



NASA Cost Symposium 2014

Historical Perspectives of NASA Missions

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- Earth Science
 - ▶ Land surface, atmosphere, oceans & climate

- Space Science
 - ▶ Heliophysics, astrophysics & lunar excluding the Small Explorer Program (SMEX)

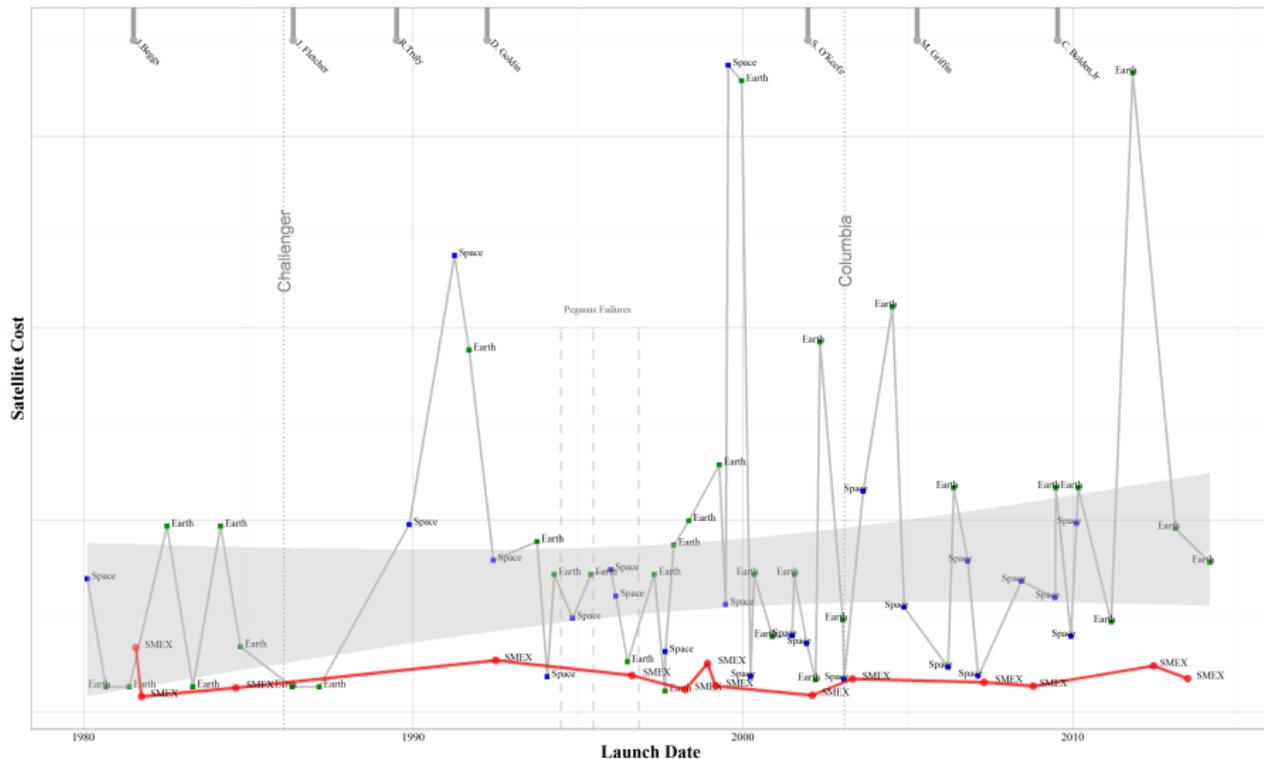
Ground Rules & Assumptions

- Database excludes Hubble Space Telescope (HST)
- Database excludes planetary missions (lunar missions are included)
 - ▶ Slides 26 & 27 include all NASA SMD missions
- Costs are for Phase C/D except where designated as life cycle cost
 - ▶ Excludes: formulation, Phase C/D for ground systems/mission operations, prime contractor fee, Phase E and launch vehicle
- Costs normalized to out-of-house rate and are in constant year millions
- Satellite refers to the instrument payload (WBS 5), spacecraft bus (WBS 6) and systems I&T (WBS 10)
- Bus costs include the cost of the spacecraft bus and systems I&T
- Meteorological and operational missions in a series are included in cost and mass, but schedule represents only the first build

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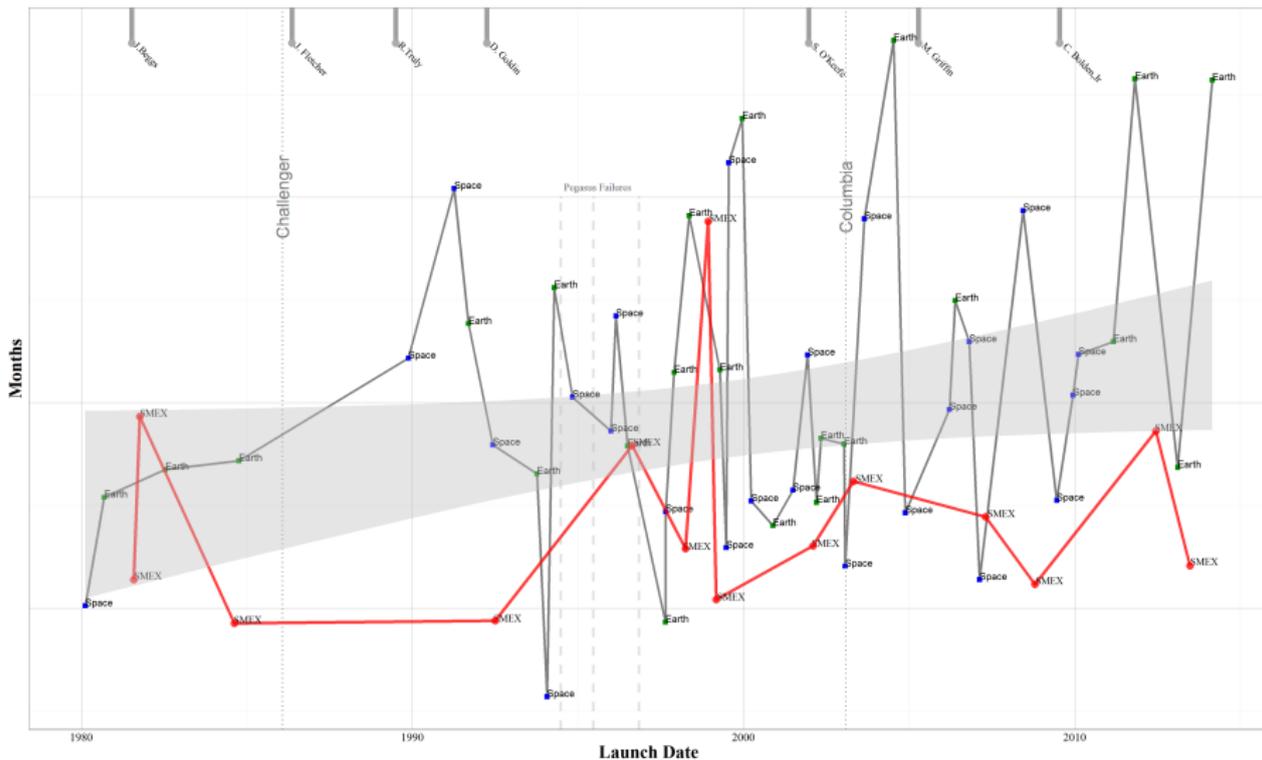
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Satellite Cost Time Series



