THE COMMERCIAL SPACE SEGMENT MARKET OVERVIEW....A CONSOLIDATED VIEW OF COMMERCIAL SPACE SEGMENT MARKET DATA

Prepared by Monetti & Associates, LLC
Commercial Space Segment
Research & Analysis

Market data courtesy of the Space Authority Space Report 2015;
FAA Commercial Space Transportation (AST) and the Commercial Space Transportation Advisory
Committee (COMSTAC) Forecasts April 2015;
FAA Office of Commercial Space Transportation (FAA AST) Commercial NGSO Forecast 2015; Special thanks
to the Space Authority; FAA Commercial Space Transportation (AST) and the FAA Office of Commercial
Space Transportation (FAA AST) Commercial NGSO; www.aerospace.org & Space and Missiles Systems
Center. This information was provided in their publically available reports.
Introduction

• Today we are seeing an increased interest in the U.S. Federal Government moving towards the use of commercial space services for all aspects of their mission life cycle.

• Market dynamics like Space 2.0 and Enterprise Ground Services are showing strong participation by commercial providers and the investment community.

• This overview is intended to educate those government integrators interested in moving their services into the Commercial Space Sector as well as provide a general overview of trends over the next several years.
Market Research and Analysis
Overview

- Global Overview
- Government vs. Commercial
- Commercial Satellite Service Market Dynamics
- Space 2.0
- Space Economy & Infrastructure Growth
- GSO & NGSO Comparisons
- GSO Launch & Satellite Market Review
- NGSO Launch and Payload Market Review
- Segment Partners
- Start-up Broadband Ventures
- Remote Sensing Satellites
- ISS Cargo and Crew Transport Services
- NASA Cargo and Crew Contracts
- NGSO Payload Projection and Breakdown
- Launch Vehicle Type Projections
Global Space Activity 2014

......After years of steady, respectable growth, the space industry appears to be on the cusp of a new era of rapid expansion in both capabilities and customers. Startup companies are experimenting with novel approaches for building and deploying constellations of spacecraft and delivering services to their customers in new ways. Long-established space operators are refreshing their offerings as well, taking advantage of the latest technology to offer increasingly powerful products at more affordable prices.

Commercial: $251 B (76%)
US Government: $43 B (13%)
Non US Gov.: $36 B (11%)

Courtesy the Space Authority Space Report 2015
## Government vs Commercial

<table>
<thead>
<tr>
<th>Activity</th>
<th>Government</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Budget Environment</strong></td>
<td>Constrained and uncertain</td>
<td>Growth fueled by innovation and venture investment</td>
</tr>
<tr>
<td><strong>How to find and monitor opportunities</strong></td>
<td>Deltek Govwin, Febbizops, relationships, networking, current work programs</td>
<td>Trade Associations, trade shows, seminars, web sites, relationships, current work programs, networking</td>
</tr>
<tr>
<td><strong>Procurement Process</strong></td>
<td>• Sources Sought, RFI, DRFP, RFP, Award, Protests&lt;br&gt;• FARS Compliance, Strong OCI oversight&lt;br&gt;• Timeline: long and uncertain (often years)&lt;br&gt;• Some solutions bid become outdated before they are delivered to users</td>
<td>• Understanding of customer needs, market trends, and the technology landscape to preemptively create innovative solutions&lt;br&gt;• Commercial entity releases requirements to potential prime bidders, form consortiums&lt;br&gt;• Timeline: fast driven by shareholder value and return (often months)</td>
</tr>
<tr>
<td><strong>Industry Outreach</strong></td>
<td>Industry Days, Bidders conferences, government association conferences</td>
<td>Trade shows, web sites, public announcements &amp; news releases.</td>
</tr>
<tr>
<td><strong>Award Criteria</strong></td>
<td>LPTA, Best Value</td>
<td>Price, value proposition/solution, reputation/experience, trusted relationships, references</td>
</tr>
<tr>
<td><strong>Performing the work</strong></td>
<td>PMO, IPT’s, CDR/PDR, government oversight, audited accounting systems</td>
<td>Project manager</td>
</tr>
</tbody>
</table>
Commercial Satellite Services Market Dynamics:

- **DOD use of Commercial Satellite Providers:** DOD has been looking at using commercial satellite services for several years. DISA had released RFI’s in the 2010-2012 time frame to determine the feasibility and cost saving with implementing commercial Satellite services.

