U.S. SPACE INDUSTRY 'DEEP DIVE'

A COLLABORATION BETWEEN THE DOC AND THE USAF, NASA, AND NRO

SECOND WAYPOINT PRELIMINARY FINDINGS

Source: U.S. Department of Commerce, Bureau of Industry and Security,
U.S. Space Industry Deep Dive, Preliminary Data – January 2013.

U.S. Space Industry 'Deep Dive' Assessment - Background

- Partnership with the U.S. Air Force, National Aeronautics and Space Administration, and the National Reconnaissance Office.
- The principle goal is to gain an understanding of the intricate supply chain network supporting the development, production, and sustainment of products and services across the defense, intelligence, civil, and commercial space sectors.
- Objectives:

  a) Map the space industrial base supply chain in unprecedented detail;

  b) Identify interdependencies between respondents, suppliers, customers, and USG agencies;

  c) Benchmark trends in business practices, competitiveness issues, financial health, etc. across many tiers of the industrial base; and

  d) Share data with USG stakeholders to better inform strategic planning, targeted outreach, and collaborative problem resolution.

Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

U.S. Space Industry 'Deep Dive' Assessment - Background (cont.)

- All partners worked together to develop a survey that minimized industry's burden and meet the objectives of all stakeholders.
  - Open and cooperative collaboration between partners was critical to making this assessment as success.
  - All partners will receive the survey data – they know best how to use this information to support their respective missions.

- In June 2012, the 'Deep Dive' survey was distributed to approximately 9,150 organizations, including companies, universities, non-profits, and USG agencies.

- The collection is divided into three, three-month long waypoints. We have reached the second waypoint.

Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Overview of Second Waypoint Data

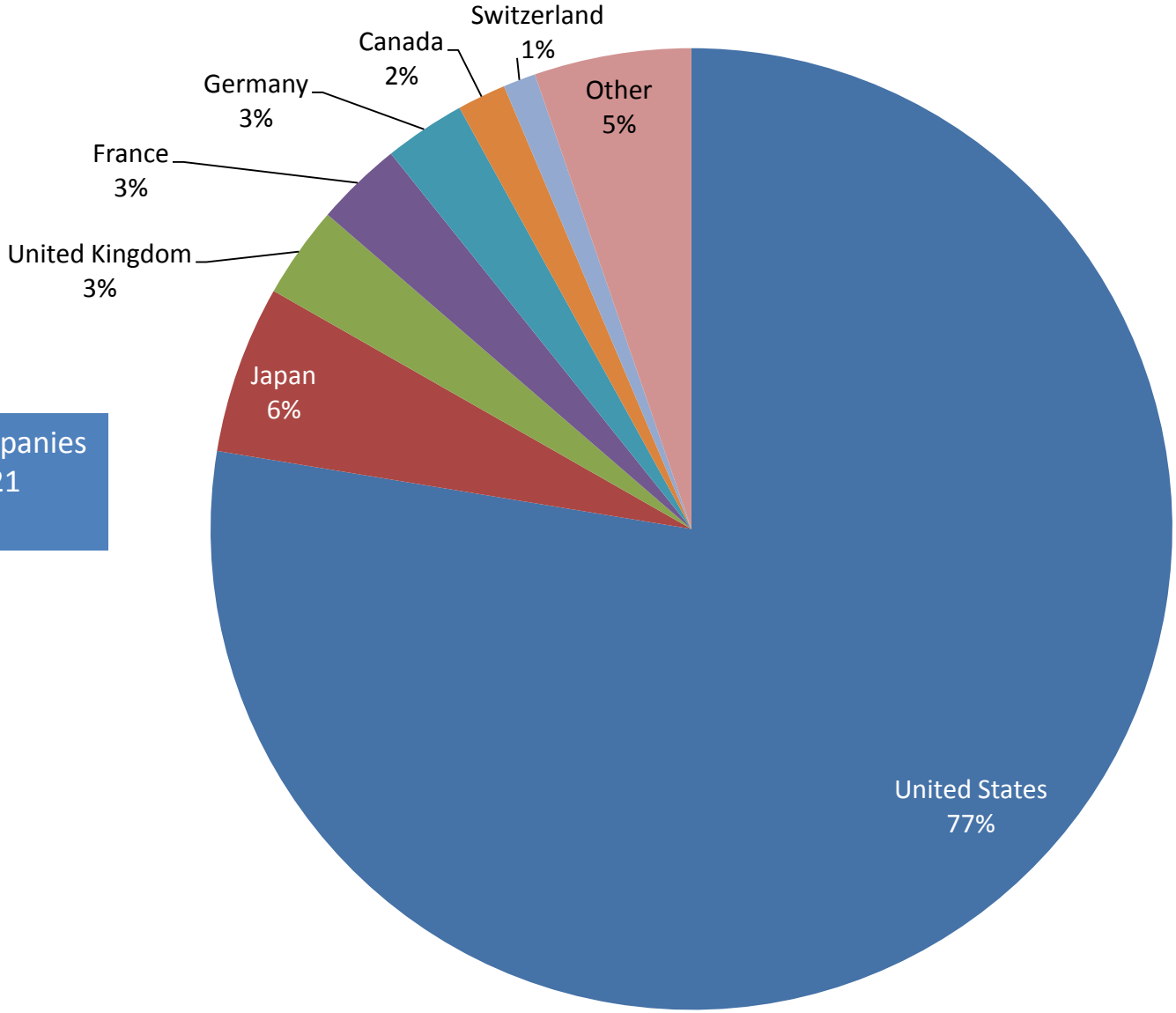
Respondents by Type of Organization	
Commercial Companies	1,892
Universities	83
Non-Profit Organizations	30
U.S. Government Agencies	17
Total	**2,022**

60% Respondents are small businesses, as defined by the Small Business Administration

Second Waypoint Respondents by Average Annual Net Sales (2009-2012)	
Very Small (Less than $10M)	899
Small ($10 – 50M)	508
Medium ($50 – 250M)	289
Large ($250M – 1B)	120
Very Large (Greater than $1B)	89
No Sales	117

Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

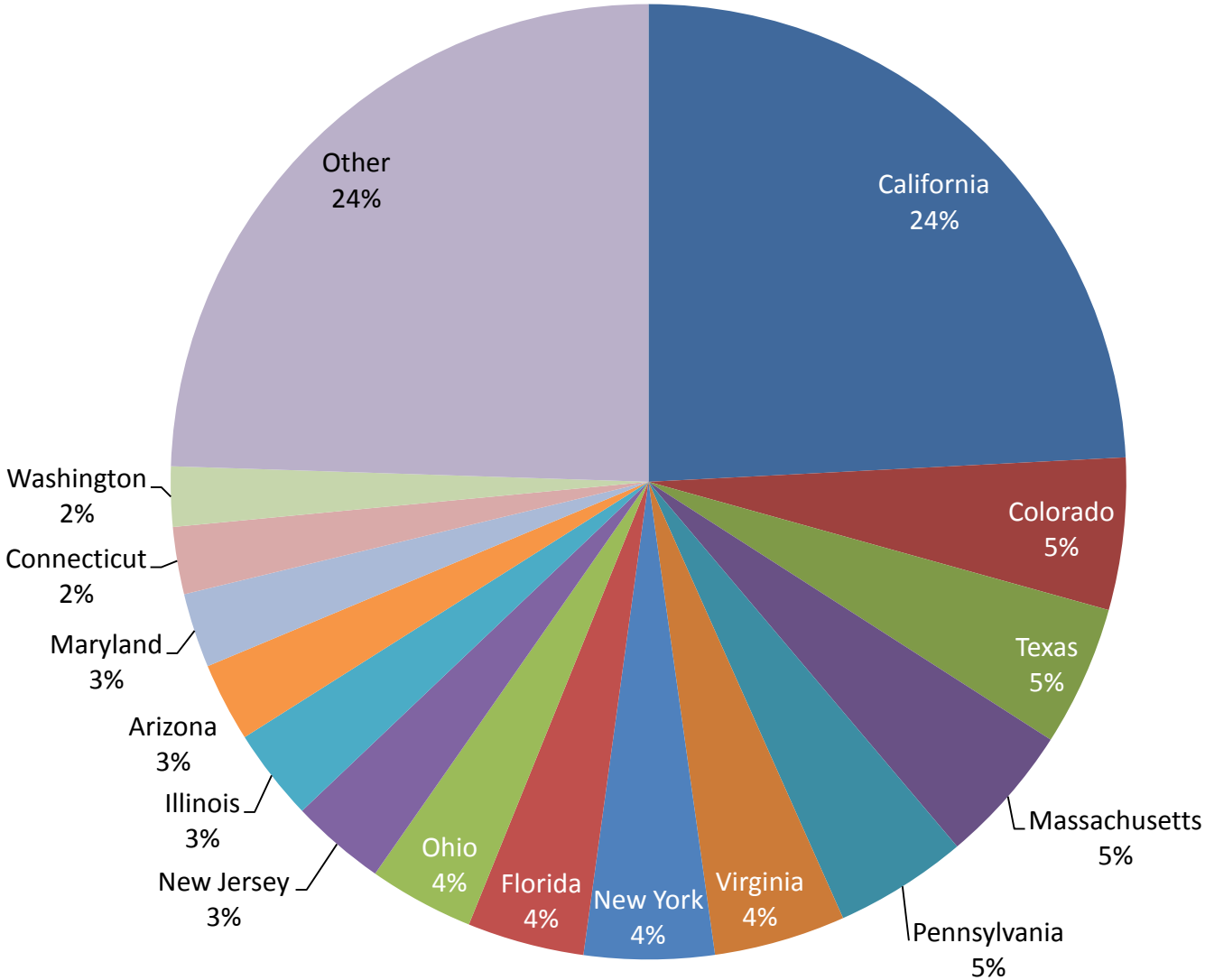
Location of Respondent Parent Companies



Parent Companies Located in 21 Countries

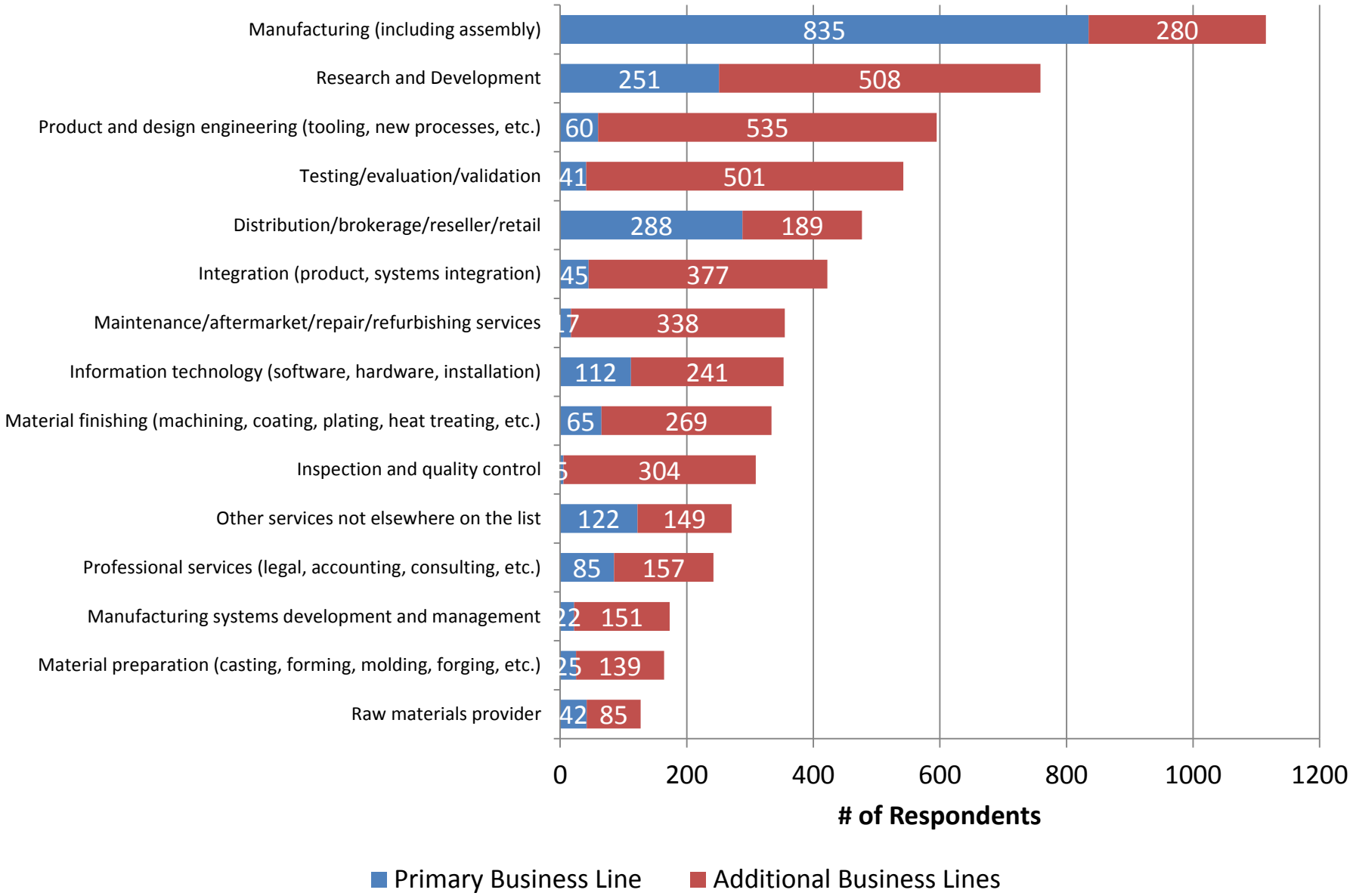
Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

U.S.-Based Respondents by State



Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Respondents' Primary and Additional Business Lines



Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

The Product and Service List

- The Product and Service List is comprised of 360 individual products and services, grouped into 16 general segments.

