



NASA Electronic Parts & Packaging (NEPP) Program

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Acronyms

Abbreviation	Definition
AF	Air Force
BGA	Ball Grid Array
BN	Bayesian Network
BoK	Body of Knowledge
CMOS	Complementary Metal Oxide Semiconductor
COTS	Commercial Off the Shelf
CPU	Central Processing Unit
DDR	Double Data Rate
DLA	Defense Logistics Agency
DMEA	Defense Microelectronics Activity
DoD	Department of Defense
DoE	Department of Energy
EEE	Electrical, Electronic, and Electromechanical
ETW	Electronics Technology Workshop
FPGA	Field Programmable Gate Array
GaN	Gallium Nitride
GIDEP	Government Industry Data Exchange Program
GPU	Graphics Processing Unit
GRC	Glenn Research Center
GSFC	Goddard Space Flight Center
GSN	Goal Structuring Notation
HQ	Headquarters
IC	Integrated Circuit
IEEE	Institute of Electrical and Electronics Engineers
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
LaRC	Langley Research Center
LGA	Land Grid Array
MAPLD	Military and Aerospace Programmable Logic Devices (Workshop)
MBMA	Model-Based Mission Assurance
MRAM	Magnetic Random Access Memory
MSFC	Marshall Space Flight Center

Abbreviation	Definition
NASA	National Aeronautics and Space Administration
NEPAG	NASA Electronic Parts Assurance Group
NEPP	NASA Electronic Parts and Packaging (Program)
NESC	NASA Engineering and Safety Center
NODIS	NASA Online Directives Information System
NPR	NASA Procedural Requirement
NRO	National Reconnaissance Office
NSREC	Nuclear and Space Radiation Effects Conference
OCE	Office of the Chief Engineer
OGA	Other Government Agency
PIC	Photonic Integrated Circuit
POC	Point of Contact
PoF	Physics of Failure
RF	Radio Frequency
RH	Radiation Hardened
RHA	Radiation Hardness Assurance
SAPP	Space Asset Protection Program
SDRAM	Synchronous Dynamic Random Access Memory
SEE	Single-Event Effects
SiC	Silicon Carbide
SMA	Safety and Mission Assurance
SMC	Space and Missile Systems Center
SOA	Safe Operating Area
SoC	System on a Chip
SRAM	Static Random Access Memory
SSAI	Science Systems and Applications, Inc.
STMD	Space Technology Mission Directorate
STT	Spin Transfer Torque
SysML	System Modeling Language
TID	Total Ionizing Dose
TSV	Thru-Silicon Via