- **Space 2.0:** Much like the evolution of the Internet from web 1.0 to web 2.0, Space 2.0 will drive innovation in the communications and surveillance segment that will evolve, fueling more private sector investment and opportunity. More on this on the next slide.

- **Enterprise Ground Systems:** The US Military is pushing to knock down stove-piped proprietary government provided ground control systems for a more ubiquitous, interoperable, resilient, secure space network some of which will utilize commercial operators, launch partners and integrators.

- **Better Economics for Launches:** Despite previous obstacles in efficiency, developments in the market have now made launching satellites infinitely more cost-effective.

- **Satellite Analytics:** In the past decade the satellite analytics market continues to grow at a jaw-dropping pace. *(courtesy SpaceKnow March 2016)*

- **Regulatory Changes:** The US government has recently relaxed restrictions on the resolution of satellite imagery down to 30 cm spatial resolution as seen below right.

- **Global Reach:** The global reach of satellites is gaining new interests and investment from new industries interested in connecting the billions of people who inhabit our planet. Skilled professionals who constitute the Space industry are poised to take a leading role.
Commercial Space Segment Market Research and Analysis (Space 2.0 Explained)

- **The National Security Community:** The security community defines it as the migration from the traditional US-Russia-China dominant space regime (essentially Space 1.0) where space assets dedicated to US government mission needs are migrating to a broader adoption of commercial satellite services with a broader set of country participants.

- **New Levels of Resiliency:** Space 2.0 has resiliency as paramount as critical space and ground based systems could be attacked physically and electronically through cyber attacks.

- **Commercial Space Assets:** Space 2.0 is embracing the growing importance of commercial assets for surveillance, mission critical communications and launch as well as acquisition and O & M.

- **Consumer Demand:** Consumer demand for space manufactured products across several verticals especially pharmaceuticals.

- **Space 2.0 Investors:** The commercial space and investment community are waking up focused on the a number of exiting developments.
  - More Traditional: Launch, remote sensing, communications
  - Less Traditional: Space manufacturing, space tourism, space debris cleanup, and others.

- **New Market Entrants with Deep Pockets:** Google, Amazon, Microsoft and others are springing up well beyond the traditional aerospace firms we are familiar with like Orbital and SpaceX.

- **Space 2.0 Conference:** Recently held in April 2016 see [http://www.space-2-0.com/](http://www.space-2-0.com/). The conference brought together a broad spectrum of these new players and investors.
ENTERPRISE GROUND SYSTEMS OVERVIEW
The U.S. military is preparing to shift away from having multiple independent ground systems in favor of one unified system for its satellite networks. This effort, known as the Enterprise Ground System (EGS), aims to modernize the ground segment for military users, expunging integration and scalability challenges by introducing a more effective system with greater cost efficiencies.

“Our space ground enterprise was designed in a different era for a different time. This is an architecture that must be secure, it must be agile and it must be cost effective,” Lt. Gen David Buck, United States Air Force commander,
HUNTSVILLE, Ala. - August 21st, 2015 — The head of U.S. Air Force Space Command is pressing ahead with an initiative to commercialize some of the service’s satellite operations and move others to a new common ground system.

The top-to-bottom review of the Air Force’s satellite ground infrastructure is driven in part by budget constraints and emerging threats from China and Russia. Air Force leaders want to use uniformed space personnel more for battle management operations and save money on expensive infrastructure.

