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Phaeton: Training Young Engineers at JPL

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Current NASA Workforce



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- NASA scientists & engineers over 70 outnumber those under 25 by a factor of 6
- 33% of NASA scientists & engineers are eligible to retire today
- Average age of NASA scientists & engineers is 47.6 years of age
- Increasing by 0.3 years of age annually

How do we capture the knowledge from experienced employees and transfer it to younger employees?

Solution



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Rapidly train and develop early career hires (ECHs) to be future system-level thinkers by instilling in them the experience of senior staff

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Phaeton: An Overview



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- Combine training classes, mentoring, and project-based learning
- Multiple concurrent small projects staffed and run by ECHs
- Rapid experience for participants
- Interdisciplinary training
- Multiple-phase exposure
- Small-scale technology development and testing
- Mentors staffed in a 1:1 to 1:2 ratio with participants and provided a charge number

Project Details



- Modeled after NASA AO Step 1 and Step 2 stages, appropriately scaled
- Phaeton Program Office releases request for concepts (RFC) lab-wide to all personnel
- Technical review board selects all reasonable project concepts
- ECH teams choose projects for pre-phase A proposal
- Proposal teams submit:
 - Written proposal
 - Poster display
 - Presentation
- Proposals judged by Technical review board
 - Evaluation based on training potential, scope, risk, technical benefits, and recruiting potential
- All ECHs in Phaeton work on selected projects
- All selected projects are different, but include all major reviews

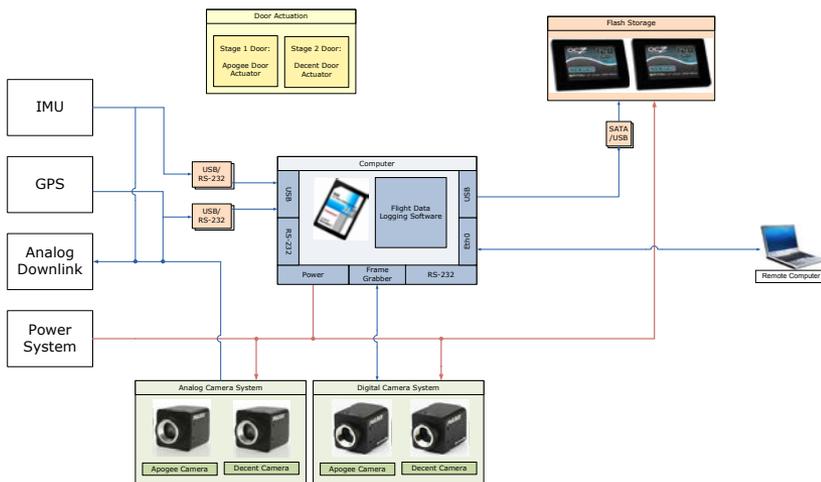
Terrain Relative Guidance System (TRGS)



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TRGS Functional Block Diagram



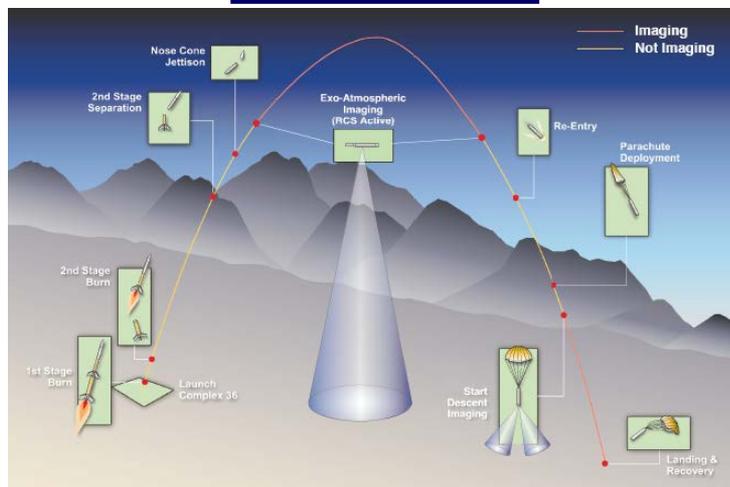
Objectives:

- Capture Exo-Atmospheric and Descent Imagery, IMU and GPS Data Sets During a Sounding Rocket Flight
- Collect and Analyze imagery, Inertial Measurement, and GPS Data During a Sounding Rocket Flight to Advance the Development of Terrain Relative Navigation Technology