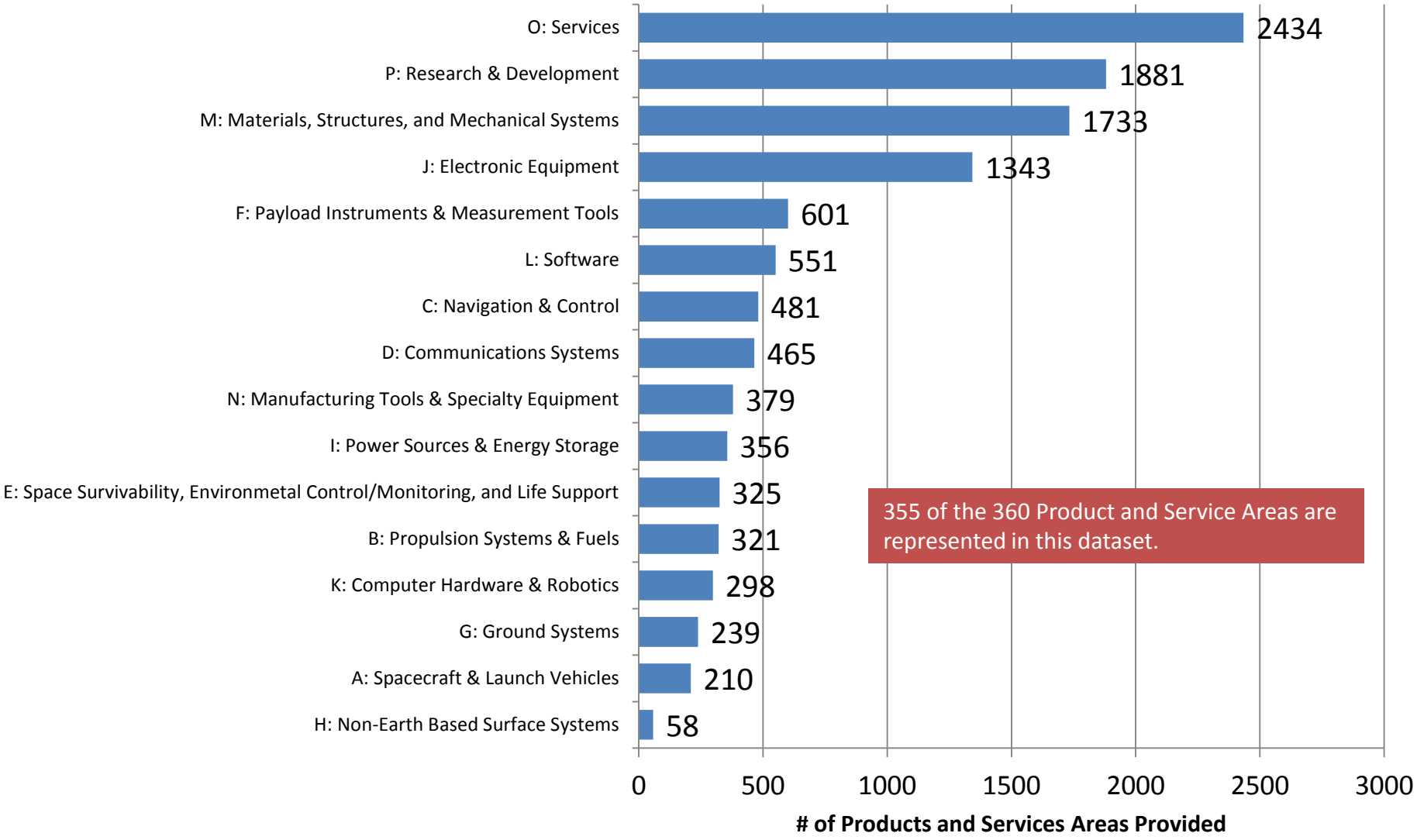
- The list is designed to capture how respondents fit into the space industrial base.

- <u>Product and Service Segments</u>:

A. Spacecraft & Launch Vehicles
B. Propulsion Systems & Fuels
C. Navigation & Control
D. Communications Systems
E. Space Survivability, Environmental Control/Monitoring, and Life Support
F. Payload Instruments & Measurement Tools
G. Ground Systems
H. Non-Earth Based Surface Systems
I. Power Sources & Energy Storage
J. Electronic Equipment
K. Computer Hardware & Robotics
L. Software
M. Materials, Structures, and Mechanical Systems
N. Manufacturing Tools & Specialty Equipment
O. Services
P. Research & Development

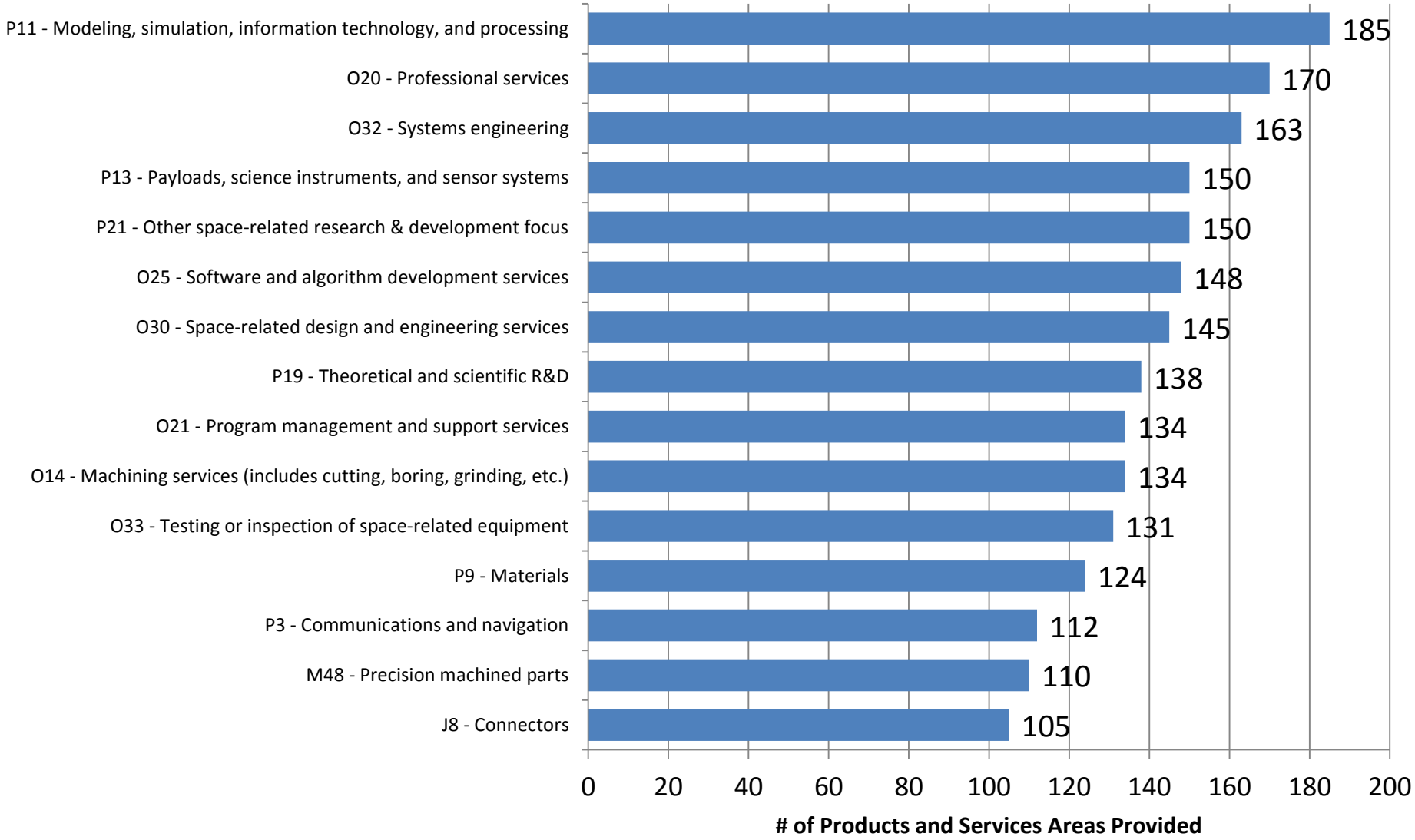
Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Products and Services Provided by Segment



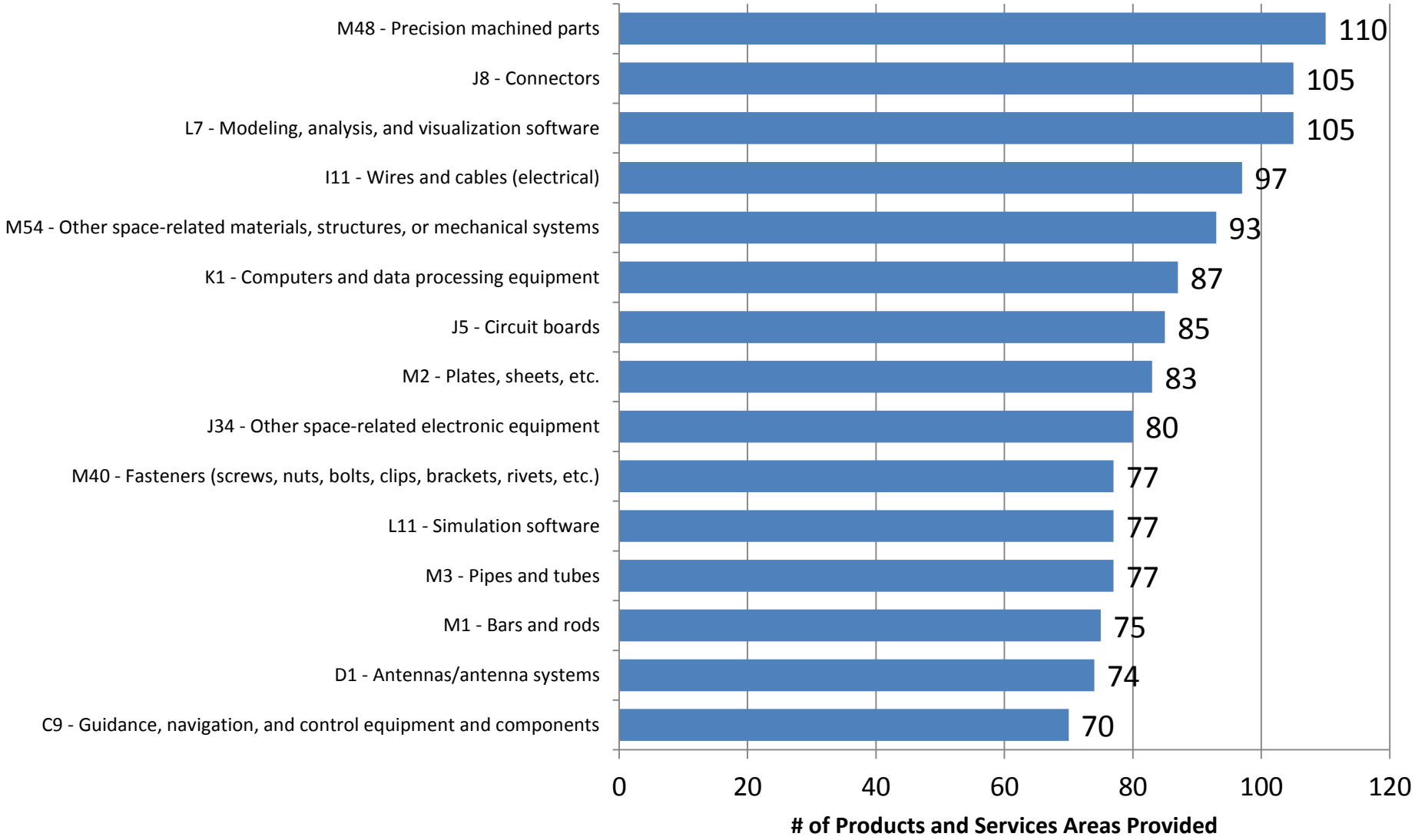
Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Top 15 Product/Service Areas Provided by Respondents – All Segments