“Even our newest systems lack required resiliency and survivability,” Gen. John Hyten, commander of Space Command, said in a letter to senior subordinates. “We must retool our entire space architecture to one that can be commanded through a robust common platform.”

- See more at: http://spacenews.com/gen-hyten-pushes-revamp-of-satellite-control-infrastructure/#sthash.8YQ79wv5.dpuf
Commercial Space Segment Market Research and Analysis (Enterprise Ground explained)

- The U.S. Armed Services and Intelligence community cannot afford separate ground systems for each of its satellite constellations.
- The current ground systems control elements remain isolated within constellation they support so there is no interoperability at ground stations across constellations.
- The U.S. government wants to own and control the baseline software release rather than have government contractors charge license fees and hold them hostage for S/W and feature releases driving program costs up.
- Solutions could range from interoperable gateways to connect disparate constellations to more pure outsourced satellite services to commercial providers. Here we believe the government will still have more government managed specialized programs for more granular, higher resolution, surveillance and imaging systems.
- Resiliency and survivability will be paramount requirements pushing up the reliability by implementing backup scenarios that could include rerouting around space segment failures on the ground or directly in space. Link diversity can be another option.
- Securing against Cyber attacks in space that could take out a satellite or entire constellation will be of major importance to the U.S. government.
Enterprise Ground Systems Notional Architecture (1 of 3)

courtesy www.aerospace.org
Virtual Mission Operations Center (VMOC)

courtesy www.aerospace.org
Enterprise Ground Systems Notional Architecture (3 of 3)

Operationally Responsive Earth Ground Station Enterprise for intelligence, surveillance and reconnaissance

courtesy www.aerospace.org
EGS Space and Missile Command Advanced Systems and Development Directorate Phased Approach

Plan
- Phase I
  - Establish Infrastructure
  - Transition

Phase II
- Early Capability Demos

Phase III

Expanded Phase I Tasks and Schedule

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Duration</th>
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<tbody>
<tr>
<td>1</td>
<td>Pre-Kickoff Planning</td>
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<tr>
<td>2</td>
<td>Project Kickoff</td>
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<tr>
<td>3</td>
<td>Establish Working Groups</td>
<td>15 days</td>
</tr>
<tr>
<td>4</td>
<td>East Cost OGA Trip</td>
<td>4 days</td>
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<tr>
<td>5</td>
<td>Working Group Technical Activities</td>
<td>35 days</td>
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<tr>
<td>6</td>
<td>1st Steering Group Review</td>
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<td>7</td>
<td>ISAG TIM</td>
<td>1 day</td>
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<tr>
<td>8</td>
<td>Vector Check Briefings</td>
<td>7 days</td>
</tr>
<tr>
<td>9</td>
<td>2nd Steering Group Review</td>
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<td>10</td>
<td>GSAW Workshop</td>
<td>3 days</td>
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<tr>
<td>11</td>
<td>3rd Steering Group Review</td>
<td>3 days</td>
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<td>12</td>
<td>Preparation of Transition Plan</td>
<td>14 days</td>
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<tr>
<td>13</td>
<td>Stakeholder Review</td>
<td>7 days</td>
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<tr>
<td>14</td>
<td>Target SMC Out Brief</td>
<td>0 days</td>
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<tr>
<td>15</td>
<td>Target AFSPC Out Brief</td>
<td>0 days</td>
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</tbody>
</table>

Envisioning and Shaping the Future of Space

Courtesy Lt Col Matt Kimsal SMC/SDY presentation April, 2015
EGS Space and Missile Command Advanced Systems and Development Directorate Guidance to Industry
.....How can industry help?

