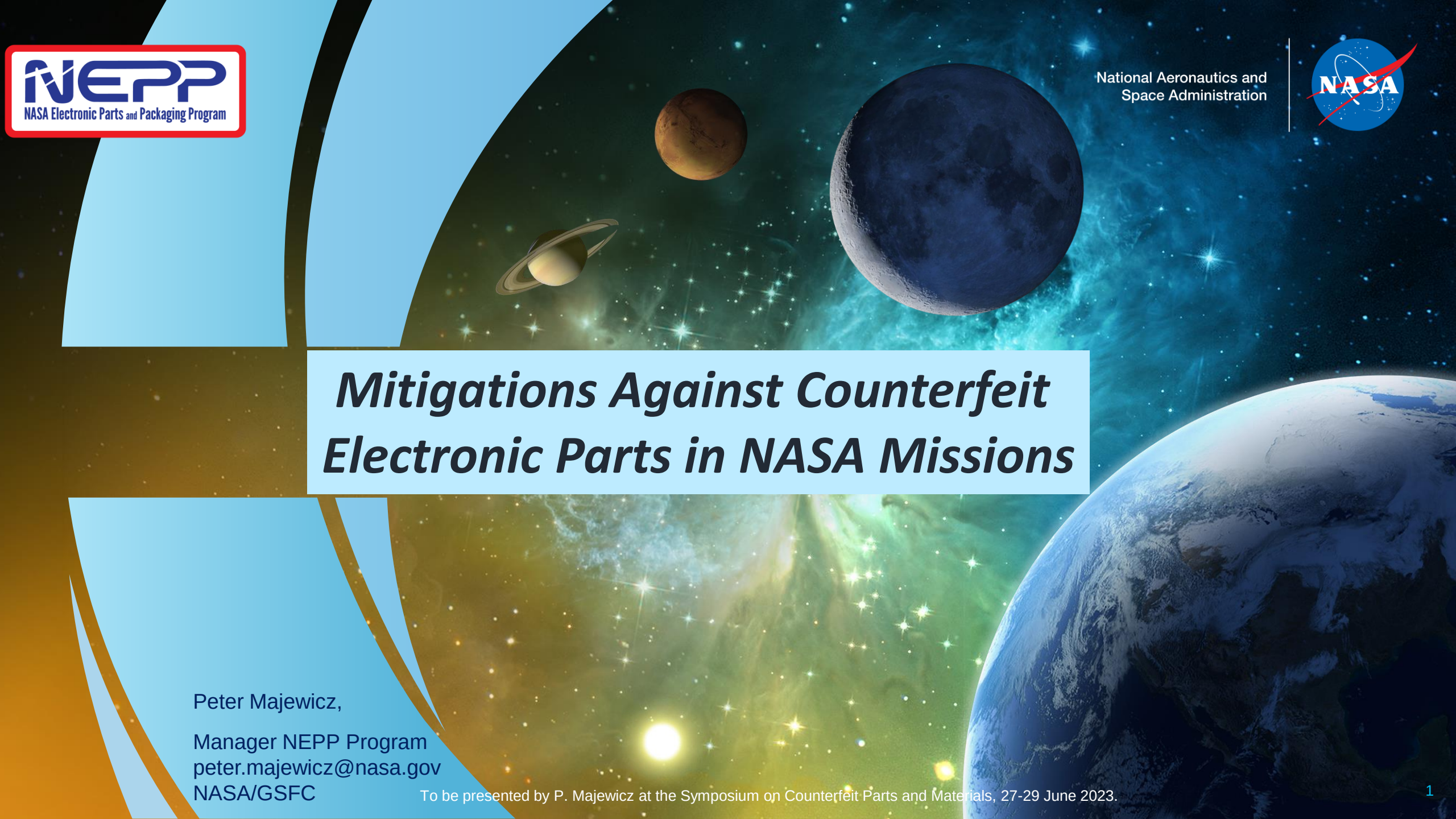

NEPP
NASA Electronic Parts and Packaging Program

National Aeronautics and Space Administration

NASA

Mitigations Against Counterfeit Electronic Parts in NASA Missions

Peter Majewicz,

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To be presented by P. Majewicz at the Symposium on Counterfeit Parts and Materials, 27-29 June 2023.

Outline

- Short Bio
- NAVY Incident
- NEPP Mission
- NASA NEWS I
- MILSPEC vs. Commercial Electronics
- NASA Parts Policy & Controls
- NASA NEWS II
- Conclusion

Pete Majewicz – Short Bio

- Anchors Aweigh!
  - Enlisted Sep 1987
  - Naval Nuclear Power Program
    - Nuclear Quality Assurance Office
  - Commissioned 1999
  - Surface Warfare Officer – *USS Halyburton (FFG-40), USS Gettysburg (CG-64)*
  - Engineering Duty Officer – *Norfolk Naval Shipyard*

"All technical requirements must be met *all* the time."

