

Panel: Risk Mitigation Using non- Military or non-Space Grade Products

Presentation for:

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Outline

- ◆ What SSL heritage is in terms of class of parts
- ◆ What classes of parts SSL foresees using in next 1 to 5 years
- ◆ How we will maintain reliability using the class of parts we intend to use if non-Space
- ◆ How we view risk mitigation based on our applications

SSL Heritage Parts Requirements for Geo Communications Satellites

- **Heritage commercial satellite programs demand long-term product performance and reliability: 18 year life requirement on orbit with low tolerance for any failures**
 - **Even a loss of a redundant unit has an impact on customer's business model**
 - **Any late findings on parts could impact launch dates, not acceptable to customers**
 - **A special 12 step DMAIC process has been used at SSL to identify additional part tests and screens (over MIL levels) to reduce parts related issues to very low levels**
- **Standard SSL parts include NASA Grade 1 and similar types**
 - **MIL-PRF-38535 level-V microcircuits**
 - **MIL-PRF-38534 class-K hybrids**
 - **JANS semiconductors**
 - **Established reliability passive devices (R minimum, S preferred, and "T" grade where available on certain higher risk types)**
- **Subcontractor parts are analyzed to the same standards**
 - **A typical commercial program may have upwards of 1000 NSPAR's PAD's submitted by subcontractors for non-standard parts**
 - **Highest quality ESA parts are accepted for European subs**
- **Non-standard parts are typically controlled by a Specification Control Drawing (SCD) to space grade**

New Non-Space Grade Parts for SSL in next 1 to 5 years

- **For heritage commercial satellite customers (18 year design life at GEO)**
 - **Only evolutionary changes contemplated**
 - **A small number of automotive grade microcircuit types to save weight and complexity**
 - **A small number of COTS low complexity parts are being used to save weight and schedule**

- **For various new NASA and Government related programs (Mission duration and orbit vary)**
 - **For programs that allow Grade 2 parts per EEE-INST-002, internal systems for separate use of Grade 2 are being implemented**
 - **Otherwise, heritage Geo- Comm parts (Grade 1 or equivalent) are being used**

- **For various New Space customers (1-5 year at LEO)**
 - **SSL will use a combination of Grades 1, 2, Automotive and COTS**

How SSL Will Maintain Reliability and Mitigate Risk for Non-Space Grade Parts

- **For GEO Communications Satellite Customers, automotive grade microcircuit types**
 - **Extensive qualification up-screening per SSL SCD**
 - **Encompasses requirements of NASA PEM-INST-001**
 - **Encompasses requirements of ESA ECSS-Q-ST-60-13C “Commercial electrical, electronic and electromechanical (EEE) components”**
 - **For COTS or Automotive low complexity parts**
 - **Use Accelerated Life Tests to show mission “life”**
 - **Test extra large sample sizes to demonstrate FIT rates**
- **For various New Space programs that allow COTS / automotive grade**
 - **Parts quality selection depends on functionality and mission requirements (including redundancy to meet Ps)**
 - **May use a combination of Grade 1, 2 and COTS as appropriate and other requirements**
 - **Radiation test data required**
 - **Total dose**
 - **Heavy ion SEE and / or proton test data**

All new parts must be analyzed to ensure highest reliability for the entire mission life