VENTURE CLASS LAUNCH SERVICES

Mark Wiese
Launch Services Program
LSP Vision
To be the recognized leader in launch services

LSP Mission
Leadership and expertise in providing on-orbit, on-time, on-cost launch services

LSP Goals:
Goal 1: Maximize Mission Success
Goal 2: Assure Long-Term Launch Services
Goal 3: Promote Evolution of a US Commercial Space Launch Market
Goal 4: Continually Enhance LSP’s Core Capabilities
Feedback drove strategy to demonstrate contracting flexibility
CSLI provides NASA Centers, educational & non-profit organizations opportunities to fly small satellite payloads on upcoming launches.

Graphics below represent a snapshot of CSLI selections vs. launches before LSP’s Venture Class Launch Services (VCLS) contract awards.
Requirement Evolution

- Initial NEXT Contract Awarded in Fall of 2013 (w/2016 launch)
  - CubeSat’s serve as primary payload, high risk tolerant
  - Contracted for 15kg to LEO
  - Industry maturing to support micro-sat commercial space
  - Multiple commercial providers attempting to be first to market

- Following award, SMD’s Earth Sciences Division expresses interest to further study potential launch solutions for future Earth Venture class missions launching NET 2019

- LSP releases NEXT-XL RFI in Summer of 2014

- LSP/SMD partners on development of NEXT-XL requirement

- NEXT-XL Demo renamed to Venture Class Launch Services (VCLS), with approval of strategy, and securing of funding to award to multiple providers
  - draft RFP targeted for Spring 2015, w/award planned for Fall of 2015
VCLS Overview

- Firm-Fixed Price contract of a demonstration flight, with three separate providers
  - Firefly Space Systems
  - RocketLab USA
  - Virgin Galactic

- Milestone-based payment structure; limited NASA insight through milestone reviews

- Minimum 60kg to LEO (425km), orbit inclination of providers choosing (within 33 – 98 degrees), launch date no later than April 15th, 2018

- Companies responsible for Launch Vehicle development

<table>
<thead>
<tr>
<th>Event</th>
<th>Typical Payment Months Before/After Milestones*</th>
<th>Payment Amount Percentage</th>
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<tbody>
<tr>
<td>Kick Off Meeting</td>
<td>NET Award</td>
<td>5</td>
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<tr>
<td>System Requirements Review (SRR)</td>
<td>NET Award + 2 Weeks</td>
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<tr>
<td>Preliminary Design Review (PDR)</td>
<td>NET SRR + 3 Months</td>
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<tr>
<td>Critical Design Review (CDR)</td>
<td>NET PDR + 6 Months</td>
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<td>Qualification Testing (QT)</td>
<td>CDR + 3 Months</td>
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<td>Qualification Data Review (QDR)</td>
<td>NET QT + 3 Months</td>
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<tr>
<td>Launch Vehicle Readiness Review (LVRR)</td>
<td>NLT L- 3 Months</td>
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<tr>
<td>Flight Readiness Review (FRR)/Launch Readiness Review (LRR) &amp; Launch</td>
<td>NLT L-0</td>
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<tr>
<td>Post-Launch Assessment Report</td>
<td>NLT Launch + 2 months</td>
<td>20</td>
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CSLI Post VCLS

NASA’S CUBESAT LAUNCH INITIATIVE (CSLI)

CUBESATS are small research spacecraft called nanosatellites, built to standard dimensions of 10x10x11 cm.

CSLI provides opportunities for small satellite payloads to fly on upcoming launches to NASA Centers, educational & non-profit organizations.

CubeSats sizes are in standard 10x10x11 cm units, or U: 1U, 2U, 3U, or 6U, usually weighing less than 3 lbs per U. This is about the weight of a half gallon of milk.

7 YEARS
• Proof of Concept 2008
• 1st Initiative: 2010
• 7th Initiative 2015

119 CUBESAT MISSIONS SELECTED

95% of those selected have been offered a launch

400 Pre-K – 8 students built the 1st CubeSat deployed into space by an elementary school in May 2016.

66 UNIQUE ORGANIZATIONS

51 UNIVERSITIES

32 STATES SELECTED TO LAUNCH A CUBESAT

PAYLOAD FOCUS AREAS

67% Technology Demonstration

50% Scientific Research

55% Education

g.o.nasa.gov/CubeSat_initiative
VCLS Impact

Beyond CubeSats, NASA LSP’s VCLS initiative

- Helps enable the market for low end of performance range
- Provides LSP early influence & insight to emerging providers
- Demonstrates LSP’s flexibility in contracting and approach
- Opens the door to affordable and dedicated NASA SmallSat launches

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