NATIONAL INSTITUTE FOR ROCKET PROPULSION SYSTEMS

NIRPS - Solutions Facilitator Team 2012 Overview and Accomplishments

Joint Army Navy NASA Air Force 45th Combustion / 33rd Airbreathing Propulsion / 33rd Exhaust Plume and Signatures / 27th Propulsion Systems Hazards Joint Subcommittee Meeting

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Thomas M. Brown III, Ph.D.

NASA Marshall Space Flight Center

NIRPS: A Joint 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:** Monitor and analyze the state of the industry in order to formulate and recommend National Policy options and strategies that promote a healthy industrial base and ensure best-value for the American taxpayer

- **Technology:** Identify technology needs and recommend technology insertions by leading roadmap assessments and actively participating in program formulation activities

- **Solutions Facilitator/Provider:** Maintain relationships and awareness across the Government, industry and academia, to align available capacity with emerging demand

A Unique National Resource with the Capability to Serve Multiple Interests

Solutions Facilitator Team

- **Lead:** Thomas Brown – NASA/MSFC
- **Facilitator:** Rhonda Childress-Thompson – NASA/MSFC
- **NASA members:**
  - Steve Gentz & Roberto Garcia – NESC/MSFC
  - Roger Baird & Sam Dougherty – MSFC
  - Mark Moody – RPT/SSC
  - David Jacobson – GRC
  - Paul Caraccioli – MSFC
- **USG:**
  - Douglas Chapman – Army/Redstone Test Center
  - Nickolas Demidovich - FAA
- **Industry:** Brett Alexander (Blue Origin), Randy Kendall (Aerospace Corp.), Eun Kim (Aerospace Corp), Frank McCall (Boeing), Chris Sanders (PWR), Mark Salita (Retired, Solids Industry Expert)
- **Academia:**
  - Mitchell Walker – Georgia Institute of Technology

Grand Challenges Allocation to Strategy Teams

Grand Challenge	Stewardship	Technology	Solutions Facilitator
Support the competitiveness and resilience of the industrial base	**Primary**	Secondary	Secondary
Invigorate the STEM pipeline	**Primary**	Secondary	Secondary
Develop and implement an integrated science & technology plan for propulsion systems	Secondary	**Primary**	Secondary
Reduce development and sustainment costs for missile and rocket systems	Secondary	**Primary**	Secondary
Collaborate across agencies for missile and rocket propulsion system development	Secondary	Secondary	**Primary**
Foster access to facilities and expertise across Government, industry, and academia	Secondary	Secondary	**Primary**

NRPS

Task Primary Focus for Strategies with Objectives

Strategy	Objectives	Grand Challenges					
		GC1	GC2	GC3	GC4	GC5	GC6
F1. Communicate and foster a broad understanding of skills and capabilities across the entire propulsion community.	1. Conduct a Cross-Community Capabilities Inventory; notionally an internet accessible/searchable database. Potential for multi-user site representative update capability.	S	S	N/A	P	P	P
F2. Communicate and foster a broad understanding of projects and activities across the entire propulsion community.	1. Disseminate information throughout the propulsion community to create an awareness of on-going and potential projects and activities including (a) provide web-based info and current status for existing projects & activities and (b) facilitate/ coordinate NIRPS related meetings/conference sessions and papers	S	S	S	S	P	P
	2. Compile and maintain a complete list of existing and potential collaboration activities using web-based tool	S	S	S	S	P	P
F3. Provide streamlined facilitation mechanisms for interactions between members of the entire propulsion community.	1.Ease access to government skills/capabilities by: (a) facilitating the establishment of SAAs/MOUs; (b) using potential pass-through strategies to reduce the number of contractual mechanisms.	S	S	S	S	P	P
	2. Investigate & establish internal (government-funded) pool for quick starts and small short duration activities (cross-cutting collaborative solutions).						
	3. Investigate university access to special skills/capabilites.						
F4. Provide periodic assessment of skills and capabilities across the government and propulsion community, and contrast against projected requirements and need.	1. Conduct a periodic propulsion skills and capabilities assessment, including: (a) the state of the skills and capabilities (level of competence and capacity); (b) an assessment of the "in situ" utilization of the available skills and capabilities; (c) a projection of future demand for propulsion skills and capabilities; (d) definition of gaps; (e) barriers to innovation.	S	S	S	S	P	P

Solutions Facilitator Team Major Accomplishments

- **Developed key "solutions strategies"** (top level plan) to begin to address the primary solutions Grand Challenges – Simplify access to Government skills and capabilities & Facilitate collaboration across the government, academia and industry

- **Initiated contracted tasks with CPIAC** to continue additional development of NIRPS Web Capability including the "Cross-Community Skills and Capabilities Directory/Database, the Propulsion Community of Interest, and potential web collaboration portals.

