



Rationales for Spaceflight – Roger Launius

- **Human Destiny/survival of the species**
 - The image of the frontier
- **Geopolitical/national pride and prestige**
 - Foreign policy and self-image
- **National Security and military applications**
 - From the Cold War to Terrorism
- **Economic competitiveness and satellite applications**
 - Information Technology to New Space
- **Scientific discovery and understanding**
 - Robots, Humans, and both

U.S. National Space Policy

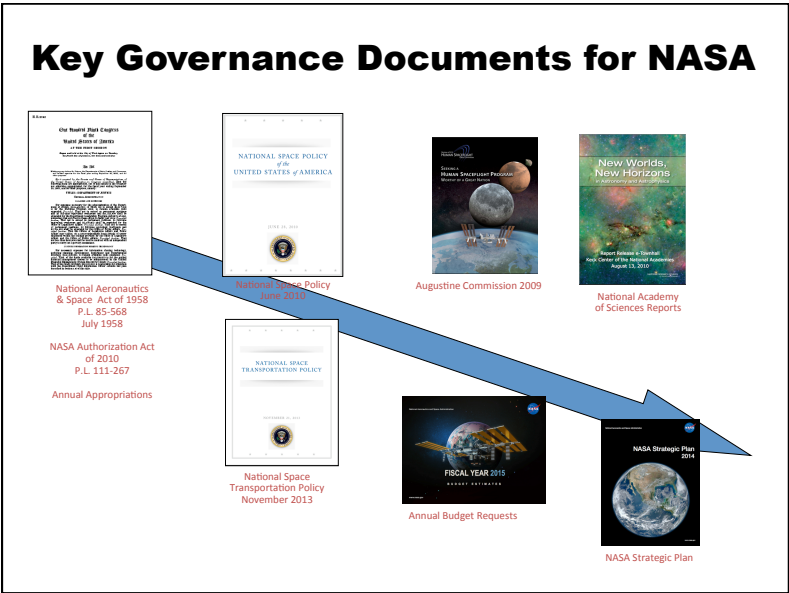
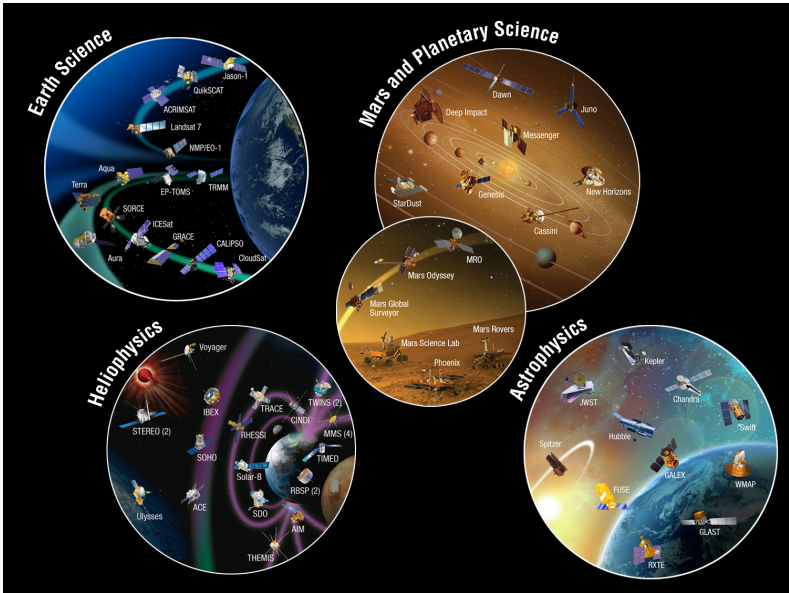
- Recognizes three distinct sectors of space activity:
 - National Security (military, intelligence)
 - Commercial (satellite communication)
 - Civil (including both scientific research and services such as weather forecasting)
- The functions performed by each can be organized along a spectrum, depending on whether they are driven by government or markets

