The State of NEPP
NASA Electronic Parts & Packaging Program

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To be presented by P. Majewicz at the NEPP Electronics Technology Workshop (ETW), Greenbelt, MD, June 15-18, 2020.

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

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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

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Standards, Policy Documents, Guidance, Procedures and Reports

- Updating EEE-INST-002, Instructions for EEE Parts Selection, Screening, Qualification, and Derating
  - Transforming to an Agency level document
- 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) and to part grade level (space, military, industrial, COTS, etc.)
- Body of Knowledge (BoK) documents
  - Copper Wire Bonds (Sampson/Rutkowski, 2018)
  - Graphics Processor Units (Wywras, 2018)
  - Cracking Problems in Low-Voltage Chip Ceramic Capacitors (Teverovsky, 2018)
- Evaluation Reports
  - Commercial LIDARS (Ott, 2020)
  - Isolated Gate Driver at Extreme Temperature (Boomer, 2020)
- Numerous papers and presentations
  - Approximately 100 deliverables a year
  - Posted to NEPP website

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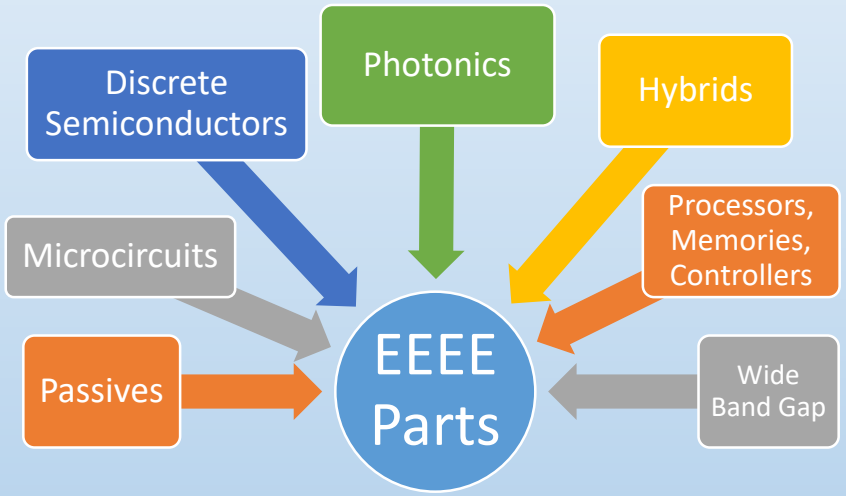
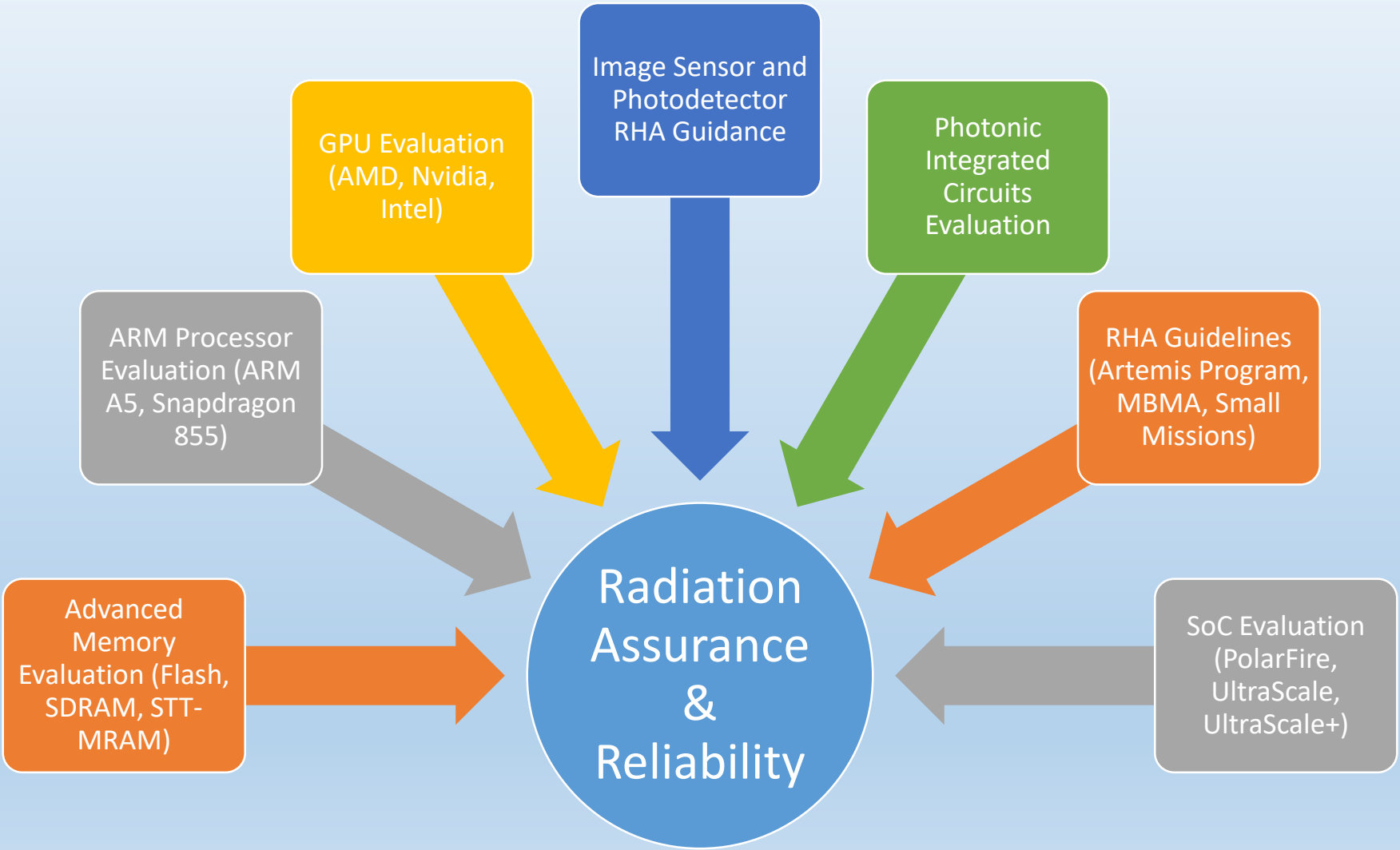
EEEE (Quad-E) Parts

