applications of EO for societal benefit; (2) EIAL should leverage existing authorities and appropriations to create partnerships that enable public, nonprofit, and commercial applications of EO for climate action & societal benefit.

21. Modernize data systems: The Administration should work across USG agencies and missions (NASA, NOAA, U.S. Geological Survey [USGS], DoD, Intelligence Community) to standardize and require better data architectures, standards, and interoperability for broader use and more equitable access within the USG, industry, and user communities. Process should also identify areas where EO applications can digitize workflows and incorporate advanced artificial intelligence (AI) or machine learning methods.

22. Space data ethics: The National Academies should convene a group to develop a framework for space data ethics, as distinct from existing data ethics.

23. Space Sustainability National Policy: A national strategy should be developed by the White House for the mission of space sustainability. This strategy with the corresponding allocation of resources to implement it should lay out clearly the responsibilities of each of the above-mentioned USG agencies for space sustainability. This goes beyond Space Policy Directive (SPD)-3.

24. Take actions to build owner/operator confidence in the DOC systems: (1) A clear goal of the Traffic Co-ordination System for Space (TraCSS) must be to reduce the uncertainty associated with predictions of collisions to the point where operators can trust them enough to take maneuver decisions with confidence; (2) operators should voluntarily provide their own tracking data on their systems to the DOC, this should include their best estimate of the data quality; (3) as TraCSS develops, it must not get into vendor lock with tools.

25. Develop the technical systems to remove space debris by the NASA Space Technology Mission Directorate (STMD): To cross the "technology acceptance valley of death", a USG agency must be directed to take the technology development from Technology Readiness Level (TRL) 2 or 3 to TRL 8 and then share the knowledge with commercial industry for implementation.

26. Develop an international coordination mechanism for Space Traffic Coordination: (1) Given the danger of catastrophic events, the Department of State should be directed to establish an international coordination mechanism such as the International Committee on Global Navigation Satellite Systems (ICG) as soon as feasible; (2) start with active coordination with Europe and Japan. There is a high need to share and low ability to trust. The USG speaking with a cohesive voice will make a difference.

27. Adopt best practices around finding systems, removing unnecessary systems, and maneuvering systems: (1) Satellite performance will be improved if all satellites have Global Navigation Satellite System (GNSS)-based on-board orbit and trajectory determination, and then share predictive ephemerides data to space situational awareness stakeholders (i.e., other operators) as well as TraCSS; (2) launch upper stages should always be deorbited; (3) the FCC, National Oceanic and Atmospheric Administration (NOAA), and FAA should mandate that U.S.-licensed spacecraft can conduct effective collision avoidance, through maneuverability or other means, and these spacecraft should incorporate tracking capabilities such as a "transponder, reflect or other identification" to enable effective tracking as part of approval for launch within the U.S.; (4) all satellite manufacturers would be asked to consider design choices that would facilitate tracking in the event they lost power; and (5) all passive satellites must be highly trackable with design choices that allow for this.

28. Space Sustainability: (1) Require participation in civil space situational awareness and future civil space traffic coordination services; (2) encourage ability for spacecraft to be uniquely identified and reliably tracked from the ground once deployed; (3) recommendations for Office of Space Commerce (OSC) TraCSS program training and expertise; (4) five-year end of life requirement; (5) maneuverability requirement; (6) limitation of U.S. Orbital Debris Mitigation Standard Practices (ODMSP) waivers; (7) determination on responsibility for orbital debris remediation; (8) support for orbital debris remediation technology

development; (9) development of international best practices and norms; (10) increase international transparency of debris mitigation and space safety; and (11) assess spectrum needs for space sustainability operations.

29. Mission Authorization and Supervision: Include the following in the framework for authorizing and supervising novel space activities: (1) public review and comment; (2) tailored approach; (3) presumption of authorization; (4) strict timeline; (5) transparency; (6) technical support approach; (7) information requirements; (8) mission-level authorization; (9) protect proprietary information; (10) continued validity of existing and pending authorizations; (11) supervision conducted via self-certification; and (12) managed by a single agency.

30. Space Supply Chain: (1) The FY 2022 National Defense Authorization Act (NDAA) directed DoD to undertake a study exploring how current policies and requirements create a barrier to the commercial sector's willingness to engage in business with the federal government. The Administration should complete this study and share with the Subcommittee for its analysis; (2) DoD's Industrial Base Policy office is leading a Supply Chain Resiliency Working Group to catalog available DoD industrial base data, identify data gaps, standardize data collection, and develop proposals to integrate disparate data sources into a centralized database. The Administration should complete this effort and share with the Subcommittee for analysis; (3) the Bureau of Industry and Security is conducting a comprehensive assessment of U.S. civil space industrial base in partnership with NASA and NOAA. The Administration should expand this study to include all government space activities and serve as an update to Commerce's comprehensive 2014 space supply chain study.

Table of Contents

Meeting Notes

Users' Advisory Group Convenes: Call to Order, Logistics, & Announcements
Mr. James J. Miller, *Executive Secretary, UAG, NASA HQ*

Mr. James J. Miller welcomed everybody on behalf of Gen Lester L. Lyles (USAF, ret.) and thanked the National Space Council (NSpC) for sponsoring the Users' Advisory Group (UAG) as well as Mr. Chirag Parikh (Executive Secretary, NSpC) for their support. General Lyles is the lead for the discussion, with support from his six subcommittee chairs. This meeting is held under Federal Advisory Committee Act (FACA) guidelines. If any Special Government Employee (SGE) or other member believe they have a potential conflict of interest with any particular topic, then they need to recuse themselves for the record. At the conclusion of the meeting all materials will be posted for public access on the UAG website hosted by the National Aeronautics Space Administration (NASA) [https://www.nasa.gov/usersadvisorygroup]. Throughout the meeting members, members of the public are encouraged to submit their questions [to: contact@spacecouncciluag.org, see meeting agenda].

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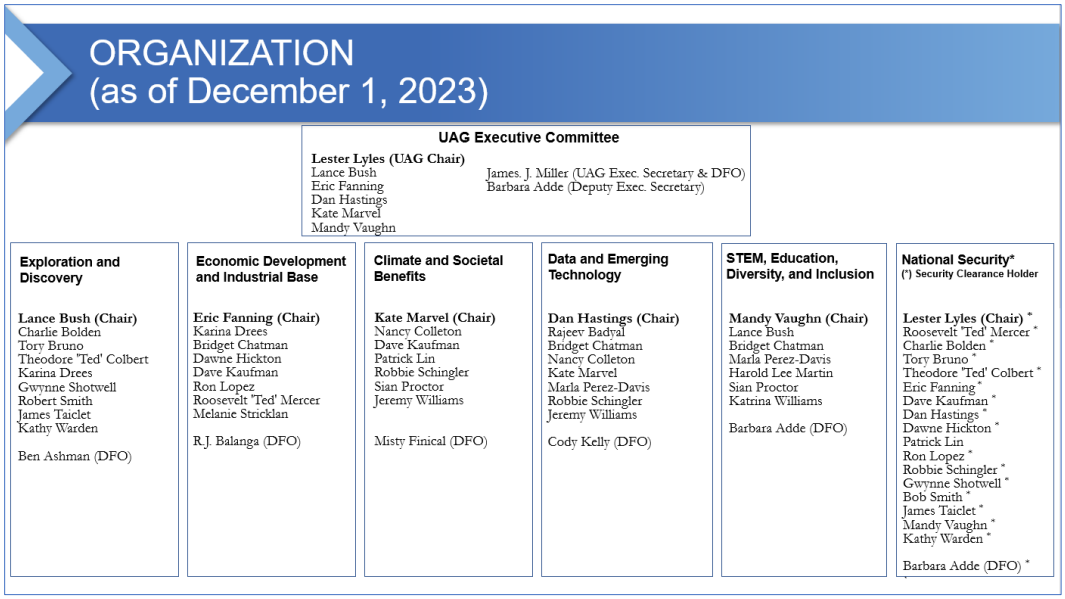
Meeting Goals & Objectives
Gen. Lester Lyles (USAF ret.), *Chair, UAG*

Gen Lyles noted it was an honor to host this meeting of the NSpC UAG (Slide 1). The UAG's function is to provide policy advice, findings, and recommendations to the NSpC. This is done through 29 members of the UAG, including both SGE's and Representatives (from corporations, academia, and other fields of expertise).

Slide 1

In terms of organization, the UAG is divided into six subcommittees (Slide 2), each covering specific areas for space writ large including both U.S. and international involvement in space activities. The subcommittees are: (1) Exploration and Discovery; (2) Economic Development and Industrial Base; (3) Climate and Societal Benefits; (4) Data and Emerging Technology; (5) Science, Technology, Engineering, and Mathematics (STEM) Education, Diversity, and Inclusion; (6) National Security. Today's speakers are chairs of these subcommittees. Gen Lyles reminded meeting participants that the UAG's purpose is also to get advice from experts across the nation and get information to address specific topics. Since the UAG may not have all the answers, the purpose for today's meeting is deliberation in public on the subcommittee findings and recommendations. In the future, there will be opportunities for the UAG to reach out further and refine the findings and recommendations being provided to the NSpC.

The meeting agenda is depicted on Slide 3. Gen Lyles noted that, as in previous UAG meetings, there is a guest speaker. Ms. Valda M. Vikmanis Keller (Director, Office of Space Affairs, Bureau of Oceans and International Environmental and Scientific Affairs, Department of State) will provide a perspective on space activities the Dept. of State (DOS) is involved with. If meeting attendees have any questions for Ms. Keller, they should submit them to the UAG contact e-mail [contact@spacecounciluag.org] and UAG staff will make sure it gets to Ms. Keller. Following the guest speaker, the subcommittee chairs will present their updates, findings, and proposed recommendations for deliberation by the UAG. At the end of the subcommittee briefings, there is an opportunity under FACA rules for public comment. Mr. Miller, the Designated Federal Officer (DFO), will read any comments we get today, and the UAG will respond through its website. Lastly, Gen Lyles will talk about the next steps and closing remarks about today's deliberations and future UAG activities.



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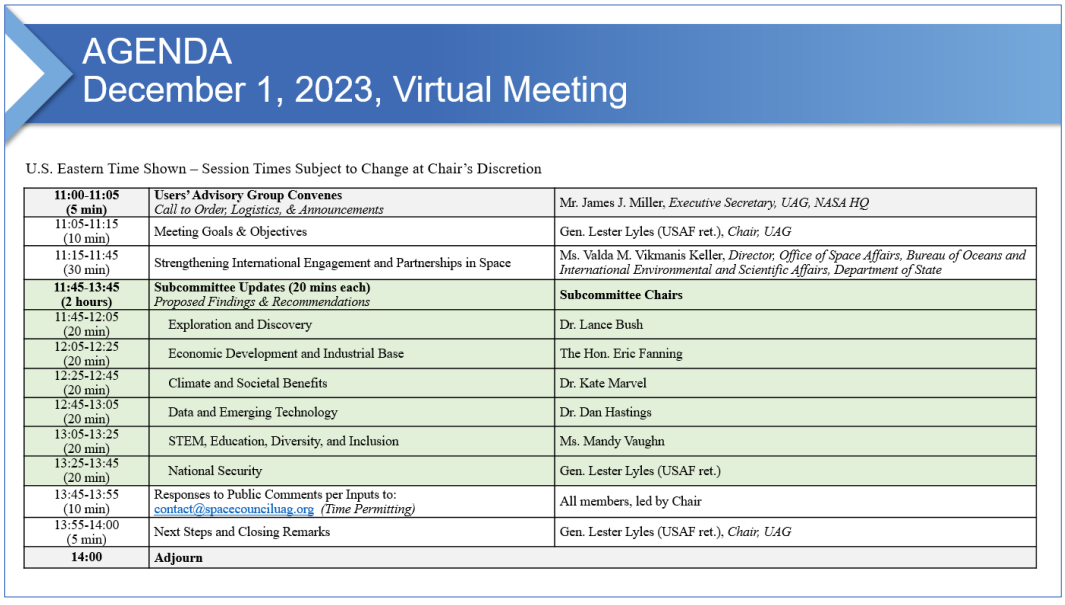

Slide 3

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Opening Remarks: Strengthening International Engagement and Partnerships in Space
Ms. Valda M. Vikmanis Keller, *Director, Office of Space Affairs, Bureau of Oceans and International Environmental and Scientific Affairs, Department of State*

[Ed. Note: There were no slides for this presentation]

Ms. Keller thanked Gen Lyles for the introduction, and the UAG for the invitation to speak and highlight efforts at DOS to advance international engagement of civil space issues. Her department is usually referred to as "OES" for short. It oversees civil and commercial space diplomacy on behalf of the U.S. Government (USG).

OES is responsible for promoting international best practices, norms, and principles at the United Nations (UN) and other multi-lateral fora to help guide peaceful, sustainable, responsible, and transparent exploration in outer space. These principals are then integrated into bilateral frameworks and other cooperation agreements with individual countries in the hopes of making it easier for NASA, the National Oceanic and Atmospheric Administration (NOAA), and other USG agencies to engage in the practical, scientific, and research development and technical cooperation for which they are responsible. They also convene regional and bilateral space dialogues to exchange views and identify potential areas of cooperation for our close space fairing partners. Additionally, they promote global use of U.S. space-based services and applications, with the U.S. Global Positioning System (GPS) being the prime example, and expand market access and improve foreign regulatory frameworks so that U.S. space industry can compete for business overseas. Finally, they also create new communities of interest on emerging space issues through agreements such as the Artemis Accords.

In May of this year, U.S. Secretary of State Blinken released a new strategic framework for space diplomacy. This document specifically highlights the role of DOS and how its diplomacy will advance U.S. leadership in space, expand international cooperation on mutually beneficial space activities (like the Artemis Program), and more generally promote responsible behavior and a rules-based international order in space. The framework highlights not only diplomatic challenges in bringing nations together, but also the real opportunities in using space-based assets and satellite data to address urgent challenges for the Administration, such as climate change. Under the framework, DOS is expanding its work with the Department of Commerce (DOC) to support multi-stakeholder engagement with the U.S. and worldwide commercial space sector. An example of this is this part October's successful meeting, co-hosted by DOS and DOC, with U.S. and African stakeholders, held on the margins of the International Astronautical Congress (IAC) in Baku, Azerbaijan. This type of outreach is critical for the U.S. to achieve its goals in space diplomacy in this new and collaborative space era. It also helps create jobs in the U.S. and keep the U.S. industry as the global leader. The strategic framework will enable greater coordination and collaboration between the USG and the commercial sector, to better leverage commercial capabilities to achieve U.S. foreign policy goals. As an example, public-private partnerships will help us achieve better coordination to provide space-based imagery to developing nations and capacity building for emerging space-faring nations.

Specific areas OES works on includes:

- OES includes private sector advisors in delegations to the UN to help integrate the U.S. industry's perspective in multi-lateral negotiations.

- OES, together with NASA, leads public outreach for the Artemis Accords. Its principles guide the U.S. and other signatories as we return to the Moon and head beyond. To-date there are 33 signatories in the Artemis Accords, most recently Angola. Members include major space fairing nations, like Japan and India, and countries with emerging space programs like Iceland and Ecuador. Most importantly, a commitment to the accords is a commitment to a safe, sustainable, and peaceful space environment. The U.S. commercial space sector is encouraged to think on how its work aligns with, and can support, the principles in the accords we are promoting across the world.

- OES leads the U.S. delegation to the UN Committee on the Peaceful Uses of Outer Space (COPUOS), which is the pre-eminent multi-lateral forum focused on international cooperation in outer space. There are more than 100 countries that are part of COPUOS, and they come together every year in this forum to debate emerging trends in space exploration and utilization, discuss international law and how it applies to new opportunities and challenges, and when appropriate negotiate guidelines and best practices. The agenda at

COPUOS is full with issues relating to space resources, long-term sustainability in space, and connecting space activities with sustainable development. In the past OES has provided technical presentations from both the USG and private sector representatives on issues of planetary defense [asteroids, etc.], Cislunar policy, commercial remote sensing, and space sustainability.

- OES also leads the U.S. delegation to the International Committee of Global Navigation Satellite Systems, or ICG, multi-lateral organization focused on compatibility and interoperability issues, and promoting satellite navigation systems across the world with particular focus on developing countries[1]. The U.S. was instrumental in establishing the ICG in 2005 and remains a leader in: (1) advancing technical discussions and initiatives; (2) co-chairing the ICG working group on Systems, Signals, and Services; and (3) participating in numerous subgroups that carry out technical work.

There are also challenges and opportunities engagement. These issues keep OES busy and are pushing them to think creative on how to organize to address them, how they message their work to the public, and identify areas where the U.S. might have to rethink or recalibrate its approach.

A critical issue that has gained most momentum in recent years is that of space sustainability, or the question of how we keep outer space safe and usable by addressing orbital traffic congestion, debris, and similar concerns. These challenges are growing by the day, and we are seeing a rapidly increasing rate of private sector launches and ambitious plans to deploy large satellite constellations. This, combined with plans for commercial space stations, is exciting. A genuine space economy is emerging. However, these trends also led to a misperception by some that orbit is increasingly becoming like the Wild West by the private sector with the USG turning a blind eye. Of course, that is not the case. The USG is deeply involved in many of these efforts as partner, funder, and regulator. The USG takes its obligations under international law very seriously. The 1967 Outer Space Treaty makes it clear that the USG must authorize and provide continuing supervision for U.S. private sector activities in space. We need to emphasize the importance of implementing existing legal frameworks as well as best practices, norms, and principles for space activities. An on-going effort to build on these government frameworks is critical. It's important that we highlight collectively what the U.S. private sector is already doing to keep space sustainable for all. Beyond messaging, the increasing pace and volume of Earth orbit activities leading to real issues is on the agenda as we engage our partners. While the USG has taken many positive steps to address these issues, our actions are not always understood by the public. The U.S. is a key driver of nearly ten years of negotiations at UN COPUOS that led to the adoption of 21 guidelines for the long-term sustainability of space in space. DOS supported the NSpC's work to develop a proposal to modernize the U.S. regulatory framework for novel space activities, which was released by the White House on November 15. Also, at the last UAG meeting, Mr. Richard Dal Bello (Director, Office of Space Commerce, National Oceanic and Atmospheric Administration, DOC) spoke about the challenges facing the Dept. of Commerce as it takes over Space Traffic Management duties in an increasingly congested orbital environment. A lot has been done to address these challenges, but there remains much we need to address. Related to the question of congestion in space there is also the issue of space debris, and the likely hood that this problem is going to get worse over time. To illustrate positive steps taken so far, the Federal Communications Commission (FCC) has adopted new rules that require U.S. satellite operators in Low Earth Orbit (LEO) to dispose of their satellites within five years of completing their mission. Other developments include the 2021 National Orbital Debris Research and Development Plan, a whole-of-government approach on how to better tackle these challenges. Also, in 2022 we saw the adoption of the National Orbital Debris Implementation Plan outlining how the USG will work with the private sector to incorporate debris reduction into the design of new spacecraft, track orbital debris, and develop technologies and techniques for removing debris. However, preventing, mitigating, and removing space debris remains a huge political and technical challenge that will require significant international collaboration and cooperation.

Also related to this issue is the challenge of satellites and large satellite constellations' impact on Earth-based astronomy. The rapid expansion of these constellations has helped bring internet, improved disaster relief capabilities, and monitoring across the world. At the same time, they pose a real challenge to astronomers because the reflectivity from these objects can interfere with their observations. A number of nations, including those with a rich history of astronomical science, have brought these concerns to UN COPUOS. Their effort, known as Dark and Quiet Skies, seeks to balance the current growth of large constellations in LEO with the needs of astronomical observations. The

[1] https://www.unoosa.org/oosa/en/ourwork/icg/icg.html

U.S. has been working with these delegations and coordinating with our domestic astronomical and satellite operator communities to find a path forward, and in Ms. Keller's view they've made significant strides in identifying solutions.

In conclusion, as OES seeks to create international standards and norms on the peaceful exploration of space, it encourages all nation, including the U.S.' strategic competitors, to help ensure that we pass on to future generations a safe and sustainable space environment. The U.S. approach to international cooperations underscores that there is room for all in peaceful exploration and that successful space actors should also act with the transparency that space operations require. It is critical that major space operators share more information regarding their activities and plans.

General Lyles thanked Ms. Keller. He noted that the USG noted that an additional challenge is not finding ways to help the public figure out and understand what is already going on, but also for the public to let us know what it is they would like us to do in space. Gen Lyles added that the UAG is ready to support OES in any way it can to achieve their goals.

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Subcommittee Updates

Gen Lyles noted that the discussion would include updates from the UAG six subcommittees. Slide 3 in his Opening Remarks lists the members of each subcommittee. The subcommittee updates would be provided by the chairs. Gen Lyles reminded meeting participants that, per FACA rules, the reason for having these meetings is for UAG members to provide comments to the briefers and for public deliberation of the subcommittees' finding and recommendations. While the UAG may not have a unanimous view on some of the findings and recommendations, it needs to strive for consistency on these topics so that they can be presented to the NSpC. This is part of the deliberations that need to happen at this meeting.