- **Stimulated New Collaboration between MDA and NASA** by supporting initial "Quick Start" to thruster system test investigation and provided bridge to enable uninterrupted support through funding transition

- **Supporting STEM:** Supported continued development and university utilization of the MSFC Generalized Fluid System Simulation Program (GFSSP) - Student Version, in support of fluid dynamics education and student design projects.
  - Addition of six university partners
    - *Auburn University, UAB, UAH, Alabama A&M, University of Houston Clearlake, Vanderbilt University*
    - *Initial discussions with: with University of Texas at Austin, Florida Institute of Technology , University of Colorado*
  - Development of teaching manuals and technical/user manuals.
  - Support of multiple university student design activities.

Solutions Facilitator Team Major Accomplishments

- **Facilitated partnership/collaboration** between NASA and U.S. Air Force (USAF) Space and Missile Systems Center's (SMC) Launch Systems Directorate (LR) on SLS Advanced Development NRA
  - USAF resources leveraged to increase total amount of NRA awards
  - USAF personnel included in planning, solicitation and evaluation, assuring inclusion of critical AUSEP activities

- **Supported partnership/collaboration** between NASA SLS and USAF on SLS Advanced Booster NRA
  - Potential collaborative tasks between NASA SLS and AFRL Hydrocarbon Boost Program still in work
  - Leveraging of SLS and Hydrocarbon Boost resources holds potential for acceleration of LOX Rich Staged Combustion (LRSC) technology development

Proposed NIRPS FY13 Goals

Grand Challenges	FY13 Goals	Team
1. Support the Competetiveness and resilience of the industrial Base	1.1 Develop Supply Chain Analysis for SLS Architecture Decisions.	Stewardship
	1.2 Develop Metrics to Determine Health of Industrial Base.	Stewardship
2. Invigorate the STEM pipeline	**2.1 Provide engineering students with practical experience utilizing propulsion design and analysis tools and methodologies.**	**Solutions Facilitator**
3. Develop and integrate a science and technology plan for propulsion systems	3.1 Use existing roadmaps to identify opportunities for collaborations and leveraging of complimentary activities.	Technology
4. Reduce development and sustainment costs for missiles and rocket systems	4.1 Conduct a study/survey of low cost technology test beds and/or other methods for transitioning propulsion component /sub-system technologies through the TRL valley of death (TRL 4-6).	Technology
5. Collaborate across agencies for missile and rocket propulsion system development	**5.1 Develop initial community of interest capability.**	**Solutions Facilitator**
	5.2 Establish a Cross-Cutting Collaborative Solutions Team that executes tasks of cross community interest, stimulating potential follow-on collaborations.	**Solutions Facilitator**
6. Foster access to facilities and expertise across Government, industry, and academia	**6.1 Develop initial Propulsion Skills and Capabilities Directory & Web Tool.**	**Solutions Facilitator**
	6.2 Complete study of mechanisms for potential pass through process to ease access to cross government skills and capabilities.	**Solutions Facilitator**

Integrated Goals		
Integrated Goals	IG.1 Develop operational model defining management concepts, operating principles and framework, and high-level goals including a concept of management oversight for periodic evaluation.	Integrated
	IG.2 Develop a comprehensive Strategic Communications Plan that addresses external and internal stakeholders, interactive websites, and outreach planning for public, STEM, and Agency/Industry engagement.	Integrated

Multi-source funded University Institutes Program?

- **During the Constellation, NASA (with some funding from other agencies) funded the Constellation Universities Institutes Program (CUIP).**
  - Fairly broad university executed, with government guidance, technology program
  - Significant number of propulsion centric tasks/efforts.
  - CUIP was a large supporter of STEM Pipeline producing a large number of BS, MS and Ph.D. level engineers and scientists
  - Last of funded CUIP efforts ended in September 2012.

- **If many government agencies/departments have common propulsion technology interests, and common goals of supporting STEM, should we consider a new, cross-government effort.**
  - Leverages multiple funding sources to provide stability to technology efforts and students
  - Stimulates cross agency collaboration on common interests
  - Builds on past STEM successes of the CUIP program

1:30 – 3:30 Solutions Facilitator Team

1:30 PM

2012 Overview and Accomplishments

Thomas Brown – NASA MSFC

Industry Perspective

Brett Alexander - Blue Origin

Academic Perspective

Robert Frederick – University of Alabama Huntsville

Web Capabilities Development Discussion

Nick Keim – JHU CPIAC

Wrap-up, Additional Questions/ Discussions

3:30 PM BREAK