National Institute for Rocket Propulsion Systems

Dale Thomas, Ph.D., P.E.
Associate Director – Technical, Marshall Space Flight Center
“The time for industry and government to work together to define future space policy is now. We must establish an overarching policy that recognizes the synergy among all government space launch customers…. The need to move with clear velocity is imperative if we are to sustain our endangered U.S. space industrial base, to protect our national security, and to retain our positions as the world leader in humans spaceflight and space exploration.”

Jim Maser, Chairman of Corporate Membership Committee AIAA and President, Pratt & Whitney Rocketdyne. Testimony to Congress (3/30/11)

“Anything that NASA does is important to us in terms of the industrial base. And anything that we do is important to NASA as well.”

Gregory Schulte, Deputy Assistant Secretary of Defense for Space Policy, The National Journal (7/20/11)
Collaboration: A National Pursuit

- “Departments and agencies shall improve their partnerships through cooperation, collaboration, information sharing, and/or alignment of common pursuits. Departments and agencies shall make their capabilities and expertise available to each other to strengthen our ability to achieve national goals, identify desired outcomes, leverage U.S. capabilities, and develop implementation and response strategies.”
  *National Space Policy* June 28, 2010

- “We seek to foster a U.S. space industrial base that is robust, competitive, flexible, healthy, and delivers reliable space capabilities on time and on budget. DoD and the IC [Intelligence Community], in concert with the civil space sector, will better manage investments across portfolios to ensure the industrial base can sustain those critical technologies and skills that produce the systems we require.
  *National Security Space Strategy (Unclassified Summary)* January 2011

**NIRPS is Responsive to National Space & Security Space Policies**
The Challenges Before Us

- Recent GAO report highlights the need for better information and government-wide coordination to support acquisition strategy decisions

- More than 40 industrial base studies and assessments, focused on the challenges facing the propulsion community, have been performed over the past decade.

- Continued budgetary constraints lead to a lack of development programs to sustain workforce and suppliers

The Challenges are Known – Multi-agency Collaboration is Required to Address
### Partial Listing of Studies Under Review

<table>
<thead>
<tr>
<th>Year</th>
<th>Title of Study/Policy</th>
<th>Sponsor</th>
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<tr>
<td>2011</td>
<td>Sustaining Critical Sectors of the US Defense Industrial Base</td>
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<td>Final Session of the USSTRATCOM S&amp;T Panel, SRM Propulsion Industrial Base</td>
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<td>EELV Plan for Sustainment to 2030</td>
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<td>Report to Congress on the Liquid Rocket Engine Industrial Base Sustainment and Implementation Plan</td>
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<td>Sector-by-Sector, Tier-by-Tier (S2T2) Review of the Industrial Base</td>
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<td>Space &quot;deep dive&quot; Industrial Base Assessment</td>
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<td>Tipping Point: Maintaining the Health of the National Security Space Industrial Base</td>
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<td>Report of the Annual Industrial Capabilities Report to Congress</td>
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<td>The Future of Launch Vehicle Systems for the US Air Force</td>
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<td>Industry Economic Assessment: Space and Missiles</td>
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<td>Letter on Space Launch Propulsion</td>
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<td>Impact of Ares/Shuttle Booster Production on the Industrial Base</td>
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<td>Department wide Framework to Identify and Report Gaps in Defense Supplier Base</td>
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<td>Creating an Effective National Security Industrial Base for the 21st Century</td>
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<td>Health of the US Space Industrial Base and the Impact of Export Controls</td>
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<td>National Security Space Industrial Base Assessment and Recommendations</td>
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<td>National Rocket Propulsion Strategic Plan</td>
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Surveying These Reports for Correlation with Issues and to Harvest Recommendations
The Grand Challenges

- Reduce development and sustainment costs for missile and rocket systems
- Support the competitiveness and resilience of the industrial base
- Foster access to facilities and expertise across Government, industry, and academia
- Develop and implement an integrated science and technology plan for propulsion systems
- Invigorate the STEM pipeline
- Collaborate across agencies for missile and rocket propulsion system development
NIRPS: A Responsive Solution