Mission Schedule Time Series

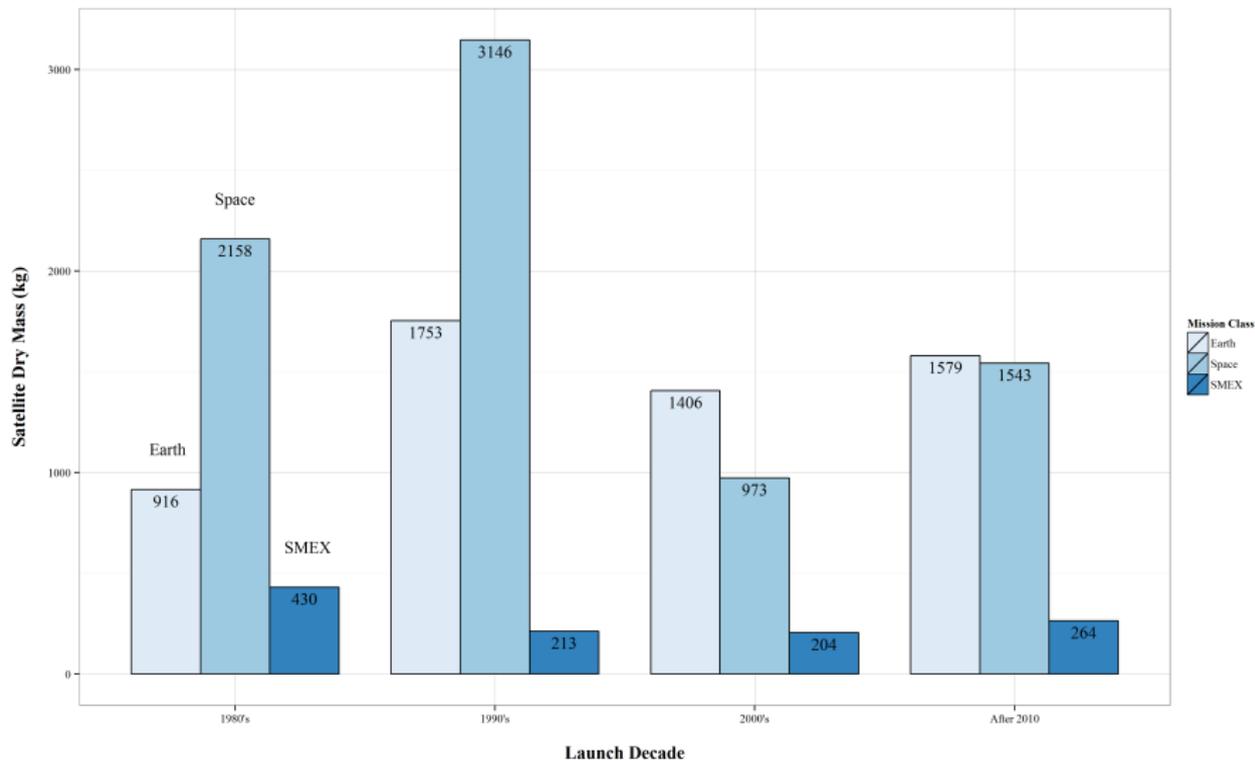
Start of Phase A to Launch



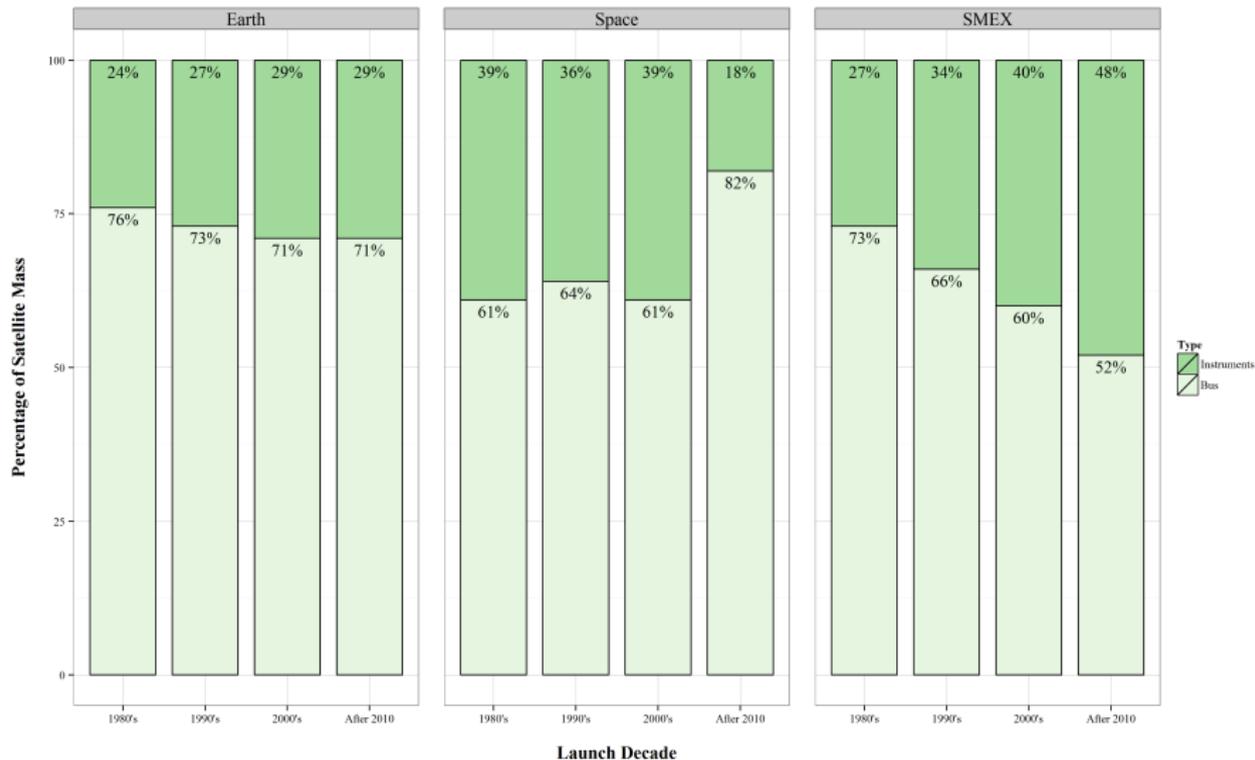
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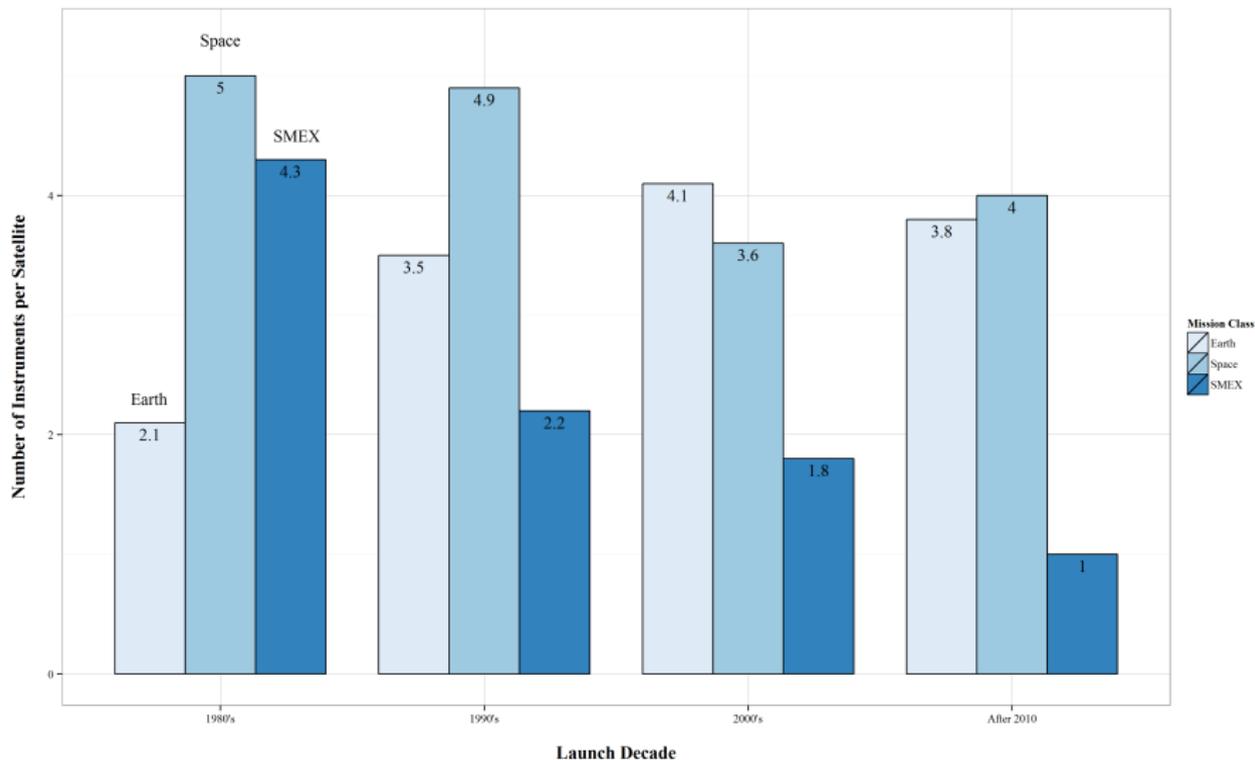
Average Satellite Mass