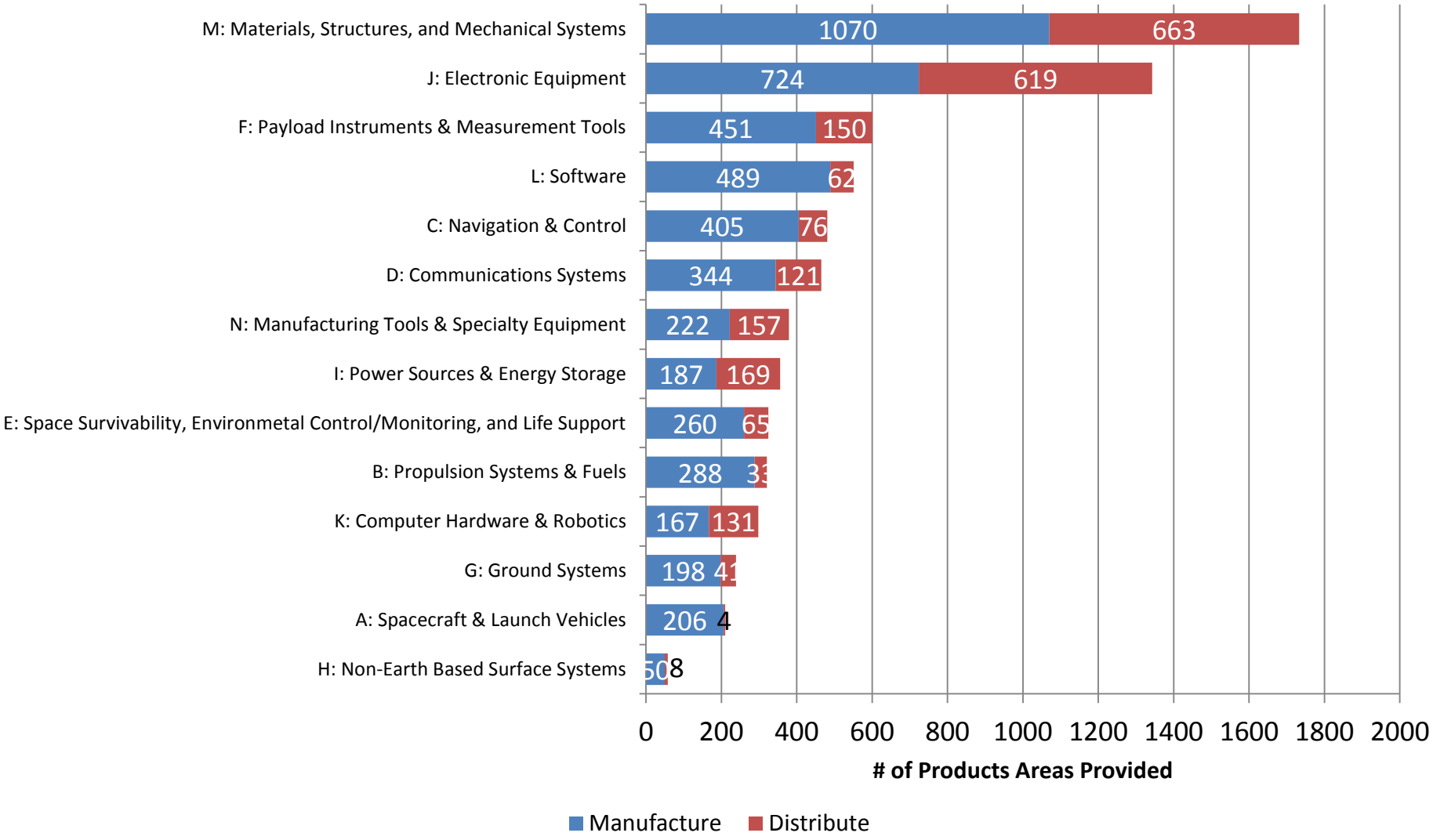
Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Top 15 Product/Service Areas Provided by Respondents – Excluding Services and R&D



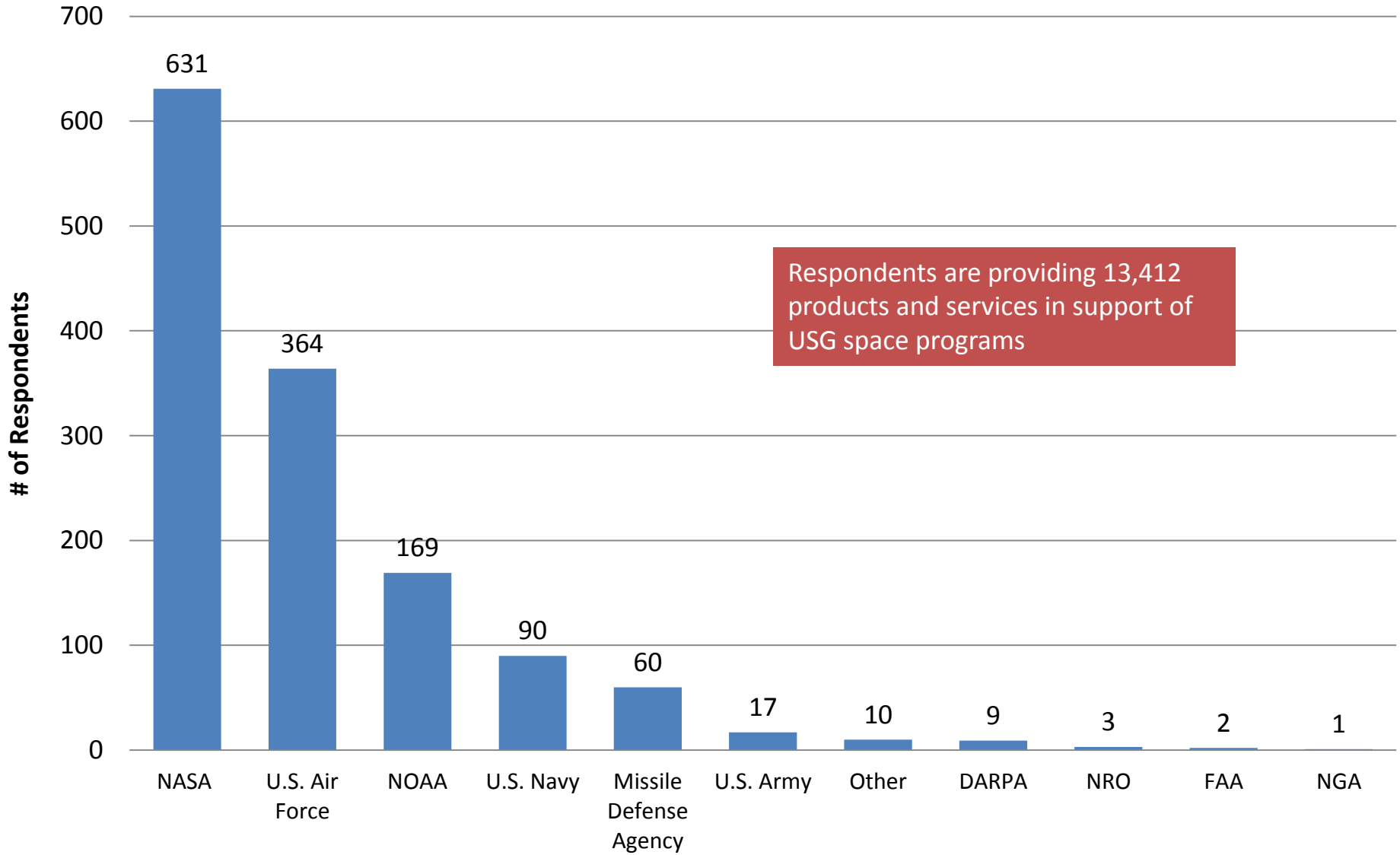
Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Products Provided by Respondents – Manufacturing vs. Distribution



Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

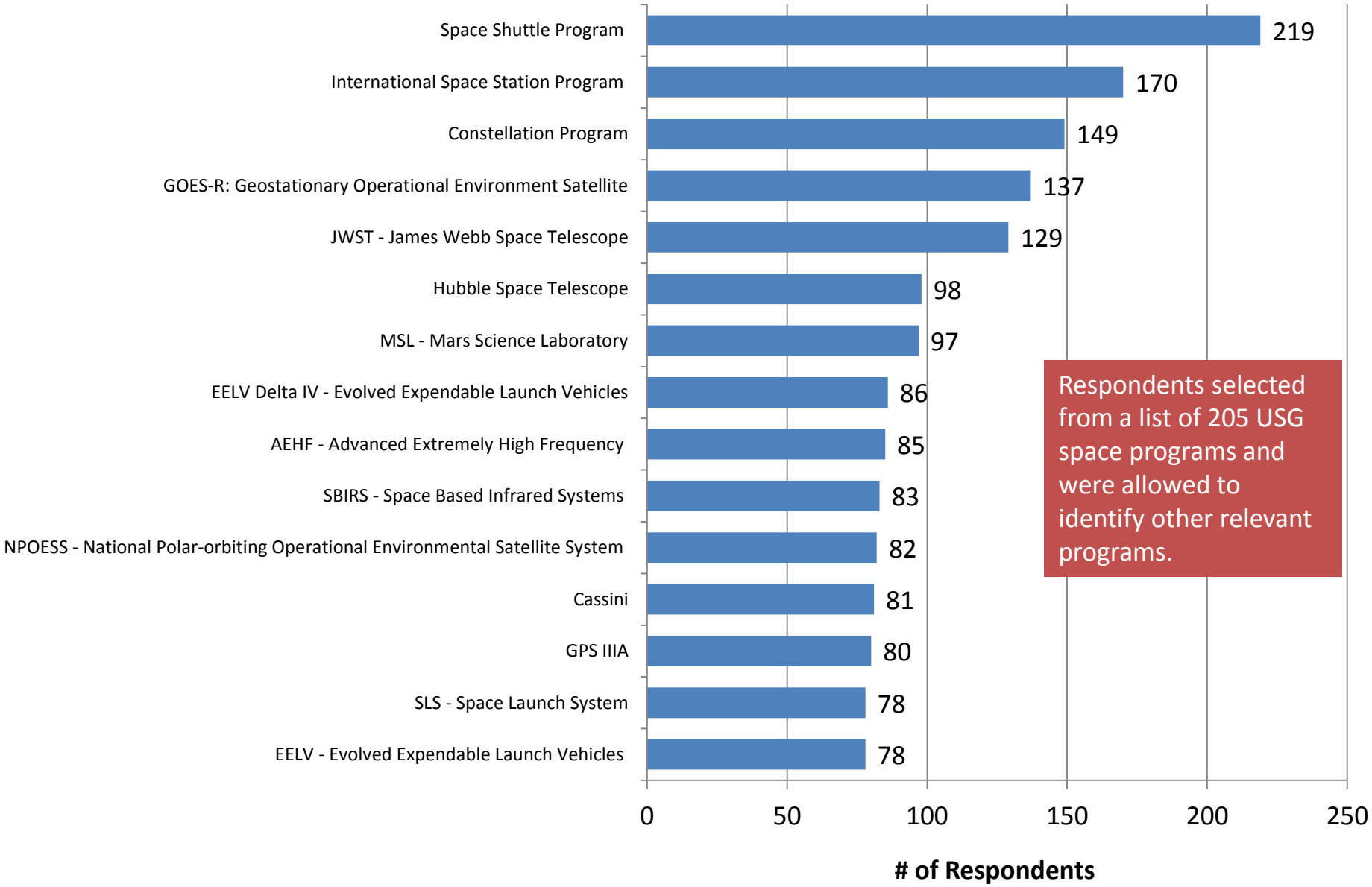
Support for Space Programs By USG Organization*



* Respondents identified direct support of a specific USG space program

Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Support for USG Space Programs Based on Respondent Participation



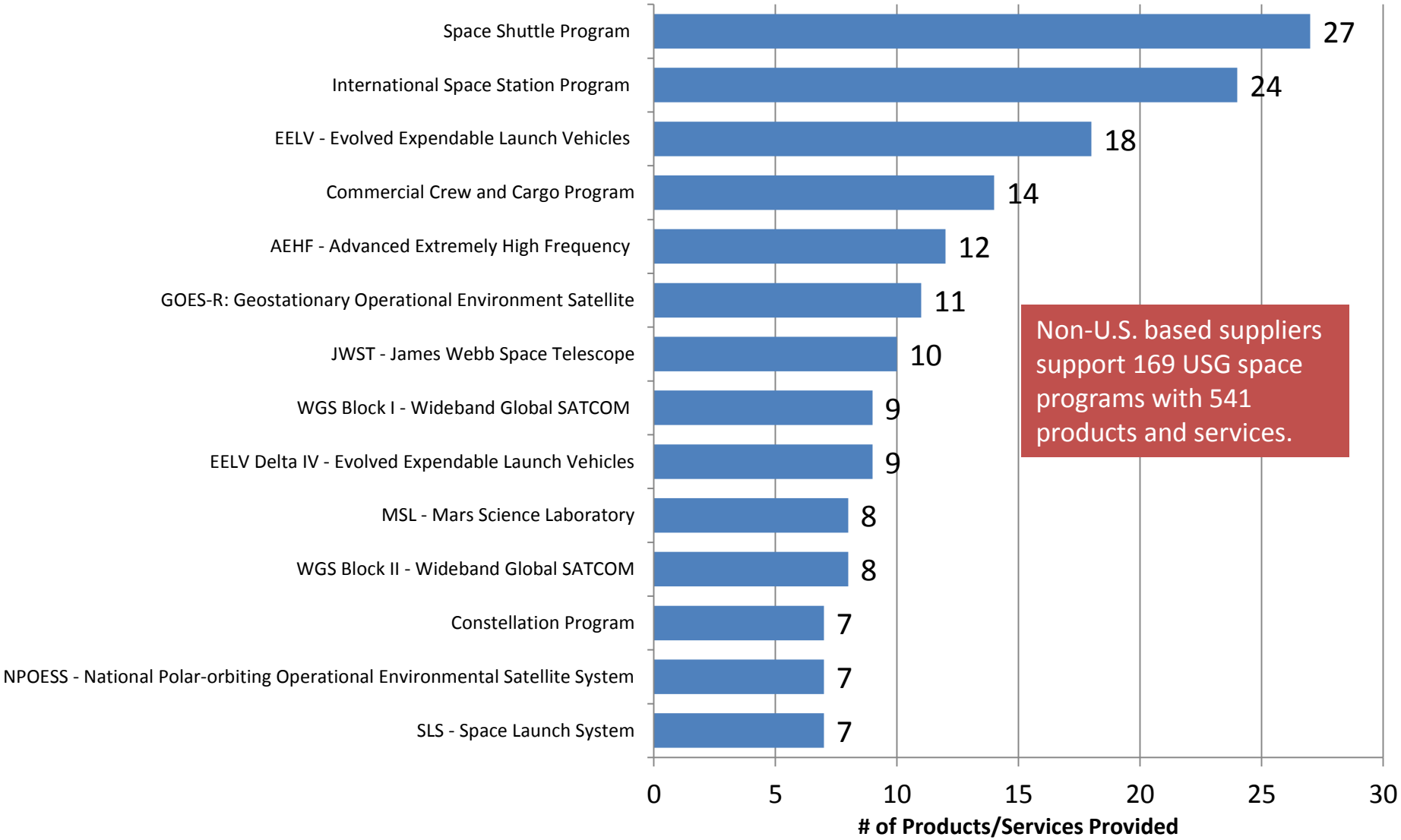
Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Critical Suppliers

- Respondents identified 4,607 unique, critical suppliers that support items on the Product and Service List.
- These suppliers most commonly supported respondents with materials, structures, and mechanical systems, electronic equipment, and services.
- Eleven percent of products and services provided to respondents were from sole source suppliers. Twenty-two percent of products and services were from single source suppliers.
- Respondents identified critical suppliers from 56 countries.
  - Based on the number of products and services provided, the most prominent non-U.S. suppliers were located in Japan, Germany, Canada, France, and the United Kingdom.
  - Non-U.S. suppliers most commonly provided respondents with materials, structures, and mechanical systems, electronic equipment, and communications systems.

Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

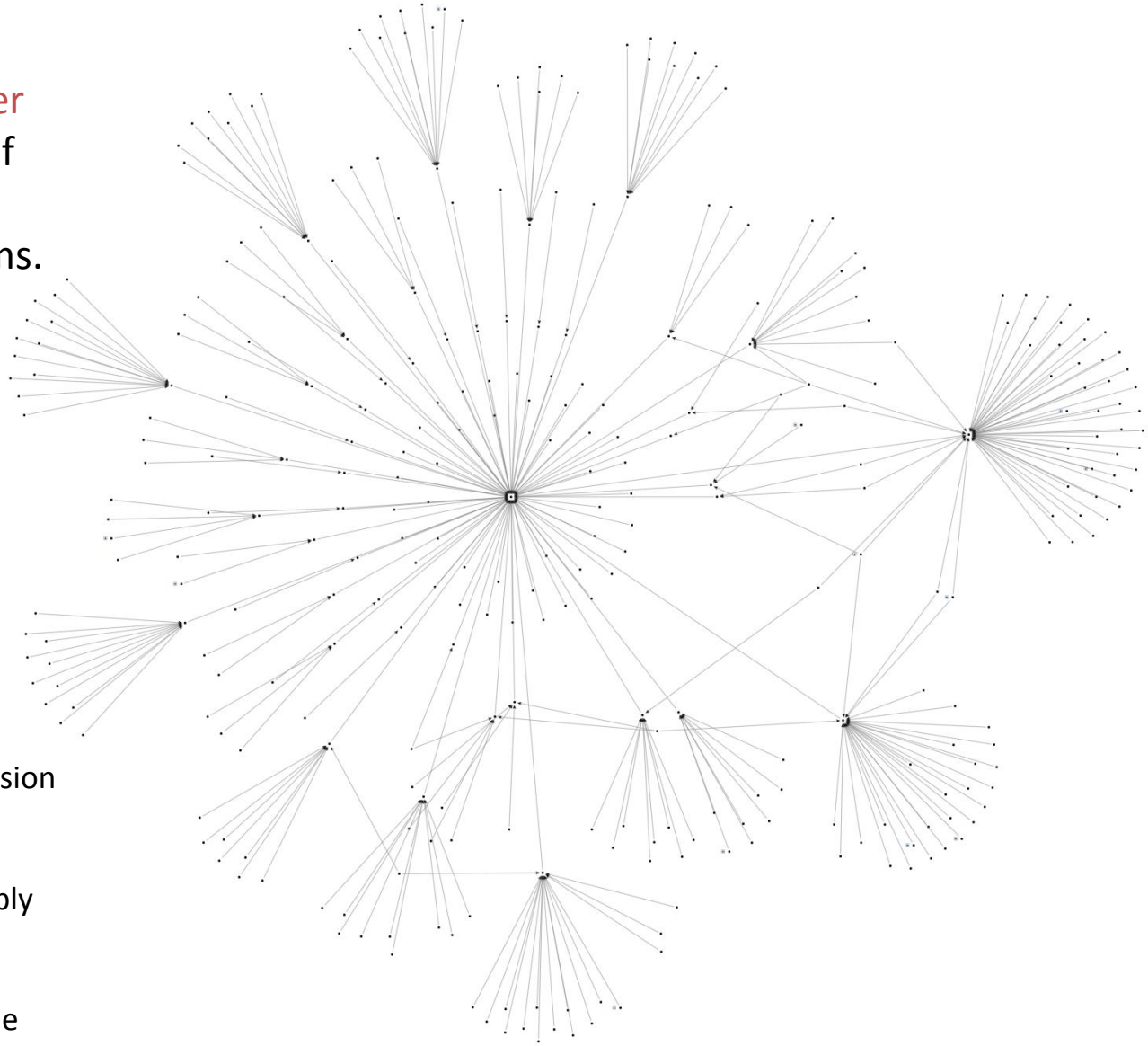
USG Space Programs with the Greatest Non-U.S. Based Supplier Support



Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Utilizing the Data: Supply Chain Mapping
Mars Science Laboratory (MSL) Curiosity Rover

Linking Respondent, Supplier, and Customer data allows creation of detailed supply chain maps for USG programs.



Customer – NASA Jet Propulsion Laboratory (at center)

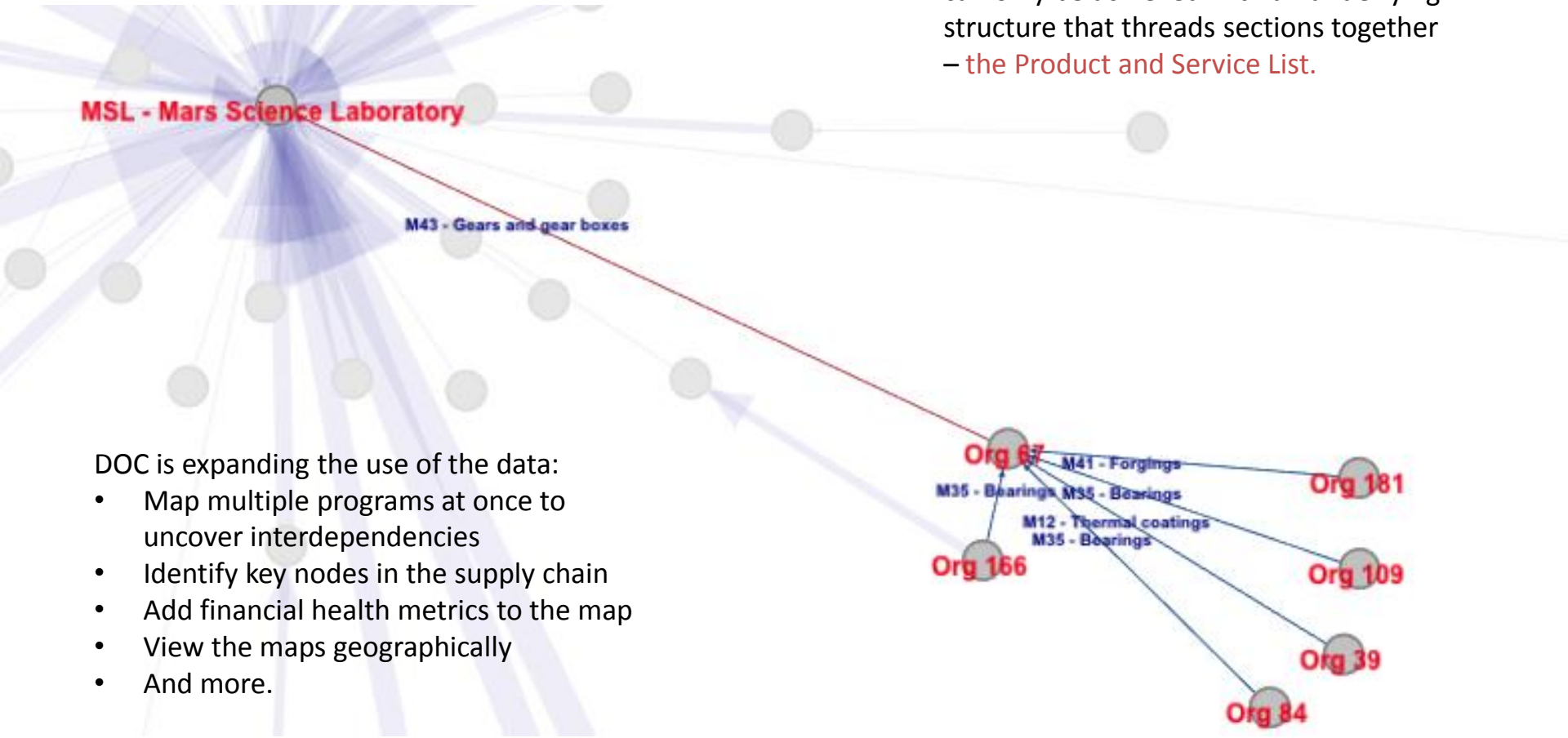
Approx. five tiers of the supply chain are represented

As more data is collected, the map will grow

Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Mars Science Laboratory (MSL) Curiosity Rover - Detailed View

This level of detail in supply chain mapping can only be achieved with an underlying structure that threads sections together – the Product and Service List.



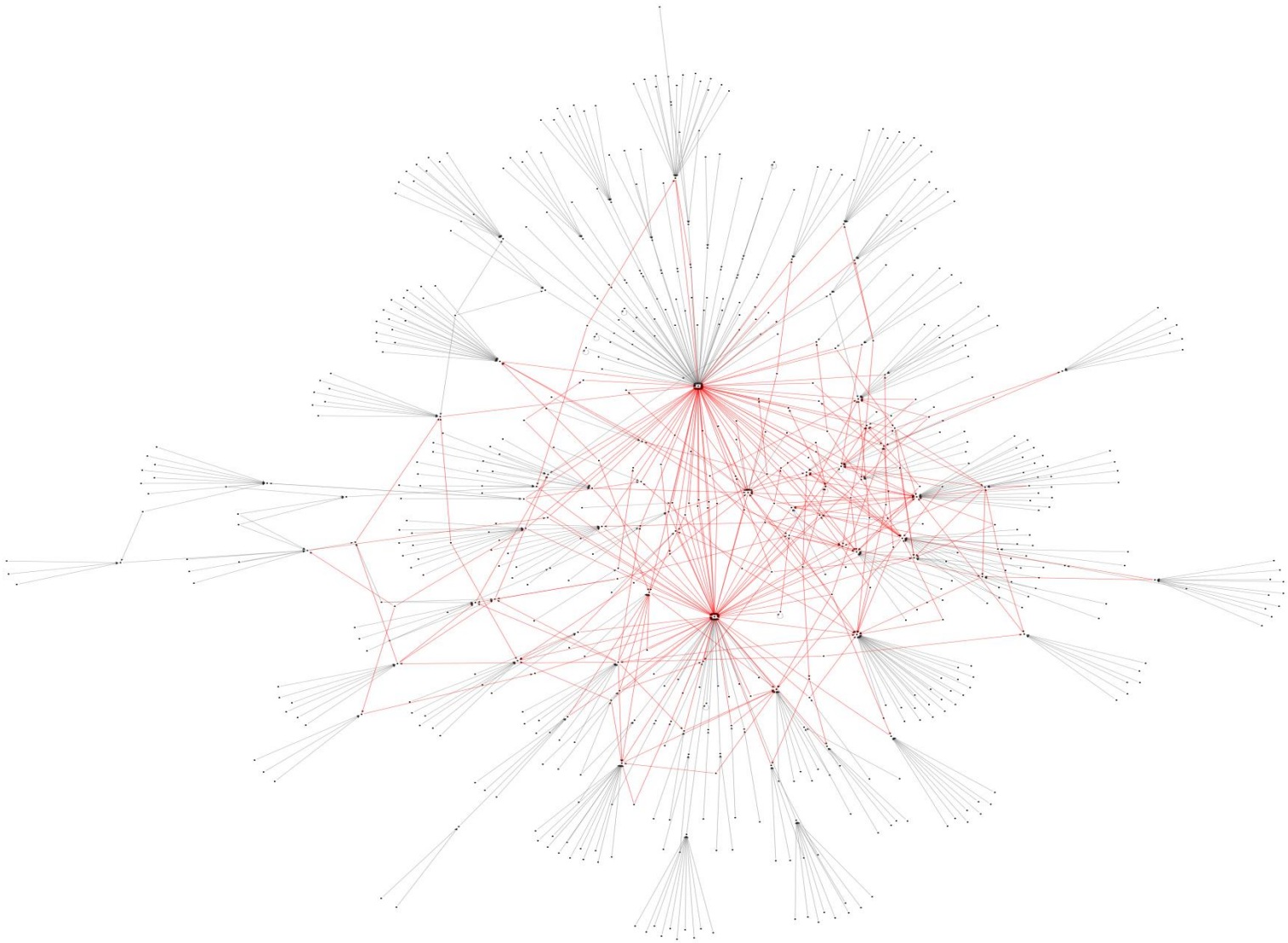
DOC is expanding the use of the data:

- Map multiple programs at once to uncover interdependencies
- Identify key nodes in the supply chain
- Add financial health metrics to the map
- View the maps geographically
- And more.

Partner organizations can tailor these maps to their specific needs.

