



NASA EXPLORES

NASA RHA Update and Workforce Development

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08-Jan-2020

Acronyms

Abbreviation	Definition
CAD	Computer-Aided Design
CSG	Combinatorial Solid Geometry
CY	Calendar Year
EEEE	Electrical, Electronic, Electromechanical, and Electro-Optical
GSFC	Goddard Space Flight Center
IEEE	Institute of Electrical and Electronics Engineers
JPL	Jet Propulsion Laboratory
NASA	National Aeronautics and Space Administration
NEPP	NASA Electronic Parts and Packaging (Program)
NOVICE	Numerical Optimizations, Visualizations, and Integrations on CAD / CSG Edifices
OTA	Other Transaction Agreement
PI	Principal Investigator
RHA	Radiation Hardness Assurance
SAE	(formerly the) Society of Automotive Engineers
SEE	Single-Event Effects
SEECA	Single-Event Effects Criticality Analysis
SPENVIS	Space Environment Information System
SRHEC	Strategic Radiation-Hardened Electronics Council
TID	Total Ionizing Dose
TNID	Total Non-Ionizing Dose

A large, stylized graphic on the left side of the slide depicts a cosmic scene. It includes a bright yellow sun in the lower-left, a blue and white Earth horizon at the bottom, a large grey moon in the center, and a ringed planet like Saturn in the upper-left. The background is a deep blue space filled with stars and a glowing blue nebula. A thick, white, curved line sweeps across the scene from the top-left towards the bottom-right, separating the graphic from the text area.

