

PRODUCT QUALITY

Incorporation of lessons learned

Introduction of new technology

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Commercial spacecraft are evolving to fill many new roles

- The first 25 years – FSS
 - Voice
 - Data
 - Video
- The last 15 years – Direct-to-User Applications
 - Video National coverage → DMA Spot Beams
 - Audio 2nd generation EIRP → 3 dB greater than 1st generation
 - Mobile 5 → 12 → 18 → 22 m reflectors; GBBF
 - Broadband 10 → 40 → 100+ → ?? Gbps; x3 rf equipment count
 - These new services are enabled by new technology
 - Would not have been possible w/o product development

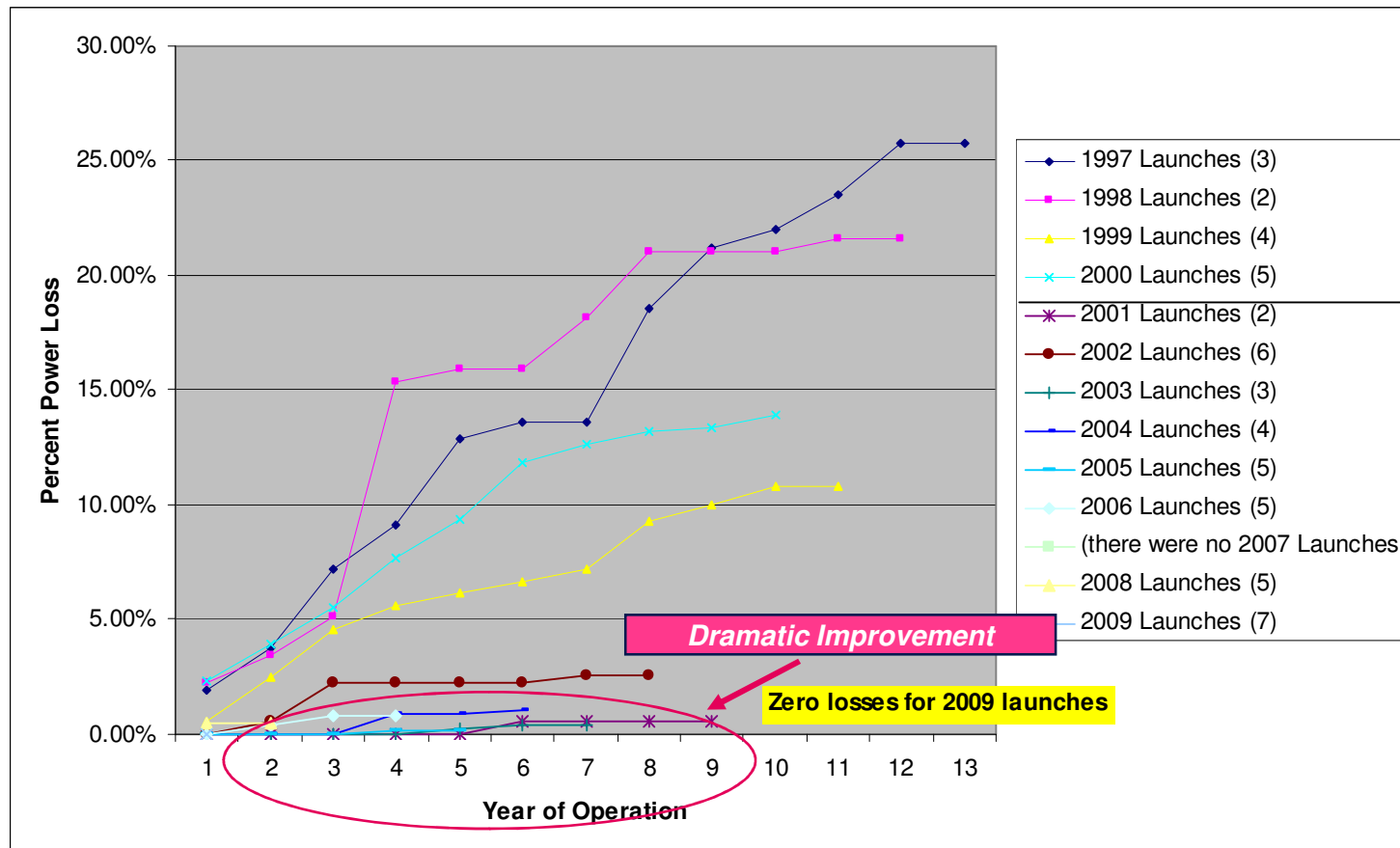
Example of learning from problems – SS/L Solar Arrays