Percentage Distribution of Satellite Mass



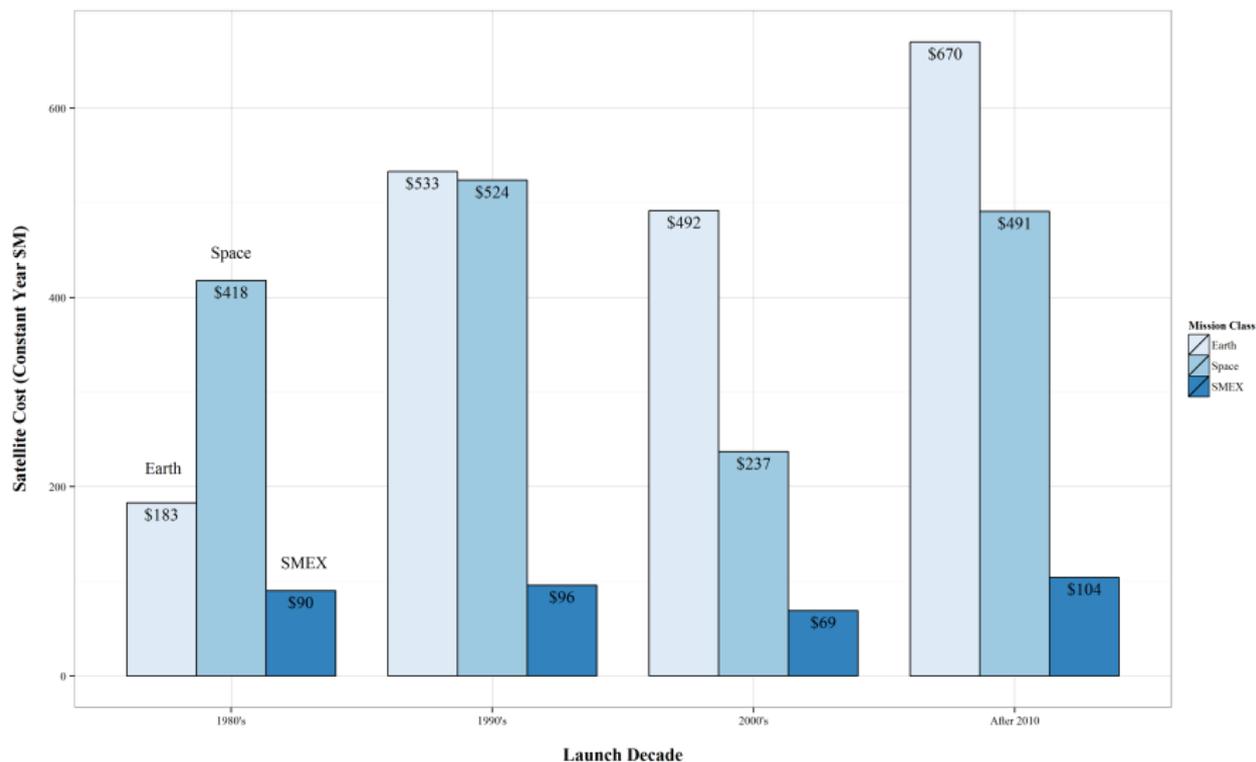
Average Number of Instruments per Satellite



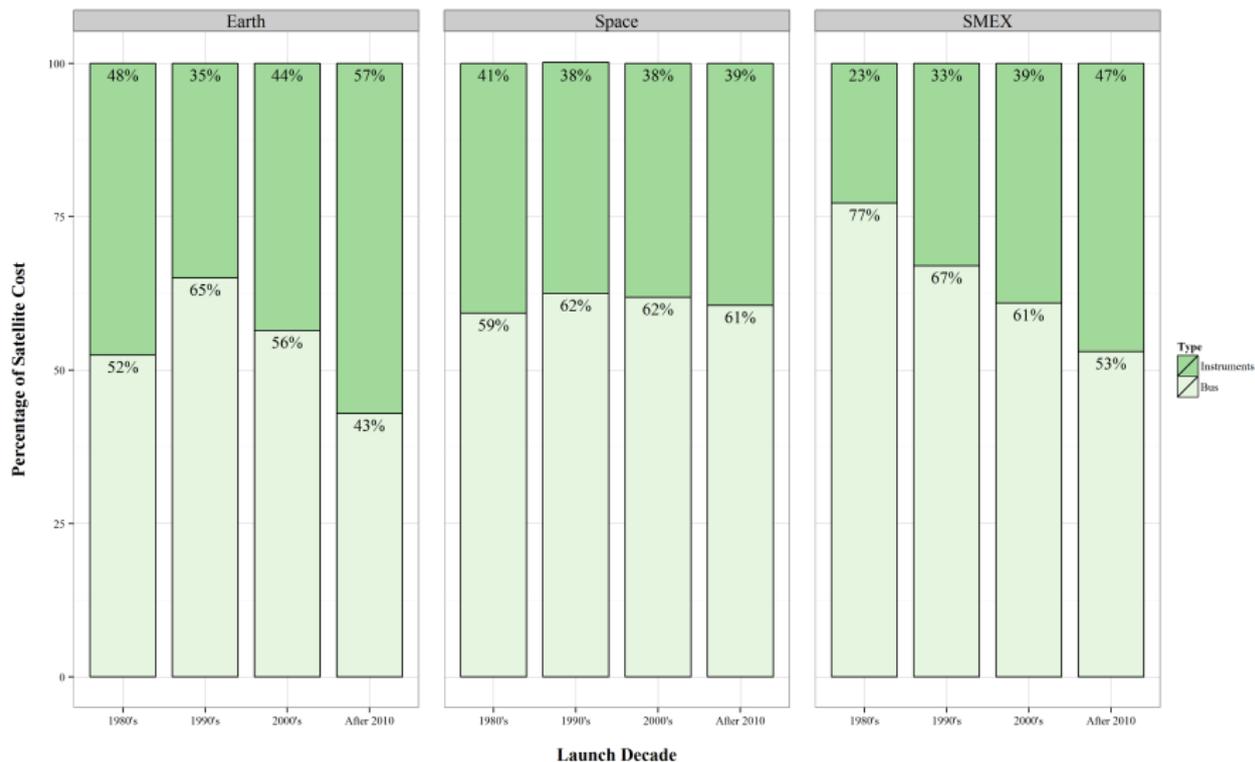
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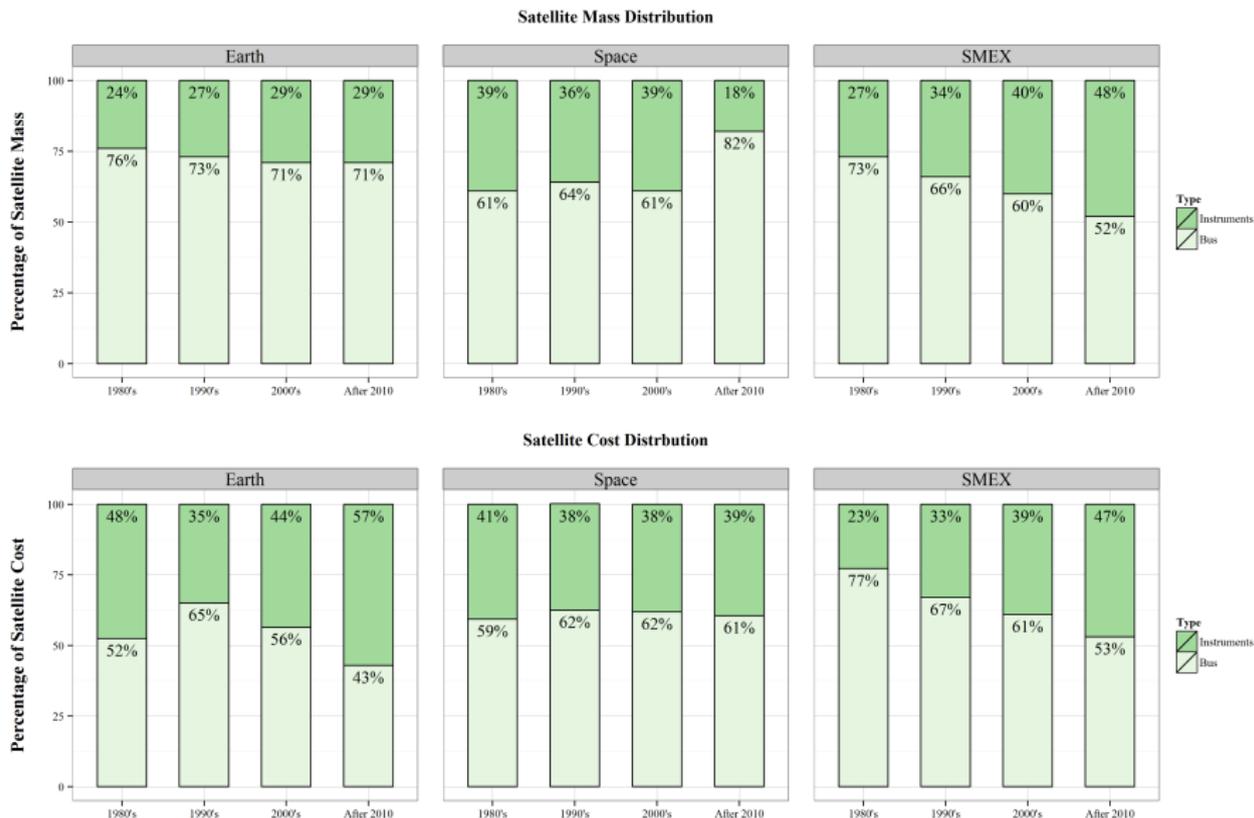
Average Satellite Cost