**Scope:**
- National
- Multi-organizational
- Multi-sector

**Purpose:**
NIRPS will help preserve and align government and private rocket propulsion capabilities to meet present and future US commercial, civil, and defense needs, while providing authoritative insight and recommendations to National decisional authorities

**Tri-faceted approach:**

- **Stewardship:** Formulate and recommend National Policy options and strategies that promote a healthy industrial base
- **Technology:** Identify technology needs and recommend technology insertions
- **Solutions facilitator:** Maintain relationships and awareness across the Government and industry to align available capacity with emerging demand

A Jointly Created and Sponsored Institute Providing Coherent Policy Recommendations to National Decision Authorities
Proposed Operational Model

- **Initial Operations**
  - NASA has committed to fund initial baseline operating requirements
    - Estimated staff required to fulfill baseline stewardship and technology roles is 12-15 civil service FTEs with some billets possibly filled by other agencies
    - Technical staff requirements in support of the solutions provider component will scale as required

- **Future Operations**
  - As NIRPS matures, it will employ a multi-agency funding model
    - Sponsorships from NASA and other government agencies to sustain baseline activities
    - Reimbursable Space Act process to support demand for the solutions provider component

NIRPS will have a Small Footprint, but a Very Long Reach
Planning Team

All Sectors of the Propulsion Community are Engaged in NIRPS Formulation Efforts
Areas for Collaboration

- Government
  - Joint support for technology developments and the development of propulsion systems
  - Technical and programmatic support contributing to mission success

- Industry
  - Identification of methods to improve the health of the propulsion industry
  - Access to government facilities and expertise
  - Maturation and certification of propulsion systems and components

- Academia
  - Identification of new areas of research that energize the creative talents of tomorrow’s workforce
  - Inclusion in technology development and planning
Collaborative Areas of Interest: Past, Current, and Future

- Past collaborative efforts include:
  - Integrated Powerhead Demonstrator (IPD)
  - Upper Stage Engine Technology (USET)
  - Rocket Propellant (RP) fuel characterization

- Current collaborative efforts include:
  - Advanced metallic material research
  - Aerospike nozzle testing
  - Hydrocarbon Boost Technology Demonstrator (HC Boost)

- Future collaborative efforts and technology transition include:
  - Next Gen Engine (NGE) a Upper Stage Engine Development Program
  - National Domestic Hydrocarbon Engine Development
  - Advanced monopropellants and monopropellant catalysts
  - Electrodynamically Propulsion

AFRL and NASA Have Long Shared Interests in Propulsion Research and Technology Development
The Next Generation Engine

- A pathfinder for collaboration between the USAF and NASA
- Recognizes the mission-unique needs of both
- Leverages the unique capabilities of both for engine design, development, test, & evaluation

An example of DoD & NASA meeting the intent of the National Space Policy & National Security Space Strategy

- Provides timely impetus to the US Propulsion industrial base
- Improves affordability of US Government space launch

One of Several Collaborative Opportunities with Mutual Benefit
NIRPS is a responsive solution to the current needs of Nation and the direction of the National Space Policy

NIRPS will leverage the capabilities of the entire community

NIRPS is a distributed and low-cost solution

As a Jointly Created and Sponsored Institute, NIRPS can serve as the Nation’s Authoritative Voice for Rocket and Missile Propulsion Systems
Path Forward

Outline the ‘Grand Challenges’

Forum: Von Braun Symposium
October 26, 2011

Activities: • Refined list of key issues/concerns

Outline the ‘Plan of Attack’ – Problems and Resolution Strategies

JANNAF
December 5-9, 2011

Activities: • Preliminary Governance/Organization structure
• Key issues/concerns categorized
• Key participants identified
• Initial priorities
• Preliminary resolution approaches for key concerns

Progress Against Strategies; Proceed to Implementation

National Space Symposium
April 16-19, 2012

Activities: • Charter
• MOA’s & agreements in place
• Finalized Governance/Organization structure
• Refined resolution approaches
• Initial implementation into budgetary planning
Panelists

- Brett Alexander (Blue Origin)
- Dr. Bob Frederick (University of Alabama in Huntsville)
- Julie Van Kleeck (Aerojet)
- Dr. Jamie Neidert, (U. S. Army Aviation and Missile Research Development and Engineering Center (AMRDEC))