



A New Partnership *For a Changing Industrial Base*

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Space Industry Is Changing

- New entrants
 - Over \$1.5 billion of private and state investment into commercial human spaceflight industry to date
 - Medium-sized companies focused on orbital spaceflight
 - Smaller companies focused on suborbital spaceflight
- New practices
 - NASA using public-private partnerships and fixed-price contracts
 - NASA spending ~\$9 billion on commercial cargo and crew to ISS through 2016
 - \$800 million on COTS
 - \$3.5 billion for Commercial Resupply Services
 - \$4.25 billion for Commercial Crew (\$850m x 5 yrs)
- New markets
 - Human spaceflight emerging
 - Suborbital spaceflight



Propulsion Industrial Base Changing

- Commercial development activities:
 - Broaden and strengthen the propulsion industrial base
 - Expand capabilities available to government
 - Expand activity, increasing production rates, improving reliability and lowering costs
- Propulsion remains key, but...commercial drivers different
 - Low cost
 - Reusability
 - Performance no longer king
 - Safety more important than mission assurance
- Significant propulsion development by emerging industry
 - Falcon 9, Taurus II, Blue Origin, SpaceShipTwo, Lynx, et al.
- Most developing own design, manufacturing and test capabilities, duplicating government capabilities at great expense
 - Reduces development timeline
 - Reduces recurring production costs
- Result is capabilities being developed largely with limited-to-no government involvement

Creating a New Partnership

- A new partnership between government and industry *should*:
 - Provide access to unique national assets
 - Provide expertise to proprietary development efforts
 - Eliminate pricing and other bureaucratic obstacles
 - Provide better understanding of new commercial space endeavors
 - Be accessible to both new and existing industry players
 - Focus on propulsion technology development (not systems funded by programs)
- Establish over-arching mechanism for propulsion technology development
 - Use of Space Act Agreements (SAAs) eliminates bureaucratic bottlenecks
 - Creates “program interface” for internal government use, i.e. charge code
 - ...and *could* providing funding, or in-kind services, for technology development
 - Even small funding would not be insignificant
 - Significant benefits for both industry and government while promoting U.S. rocket propulsion industry

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