



National Aeronautics and
Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California



Patents and Technology Transfer at JPL

NAC Technology and Innovation Committee

August 2, 2011

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NASA Jet Propulsion Laboratory
California Institute of Technology





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JPL: From Caltech students testing rockets to exploring the planets in our lifetime



Caltech students (1936)



Missiles (1940s)



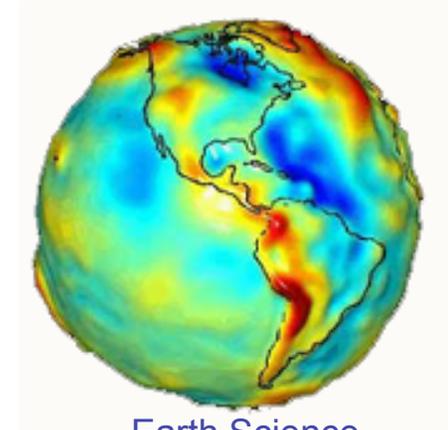
Explorer 1 (1958)



Mars Exploration Rovers
(2004 – present)



Spitzer Space Telescope
(2004 – present)



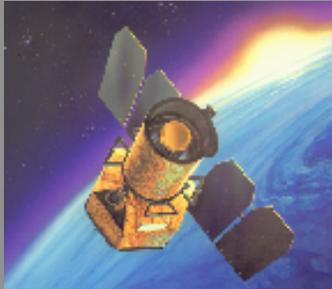
Earth Science
(1978 – now)



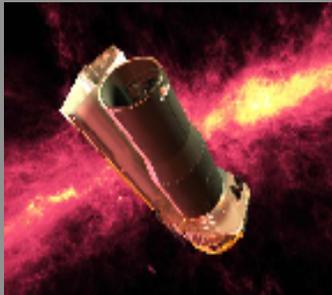
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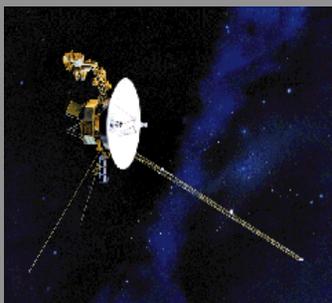
Seventeen spacecraft, nine instruments across the solar system (and beyond)



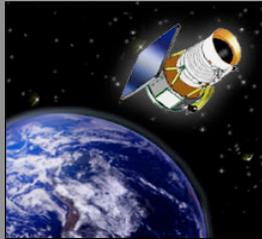
GALEX



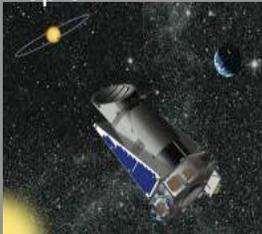
Spitzer



Two Voyagers



Kepler



ACRIMSAT



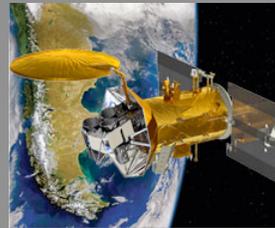
Dawn



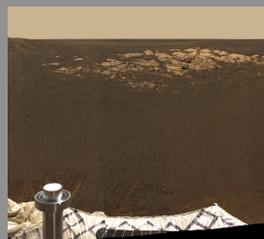
Wide-field Infrared Survey
Explorer (WISE)



Mars Odyssey



Aquarius



Opportunity



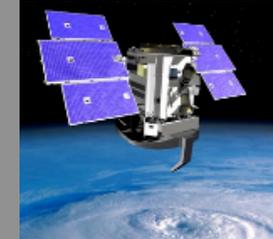
Mars Reconnaissance
Orbiter



Cassini



Jason 1 and Jason 2



CloudSat



GRACE

Plus Instruments:

- ASTER
- MISR
- TES
- MLS
- AIRS
- MIRO
- Herschel
- Planck
- Diviner

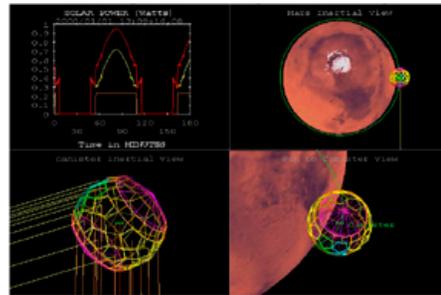


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End-to-end capabilities needed to implement missions