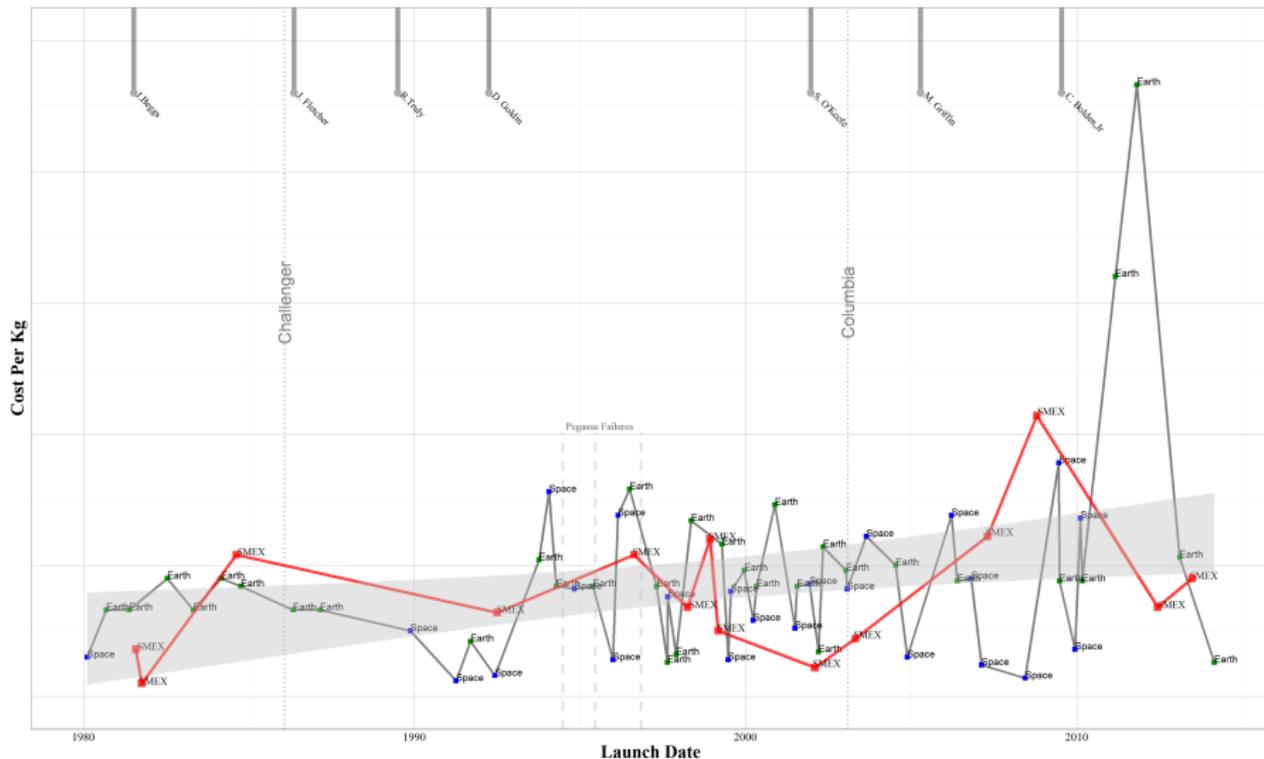
Average Percentage Distribution of Satellite Cost



