Maryland Space Business Roundtable

NASA's Engagement with the Commercial Space Communications Industry to Support NASA Mission Communications

Greg Heckler – Acting Director, SCaN Commercial Communications Services Division
Develop, operate and manage all NASA space communications capabilities

Develop technologies to enable and enhance future mission experience

Manage NASA spectrum; represent NASA on national and international spectrum management forums

Develop space communication standards as well as positioning, navigation, and timing policies

Represent and negotiate on behalf of NASA on all matters related to space communications
SCaN’s Vision, Goal & Strategy

VISION: Interoperable and resilient space and ground communications and navigation infrastructure

GOAL: Enable high speed, robust, secure, and cost-effective space communications and navigation services to future science and exploration missions

- Foster an Affordable and Growing U.S. Space Industry
- Leverage Commercial Capabilities to Increase Efficiency and Robustness of NASA Space Networks
- Infuse Transformational Technologies to Enhance Services Near the Moon and Beyond
- Ensure Efficient Use of Spectrum through Regulatory Oversight and Streamlined Processes
- Provide Technical Leadership in Pursuing and Implementing PNT Policies and Technology
# NASA’s Road to Commercialization

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<th>2005</th>
<th>Today</th>
<th>Beyond</th>
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<td><strong>Commercial Cargo Program</strong></td>
<td><strong>Commercial Crew Program</strong></td>
<td><strong>Low Earth Orbit (LEO) Commercialization</strong></td>
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<td>“What I would like to do is to be able to buy [crew and cargo] services from industry…and utilize the market that is offered by the International Space Station’s requirements” - NASA Administrator Mike Griffin, June 2005</td>
<td>“Embrace the commercial space industry…by contracting with American companies to provide astronaut transportation to the Space Station.” - NASA’s 2011 President’s Budget Request</td>
<td>“Transition in a step-wise approach from the current regime that relies heavily on NASA sponsorship to a regime where NASA could be one of many customers of a low-Earth orbit non-governmental human space flight enterprise.” - NASA Transition Authorization Act of 2017</td>
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<td><strong>SCaN Near Earth Commercialization</strong></td>
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<td>“NASA will define the acquisition strategy for transitioning near-Earth NASA users to suitable commercially provided services.” - NASA’s 2020 Budget</td>
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The Space Communication and Navigation (SCaN) Program Plan is a Natural Next Step in Commercialization of the LEO Space Environment
Plan for Commercial Communications Services

“Divide and Conquer” approach is tailored to market capabilities and risks...

- NASA will no longer build/deploy Tracking and Data Relay Satellites (TDRS); current network can support users into the early 2030’s
- Time required to gradually transition future NASA users
- New commercial SATCOM capability used only for new missions; legacy missions fly out on the Space Network
- Glenn Research Center (GRC) is assigned responsibility for demonstration and initial planning for acquisition of SATCOM services

- Near-term increase in services provisioned by current commercial & partner ground sites
- Infuse new vendors drawing on vibrant and growing market
- Targeting 2023 for 100% commercial service; applies to existing and new missions
- Responsibility assigned to Goddard Space Flight Center (GSFC)
SCaN Commercialization Team

- Overall responsibility for demonstration and acquisition of commercial services
- Lead user transition to commercial services
- Pursue spectrum regulatory changes required to use commercial services
- Invest in supporting technology and standards

- Manage Communications Services Project
- Execute commercial SATCOM demonstrations building on successful commercial cargo approach
- Assess and provide recommendations for operational services
- Perform initial planning for acquisition of SATCOM services

- Operations and management of the Near Space Network
- Engage and solicit new DTE commercial providers from diverse/existing market
- Leads engagement activities that target small, medium, and large commercial providers
- Strategic realignment and divestment of NASA assets as appropriate
Communications Services Project (CSP)

• Commercial industry has invested in capability over the last four decades; significant SATCOM capacity exists today
  – 1980’s: 6 commercial satellites and 200 transponders
  – Today: ~500 satellites and 6,000 transponders

• Significant U.S. commercial SATCOM infrastructure exists, however...
  – Industry capability has been tailored to terrestrial/aeronautical/maritime use and is not yet ready to meet the full breadth of NASA use cases
  – Demonstrations are required to validate technical performance and increase confidence