[Note: 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]

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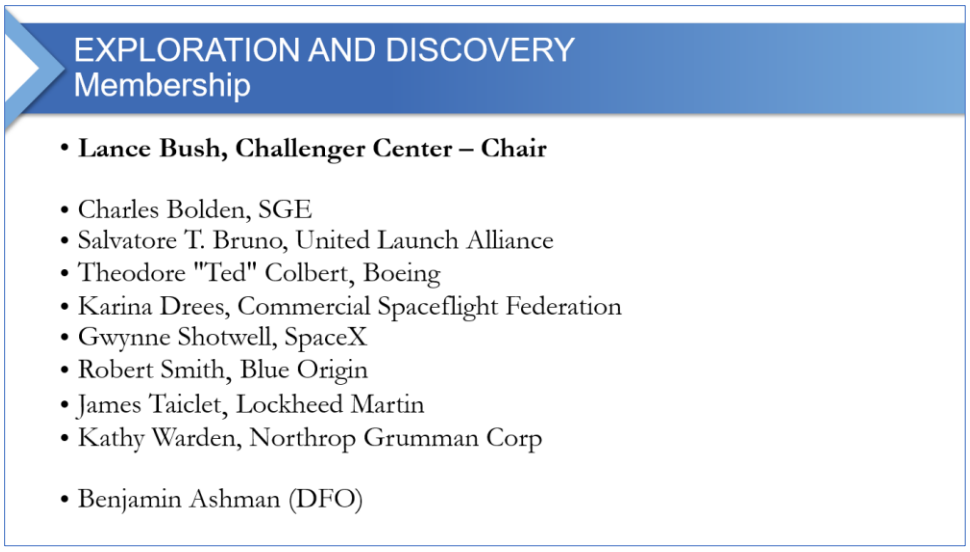
Exploration and Discovery Subcommittee Report
Dr. Lance Bush, Subcommittee Chair

Dr. Bush thanked Gen. Lyles for his leadership and incredible fortitude through this process, as well as Vice President Harris, Mr. Parikh, and the NSpC staff for their support and genuine interest in the UAG's work. He also recognized the subcommittee members, stating that they've been very engaged and given much of their time and expertise to this activity (Slides 1-2). A quick glance at the member list reveals the strength of the subcommittee, which includes hundreds of years of combined experience. Space is a long-term commitment to a bigger vision and national goals, and this team really brought that spirit of cooperation.

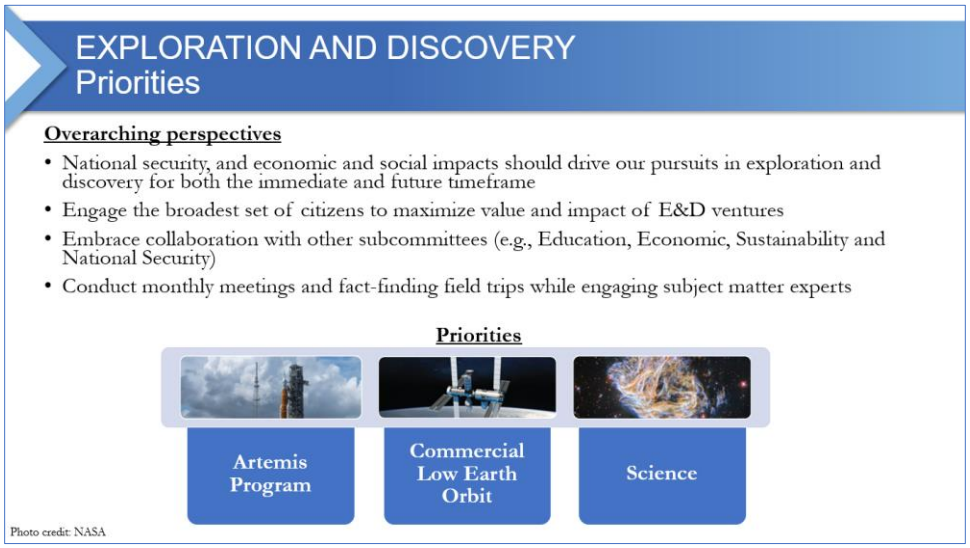
Slide 1



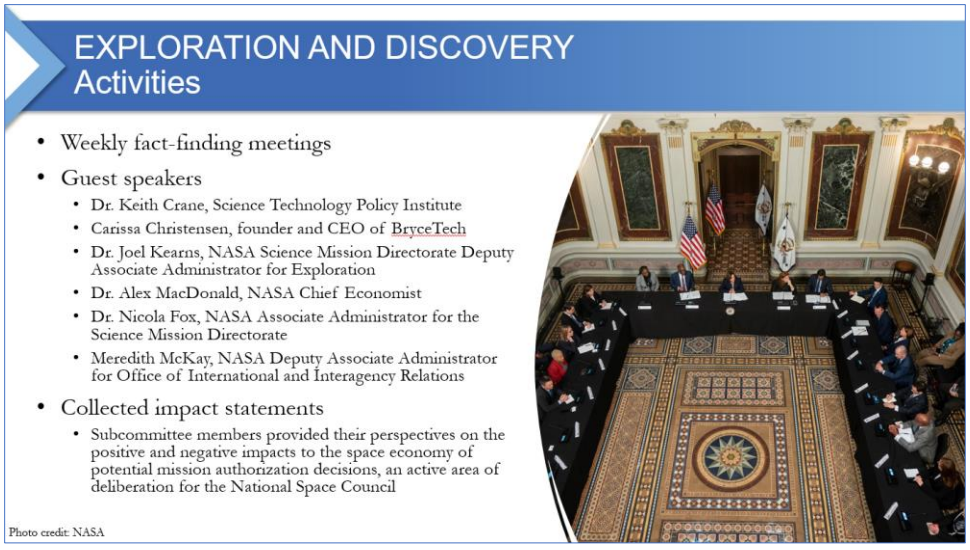
Slide 2

The subcommittee's priorities included taking a deep look into the Artemis Program, Commercial LEO, Cislunar space, and science (Slide 3). The subcommittee conducted weekly meetings with a number of incredibly insightful guest speakers from government and industry (Slide 4).

Before reviewing the subcommittee's recommendations, Dr. Bush noted that U.S. space exploration and discovery is extremely successful and impactful. It's unparalleled to anywhere else in the world and in any period throughout history. This is a deserved compliment to NASA, Federal Aviation Administration (FAA), DOC, DOS, and other the USG agencies and individuals that play a role in space. He noted this makes the job of being an advisor and trying to counsel through this tough because when we look at this, there's just so much positivity and great work being done. The subcommittee has taken a close look at international coordination and collaboration with the Artemis Program, and would like to emphasize the need for NASA to continue these international engagements to meet and communicate the exploration objectives regarding the scope for the U.S. industry and the opportunities for international partners.



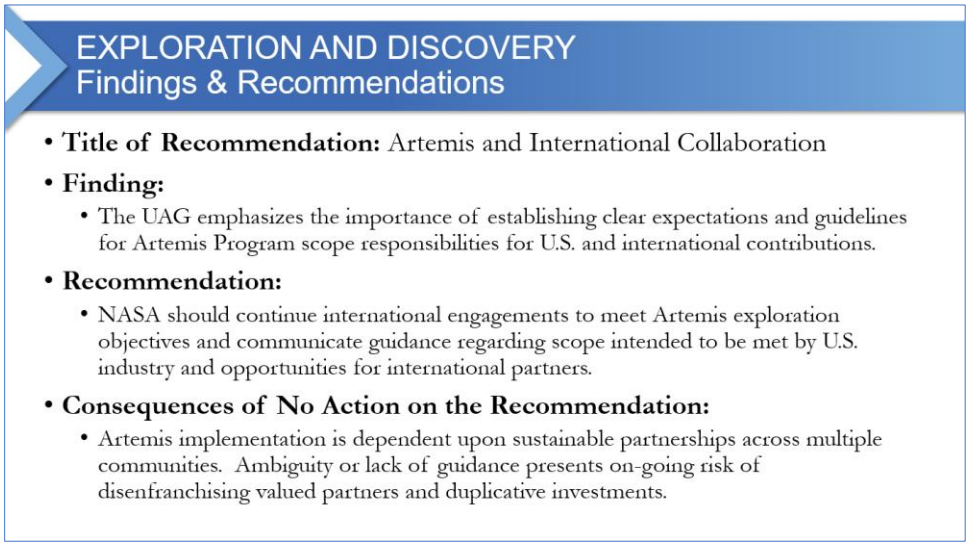
Slide 3



Slide 4

The subcommittee has taken a close look at international coordination and collaboration with the Artemis Program and would like to emphasize the need for NASA to continue these international engagements to meet and communicate the exploration objectives regarding the scope for U.S. industry and opportunities for international partners. (Slide 5).

The subcommittee is also focusing on the industry engagement with Artemis (Slide 6). He commended NASA for the architectures it has put together, which was a massive undertaking. The architectures that came together in previous years were focused on the technologies needed to get us there, and they were reviewed and approved by the previous UAG. From an industry perspective, there is a desire to see even more work as we're going forward so that we can understand where we can plug in small or emerging participants to help our commercial industry and our national economic database, and we need to be able to leverage that. This is a strong call for more cooperation.



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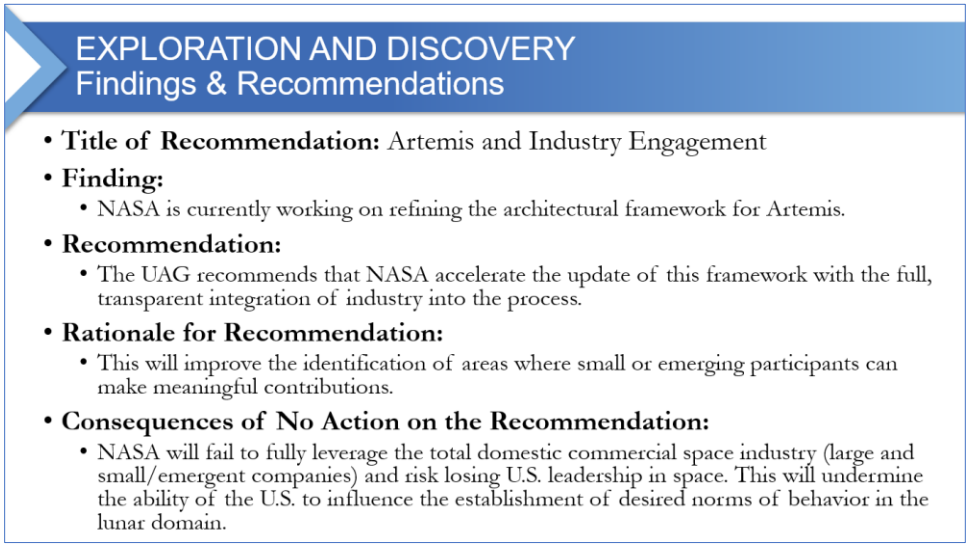


Slide 6

Discussion

Gen. Lyles noted that he wants to make sure that members provide any comments they may have to Dr. Bush. In looking at the previous (Slide 5) recommendation, it dawned to him that it is a takeoff from another FACA organization he chairs. This UAG subcommittee is endorsing what's already been going on at NASA. Also, some

FACA organizations have a different definition of the term “finding.” In his view, it appears that in this case it refers to endorsement of something that may not have any specific action to it, but the UAG wants to let people know that it’s an issue it has looked at and it believes the right things are being done. Is this what the subcommittee is referring to in these charts?.

Dr. Bush responded that they are endorsing what NASA has been doing, and believe it's been phenomenal. This does not preclude that we could, of course, be doing more and better. The intent here is to show there is a strong desire by all to make sure we're successful.

Gen. Lyles asked if any other UAG members have any questions or comments before moving on. He then stated that we all agree with the “Artemis and International Collaboration” recommendation, and the UAG will talk afterwards about the formatting. He asked if the UAG wants to have something like this which endorses an existing activity. Also, is this something we perhaps want to call something other than a “finding” or a “recommendation”?

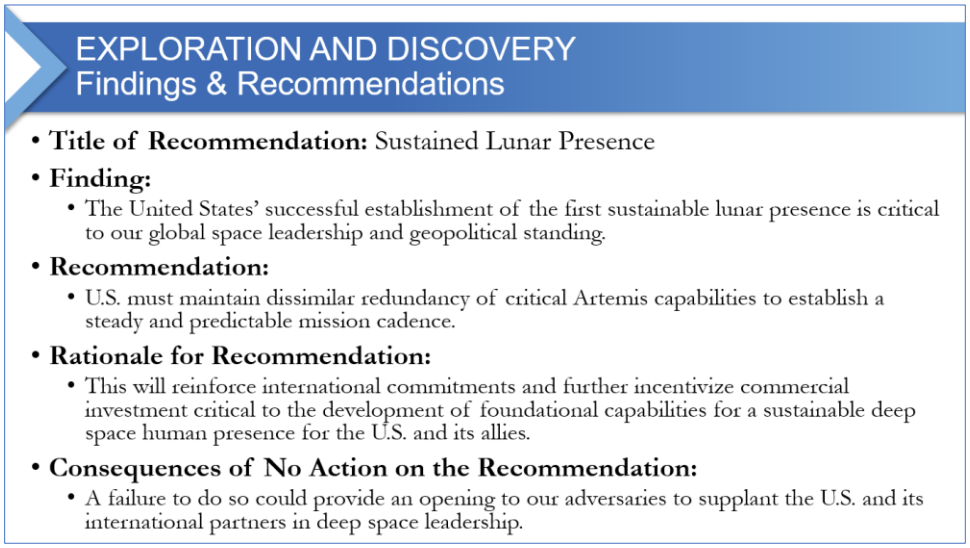
Dr. Bush said that regarding “Artemis and Industry Engagement,” the subcommittee makes good specific comments about the architectural framework for Artemis. We are all aware that earlier this year in the April timeframe, NASA released this architectural document describing Artemis and the lunar program. Along with releasing the document, they also discussed a framework and a process for refining that architecture. This process is going to be annually in the April timeframe. This means that NASA is in the process of going through this right now, and the next formal deliberation will be in April.

Gen. Lyles stated that he loves the idea of the recommendation to ask NASA to fully leverage the domestic commercial space industry as they go through their architecture deliberations. He suggested that the UAG make sure to recommend that as they go through this first iteration of the architecture, they include what is listed here as the recommendation. So, we're taking advantage of what NASA's already doing, we're giving them credit for something new, and we’re offering input to something that we think is important for them to consider. Gen. Lyles asked the UAG members for comments, agreements, or even disagreements to this approach. Essentially, the UAG is taking advantage of what NASA's already doing, but offering them something they may want to take into consideration as they go through this annual process.

Dr. Bush encouraged members of his subcommittee, and the whole UAG. to weigh in. Every member of this subcommittee is an expert and has some perspective they contribute to these recommendations. Some of them have been more involved than others, so members are encouraged to speak up if they feel strongly for or against any of these, or if they would like to add some color to it.

Gen. Lyles thanked Dr. Bush, and stated that he is constantly reminded of the fact that the public obviously is listening in, and it is appropriate to remind the public that FACA rules say the UAG cannot deliberate without the public listening in. So, while to some it may seem like the UAG making sausage, that's not the case. The UAG has had lots of discussions, but formal deliberations must take place in front of the public.

The next recommendation is related to Artemis, but focusing on maintaining a sustained lunar presence (Slide 7). We are determined as a nation to make this go at the Moon a sustained presence, and that's what the architecture of Artemis is. This subcommittee would like to emphasize that the U.S. needs to maintain a dissimilar redundancy for critical Artemis capabilities so that it an establish a steady and predictable mission cadence. This will reinforce our commitment to our partners, as well as incentivize commercial industry and investment. Therefore, it is important for our program to maintain that approach. Although some of these approaches exist already, as we're building this architecture out for the future, we need to maintain that approach.



Slide 7

Discussion

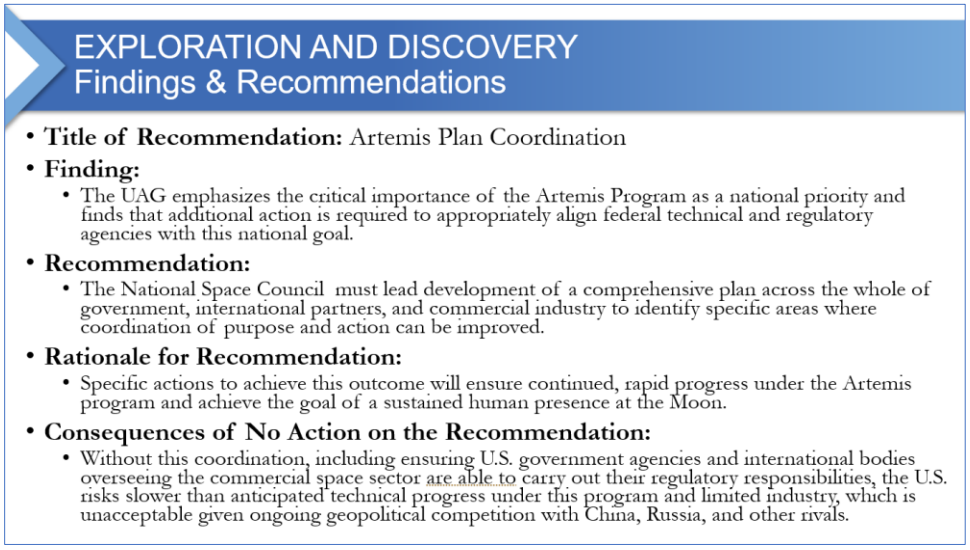
Mr. Taiclet asked Dr. Bush if there any effort to collaborate between NASA and the Dept. of Defense (DoD) on Cislunar services that are eventually going to be needed, such as position the use of Global Positioning System (GPS) positioning, navigation, and timing (PNT) use in Cislunar space, broadband communication link back to earth, transportation services on the surface, resupply services back and forth to Earth. Has there been any collaboration between National Security and Exploration and Discovery subcommittees?

Gen. Lyles said that from a national security perspective, there are lots of things going on. The National Security subcommittee will provide a recommendation specifically about that. There is a whole government S&T strategy for Cislunar space, and the recommendation is to make sure that DoD and National Security perspectives are included in ongoing S&T research development activities associated with Cislunar space. All the things mentioned here certainly apply to civil space, but they also apply to the national security space. And, yes, DoD and the U.S. Space Force (USSF) are involved in this strategy for Cislunar space though only as advisors.

The subcommittee feels strongly that the NSpC, which is a cabinet level organization, must lead the development of a comprehensive plan across the whole of government, international partners, and commercial industry (Slide 8). It needs to identify specific areas of coordination, purpose, and action and continue to look for improvements. As we heard earlier today, DOC, DOS, FAA, NASA and many other organizations are involved in efforts to explore space. So, the U.S. needs to continue to improve this across the government and coordinate it because we are in an ongoing geopolitical competition in space, and this needs the attention of the whole government.

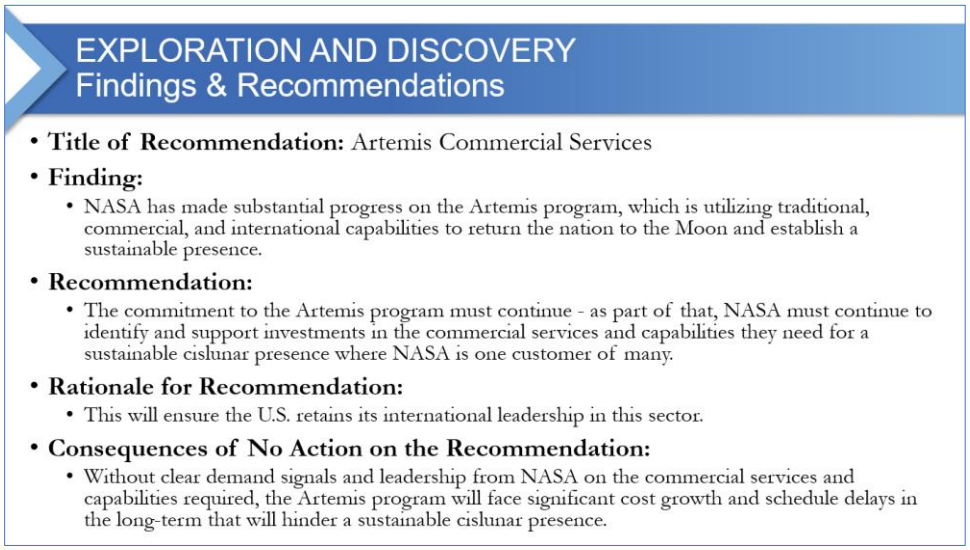
Gen. Lyles commented that there are so many good things going on that not everybody may be aware of. In some areas, people have concerns and perhaps don't know that their concerns are already being addressed. Dr. Bush, in some respects, took an idea from something he participated in during the previous administration, which was a whole-of-government strategy in the Arctic for the U.S., and it brought everybody together. We don't have such a document for space for the U.S., but we have lots of things that are ongoing and the whole-of-government is participating in. He suggested that this recommendation be presented to the NSpC and have further discussions

about how we can make sure that all activities are connected to each other, whether it's one document like the U.S. Arctic Strategy, or something else. This is something that should be presented to the NSpC for their consideration.