Project Formulation - Team X



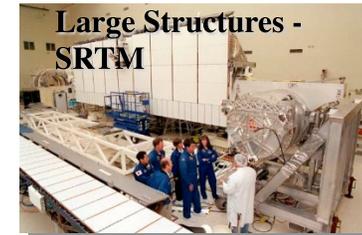
Mission Design



Mars Rovers



Scientific Research



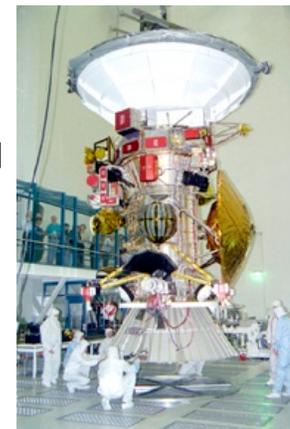
Large Structures - "SRTM"



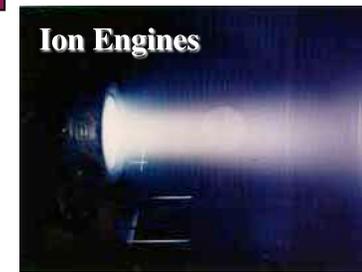
Real Time Operations



Environmental Test



Integration and Test



Ion Engines

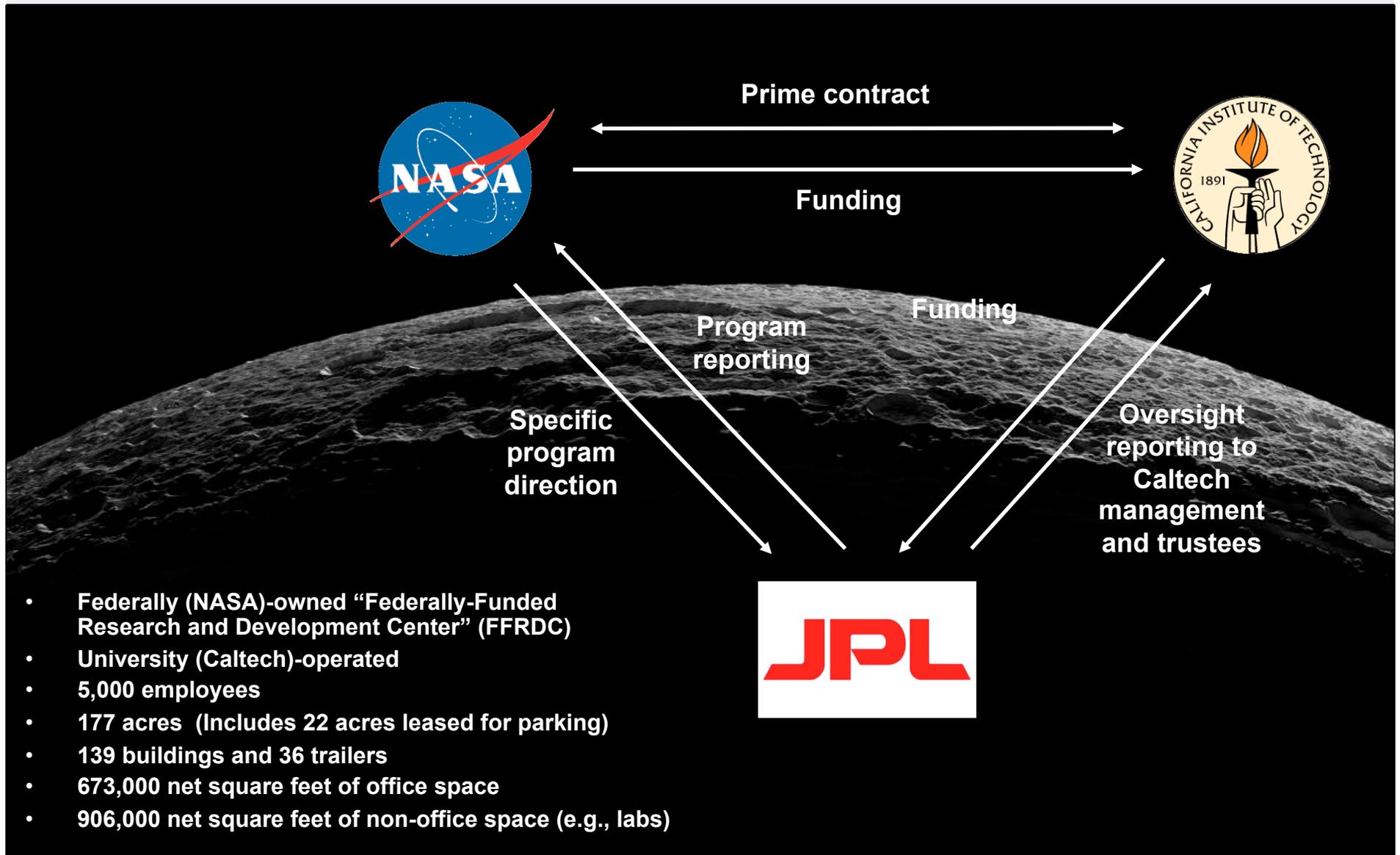
Spacecraft Development



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Caltech operates JPL for NASA





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The Technology Transfer Process

Invent

- New concept to meet a NASA need

Disclose

- File New Technology Report (NTR)