• Start preparing to support the target architecture
  – Supporting and maintaining a cloud environment
  – Developing and instituting a set of standard interfaces

• Allow us time to define our needs
  – Need a clearer path forward before involving industry
  – Will reach out after conclusion of 90-day study
  – Look for RFIs in the near-mid term

Courtesy Lt Col Matt Kimsal  SMC/SDY presentation April, 2015
Commercial Space Segment Market Research and Analysis (Economy and Infrastructure Growth)

Space Economy:
- In 2014 launch and ground services, satellite manufacturing, satellite television and communications, government exploration, military spending grew by 9% to $330 billion worldwide.
- Commercial space made up 76% and grew 9.7%. The remainder was composed of government investments in space, which experienced a combined growth of 7.3% in 2014.
- U.S. government and military space budgets comprised about 24% of space spending. NASA’s budget, which grew 4.6% over the 2013 budget, was 53% of what governments around the world invested in space in 2014.

Space Infrastructure:
- Space infrastructure comprised of launch vehicles, satellite operations and services, human spaceflight saw rocket launch attempts increased in 2014 to 92, up 9% from 81 launch attempts in 2013.
- The nature and size of rocket satellite payloads, are changing. Of the nearly 300 satellites launched in 2014, slightly less than half weighed 10 kilograms (22 pounds) or less.
- In 2014, a single Russian space launch vehicle launched and deployed a combination of 33 small satellites and cubesats into low Earth orbit.
Commercial Space Segment Market Research and Analysis (GSO & NGSO)

Combined 2015 GSO and NGSO Historical Launches and Launch Forecasts

General Observations:
• Growth in both NGSO and GSO near term launch forecasts
• Transition to NGSO payloads and launches beginning in 2018
• Transition to smaller NGSO space assets beginning in 2018.

Table 1. Commercial Space Transportation Payload and Launch Forecasts

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<tr>
<td>GSO Forecast (COMSTAC)</td>
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<td>25</td>
<td>26</td>
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<td>--</td>
<td>--</td>
<td>75</td>
<td>25.0*</td>
<td></td>
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<tr>
<td>NGSO Forecast (FAA)</td>
<td>65</td>
<td>136</td>
<td>151</td>
<td>104</td>
<td>92</td>
<td>92</td>
<td>87</td>
<td>86</td>
<td>87</td>
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<td>986</td>
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<tr>
<td>Total Payloads</td>
<td>89</td>
<td>161</td>
<td>177</td>
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<tbody>
<tr>
<td>GSO Medium-to-Heavy</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>--</td>
<td>--</td>
<td>--</td>
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<td>--</td>
<td>--</td>
<td>--</td>
<td>51</td>
<td>17.0*</td>
</tr>
<tr>
<td>NGSO Medium-to-Heavy</td>
<td>13</td>
<td>17</td>
<td>15</td>
<td>13</td>
<td>11</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>119</td>
<td>11.9</td>
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<tr>
<td>NGSO Small</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
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<td>1</td>
<td>0</td>
<td>12</td>
<td>1.2</td>
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<tr>
<td>Total Launches</td>
<td>30</td>
<td>36</td>
<td>37</td>
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* For this edition of the Report, the GSO forecast is limited to the period 2015-2017.

Courtesy FAA Commercial Space Transportation (AST) Forecasts April 2015
Observations:
• The GSO market remains stable
• 2015-2017-demand is projected @ 25 satellites/yr. up from 2014’s average of 22.3 % 2014 – 2016.
• 2015-2017 growth projected @ 35% of GSO satellites which are the heaviest mass class (above 5,400 kg).
• At the same time, 7% of the satellites in the same period are in the lowest mass class (below 2,500 kg).
General Observations:

• Communications will replenish their constellations and NASA ISS cargo and crew will be replenished more regularly.

• Launches expected to grow from 7 to 12 per year.

• The period will see 986 payloads sent from 131 launches indicating a trend towards smaller cluster deployments and multi-manifesting.