Slide 8

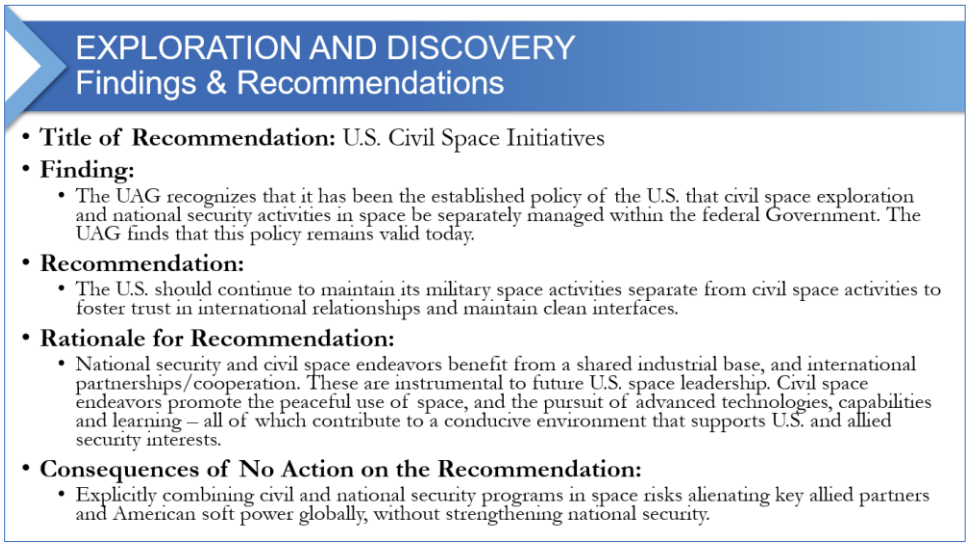
The next recommendation regards Artemis commercial services and ensuring there is a strong industrial base in the U.S. (Slide 9). We need to make sure there's a commitment to this program, and as part of that now NASA continues to identify and support the investments. We need to have consistent investment in this to keep an ability to sustain our leadership in space for the future.



Slide 9

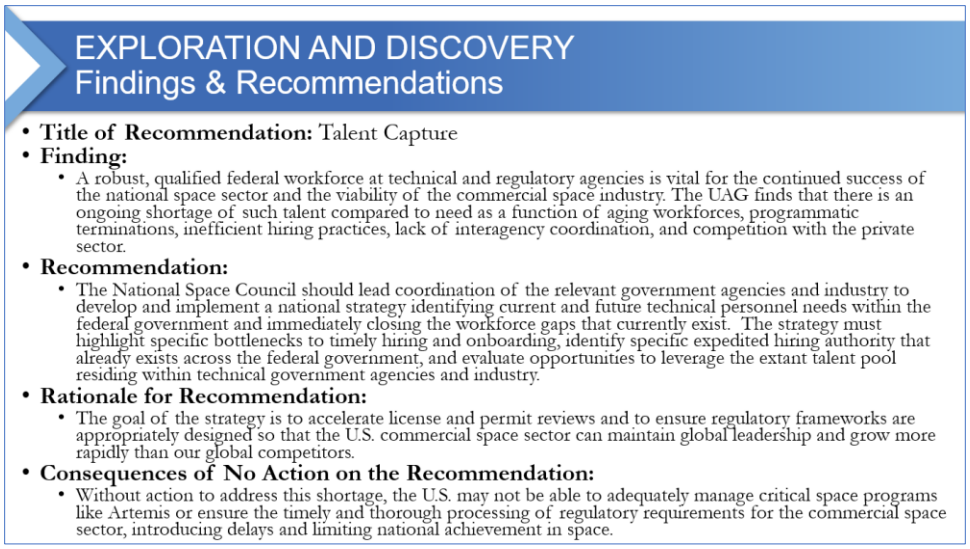
The next recommendation (Slide 10) regards the subcommittee's commitment to U.S. civil space initiatives. Looking at history, the space race started in the late fifties, and in response to that, the USG created a civil space agency called NASA. Today, we have very strong work in the defense sector, as well as military, civil, and commercial. One of the things this subcommittee would like to recommend is that we continue to maintain those strong military and civilian space activities, but ensure they are separate when it comes to civilian space activities so we can foster trust in these international relationships and maintain clean interfaces. Earlier, Mr. Taiclet brought up that there are places where national security and commercial space can cooperate, but they are often separate and distinct. The subcommittee wants to make sure that the U.S. is explicit with our key allies in how we're approaching this.

Gen. Lyles commented that the previous recommendations and findings are linked to Artemis in some form or another, so it may be appropriate for the UAG to package them as one recommendation that deals with Artemis, and include all of the points that you have and key things the UAG wants to make sure are being considered. The UAG can recommend that the NSpC provide them to NASA, or help set up a dialog with NASA so that we can all understand what they are doing under each one of the things that Dr. Bush mentioned. Gen. Lyles noted he is also the chair of the NASA Advisory Council, so he knows that every one of the things that Dr. Bush mentioned are being covered. However, these are perhaps not being properly communicated. So, by providing a package recommendation we could perhaps get NASA to set up, with the support of the NSpC, a meeting where the UAG could review what they're doing in each one of the things that you recommended. So, if the other team members agree, we'll package those recommendations accordingly so that we can properly address the UAG's concerns to the NSpC, they can pass it to NASA, and hopefully we could set up an opportunity to have a dialog with NASA on each one of the items.



Slide 10

The next and final recommendation regards talent capture (Slide 11). There is a real need for a robust, qualified workforce. The subcommittee feels that this is another place where the NSpC could lead a coordinated effort among relevant government agencies to capture these needs and close the workforce gaps that exist. We need to have a strategy that highlights where the specific bottlenecks are. Our exploration efforts are moving relatively quickly, so we need to be able to do timely hiring and onboarding and be able to expedite specific hires to ensure that we can continue to compete at a high level.



Slide 11

The subcommittee has also worked collaboratively with a couple other subcommittees on different issues, including the STEM Education Subcommittee. There may be some overlap with them regarding this discussion. Additionally, some of the work conducted within this subcommittee has been referred to others, such as Economic Development and Industrial Base Subcommittee chaired by the Honorable Eric Fanning, who will be discussing mission authorization.

Discussion

Ms. Warden commented this is a key consideration that ties closely to what the STEM Education Subcommittee will discuss later in terms of inspiring the next generation workforce and ensuring they're prepared with the skills necessary to fulfill these jobs, whether it be in the government or in the industrial base. She asked Gen. Lyles if this recommendation should be emphasized as a very broad reaching finding and recommendation, not just buried in each of the subcommittees.

Gen. Lyles agreed, saying that it does underpin all the subcommittees and everything that industry is doing. This recommendation needs to be captured in a particular form because this is a national issue that needs to be addressed. So, we'll take that to ensure that this is captured properly before we present it to the NSpC.

Ms. Vaughn stated that she totally agrees with what Ms. Warden said and the reason why we had left this one here in Dr. Bush's section is just for exactly this point to show that it is cross-cutting and underpinning across the UAG. So, we should roll all of this up into a broader recommendation for the NSpC. However, the Exploration and Discovery Subcommittee organically came up with the regulatory element, which is one of the driving factors for this.

Dr. Hastings stated that earlier on we heard about messaging. He believes this is an area where a strategy to get the message out about all the exciting things happening in space will make a difference to attract the talent in this country.

Gen. Lyles agreed, saying that it's amazing how many people do not know about all the great things going on in its space. He still gets questions from people in the public who ask, is NASA still alive? This is because they identified NASA with the Space Shuttle Program many, many years ago. This is a challenge to every agency, including DoD who has been dealing with recruiting people, particularly technically and competent individuals. This needs to be a national strategy.

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

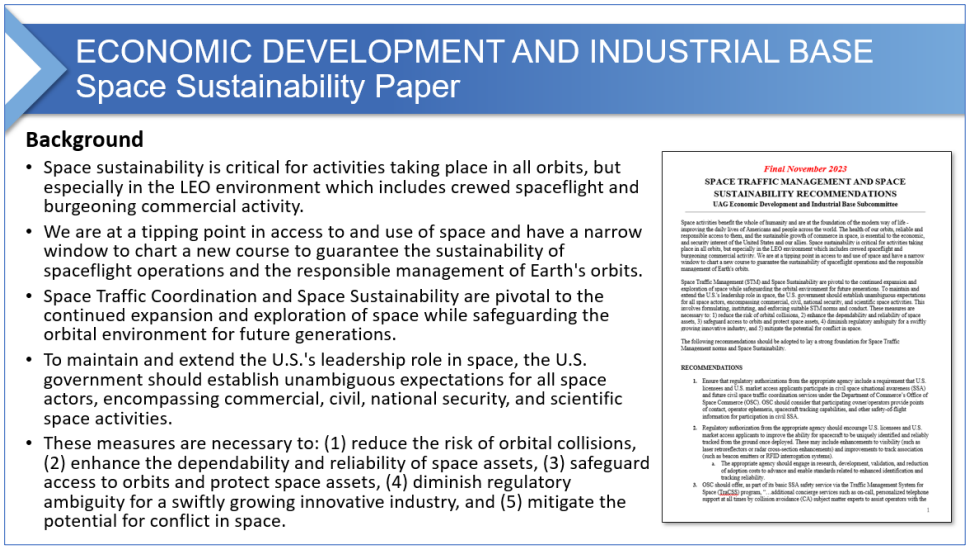
Hon. Fanning started by thanking the subcommittee members as they all have been very engaged and active (Slides 1-2). The subcommittee has a series of recommendations it has organized into three white papers, which have been submitted to the full UAG for review. Hon. Fanning then thanked the UAG members for providing constructive feedback and helping the subcommittee advance those papers. The three papers focus on sustainability, mission authorization, and the supply chain. Mission authorization may lead to a broader conversation because there's lots of simultaneous activity and thinking taking place in that field. The subcommittee had individual leads for each of the papers, so those members will present their respective paper. Mr. Lopez is one of the leads for sustainability and will be presenting the paper on space sustainability paper.

Slide 1

Slide 2

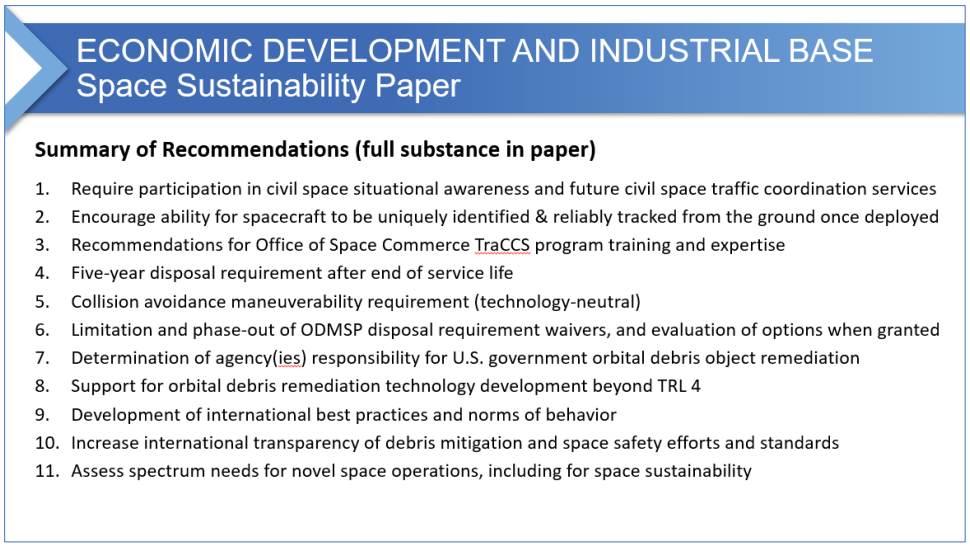
Mr. Lopez thanked Gen. Lyles and Hon. Fanning for the opportunity to present the space sustainability paper and related recommendations (Slide 3). A lot of great work done has been done by the entire subcommittee and a lot of coordination has taken place with other subcommittees. Mr. Lopez summarized the recommendations by saying that these are common sense measures that are essential to sustaining the incredible growth that we've seen in the space

economy over the last few years. These are also needed to continue economic growth. Without these measures and continued work, space operators of all kinds will suffer increased risks and constraints on their day-to-day operations.



Slide 3

Mr. Lopez noted that the following recommendations are paraphrased from the white paper, which goes into more detail on each of the recommendations (Slide 4). The first requires participation in appropriate Space Situational Awareness (SSA) and STC services. The second encourages the ability to identify and track spacecraft. The third offers various recommendations for training in the TraCCS Program. The fourth relates to a five-year disposal requirement. The fifth regards an avoidance capability requirement. The sixth phases out of the USG Orbital Debris Mitigation Standard Practices (ODMSP) disposal waivers. The seventh addresses which government agency is responsible for active debris removal mission authorization,. Number eight supports the maturation of active debris removal technology. Number nine relates to the development of international best practices and norms of behavior. The tenth encourages governments to share information on how they're regulating space safety. And finally, the last one addresses spectrum needs for novel space operations, not just related to space sustainability but also In-Space Servicing, Assembly, and Manufacturing (ISAM). Mr. Lopez asked the group if there are any questions and comments so far.



Slide 4

Discussion

Dr. Hastings stated that the Data and Emerging Technologies Subcommittee supports these and that they have specific recommendations on orbital debris remediation.

Mr. Lopez stated that this subcommittee had a lot of coordination with Dr. Hastings' subcommittee.

Gen. Lyles noted he was impressed when he listened to Ms. Vikmanis-Keller from DOS talking about the space sustainability initiatives that DOS is involved in with other government agencies. Perhaps the right thing to do for the UAG as body is to present these recommendations to the NSpC and encourage a meeting, including DOS, to discuss what's going on in the interagency. Gen. Lyles was not aware of DOS involvement, particularly with the international perspective of these things. It may be appropriate to present these as recommendations, as we're allowed to do as an independent body, to the NSpC, and in further deliberations, encourage a meeting with some of the interagency activities that are already ongoing in this area so we can better understand what they're doing to address these topics.

Hon. Fanning noted that, regarding the mission authorization paper, there's a lot of activity taking place in real time. The U.S. House of Representatives voted on its views and proposals on mission authorization. The Senate hasn't yet, but we have a sense of what's going on. A couple of weeks ago, the White House issued its legislative proposal on mission authorization, simultaneous to the work that we were doing on this. In this subcommittee's administrative meeting, we made a decision to still share the work and thinking of the UAG. This paper has a lot of industry, and we recognize that a lot of the activity on this has moved to Capitol Hill. The subcommittee lead on this, Ms. Drees, would brief our recommendations and thoughts on mission authorization.

Ms. Drees thanked Hon. Fanning for his leadership of this subcommittee. One of the key topics the space community has been discussing is mission authorization to ensure the U.S. retains its leadership in space (Slide 5). There are several approaches under consideration, and the UAG was fortunate enough to have the opportunity to weigh in with its consensus position. This subcommittee has developed a list of recommendations in a paper to be submitted following this meeting. As a signatory of the outer space treaty, the U.S. has an obligation to authorize and supervise the space activities of U.S. entities. Congress has not legislated specific authority to any USG agency to carry out this responsibility; however, the USG has granted a handful of mission authorizations over the past using an ad hoc interagency process. In September of 2022, the Vice President announced an interagency process to develop a framework for authorizing and supervising novel space activities, and the White House issued a legislative recommendation on November 15, 2023.

Slide 5

Mr. Drees continued explaining that to ensure a minimally burdensome and properly scoped process, the subcommittee recommends the inclusion of these elements in a mission authorization and supervision framework (Slide 6). First and foremost, a public review and comment of stakeholders is needed before implementation to make sure we maintain a focus on promising economic and technology areas. Second, we recommend a tailored approach to ensure any new regulation is not duplicative. We recommend that given the varied and novel nature of these activities, a presumption of authorization in any proposed process. Similar to the NOAA commercial remote sensing regime, the USG should have no more than 60 days from submission to determine authorization, and the authorization process should be guided by transparency between the submitter and the USG. The framework and authorizing authority should be established and incentivized with a technical support approach with a single point of contact and concise roadmaps should be provided. Submissions should not require any additional information beyond what is already required under the pre-existing U.S. space activity licensing process. Authorizations should apply to all activities reasonably assumed for the entire scope of the mission and applications not required for each individual mission component. The subcommittee wants to ensure that documents are considered and must be protected. Any updated process should not impact the validity of existing mission authorizations and submissions currently under process at the time and a new process established should not be delayed. And finally, there should be one clear agency industry works with for this kind of authorization to minimize confusion and compliance burden. These are the twelve recommendations, which are elaborated much more in the paper.

Slide 6

Discussion

Gen. Lyles commented that regarding some of the existing documentation, for example the White House proposal that came out earlier this month, there aren't any fundamental differences from the recommendations that are captured here. There may be some semantic differences, but there are no fundamental differences. Gen. Lyles suggested that the UAG present this as a recommendation to the NSpC for their consideration in the activities and discussion that they're already doing. In a discussion with one of the individuals involved in the White House proposal, Gen. Lyles received a suggestion that a meeting should be held to discuss these and other things that are ongoing with the NSpC Office, DOC, the Department of Transportation (DOT), and DoD. NASA may be appropriate to ensure we are all speaking the same language. They are willing to support and arrange such a meeting.

Ms. Drees noted that the subcommittee did discuss that briefly during the meeting last week where it proposed the NSpC staff have this discussion with the UAG. There may be some areas of this list that could be reworked, but since this subcommittee has been working on these topics for the last several months, it would be important for the UAG to weigh in with this position. Ms. Drees agrees that folks would welcome any discussions with the NSpC.

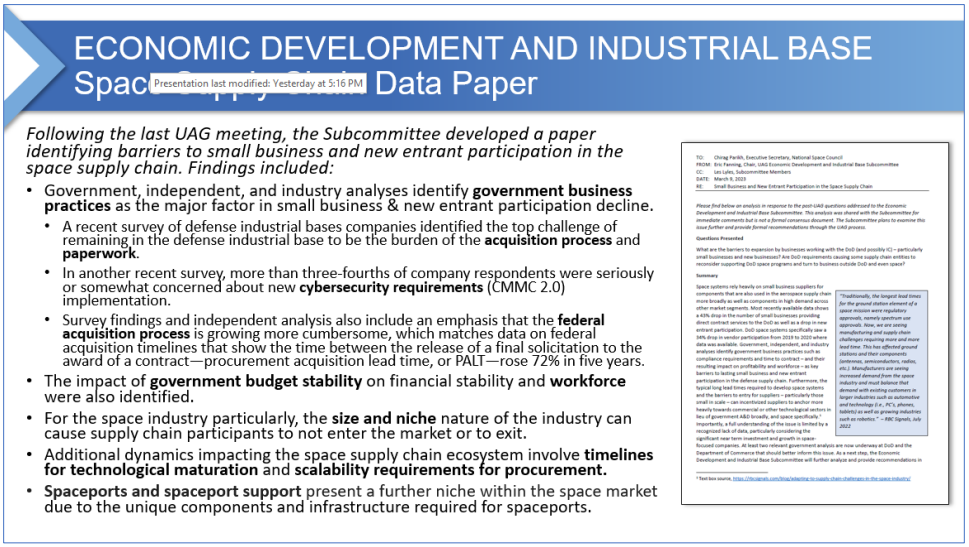
Gen. Lyles emphasized that this is an independent body. We will make our recommendations to the NSpC Office, but that dialog would be very appropriate to have all the right parties.

Hon. Fanning said there are some disconnects between what the U.S. House of Representatives is doing, what the Senate is doing, what the White House proposed, and the recommendations from this subcommittee. We should follow through with a meeting for the full UAG to brief on what the difference is between those four different proposals: where they overlap, where there are similarities, and where there's some daylight between them before we decide what to do.

Dr. Bush emphasized that this was one of the very first and most important areas that the Exploration and Discovery Subcommittee was interested in, and they did spend quite a bit of time talking about discussing it. His subcommittee communicated with Hon. Fanning's subcommittee and saw that they had a good leadership position on a strong white paper, so they supported the work that they were doing.

Gen. Lyles stated that the UAG will take the action of presenting this as a recommendation with those 12 recommendations to the NSpC, but specifically encourage a meeting which their office has suggested. This is suggested with all the right parties so we can make sure we all understand each other's perspective. Everything that Ms. Drees mentioned is being addressed and we need to make sure we're all in communication with each other.

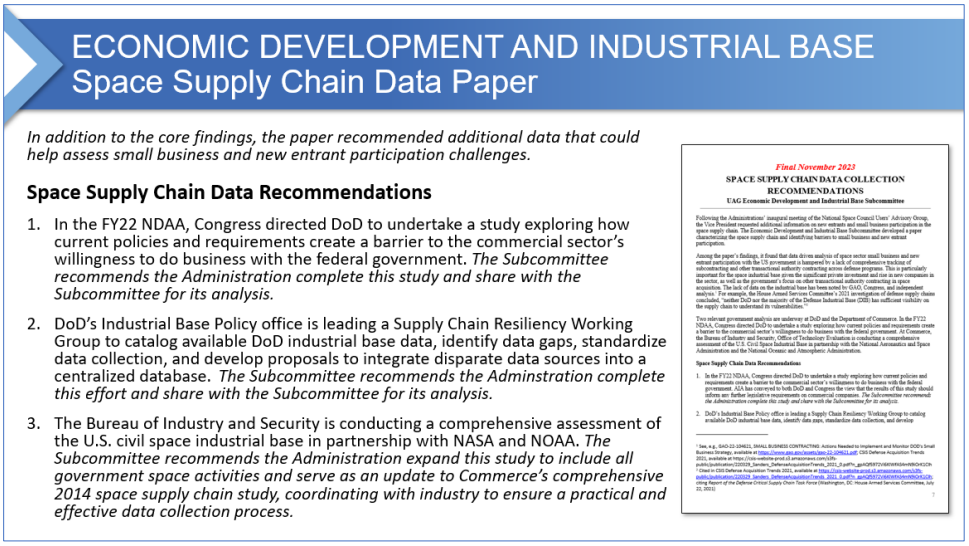
Hon. Fanning stated that the supply chain data white paper was a direct request from the Vice President to better understand what barriers to entry there are for smaller companies to get into the supply chain (Slide 7). This subcommittee put a paper together based on existing data that was out there and submitted it in March of 2023. There were some initial findings about what some of those barriers may be: The acquisition process, acquisition timelines, compliance issues, budget instability and how that's hard for financial planning and workforce planning, and how a lot of these things contribute to anchoring the supply chain on the commercial side versus the government side.