• CSP will focus on demonstrating the feasibility of commercial SATCOM providing data services to space users
  – Establish public private partnerships to leverage private investment and existing commercial capability
  – Increase confidence and ensure services are ready for operations

• Rolling wave approach of demonstrating new or expanded services over the 2020’s
  – Multiple providers demonstrate services during each demo period
  – Business case, user burden, performance and security to be addressed
  – Nearer term opportunity to meet a subset of user needs
  – As commercial capabilities are matured and demonstrated, broader set of capabilities and user needs will be met

*Companies listed are illustrative of market activity, not indicative of NASA preference or commitments
Commercializing Direct-to-Earth Comms

- Pursue commercial services in accordance with the market:
  - Direct-to-Earth (DTE) service, wherein missions transmit directly to antennas on the ground, is an established commercial market with multiple vendors
- Creates an opportunity for NASA to develop a near-Earth service portfolio with multiple vendors
  - Robust and flexible architecture for the user community; not reliant on a single vendor
  - Contribute to market stimulation and growth
  - Savings in infrastructure, ongoing operations, and maintenance costs to NASA
- NASA team realigned to better support commercial service
  - Virtual network management layer benefits users and providers
- Identifying implementation steps to meet the goal of 100% commercial DTE service by 2023
Engaging with Industry

• **Commercialization, Innovation, and Synergies (CIS) Office** at GSFC – engaging with industry to:
  
  o Foster a more robust and interoperable space communications marketplace
  o Facilitate and increase the industrial base
  o Enhance the collaboration between industry and government
    - Industry leading
    - NASA serving as a cornerstone to drive complete interoperability
    - Shared opportunity for infusion on new and enabling technology to provide for a robust user experience

• CIS is an entry point for small businesses and entrepreneurs to provide niche services and capabilities to the space communications community
Challenges

• Vendor Lock-in and Long-Term Flexibility
  – Without standard interfaces missions run the risk of vendor “lock-in”
  – SCaN is investing in wideband & multilingual user terminals
  – NASA is working to ensure radio frequency regulatory framework is supportive

• Legacy/Backward Compatibility
  – Backward compatibility cannot be addressed by adding hardware to the spacecraft
  – Needs active engagement / evaluation with industry

• Compliance with Government Security Requirements
  – Concerns include co-location of equipment, shared data/network lines, and overall network reliability/resiliency
Embracing Commercial Standards—Leaning into 5G

- NASA pushing to adopt more commercial standards as the LEO commercial space market matures → enable interoperable space
- Extension of 5G communications protocols into space
  - Opportunity for the civil space community to collaborate with 3GPP to bring 5G communications capabilities to space missions
- Capitalize on commercial activity – intersection of space and terrestrial markets creating new opportunity
- Balance opportunity for comms services against spectrum concerns
  - Increasing risk of interference to NASA satellites conducting weather and astrophysics observations from innovations in 5G technology will need to be mitigated

Adapted from: IEEE ACCESS.2020.3022981
What Industry Can Expect Moving Forward

Next steps:

• General: More frequent tempo of industry engagement opportunities
  – GSFC Industry Engagement Activities occurring starting in March 2021
  – Industry days associated with solicitations
  – Periodic RFIs to ensure NASA keeps pace with industry capabilities

• SATCOM Capability Demos:
  – CSP team will proceed through announcement release, industry day, and associated steps on a path to an award by the end of this fiscal year

What NASA is looking for in addition to end-to-end commercial service providers:

• Engagement on interoperability and standards
• Support and engagement in realizing spectrum regulatory change
• Identification of potential common customer/customer groups across commercial and government
• Products or services that support reaching commercialization goals
• Additional opportunities for NASA to invest in commercial capabilities that can be matured into reliable services
Summary

- NASA seeks to provide access to a broader set of commercial capabilities and a streamlined interface for provision of services.
- Commercialization plans will ensure capabilities not only for larger missions, but also for the growing set of SmallSat missions.
- SCaN will continue to provide services to missions; objective is seamless and transparent transition.
- Participation and engagement from industry is critical to meeting NASA commercial communications objectives.