Assess

- Evaluate commercial potential

Protect

- Patent or copyright

Make known

- Create awareness

Transfer

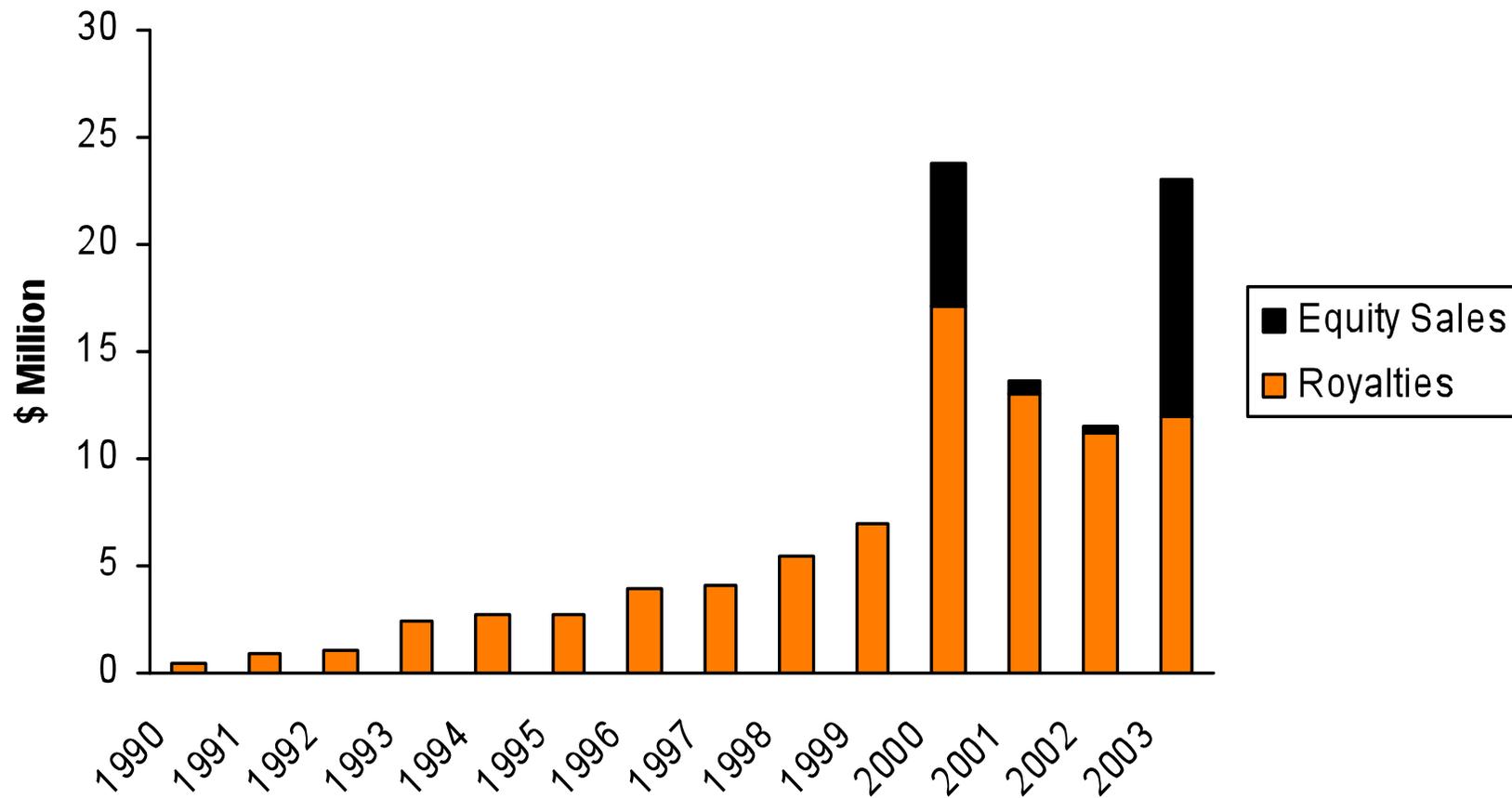
- License, SAA



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Historical Data





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A Dozen Features

1. Innovator relationships
2. Awards
3. Provisional Applications
4. Patent Attorneys
5. Enforcement
6. Outreach process
7. Empowered licensing agents
8. Option Agreements
9. VC Relationships
10. Start-ups, Equity
11. Innovator Participation Again
12. Leadership





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2009 Comparisons

	JPL	Lawrence Berkeley ¹	NASA ²	MIT ¹
FY09 Budget (estimate)	\$1.6 B	\$ 800 M	\$18 B	\$ 2.4 B
NTRs (Disclosures)	376	109	1373	501
U.S. Patents Issued	32	26	114	153
New Options	3	7	0	18
New Commercial Licenses	23	10	67	67
Disclosures / \$B Budget	235.0	136.3	76.3	208.8
Patents Issued / \$B Budget	20	32	6.3	64
License / \$B Budget	14.4	12.5	3.7	27.9

1. Source: Annual reports

2. NTTS



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2007 AUTM Average

	Per \$1B R&D	
Disclosures	400	
Patent Applications	250	
Patents Issued	80	
Licenses	100	
Licensing Revenues	\$48M	
Start-ups	120	



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2009 University Revenues

- **1. Northwestern University, \$161 million**
- 2. Columbia University, \$154 million**
- 3. New York University, \$113 million**
- 4. University of California System, \$103 million**
- 5. Wake Forest University, \$96 million**
- 6. University of Minnesota, \$95 million**
- 7. University of Washington/Washington Research Foundation, \$87 million**
- 8. University of Massachusetts, \$71 million**
- 9. Massachusetts Institute of Technology, \$66 million**
- 10. Stanford University, \$64 million**
- 11. University of Wisconsin at Madison, \$57 million**
- 12. University of Florida, \$54 million**
- 13. California Institute of Technology, \$48 million**
- 14. University of Rochester, \$46 million**
- 15. University of Iowa Research Foundation, \$43 million**