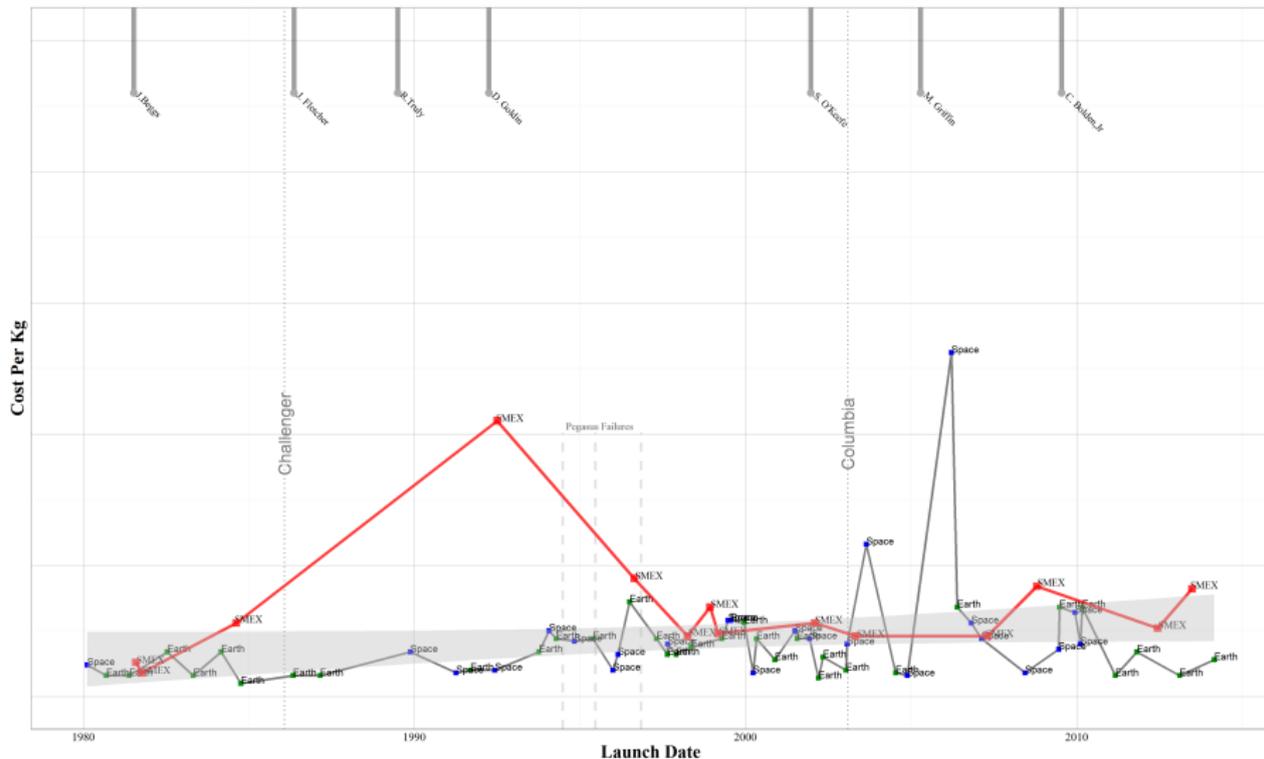
Satellite Mass & Cost Distribution Comparison



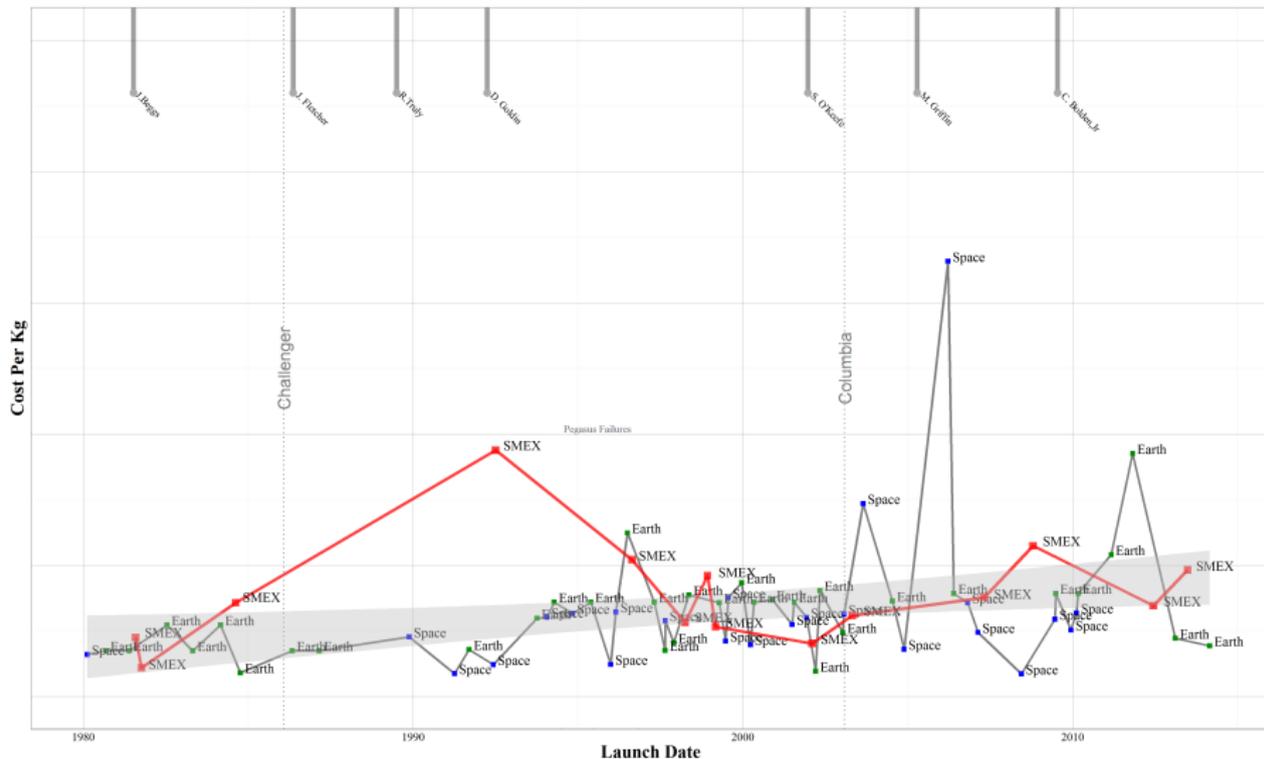
Instrument Payload Cost per Kilogram Time Series



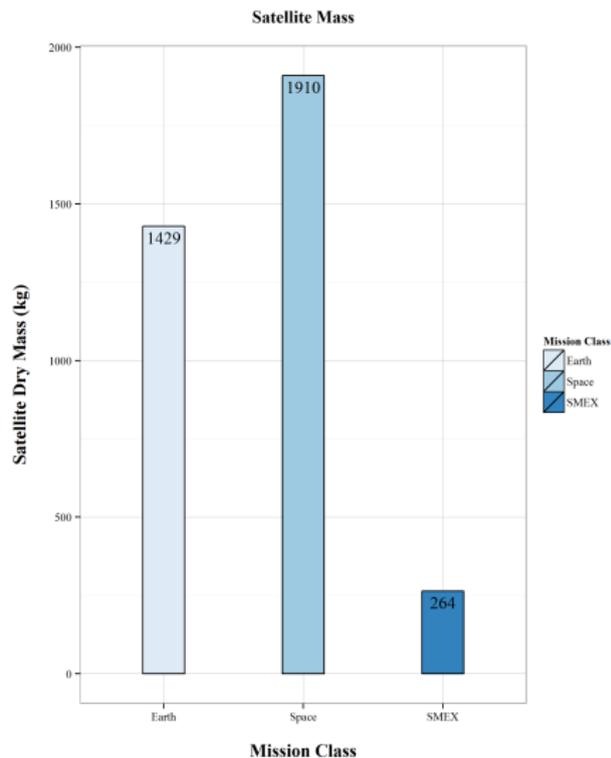
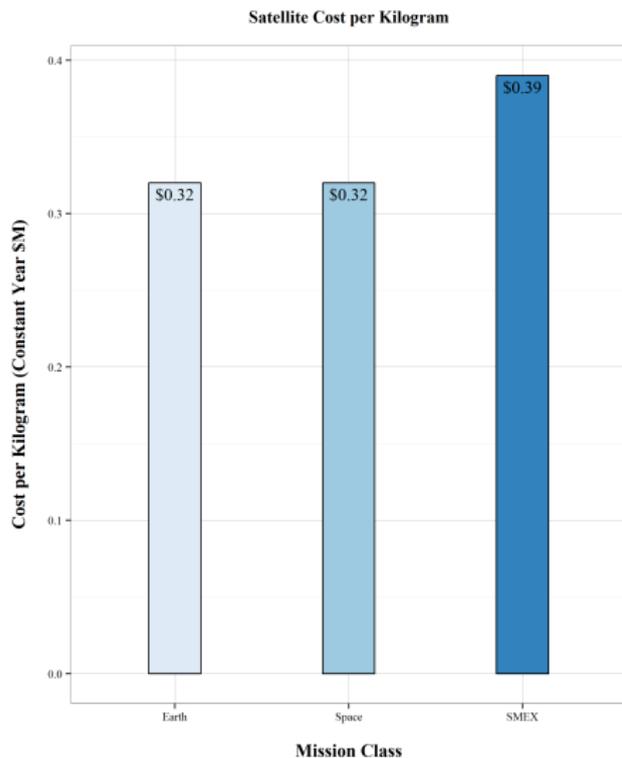
Bus Cost per Kilogram Time Series



