

**NASA Engineering
and
Safety Center
(NESC)
Overview
May 5, 2011**





NESC Background and Vision



Apollo Saturn V Launch Vehicle

- NESC was established in July 2003 in response to the Columbia accident
- Safety philosophy has 3 tenets:
 - Strong in-line checks and balances
 - Healthy tension
 - “Value added” independent assessment
- NESC provides independent assessment of technical issues for NASA programs and projects

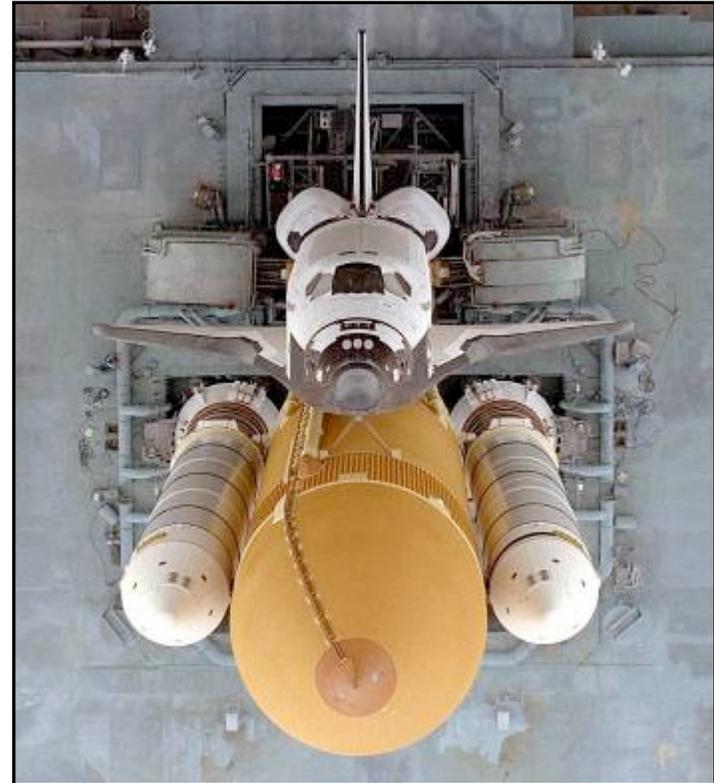
NESC is cultivating a Safety culture focused on **engineering and technical excellence**, while fostering an **open environment** and attacking challenges with **unequaled tenacity**



NESC Model



- Institutionalized “Tiger Team” approach to solving problems
- Agency-recognized NASA Technical Fellows lead Technical Discipline Teams (TDT)
 - TDTs include “ready” experts from across NASA, industry, academia and other government agencies
- Assemble diverse, expert technical teams that provide robust technical solutions to the Agency’s highest-risk and most complex issues
- Strong Systems Engineering function for proactive trending and identification of problem areas before failures occur



Space Shuttle on Mobile Launch Platform

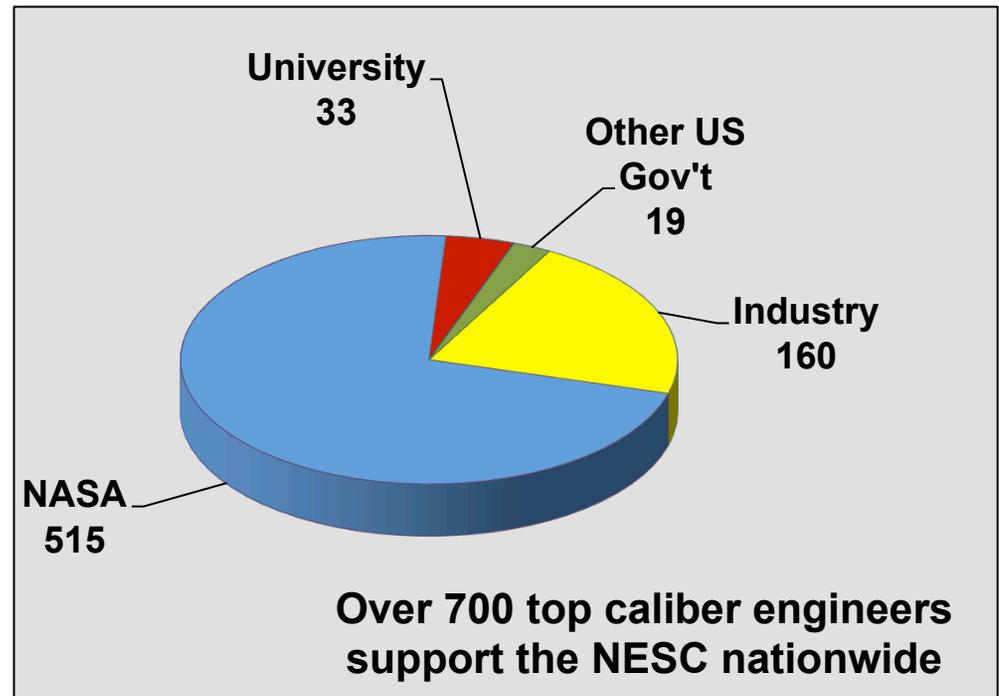
Focus on technical rigor and engineering excellence