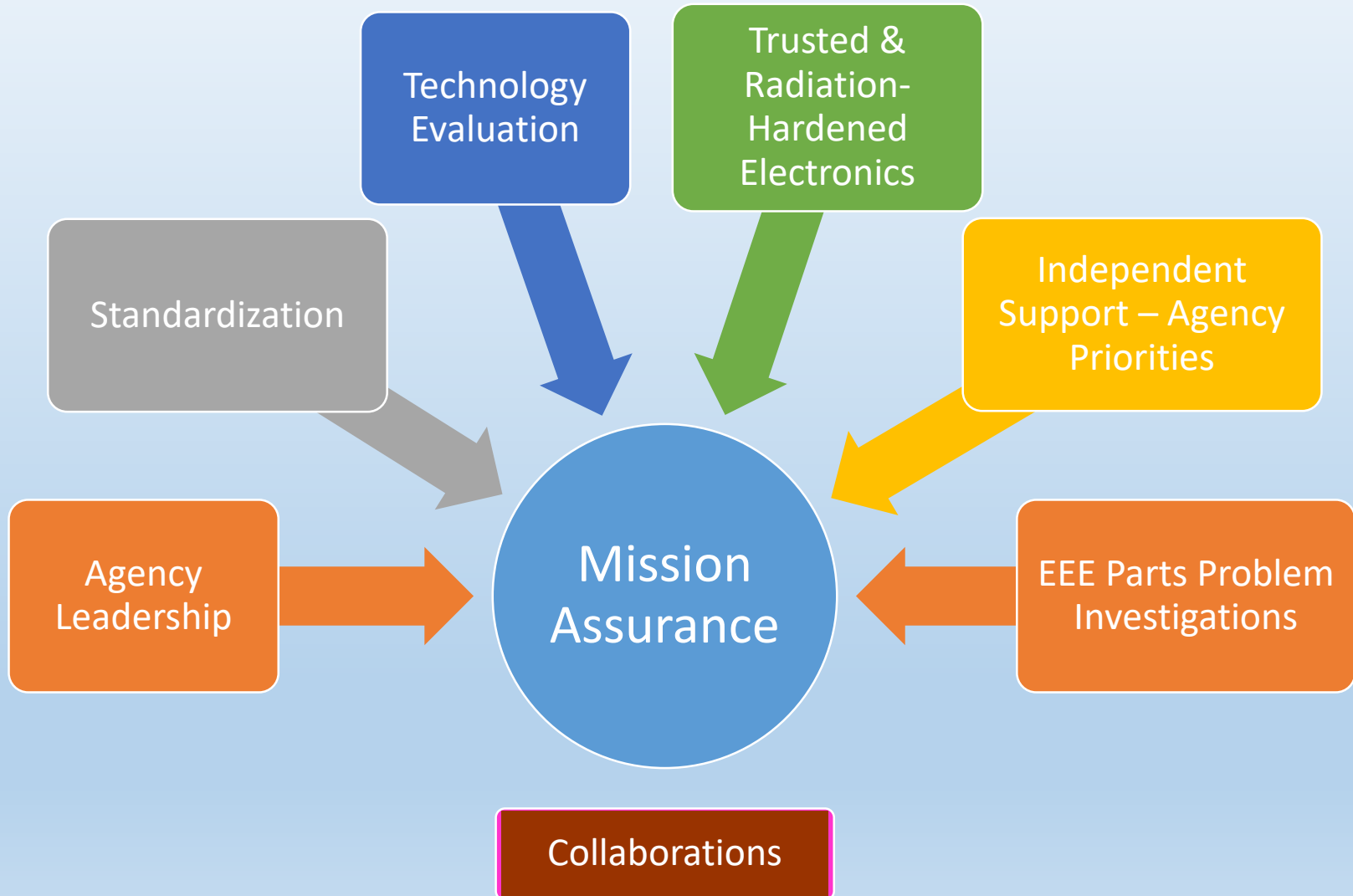
NEPP Overview – Mission Statement

Provide NASA's leadership for developing and maintaining guidance for the screening, qualification, test, and reliable use of EEE parts by NASA, in collaboration with other government agencies and industry.

***NASA Electronic Parts Assurance Group (NEPAG)
is a core portion of NEPP***



NEPP Program Charter Breakdown



KEY FOCUS POINTS



TELECONFERENCES

NEPAG

- Weekly Domestic
- Monthly International

Government Working Group

- Biweekly

Other specialty areas

- Hybrids
- 2.5 & 3D Packaging
- Small Mission Success

SUPPORT DEFENSE STANDARDIZATION PROGRAM / DEFENSE LOGISTICS AGENCY (DLA)

- DLA audits
- Review MILSPEC Changes
- Attend JEDEC and SAE WG meetings
 - Class Y, PEMS, PEDS incorporation into MIL SPECS

GWG

Government Working Group

Purpose: To discuss in detail topics from NEPAG that require additional in-depth technical solutions

Objective: To establish a single government position applicable to both terrestrial and space programs

Attendees: 7 Government User Agencies and DLA

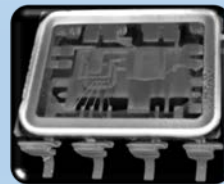
Air Force – SMC/The Aerospace Corporation; Air Force – Wright-Patterson; Army; MDA; NASA Centers; Navy – NSWC Crane Division; NRO/The Aerospace Corporation

Specifications & Standards Review



MIL-STD-1580 DPA
MIL-PRF-38534 Hybrids
MIL-PRF-55342 Resistors
MIL-PRF-123 Capacitors

Mission Assurance Efforts



Provided analysis against an optimization effort that had potential to jeopardize package integrity.