- Electrical, Electronic, Electro-Mechanical & Electro-Optic (EEEE) Parts



COTS ----------Automotive-------Industrial----- " New Space"-----MILSPEC

Radiation Work



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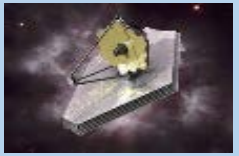
NPR-8705.4, Risk Classification for NASA Payloads

CLASS D CLASS C CLASS B CLASS A



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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

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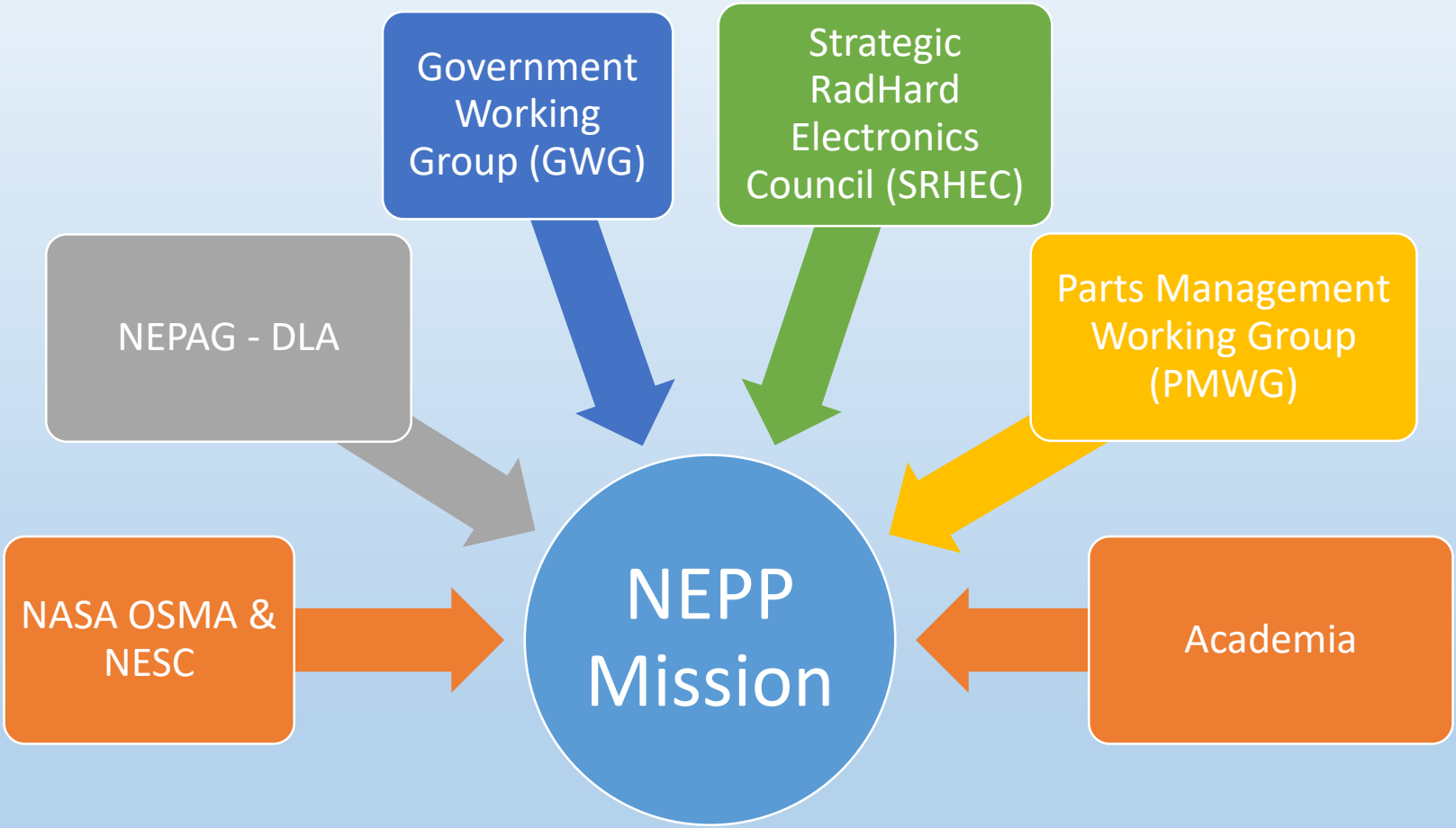
NEPP Collaborations



