

National Aeronautics and  
Space Administration



# NEPP DC/DC Converter & Hybrid Working Group



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# Key Points

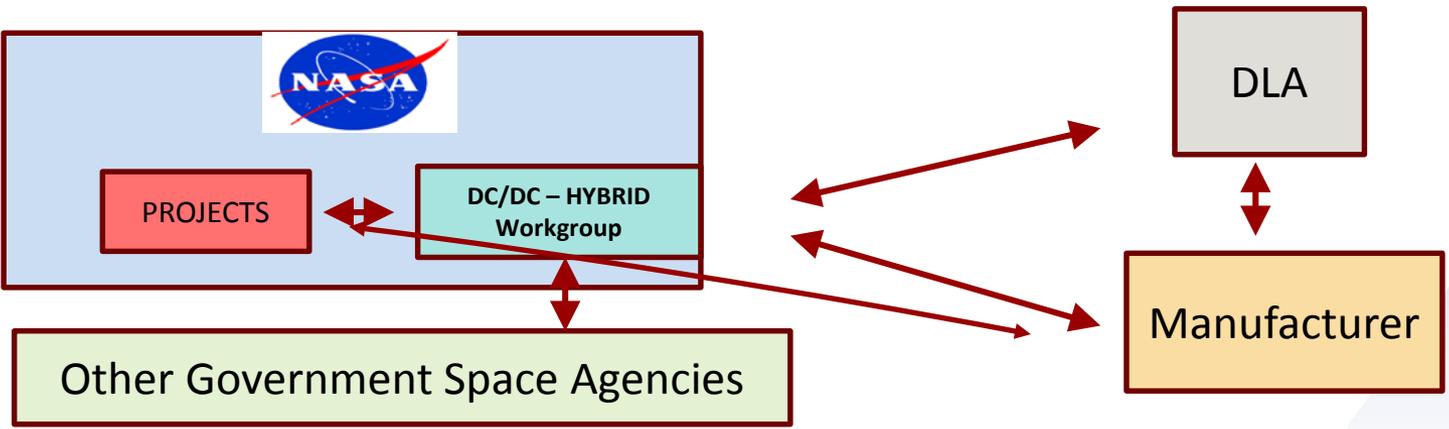


➤ **Mission:** To communicate information on key issues regarding the reliability of Hybrid Microcircuits & DC/DC Converters with specific emphasis on manufacturing, specifications & procurement (**both good news and bad news**).

## ➤ Monthly Teleconferences

- First Wednesday of every month @ 1:00p.m. EST
- Usual Attendees: NASA Centers, Aerospace Corporation, NAVSEA & DLA(L&M)