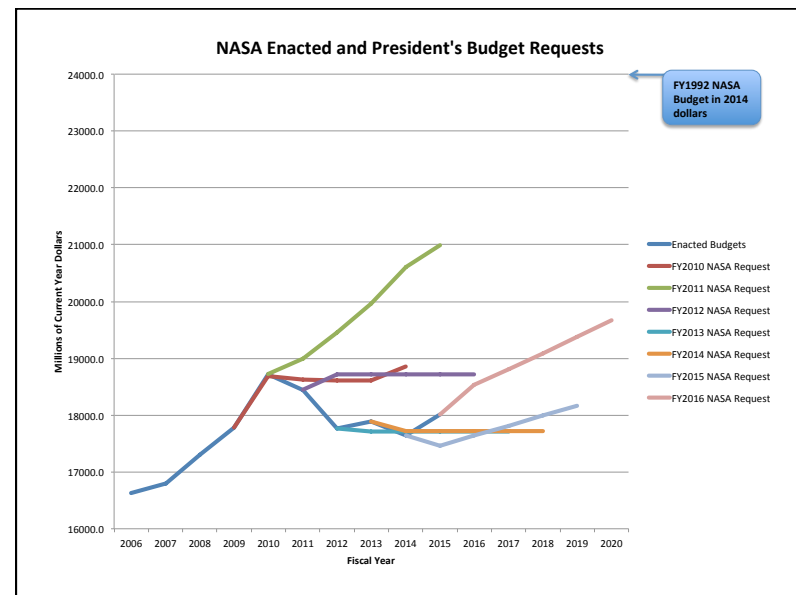
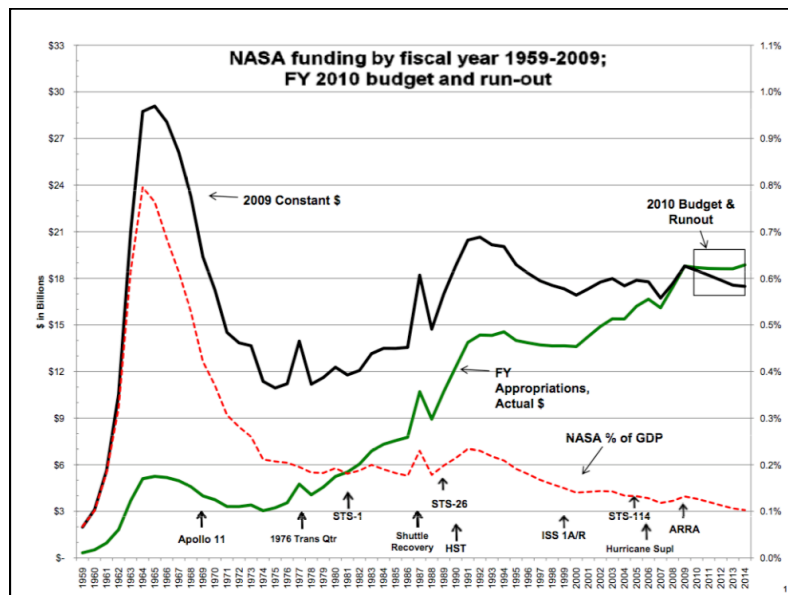
Satellite Communication
(Commercial)

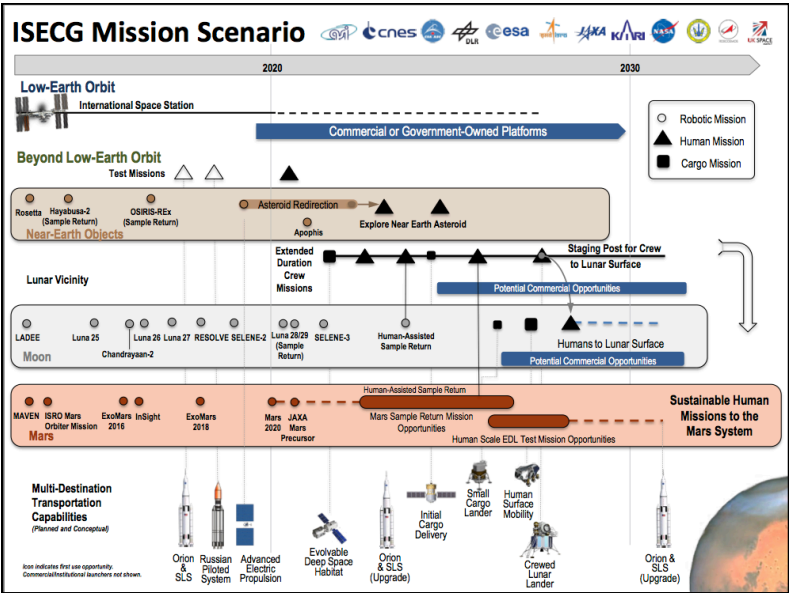
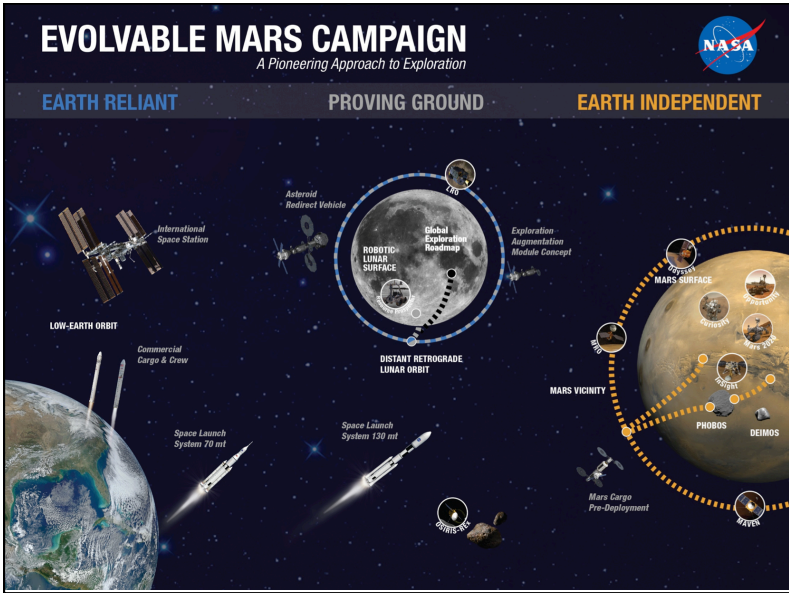
Public Safety
(Civil)

