The Rise and Fall of the Capital Asset – An Investigation into the Aerospace Industry Dynamics and Emerging Small Satellite Missions

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Premise



- Are Capital Assets Falling Out of Favor with Military, Civil, and Commercial Customers?
- Definition of the Capital Asset:
 - Multi-Purpose
 - > 1000 Kg
 - Long Duration (<5 years Mean-Mission Duration)
 - Highly Redundant (Class A)
- Conversely, are Capital Assets Being Replaced with Smaller, Shorter MMD, Spacecraft Focusing on Single Mission Functions at Reduced Cost and Complexity?

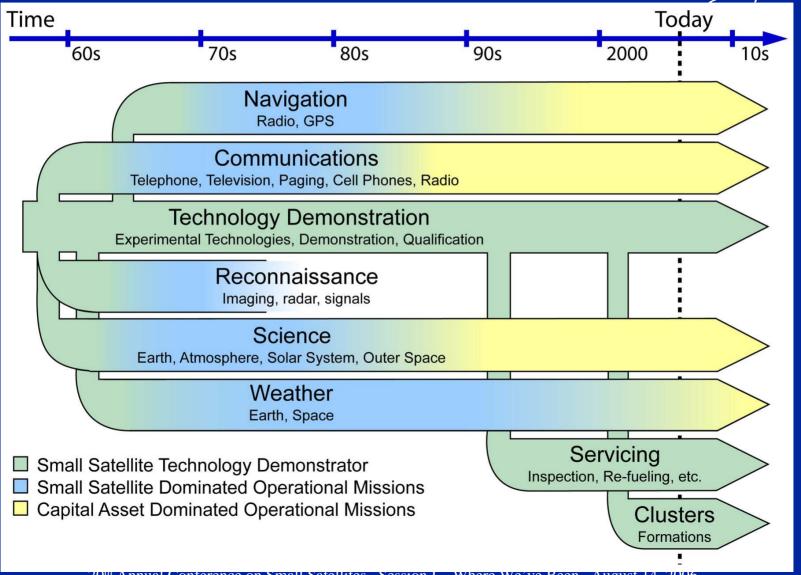
Brief Review



- Communications Satellites
 - Wide-Band Comm
 - Protected Comm
- Remote Sensing Satellites
 - Weather
 - EO/IR (Classified)
- Navigation
 - GPS Constellation
- Advent of the Capital Asset
 - Launch Vehicle Capabilities
 - Performance Push
 - Customer RequirementsPull

Mission Area	Launch Dates	Wet Mass (kg)
Wide-Band Comm. DSCS I (IDSCS) DSCS II DSCS III Wideband Gapfiller	1966-1968 1971-1989 1982-2003 ~2006-	45 520-611 2615 ~4500
Protected Comm. Milstar, Block I Milstar, Block II Advanced EHF	1994-1995 1999-2003 ~2006-	est. ~4500 ~4500 ~4100
Navigation GPS Block 1 GPS Block 2 GPS Block 2A GPS Block 2R GPS Block 2RM	1978-1985 1989-1990 1990-1997 1997-2004 2005-2007	770 1665 1816 2032 2032
Weather DMSP1 DMSP2 DMSP3 DMSP4 DMSP5A DMSP5B/C DMSP5D NPP NPOESS	1962 1964 1965-1966 1966-1969 1970-1971 1971-1976 1976- est. 2008 est. 2010	91 130 150 125 195 195 450-830 2000 est. >2000

Qualitative Mission Area Growth



Small Satellite Market Growth



- Mission Needs
 - Cost Constrained
 - Proof-of-Concept
 - Advanced Technology Demonstrators
- Technology Driven
 - Electronics
 - Miniaturization
 - Moore's Law
- Time to Market
- Obsolesces
- Customer Desires
 - Response to Asymmetric Needs
 - Emerging Mission Areas
 - Space Situational Awareness (SSA)
 - Space Control
 - NASA Space Exploration
 - Moon/Mars/Deep Space

The Crossroads



- Capital Asset and Small Satellite Co-Existence
- Complementary Missions
 - Servicing Missions
 - Adjunct/Support Payload Missions
- Space Threat Assessment
 - Space System Vulnerabilities
 - Space Force Protection
- Technology Demonstrators
 - Driven by Lower Cost Launch Options
 - Operationally Responsive Space
 - Operational Responsive Space Lift

Conclusions



- The Fall Has Not Occurred
 - Capital Assets Continue to Grow
- Indications Show that Small Sats Can and Will Play a Role in Supporting Important Mission Areas
 - Complementary Rather than Alternatively
 - New Missions Can and Will Influence The Crossroads

The Authors Await the Future
Of Small Satellites With Anticipation