Slide 7

A common finding and understanding for the recommendations is essentially to get to gather more data (Slide 8). There's some work being done already. In the Fiscal Year 2022 National Defense Authorization Act (NDAA), Congress directed DoD to undertake a study exploring the barriers for the commercial sector and getting involved in the defense side. One of the subcommittee's recommendations is that the paper be accelerated and then shared widely, including with the UAG, so we can look for more findings and recommendations from there. Second, DoD's Industrial Base Policy Office is trying to consolidate data, so the second recommendation is the same as the first: that the information be shared. As for the third recommendation, the DOC Bureau of Industry and Security is conducting a pretty comprehensive assessment of the US civil space industrial base in partnership with NASA and NOAA. The recommendation is twofold: First, that they expand that to include food space writ large, not just the commercial side.

Second is that they work with industry to make sure that their data collection methodology isn't overly burdensome and gets us the information we need quickly in the most efficient and effective way. These three recommendations regard getting more data so we can go back and look for some more recommendations about how to break down some of those barriers. Hon. Fanning also emphasized that in the DOC study that we want to make sure they work closely with industry on how they are gathering that data.



Slide 8

Discussion

Gen. Lyles reiterated that this is a particular topic that the Vice President specifically addressed in the February NSpC meeting and wanted more information. It behooves us to make sure we provide these recommendations to the NSpC Office and encourage the dialogue between the different agencies. These recommendations are solid, but we need to make sure the parties that are doing this activity understand the UAG's perspectives.

Ms. Hickton commented, regarding the first recommendation and the scalability for small to medium sized businesses and the timeline for the funding of that. This coincides with what has been said about getting private sector support with public sector support. More than ever, you'll see this in the small business sector where you have small businesses that want to be in the game, and they just cannot get the funding at the level needed to continue to be part of that process.

Gen. Lyles stated one reason why the Vice President is very much interested in this is to make sure that the full spectrum of U.S. industry, small and large, have an opportunity to participate in this important space economy that we have. We will make sure we get these packages to the NSpC Office and work with them to encourage the sharing of data and these ideas with the agencies that are working on some of the things you just mentioned here.

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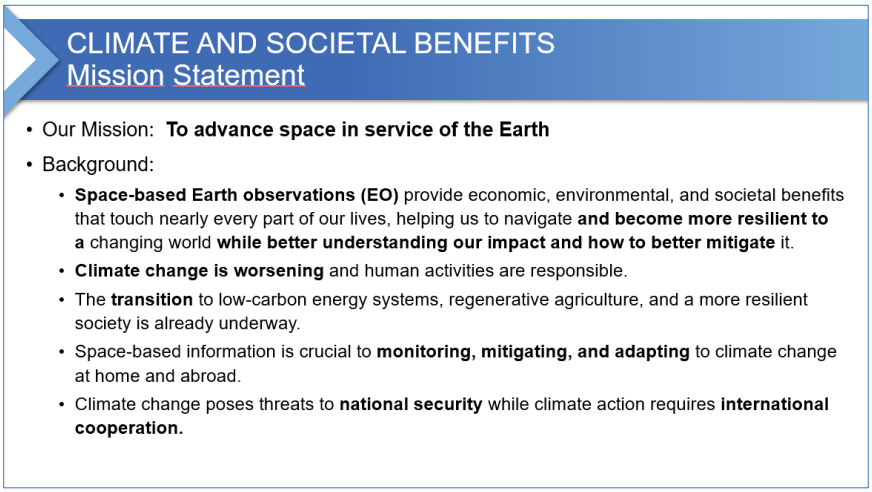
Climate and Societal Benefits
Dr. Kate Marvel, Subcommittee Chair

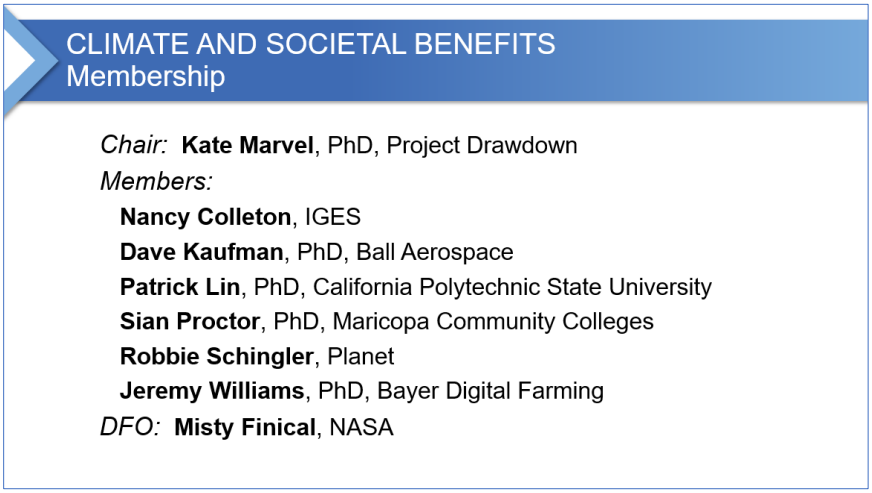
Like the full UAG, this subcommittee believes that it's vital to explore, understand, and utilize space (Slides 1-2). Our ability to look down upon Earth from space has deepened our appreciation for this perfect planet that we live on. The mission of the subcommittee is very simple: to advance space in service of the Earth, which we all know is the best planet. Space-based Earth observations provide economic, environment, and societal benefits that touch nearly every part of our lives. They help us navigate and become more resilient to this world, which is changing, and also help us better understand and mitigate our impact. This subcommittee is predicated on the realization that we live in a unique time. We live in a time where climate change is worsening and we know unequivocally that human activities, particularly the activities that emit greenhouse gasses, are responsible for the rise in global temperatures. At the same time, other things are changing as well. We are underway in the transition to carbon energy systems, regenerative agriculture, and a more resilient society. Space is very crucial to all aspects of living on this changing planet. It's crucial to monitoring, mitigating, and adapting to climate change both at home and abroad. This subcommittee also recognizes that climate change poses threats to national security, and doing something about it requires international cooperation because greenhouse gasses are well-mixed in the atmosphere. It does not matter where they are emitted.

Slide 1

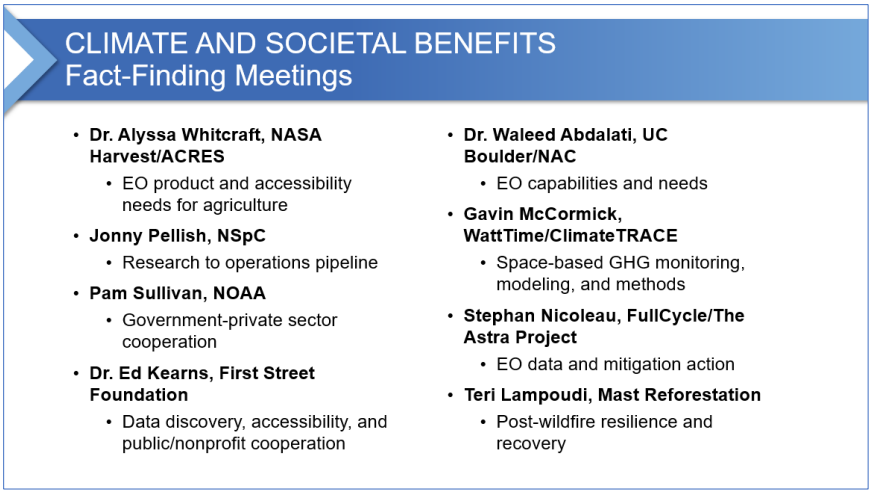


Slide 2

Dr. Marvel acknowledged the subcommittee members, who've been active, hardworking, and creative (Slide 3). She stated that it's been a pleasure to work with them, especially the DFO, Ms. Misty Finical. The subcommittee has heard from several distinguished speakers and experts (Slide 4). These include Dr. Alyssa Whitecraft from NASA's Harvest/ACRES, who's helped the subcommittee understand Earth observation products and accessibility needs for agriculture. They have also heard from a wide variety of folks within the government, who have discussed the research to operations pipeline and cooperation between the government and private sector. Other speakers include Gavin McCormick from WattTime and Stephan Nicoleau from FullCycle, the Astro Project, who discussed needs for greenhouse gas monitoring and how we turn monitoring into action on the ground. Terry Lampoudi from Mast Reforestation also discussed post wildfire resilience and recovery.

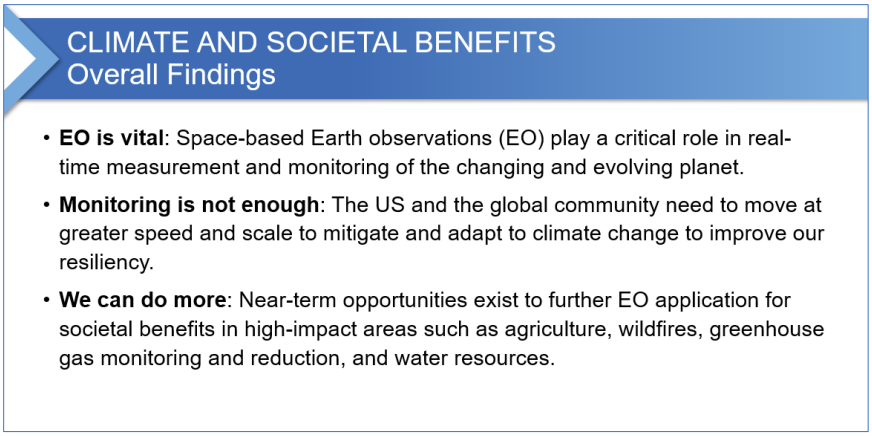


Slide 3



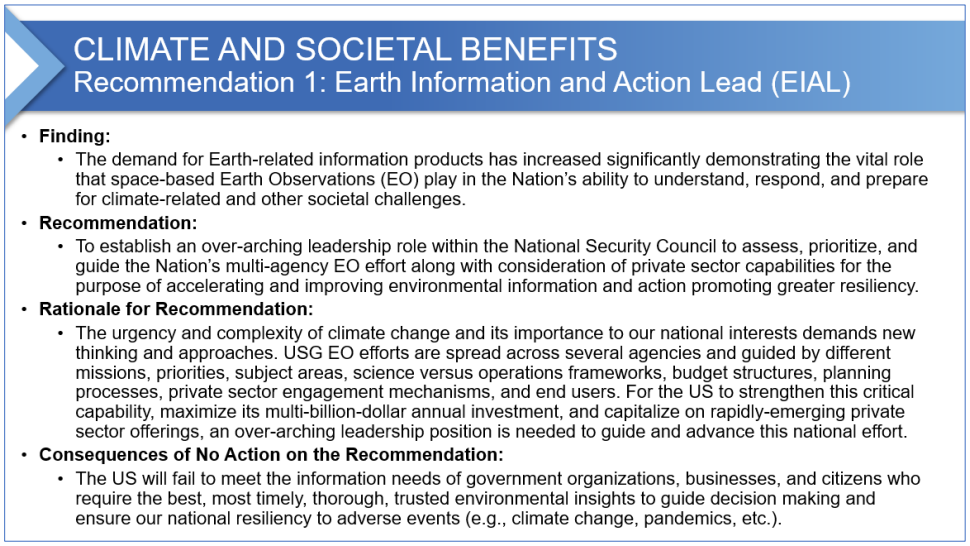
Slide 4

These fact-finding meetings have led the subcommittee to a few overarching findings which inform the recommendations (Slide 5). The first overarching finding is that Earth observation is vital. The ability to look at Earth from space plays a critical role in real time measurement and monitoring of our changing and evolving planet. The second overall finding is that it's not enough to simply say changes happen. Monitoring is not enough. Both the U.S. and the global community with U.S. leadership, need to move at greater speed and scale to mitigate and adapt to climate change in order to improve our resiliency. The third overarching finding is that we can do more. There are opportunities that already exist in the near-term to further Earth observation applications for societal benefits in very high impact areas such as agriculture, wildfire monitoring, detection, prevention and recovery, greenhouse gas monitoring and reduction, and water resources.



Slide 5

The first recommendation is called the Earth Information and Action Lead, or EIAL (Slide 6). There has been a dramatic increase in the demand for Earth observation products from a wide variety of different users across the federal, local, tribal, and state governments, as well as industry, nonprofits, and civil society. The subcommittee recommends that somebody needs to be in charge. This recommendation is to establish an overarching leadership role within the National Security Council to assess, prioritize, and guide the nation's multi-agency Earth observation effort. An accompanying draft white paper provides a decision matrix for the location of this lead. This needs to happen along with the consideration of the private sector capabilities for the purpose of accelerating and improving environmental information and driving action to promote greater resiliency. The subcommittee's rationale for this recommendation is that the urgency and complexity of change means that we have to think about things differently. Right now, Earth observation efforts are scattered across several agencies, guided by different processes, missions, priorities, and subject areas. It is crucial that the U.S. strengthen this capability and capitalize on its multibillion-dollar investments to advance this national effort. The consequences of no action are severe. The U.S. might fail to meet the information needs of these diverse stakeholders and will fail to insure our national resiliency against adverse events, such as climate change and its consequences.



Slide 6

Discussion

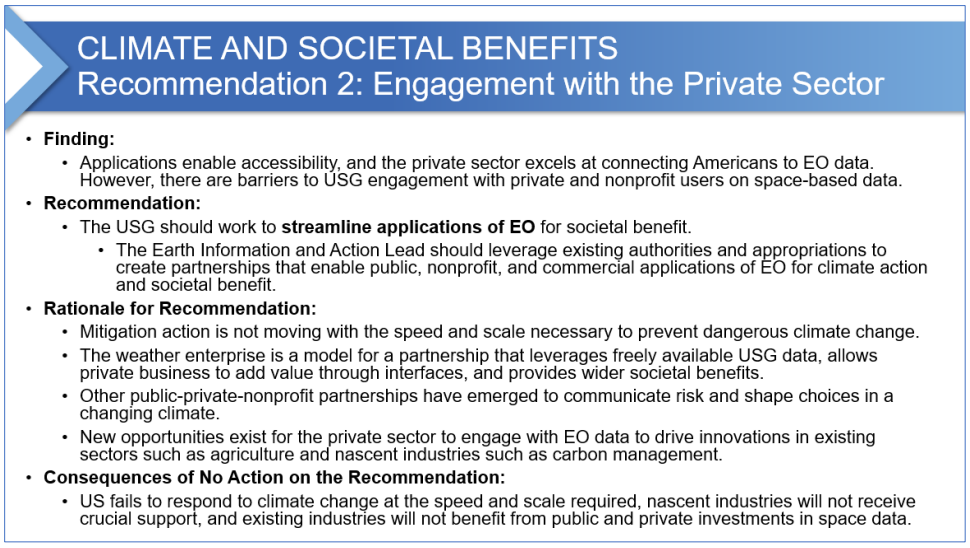
Gen. Lyles stated that he is glad the recommendation includes in the white paper includes a decision matrix as to which agency should lead this great initiative. It will be helpful to the NSpC to have a decision matrix to help guide them in determining who it should be is appropriate.

Dr. J. Williams commented that this recommendation recognizes something we've touched on before: that there is a lot of work happening across many agencies, often in a way that's not always the most highly connected. In consequence, it is not always efficient to move to applications and action in the most expeditious manner. This is a lightweight way of harnessing what's already there and making it more streamlined.

Gen. Lyles stated that this recommendation will be submitted to the NSpC.

Dr. Marvel said that Dr. J. Williams brought up a great point that it's not enough to simply be an information clearinghouse. We want to enable the development of those applications.

People all over the world interact with Earth observations every day (Slide 7). Dr. Marvel noted that we do this every time we check the weather on our smartphones. The finding from this is that applications enable accessibility. The private sector excels in connecting U.S. citizens and the global community to Earth observation data. However, right now there are barriers to the government engagement with private and nonprofit users on space-based data. Given this finding, and the overarching findings, the subcommittee's recommendation is that the government should work to streamline applications of Earth observations for a societal benefit. The EIAL, which we previously recommended should be established, should work to leverage existing authorities and appropriations to create partnerships that enable public nonprofit and commercial applications of Earth observation, both for climate action and for broader societal benefits. The rationale for making this recommendation is that mitigation action is simply not moving to the speed and scale necessary to prevent dangerous climate change. The weather enterprise is a model for a partnership that leverages freely available government data and allows private businesses to add value through interfaces, which provides wider societal benefits. The subcommittee believes that there is immense potential for other public-private-nonprofit partnerships, some of which have already emerged to communicate risk and shape choices in a changing climate. There are so many opportunities for the private sector to engage with Earth observation and data in order to drive innovations both in existing industries such as agriculture (the subcommittee has an agriculture whitepaper), and in nascent industries such as carbon management. If we fail to engage the private sector and to make the data available, then we could miss out on the potential benefits, including the ability of the private sector to move with the speed and scale that's necessary.



Slide 7

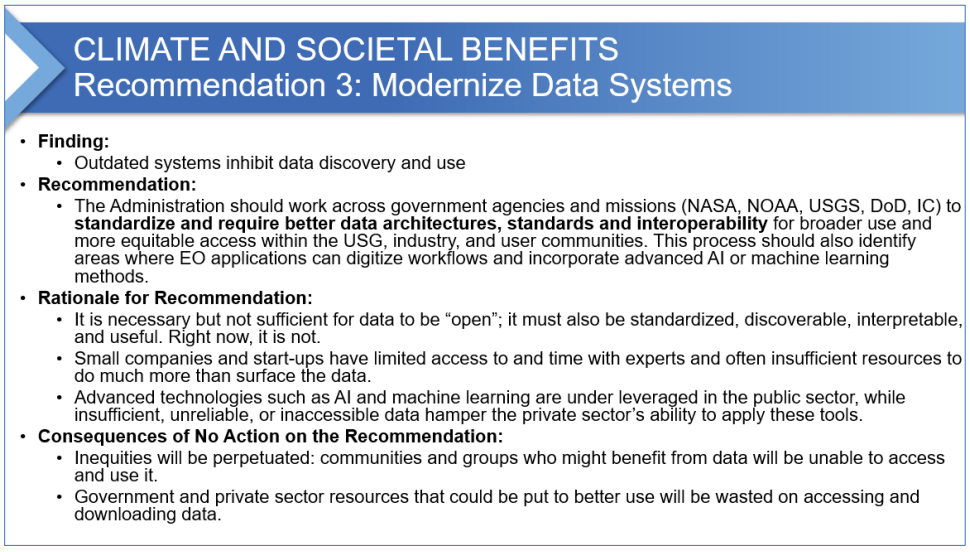
Discussion

Gen. Lyles stated that this is one of the rationales of why an EIAL would be so important. This recommendation is very appropriate; however, the UAG may want to package these two recommendations together. The EIAL is the primary recommendation, but it is just one of the major things that it needs to address." Gen. Lyles asked the UAG if there are any other comments.

Dr. Marvel responded saying that she'd love to get Gen. Lyles's take on how the UAG does that packaging because it's very important that this gets done. If for whatever reason, the first recommendation does not or can't be acted on, the subcommittee still feels very strongly that this engagement with the private sector is extremely important. So, packaging would need to be done with care.

Gen. Lyles agreed, saying that the UAG should quote her words. Even if the first recommendation is not acted upon, the second recommendation needs to be addressed. The UAG will make sure the wording clearly conveys that.

The third recommendation, which modernizes data systems, flows from our finding that outdated systems are inhibiting the use and discovery of data (Slide 8). The recommendation is that the Administration should work across government agencies and missions to standardize and require better data architectures, standards, and interoperability for broader use and more equitable access within the government, industry, and user communities. This process should also identify areas where Earth observation applications can digitize workflows and incorporate artificial intelligence or machine learning methods. The subcommittee also has a white paper that lists the attributes of data that make it most useful as well as the attributes of data architectures that make them most useful. The rationale for the recommendation is that it's necessary, but very far from sufficient for data to be open. Open data is a starting point, not an endpoint. This data must also be standardized, discoverable, interpretable, and useful. Right now, it's not, which is inhibiting small companies, startups, nonprofits, community groups who have limited access to experts and don't have the resources, as in most cases, to do much more than surface this data. The subcommittee also found that advanced technologies like artificial intelligence (AI) and machine learning are very under leveraged in the public sector. Also, insufficient, unreliable, or inaccessible civil data hamper the private sector's ability to apply these tools. This recommendation has equity implications. Communities, groups, and startups who may benefit from this data will be unable to access and use it, and both government and private sector resources that could be put to much better use might be wasted just on accessing and downloading this data. Dr. Marvel called attention to the white paper that the subcommittee has been working on that they will circulate.