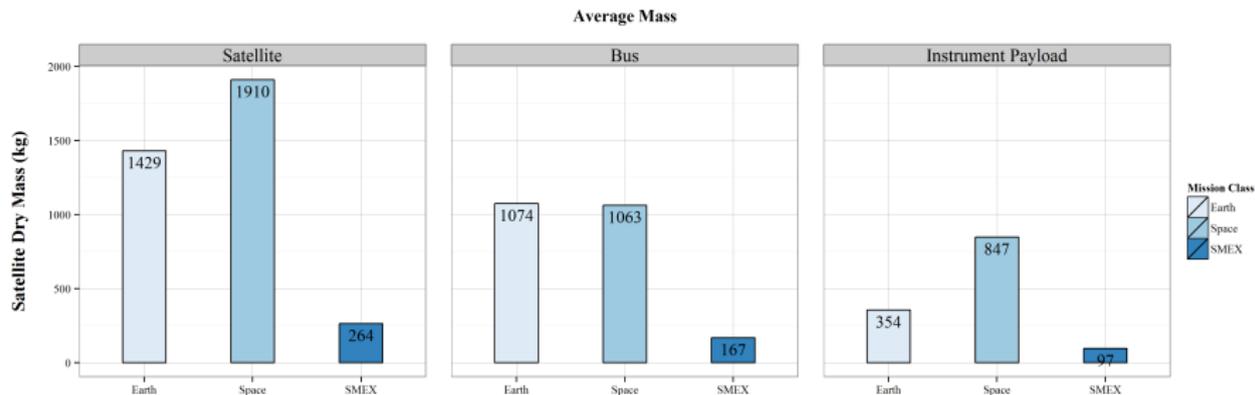
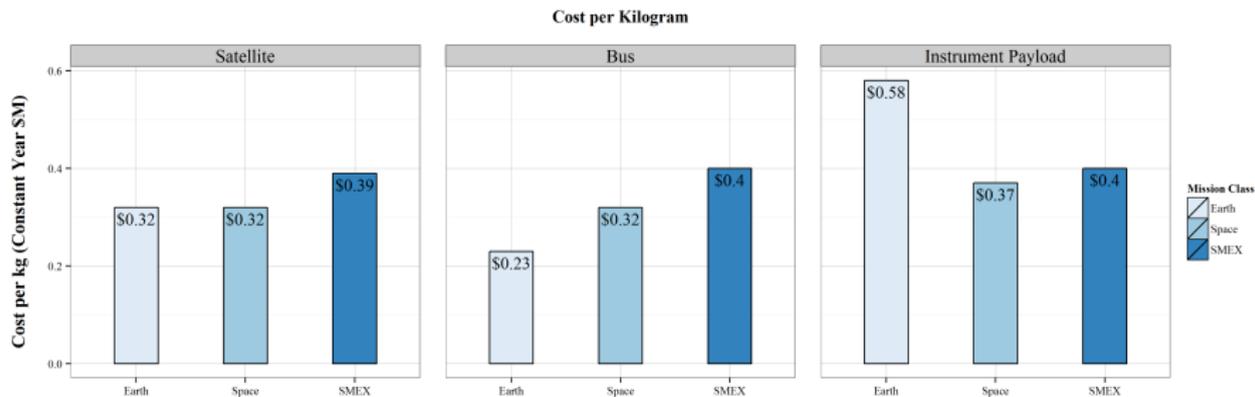
Satellite Cost per Kilogram Time Series