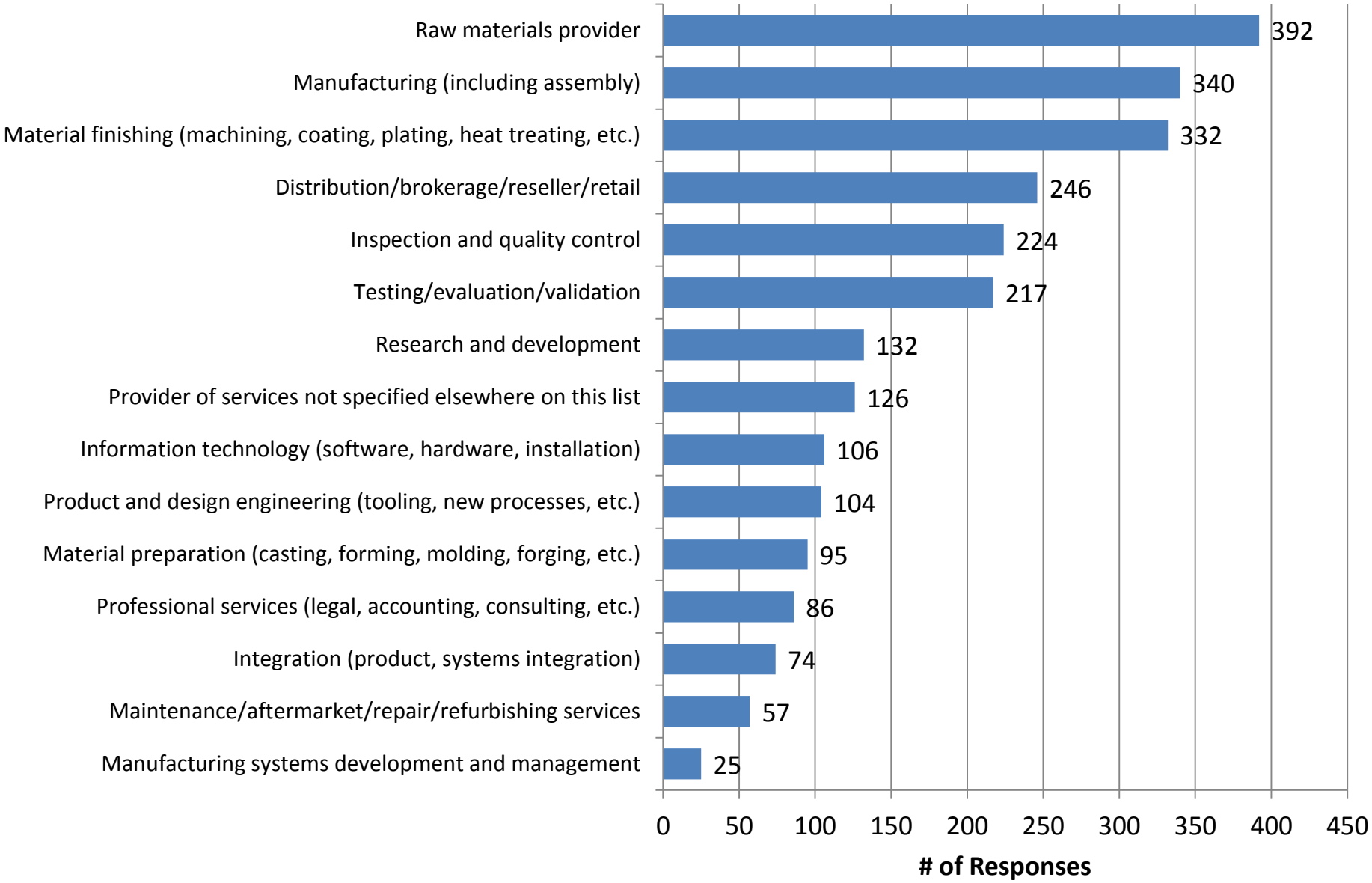
Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Mapping Multiple Space Programs: James Webb Space Telescope (JWST) and the Evolved Expendable Launch Vehicle (EELV)



Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Most Challenging Type of Outside Support Operations



Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

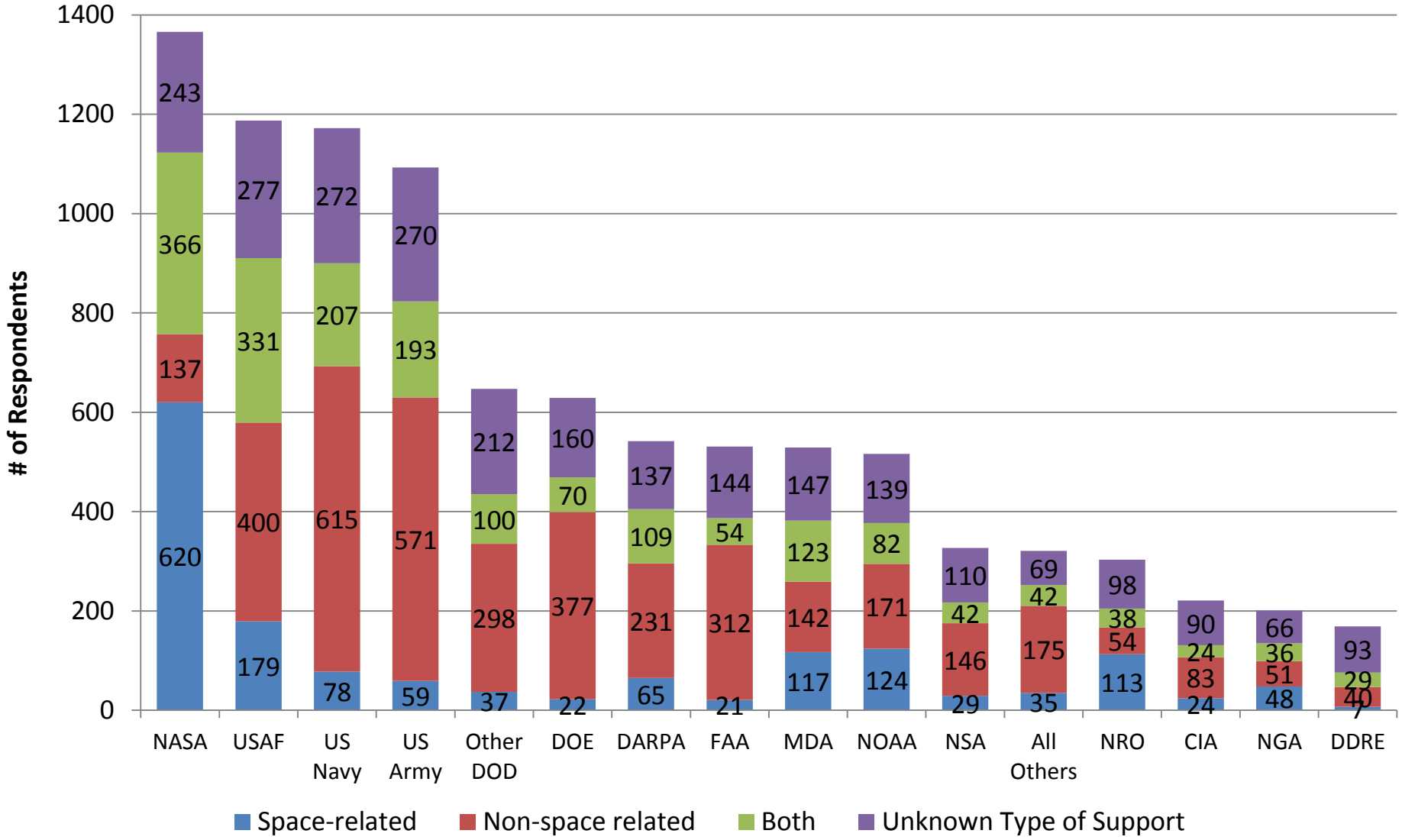
Encounters with Counterfeits

- From 2009-2012, 175 respondents encountered counterfeits in some form.
  - Of these, 71 respondents do not have a formal, written protocol for handling, documenting, and reporting incidents of counterfeits.
- Overall, **74 percent** of respondents do not have a formal protocol for handling counterfeits.
- 66 percent of respondents involved in manufacturing (including assembly) do not have a formal protocol for handling counterfeits.

Type of Counterfeits	# of Respondents
Electronics	104
Materials (metals, alloys, elements, etc.)	29
Other types of Counterfeits	20
Software	17
Fasteners	15
Testing procedures and/or documentation	13
Power source or energy storage equipment	8
Mechanical systems (hydraulics, gear boxes, etc.)	3
Systems/sub-systems (navigation, communication, propulsion, etc.)	3

Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

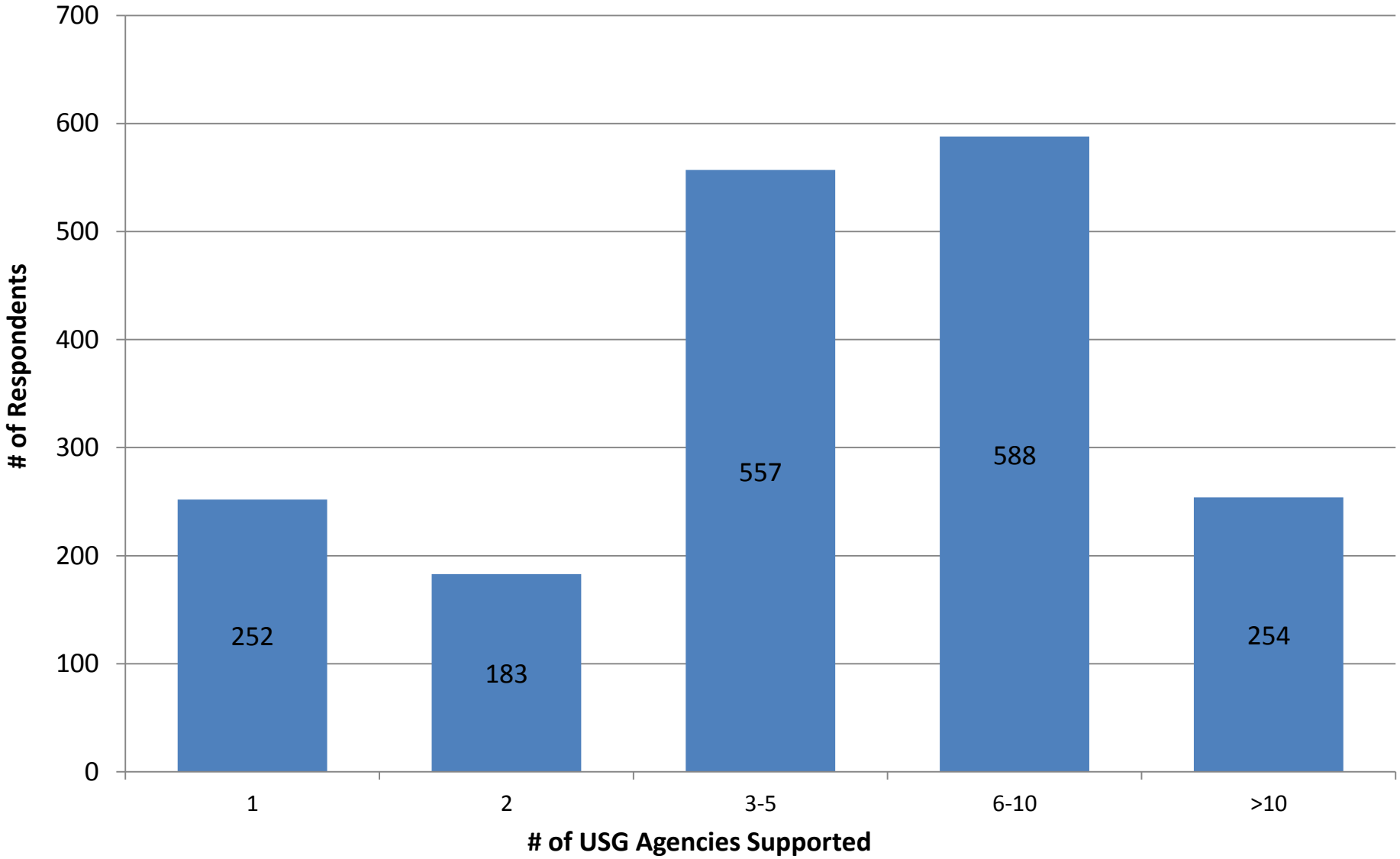
Support for USG Agencies*



* This identification of support is not tied to a specific USG program.

Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

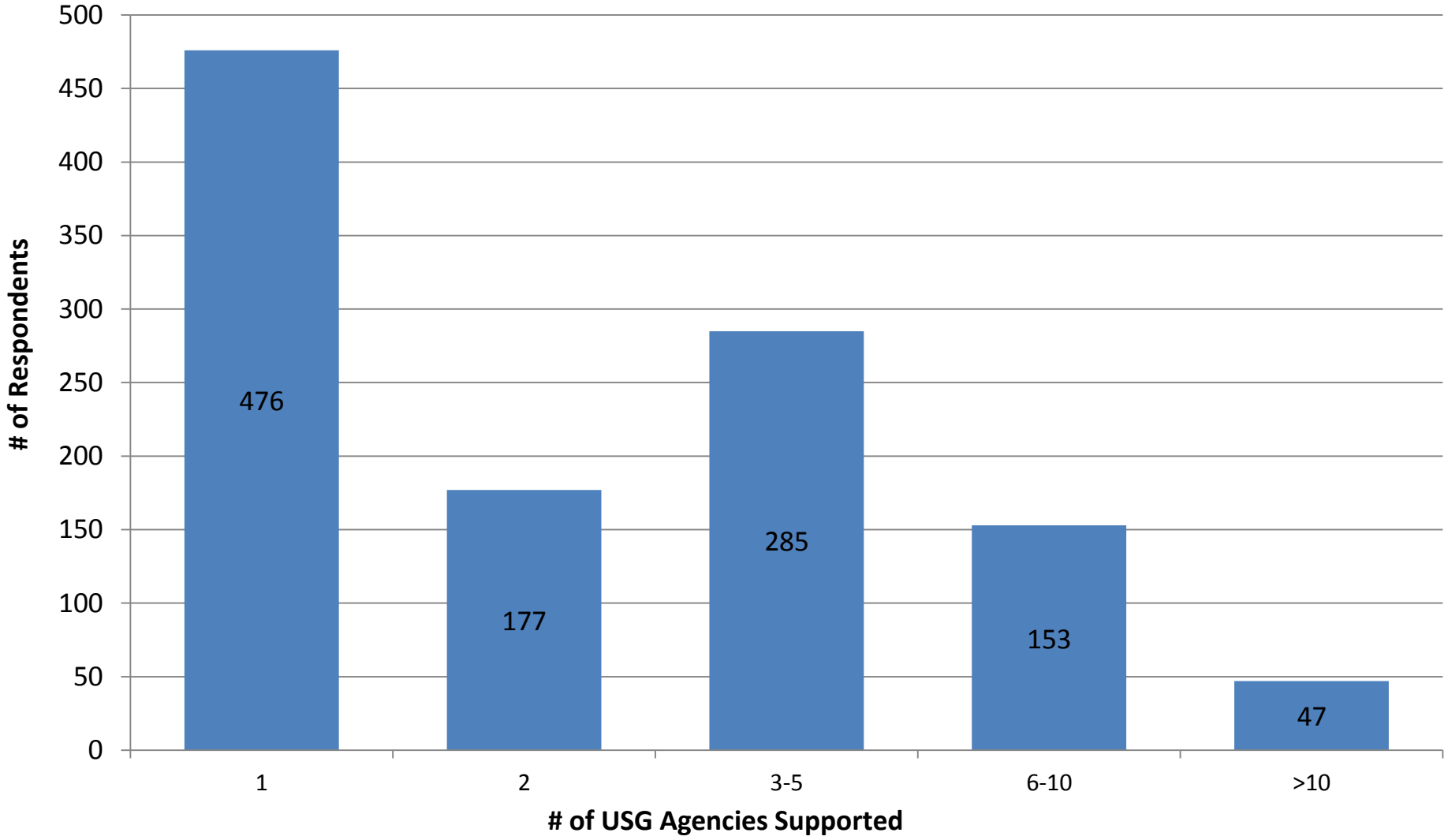
Respondents Supporting Multiple USG Agencies*



* Based on any type of support.

Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

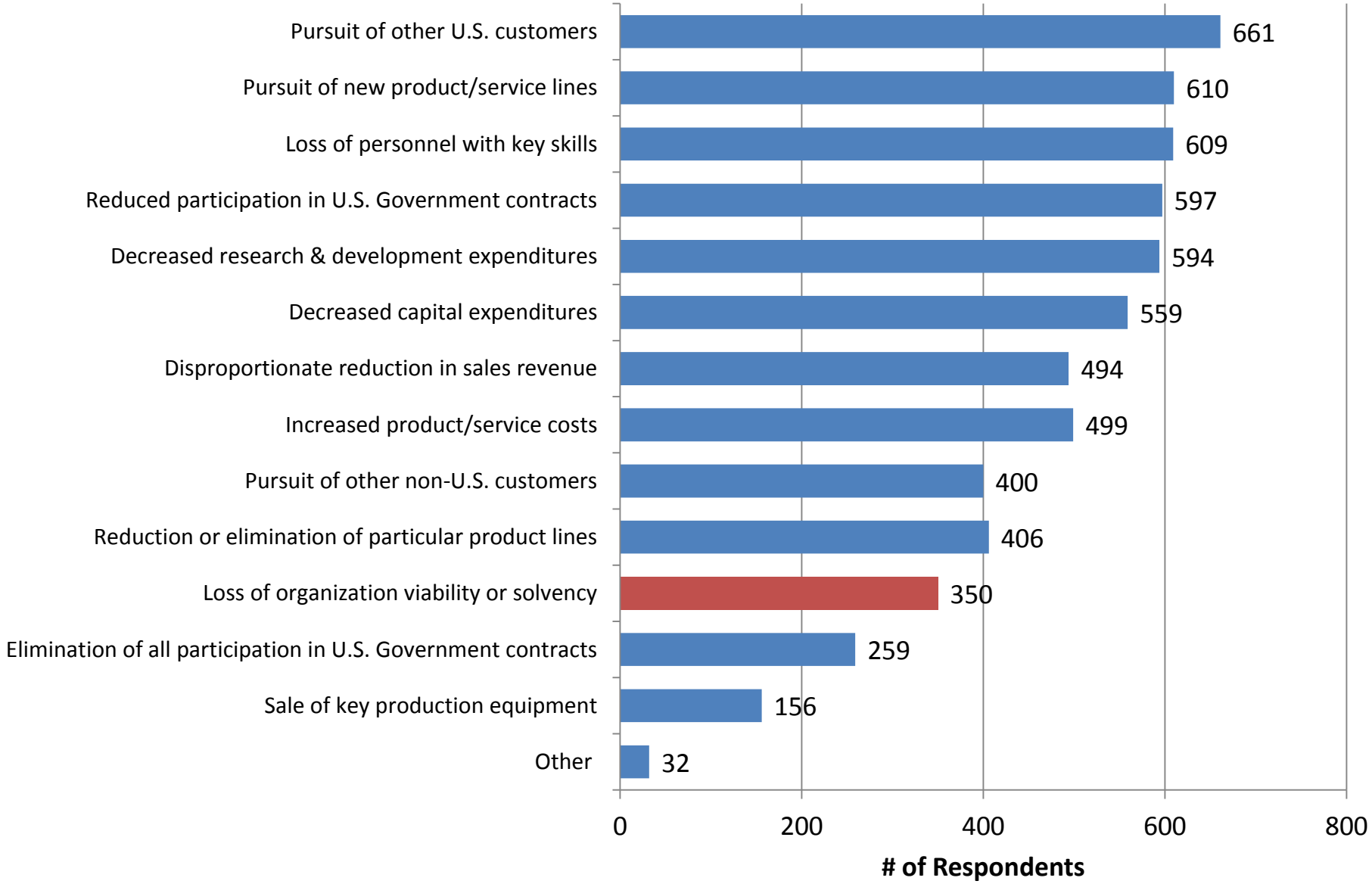
Respondents Providing Space-Related Support to Multiple USG Agencies*



* A combination of "space-related" support and "both" responses.

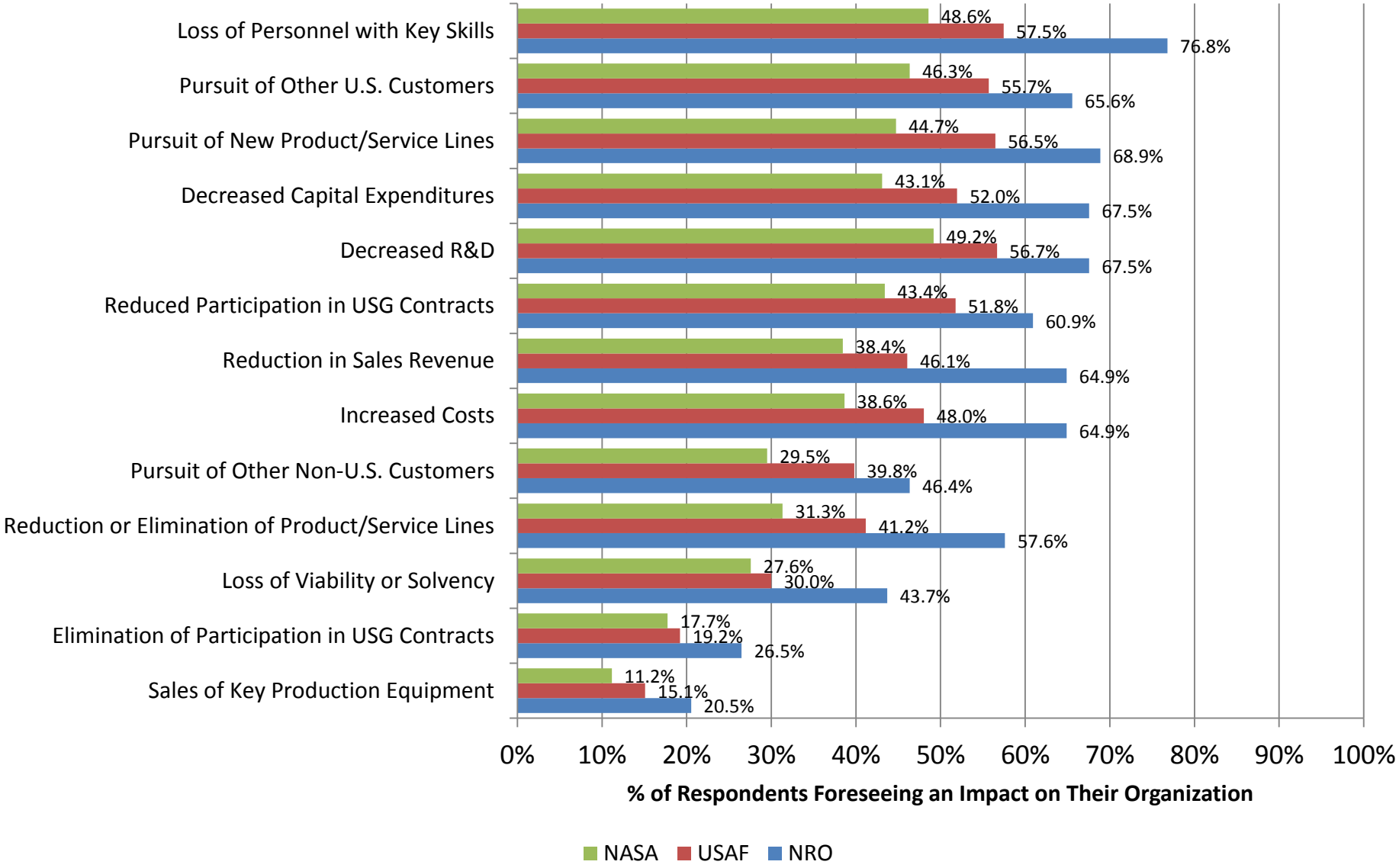
Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Potential Impacts of a Sudden Decrease in USG Space-Related Demand



Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Potential Impacts of a Sudden Decrease in USG Space-Related Demand – Respondents Providing Space-Related Support



Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Dependency on USG Space Programs

- "Government space related technology development and product manufacturing have been a primary part of our business. We are actively working to reduce our dependency on the government, however the type of work we do is highly specialized and there are not many non-governmental customers for this specialized work. Commercial space is growing, but the path to making it a viable industry is very uneven and difficult to navigate." – Small company

- "The export laws are hindering our ability to compete overseas and therefore all space related revenues are coming from US Gov't space related programs. We are hopeful this will change dramatically in 2013." – Very small company

- "Companies such as ours which provide high level engineering support to NASA recruit staff and tailor hiring to provide the best possible mix of education, experience and expertise for a given NASA program. When an existing program is cut or its direction is greatly altered, it puts us in the position of trying to support the new or modified direction to the best of our ability while struggling to retain skilled staff, who may consider leaving us for a larger contractor. It is more difficult for a small contractor to retain skilled personnel in times of job/program uncertainty than it is for a large contractor, since larger companies are perceived to be more economically stable and able to weather a period of budget or program cuts without the threat of possibly closing their doors." – Small company

- "Universities are very diverse and receive funding for fundamental R&D for many different activities. Space-related funding is an incredibly important source of funding for this university and if it became unavailable it would have a significant negative impact but the university would most likely remain viable due to its diversification." – University

- "Many of the companies that we do business with would not exist without these programs" – Small company

- "[Company] derives the majority of its sales from commercial and international space programs. However, 100% of operations at our … facility are in support of US Government contracts. The viability of this facility is dependent on US Government programs. – Medium Company

Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Continued Desire to Work With the USG

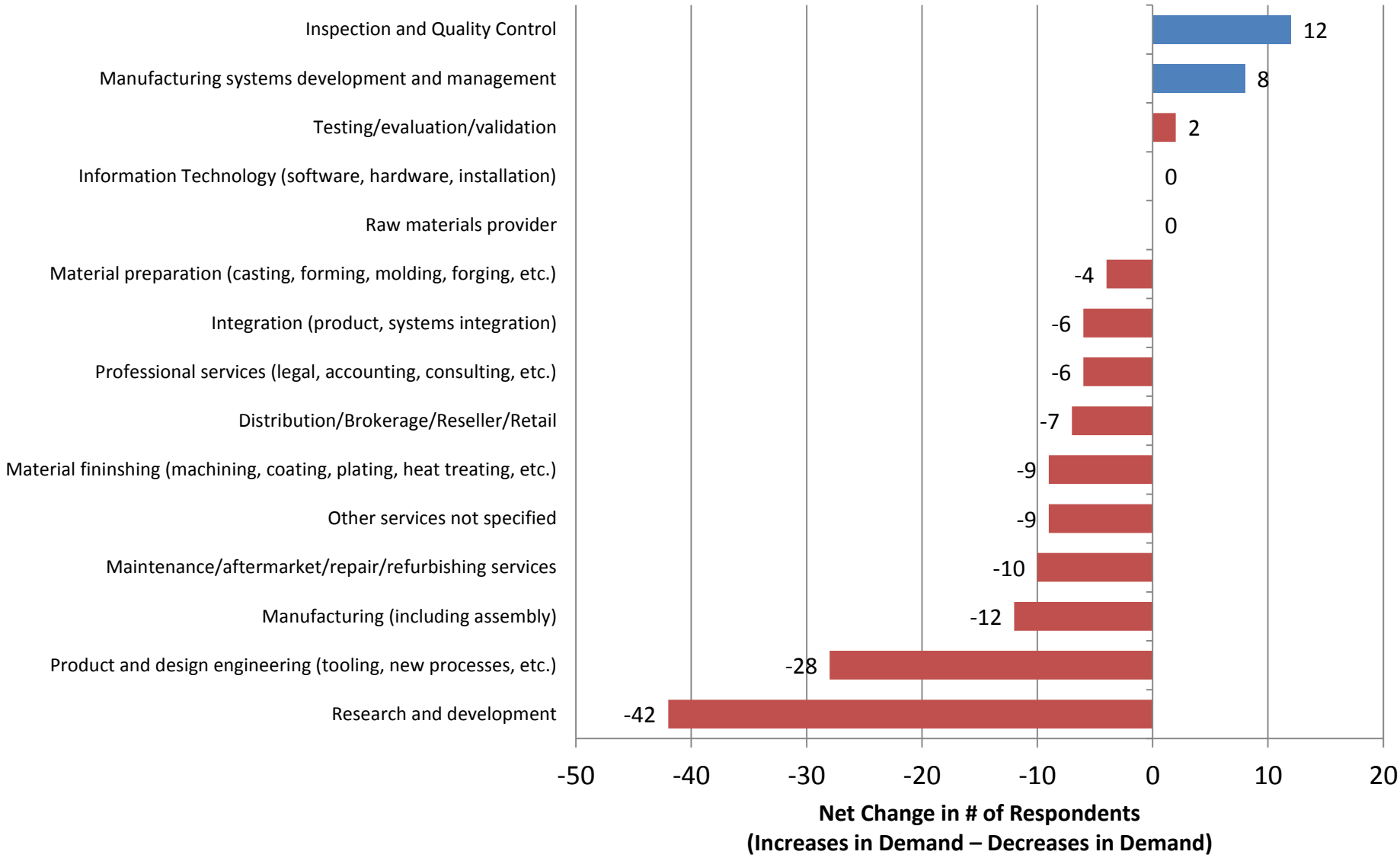
19 percent (376 of 2,022) of respondents said that variability in demand from the USG for space-related products and services have somewhat or significantly adversely impacted their desire to serve these customers.