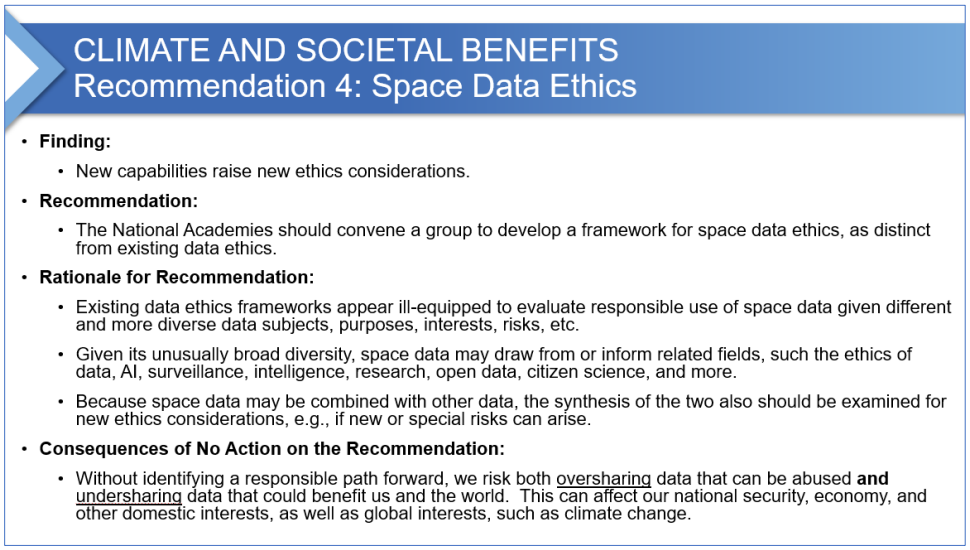


Slide 8

Discussion

Gen. Lyles commented that this idea or policy regarding standardizing and modernizing data systems would certainly be enhanced by having an EIAL. But that's not sufficient in of itself. This needs to be addressed regardless of whether that gets established or not. Gen. Lyles suggested that this be a recommendation to the NSpC for a dialog on whether a policy letter emphasizing the standardization of data is something that's appropriate as well as addressing where such policy should come from.

The fourth finding is that the rapid development of new capabilities raises new ethics considerations (Slide 9). Therefore, the subcommittee's recommendation is that the National Academies should convene a group to develop a framework for space data ethics distinct from existing data ethics. The rationale for this recommendation is that existing data ethics frameworks aren't good enough to evaluate the responsible use of space data, given that they're different and more diverse data subjects. Space data is incredibly broad, so thinking about an ethical framework for responsible use of space data has to draw from fields like data ethics, surveillance, intelligence, research, open data, citizen science, and more. Space data in and of itself is made much more worthwhile with in-situ data, model data, and other data that we use to contextualize it. It is also very important to examine the synthesis of space data and other forms of data for new ethics considerations. Without a robust, ethical framework to guide our decision making, we might risk both data that might be abused and under sharing data that could really help our international partnerships. This could have implications for our national security, economy, and other domestic interests, as well as global issues like climate change.

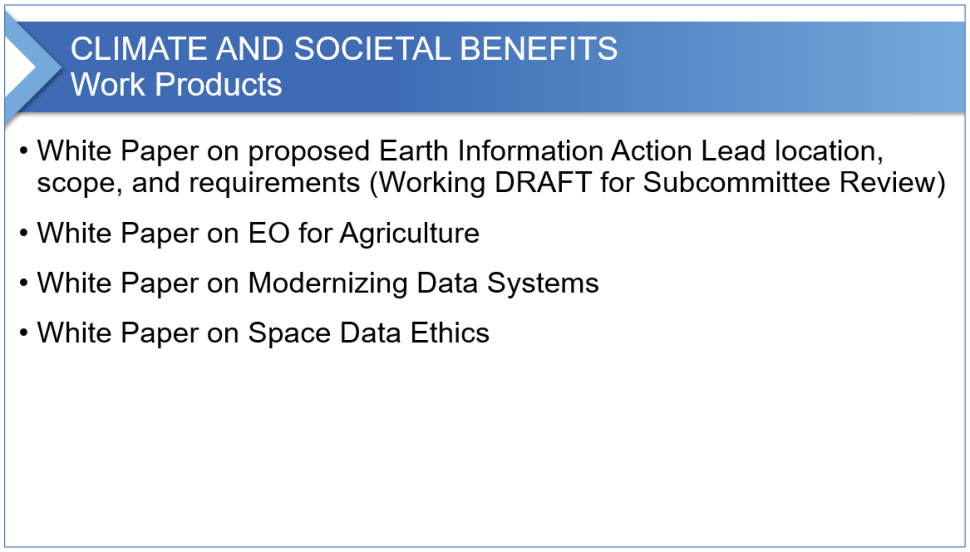


Slide 9

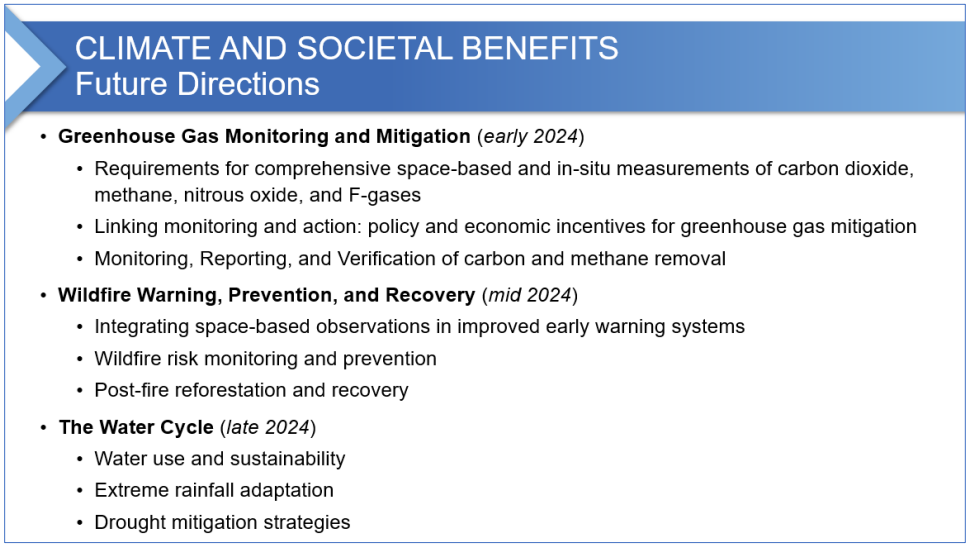
Discussion

Gen. Lyles stated that he is a member of the National Academy of Engineers, and one of the complaints about the National Academies is that its process takes time because they want to make sure that they've vetted with stakeholders and subject matter experts regarding recommendations. However, a process change that the Academy is adopting is to hold workshops with the stakeholders of a particular issue that need to be addressed to try to understand the key elements and problems. Identifying these things in a workshop setting can do one of two things: either provide answers and information to the stakeholders without having to go through the lengthy process of an Academy study, or provide the tenets of a major study that the Academy needs to do. A recommendation that the Academy conduct a workshop that could lead to a major academy study on this particular subject of data ethics could provide earlier answers to the UAG, in addition to providing better guidance to the Academy on what needs to be addressed.

Dr. Marvel ended with an explanation of the subcommittee's work products (Slide 10). They have a white paper on the proposed EIAL, location, scope and requirements, a white paper on Earth observation for agriculture, a white paper on modernizing data systems, and a white paper on space data ethics. The subcommittee also has a very clear roadmap for future directions that they'd like to explore (Slide 11).



Slide 10



Slide 11

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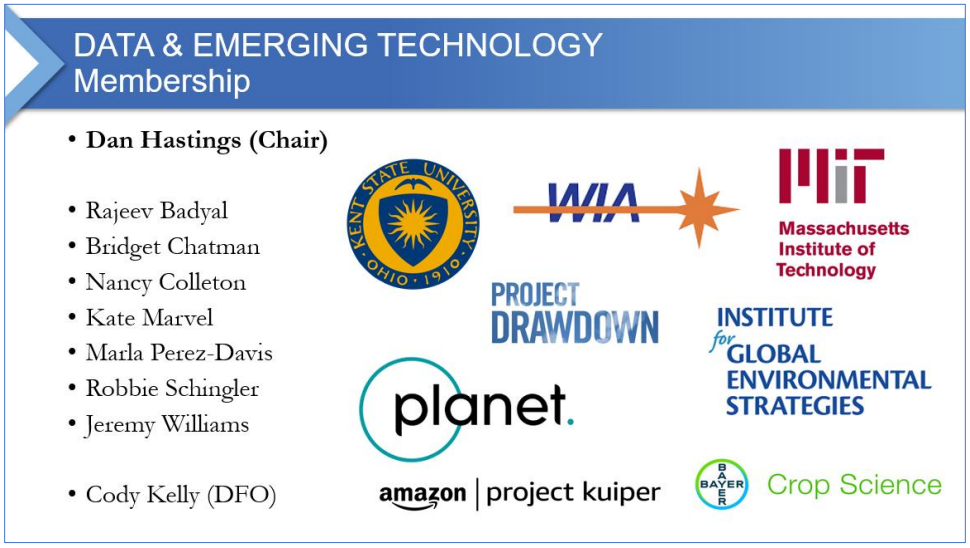
Data and Emerging Technology
Dr. Dan Hastings, Subcommittee Chair

Dr. Hastings thanked Gen. Lyles and introduced the members of his subcommittee (Slides 1-2).

Slide 1

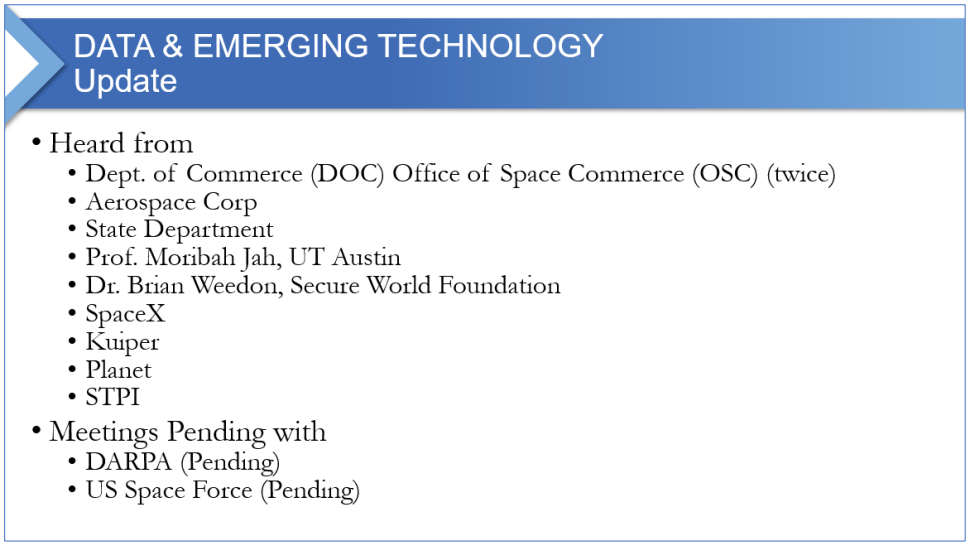


Slide 2

This subcommittee is looking at data associated with space traffic coordination and space situational awareness, or SSA (Slide 3). A lot of new space companies operate in LEO. There are big commercial constellations now, but commercial efforts are also growing to provide SSA and satellite operations. The organizational structure across the USG is evolving and needs to evolve. There are a lot of different equities between the different players. People coming into the business have a range of competencies relative to flying satellites, and there are a lot of other countries putting things up in space.

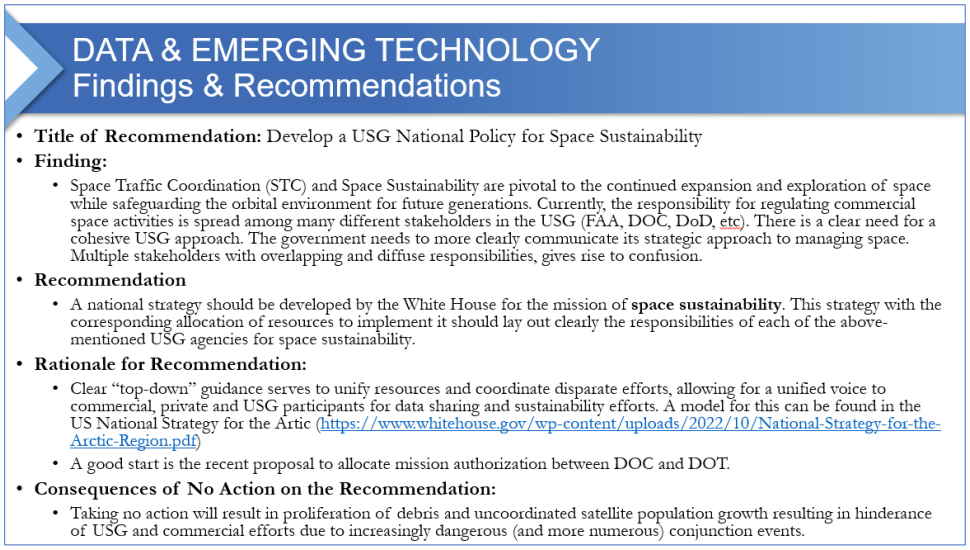
Slide 3

The subcommittee heard from the DOC Office of Space Commerce (twice), Aerospace Corporation, DOS, Moribah Jah, Brian Weedon, SpaceX, Kuiper, Planet, and the Science Technology Policy Institute (Slide 4).



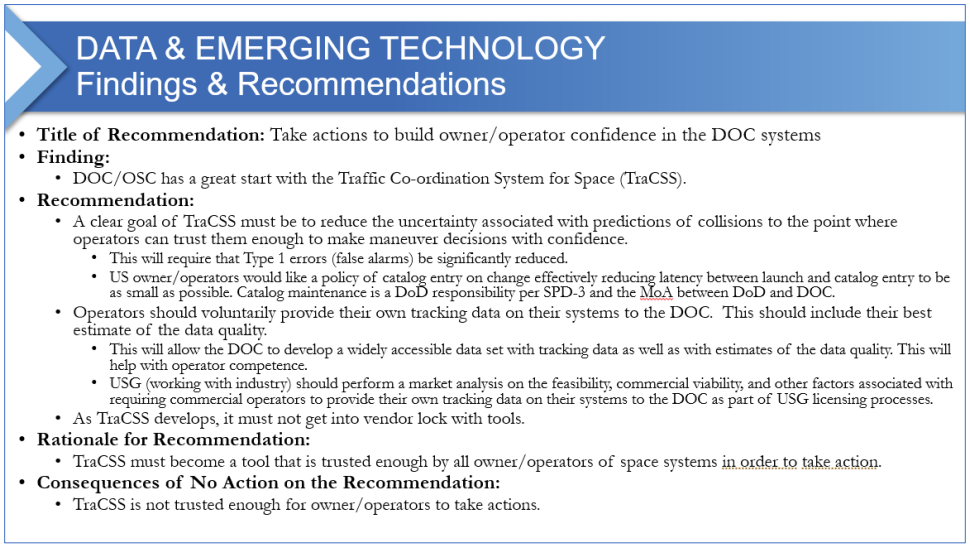
Slide 4

As the other subcommittees, this subcommittee is presenting in the format of findings and recommendations. These recommendations sound very similar to what you heard from the Hon. Eric Fanning's subcommittee. The first one is to have an overarching national policy for space sustainability, because there are lots of players in the government, which needs a more clear, strategic approach to managing space (Slide5). There should be a national strategy developed by the White House on the mission of space sustainability, which is much broader than just space coordination, as well as the allocation of resources. The National Strategy for the Arctic is a model we could follow, and the government should do something similar to that. The recent mission authorization proposal is a good start, but the subcommittee believes something more comprehensive needs to be done.



Slide 5

The subcommittee's second finding is that it's important to build owner operator confidence in what the DOC is developing, which is the Traffic Co-ordination System for Space, or TRaCCS (Slide 6). It is off to a great start, but the subcommittee has some suggestions. What's really important is that the TraCCS program requires that type one errors (false alarms of collisions) be significantly reduced because that will build trust in the system. The operators should voluntarily provide the data to DOC, as well as data quality. And out of that, the TraCCS system can build estimates of increasing quality of where satellites actually are. The subcommittee also believes it's important that TraCCS not get into vendor lock with specific tools, but have a range of tools that allow you to do that.



Slide 6

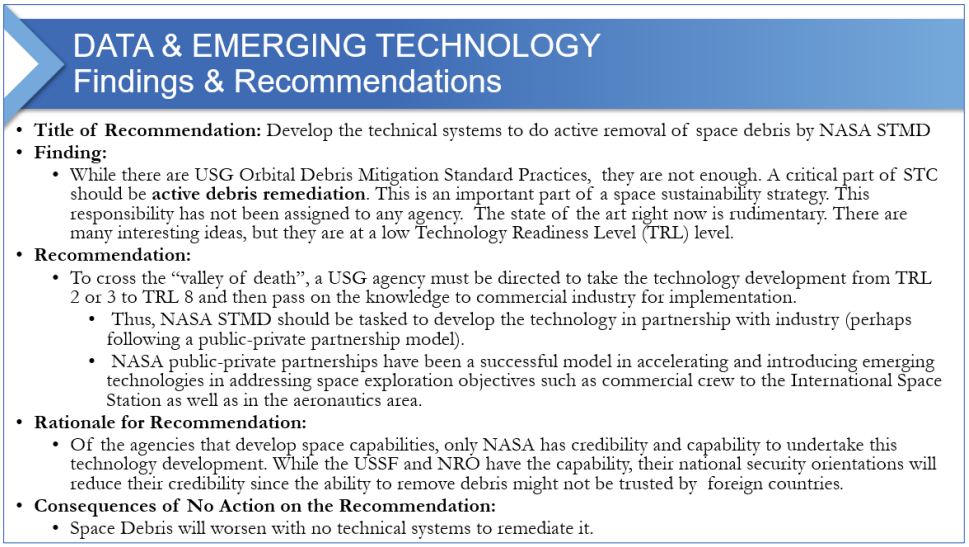
Discussion

Gen. Lyles asked if these different elements, objectives, and goals are part of the TraCCS program today. He also asked if this should be something that the UAG work on independently with DOC as part of the existing TraCCS program or if it is appropriate for the UAG to make the recommendation to the NSpC for them to provide this guidance to DOC?

Dr. Hastings responded that DOC would certainly buy into these things, but these are specific recommendations to help them build the trust to the owner operators.

Gen. Lyles said that when developing major programs in an agency like DoD, it's best to communicate with whoever is leading this effort and ensure that the requirements and objectives are understood. Gen. Lyles suggested that before the UAG provides a recommendation to the NSpC, that the subcommittee, along with Gen. Lyles, meet to discuss the requirements for the TraCCS program to make sure DOC understands some of the elements that the subcommittee is recommending.

The next recommendation is to develop the technical systems to do active remediation (Slide 7). The orbital debris mitigation standard practices are not enough. We must be able to grab hold of the debris and do something about it. Therefore, the subcommittee suggests that a USG agency take the debris from Technology Readiness Level (TRL) 2 or 3 to TRL Level 8 and then pass it on for commercial industry implementation. The subcommittee recommends that the agency be NASA because they have shown in the past that they are capable of public private partnerships to introduce emerging technologies into the space area, as they did with commercial crew and the International Space Station (ISS).



Slide 7

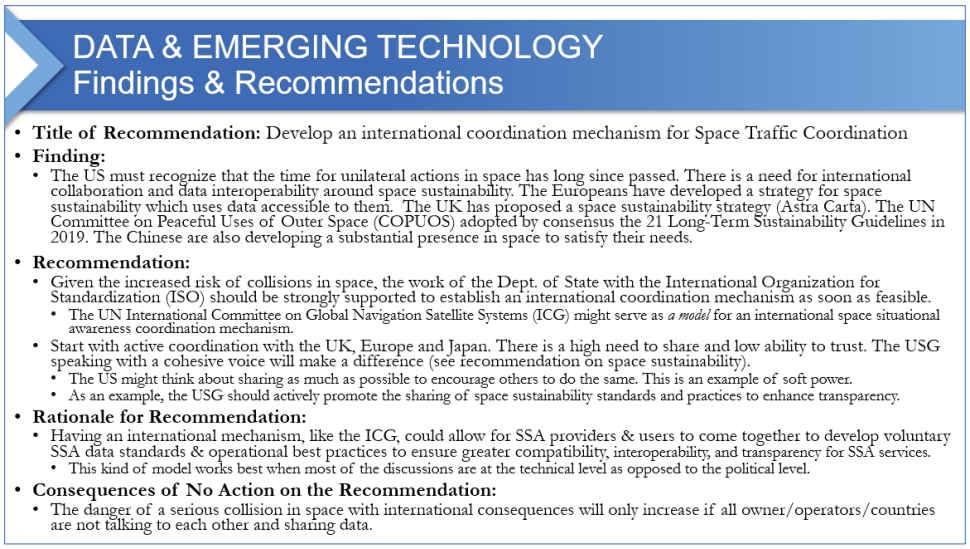
Discussion

Gen. Lyles wondered if there are activities underway at NASA. He suggested that the UAG make the recommendation to the NSpC, but one of the first steps may be ensuring we all understand who's doing what in this particular area. In addition to the recommendation, the NSpC Office may be able to help the UAG to figure out who all the players are.

