EEE Parts Selection and Procurement Includes:

- Radiation evaluation of all active components.
- Radiation testing (TID and/or SEE).
- Part stress analysis.
- PIND testing on all activity cavity devices.
- Destructive Physical Analysis (DPA), when and where applicable.
- Pre Cap or sample DPA on semiconductors, microcircuits, and hybrids devices.
- Life testing if Quality Conformance Inspection (QCI) data within one year of the lot being procured is not available.
- No pure tin is allowed (Risk for whisker formation).
- 50V ceramic capacitors require 85°C/85%RH low voltage testing.
- Mandatory surge current testing on all tantalum capacitors.
- Plastic Encapsulated Microcircuits (PEMs) requires special evaluation as outlined earlier.
- Age control requirements. Lot Date Code (LDC) older than 9101 requires DPA and room temperature re-screen.
- Parts traceability.
- GIDEP alerts & NASA Advisories review and disposition.

Manufacturing Requirements

a) NASA
   - NASA-STD-8739.1, Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies.
   - NASA-STD-8739.2, Workmanship Standards for Surface Mount Technology.
   - NASA-STD-8739.3, Soldering of Electrical Connections.
   - NASA-STD-8739.4, Crimping, Interconnecting Cables, Harness, and Wiring.
   - NASA-STD-8739.5, Fiber Optics

b) IPC
   - IPC 2221-2223 (Printed Wiring Board Design), with NASA supplement GSFC-S-312-P003.
   - IPC 6011-6013 (Printed Wiring Board Performance and Qualification), with NASA supplement GSFC-S-312-P003.

c) Other Specification
   - ANSI/ESD S20.20 (ESD Control), NASA alternate NASA-STD-8739.7.
   - ANSI/J-STD-001 (High Reliability Class and the applicable associated standards ANSI/J-STD-002 through ANSI/J-STD-006 may be used as an alternate.

d) Address all potential issues early on.

e) Are the correct processes in place, valid, and approved.

f) Are the right people performing the work (trained, certified, etc.)

g) Solder, Staking, Conformal Coating
   - Intended use
   - Special applications

h) Stress Relief
   - Is potting being incorporated (glass transition temperature needs to be considered during material selection and application).
   - If fiber is being used, define process.
   - High voltage cabling.

i) Wire/Harness Bend Radius
   - High Voltage
   - Fiber
   - Coax

j) Wire/Harness Routing
   - High Voltage
   - Fiber
   - Coax
   - Special Considerations

k) Shielding techniques and terminations

Fabrication / Quality Control

1. EEE part inspection and other hardware at the tie of receipt.
2. Operators qualified / certified
   - Soldering
   - Surface Mount Technology
   - Crimping, Cable, Harness, and Wiring
   - Fiber Optics
   - Staking, Potting, Conformal Coating
   - ESD
   - Wire bonding

3. Processes defined and documented (including non-standard processes)
   - Non-standard processes shall include special inspection instructions and techniques review and approval is required.
   - Qualification or demonstration shall be addresses for each special process.

4. More emphasis on process control and in build quality

5. Inspections inserted at the correct fabrication points

Recommended Inspection Points

1. Incoming Piece Part (Electrical)
    a. Review procurement document for proper requirements
        i. Is source inspection required/necessary
        ii. Verify pure tin is not being used
        iii. Are the correct requirements imposed
    b. Perform receiving inspection
        i. Verify data per procurement call outs and receiving plan
        ii. Perform test data review
        iii. Perform piece part inspection (per plan or mfg. Requirements)
        iv. Test, if required
        v. Visual (4x-10x) / typical
        vi. Is additional testing or screening required
        vii. Bag and tag hardware (flight)
        viii. Nitrogen purge storage
2. CCA Inspection
    a. PWB coupon analysis for all PWBs
        i. GSFC or GSFC approved lab
    b. Kit pull verification / inspection (items required for flight assembly)
        i. Traceability
        ii. Damage
    c. Assembly Inspection (in-process)
        i. PWB pre-baked
        ii. Verify that any inspection that are inaccessible later, are performed real time
        iii. Post Solder (100% inspection)
        iv. Verify as built vs. as design
        v. Post open-frame, card test handling damage and data review (includes TBD components)
        vi. Pre conformal coating / staking
        vii. Post conformal coating
            1. Verify witness sample (cure/shore hardness)
            2. Control specimen (coated concurrently with regular operation)
            3. UV (black light) inspection
            4. 4x-10x inspection performed
3. Harness Fabrication Inspections
    a. Kit pull verification / inspection (items required for flight assembly)
        i. Traceability
        ii. Damage
    b. Assembly Inspection (in-process)
        i. Crimp Inspections (100%)
        ii. Crimp pull test (am/pm)
        iii. Solder inspections (100%)

1. Solder cups
2. Solder shields
3. Raychem's (solder sleeves)

iv. Shrink tubing
v. Stress relief, cable ties, routing
vi. Potting (includes shore harness check)
1. Witness sample (cure/shore hardness)
vii. As-built vs. as design
viii. Marking / Identification

c. Test
i. Continuity
ii. IR / Hypot (insulation resistance/dielectric withstanding voltage)
1. Reference NASA-STD-8739.4
iii. Special test considerations

4. Component/Subsystem/Level Inspections
a. Kit pull verification / inspection (items required for flight assembly)
i. Traceability
ii. Damage

b. Witness Assembly
i. Follow print
ii. Verify torque
iii. Verify locking applications
iv. As-built vs. as design
v. Markings per print
vi. Photographs of the individual CCAs (front and back) and box closure are recommended

c. Pre-test review
i. Manufacture test and inspection logs (lower level)
ii. Open items
iii. Anomaly reports and disposition
iv. Identify all constraints

d. Test Inspection (in-process)
i. Verify procedure approved for use
ii. Verify ground support equipment (GSE) is acceptable for flight use
1. When interfacing with flight hardware, interfaces shall be of flight quality
iii. Calibration of all support equipment current and will not expire prior to test completion
iv. Connector savers being utilized
1. Procedures should detail when and when not acceptable for use
v. Witness set-ups and critical test
vi. Perform data reviews throughout acceptance test program
vii. Perform inspections pre/post environments and moves
viii. Perform final acceptance test data review/inspection