The key findings of the Report are:

- The commercial satellite services market is generally robust, and new launch vehicle options have altered the dynamics of the launch industry.
- 24 addressable commercial GSO satellites on 16 launches were planned for 2015 with an annual average of 25 satellites on 17 launches from 2015 through 2017.
- The number of addressable satellites launched in 2014 (16 satellites) remained the same from 2013, continuing a pattern of satellite delays and launch failures.
- The average number of satellites to be launched in the next three years has increased from 22.6 in 2014 to 25 in 2015.
- The number of launches has increased slightly, from 16.3 in 2014 to 17 in 2015 representing a reduction in the overall percentage of dual-manifest launches.

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<tr>
<td>Satellite Demand</td>
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<td>--</td>
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<td>75</td>
<td>25.0</td>
</tr>
<tr>
<td>Launch Demand</td>
<td>16</td>
<td>17</td>
<td>18</td>
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<td>--</td>
<td>51</td>
<td>17.0</td>
</tr>
<tr>
<td>Dual Launch Demand</td>
<td>8</td>
<td>8</td>
<td>9</td>
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<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>25</td>
<td>8.3</td>
</tr>
</tbody>
</table>

2015 COMSTAC GSO Forecast Commercial GSO Satellite and Launch Demand
Ariane 5 Mass Class Example:

- The Ariane 5 vehicle has been launching dual-manifested, competitively-procured, commercial launch services missions for more than a dozen years.
- Typically, a satellite of 5,000-6,000 kg flies in the upper slot, along with a satellite of 2,000-3,500 kg in the lower slot. Arianespace has the capacity to conduct up to seven commercial dual manifested launches per year.
- This mass class is shown above in purple.
Commercial GSO Satellite Near-Term Manifest:

- These are the satellites projected to be launched in the next three years.
- The projections for 2015 – 2017 show an increase in the number of satellites to be launched over the previous three years (2012 – 2014).
- These are potential opportunities for Federal industry partners to pursue in 2017 assuming consortium teams have not been solidified.
Commercial Space Segment Market Research and Analysis (NGSO Forecast)

**Market Data Source:** Federal Aviation Administration’s Office of Commercial Space Transportation (FAA AST) 2015 Commercial Space Transportation Forecast for Non-Geosynchronous Orbits

**About the Report:**

- The report projects commercial launch demand for all space systems deployed to non-geosynchronous orbits (NGSO). These include
  - Low Earth orbit (LEO)
  - Medium Earth orbit (MEO)
  - Elliptical orbits (ELI)
  - External trajectories (EXT) to the Moon or other solar system destinations.

- Research and discussions were conducted within the U.S. commercial space industry, including satellite service providers, spacecraft manufacturers, launch service providers, system operators, government offices, and independent analysts.

- The Report examines progress for publicly announced payloads (satellites, space vehicles, and other spacecraft) and considers the following factors
  - Financing; Regulatory developments; spacecraft manufacturing and launch services contracts; investor confidence; competition from space and terrestrial sectors; and overall economic conditions.
Distribution of Forecasted Launches by Payload Segment and Vehicle Size

- 60% of the NGSO launches projected for the next 10 years are for commercial crew and cargo to the ISS.
- The commercial crew launches to the ISS are scheduled for spacecraft still in development, therefore, technical or financial issues could potentially delay the ISS crew launches.
- Other Commercially Launched Satellites, which are predominantly government satellites launched commercially, represent the second largest market @ 21%.
- Commercial remote sensing and telecommunications segments comprise 7% of the launch.
Commercial NGSO Launch History and Projected Launch Plans

- Annual launch rate is considerably higher than in the previous decade
- Commercial space transportation, emerging commercial remote sensing, and telecommunications constellation replenishments drive this increase.
- 2015 – 2018 projections are based on publicly announced launches.
Commercial GSO Satellite Near-Term Manifest:

- These are potential opportunities for federal industry partners to team in 2017 & 2018 assuming consortium teams have not been already solidified
Commercial Space Segment Market Research and Analysis (NGSO Telecom Segment)