Satellite Cost per Kilogram & Satellite Mass



Cost per Kilogram & Mass Comparison

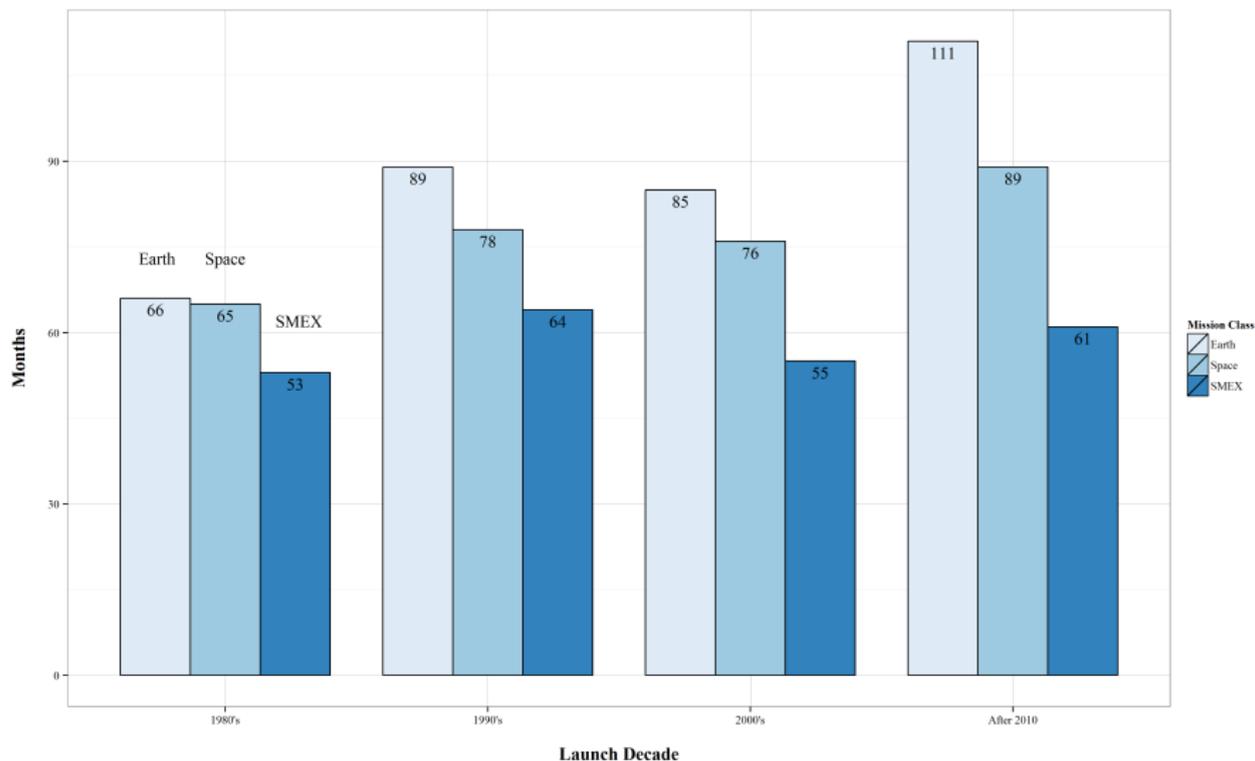


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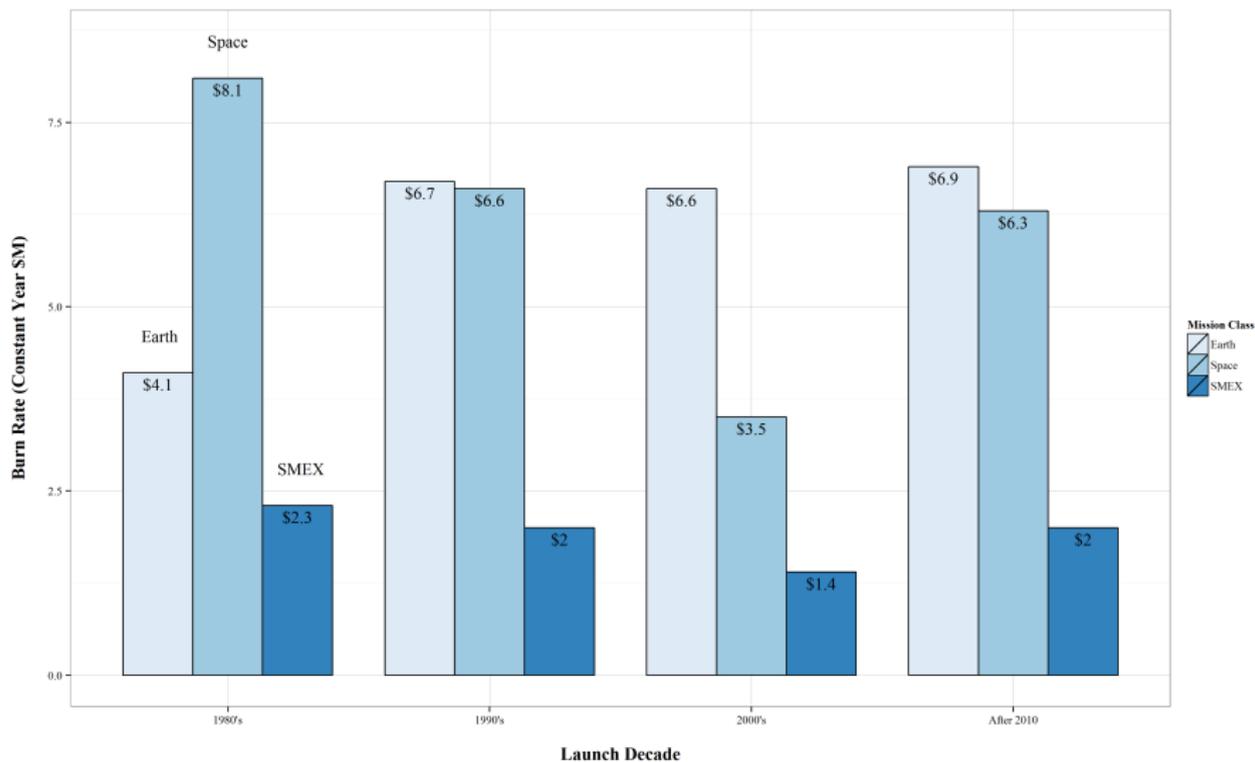
Average Mission Schedule by Decade

Start of Phase A to Launch



Life Cycle Average Monthly Satellite Burn Rate

Start of Phase A to Launch

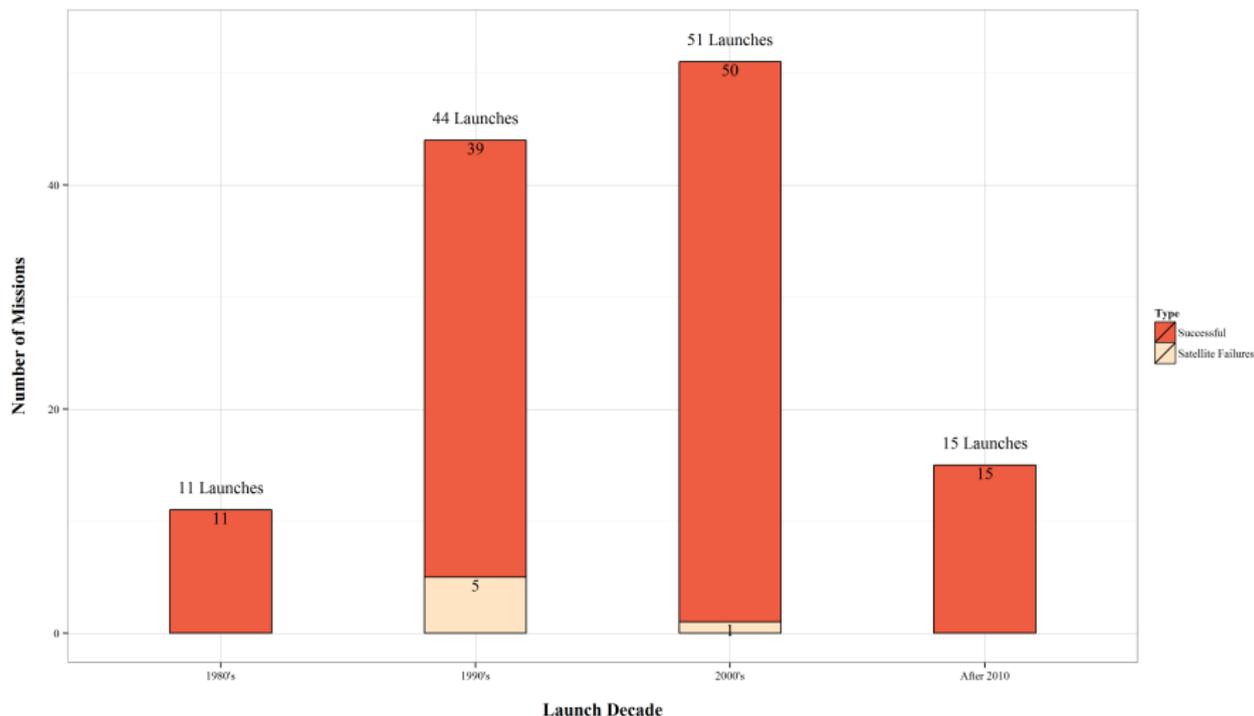


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Number of Launches & Hardware Failures

