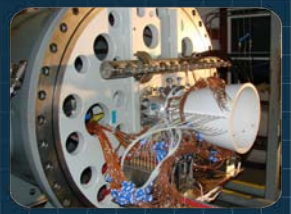
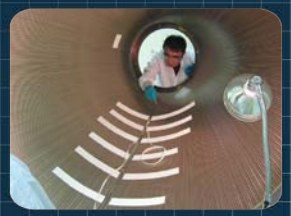
NATIONAL INSTITUTE FOR ROCKET PROPULSION SYSTEMS




NIRPS Overview

Joint Army Navy NASA Air Force 8th Modeling and Simulation/6th Liquid Propulsion/5th Spacecraft Propulsion Joint Subcommittee Meeting

December 5-9, 2011

Dale Thomas PhD, PE
Associate Director – Technical
NASA Marshall Space Flight Center

Agenda

Dale Thomas – NIRPS Overview

Jamie Neidert – Stewardship of the Industrial Base

George Schmidt – Integrated Technology Planning & Roadmapping

Tom Brown – Solutions Facilitator

Jim Reuter – Cross Cutting

Dale Thomas – Q&A

State of the Propulsion Industry

- "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)

- "As constrained DoD budgets become more strained by higher priority programs, **investments in missile research & development and procurement may be more challenged."** Annual Industrial Capabilities Report To Congress, May 2010, DoD report

A Shared Industrial Base Underlies Both DoD & NASA Propulsion Systems

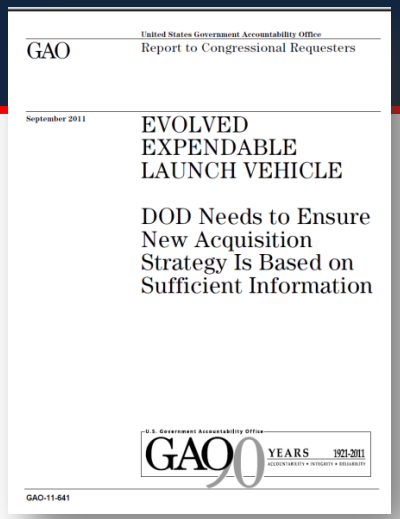
Collaboration: A National Pursuit

- "**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

The NIRPS is responsive to National Space & Security Space Policies.

Industry Pressure Mounts


United States Government Accountability Office
GAO
Report to Congressional Requesters

September 2011

EVOLVED EXPENDABLE LAUNCH VEHICLE

DOD Needs to Ensure New Acquisition Strategy Is Based on Sufficient Information

U.S. Government Accountability Office
GAO 90 YEARS 1921-2011
ACCOUNTABILITY • INTEGRITY • RELIABILITY