41.068 NT/Seybold launching from White Sands Missile Range 5 April 2006

Mission Scenario



Funding Profile (\$K):

FY '08	FY '09	FY '10
67	600	300

FY08-FY10 Key Milestones

- FY'08: Major Procurements Completed
- FY'09: PMSR (Oct 2008)
SRR (Mar 2009)
PDR (Jun 2009)
- FY'10: CDR (Oct 2009)
I&T (Jan 2010)
Launch (Mar 2010)
Data Processing Complete (Jun 2010)

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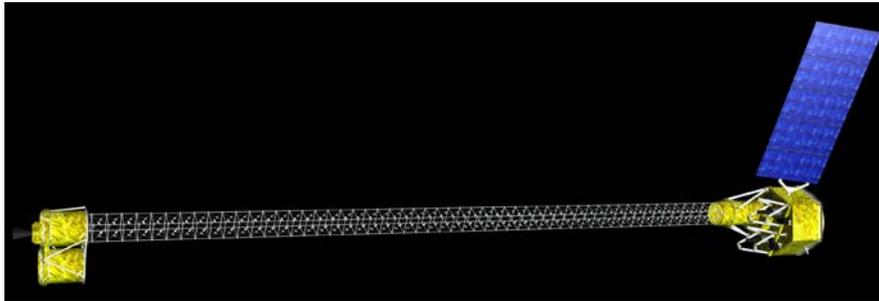
Phaeton Mast Dynamics (PMD)



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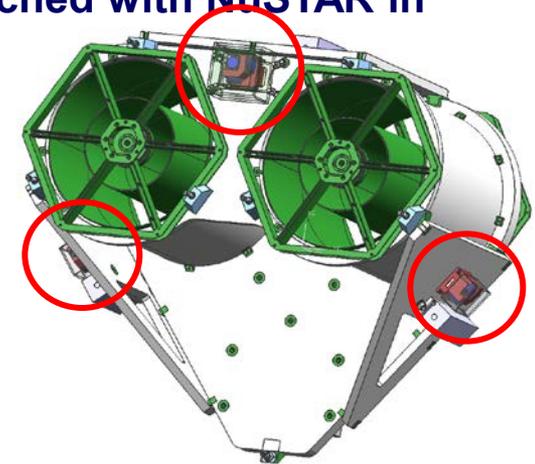
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Design, Build, and Deliver a sensor package to measure on-orbit mast vibration for the purpose of characterizing the dynamics of the NuSTAR observatory mast.



PMD will be launched with NuSTAR in August 2011

- Non-mission critical instrument
- Some resources will be provided by NuSTAR



Caltech Collaboration (WBS 04.01)

- Working with S. Pellegrino
- PMD budget plans for 0.1 to 0.4 FTE until delivery in March of 2010
- Mission operations, analysis and testing to be completed with Caltech
- Only ITAR approved information will be provided

Funding/ECH Labor Profile (\$K/FTE):

Fiscal Yr	'09	'10	'11+
Phaeton Project Funds, \$K Real Yr, Burden	600	400	100
Phaeton Project Workforce, Work Years, ECH	3.2	2.2	0.25

Major Milestones :

- PMSR – 10/30/2008
- SRR – 11/13/2008
- PDR – 1/2009
- CDR – 5/2009
- TRR – 10/2009
- HRCR – 2/2010

Results



- 19 participants from all branches of engineering, business, and procurement
 - From a total of 70 applicants

	Very much so	Somewhat	Not at all
Recommend Phaeton to others	77%	23%	0%
Excited about their project	69%	31%	0%
Provided with adequate tools	57%	43%	0%

Results



- What about the project is most stimulating to you?
 - “I find it stimulating that I am working on developing technology that will advance the state of the art. I also find it exciting to be a critical part of that process.”
 - “Being fully responsible for work in my area of expertise.”
 - “The fact that I'm responsible for the entire software, rather than just a small chunk.”
 - “The opportunity to work with other ECHs”

Results



- What additional tools or resources can we provide to help you be successful?
 - “More money”
 - “More direction before we need it, not after.”

Results



- What about the project is draining the excitement?
 - “Too much paperwork. Too much emphasis on procedure when a small project would not normally do this.”
 - 3 other similar responses
 - “This is a 100% time-commitment job, but we only have budget to work 50%.”

Results



- What do you need?
 - “Nothing, the program and the staff supports are great.”
 - “Things are on the right track! I'm looking forward to the next year.”
 - “Make training classes more relevant.”
 - “Guaranteed launches and the freedom to fail.”