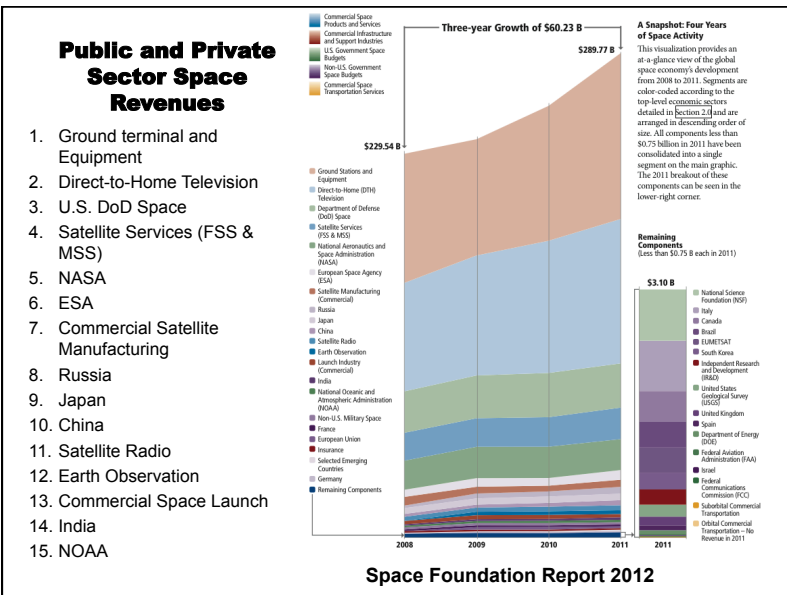
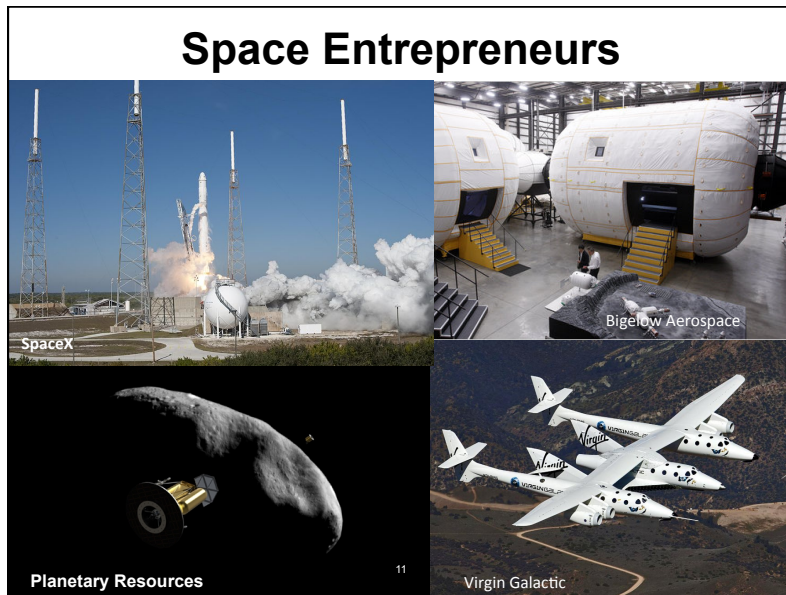
Space-based Weapons
(National Security)