GAO-11-641

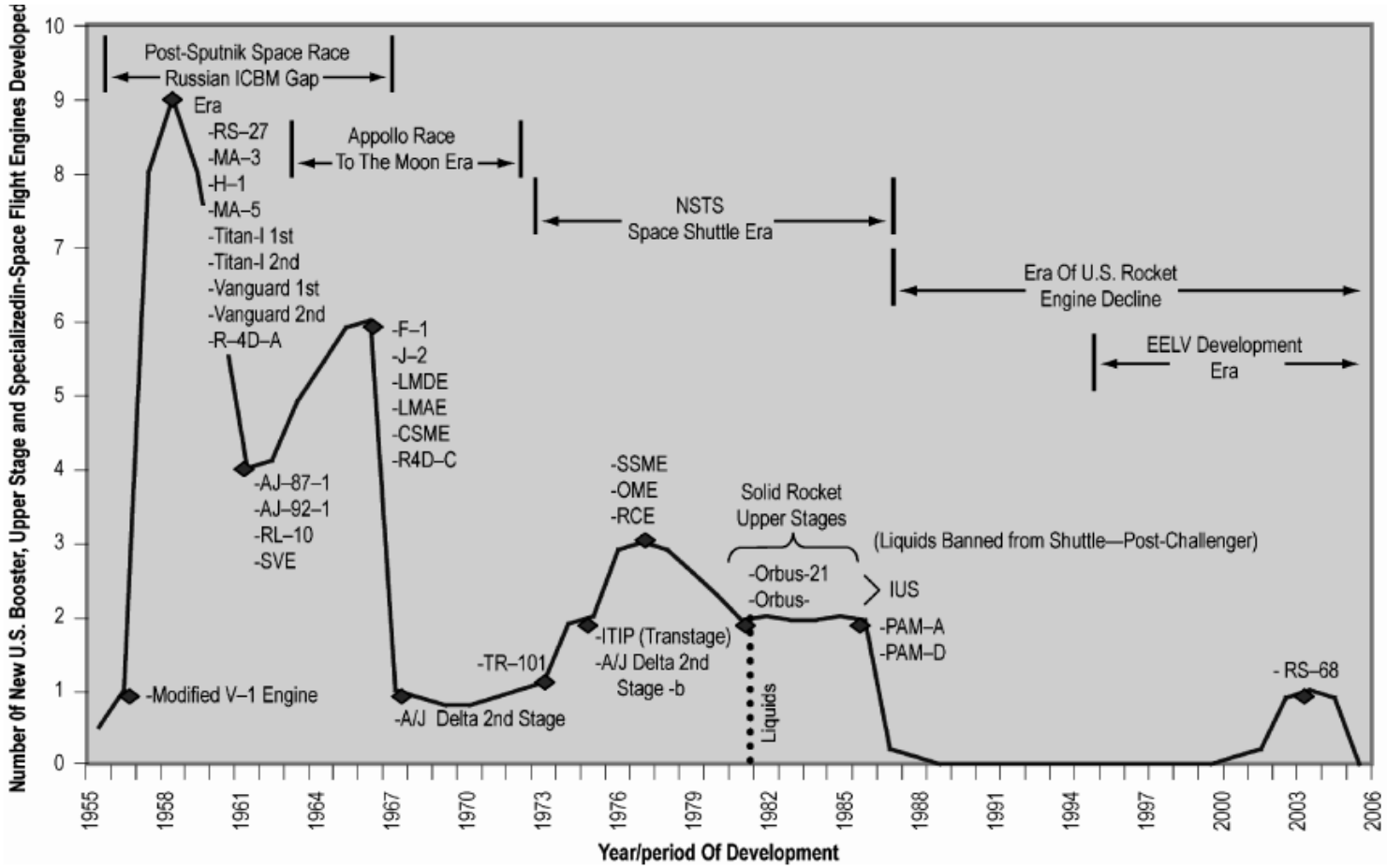
- Recent GAO report highlights the need for better information and government-wide coordination to support acquisition strategy decisions

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

- Common problematic themes:
  - Budget constraints require acquisition programs to rely on heritage hardware, leading to a lack of development programs to sustain workforce and suppliers
  - Absence of an integrated science and technology plan for launch technologies
  - Difficulty in obtaining access to government facilities

The Challenges are Known

U.S. Rocket Engine Development History



Ref: Sackheim, AIAA-23257-7531, Journal of Propulsion and Power, Nov. – Dec. 2006

No Competitive Liquid Rocket Engine Developments in 3 Decades

U.S. Propulsion Program Stability

Aerojet Launch Vehicle Propulsion Programs Over the Last 20 Years

Engine Program	Application	Customer	Program Maturity: Preliminary Design	Component Development	Demonstration Testing	Protoqual	Qualification	Full Scale Development	Flight	Production
Transtar	Upper Stage	A/F	■	■	■					
Uprated OME	Shuttle	NASA	■	■	■					
XLR-132	High Performance Upper Stage	A/F	■	■	■					
XLR-134	Cryogenic Upper Stage	A/F	■	■						
NLS	Low Cost Booster Engine	NASA	■	■						
ALS	Low Cost Booster Engine	NASA	■	■						
LOCUS	Low Cost Upper Stage	A/F	■	■	■					
Agena-2000	Low Cost Upper Stage	A/F	■	■	■					
X-33 RCS	Low Cost RCS Engines	NASA	■	■	■	■	■	■	■	■
Green RCS	LOX/Ethanol RCS	NASA	■	■	■	▶				
Cobra	RLV Booster Engine	NASA	■	■						
ARRE	Advanced Peroxide Upper Stage	A/F	■	■	■					
HOPE-X	Japanese Upper Stage	Japan	■	■	■	■	■	■	■	■
Atlas V Solid	Advanced Solid Rocket Booster	L/M	■	■	■	■	■	■	■	▶

Commercially Funded

We Need A Plan and Commitment to "Stick to It" and Finish What We Start

Ref: Van Kleeck, Von Braun Symposium, Oct. 26, 2011

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 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

Planning Team

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

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 "Grand Challenges" Strategy Teams

Team	Leader	Facilitator
Industrial Base Stewardship	Dr. Jamie Neidert/AMRDEC	Dr. Rajiv Doreswamy/NASA
Integrated Technology Planning and Roadmapping	Dr. George Schmidt/Glenn Research Center	Bill Ondocsin/NASA
Solutions Provider	Dr. Tom Brown/NASA	Rhonda Childress-Thompson/NASA
Cross-Cutting	Jim Reuter/NASA	TBD