- An offer I couldn't refuse - 2009
  - NASA – EEE Parts Office, Langley Research Center (LaRC)
  - Assistant NEPP Program Manager
    - Coordinated Development of NASA EEE Parts Assurance Standard (NASA-STD-8739.10)
  - NEPP Program Manager, Goddard Space Flight Center (GSFC)
- Education
  - B.S. Computer Engineering, 1999, Old Dominion University
  - M.S. Electrical Engineering, 2005, Naval Postgraduate School
  - Ph.D. Systems Engineering, 2017, George Washington University

NAVY Incident That Shaped Mentality Regarding Quality & Assurance

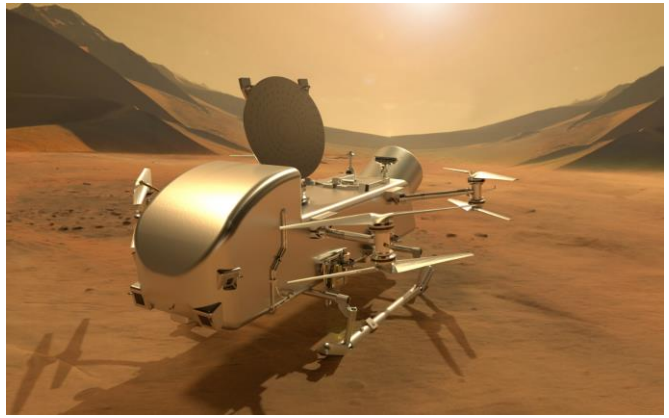
- USS Iwo Jima – 1990, Deployed in Persian Gulf ISO
  - Steam Plant – propulsion and electric generator turbines - 850F / 600psi
- Docked in Bahrain shipyard for emergent repairs
- Maintenance involving replacing steam plant valve fasteners
  - ** NOT Counterfeit Material Issue **
  - Unauthorized substitution of fasteners
  - Black oxide coated brass fasteners instead of high strength steel fasteners
  - Repair specs did not identify requirement for Level I fasteners
  - Inadequate supervision for installation of Level 1 material
- Catastrophic Failure - Nine sailors killed instantly, one fatally injured

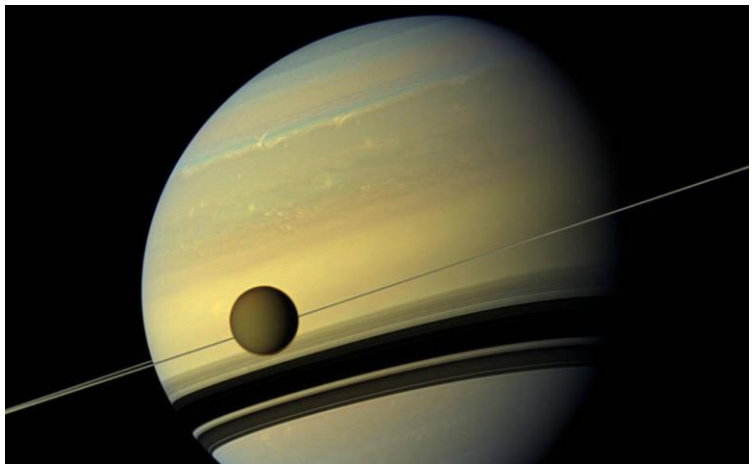
NASA Electronic Parts & Packaging Program (NEPP)

