PROCUREMENT
DATA REQUIREMENT DESCRIPTION

TITLE
SUITE OF ELECTRONIC COMPONENT PACKAGING ANALYSES

NUMBER SDRL 135

DATE 1/14/09

REVISION NEW

SUBMITTAL SCHEDULE
Initial submittal per contract, updates as required

APPROVAL TYPE

_ X_ Product Lead ___QE

Approval: ___X___

Review: ____________

REFERENCE DOCUMENTS

DESCRIPTION / PURPOSE
The Statement of Work (SOW) will specify a suite of Electronic Component Packaging Analyses selected from the list herein. Determination of the suite is based upon several factors: specific type of electronic component, qualification status, custom vs COTS, and severity of environmental requirements. Under no circumstances will all thirteen analyses be necessary in one suite. The suite of analyses will range from one to eleven items from the list herein. Electronic Packaging Group will refine the suite for the SOW.

The supplier shall deliver a suite of analyses as specified in the Statement of Work and described below that demonstrate the manufacturability of the electronic component and the ability of the component to satisfy the requirements for specified dynamic and thermal environments.

SCOPE/PREPARATION INSTRUCTIONS

CONTENT-
Contractor format acceptable. Electronic submission required.

Document shall be delivered to the Orbital Procurement Agent. Approval shall be in the form of a Contracts Letter from the Orbital Procurement Agent. Verbal approval is inadmissible.

Suite of Analyses to be selected from the following list per the SOW:

1. Keepout analysis: Demonstrate that all external conductors (including all metallic hardware and metallic component bodies) have appropriate electrical clearance from vias, traces, solder pads, and other external conductors per IPC 2221 at worst-case tolerance conditions.

2. Hardware restrictions: Show that the electronic component design complies with the following: No 300 series CRES screws; A286 screws are preferred; no swages; locking features or loctite required on all fasteners; no isolators; no hardware installed into chassis through-holes at final assembly; no nylon or other compliant washers; G-10 non-conductive washers acceptable; reliance on pin retention forces alone to maintain connector mate is not acceptable.
3. Bolt analysis: Perform bolt analysis for all bolted interfaces. Reference Joseph E. Shigley "Mechanical Engineering Design". Torque values in excess of 75% of bolt yield strength are not permissible. Torque values must be sufficient to prevent gapping under dynamic QTP environments. Safety factor for thread pullout must be at least 1.75. Ultimate safety factor for bolts must be at least 1.75.

4. Staking analysis: Determine which components require staking or other means of support to survive QTP environments. Assess whether coefficient of thermal expansion (CTE) mismatches between staking material, component body, component leads, solder joints and any ancillary contact could cause failures during dynamic or thermal QTP testing.

5. Steinberg analysis: Compare allowable deflection vs predicted deflections for required shock, random and sine vibration QTP environments per Vibration Analysis for Electronic Equipment by Dave Steinberg. Assess worst-case components and worst-case component orientations on every PWB. If the vibration safety factor is less than 1 for 20,000,000 cycles in random vibration, calculate the predicted fatigue life for the worst-case components.

6. Tolerance analysis: Examine all aspects of the avionics assembly to determine whether the part can be assembled, the part can be mounted to an external fixture, adequate static clearances exist, performance is not compromised, and appropriate thread engagements are maintained at the minimum and maximum tolerance conditions.

7. Dynamic clearance analysis: Examine all aspects of the avionics assembly to determine whether adequate dynamic clearances exist and performance is not compromised at minimum and maximum tolerance conditions.

8. Chassis/PWB FEA analysis: Prepare a Finite Element Model of the avionics assembly including at minimum the chassis and pwbs. Perform modal analysis to determine at minimum the first two modes of each pwb, chassis, lid and any other key subassemblies. Determine the predicted dynamic deflection due to QTP shock and vibration environments.

9. OBS analysis: Assess whether proposed change impacts the qualification status of component. General guidelines are available in Mil Handbook 340.

10. Mechanical Stress analysis: (see structural group description)

11. Avionics Component Thermal analysis: Prepare a component-level thermal analysis of the avionics assembly showing maximum predicted junction temperatures for all components during ATP & QTP thermal cycle and thermal vacuum testing. Compare to allowable derated junction temperatures.

12. Antenna thermal test analysis: Determine whether thermal QTP environments are too severe for the antenna or support equipment.

13. Cable support analysis: Determine minimum distance to first tie-down using flight-like cables during QTP dynamic environments to avoid damaging the cable-to-chassis interface.