- The last significant Loral problem was solar cell short circuits to ground
- Since our last significant solar array improvement, we have launched 37 satellites, the oldest of which is in its 9th year of operation
- All are within their budgeted solar array capabilities¹
- We continue to make small, incremental improvements:
 - Robust Substrate
 - Laminated Kapton dielectric
 - Black Kapton on rear
 - Kapton/RTV coverings on substrate edge
 - Wire Feed-thru with bonded surface protection
 - Single 100 V wire feed-thru for each circuit
 - Overcoat bus tabs at panel edge
 - Additional cell edge grouting near hold downs
 - Additional wire stress relief
 - Minimize cell repairs
- Smaller string size (a short causes a much smaller performance reduction)

¹With the exception of Estrela do Sul, which was damaged in launch

Solar Array Performance

- The 37 SS/L launches after 2000 show dramatic improvement

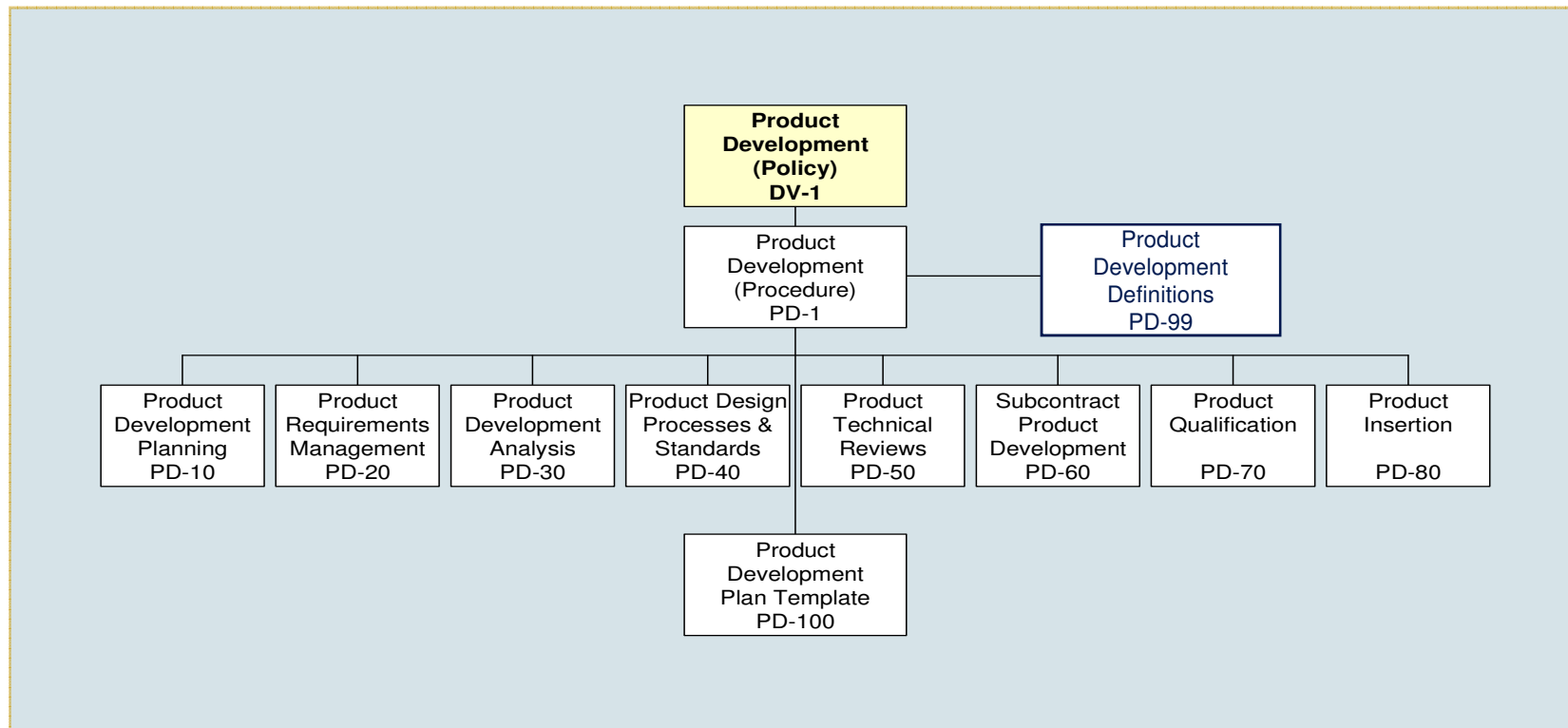


Is it possible to introduce new technology while maintaining product quality?

- My answer is a resounding YES
 - For 10 years SS/L has had in place a company-wide Product Development standard
 - We have launched 38 satellites during that time; the only insurance claim on any of these spacecraft was Estrela do Sul, which was damaged in launch 6 years ago
 - Standard is constantly being tweaked, but only to improve it
 - Changes to both process and product follow the Deming cycle:
 - Plan
 - Do
 - Check
 - Act
- 
- All metrics show a steady improvement in quality and reliability
 - In spite of increasing spacecraft complexity
 - In spite of the introduction of new technologies; e.g.
 - We are about to introduce our fourth generation digital control and data handling system
 - The first three have outstanding reliability records
 - Large Unfurlable Antennas
 - 3 spacecraft launched since 2008 – performing well
 - Lithium Ion Batteries and completely new power electronics
 - 10 spacecraft launched since 2005 – performing well
 - Electric Propulsion
 - 6 spacecraft launched since 2004 – performing well
 - The only element of our 1300 spacecraft that is the same as our first 1300 launched 21 years ago is the sun sensor!