Commercial Telecommunications Launch History and Projected Launch Plans
Commercial Space Segment Market Research and Analysis (NGSO Telecom Segment-Broadband)

<table>
<thead>
<tr>
<th>System/Operator</th>
<th>Prime Contractor</th>
<th>Satellites</th>
<th>Mass kg (lb)</th>
<th>Orbit Type</th>
<th>First Launch</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>O3b/O3b</td>
<td>Thales Alenia</td>
<td>Operational</td>
<td>700 (1,540)</td>
<td>MEO</td>
<td>2013</td>
<td>Under Development</td>
</tr>
<tr>
<td>Networks Ltd.</td>
<td>Space</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The first four satellites of the constellation launched in 2013. Eight more deployed in 2014. Follow-on satellites are likely, but no construction or launch schedule announced at this time.</td>
</tr>
</tbody>
</table>

Broadband Systems

- These satellites provide high-speed data services at Ka and Ku-band frequencies.
- O3b Networks Ltd. accomplished an initial deployment of its first four satellites in 2013.
- Other market data is available for narrowband and wideband systems but not included in this presentation.
- Thales is one of the companies in our call plan.
Globalstar, Inc & Thales Alenia Space (TAS) & Arianespace/Starsen
Iridium Communications & TAS-Iridium Next & SpaceX
ORBCComm & Sierra Nevada w/ Boeing and former ITT (now Harris) & SpaceX Falcon 9

- Globalstar reported it is in negotiations with TAS for an option to manufacture 23 additional satellites in the coming years. The spacecraft would be spares for the existing fleet and launch as needed.
- The first two Iridium NEXT satellites are currently planned to launch on a Dnepr rocket in late 2015.
- The rest of the Iridium NEXT constellation will launch on seven Falcon 9 launches carrying 10 satellites each.
- Nine Iridium NEXT satellites will remain ground spares.
- ORBCOMM deployed a narrowband constellation of 35 satellites
  - It is the only company to have fully deployed a system that provides low-bandwidth packet data services worldwide to serve the M2M IoT market.
Commercial Space Segment Market Research and Analysis (Start-up Broadband Ventures)

**O3b**
- O3b Networks, headquartered in St. John, Jersey, Channel Islands, provides broadband connectivity to underserved parts of the world.
- O3b has high profile investors, including, Google, HSBC, Liberty Global, and major GEO commercial satellite operator SES.
- O3b Networks provide high capacity, fiber-like backhaul to Mobile Operators backhaul and connectivity to maritime clients, in partnership with Harris CapRock. (We have a meeting scheduled with Harris CapRock VP)

**SpaceX**
- SpaceX submitted to international regulators the documentation for a 4,000-satellite broadband Internet LEO constellation, claimed to begin initial service within five years.

**OneWeb, LLC**
- OneWeb is developing 650 to 900 125- kg satellites operating in LEO at 1,200 km altitude, each providing an 8 Gbps Ku-band Internet access to residential and mobile customers.
- OneWeb founder Greg Wyler (former founder of O3b) reported that the company is currently reviewing potential bidders for manufacturing the satellites and was planning on selecting a prime contractor in spring of 2015. Instead they opened their own manufacturing plant near Cape Canaveral
- Major investors include Qualcomm and Virgin Galactic
Commercial Remote Sensing Systems:

- Aerial imagery
- Satellite imagery
- Value-added services including geographic information systems (GIS)
- Satellite imagery market is composed of companies that acquire and operate their own remote sensing satellites
- These include Airbus Defense and Space, BlackBridge, DigitalGlobe, DMC International Imaging, ImageSat, MDA Geospatial Services, Planet Labs, and Skybox Imaging as well as new companies, like Spire and HySpecIQ
Peaks can be seen during 2016 through 2019, reflecting projected deployment of satellites operated by Airbus Defense and Space, BlackBridge, DigitalGlobe, ImageSat, MDA, Planet Labs, and Skybox.

Nearly 800 commercial remote sensing satellites are projected to be launched through 2024.