Adverse Impacts:

- "Variation in year-to-year R&D budgets over the last 2 - 3 years due to changes in program priorities, federal budget pressures, cancellation of key programs has had a significant negative impact on our business stability over those years. Hiring and other long range investments have been strongly affected" – Very small company.
- "The decrease in USG space programs has fundamentally changed the outlook for several of our clients and just as importantly it has significantly impacted several potential clients resulting in a drastically reduced demand for services we provide. Consequently, while we are still interested in this segment, the market outlook is much more somber than it was just 2-3 years ago" – Very small company.
- "Desire unchanged, just fewer opportunities" – Very small company.
- "This is the work we do and we love it. We do it by choice. We are very dependent on the US government, but we couldn't do the same work in any other context. So we just keep doing it, even if it's not always stable. A lot of great talent is leaving the industry because of this, though. The massive NASA layoffs of last year are a sad example of that" – Very small company.
- "We invested approximately one man-year plus tens of thousands of dollars to develop a product for our customer only for them to buy only three units. Due to the customer's lack of business, we have effectively cancelled the product" – Large company.
- "In the past we could make an investment in technology development targeting future or current space NASA space programs and get a reasonable return on that investment. Now such investments do not provide a return because NASA is either changing direction or all the money is being diverted internally" – Small company.

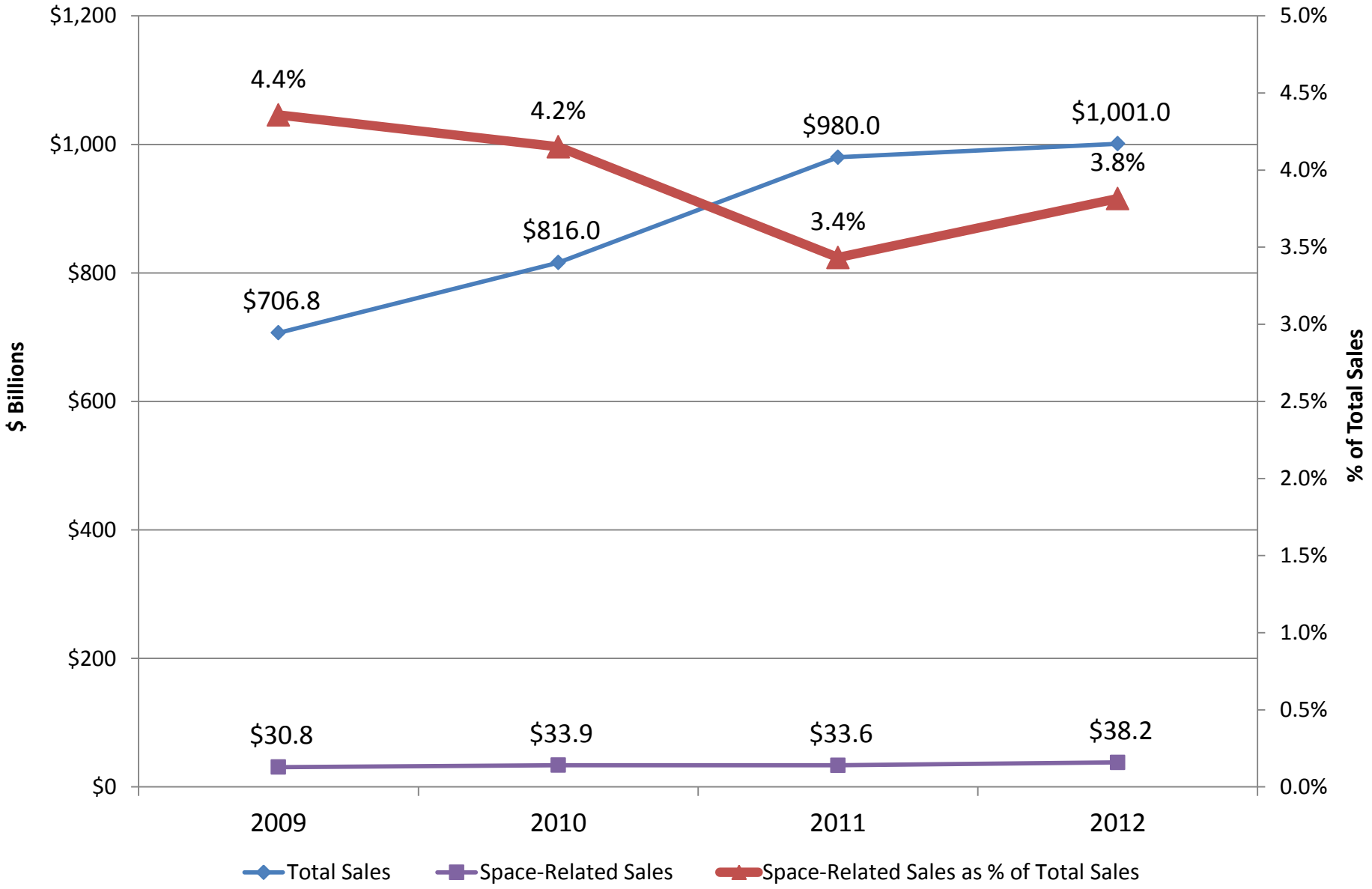
Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Net Change in Space-Related Customer Demand for Respondents' Business Lines (2009-2012)



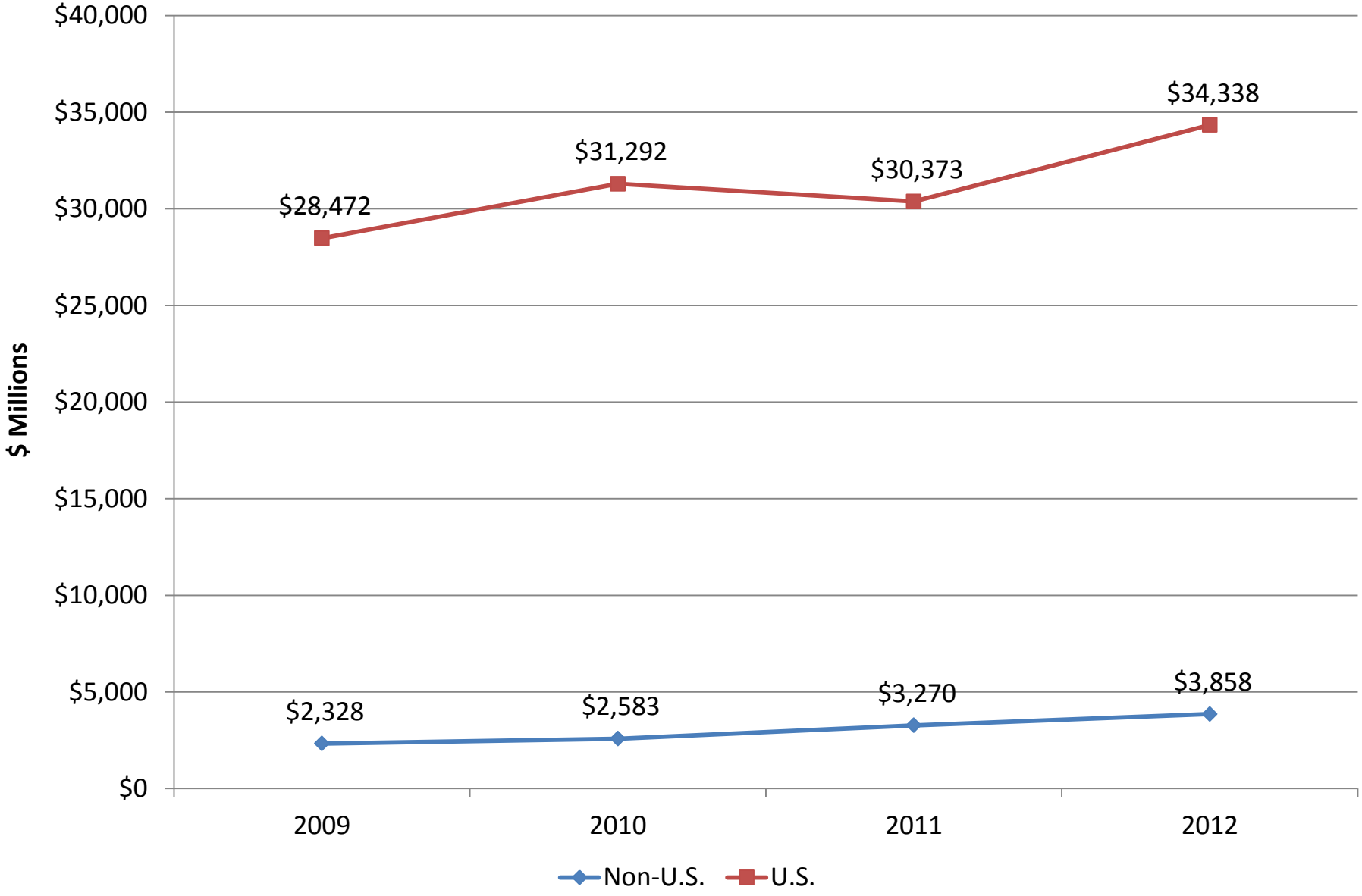
Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Total Sales vs. Space-Related Sales (2009-2012)



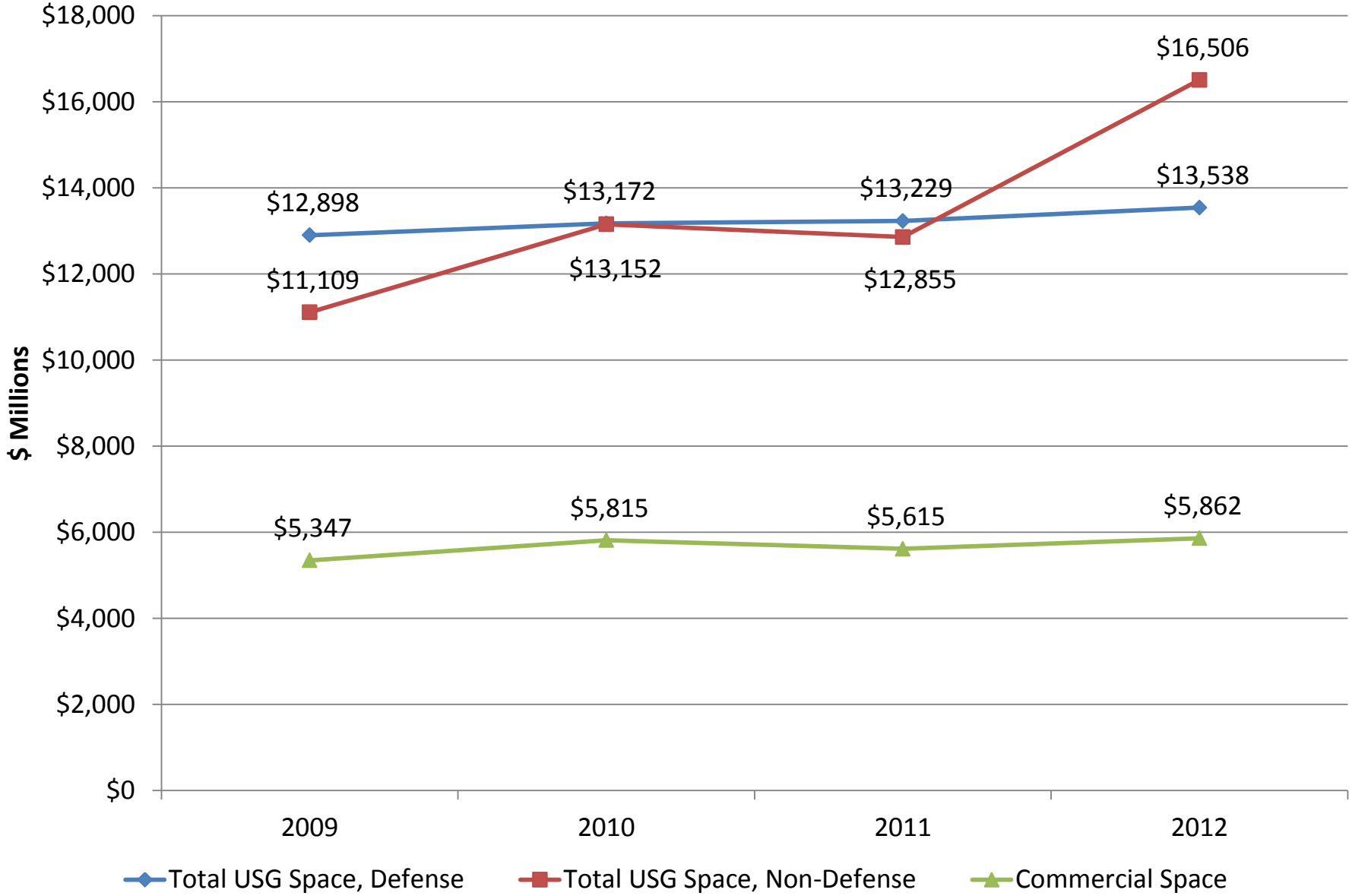
Source: U.S. Department of Commerce, Bureau of Industry and Security,
U.S. Space Industry Deep Dive, Preliminary Data – January 2013.

