NASA Supply Chain Network Survey Results

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Office of Technology Evaluation

NASA Supply Chain Quality Assurance Conference
Goddard Space Flight Center
Office of Technology Evaluation (OTE)

MISSION:
OTE is the focal point within BIS for assessing:

- The effectiveness of export controls
- The capabilities of the U.S. industrial base to support the national defense
OTE Industry Assessments

- Background

- Defense Production Act of 1950 and Executive Order 12656 provide broad authority to analyze:
  - Economic health and competitiveness
  - Defense capabilities and readiness

- Conduct surveys of industry and organizations

- Enable industry and government agencies to:
  - Monitor trends and benchmark industry performance
  - Raise awareness of diminishing capabilities
NASA Supply Chain Network

✓ OTE Survey Assessment Aims

- Determine viability of this supplier segment
- Measure impact of Shuttle/CxP cancellation on capability
- Understand what suppliers do for NASA/other agencies
Sample Business Lines

- Manufacturing: 315
- Distribution: 98
- R&D: 74
- Product and Design Engineering: 65
- Professional Services: 62
- Reseller: 40
- Service: 39
- Material Finishing: 35
- Testing/Evaluation/Validation: 30
- Raw Materials: 30
- Manufacturing Systems D&M: 22
- Material Preparation: 21
- Maintenance/Aftermarket: 20
- Inspection and Quality Control: 16
- Integration: 16
- Other: 13
- Retail: 1

3 business lines per survey ranked by net sales

897 business lines identified
Methodology: Tiering

<table>
<thead>
<tr>
<th>Tier</th>
<th>Net Sales (2009)</th>
<th>Number of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&gt; $200 Million</td>
<td>101</td>
</tr>
<tr>
<td>2</td>
<td>$25 – 200 Million</td>
<td>155</td>
</tr>
<tr>
<td>3</td>
<td>&lt; $25 Million</td>
<td>280</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>536</strong></td>
</tr>
</tbody>
</table>

Tiering not based on contractual relationship
Respondent U.S. Location

- **California**: Tier 1 (16), Tier 2 (29), Tier 3 (66)
- **Florida**: Tier 1 (3), Tier 2 (14), Tier 3 (32)
- **Alabama**: Tier 1 (1), Tier 2 (8), Tier 3 (22)
- **New York**: Tier 1 (10), Tier 2 (17)
- **Other**: Tier 1 (9), Tier 2 (4), Tier 3 (12)
- **Utah**: Tier 1 (5), Tier 2 (19)
- **Texas**: Tier 1 (9), Tier 2 (4), Tier 3 (12)
- **Pennsylvania**: Tier 1 (6), Tier 2 (11)
- **Ohio**: Tier 1 (6), Tier 2 (7), Tier 3 (8)
- **Massachusetts**: Tier 1 (4), Tier 2 (11), Tier 3 (4)
- **Virginia**: Tier 1 (9), Tier 2 (4), Tier 3 (4)
- **Maryland**: Tier 1 (2), Tier 2 (10)
- **New Jersey**: Tier 1 (2), Tier 2 (3), Tier 3 (10)
- **Colorado**: Tier 1 (6), Tier 2 (3), Tier 3 (5)
- **Illinois**: Tier 1 (2), Tier 2 (8)
- **Washington**: Tier 1 (4), Tier 2 (4)
- **North Carolina**: Tier 1 (4), Tier 2 (4)

- **Tier 1**, **Tier 2**, **Tier 3**
## Method of Sale to NASA

<table>
<thead>
<tr>
<th>Method</th>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 3</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct to NASA</td>
<td>15%</td>
<td>13%</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>Indirectly/Third-Party</td>
<td>21%</td>
<td>35%</td>
<td>36%</td>
<td>33%</td>
</tr>
<tr>
<td>Both Direct and Indirect</td>
<td>52%</td>
<td>42%</td>
<td>40%</td>
<td>43%</td>
</tr>
<tr>
<td>Not Sure</td>
<td>12%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Informs programmatic scope of 2011-2012 “deep dive” collection
Human Space Flight Program Participation

Number of respondents by Tier

- Ares: Tier 1 (40), Tier 2 (58), Tier 3 (73)
- International Space Station (ISS): Tier 1 (45), Tier 2 (58), Tier 3 (62)
- Solid Rocket Booster (SRB): Tier 1 (33), Tier 2 (35), Tier 3 (87)
- Orbiter: Tier 1 (35), Tier 2 (39), Tier 3 (68)
- Orion: Tier 1 (36), Tier 2 (50), Tier 3 (50)
- Crew Launch Vehicle (CLV): Tier 1 (29), Tier 2 (35), Tier 3 (36)
- Ares Upper Stage: Tier 1 (29), Tier 2 (29), Tier 3 (34)
- Space Shuttle Main Engine (SSME): Tier 1 (18), Tier 2 (27), Tier 3 (49)
- Reusable Solid Rocket Motor (RSRM): Tier 1 (20), Tier 2 (21), Tier 3 (46)
- Ares Upper Stage Engines: Tier 1 (18), Tier 2 (22), Tier 3 (34)
- Launch Abort System: Tier 1 (24), Tier 2 (27), Tier 3 (24)
- External Tank (ET): Tier 1 (19), Tier 2 (21), Tier 3 (28)
- Cargo Launch Vehicle (CaLV): Tier 1 (21), Tier 2 (20), Tier 3 (28)
- Extravehicular Activity: Tier 1 (18), Tier 2 (11), Tier 3 (18)
- Altair Lunar Lander: Tier 1 (18), Tier 2 (14), Tier 3 (9)
- Service Module: Tier 1 (10), Tier 2 (13), Tier 3 (12)
Product and Service Category Participation