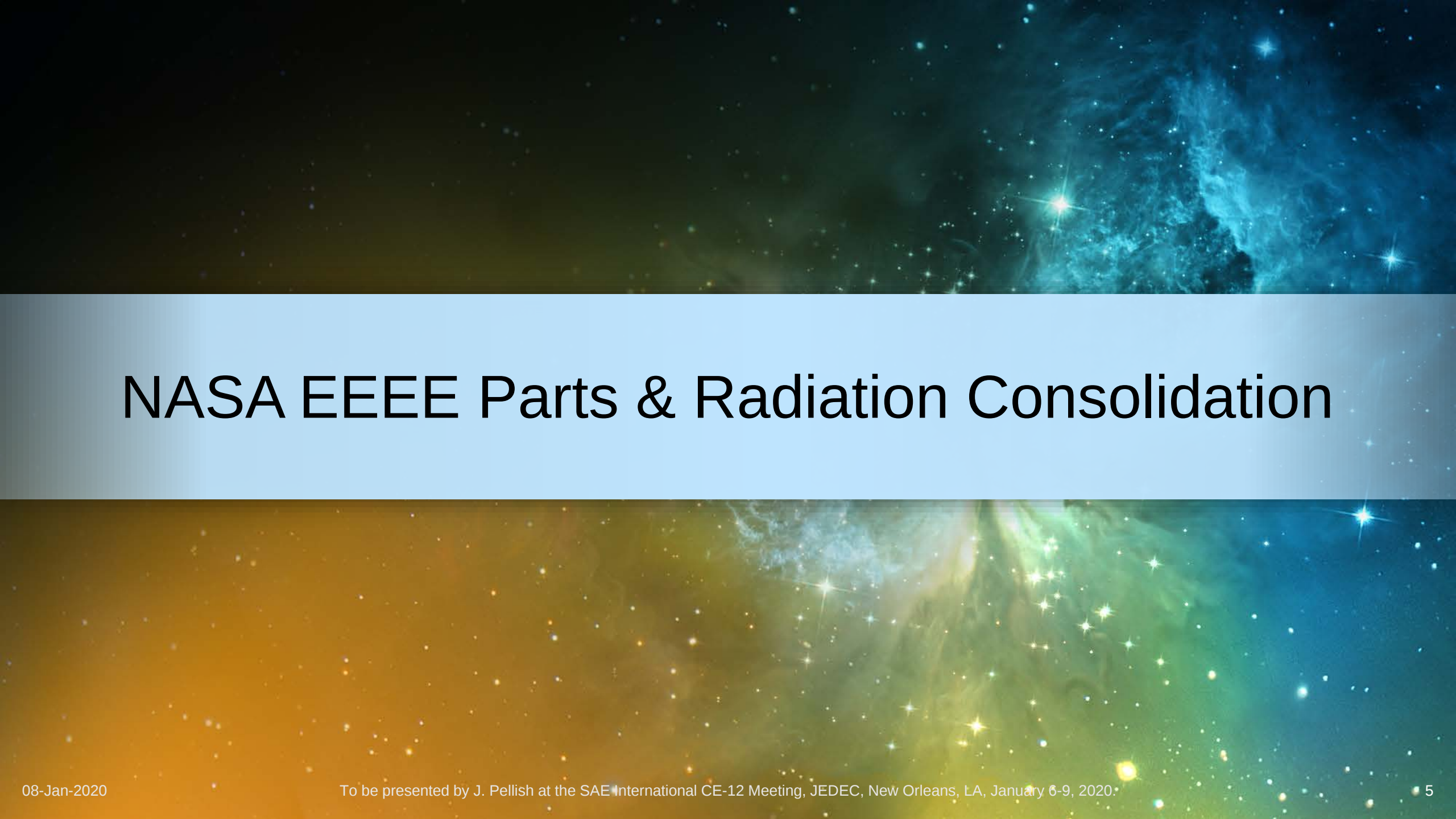
Acknowledgements

- NASA Electronic Parts and Packing Program
 - Supported by the NASA Office of Safety and Mission Assurance
- NASA Engineering and Safety Center
- NASA colleagues and community peers

A large, stylized graphic on the left side of the slide. It features a curved, semi-circular shape containing various celestial bodies: a large blue planet (Earth) at the bottom, a smaller brown planet (Mars) above it, a ringed planet (Saturn) to the left, and a bright yellow sun or star at the bottom left. The background is a deep blue space filled with stars and a vibrant, colorful nebula in shades of blue, green, and yellow. A thick white curved line separates this graphic from the text area on the right.

Outline

- Organizing skills within NASA
 - Leadership by GSFC with support from JPL
- Progress on new radiation hardness assurance (RHA) initiatives
 - In support of the Artemis Program and other Agency objectives
- Workforce development
 - NASA and U.S. Government focus on microelectronics
 - Developing existing personnel & growing new personnel



NASA EEEE Parts & Radiation Consolidation

NASA's Organization for Providing Skills & Services

Agency EEEE Parts & Radiation Effects

(NASA Electronic Parts Manager – Steward & Advocate for Capability)