NESC Organization Distributed NESC Team



- NESC has 61 full-time employees selected from across the Agency and externally
- NESC Chief Engineers at each Center provide technical insight and liaison roles
- 15 NASA Technical Fellows are recognized experts in their respective engineering fields
- 18 Technical Discipline Teams (TDT) comprised of 16 engineering and 2 operations disciplines create a network of over 700 engineers available for matrix support
- More than 200 TDT members are drawn from industry, academia and other government agencies





NASA Technical Fellows Disciplines



- 15 NASA Technical Fellows are currently active
 - Aerosciences - Dave Schuster (LaRC)
 - Avionics - Oscar Gonzalez (GSFC)
 - Electrical Power – Denney Keys (GSFC)
 - Flight Mechanics – Dan Murri (LaRC)
 - Guidance, Navigation, and Control - Neil Dennehy (GSFC)
 - Human Factors - Cynthia Null (ARC)
 - Life Support / Active Thermal - Hank Rotter (JSC)
 - Loads and Dynamics - Curt Larsen (JSC)
 - Materials - Bob Piascik (LaRC)
 - Mechanical Systems – Joe Pellicciotti (GSFC)
 - Non-Destructive Evaluation - Bill Prosser (LaRC)
 - Passive Thermal – Steve Rickman (JSC)
 - Propulsion – Roberto Garcia (MSFC)
 - Software - Mike Aguilar (GSFC)
 - Structures - Ivatury Raju (LaRC)
- Four additional disciplines to be added pending available funding
 - Space Environments
 - Systems Engineering
 - Cryogenics
 - Instruments and Sensors



NESC Resident Engineer Program



- Creates an opportunity to allow early career participants to gain hands on experience
 - Provide a technically diverse learning experience for resident engineers within the NESC organizational framework
 - Gain first-hand experience working with NASA technical experts and leaders
- Builds upon the principles of the MLAS Resident Engineer model
- Benefits the Agency by connecting to a younger generation and providing a fresh perspective to technical activities
- One year detail assignment for GS-12's and 13's