Mr. Lopez commented, while there are some activities going on, we are in a position where the European Space Agency (ESA), the Japan Aerospace Exploration Agency (JAXA) and like-minded nations are leading the charge. He thought that this is an opportunity for the U.S. to show leadership.

Gen. Lyles agreed, saying that European agencies are doing some things regarding this issue so we need to make sure that we're working with them.

Earlier today the UAG heard about the work going on at DOS, which the subcommittee is very supportive of (Slide 8). Other countries have developed strategies for space sustainability, as well as COPUOS has done with their guidelines. The subcommittee supports the work of DOC in bringing what the U.S. is doing together with other nations for STC. The ICG brings together several countries in regards to GNSS, including GPS, can be used as a model. The recommendation is to let's get on with it.



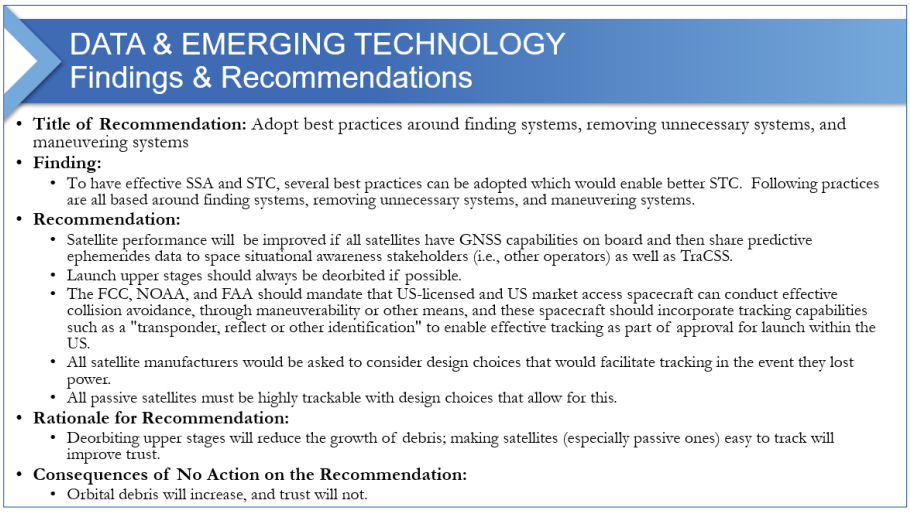
Slide 8

Discussion

Gen. Lyles stated that, in terms of the recommendation, the UAG needs to make sure that they aren't stating the obvious. The UAG can clearly articulate support as well as recommend solutions to issues that are not being addressed. However, it sounds like the subcommittee is primarily endorsing what's already ongoing.

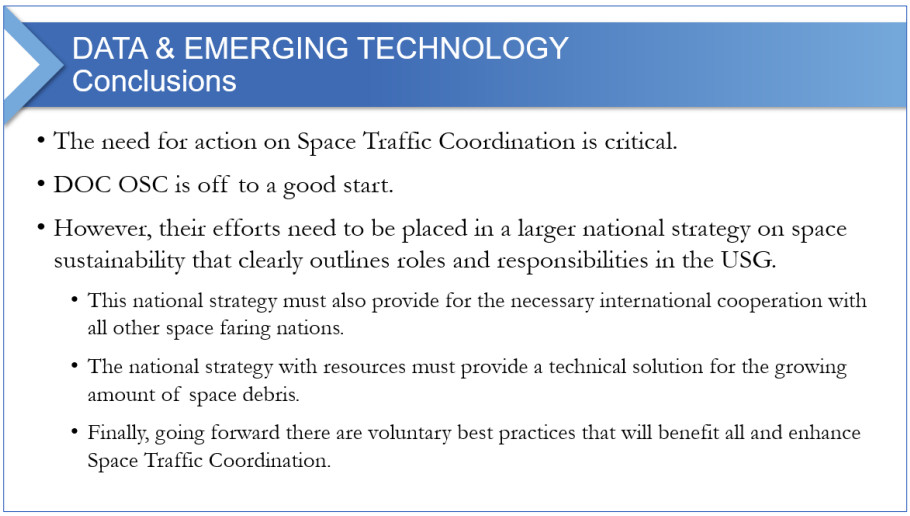
Dr. Hasting responded saying that the subcommittee is recommending models, but there may be other ways to go about this.

The last recommendation regards best practice of finding, removing, and maneuvering unnecessary systems (Slide 9). The subcommittee suggests that everybody have GNSS capabilities and share predictive ephemeris data, as well as launch upper stage deorbit, if possible, as a requirement for licensing in the U.S. Also, spacecraft should incorporate tracking abilities, manufacturers should incorporate tracking capabilities into their design, and passive satellites should be highly trackable. All of these things will help improve the situation in space. This is very similar to what Mr. Lopez previously stated, so one could reasonably think about how to combine these together.



Slide 9

In conclusion, space traffic coordination is critical (Slide 10). The subcommittee believes that DOC is off to a good start, but what they're doing needs to be placed within a larger national strategy on space sustainability that lays out who is responsible for what. The subcommittee also believes that it's critical to get the technical solutions to deal with space debris more actively.



Slide 10

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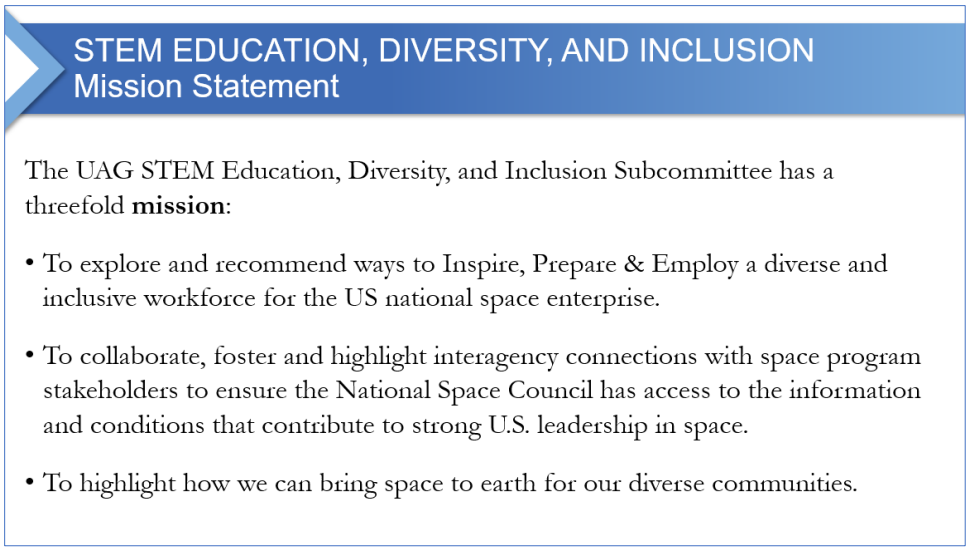
STEM Education, Diversity & Inclusion and Outreach
Ms. Mandy Vaughn, Subcommittee Chair

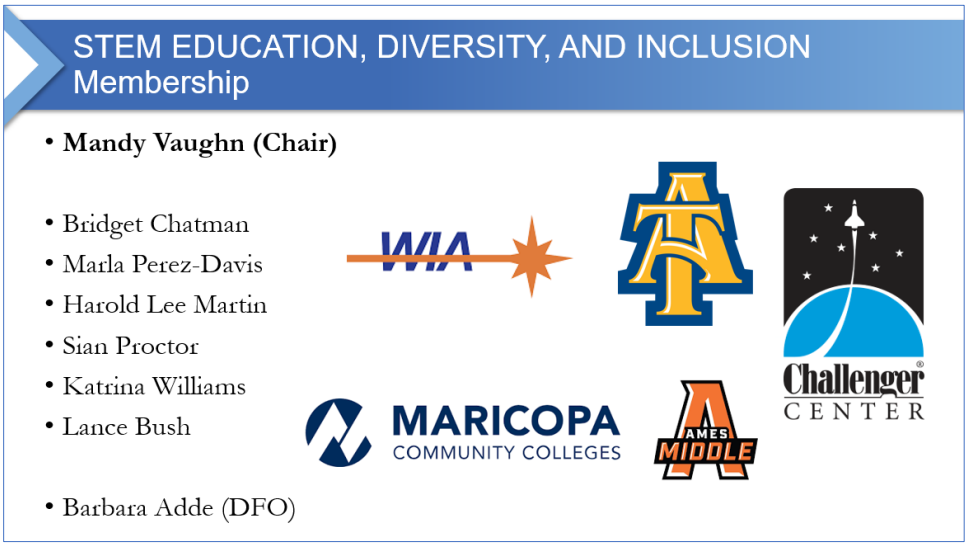
The subcommittee's mission statement was established to help it stay grounded in what is a huge underpinning issue: how do we find the talent and the people that are needed to make all of these space systems work, from the design, development, operation, data understanding, regulatory elements of it, and even in our day to day lives as we interact with this space technology (Slides 1-2)? The subcommittee has a three-fold mission. First, how do we support the Administration's Inspire, Prepare, Employ strategy, which is mainly about the workforce as a whole? How do we then take that set of recommendations and that framework and bring it forward to the U.S. National Space Enterprise and make it extensible to our allies and partners? Our second is what makes the NSpC and the UAG really unique: the NSpC is at this Cabinet level, so how do we highlight and focus the interagency elements on what can help enable these other programs to move forward? What are the conditions of success in one area where another department or program can emulate it and we can all benefit? The third is rooted in why the UAG is here. How can we bring space to Earth for our diverse communities? What's going on that we can highlight within our communities and workplaces, our and not just for us, but for the space community broadly.

Slide 1



Slide 2

Ms. Vaughn took a moment to thank the members of her subcommittee (Slide 3). They come from very different perspectives and backgrounds. There is even an educator sitting in her classroom right now in Iowa. Ms. Harden Williams. Everyone on this team is incredibly passionate in their day jobs and as well as in their personal time, working in various programs to try to reach the next generation of students and young professionals to increase the talent that all of our companies and all of our organizations need. Ms. Vaughn also thanked Ms. Barbara Adde, the subcommittee's DFO, who is equally as passionate about this.

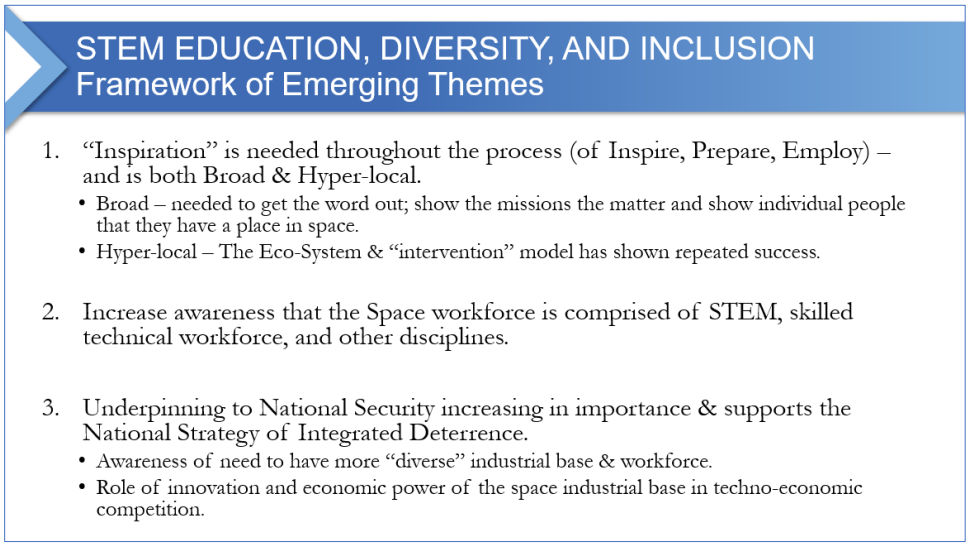


Slide 3

As shown on Slide 4, the subcommittee has had a slew of briefings and information gathering sessions that range from industry to academia to other government entities and agencies in terms of where are there other programs with efforts ongoing, and what are some areas of common success? What are areas of common challenges? How are other groups organizing the data? Where are the trends and how can we kind of codify some of those commonalities between various programs and create a framework that could be emulated for further success? The subcommittee has also worked various outreach campaigns through the members' day to day activities and areas of personal interest. Furthermore, what has already been talked about regarding how we can increase awareness of what space is, its impact, and how we can all play a part?

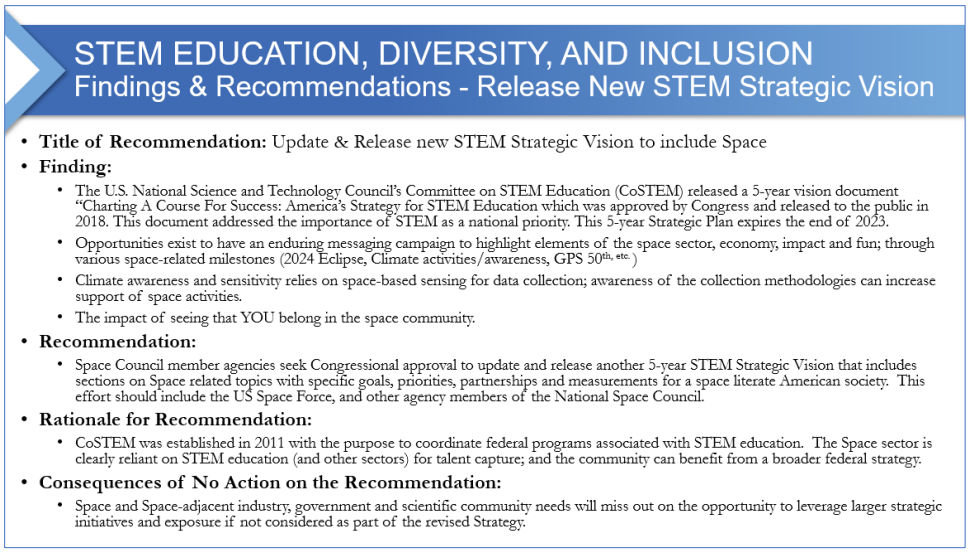
Slide 4

Through the course of these discussions, big themes started to emerge that the subcommittee has digested into four recommendations that will be discussed (Slide 5). The first theme is, when looking at the Inspire, Prepare, Employ strategy, the inspiration element is essentially two bookends. It's this very big, broad, bold, national, worldwide, audacious goal and something that's amazing to strive for. On the flipside, it's also hyper local. How does that impact you? How does that impact an individual community or even an individual person? How can you bridge that seemingly impossible gap? The second major theme is the need to increase awareness that the space workforce consists of STEM, but also all the other fields. People talk about STEM and all the other things, but it is the multi-discipline approach, as well as the skilled technical workforce, that underpins a large part of the industrial base that's needed across the sector. The third is the underpinning with national security. When we talk about building the systems that feed the defense industrial base and the classic national security elements, there is a larger commercial space industrial base perspective that may become a larger area of focus. How do we work things across a more diverse industrial base and workforce to take advantage of that?



Slide 5

The first recommendation is about a new STEM strategic vision (Slide 6). In 2018, the U.S. National Science and Technology Council Committee on STEM Education released a five-year vision document that was approved by Congress and released to the public. This document addresses the importance of STEM as a national priority and expires at the end of this year. This new strategic plan laid out a high-level vision of a future where all U.S. citizens have lifelong access to high quality STEM education to ensure the U.S. is a global leader in STEM literacy, innovation, and employment. The recommendation is to look for innovative ways to ensure that a future five-year strategic plan is developed to include space, not only as a priority, but as part of a larger national security plan, and to include a framework and metrics for by using innovative new approaches. Specifically, the recommendation updates and releases another five-year strategic vision, which includes space with specific goals, priorities, partnerships, and measurements for a space literate American society.



Slide 6

Discussion

Gen. Lyles asked if the UAG needs permission from Congress to do this, or whether it should ask NSpC to take this on.

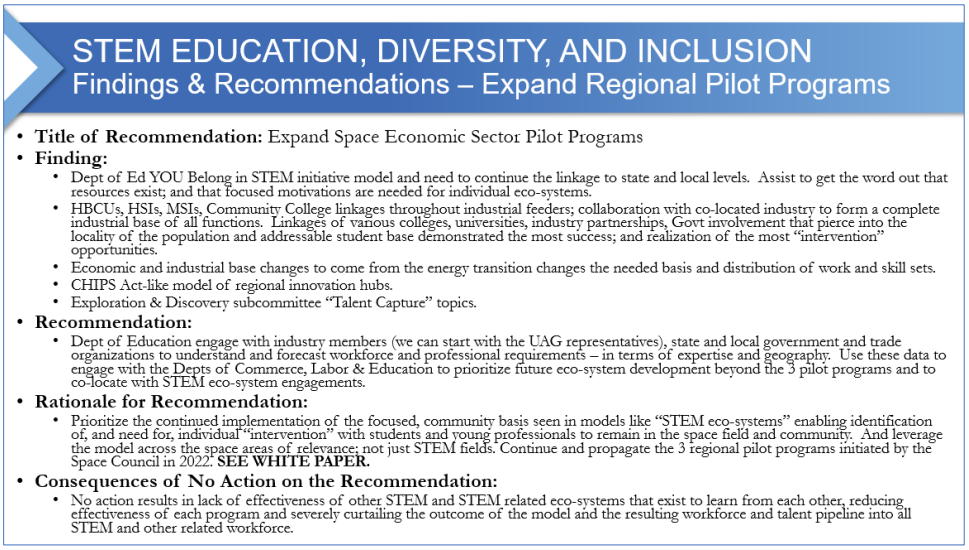
Ms. Vaughn responded that Congress is the final approval for this. The NSpC is starting to take it on, which is absolutely fantastic. The point of this recommendation is to support what is already ongoing and to add in some of the viewpoints from the other areas of the NSpC members and make that emphasis on the space literate society. The subcommittee believes that is an element that is important, and they'd like to make sure it is uniquely called out.

Dr. Marvel offered her strong support for this recommendation from the perspective of Climate and Societal Benefits. It is very important that the U.S. has that space literacy. The groundwork is already laid out because NASA is the most popular agency with the public and the Yale Program on Climate Change Communication recently released a study on America's most trusted sources of information about climate change and NASA was number one, followed by friends and family.

The next recommendation regards regional pilot programs for skilled technical workforce and STEM ecosystems (Slide 7). Following the inaugural meeting of the NSpC, the Vice President outlined regional pilot programs with the intention of increasing the skilled technical workforce pipeline into space related technology areas and industry. In addition to these pilot programs, the Administration created a roadmap representing the initial coordinated steps that can inform future STEM education and workforce strategy. Implementing this roadmap will advance ongoing work and create new opportunities to reach people of all backgrounds and create pathways into these careers. The subcommittee has received numerous briefings that address this overall STEM ecosystem model, which is a good area of focus for pipeline programs for STEM and other fields in addition to these skilled technical workforce elements.

The subcommittee has prepared a background paper which is intended to capture more detailed findings than what are displayed on the chart, but find relevant. This ecosystem model provides linkages and pathways to the state and local levels, including multiple pathways of colleges, universities, early education, industry, and partnerships across the board. The subcommittee found that even local level government involvement really helped pierce into the locality of the population and the addressable student base. This is where there is demonstrated success, which helped the subcommittee realize this intervention model of where students in the pipeline stay in the pipeline and then enter into the space economy at the end. The recommendation is to expand the pilot programs that have started and look at the forecasted and geographic needs that are being projected within our industrial base. The UAG internally could look at what are the other STEM ecosystems that either exist or are forming and how can we couple the two? How can we

really bolster the skilled technical workforce element with the pilot programs with this STEM ecosystem model, and amplify the inputs and impact that these programs can have.



Slide 7

Discussion

Gen. Lyles stated that there is no better example of a whole of government need. Although the recommendation involves the Department of Education, it's clear that from the Department of Labor, DOC, and DoD, specifically when talking about the defense industrial base, are all involved. So, this recommendation needs to emphasize that this evolves all agencies that have a foot in space.

Mr. Bruno commented that Ms. Vaughn's team has done an exceptional job.

Ms. Vaughn stated that there is a lot of overlap with this recommendation and what Dr. Bush presented earlier on the talent capture topic. Both subcommittees can combine the formal write up, but would like to capture these separately since they came from different perspectives.