Assurance

Development

Facilities

Office of Safety &
Mission Assurance

Office of the Chief
Engineer

Flight Projects

Mission Support

- NEPP Program
- Quality
- Reliability
- Workmanship

Capability Leadership

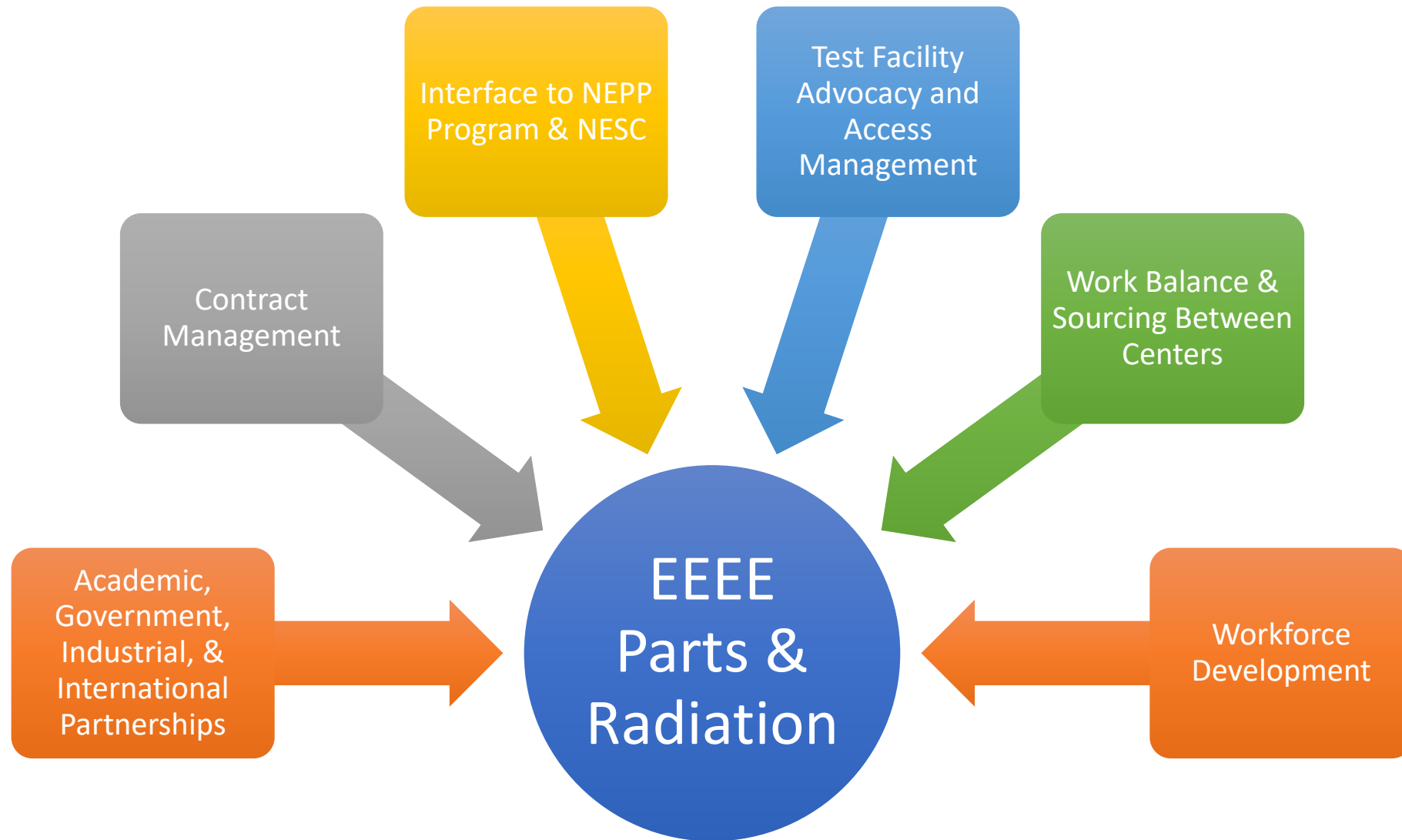
NASA Engineering &
Safety Center

Field Centers

Mission Directorates

Space Environments Testing
Management Office

NASA's Organization for Providing Skills & Services



Led by NASA GSFC with support from JPL

The background of the slide is a cosmic image featuring a dark space filled with numerous stars of varying brightness. Two prominent nebulae are visible: a blue one in the upper right and a greenish-yellow one in the lower right. A horizontal light blue band serves as a backdrop for the title text.