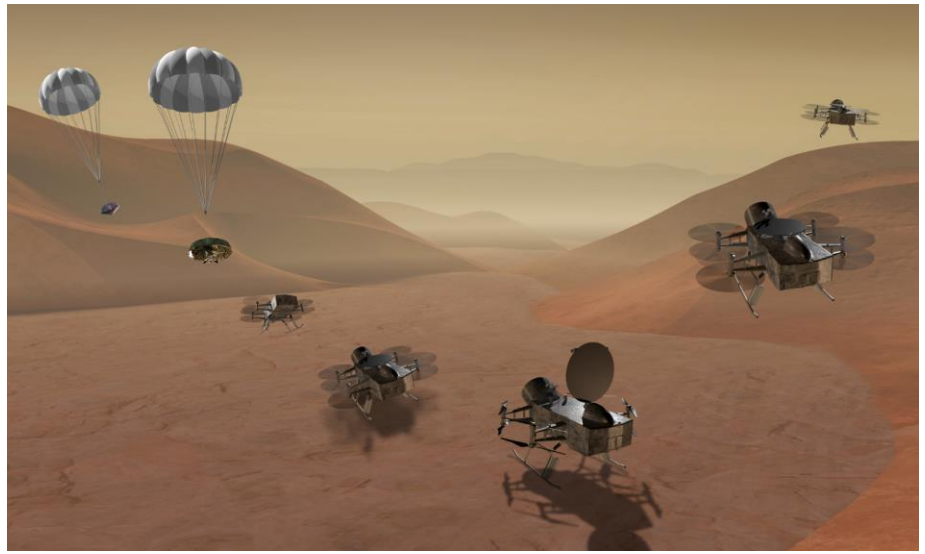
Provide NASA's leadership in the development and maintenance of guidance to support the reliable use of electrical, electronic, electromechanical, and electro-optical (EEEE) parts through characterization, lot acceptance, screening, and qualification testing in collaboration with academia, industry, international partners, and other government agencies.