2009–2010 NESC Resident Engineers



2010-2011 NESC Resident Engineers



NESC Technical Highlights



**Shell Buckling
Knockdown Factor
Testing**



**Crew Module Water Landing
Modeling Assessment**





NESC Technical Highlights



Support for Chilean Miners Rescue Effort

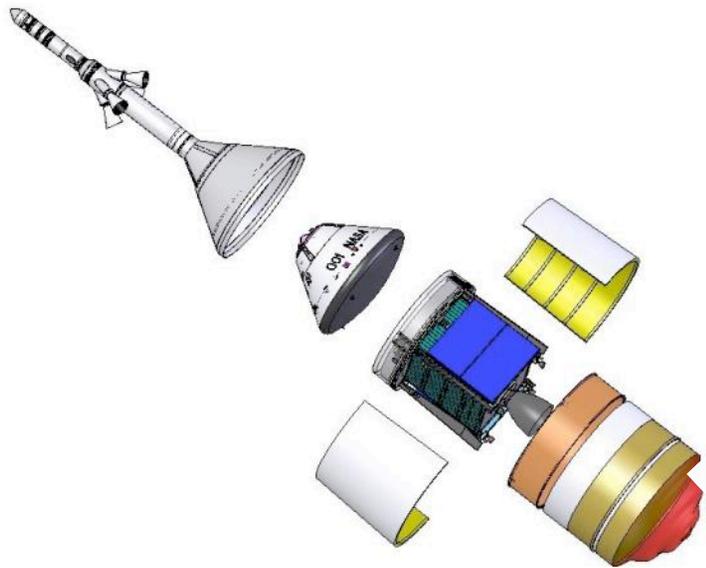


NHTSA Toyota Sudden Acceleration Investigation





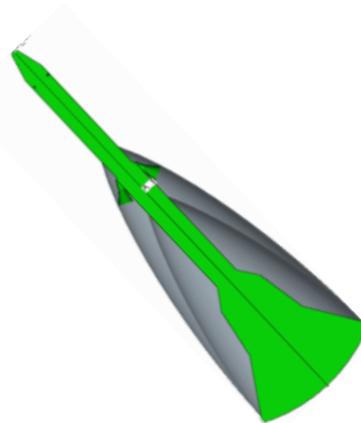
NESC Leading Agency-Wide Teams Gaining Hands-On Experience In Design, Development, and Test



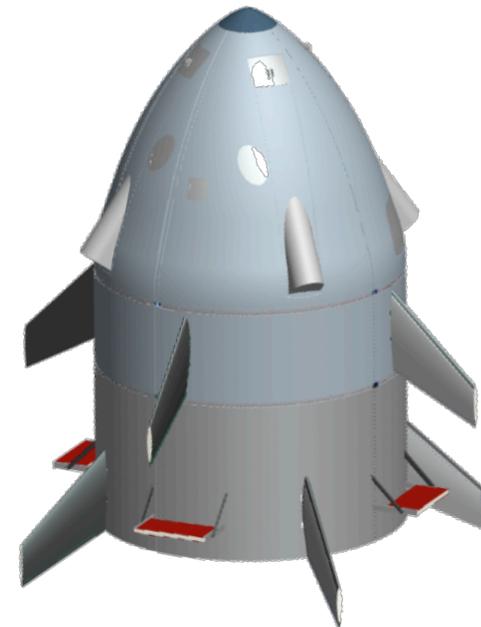
CEV Smart Buyer



Composite Crew Module



Alternate Launch Abort System



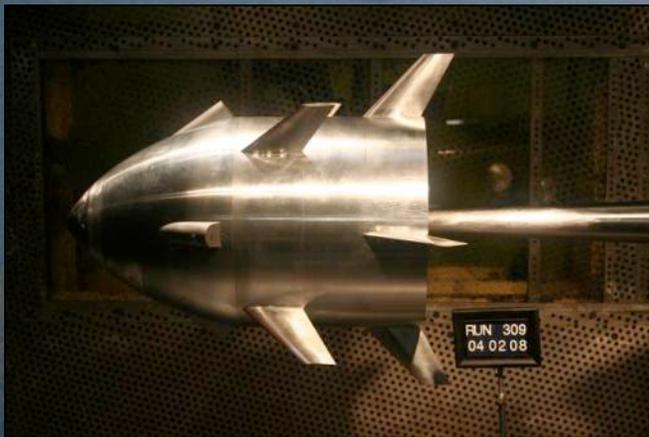
Max Launch Abort System



NESC Leading Agency-Wide Teams Max Launch Abort System



Develop an alternate launch abort system design as risk mitigation for the Orion LAS and demonstrate the concept with a pad abort flight test.

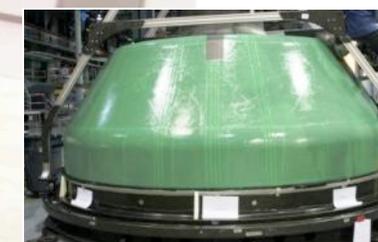




NESC Leading Agency-Wide Teams Composite Crew Module



Design and build a composite crew module to gain hands-on design, build, and test experience.





Contributions to the Agency



- After 7 years and 400+ technical assessments the NESC has become the “value added” independent technical organization for the Agency
- The NESC model provides an excellent example of the benefits of bringing together diverse technical experts to solve the Agency’s most difficult problems
 - Creative, robust technical solutions
 - Stronger checks and balances
 - Well informed decision making
- The NESC has fulfilled a role for off-line design, development and test to provide alternate solutions, gain valuable hands-on experience, and help train the next generation of engineers