Continuous Improvement Efforts



Support JEDEC task groups on issues including PIND enhancement study, copper wire bonds,

Standards & Policy Development

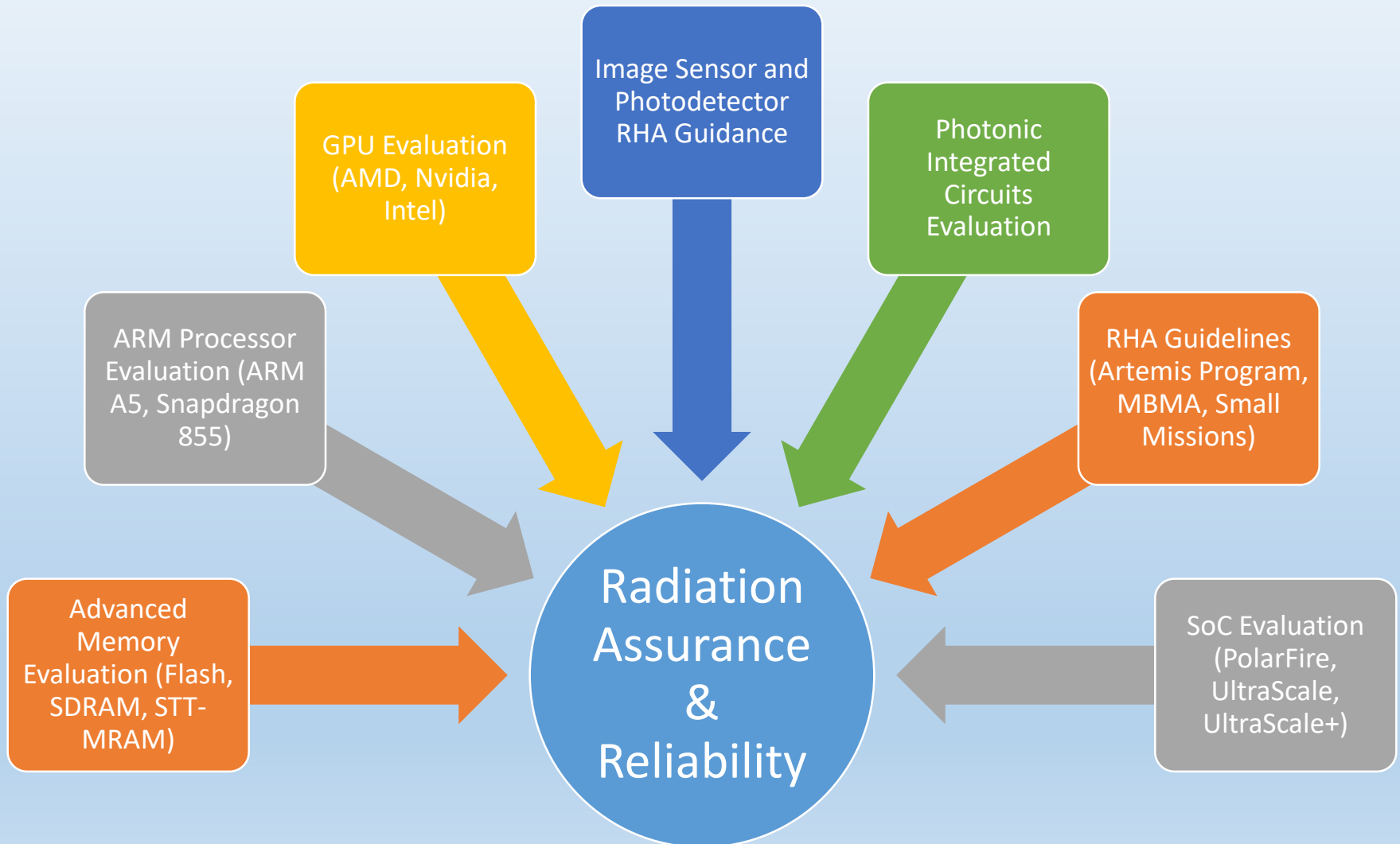
Updating NPR-8705.4, *Risk Classification for NASA Payloads*

- Appendix D – Recommended SMA-Related Program Requirements for NASA Class A-D Payloads
- Contains a mapping for EEE Parts that recommends parts with respect to payload class (A-D), mission criticality (critical/noncritical) to part grade level (space, military, industrial, COTS, etc.)