NASA News I

Dragonfly Will Fly Around Titan Looking for Origins, Signs of Life





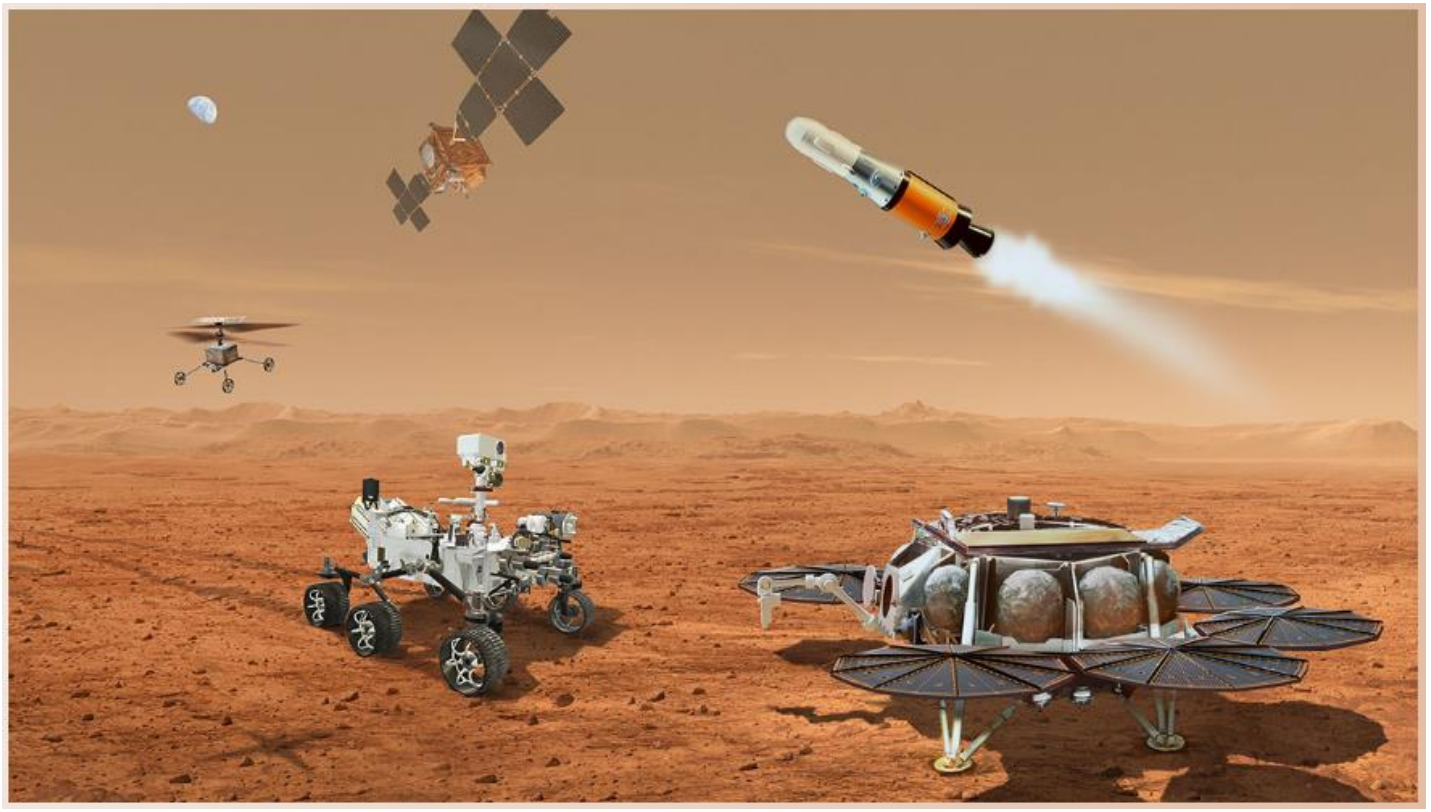


Scheduled Launch: 2027, Reach Titan: 2034

First mission to study Venus using both spacecraft flybys and a descent probe

Scheduled Launch: 2029
Enter Venus Atmosphere: 2031

Mars Sample Return



- Perseverance
- Sample Retriever Lander
- Sample Recovery Helicopters (2)
- Mars Ascent Vehicle
- Capture, Containment & Return System
- Earth Return Orbiter
- Earth Entry System

https://mars.nasa.gov/msr/multimedia/videos/?v=523

MILSPEC vs. Commercial Electronics - Pros

- Numerous Reasons to Select MILSPEC Electronics
  - Increased Operational and Environment Testing
  - Traceability Requirements
  - Government Agency Control (Defense Logistics Agency)
  - Controlled Changes
- Numerous Reasons to Select Commercial Electronics
  - Increased Functionality
  - SWAP Benefits
  - Availability
  - Significantly Higher Manufacturing Quantities

MILSPEC vs. Commercial Electronics - Cons

- Numerous Reasons to Select MILSPEC Electronics
  - Commercial Electronics
    - Reduced Testing (especially on finished product / prior to shipping)
    - Limited Communications with Manufacturers
    - Self-certification (limited 3rd party assessments)
- Numerous Reasons to Select Commercial Electronics
  - MILSPEC Electronics
    - Delay in Qualifying Newest Technologies
    - Bulkier construction
    - Limited number of Certified Manufacturers / Reduced Availability
    - Smaller Lot Sizes – Reduced Statistics for Reliability

NASA Parts Policy & Controls Regarding Counterfeit Prevention

- Hardware Quality Assurance Program Requirements for Programs and Projects (NPR 8735.2C)
  - Section 5.3 Counterfeit Avoidance System
    - SAE AS6174A, Counterfeit Materiel, Assuring Acquisition of Authentic and Conforming Materiel for parts and materials that are not considered to be EEE parts.
    - AS5553C, Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition, for EEE parts.
    - Reporting Nonconforming Items, 48 CFR § 46.317, for regulations and contract clauses used to require suppliers to control and report instances of suspected counterfeit items.
  - 6.5.3 Personnel performing receipt/inspection should be trained in counterfeit parts detection

NASA Parts Policy & Controls

- NASA EEE Parts Assurance Standard (NASA-STD-8739.10)
  - Section 7.1 Procurement Management
    - 7.1.1. Parts shall be procured from Original Component Manufacturers (OCM) or authorized distributors unless unavailable and in accordance with federal procurement regulations. This minimizes the risk of receiving parts that have been mismarked, misrepresented or subjected to substandard storage or handling conditions.
    - 7.1.4 Authorized distributors should be compliant to SAE AS6496 (2014) or equivalent. - Fraudulent/Counterfeit Electronic Parts: Avoidance, Detection, Mitigation, and Disposition
  - Section 7.2 Obsolescence Management
    - 7.2.6. Continuous monitoring of product end-of-life (EOL) notifications, manufacturer's PDN, GIDEP PCN, or a GIDEP DMSMS Notice.
    - EOL information entered into NASA Parts Database (EPARTS)

NASA Parts Policy & Controls

- NASA EEE Parts Assurance Standard (NASA-STD-8739.10)
  - Section 7.3 Counterfeit EEE Parts Avoidance
    - 7.3.2 The programs and projects shall document the required actions with a **Counterfeit Control Plan (CCP)**.
      - 7.3.2.3 The controls shall **cover all reliability grades** of parts, including **commercial grade**, to prevent entry of suspect counterfeit parts.

PROCESS	CONTENTS
Part Availability	To address obsolescence, sparing plans and lead times.
Procurement	To address required assessments of supply sources, mitigation plans when using sources other than OCM's or authorized vendors and contract/purchase order quality requirements.
Product Assurance	To address the required verification of authentic conforming parts.
Material Control and Disposition	To address required actions to identify and quarantine suspect or confirmed counterfeit parts, along with subsequent actions.
Reporting	To address the required actions for the reporting of nonconforming, defective, and suspected counterfeit parts in accordance with NPR 8735.1, and for all cases involving counterfeit parts or other potential fraud to the NASA Office of Inspector General and the NASA Director, Acquisition Integrity Program (AIP).