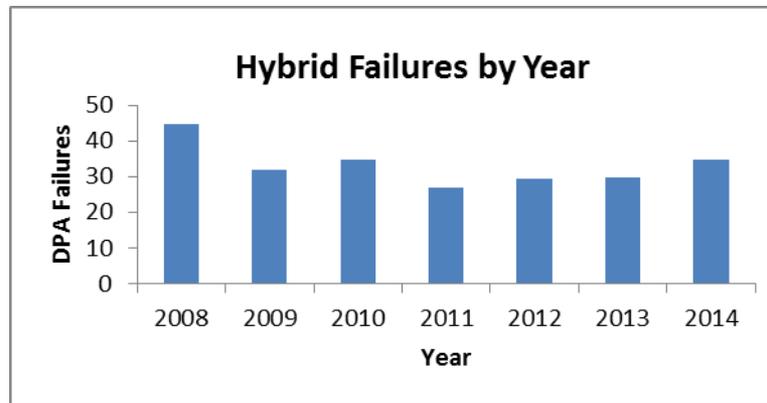
### ORGANIZATIONAL INTERFACES





# Motivation

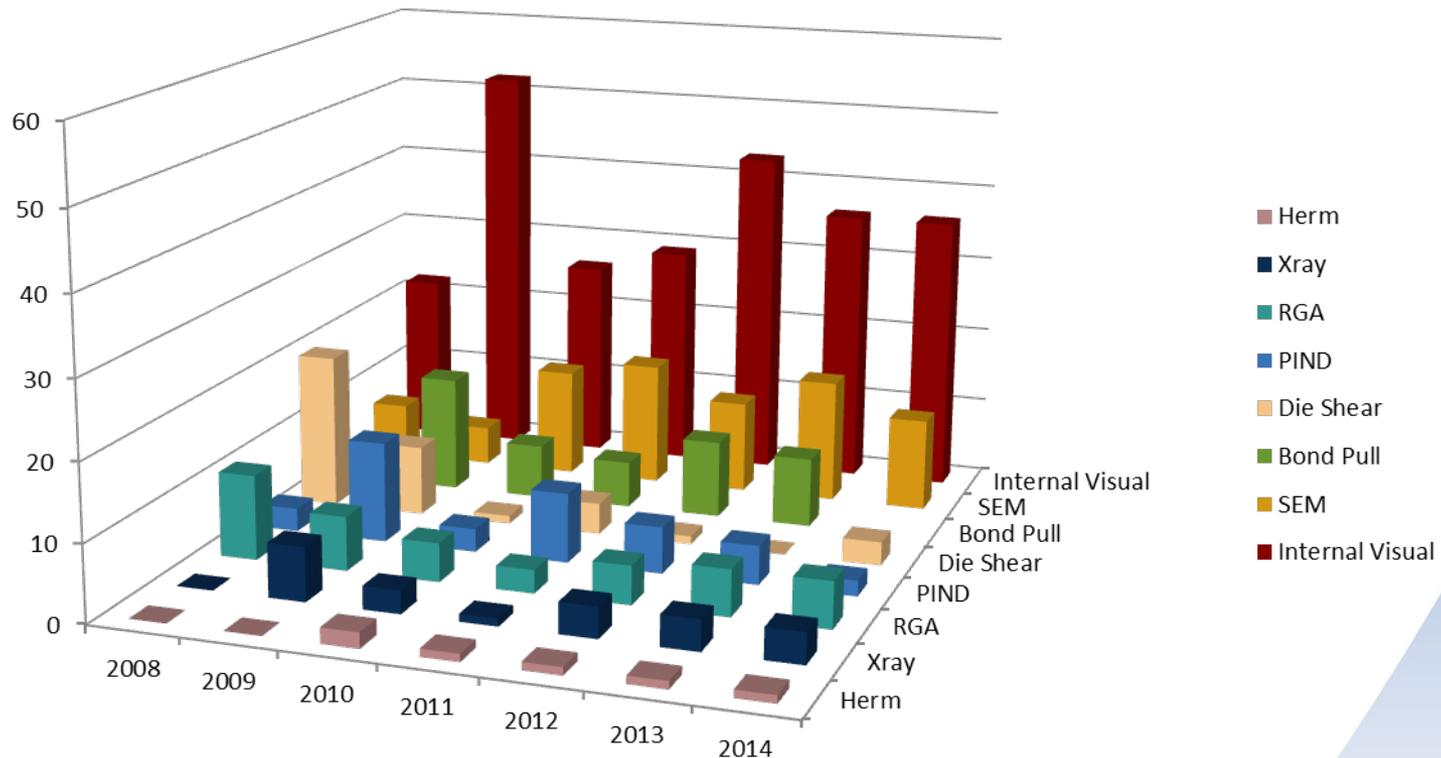
- **Switch Mode Power Supplies (DC/DC Converters)**
  - Enormously Complex due to Extreme Miniaturization
  - Paramount Programmatic Penalties [Budget, Time]
  - Manufacturing challenges
    - Assembling hundreds of components using various techniques in a hermetic package (typically 1in<sup>2</sup> – 5in<sup>2</sup>)
    - Low production numbers
    - High reliability in extreme environments [verified by sampling & screening]



\* Data compiled from Hi-Rel Laboratories at Space Parts Working Group Conference presentation (2009-2014)



# Classification of DPA Failure Causes \*



\* Data compiled from Hi-Rel Laboratories presentations at Space Parts Working Group Conference (2009-2014)

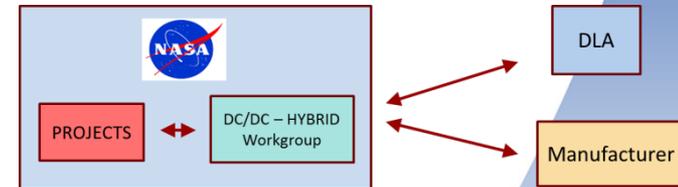


# Key Points



## General Topics

- Sharing of data on purchases, requirements, specifications (SMDs vs. SCDs)
  - Customizations by Centers and Product Performance Issues
  - Discussions on Failure Mechanisms, purchase lead time and delay issues
- Sharing of information on failures, delays, GIDEPs, vendor notifications, etc.
- Updates from Defense Logistics Agency
  - Audit reviews
  - Moves, Consolidations, New ownership
  - Alternate Methods
- Review / revising of current Military Specifications
- Attendance at JEDEC / G-12 Conferences (JC-13\* Government Liaison)
  - Attend 13.5 Hybrid Working Group Meetings



\* JC-13 is responsible for standardizing quality and reliability methodologies for solid state products used in military, space, and other environments requiring special-use condition capabilities beyond standard commercial practices. This includes long-term reliability and/or special screening requirements.



# Current & Future Actions



## Audits

- 10 Class H & K Hybrid Manufacturer Audits since last year
  - Under review during typical audit
    - Review of any current issues
    - Design Analysis: Derating / Stress
    - Failure Analysis (Customer returns)
    - Testing
    - Traceability
    - Organizational QA Program
  - Reports available on NASA SAS website

### NOTE:

We need to better communication between Projects and WG!

- Target businesses NASA Centers use.
- We can review your order.



# Current & Future Actions



## ➤ Military Specifications

- MIL-STD-883 TM 2017 (Internal Visual Inspections – Hybrids)
  - Debate on high and low magnification requirements
- Gen Spec for Hybrids (MIL-PRF-38534)
  - Rev K dated March 2015
  - Revision of Periodic Requalification Requirements

## ➤ Current Reliability Issues

- GIDEPS
- Specific issues:
  - Teflon tape
  - Epoxy
  - Peeling pads after TC's

## ➤ Continued Communications

- Need information on procurements, failures, CSI's , lessons learned, etc.



# Conclusions



## ➤ Hybrids are considered “High Risk”

### ➤ Mitigation

- Fostering communication among Government Space Agencies, Manufacturers and DLA
  - **Need involvement from all NASA Centers!**
- Appropriate level of requirements (Procurement)
  - Class H, K, E... (using the Mil-Spec System)
  - **PreCap Inspections** [New: Provide data to DLA]
  - Traveler / Test Data Review
- Appropriate level specifications
  - What do we want to make standard practice?
  - What gives up the most value with modern budgets/schedules?



# QUESTIONS / FEEDBACK