Global Space Trends

- Growing Private Sector Space Investments and Capabilities
 - Small satellites
 - IT and data drivers
- A Changing Space Industrial Base
 - Globalization
- Space Governance
 - Increasing number of State and non-State actors
 - Integration vs. Fragmentation
- Threats to Competitiveness
 - Supply Chain Dependencies
 - RD-180, Pu-238
 - Regulatory Burdens
 - Commercial licensing, esp. remote sensing
 - Space spectrum protection, esp. 1-3 GHz
 - Federal Acquisition Systems
 - Instability in Civil Space Cooperation
 - Post-ISS uncertainty
- Threats from Foreign Counterspace Capabilities
 - China, Russia, others?

U.S Space Policy - 2010

- Identify Areas for Potential International Cooperation. Departments and agencies shall identify potential areas for international cooperation that may include, but are not limited to: space science; space exploration, including human space flight activities; space nuclear power to support space science and exploration; space transportation; space surveillance for debris monitoring and awareness; missile warning; Earth science and observation; environmental monitoring; satellite communications; **GNSS; geospatial information products and services; disaster mitigation and relief; search and rescue; use of space for maritime domain awareness; and long-term preservation of the space environment for human activity and use.** The Secretary of State, after consultation with the heads of appropriate departments and agencies, shall carry out diplomatic and public diplomacy efforts to strengthen understanding of, and support for, U.S. national space policies and programs and to encourage the foreign use of U.S. space capabilities, systems, and services.
- Develop Transparency and Confidence-Building Measures. The United States will pursue bilateral and multilateral transparency and confidence-building measures to encourage responsible actions in, and the peaceful use of, space. **The United States will consider proposals and concepts for arms control measures if they are equitable, effectively verifiable, and enhance the national security of the United States and its allies.**

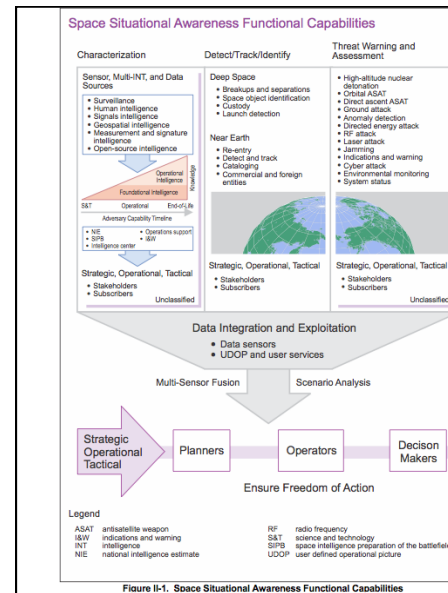
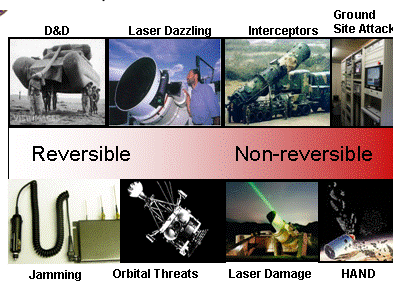
Congested and Contested

Space capabilities are vital to U.S. national and global interest, but face a wide range of maturing threats and challenges

- Congested - increased access to and use of space— orbital crowding; spectrum competition; debris; collision risk
- Contested - Adversaries continue to seek means to deny space advantages

- 2002 - Falun Gong jamming and hijacking TV on Chinese COMSATS
- 2003 - Iran jams Telestar-12 & Iraqis jam GPS
- 2005 - Libya reportedly jams Telestar-12
- 2007 - China tests direct-ascent anti-satellite
- 2008 - Interference on Terra AM-1 & Landsat
- 2009 - Iran launches experimental satellite
- 2009 - Iridium 33 – COSMOS 2251 collision
- 2009 - North Korea space launch attempt fails
- 2010 - Chinese Interceptor test
- 2010 - Iranian SATCOM jamming
- 2012 - North Korea space launch succeeds
- 2013 - Chinese high altitude suborbital test Egyptian Satcom jamming
- 2014 - Chinese non-destructive ASAT test