Percent of 536 respondents

A: Services 59%
B: Spacecraft 55%
E: Propulsion Systems 39%
G: Specialty Materials 29%
D: Computer Hardware and Software 20%
K: Surface Systems 19%
F: Ground Systems 19%
C: Space Electronics 19%
H: Structures 17%
I: Protection Systems 13%
R: End-User Equipment 11%
L: Extra-Vehicular Activity (EVA) 10%
N: Environmental Control and Life Support (ECLS) 10%
Q: Communications and Navigation 9%
O: Environmental Monitoring and Control 8%
J: Dust Management 7%
M: Robotic Systems 7%
P: In-Situ Resource Utilization 5%
Shared Supply Chain

A: Services
B: Spacecraft
E: Propulsion Systems
G: Specialty Materials
D: Computer Hardware and Software
C: Space Electronics
F: Ground Systems
K: Surface Systems
H: Structures
I: Protection Systems
N: Environmental Control and Life Support (ECLS)
L: Extra-Vehicular Activity (EVA)
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53% of Respondents Support DoD End-Users
USG Impacted by Cancellation

- 83 respondents expect their work for other USG agencies to be impacted by loss of Shuttle/CxP
- 207 instances of USG program impacts

Bar chart showing agencies affected by the cancellation:
- NASA: 59
- MDA: 27
- SMDC: 26
- SMC: 26
- ONR: 15
- DARPA: 14
- NOAA: 10
- FAA: 10
- Other: 8
- NRO: 7
- DDR&E: 4
- CIA: 1
Supply Chain Management: Practices and Methodologies

Partnership behavior across the ecosystem
Market Segments Served

- Aerospace
- Defense
- Energy
- Healthcare
- Miscellaneous
- Commercial Space
- Industrial
- Other
- Government
- Automotive
- NASA
- Electronics
- Manufacturing
- Construction/Building
- Raw Materials/Metalworking
- Transportation
- IT Support/Consulting
- Chemical
- Optics/Sensors
- Food/Agriculture
- Telecommunication
- Marine
- Semiconductor

NAICS 3364 “Aerospace Product and Part Manufacturing” benchmark correlation
## To Improve Competitiveness: Last 5 Years

<table>
<thead>
<tr>
<th>Category</th>
<th>All</th>
<th>NASA Dependents</th>
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<tbody>
<tr>
<td>Capability, PP&amp;E Investment</td>
<td>21%</td>
<td>18%</td>
</tr>
<tr>
<td>Cost Reductions, Efficiency</td>
<td>16%</td>
<td>17%</td>
</tr>
<tr>
<td>Automation, Lean Manufacturing</td>
<td>11%</td>
<td>7%</td>
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<tr>
<td>Innovation, R&amp;D, Design</td>
<td>10%</td>
<td>10%</td>
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<tr>
<td>Customer Service, Quality Control</td>
<td>9%</td>
<td>10%</td>
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<tr>
<td>Training, Certifications</td>
<td>8%</td>
<td>11%</td>
</tr>
<tr>
<td>Business Restructuring</td>
<td>8%</td>
<td>7%</td>
</tr>
<tr>
<td>Staff Adjustments</td>
<td>7%</td>
<td>11%</td>
</tr>
<tr>
<td>Marketing Improvements</td>
<td>7%</td>
<td>5%</td>
</tr>
<tr>
<td>Status Quo</td>
<td>3%</td>
<td>4%</td>
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<td>4%</td>
</tr>
<tr>
<td>Status Quo</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td>Staff Adjustments</td>
<td>5%</td>
<td>10%</td>
</tr>
</tbody>
</table>
The Main Issues Affecting Respondents’ Long-Term Viability

- Domestic Competition
- Variability of Demand
- Foreign Competition
- Healthcare
- Government Regulations
- Taxes
- Skills Retention
- Export Controls
- Imports
- Environmental
- R&D Tax Credit
- Other

0% 10% 20% 30% 40% 50% 60%
**Top Policy Changes/Regulatory Reforms Recommended to the U.S. Government**