The vast majority of these will be microsatellites, including CubeSats, specifically those operated by Planet Labs.
Seventy-nine commercial cargo and crew launches are projected from 2015 to 2024. All the launches forecasted in the next ten years are in support of commercial crew and cargo resupply to the ISS.
NASA Commercial Crew and Cargo Projections

• This shows the distribution of ISS commercial cargo and crew flights from 2015 to 2024.
• Note that the first test flights of Falcon 9 and Antares were not funded by NASA.
NASA Commercial Crew and Cargo Awards:

- This describes NASA COTS, CRS, and CCDev Awards.

<table>
<thead>
<tr>
<th>Program</th>
<th>Year of Space Act Agreement</th>
<th>Value of Space Act Agreement</th>
<th>Companies</th>
<th>Vehicles and Technologies</th>
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<tr>
<td>COTS</td>
<td>2006</td>
<td>$396 million</td>
<td>SpaceX</td>
<td>Dragon</td>
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<tr>
<td>COTS</td>
<td>2006</td>
<td>$207 million</td>
<td>Kistler*</td>
<td>K-1</td>
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<tr>
<td>CRS</td>
<td>2008</td>
<td>$288 million</td>
<td>Orbital</td>
<td>Cygnus</td>
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<tr>
<td>CRS</td>
<td>2008</td>
<td>$1.6 billion</td>
<td>SpaceX</td>
<td>Dragon (12 flights)</td>
</tr>
<tr>
<td>CRS</td>
<td>2008</td>
<td>$1.9 billion</td>
<td>Orbital</td>
<td>Cygnus (8 flights)</td>
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<tr>
<td>CDev</td>
<td>2010</td>
<td>$20 million</td>
<td>Sierra Nevada Corp.</td>
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<tr>
<td>CDev</td>
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<td>$18 million</td>
<td>Boeing</td>
<td>CST-100</td>
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<tr>
<td>CDev</td>
<td>2010</td>
<td>$6.7 million</td>
<td>United Launch Alliance (ULA)</td>
<td>Atlas V human rating</td>
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<tr>
<td>CDev</td>
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<td>$3.7 million</td>
<td>Blue Origin</td>
<td>Launch abort systems</td>
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<td>2010</td>
<td>$1.4 million</td>
<td>Paragon Space</td>
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<td>Boeing</td>
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<tr>
<td>CDev2</td>
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<td>Unfunded</td>
<td>ATK/Astrium</td>
<td>Liberty development</td>
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<td>Boeing</td>
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<tr>
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</table>
• Demand for commercial GEO launches are expected to stay steady, while commercial NGSO launches are expected to increase significantly as major NGSO telecommunication constellations are replenished and NASA ISS commercial crew and cargo resupply missions become more regular.

• The annual average of NGSO commercial launches is expected to grow from an annual average of seven launches a year to over 13 launches annually.

• From 2015 to 2024, 986 payloads are projected to launch commercially, driving 131 launches with multi-manifesting.
This table provides the specific numbers of payloads, associated launches and launch vehicle types for each segment annually.
• This illustrates launch demand by launch vehicle mass class.
• The relatively high cost of a dedicated launch on a small launch vehicle compared to a secondary or piggyback payload on a larger vehicle has kept the demand for small launch vehicles low.
• Many small payload operators are tied to government funding or national launch capabilities (e.g. U.S. university missions getting free rides through programs like NASA’s ELaNa).
Monetti & Associates provides space segment and satcom market research, business development, capture and engineering consulting services to both Government and Industry. Visit our web site to learn more or just contact us directly at 301-514-7992 for a complimentary consultation.

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Special thanks to the Space Authority; FAA Commercial Space Transportation (AST) and the FAA Office of Commercial Space Transportation (FAA AST) Commercial NGSO; www.aerospace.org & Space and Missiles Systems Center for the information provided in their publically available reports.

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