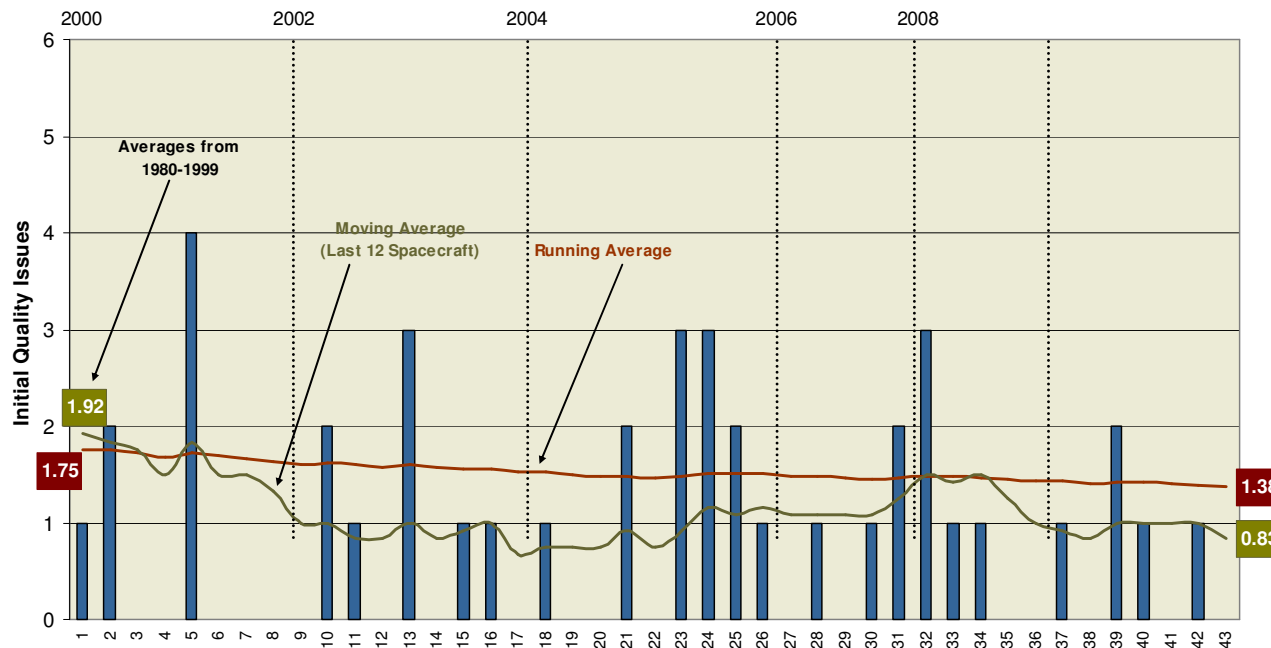
The SS/L Product Development Process

- This process has been in place for 10 years and has been used on 38 launched spacecraft, with about 20 more in backlog
- We know it works!



SS/L Initial Product Quality: 3-Axis Stabilized GEO Spacecraft

- SS/L monitors equipment issues during first year of operation as a measure of quality and the effectiveness of our design processes and test program
 - Continual improvement in long term running average
 - Running average of last 12 programs at record low
- I hope that every spacecraft manufacturer can point to similar data



Conclusion

- SS/L has built a stable development system
 - The “system” includes both processes and products
 - Constantly being improved today based on Lessons Learned from yesterday
- SS/L has demonstrated that it is possible to carefully introduce new technologies without increasing risk
- The system works, as demonstrated by flight performance
- Our competitors can make similar statements
 - When buying satellites, operators should look for and demand proven processes and designs, as demonstrated by flight performance

A word of caution

- As we acquire new customers, and as we address government markets, we encounter lots of new customer specific requirements
 - Where practical, our internal requirements are a superset of those requirements
- Beware of forcing change on a proven process that is working
 - Change outside of the Deming cycle can disrupt stable process
- I would like to see the customer community adopt very high standards of proof for satellite manufacturers to demonstrate that their processes and designs meet those requirements, without dictating new and/or unique methods
- These comments apply equally to our relationships with our suppliers
 - We listen to what they say
 - We look at their track records
 - We accept what works

Thank you.

SPACE SYSTEMS
LORAL

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Chris Hoeber - CV