NASA News II

Latest images from JWST

Image credit: NASA

Image credit: NASA

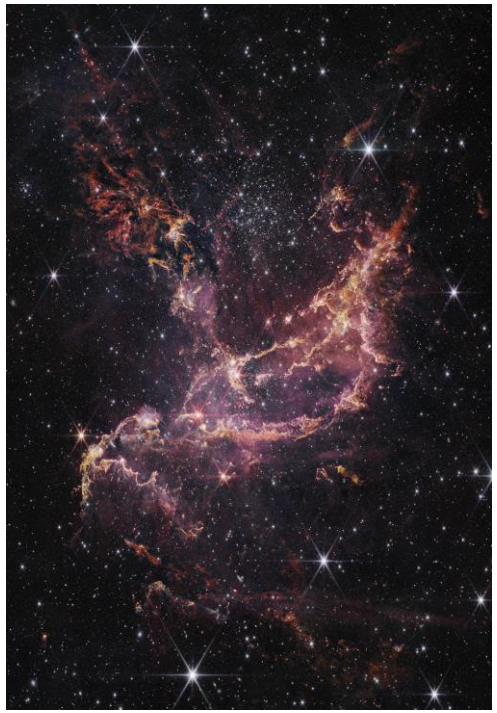


Image credit: NASA

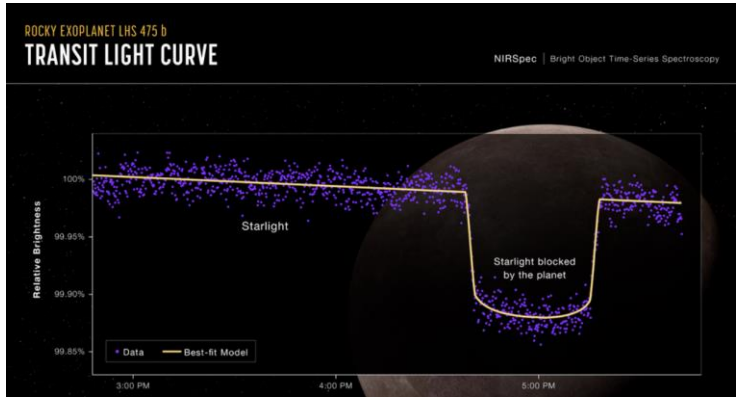


Image credit: NASA

Latest images from JWST

Comparison

Image credit: NASA

Hubble optical

Image credit: NASA

JWST Infrared

Orion Spacecraft

Space Launch System Rocket

ARTEMIS

Gateway

Exploration Ground Systems

Human Landing System

Artemis Base Camp

ARTEMIS Program

ARTEMIS I

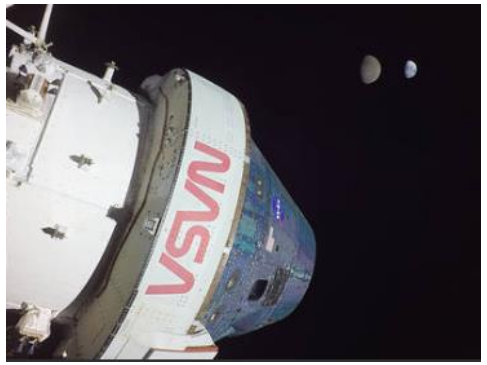
Launch:
Nov 16, 2022

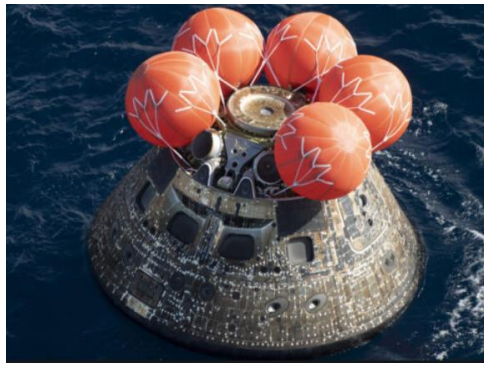
Splash Down:
Dec 11, 2022

ARTEMIS II

Launch:
Nov 2024

Splash Down:
10 days later





Conclusion

- All NASA programs and projects shall prevent the entry of suspect counterfeit EEE parts into the NASA supply chain
- Traceability requirements, DLA and relationships with the manufacturer in the MILSPEC system **reduce** the threat of using suspect counterfeit parts.
- Mission requirements (e.g. autonomous vehicles, SWAP, etc.) make the use commercial electronics unavoidable.
- Robust mitigation actions and constant vigilance are necessary to prevent the introduction of suspect counterfeit EEE parts into the NASA supply chain.

Questions?