

#### **OFFICE OF THE CHIEF ENGINEER Engineering Research & Analysis Update**

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## **Definition of Engineering R&A**

• Engineering Research and Analysis (R&A) is the application or advancement of principles, tools, models, methods, processes, design approaches, etc.; seeks improvements in theory and practice in the field of engineering; and leads to unexpected new solutions, deeper expertise, and improved engineering capabilities within the agency.



- The Program consists of two major areas:
  - Basic Research: explores unknown or poorly understood scientific areas underlying engineering; provides the raw material for innovation and discovery
  - Engineering Methods: conceives or addresses tools, models, standards, knowledge, and techniques required for advances in engineering; addresses major technical and cost barriers





### Goals of Engineering R&A Program



- Initiative seeks to continue NASA's investments for advancing engineering capabilities in targeted critical areas of discipline-based engineering approaches/techniques.
- Engineering Research & Analysis (R&A) Program seeks to:
  - Sponsor a cohesive portfolio of engineering research across the Agency
  - Drive new understanding and new capabilities to engineering principles for the future
  - Leverage NASA engineering research and analysis activities and expertise with relevant activities and expertise in other agencies, industry, and academia
  - Infuse new engineering tools, techniques and methods into standard NASA practice and integrate into academia and industry
  - Identify (ultimately) 'on-ramps' into the nation's technology development from the knowledge gained in engineering advancement activities
- This initiative builds NASA's core engineering capability, under a unified structure, that meets the future goals through investments in engineering tools, techniques, and standards
- This initiative provides investment in lower and mid-level engineering research in areas that are unique to our mission and will address gaps that external research may not fill, while supporting internal in-house work
- Engineering R&A investments will enable more efficient and effective aerospace mission execution and underpin the health of NASA's and America's aerospace mission execution

### **Status of Engineering R&A**



- Initially an action from the 2016 ASIP
  - STMD assigned to work with OCE and the other Mission
    Directorates to develop PPBE19 SPG language for formulating engineering research and analysis activities
- Different approaches to funding/managing were considered
- Agency decision was made to manage the investment/program from the Office of the Chief Engineer
  - Initial investments will occur starting in FY20 pending availability of funds
- Identification of work to be funded will result from implementation of an internal process to consider priorities for Engineering R&A



February	Distribute Internal Call for R&A candidate activities
Мау	Candidate materials due for HQ R&A Steering Panel evaluation/prioritization
July	OCE/EMB program/coordination review
August	Chief Engineer makes final selection
	Winning candidates notified
August/ September	Activity managers develop detailed project/budget plan
October	Project start contingent on funding availability
January	Status reports on prior year's R&A projects due to OCE

### **Engineering R&A Candidates**



# The following Engineering R&A project topics are potential candidates for initial implementation (under review):

- New computational fluid dynamics algorithms tailored to emerging computer hardware technology
- Development of Damage Tolerance analysis and test method tools
- Probabilistic analysis to quantify structural reliability
- New concepts and materials for space exploration
- Computational NDE Methodologies
- Development of validated high-fidelity human-system performance analysis and modeling
- Development and operations support for the Cosmic Ray Effects on Microelectronics (CRÈME) single event effects (SEE) analysis tools.
- Development support for the NASA and Air Force Spacecraft Charging Analysis Program (NASCAP) surface charging analysis tool updates.
- Nuclear Power and Propulsion Integrated System Transient Modeling Capability