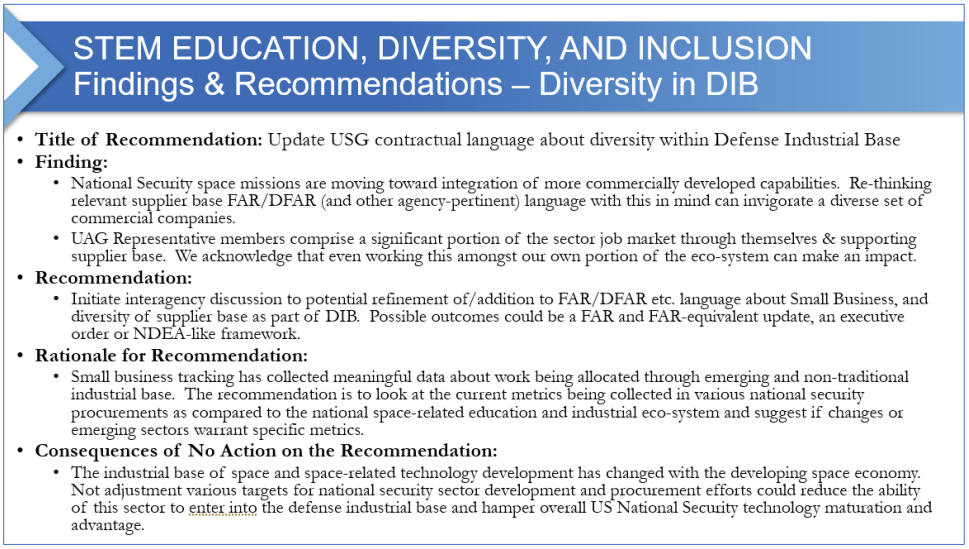
Gen. Lyles responded, saying that the UAG will package them together for the NSpC so it's clear that they're related, but highlight the unique perspectives.

Dr. Bush echoed Mr. Bruno and commended Ms. Vaughn and her subcommittee for their work. Relating to the talent capture chart that Dr. Bush's subcommittee displayed, all of the success of the U.S. space program is based on the people that we have. The U.S. has been fortunate for many decades to have people matriculate into these positions, but we need to be a lot more purposeful as we move forward. The U.S. has to be thoughtful about its investments. The U.S. is losing more than half of the interest of students at the age of 12, which is even more accentuated among women, minorities, and underserved students. Dr. Bush emphasized the importance of the work of this STEM Education subcommittee and the need for the U.S. to invest in their efforts. The work of the STEM Education Subcommittee may be the most important thing the UAG can do to carry forward success.

Ms. Vaughn responded, saying that Dr. Bush has a unique perspective as CEO of the Challenger Center, and she will discuss the early education pipeline later on.

The next two recommendations dive more into the national security element, along with the STEM education and workforce development elements.

The first one regards diversity in the defense industrial base, which can be extensible to other government entities. National Security missions have an extensive industrial base, as well as a variety of tracking mechanisms and small business goals (Slide 8). Hon. Fanning mentioned this earlier in his supply chain recommendation. The purpose of this recommendation is to blend the national security element alongside the ecosystem model that was mentioned earlier. There are already some very good tracking mechanisms in terms of small business goals and diversity in the industrial base. The point of this recommendation is to refresh some of those goals and tracking mechanisms in light of what the U.S. learns from the previous recommendation. Where are the pilot programs? Where are the STEM ecosystems? Where could they or should they be? And do we need to adjust our small business or our supplier base diversity metrics as a result of that? This recommendation initiates interagency discussion about the potential refinement of those industrial base goals, primarily for the Federal Acquisition Regulation (FAR) and Defense Federal Acquisition Regulation (DFAR), which is focused on DoD, but is also applicable to the intelligence community, NASA, etc.

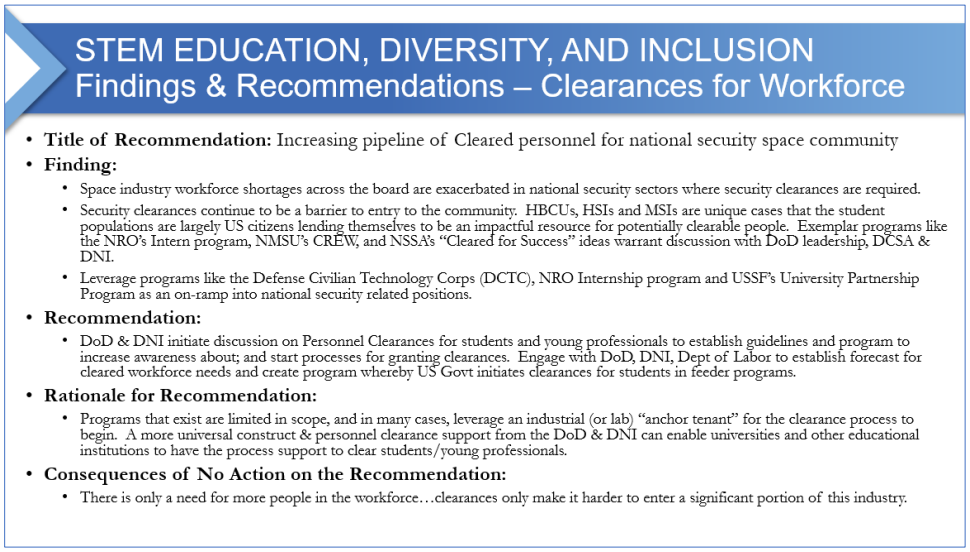


Slide 8

Discussion

Gen. Lyles stated that Ms. Vaughn's subcommittee had a few interfaces with the study mandated by Congress to look at DoD and its cooperation in STEM, particularly workforce challenges, internships, etc. A lot of people are looking at this and it's great to ensure that we have different studies being coordinated with one another so the U.S. can take advantage of the best practices, recommendations, and ideas from each one.

The last recommendation is also focused on national security and regards increasing the pipeline of cleared personnel for the national security space community (Slide 9). There's a dearth of talent in the pipeline and the U.S. needs to get more people into the pipeline to fill these jobs now and in the future. When the elements of the Department of Defense, the national security industry, and the intelligence community clearances are overlaid, these problems are exacerbated. The purpose of this recommendation is to recognize that there are some pocket programs, especially within the Historically Black Colleges and Universities (HBCU), Hispanic Serving Institutions (HSI), and the Minority Serving Institutions (MSI) university programs. Pockets of success where this is working include either industrial or government partners that are able to start the clearance process for the undergraduate students or in some cases even as early as high school to be able to get those students into the pipeline. When students graduate from college or from a program, they're employable and ready to go in this sector from day one. Therefore, the recommendation is to have DoD and the Office of the Director of National Intelligence (ODNI) initiate discussions on the personnel clearance process for students and young professionals so guidelines can be more broadly implemented rather than merely these pockets of success of a couple of programs that we've seen. This is something that can also increase awareness in terms of what the job possibilities are if you choose to take this path, and what that means for some life choices you may make as a young professional to understand the requirements associated with holding a security clearance.



Slide 9

Discussion

Gen. Lyles stated that this is a very important recommendation. This may be a threefold recommendation not necessarily in chronological order, but instead, the USG needs to be doing all these at the same time. One is to understand what the needs are for taking this on, because the whole UAG is very much aware of the need to address this particular issue, but not everybody may have a clear understanding of what the overall needs are for our government, particularly in the space sector. Second, we cannot stop these pilot programs that are already successful, but there may be some way to transition and grow them so that they can touch more people, companies, and students. The third recommendation may be the biggest and most important issue: who needs clearances for what? And how do we speed up the process of obtaining a security clearance?

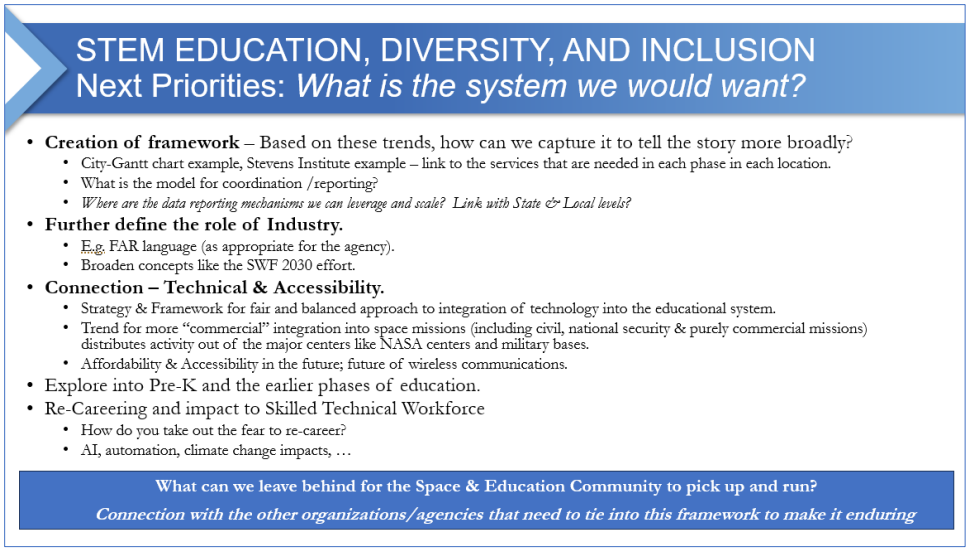
Ms. Harden-Williams expressed gratitude for how inclusive the UAG is for the students who are in the middle school setting. She stated, "it is lunch time for a group of students who have tuned in during this time listening and have walked in with their lunch to make sure that you all know that you're hearing their voices and echoing the sentiments of what they desire." Some students are listening from their homes, as well as students who are in the Ames Middle School. Ms. Harden Williams acknowledged them and let the UAG know that the school day has been filled in plentiful with what they need to do for their futures.

Gen. Lyles reiterated that Ms. Harden-Williams is one of the UAG members, but she is also an active, ongoing, dedicated teacher. Right now, she is teaching students in her classroom, as well as students who are at their homes. Gen. Lyles stated that he cannot think of a more heroic example of the things we need from teachers. He also told Ms. Harden Williams to tell her students that the UAG is going to be watching and tracking them anxiously in a few years because the nation needs their technical capabilities.

Ms. Harden-Williams responded saying that they can hear and see Gen. Lyles, and they're all smiles.

Ms. Vaughn thanked all of the students in the classroom, because the subcommittee has had many discussions where they've been in her classroom. So, they're part of this journey with the UAG.

Slide 10 captures the areas where the subcommittee would like to focus next. Although the subcommittee has already covered some of these topics, in terms of what is the role of industry, how do we get more of an understanding of the data and the needs? The subcommittee has had some discussions regarding who was able to collect data where and answer the questions: what do we know? What don't we know? How do we address accessibility and technical access to a lot of these resources as we move forward? And define what the system is that we would want, and how we link those different tools and models together in a way that can be propagated and expanded.



Slide 10

Discussion

Gen. Lyles stated that one of the things that the subcommittee may want to focus on next is a broader understanding of tools that are available to help the whole subject of STEM education. One of those tools, for example, is STEM City, which is a Meta tool developed through the communications group and how it's being utilized by industry and government (i.e., U.S. Air Force Research Laboratory). Gen. Lyles encouraged all of the members to continue looking for tools like that. But for those who are interested, Google a STEM City or go to the website and take a look at the tool itself to see how good it is. There may be some benefits there that could help you today.

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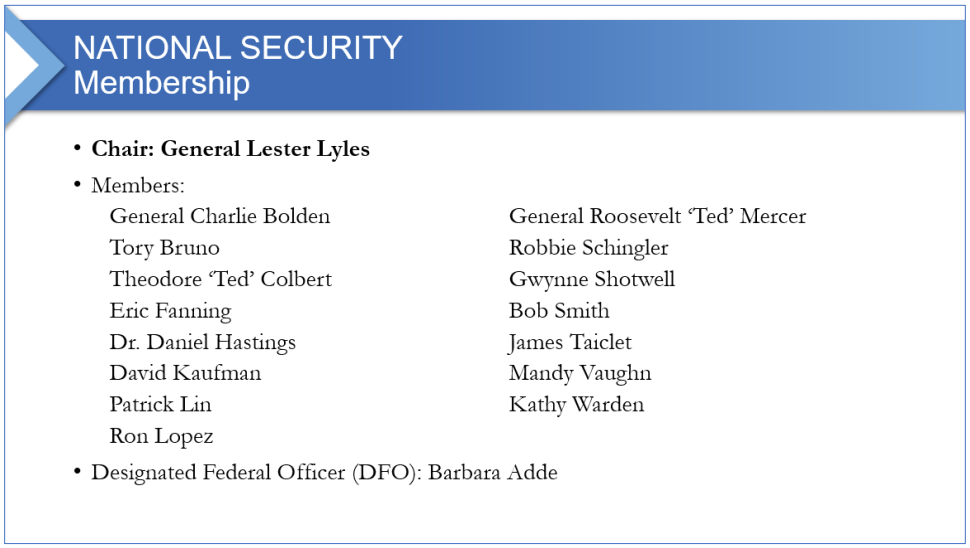
National Security Subcommittee Report
Gen Lester Lyles, USAF ret., Subcommittee Chair

Gen. Lyles noted that he chairs the National Security Subcommittee and introduced its members (Slides 1-2). With one exception, everybody on the list has appropriate, current clearances and, which is important for some of the things this subcommittee is focusing on in the area of national security. This group has also tremendously benefited from their DFO, Ms. Barbara Adde.

Slide 1

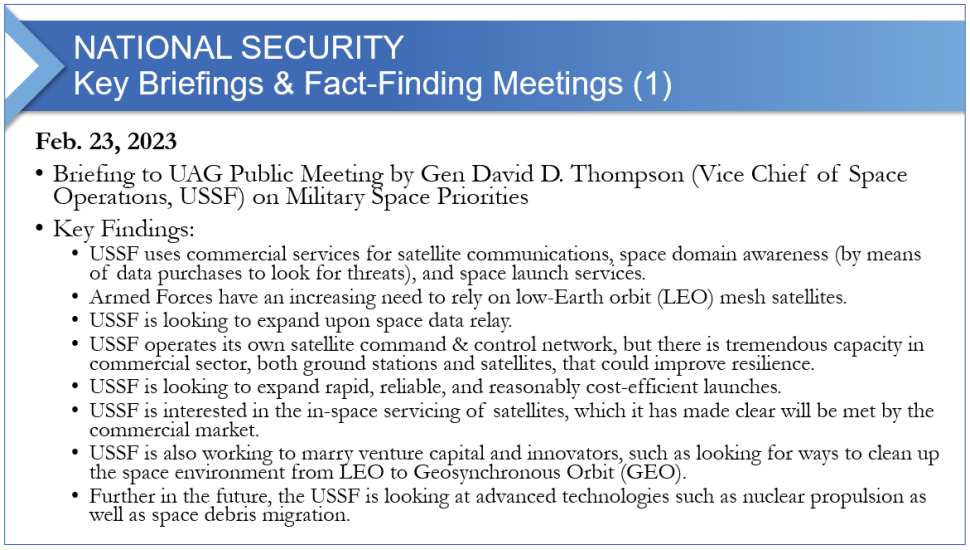


Slide 2

As shown on Slide 3, there are three focus areas of the national security subcommittee: One is assessing USSF's integration of commercial capabilities to support, augment and in some cases, assume national security missions and needs. The subcommittee has benefited from lots of dialogue in this area, but there's more that needs to come. The subcommittee will be interfacing with USSF as they update, refine and finalize their framework for commercial use in national security. This group is looking for opportunities for greater information sharing, partnerships, and collaboration amongst all the elements of the space sector for the U.S. and for the world. As he mentioned at the start of the UAG meeting, the underlying theme is international collaboration and partnerships. These are items that the subcommittee will be looking at in more detail for future UAG meetings and discussions.

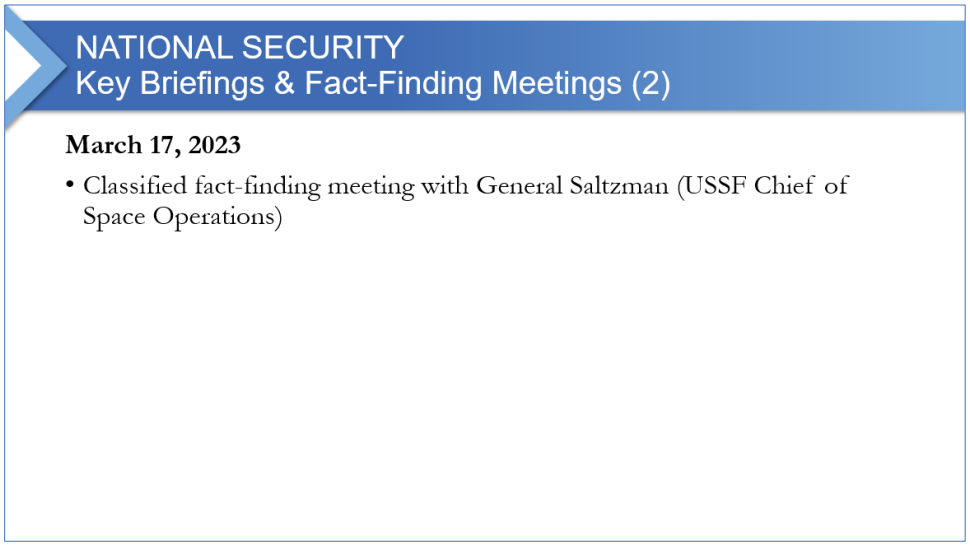
Slide 3

Slides 4-9 summarize the fact-finding meetings, deliberations, and discussions the subcommittee has had starting from its first meeting on February 23, 2023, which was the UAG public meeting where USSF Gen. David "DT" Thompson, the Vice Chief for Space Operations, gave us his perspectives on military space priorities (Slide 4). Gen. Lyles stated that he appreciated not only that he shared his perspective with the UAG, but he is going to be leaving the military in the next couple of weeks, and he couldn't think of an individual who's had more of a sterling, fantastic, successful career. He will be missed as part of USSF. All of the UAG members look forward to taking advantage of his expertise and activities for the items that each member is involved in, both individually and with the UAG.



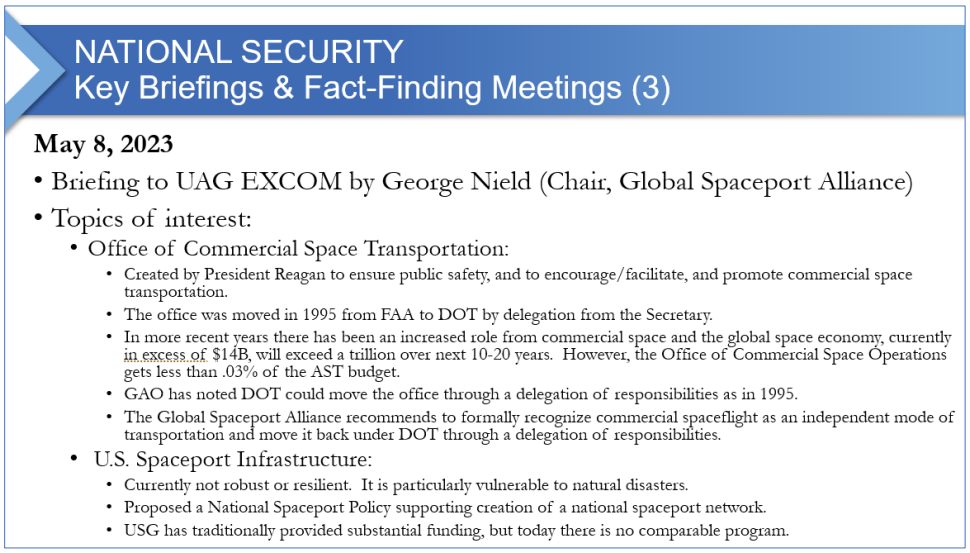
Slide 4

The subcommittee also held some classified meetings with members of USSF (Slide 5). Gen. Saltzman, the Chief of Space Operations, had a chance to meet with some members in a classified vault in the Pentagon to discuss his needs, etc.



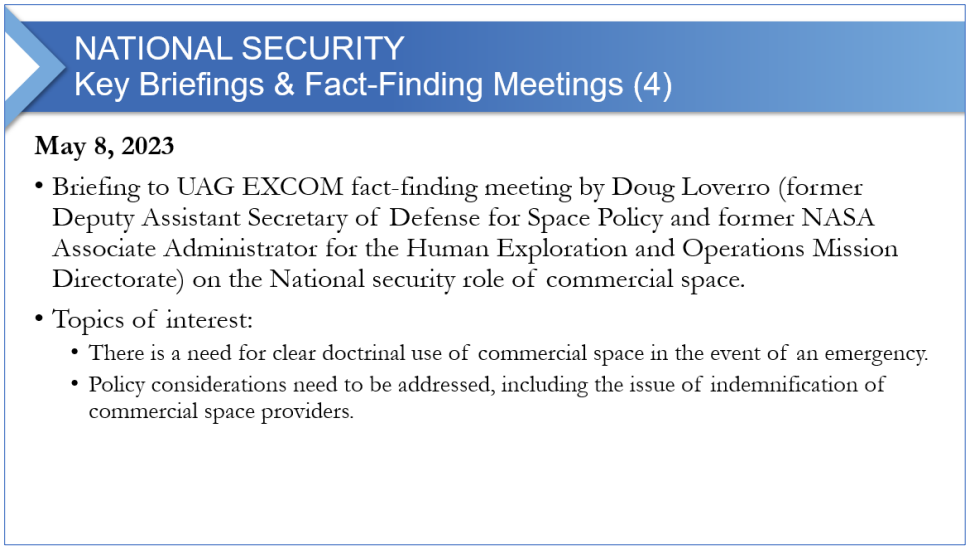
Slide 5

The subcommittee has also engaged with subject matter experts, such as George Nield, who is former Head of Space Activities at the Department of Transportation, and Doug Loverro, who's former Deputy Assistant Secretary of Defense for Space Policy and a former NASA Associate Administrator for the Human Exploration and Operations Mission Directorate (Slide 6). The subcommittee has tried to broaden their horizons of people that they have interfaced with as much as possible. For example, the MITRE Corporation released a paper recently from their interface with the Aspen Institute which particularly regards commercial opportunities to support space.