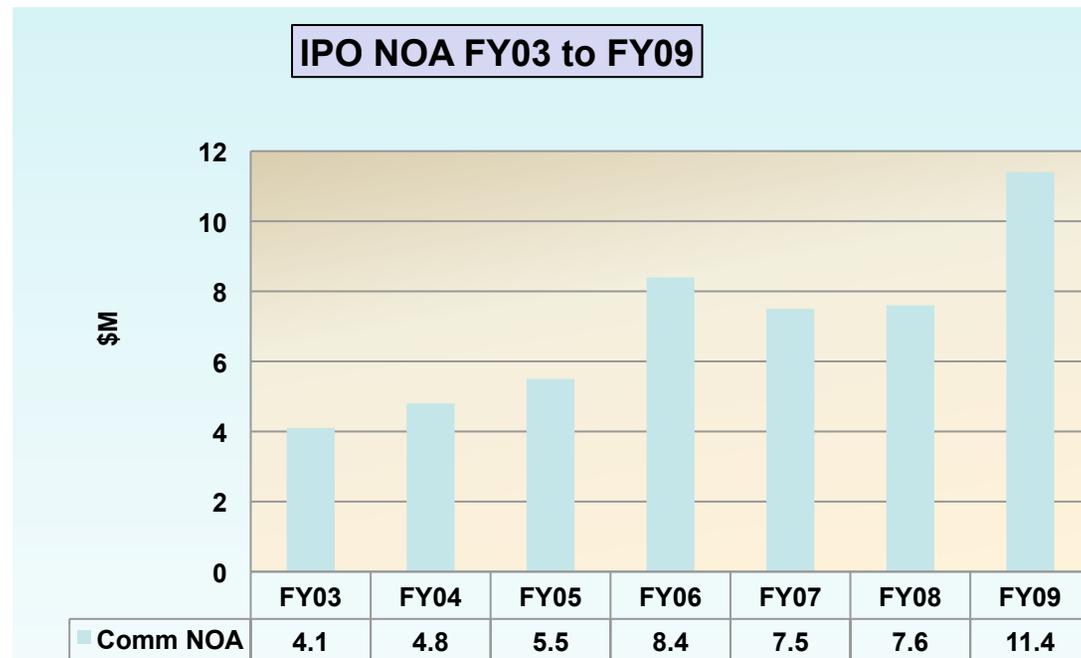


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Reimbursable Agreements

- **Allows innovators to support Licensees**
- **~20/year with commercial sector**
- **Access to low TRL funds**
- **Agreement cycle time important**



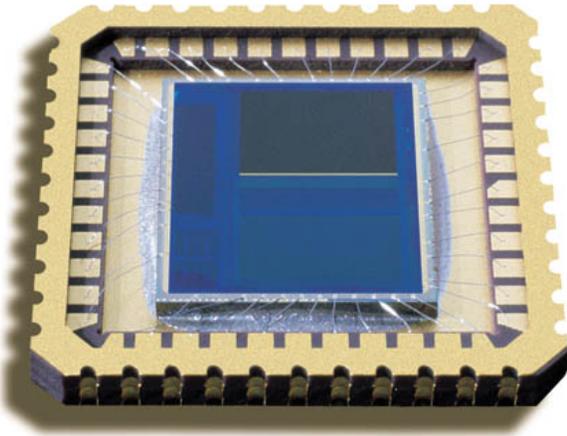


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JPL Technology Startup Photobit, Inc.

- **CMOS Active Pixel Sensor Camera now a default technology for cell phones, web cams and digital cameras**
- **Represents a Billion-dollar-per-year IC business**



Photobit was founded in 1995 by JPL researchers. In 5 years it grew to over 100 employees with \$20 M in revenue, before being acquired by Micron in 2001



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Partnerships Benefitting NASA

Creating New Suppliers: BlackJack GPS receiver hardware and software design

Developed by NASA

Transferred and licensed to Broad Reach Engineering (BRE).

NASA now has a more cost effective resource for these receivers.

BlackJack has been used in eight NASA missions:

- SRTM (02/00)
- CHAMP (07/00)
- SAC-C (11/00)
- JASON-1 (12/01)
- GRACE (03/02)
- FedSat (12/02)
- ICESat (01/03)
- Cosmic (04/06)





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Collaborations

Advancing NASA Technology and Supporting Industry: The Mercury Atomic Frequency Standard (MAFS)

Initial development funded by NASA

- ground standards
- low TRL for flight unit to enable one-way navigation

GPS-III Program now funding NASA to mature flight hardware

Symmetricom working with JPL to become the commercial supplier



	System Engr.	Physics Unit	Electronics	Algorithms/SW	I&T
Phase I Brassboard	JPL	JPL	JPL/Symm	JPL	JPL
Phase II Prototype	JPL	JPL	Symm/JPL	JPL	JPL/Symm
Phase III EQM	Symm/JPL	Symm	Symm	Symm	Symm



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