A Challenge for Statistical Engineering Community: Leveraging Limited Data



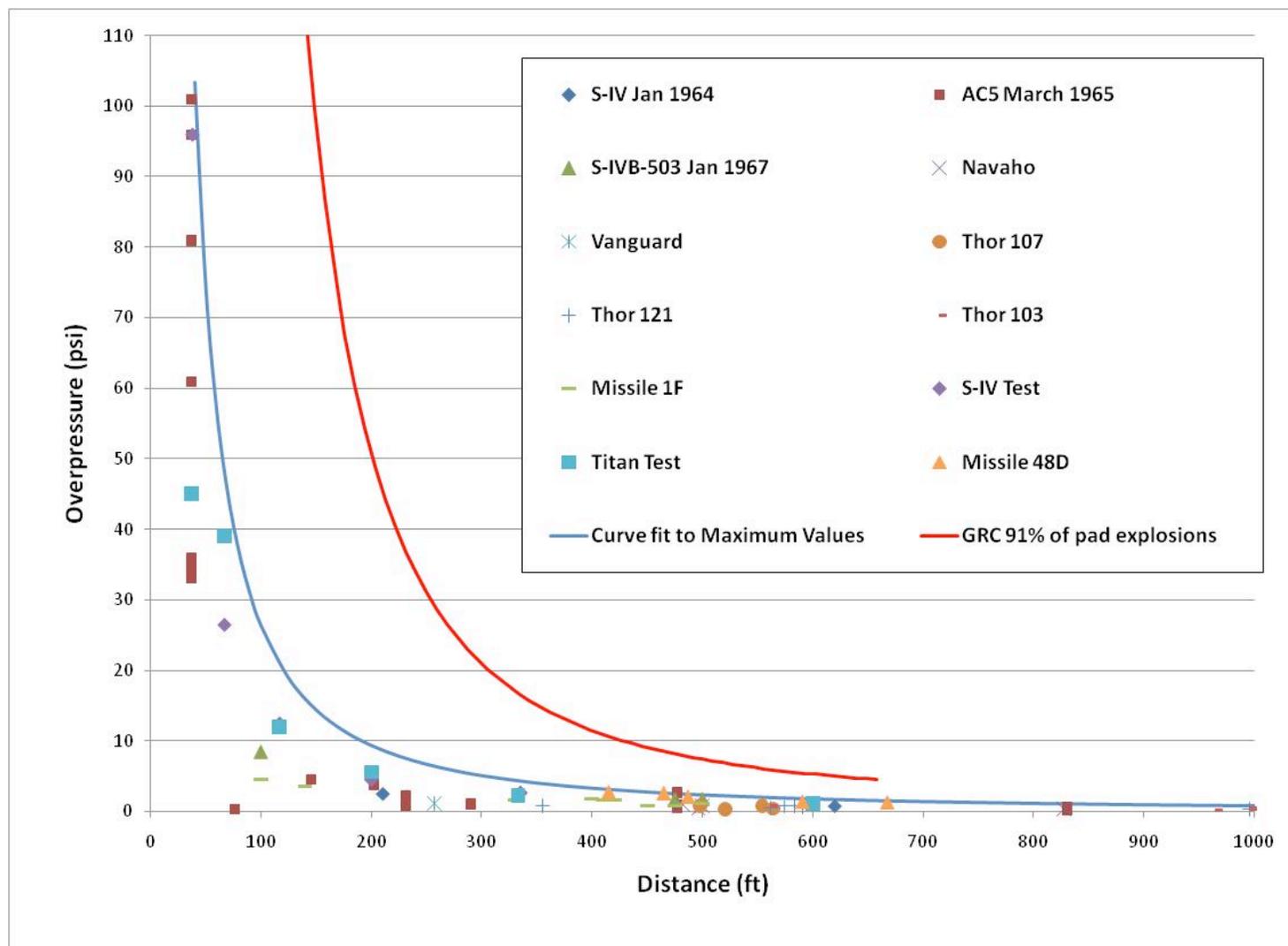
Case Study: Launch Environments



- Problem
 - Catastrophic failures of launch vehicles during launch and ascent are currently modeled using equivalent TNT estimates
 - This approach tends to over-predict the blast effect with subsequent impact to launch vehicle and crew escape requirements
 - Work has begun on a less-conservative model based on historical failure and test data coupled with physical models and estimates
- Challenge
 - Revised approach requires a statistical assessment of historical databases
 - NESC was asked to conduct a peer review of the work and provide findings and recommendations



Case Study: Launch Environments





The Challenge



- Challenge: Agency senior leaders need timely inputs to make well informed decisions, often with limited data.

- What can the statistical engineering community do to help?
 - What tools/methods are available or can be developed to deal with small data sets for real-time problem solving?
 - How can statistical information be communicated more clearly to decision makers outside of the community?
 - How can the community engage earlier in issue resolution to help guide the testing and data collections?