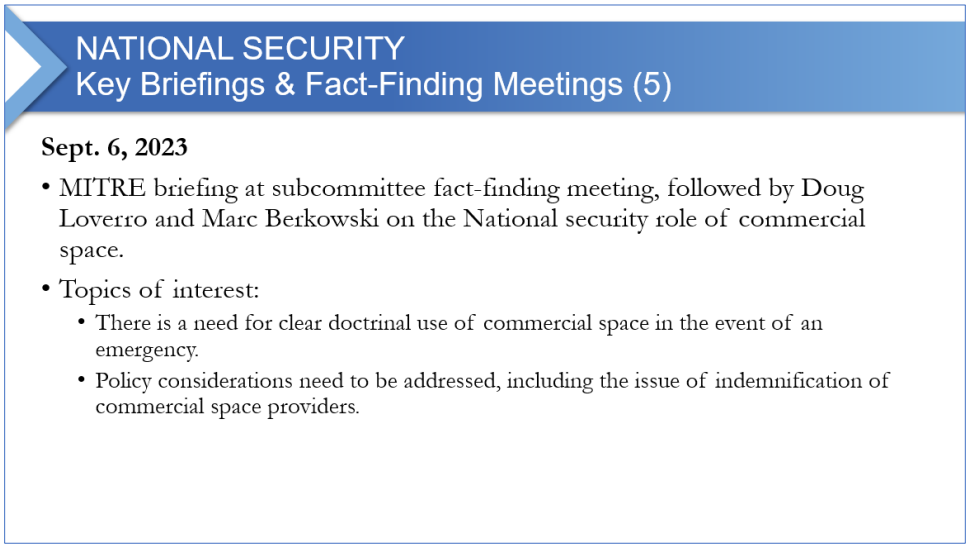


Slide 6

The subcommittee spoke with MITRE to get their perspective, as well as Doug Loverro and Mark Berkowski from the national security realm (Slide 7-8).

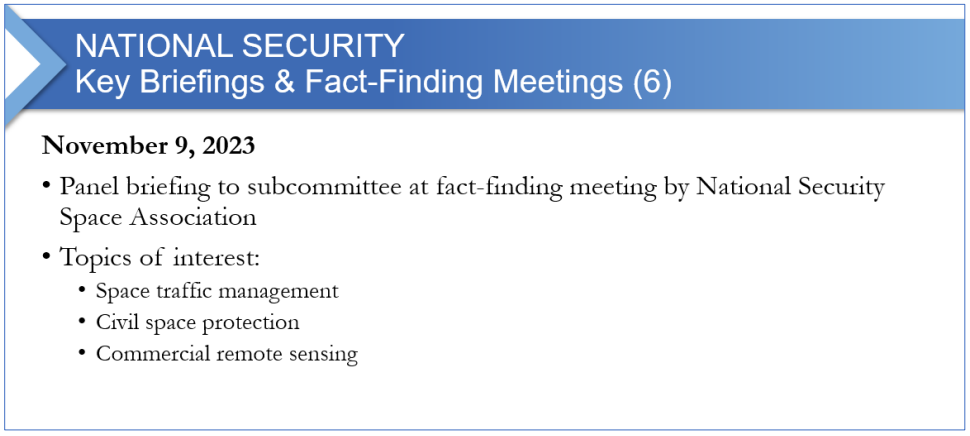


Slide 7



Slide 8

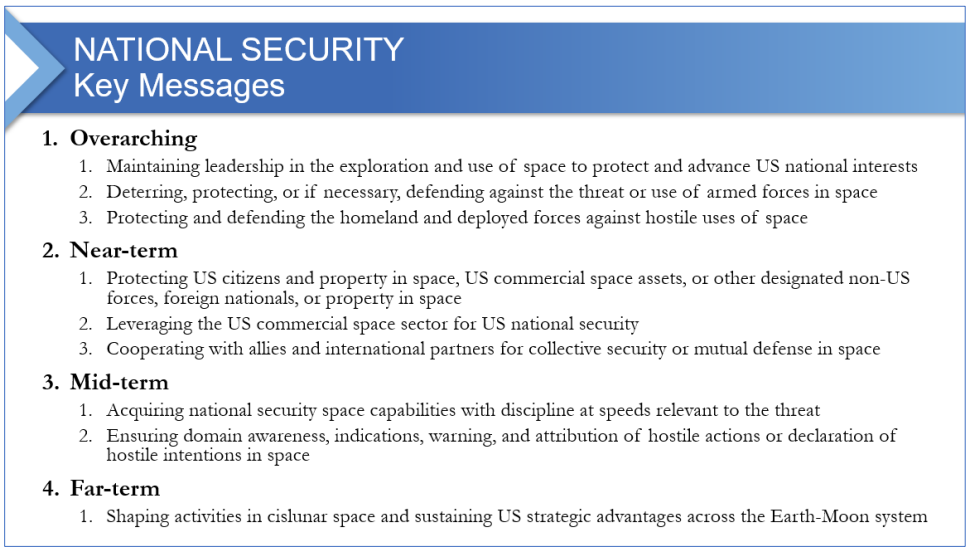
On November 9, 2023, the subcommittee had a panel briefing from the National Security Space Association (NSSA) to address their very broad national security space initiatives and ideas for space traffic management, civil space protection, commercial and remote sensing, international cooperation, etc. (Slide 9).



Slide 9

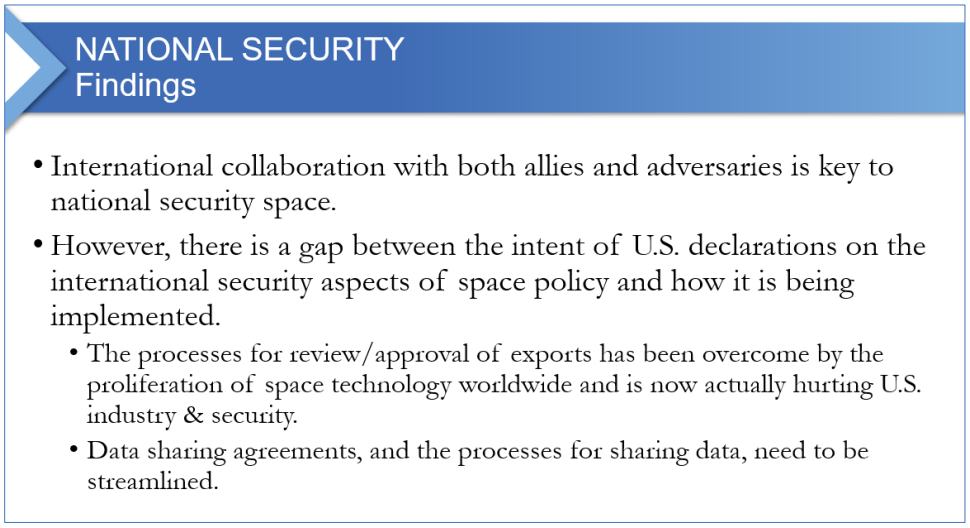
The subcommittee also had a classified meeting at KBR Corporation's facility in Northern Virginia, where we met with Chris Scolese, the Head of the National Reconnaissance Office (NRO). Additionally, Frank Calvelli, a space acquisition executive for USSF spoke with the subcommittee, and NOAA leadership discussed some of their activities.

Some overarching messages of this subcommittee are that the U.S. needs to make sure we maintain leadership in the exploration and use of space to protect and advance U.S. national interests; deterring, protecting, and defending against threats to our capabilities are absolutely paramount; and protecting and defending the homeland and deployed forces against hostile uses of space is also key (Slide 11). In terms of near-term messaging, protecting our US personnel and property in space is very critical; protection of commercial space assets or other designated non-U.S. forces, foreign nationals, and property in space is very important; leveraging the U.S. commercial space sector for national security;. and cooperating with allies and international partners for collective security or mutual defense of space is also a key element of our national security objectives. In the mid-term, ensuring the USG is acquiring NASA's security space capabilities at a speed that is relevant to the threat is critical; ensuring domain awareness, indications, warning, and attribution of hostile actions in space is also very critical; and finally, shaping activities in cislunar space and sustaining U.S. strategic advantages across the Earth-Moon system.



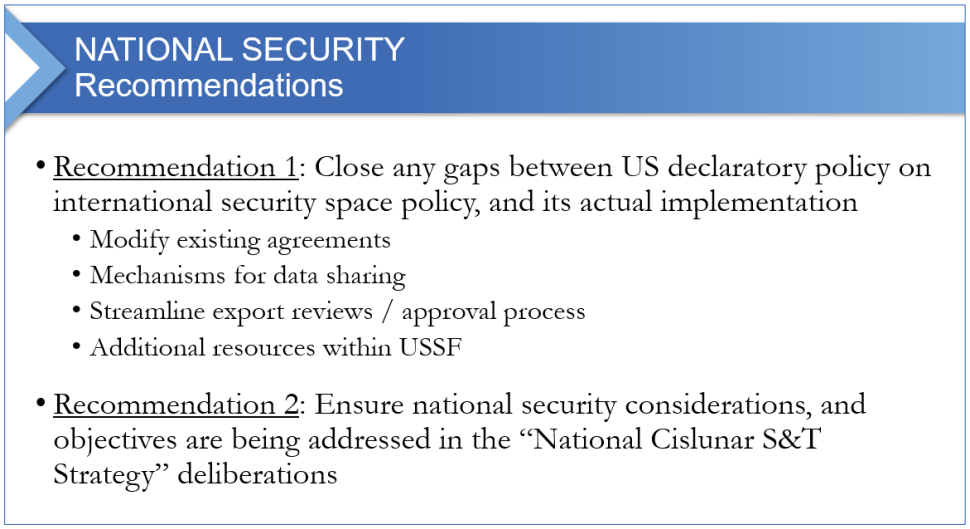
Slide 10

These messages relate to the theme of international collaboration with allies and adversaries, in some cases, which is key to national security space (Slide 11). However, there's a gap between the intent of the declarations the U.S. has made on international security aspects of space policy and how it is being implemented. This forms the heart of the subcommittee's recommendations.



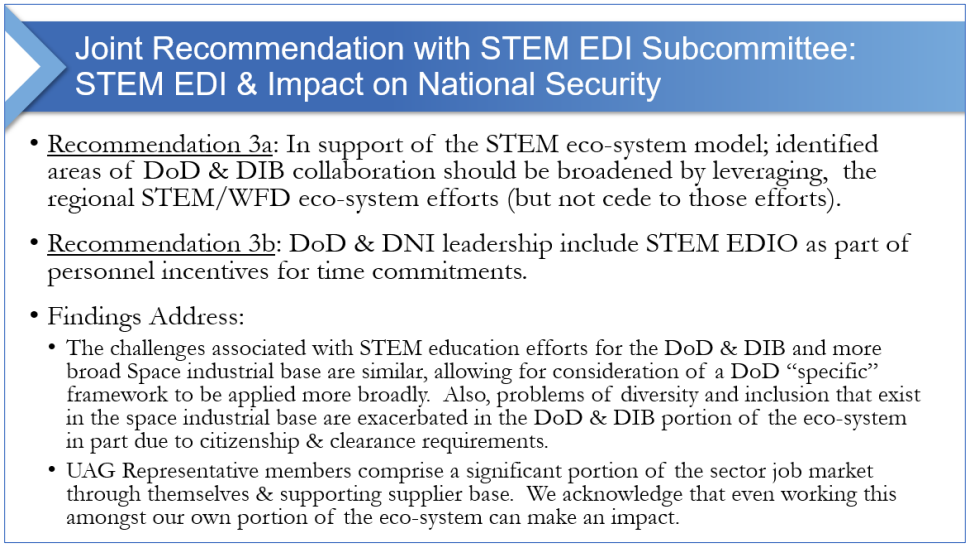
Slide 11

The first recommendation is that the process for review and approval of export control and data sharing agreements, and the processes for sharing that data, need to be streamlined (Slide 12). Recommendation one deals with the international cooperation mixture. There are two elements to this recommendation. The first is to close any gaps between those declaratory policies the U.S. has made about international security and the implementation of those policies. This may mean modifying existing agreements (the subcommittee included some recommendations on this issue in a white paper). The recommendation suggests analyzing different streamlined mechanisms for data sharing with allies, and streamlining export reviews and the approval processes. The subcommittee also touches upon the fact that if USSF is a major element of this, they recommend that USSF address the international cooperation activities using additional resources. The second recommendation relates to a comment that came from Mr. Taiclet earlier. The USG needs to ensure that where there is ongoing dialog, activity, and development of Cislunar space, that national security is a major element of those of deliberation. These are the two primary recommendations that the subcommittee has that deal with both national security and international cooperation.

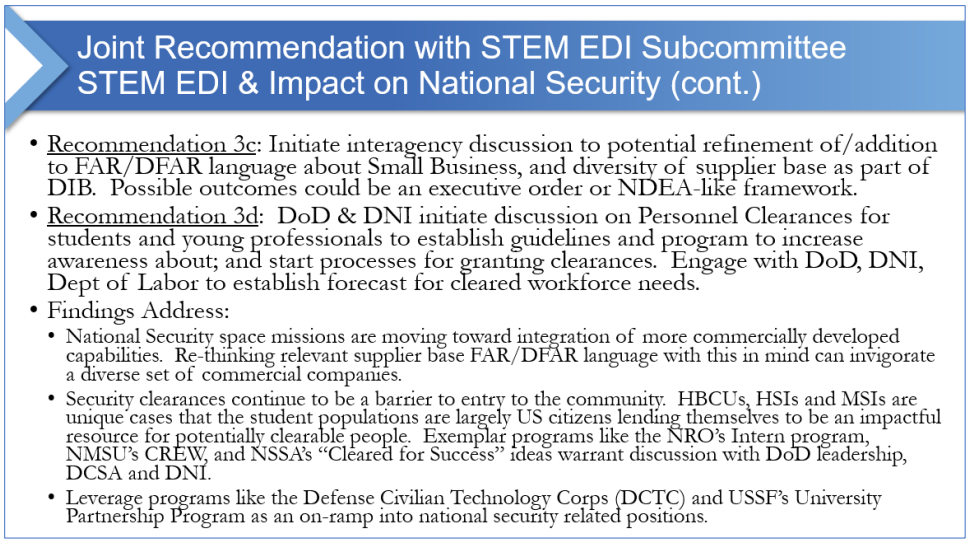


Slide 12

The other two recommendations relate to the STEM workforce, which Ms. Vaughn has already addressed (Slides 13-14). This subcommittee will provide these to the NSpC built upon what has already been presented. This will be a joint recommendation which addresses interagency discussions about needs, personnel, clearances, etc.



Slide 13



Slide 14

In future meetings, the National Security Subcommittee will be addressing other elements that deal with the national security space. They are setting up a series of meetings with stakeholders who are involved in this to help refine ideas, findings, and recommendations. For the subcommittee members, Gen. Lyles stated that he will be working with them over the next couple of weeks to establish dates and locations for those meetings so they can have broader inputs for national security ideas that they will present at the next UAG meeting.

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Responses to Public Comments

Gen. Lyles asked Mr. Miller if there were any comments from the public regarding any of the recommendations presented today.

Mr. Miller stated that there were no questions in the queue as of that moment. The UAG will make sure to answer questions that may arrive later.

***

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

Gen. Lyles thanked all of the UAG members. There has been a lot of work going on behind the scenes, and the UAG will continue this work in the future. Next steps will include working with the NSpC Office to refine and package the recommendations, as discussed today. There will also be follow-up meetings taking place and additional subcommittee fact-finding meetings will be scheduled.

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

The meeting was adjourned at 2:00 PM Eastern Time.

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Appendix A: Agenda

National Space Council Users' Advisory Group

Friday, December 1, 2023, Users' Advisory Group (UAG) Meeting Agenda

Virtual Meeting

(National Space Council UAG Portal: https://www.nasa.gov/usersadvisorygroup)

(Meeting Livestream: https://www.youtube.com/@nspcuag/streams)

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

11:00-11:05 (5 min)	**Users' Advisory Group Convenes** *Call to Order, Logistics, & Announcements*	Mr. James J. Miller, *Executive Secretary, UAG, NASA HQ*
11:05-11:15 (10 min)	Meeting Goals & Objectives	Gen. Lester Lyles (USAF ret.), *Chair, UAG*
11:15-11:45 (30 min)	Strengthening International Engagement and Partnerships in Space	Ms. Valda M. Vikmanis Keller, *Director, Office of Space Affairs, Bureau of Oceans and International Environmental and Scientific Affairs, Department of State*
11:45-13:45 (2 hours)	**Subcommittee Updates (20 mins each)** *Proposed Findings & Recommendations*	**Subcommittee Chairs**
11:45-12:05 (20 min)	Exploration and Discovery	Dr. Lance Bush
12:05-12:25 (20 min)	Economic Development and Industrial Base	The Hon. Eric Fanning
12:25-12:45 (20 min)	Climate and Societal Benefits	Dr. Kate Marvel
12:45-13:05 (20 min)	Data and Emerging Technology	Dr. Dan Hastings
13:05-13:25 (20 min)	STEM Education, Diversity, and Inclusion	Ms. Mandy Vaughn
13:25-13:45 (20 min)	National Security	Gen. Lester Lyles (USAF ret.)
13:45-13:55 (10 min)	Responses to Public Comments per Inputs to: contact@spacecounciluag.org *(Time Permitting)*	All members, led by Chair
13:55-14:00 (5 min)	Next Steps and Closing Remarks	Gen. Lester Lyles (USAF ret.), *Chair, UAG*
14:00	**Adjourn**	

Public Input:

To submit a question, comment, or idea to the UAG, please use the following e-mail: **contact@spacecounciluag.org**

Please note: Anything sent to this email account may be subject to future public release under applicable federal laws and regulations. As such, please do not send information or documents that are classified, proprietary, trade secrets, contain personally sensitive information, or are otherwise inappropriate for public release.

Appendix B: UAG Membership (as of Dec. 1, 2023)

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

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. 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: Participants

UAG Members

Rajeev Badyal
Charlie Bolden
Tory Bruno
Lance Bush
Bridget Chatman
Nancy Colleton
Karina Drees
Eric Fanning
Katrina Harden-Williams
Dan Hastings
Dawne Hickton
Ron Lopez
Lester Lyles
Marla Perez-Davis
Robert Smith
Mel Stricklan
Jim Taiclet
Mandy Vaughn
Kathy Warden
Jeremy Williams

Guests

Tahara Dawkins (National Space Council)
Valda Vikmanis-Keller (Dept. of State)

NASA

Barbara Adde
Nicole Desrochers
Misty Finical
Ken Haygood
James J. Miller
A.J. Oria
Lesha Zvosec

Appendix D: Acronyms and Definitions

AI	Artificial Intelligence
CEO	Chief Executive Officer
COPUOS	UN Committee on the Peaceful Uses of Outer Space
DFAR	Defense Federal Acquisition Regulation
DFO	Designated Federal Officer
DIB	Defense Industrial Base
DNI	See ODNI
DOC	Department of Commerce
DoD	Department of Defense
DOS	Department of State
DOT	Department of Transportation
EIAL	Earth Information and Action Lead
EO	Earth Observation
ESA	European Space Agency
FACA	Federal Advisory Committee Act
FAA	Federal Aviation Administration
FAR	Federal Acquisition Regulation
FCC	Federal Communications Commission
GNSS	Global Navigation Satellite System (e.g., GPS, GLONASS, Galileo, and BeiDou)
GPS	Global Positioning System
HBCU	Historically Black Colleges and Universities
HSI	Hispanic Serving Institutions
IAC	International Astronautical Congress
ICG	UN International Committee of Global Navigation Satellite Systems
ISAM	In-Space Servicing, Assembly, and Manufacturing
ISAM	In-Space Servicing, Assembly, and Manufacturing
ISS	International Space Station
JAXA	Japan Aerospace Exploration Agency
LEA	NASA Annual Lunar / Exploration Architecture
LEO	Low Earth Orbit
MSI	Minority Serving Institutions
NASA	National Aeronautics and Space Administration
NDAA	National Defense Authorization Act
NDEA	National Defense Education Act
NOAA	National Oceanic and Atmospheric Administration
NRO	National Reconnaissance Office
NSpC	National Space Council
NSSA	National Security Space Administration
ODMSP	Orbital Debris Mitigation Standard Practices
ODNI	Office of the Director of National Intelligence
OES	DOS Bureau of Oceans and International Environmental and Scientific Affairs
OSC	Office of Space Commerce
PNT	Positioning, Navigation, and Timing

S&T	Science and Technology
SGE	Special Government Employee
SPD	Space Policy Directive
SSA	Space Situational Awareness
STC	Space Traffic Coordination
STEM	Science, Technology, Engineering and Mathematics
STMD	NASA Space Technology Mission Directorate
TRaCCS	Traffic Co-ordination System for Space
TRL	Technology Readiness Level
U.S.	United States
UAG	Users' Advisory Group
USAF	U.S. Air Force
USG	U.S. Government
USGS	U.S. Geological Survey
UN	United Nations
USSF	U.S. Space Force