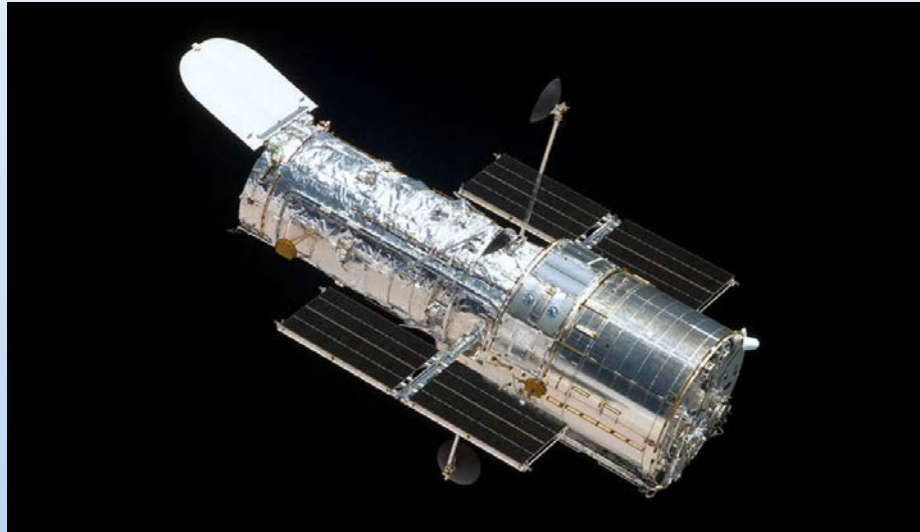
Updating EEE-INST-002, *Instructions for EEE Parts Selection, Screening, Qualification, and Derating*

- | | |
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| <ul style="list-style-type: none">• Original:<ul style="list-style-type: none">• GSFC document (used by other Centers)• 3 Quality Levels• 18 Device Specific Sections• Last update 2003 | <ul style="list-style-type: none">• Update<ul style="list-style-type: none">• 4 Quality Levels• Lot Acceptance Testing• Plan is 29 Device Specific Sections• Completion in CY20 |
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Radiation Work



Hubble Telescope Turns 30 This Year!



5 Servicing
Missions!



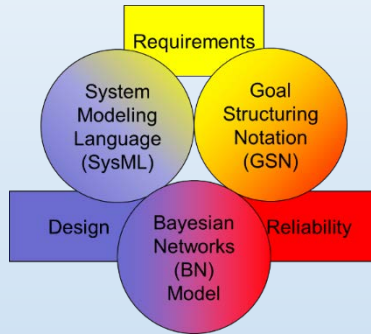
Mars 2020 Rover



July 2020 Launch



The launch period for the **Mars 2020** mission opens on July 17, **2020**. After the spacecraft lands on the **Martian** surface on Feb. 18, 2021, the rover will search for signs of past microbial life, characterize the planet's climate and geology, and collect samples.



Emerging Assurance Methods
(Witulski, Vanderbilt University, NEPP ETW 2017)

Image credit: Vanderbilt / NASA

11th Annual NEPP Electronics Technology Workshop (ETW)

Scheduled dates:

June 15-18, 2020

NASA/GSFC and on-line

<https://nepp.nasa.gov/>

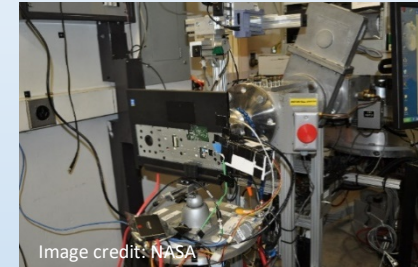


Image credit: NASA

Radiation Testing

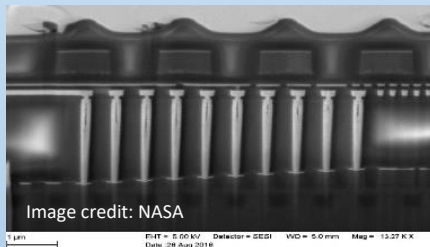


Image credit: NASA

Advanced Technology Reliability

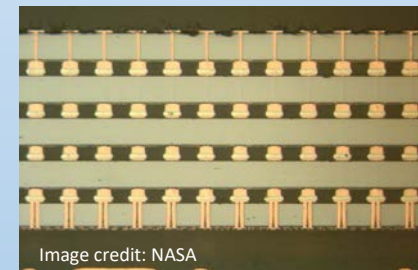


Image credit: NASA

Commercial IC Packaging

Questions?

Artemis



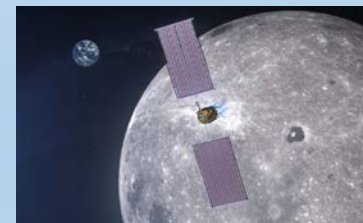
Lunar Exploration Program

- Working with U.S. companies and international partners, NASA will push the boundaries of human exploration forward to the Moon and on to Mars.
- NASA is working to establish a ***permanent human presence on the Moon within the next decade*** to uncover new scientific discoveries and lay the foundation for private companies to build a lunar economy.

- Groundbreaking Science
- Surface Exploration
- Lunar Outpost
- Getting There: SLS and Orion
- Looking to Mars



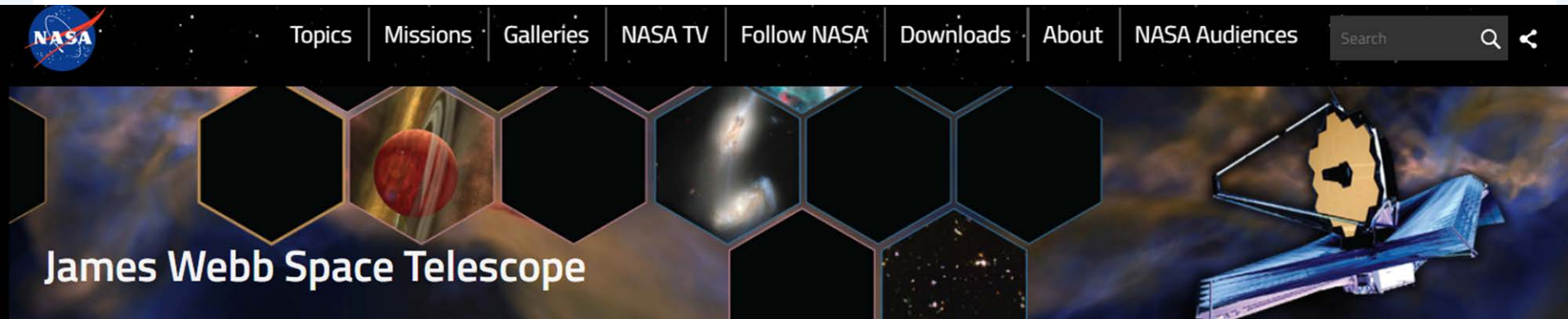
Space Launch System rocket & Orion capsule



Gateway – Power & Propulsion Element



Human Landing System



- JWST or Webb) will be a large infrared telescope with a 6.5-meter primary mirror.
- The telescope will be launched on an Ariane 5 rocket from French Guiana in 2021.
- It will study every phase in the history of our Universe, ranging from the first luminous glows after the Big Bang, to the formation of solar systems capable of supporting life on planets like Earth, to the evolution of our own Solar System.
- Webb is an international collaboration between NASA, the European Space Agency (ESA), the Japanese Space Exploration Agency (JAXA), and the Space Agency (CSA).
- Aug 2019: Mated the observatory's telescope element with the spacecraft bus and sunshield.
- Oct 2019: Deployed and tensioned the sunshield using spacecraft electronics