Current RHA Guidance Development Efforts

The Artemis Program – Overview

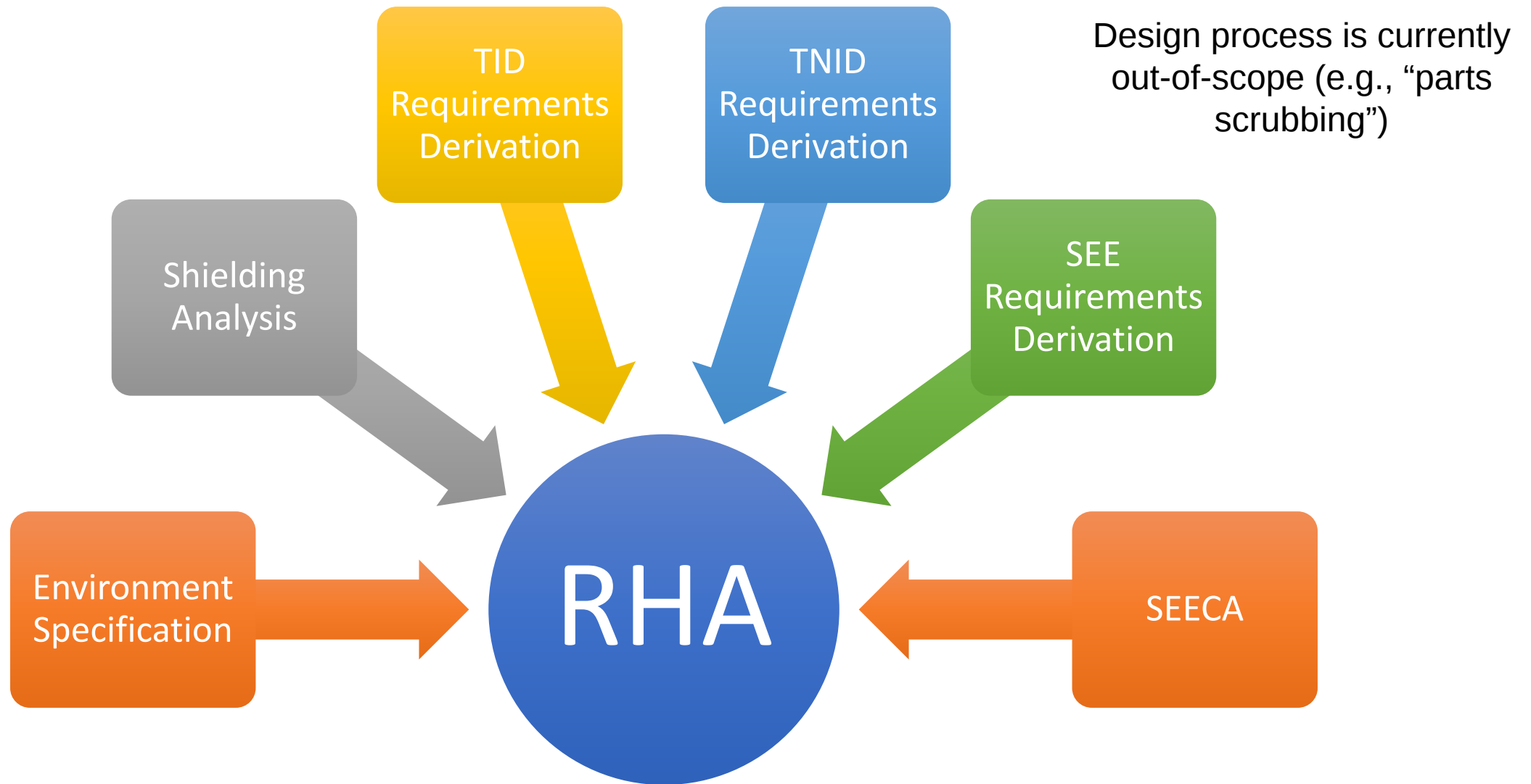


Video credit: NASA [Posted at https://youtu.be/_T8cn2J13-4]

Guideline Development for Avionics RHA

- Support the Artemis Program's objectives for human-rated vehicle functionality beyond low earth orbit – and provide benefits to NASA's other mission development lines of business
- Document current state-of-the-practice and key points of evolution over past two decades
- Incorporate recent developments in environment specification and probability of success calculations
 - Confidence levels for trapped particles and solar particle events
 - Example: M. A. Xapsos et al., "Inclusion of Radiation Environment Variability in Total Dose Hardness Assurance Methodology," in *IEEE Trans. Nucl. Sci.*, vol. 64, no. 1, pp. 325-331, Jan. 2017.
- Update of existing methodology for single-event effects criticality analysis (SEECA) [likely to continue after current assessment project ends]
- Guideline(s) will be publicly available

Guideline Contents





Workforce Development

Space User's Perspective

Space Radiation Workforce – Generally

Space Radiation Ecosystem

Systems Engineering

- Radiation Reqs. Definition
- Fastrad, NOVICE, SPENVIS, etc.
- Radiation Testing Management