- Christopher F. Hoeber is senior vice president, program management & systems engineering for Space Systems/Loral (SS/L). His responsibilities include customer satisfaction, achieving program profit, schedule and performance objectives, and planning and managing SS/L's R&D and product development activities.
- Mr. Hoeber has been in the commercial satellite business throughout his 40-year career, serving in systems test and engineering, and program and functional management. He led the systems engineering team that developed SS/L's modern geostationary satellite platform, the 1300, and managed Superbird, the first program to utilize the 1300 platform.
- Mr. Hoeber is a Fellow in the American Institute of Aeronautics and Astronautics (AIAA), a member of Institute of Electrical and Electronics Engineers, Inc. (IEEE) and member of the International Academy of Astronautics. He is also a member of the AIAA Technical Committee on Communications and the chairman of the California Space Authority board of directors.
- Mr. Hoeber holds bachelor's and master's degrees in electrical engineering from Cornell University.

Space Systems/Loral - <http://www.ssloral.com>

- SS/L is the world's leading provider of GEO commercial satellites
 - Hundreds of millions of people around the world depend on SS/L satellites every day
 - SS/L has 40 percent market share of satellites 8 kW and above, 30 percent market share looking at top six manufacturers
 - SS/L has 20 satellites in backlog
 - The company has an industry leading backlog of \$1.6 billion at the end of Q3 2009
 - With transponder capacity on orbit and under construction, SS/L is providing more bandwidth than any other manufacturer
 - SS/L has a broad base of blue-chip customers worldwide
 - SS/L does business with customers in more than 25 countries around the world
 - SS/L is the leader in putting broadband capacity in space
 - SS/L was awarded seven of the last ten North American DBS satellite contracts.
 - SS/L provided half the satellites in the Intelsat fleet, including 45 satellites delivered to Intelsat over four decades
 - Ten out of the 14 radio broadcast satellites around the world were built by SS/L
 - SS/L had seven contract awards and seven launches in 2009