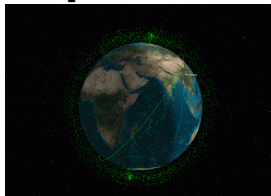
Counter Space Threat Continuum



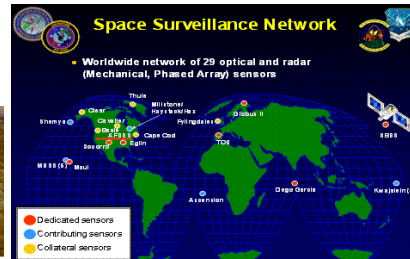
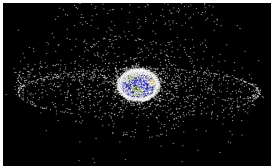
Latest and Fifth Space Mission Area: Space Situational Awareness (SSA)



Space Surveillance & Orbital Debris




- Approximately 17,000 objects larger than 10 cm being tracked in early 2014
- Collision Avoidance for the International Space Station and other major assets
- Surveillance of Asteroids & Comets for science and warning – “potentially hazardous objects”
- NASA estimated over 35,000 pieces of orbital debris larger than 1 cm from 2007 China ASAT test



Guidelines for the Long-term Sustainability of Space Activities

- Developed by UN COPUOS expert working groups over several years (proposed by France in 2009, 2010 agenda item, now on-going)
 - A: Space and Development, B: Orbital Debris, C: Space Weather, D: Regulation
 - EG A-D completed work in February 2014
 - New expert group formed on “information exchange related to space objects and events” in June 2015
- Addressing **sustainability of space activities**:
 - Mitigating and remediating space debris
 - Managing the electromagnetic spectrum
 - Understanding space weather and other natural effects
 - Review existing international mechanisms to improve space safety and sustainability
 - Capacity building for best practices in national regulatory frameworks
- Presented as complementary to higher level political agreements such as International Code of Conduct (ICoC)
- *Technically Based, Bottom Up, Consensus Driven*



United Nations
General Assembly

A/AC.105/L.299/Add.4
Date: Limited
18 June 2015
Original: English


COPUOS Plenary Meeting 2015

- Guidelines for the long-term sustainability of outer space activities
- Controversy over new Members, Workshops

A/AC.105/2015/CRP.15
10 June 2015
English/Russian only

Committee on the Peaceful Uses of Outer Space
Fifty-eighth session
Vienna, 10-19 June 2015

Draft report



Committee on the Peaceful Uses of Outer Space
Fifty-eighth session
Vienna, 10-19 June 2015

COPUOS session 2015: Time for the international community to decide whether it would support an effective set of solutions regarding the enhancement of the safety of space operations or wind up its work on this topic with inconclusive results devoid of any functional load and having marginal practical usefulness

Working paper submitted by the Russian Federation

- Russia sets the task of achieving substantive regulation

1. Throughout the three-year cycle of considering the topic of ensuring long-term sustainability of outer space activities and safety of space operations, the Russian Federation has been consistently developing its own negotiating position with an emphasis on an in-depth view of the existing problems in this field. The Russian side was doing its utmost to ensure success of the negotiations, which can be testified by the history of proposals made by Russia and their steadily increasing level of detail. A solid portfolio of important initiatives has been formed. They are distinguished by a clear logic and calibrated articulation which should appeal to all those States that value fairness in politics. All these initiatives were carefully lined up to ensure a broader array of issues to be addressed, as well as to generate real opportunities for a comprehensive and efficient safety and security regulation in outer space on the basis of an optimal combination of methods and means for

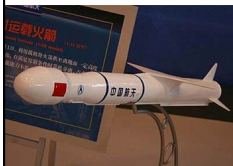
International Space Code of Conduct

- Based on European Union Proposal
 - Positive U.S. reception to Sept 2010 proposal
 - Some problems, e.g., “security guarantees”
- Voluntary, non-binding agreement to improve space security via transparency and confidence building measures as mentioned in the U.S. national space policy
- First formal negotiation session in New York, July 2015
- Key Challenges
 - Outreach to newer space and non-space states
 - “Where have all the good European diplomats gone?”
 - Opposition to negotiations outside the UN system
 - Congressional concerns with creating expectations of a binding treaty and lack of a Senate role
 - Russian objections to Section 4.2 on rationale for the destruction of space objects

