Balancing Reliability, Radiation Hardness and Affordability for Constellation Space

Introduction

The space version of Qualified Manufacturers List (QML) is overseen by the Defense Logistics Agency and was established to ensure a 15 to 20 year component service life. QML set the standard for space and non-space high reliability Integrated Circuits (IC), effectively establishing the reliability reference point for use in harsh environments.

The New Challenge in Selecting Space Components

An emerging class of Lower Earth Orbit (LEO) constellations now requires a larger number of satellites to accomplish their mission. With these commercial constellations, "bullet-proof" reliability is not always needed since the time required in space is shorter and the mission assurance requirements are often less stringent. The lower overall cost also enables the launch of replacement satellites to replenish and/or upgrade constellations. Cost is therefore a key factor for constellation space as well as other small satellite missions that are emerging today.

This combination of trends presents a paradigm shift in the satellite market and has become a great challenge for system designers wrestling with the tradeoffs between cost and mission assurance.

Looking at mission duration, you can see in Figure 1 that as mission life increases, more reliability is needed. There is a sizeable gap between heritage high reliability solutions (i.e. QML) and Commercial Off The Shelf (COTS) components. The launch of Cobham's new LeanREL™ product line bridges the gap by offering mission assurance and affordable reliability across our flight heritage proven microprocessors, microcontrollers, memories and interface products.

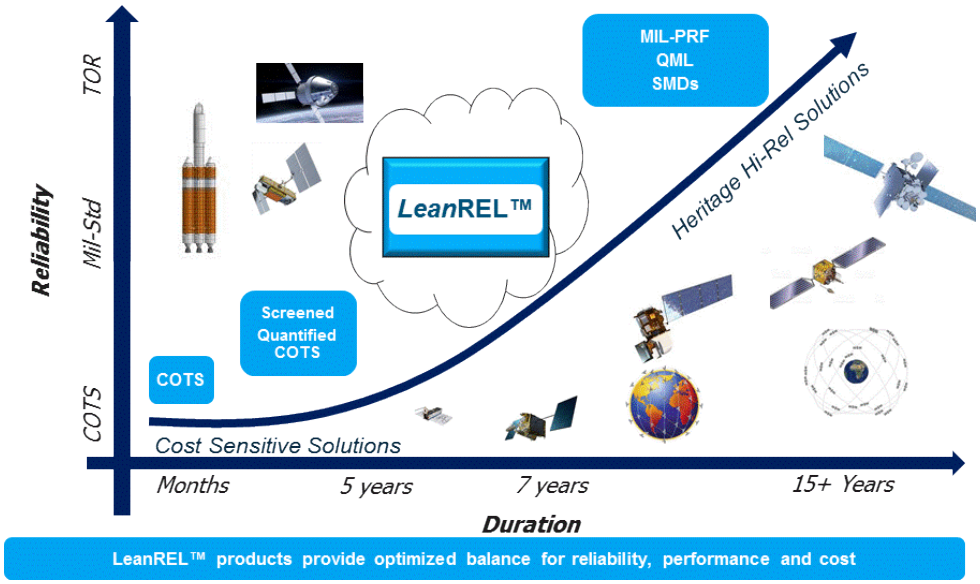

Figure 1: Duration Versus Reliability

Cobham LeanREL™ Components

To address an increasing need for affordability, while meeting mission assurance and radiation-hardness requirements for new classes of space missions, Cobham has created LeanREL™. LeanREL™ components utilize QML qualified materials and are manufactured using an optimized screening flow. This offers a balanced alternative positioned in between QML and COTS products.

The advantage of LeanREL™ over QML products is lower cost and the advantage of LeanREL™ over COTS components is QML heritage, lot acceptance testing, traceability, designed-in radiation performance, availability of radiation effects data and expert support by Cobham's space component applications team. This enables designers to build in system robustness at an affordable price point.

Satellite manufacturers are expressing a clear desire for a single system design that can be flown not only on 3 to 7 year missions (e.g. LEO satellites), but also on 15 year missions such as a typical Geosynchronous Earth Orbit (GEO) satellite. Cobham's LeanREL™ components retain an identical pin out and footprint to that of their QML counterparts, thus enabling system architects to develop platforms that can span from commercial constellations to QML level missions. Having access to both QML and LeanREL™ versions of the same ICs presents a cost effective and simple solution.

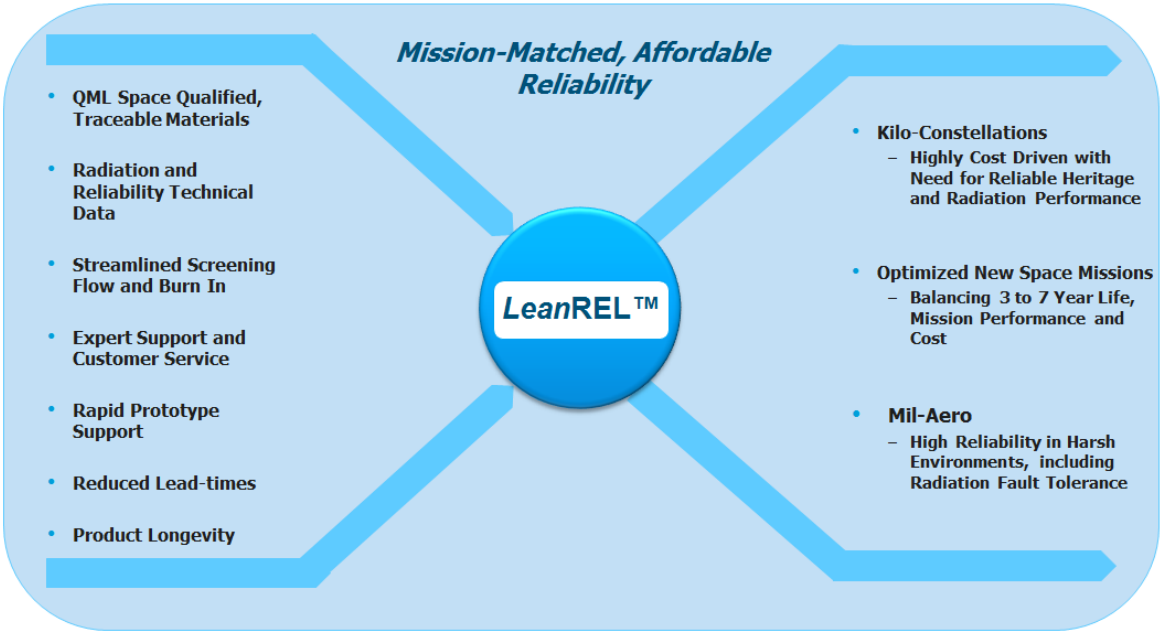

Figure 2: LeanREL™ value proposition

Conclusion

LeanREL™ components offer the right balance of reliability, radiation hardness and affordability for constellation space. Cobham's experience in high-reliability, radiation hardened design, packaging, testing, and screening is a strategic benefit to satellite designers and manufacturers looking for components that are mission matched and offer affordable reliability.