Device Physics / Electrical Engineering

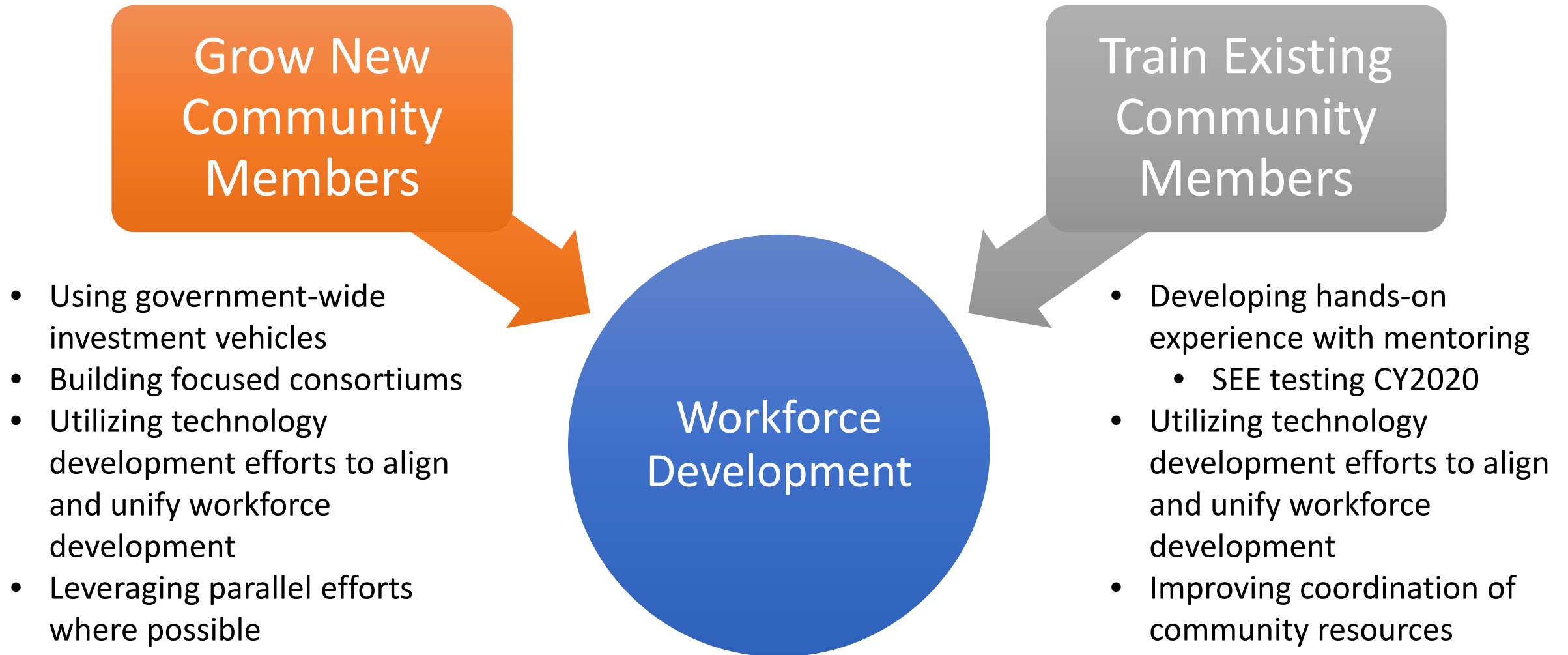
- EEEE parts programs
- Radiation testing & qualification

Space Weather Physics

- Mission Scientists / PIs
- Model Definers
- Often university + research labs based

Content adapted from K. Cahoy & W. Lohmeyer, "How to Recruit and Retain the Next Generation of Radiation Scientists/Engineers," JPL Workshop, June 2019.

Two-Fold Strategy for Workforce Development



Develop sustainable workforce with acceptable baseline capability – ideally be practitioner independent daily and maintain subject matter expertise

Workforce Development Activities

- NASA- and JPL-specific; ongoing
- NASA coordinating with and through the Strategic Radiation-Hardened Electronics Council (SRHEC)
 - NASA co-leading Workforce Development Working Group
 - Periodic data calls and health assessments covering U.S. Government and industrial base supporting space and strategic sectors
- Cornerstone Other Transaction Agreement (OTA)



Cornerstone Initiative - CS-19-1601 - Microelectronics Innovative Workforce Model

Solicitation Number: CS-19-1601

Agency: Department of the Army

Office: Army Contracting Command

Location: ACC - RI (W52P1J)

<https://ibasp-public.ria.army.mil/cornerstone/>



Thank you!

Questions Welcome



EXPLORE MOON_{to}MARS

MOON LIGHTS THE WAY