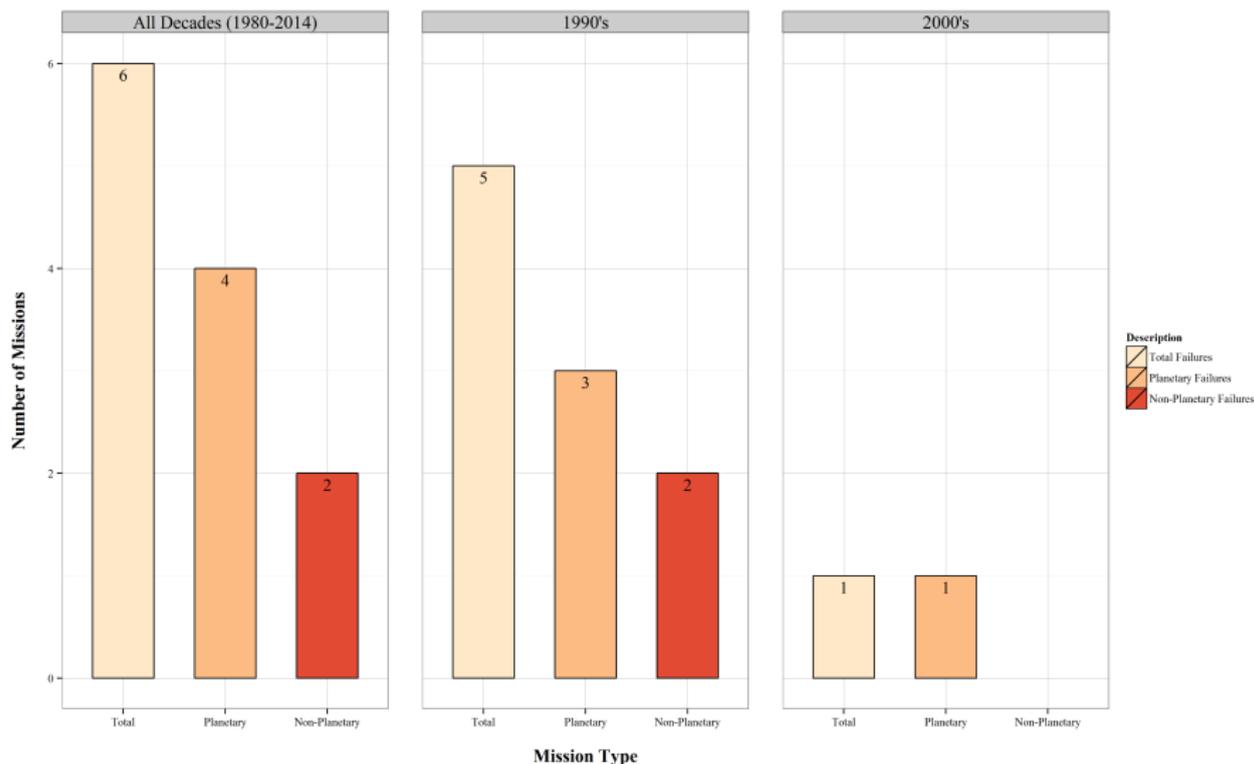
NASA SMD Missions



Failures represent failures of the spacecraft bus or instrument payload

Hardware Failures: Planetary & Non-Planetary

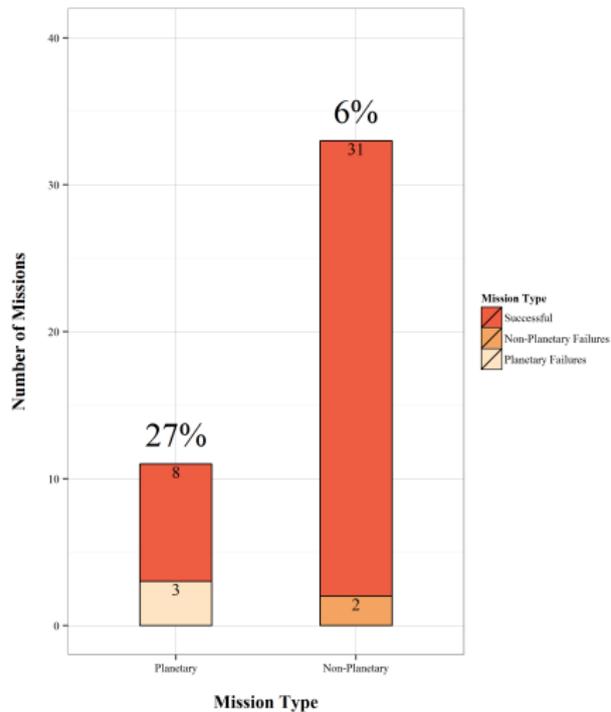
NASA SMD Missions



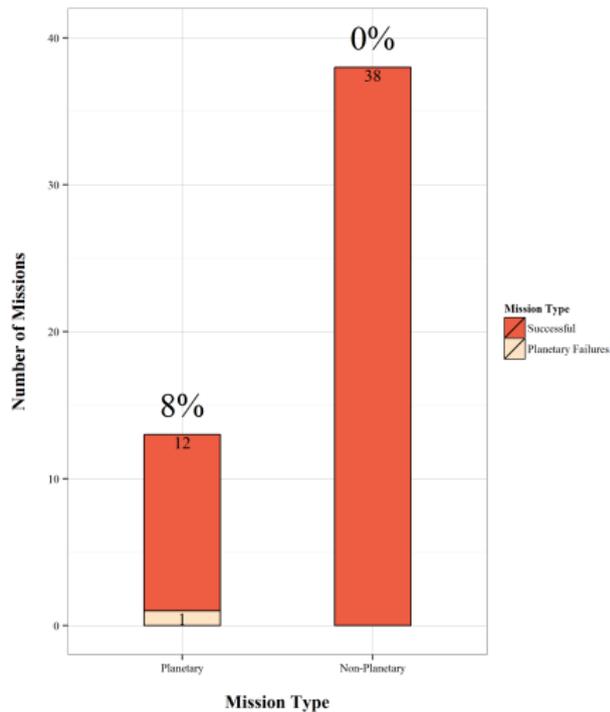
Hardware Percentage Failure Rate

Planetary & Non-Planetary Missions

1990's

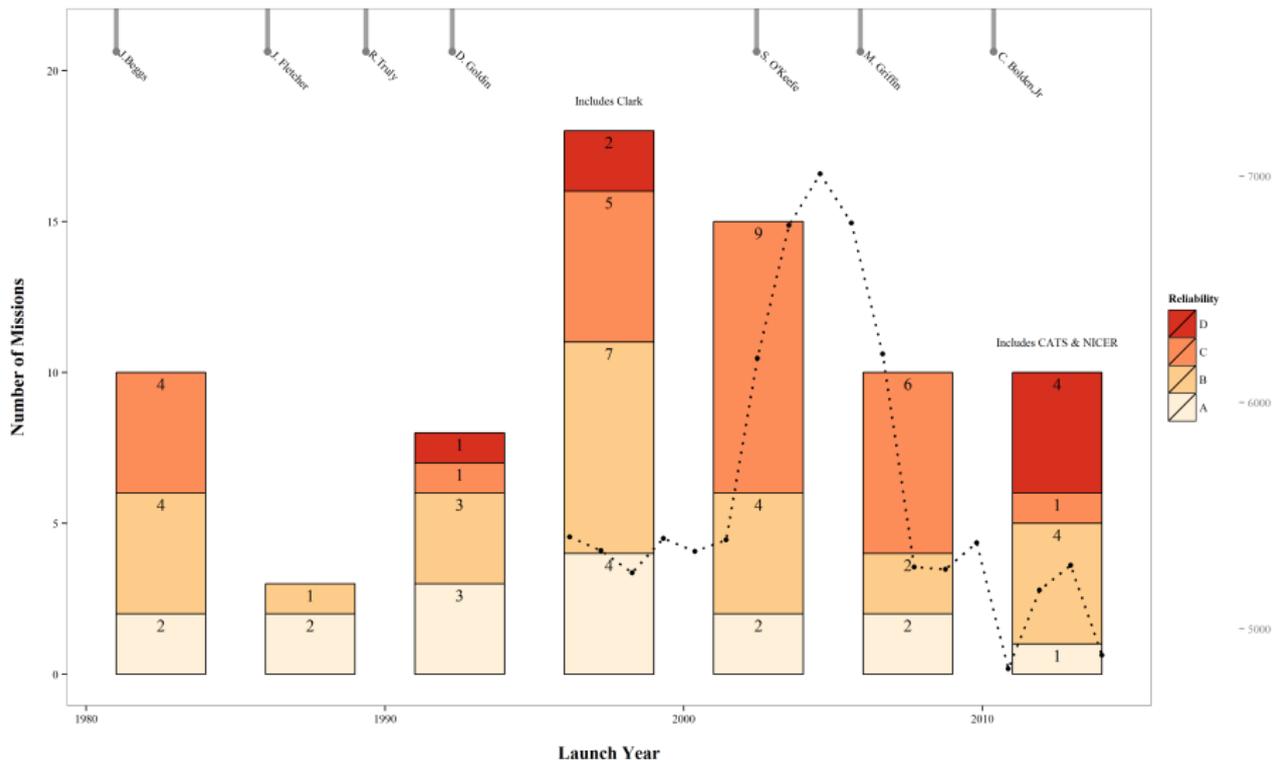


2000's



Mission Reliability Classification & NASA SMD Budget

NASA SMD Budget from 1996 to 2013



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- Last 30+ years have been relatively stable in terms of cost & schedule
- SMEX program began prior to “Faster, Better, Cheaper” initiative, which was coined by Administrator Goldin
- SMEX missions stand out as being “Faster” and “Cheaper” thus making them “Better”
 - ▶ No judgement has been made on the value of science return
- SMEX program continues to be successful with low reliability missions (Class C and D) and few failures
- “Faster, Better, Cheaper” appears to be successful with lower reliability missions