<table>
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<th>Reform Area</th>
<th>% of 429 Comments</th>
</tr>
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<tbody>
<tr>
<td>Export Control Reform</td>
<td>17%</td>
</tr>
<tr>
<td>Taxes</td>
<td>15%</td>
</tr>
<tr>
<td>Protectionism</td>
<td>15%</td>
</tr>
<tr>
<td>General Regulation</td>
<td>12%</td>
</tr>
<tr>
<td>Small-Medium Enterprise (SME) Concerns</td>
<td>10%</td>
</tr>
<tr>
<td>Other</td>
<td>7%</td>
</tr>
<tr>
<td>Contracting/Procurement</td>
<td>7%</td>
</tr>
<tr>
<td>Healthcare</td>
<td>6%</td>
</tr>
<tr>
<td>R&amp;D (Tax Credits, etc.)</td>
<td>3%</td>
</tr>
<tr>
<td>Space Policy, Including NASA</td>
<td>3%</td>
</tr>
</tbody>
</table>
Mergers and Acquisitions Activity
Non-U.S. Mergers and Acquisitions

- United Kingdom: 16
- Other: 15
- Canada: 12
- Germany: 8
- India: 6
- China: 5
- Sweden: 4
- Singapore: 4
- France: 4
- Australia: 4
- Mexico: 3
- Italy: 3
- Brazil: 3

“Other” includes multiple single country mentions
Leading U.S. Suppliers by State

- California: 566
- Other: 173
- Texas: 138
- New York: 124
- Pennsylvania: 117
- Illinois: 106
- Florida: 95
- Massachusetts: 92
- Ohio: 90
- Arizona: 59
- Alabama: 59
- Minnesota: 56
- Michigan: 54
- Virginia: 53
- New Jersey: 53
- Connecticut: 53
- Utah: 52

1,588 distinct entities identified by respondents
Leading Non-U.S. Suppliers by Country

- Canada: 49 mentions
- Germany: 43 mentions
- Japan: 41 mentions
- China: 39 mentions
- United Kingdom: 33 mentions
- Other: 23 mentions
- France: 21 mentions
- Taiwan: 11 mentions
- Italy: 10 mentions
- Sweden: 9 mentions

152 distinct entities identified by respondents

340 mentions
NASA Customers Supported

- 145 respondents supporting ≥5 NASA facilities
- 44 supporting ≥10 NASA facilities
Space Shuttle, ISS, and Constellation Sales

- Constellation Period Change: 134%
- ISS Period Change: 62%
- Shuttle Period Change: -8%

2007 2008 2009 2010

Billions

Space Shuttle  ISS  Constellation
Space-Related Customer Sales (2007-2010)

- 256 (12%) NASA customers
- 1,890 (88%) Non-NASA customers
- 124 (6%) Non-U.S. customers

Internal customers not included; Top ten space-related customers solicited by dollar amount for 2007-2010

- Constellation Period Change: 134%
- ISS Period Change: 62%
- Shuttle Period Change: -8%

415 responses
Professional Occupations: Difficult to Hire/Retain

- R&D Staff: Hire
- Production Line: Retain
- Sales and Marketing: Hire Retain
- Production Managers/Supervisors: Hire Retain
- Quality Control, Test Operators: Hire Retain
- IT/Network Engineers: Hire Retain
- Administrative Staff: Hire Retain
- Facility Operations, Maintenance: Hire Retain
Research and Development: NASA-related Expenditures

NASA-related R&D on average 30% of respondent R&D expenditures (10% median measure)
Financial Performance: Profitability
Net Profit Margin

HSF Respondents and NAICS 3364 (Aerospace Product and Part Manufacturing)
Financial Performance: Profitability
Respondents Operating at a Loss

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Profit Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>-2.5%</td>
</tr>
<tr>
<td>2008</td>
<td>-3.9%</td>
</tr>
<tr>
<td>2009</td>
<td>-3.2%</td>
</tr>
<tr>
<td>2010</td>
<td>-5.6%</td>
</tr>
</tbody>
</table>

Median Measure: 30
170 suppliers operating at a loss for at least 1 year

150 suppliers dependent on NASA; 46 suppliers exhibited both dependency and operational loss
Future Outlook

- 273 respondents (51%) do not have a plan in place to preserve their capabilities or workforce post-Shuttle/Constellation

- 161 respondents (30%) have modified their business/product lines in response to Shuttle retirement and CxP cancellation

- 289 respondents (54%) want to participate in Commercial Human Space Flight

- 461 respondents (86%) are willing to support future NASA Human Space Flight programs
U.S. Space Industrial Base “Deep Dive”

- Survey of multiple tiers of the U.S. space industrial base—defense, intelligence community, civil and commercial sectors
  - Partnership with USAF, NRO and NASA—other agencies with space activities will be brought in
  - Covers prime contractors, sub-tier suppliers, USG laboratories and facilities and universities
  - Information collected will include USG/Commercial revenue, financial and operational health, production capacity, unique capabilities and technologies, customers and suppliers and more
  - Develop accurate picture of space base, identify supplier dependencies and interdependencies and evaluate needs for USG planning and possible action
  - Late fall 2011 survey dissemination
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