Summary of Known or Suspected Chinese ASAT Tests in Space

Date	ASAT System	Target	Altitude Reached	Result
July 7, 2005	SC-19 ²	None known	Unknown (likely LEO)	Likely rocket test
February 6, 2006	SC-19 ³	Unknown satellite ⁶	Unknown (likely LEO)	Likely flyby of orbital target ³
January 11, 2007	SC-19 ⁴	FY-1C satellite ⁴	865 km ⁴	Destruction of orbital target, 3,000+ pieces of orbital debris ⁵
January 11, 2010	SC-19 ⁶	CSS-X-11 ballistic missile ⁴	250 km ⁷	Destruction of target, no orbital debris ⁷
January 27, 2013	Possibly SC-19	Unknown ballistic missile ⁸	Unknown	Destruction of target, no orbital debris ⁸
May 13, 2013	Possibly DN-2	None known	10,000 ¹¹ to 30,000 km ¹²	Likely rocket test ¹⁴
July 23, 2014	SC-19 ¹⁰	None known	Unknown (likely LEO) ¹⁰	Non-destructive test ⁹

Courtesy Secure World Foundation, May 2015



Feng Yun 1C (FY-1C) polar orbit weather satellite, launched in 1999 and destroyed by an ASAT



Excerpts from Senate Testimony, February 2015

- International space cooperation, space commerce, and international space security discussions could be used to reinforce each other in ways that would advance U.S. interests in the sustainability and security of all space activities. At present, however, these activities are largely conducted on their individual merits and not as part of an integrated national strategy.
- The next steps beyond low Earth orbit will require international partners for practical and political reasons. Therefore, it makes sense to ask what our partners would like to do, and what they are capable of doing in the future. The answer is the Moon – with Mars and other destinations in the distance. A U.S. commitment now, to lead a multinational program to explore the Moon would be a symbolic and practical first step as well as a means of creating a broader international framework for space cooperation. At the same time, the geopolitical benefits of improving relations with growing space powers through greater U.S. engagement could support more ambitious space exploration efforts than science alone might justify.
- The United States is crucially reliant on space systems, and the future sustainability and governance of space activities are key strategic interests for us. If we are to have an effective American space strategy, we need to align our policies, programs, and budget priorities with enduring national interests. This means looking beyond individual missions and seeking to determine what future humanity might have beyond the Earth, and what values will be part of that future. I would like those values to include the things we value today – democracy, human rights, the rule of law, and free markets.

What is the Future of Humans in Space?

1. *Can humans “live off the land” in space and function independently of Earth for long periods?*
2. *Are there economically useful activities in space that can sustain human communities in space?*

	Nothing commercially useful	Commercially sustainable
Live off the land	Antarctica	Settlements
Cannot live off the land	Mt. Everest	North Sea oil platform

See also Harry L. Shipman "Humans in Space: 21st Century Frontiers"

- **We do not know which of these outcomes represents our long-term future. Advocates and skeptics may believe one outcome or another is most likely, but no one actually knows**
- **Determining the actual future of humans in space would be a watershed event for the United States and humanity**

6

International Issues and Questions

- Reducing U.S. reliance on Russia for human access to space
- Next steps for Russia – declining industry, increasing isolation, renewed military aggressiveness
- Next steps for China – growing counterspace capabilities, increased regional confrontation, and options for human lunar capabilities
- Will an international space code of conduct be accepted by Russia, China, and other space powers?
- Will India scale up to larger space systems? Will they become commercially competitive? Competition with China?
- Will changes in Japan’s Space Basic Law translate into actual dual-use capabilities? Cooperation with other ASEAN countries?
- Will Europe create a militarily significant space capabilities?
- How will Space Situational Awareness cooperation evolve? Sharing of information on space objects with private sector and governments?
- International frameworks for space commerce: orbital debris, financing, insurance, and property rights. Continuing impacts of U.S. export controls
- Will space exploration develop in a more integrated, multi-polar and regional or a fragmented manner compared to today?

Domestic Space Issues and Questions

- Affordability of discretionary space programs in a budget increasingly pressed by entitlement costs and debt
- How does human and robotic space flight support the priorities of the Administration and Congress?
 - Integration of National Security, International, and Economic interests
 - What will be the policy foundation for human spaceflight post-ISS?
- Contending U.S. military, intelligence, and international objectives
 - Lack of clear accountability below the President
 - Conflicting and changing requirements for space systems
- National security space mission assurance and “rules of the road”
 - Space situational awareness, counterspace weapons, and BMD
- Management challenges in the space industrial base
 - Sustaining government intellectual capital
 - Increasing innovation and constraining cost growth
- Role of space in R&D innovation
 - What is the effectiveness and efficiency of space as a spur for innovation relative to alternative investments?
- What values shape space activities – both domestically and internationally?