Path Forward

	Outline the 'Grand Challenges'	Outline the 'Plan of Attack' – Problems and Resolution Strategies	Progress Against Strategies; Proceed to Implementation
Forum:	**Von Braun Symposium** October 26, 2011	**JANNAF** December 5-9, 2011	**National Space Symposium** April 16-19, 2012
Activity:	• Refined list of key issues/concerns	• Preliminary Governance/ Organization structure • Key issues/concerns categorized • Key participants identified • Initial priorities • Preliminary resolution approaches for key concerns	• Charter • MOA's & agreements in place • Finalized Governance/ Organization structure • Refined resolution approaches • Initial implementation into budgetary planning

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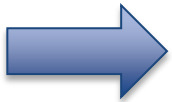

Dale Thomas – Q&A

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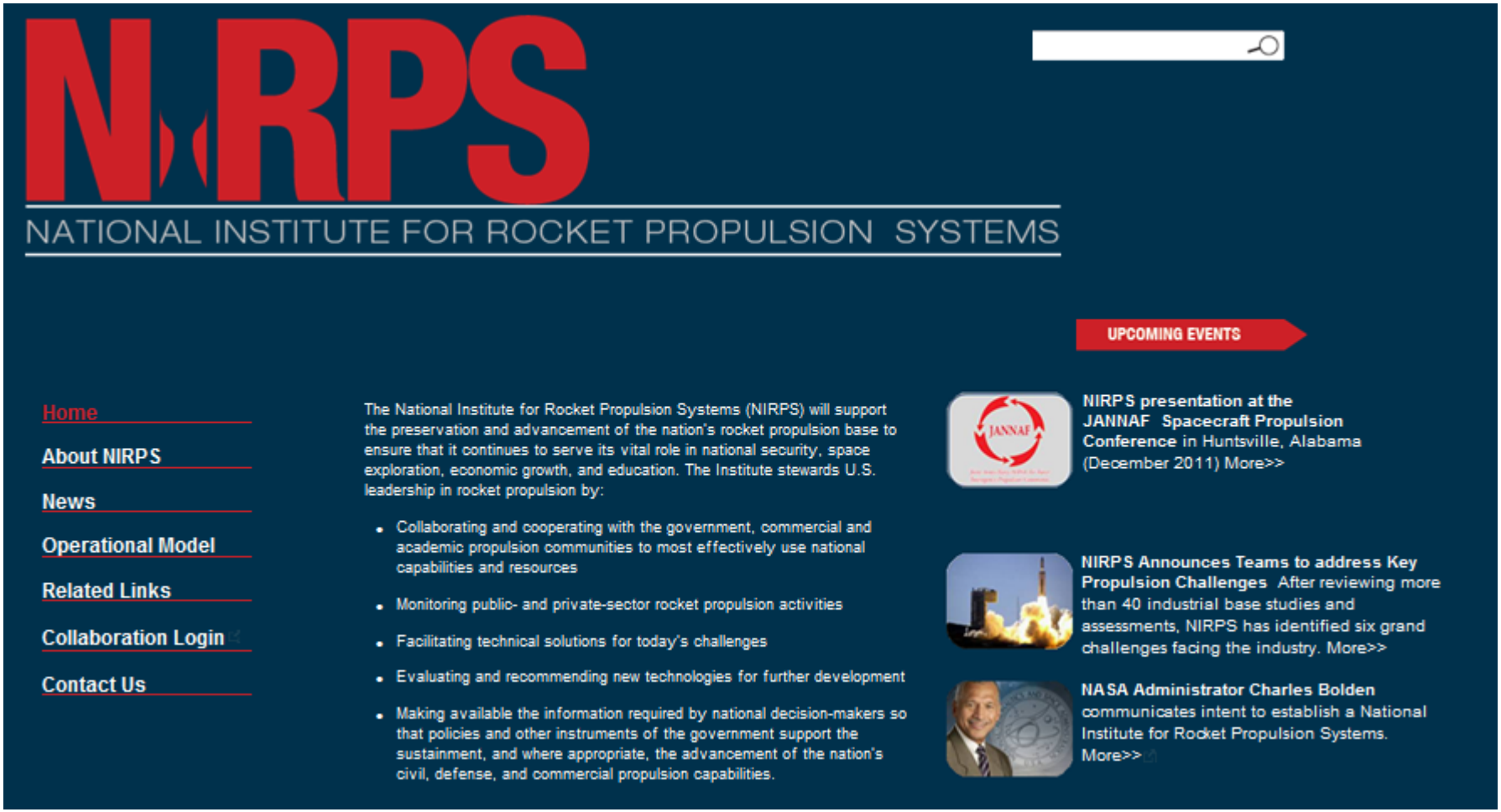


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