Total Space-Related Sales by Location (2009-2012)



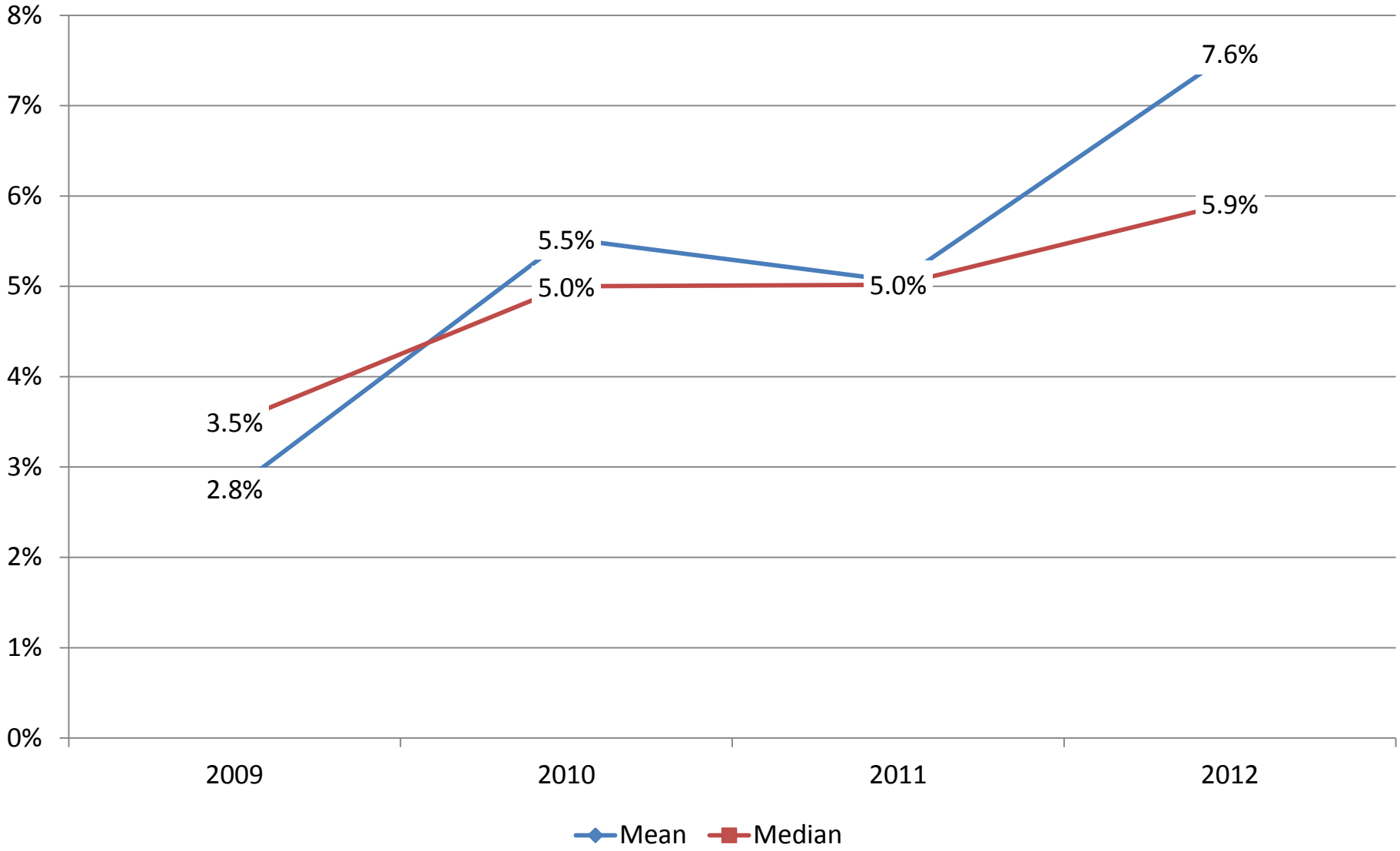
Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Total Space-Related Sales by Customer (2009-2012)



Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

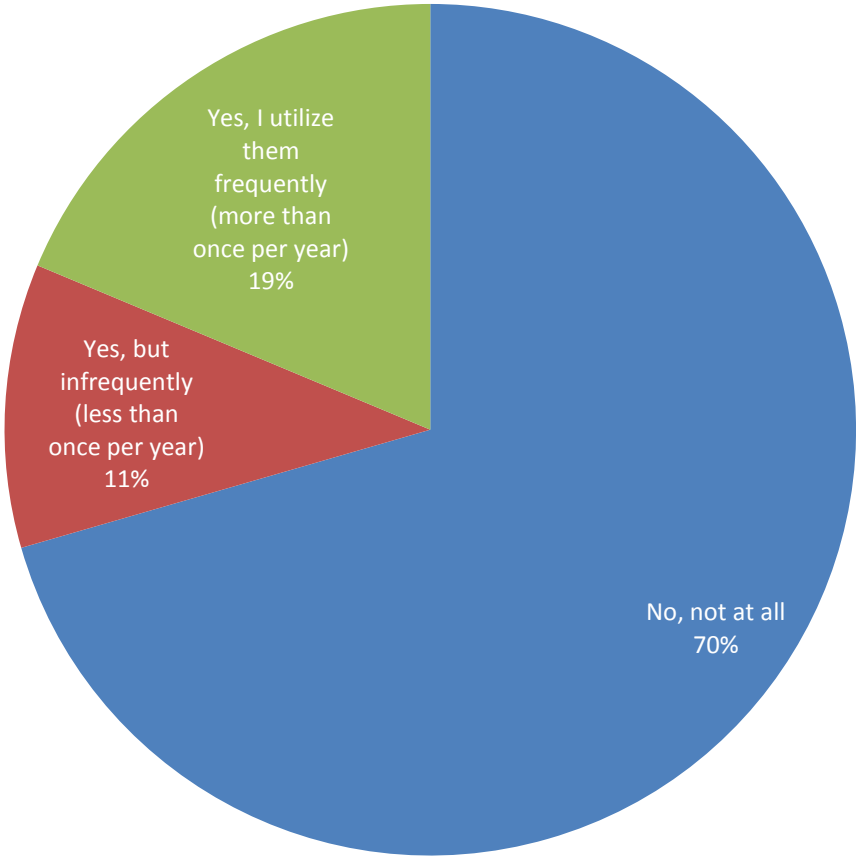
Respondents' Net Profit Margin (after tax)*



* Based on 1,838 responses

Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

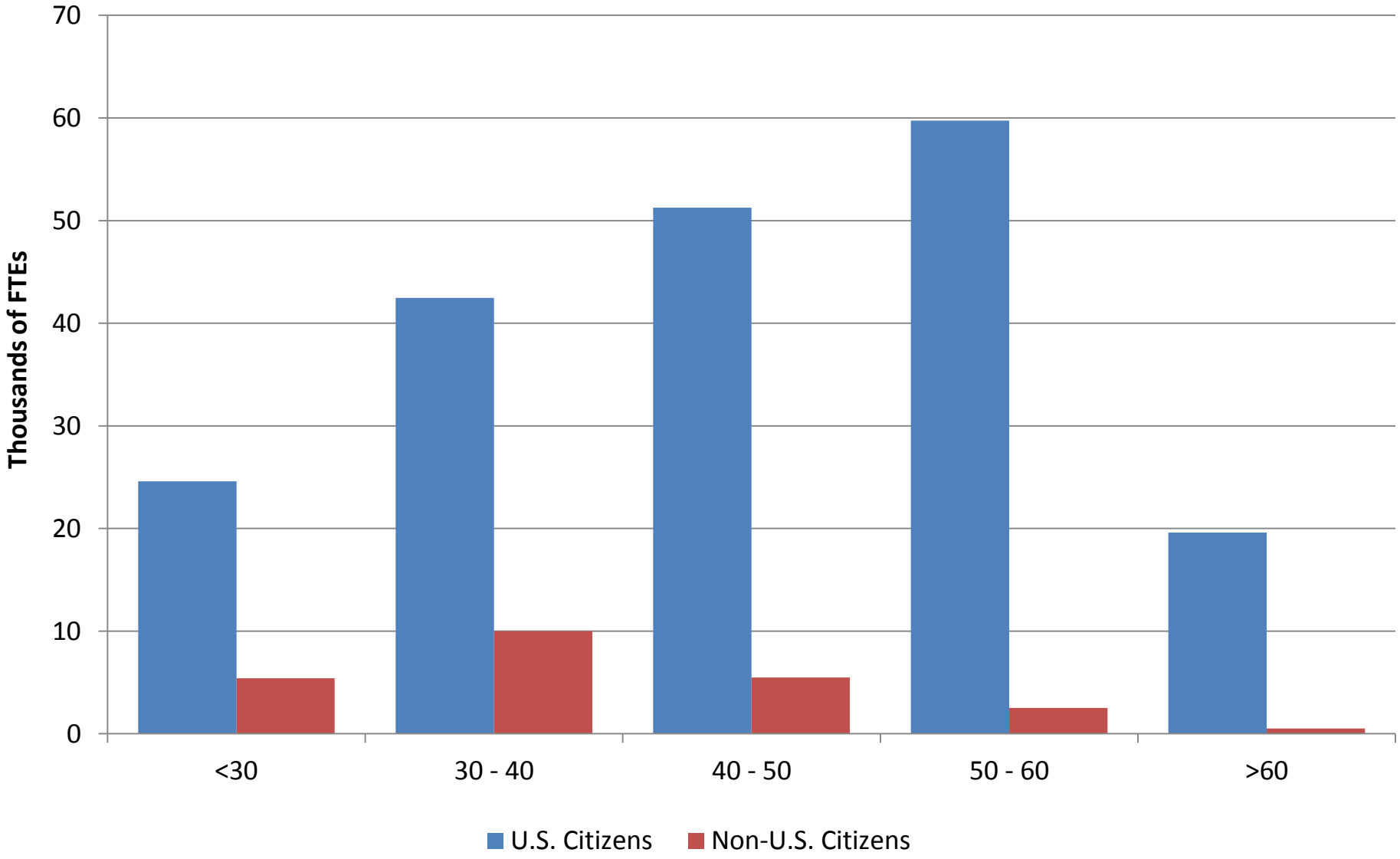
Utilization of U.S. Export Control System (ITAR/EAR) for Space-Related Products/Services



Impacts of U.S. Export Regulations on Space-Related Products and Services	
Impact	**% of Respondents***
Avoided the export of space-related products or services subject to ITAR-related controls	27.2%
Incentivized non-U.S. organizations to "design-out" or avoid buying U.S. origin space-related products or services	25.0%
Incentivized non-U.S. organizations to offer "ITAR-free" space-related products or services	20.6%
Avoided the export of space-related products or services subject to EAR-related controls	16.6%
Contributed to the creation of non-U.S. companies/business lines in direct competition with the organization's space-related products or services	14.6%
Altered space-related R&D expenditures	10.6%
Caused the abandonment or alteration of space-related business lines	9.7%
Caused re-location of space-related production/R&D facilities outside the United States due to regulatory burdens	1.7%
* Based on 596 respondents that selected "Yes" to utilizing U.S. export controls for space-related products.	

Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

Age Range of Engineers, Scientists, and R&D Staff*



* Excluding universities

Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

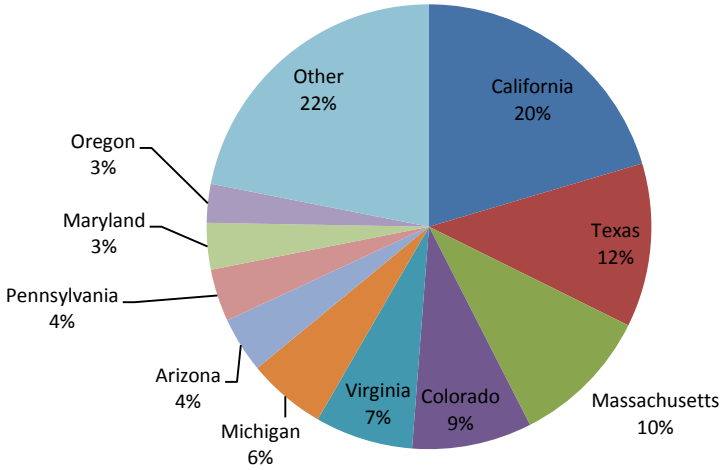
Unfilled Vacancies for Skill Positions

- We asked respondents to identify how many **unfilled vacancies** they currently have for the following positions:
  - Engineers, Scientists, and R&D Staff
  - Production Line Workers
  - Testing Operators, Quality Control, & Support Technicians

- 716 respondents (35 percent) **currently have 14,891 vacancies** for these positions.

Vacancies by Organization Size/Type	
Very Small	751
Small	878
Medium	2,701
Large	2,310
Very Large	5,469
No Sales	638
Universities	2,144

Vacancies by State (Excluding Universities)



Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

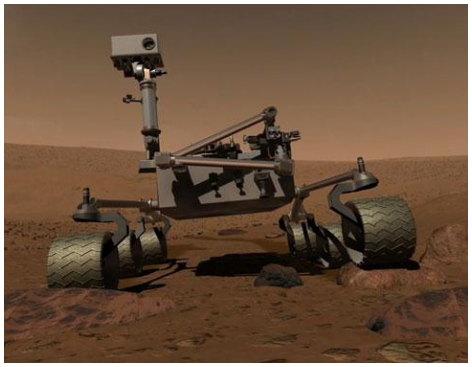
Respondents Interested in Available USG Assistance Programs and Services

Program	# of Respondents
Business development	387
R&D programs	305
SBIR and STTR contracts	252
Global export opportunities	240
Manufacturing technology development	221
Export licensing (ITAR/EAR)	221
Training Opportunities	206
Financing	184
Marketing assessment skills	174
Product/service development	164
Government procurement guidelines and e-commerce	166
Patents and trademarks	113
Energy and environmentally conscious manufacturing	109
Country Commercial Guides	38

Leverage existing USG resources to give something back to survey respondents.

Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.

BIS/OTE Contacts



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Source: U.S. Department of Commerce, Bureau of Industry and Security, *U.S. Space Industry Deep Dive*, Preliminary Data – January 2013.