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

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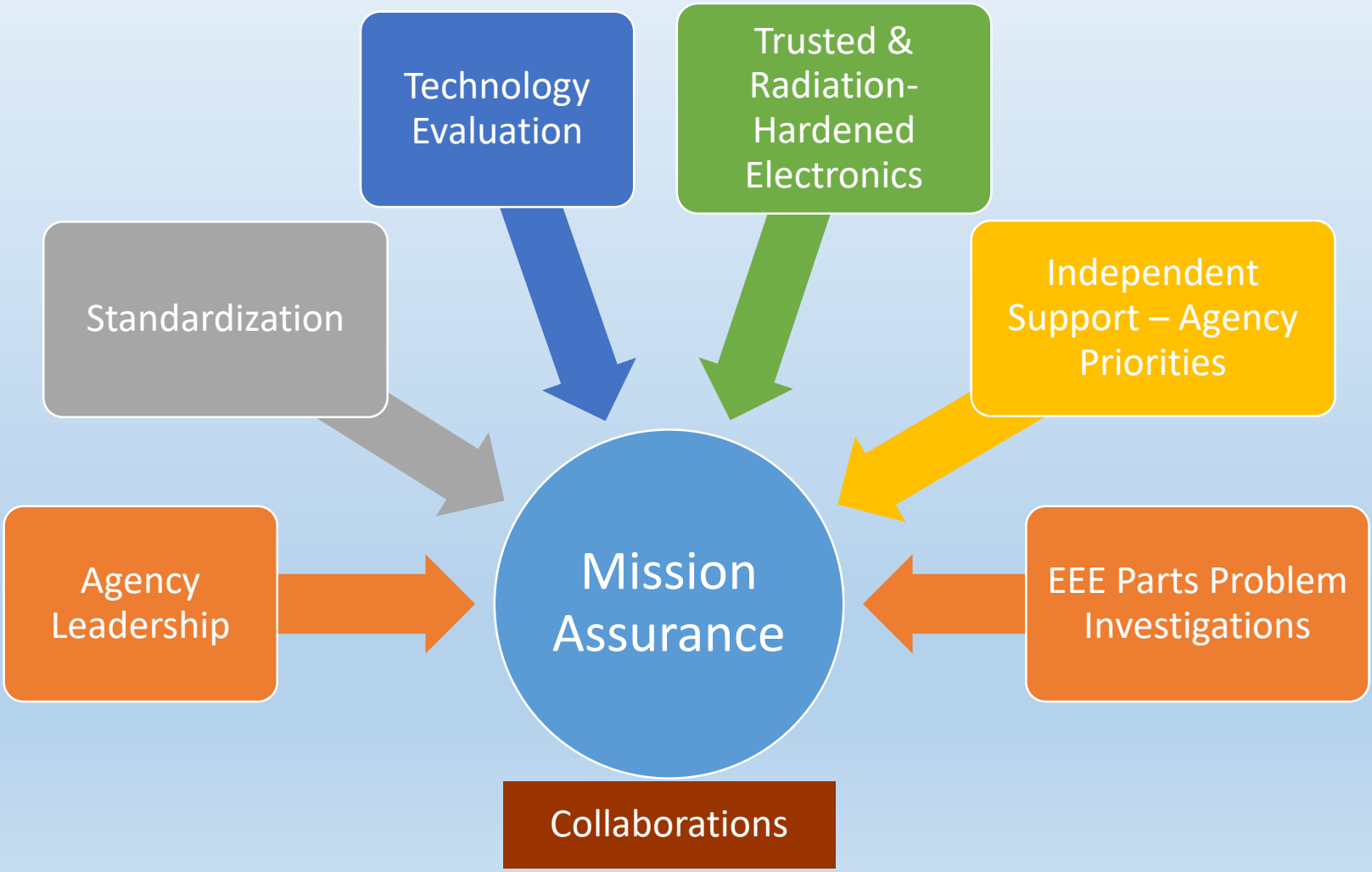
Conclusion: NEPP Program



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Questions?