



National Aeronautics and Space
Administration
Jet Propulsion Laboratory
California Institute of Technology

Wide-field Infrared Survey Explorer (WISE)



PI Perspective Lessons Learned on WISE

Ned Wright (UCLA)





Project Overview

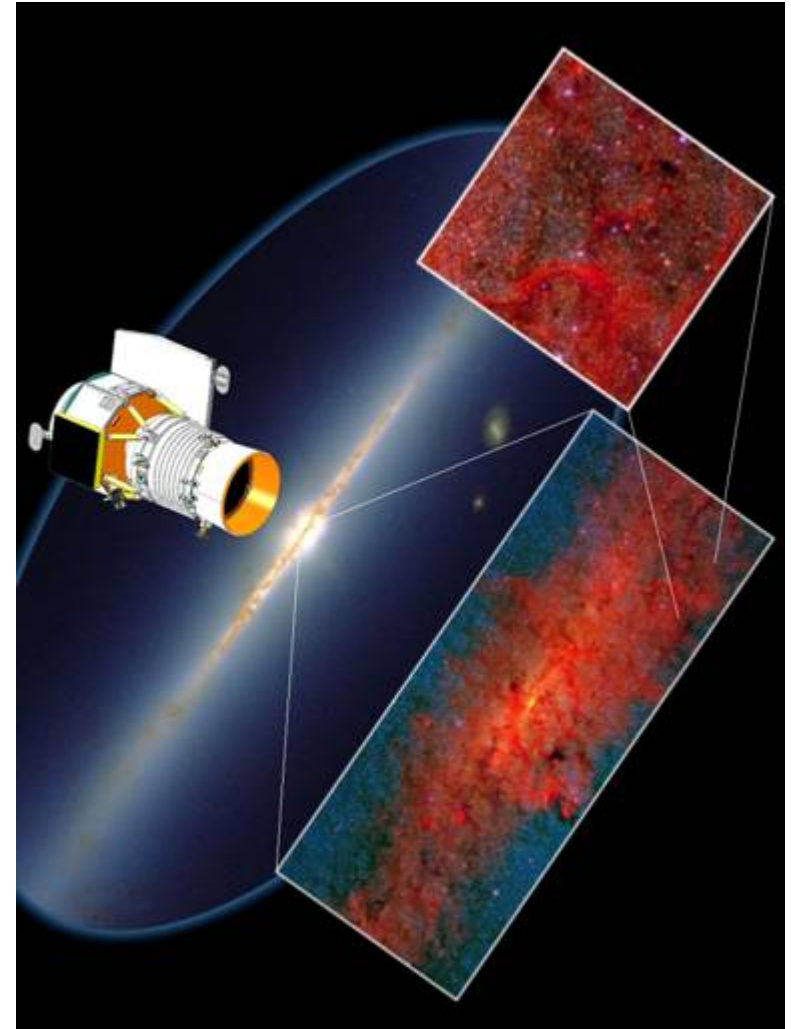
Science

- Sensitive all sky survey with 8X redundancy
 - Find the most luminous galaxies in the universe
 - Find the closest stars to the sun
 - Provide an important catalog for JWST
 - Provide lasting research legacy

Salient Features

- 4 imaging channels covering 3 - 25 microns wavelength
- 40 cm telescope operating at <17K
- Two stage solid hydrogen cryostat
- Delta launch from WTR: 14 Dec 2009
- Sun-synchronous 6am/6pm 500km orbit
- Scan mirror provides efficient mapping
- Expected life: 10 months
- 4 TDRSS tracks per day

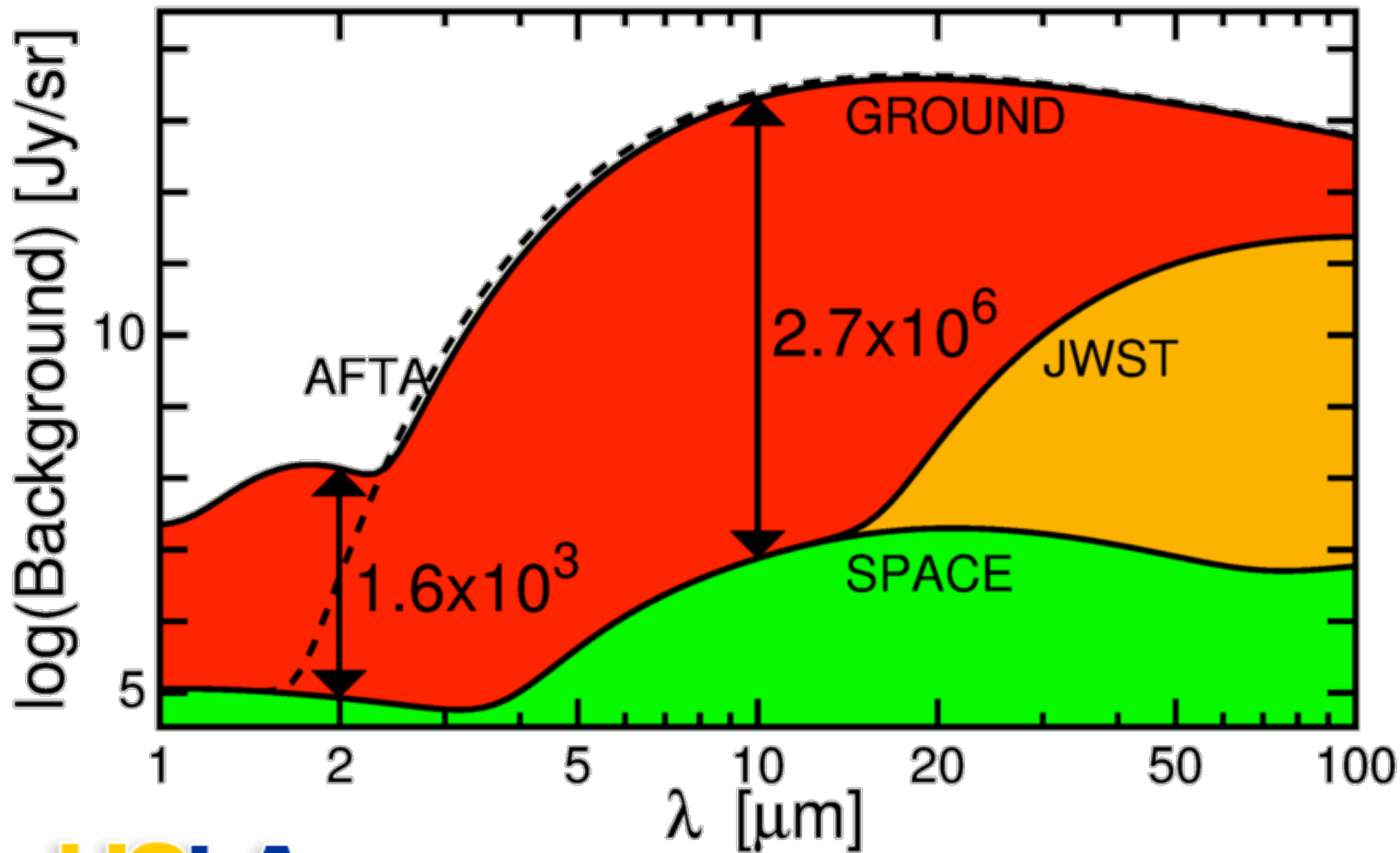
Wide Field Infrared Survey Explorer





Be a Huge Advance

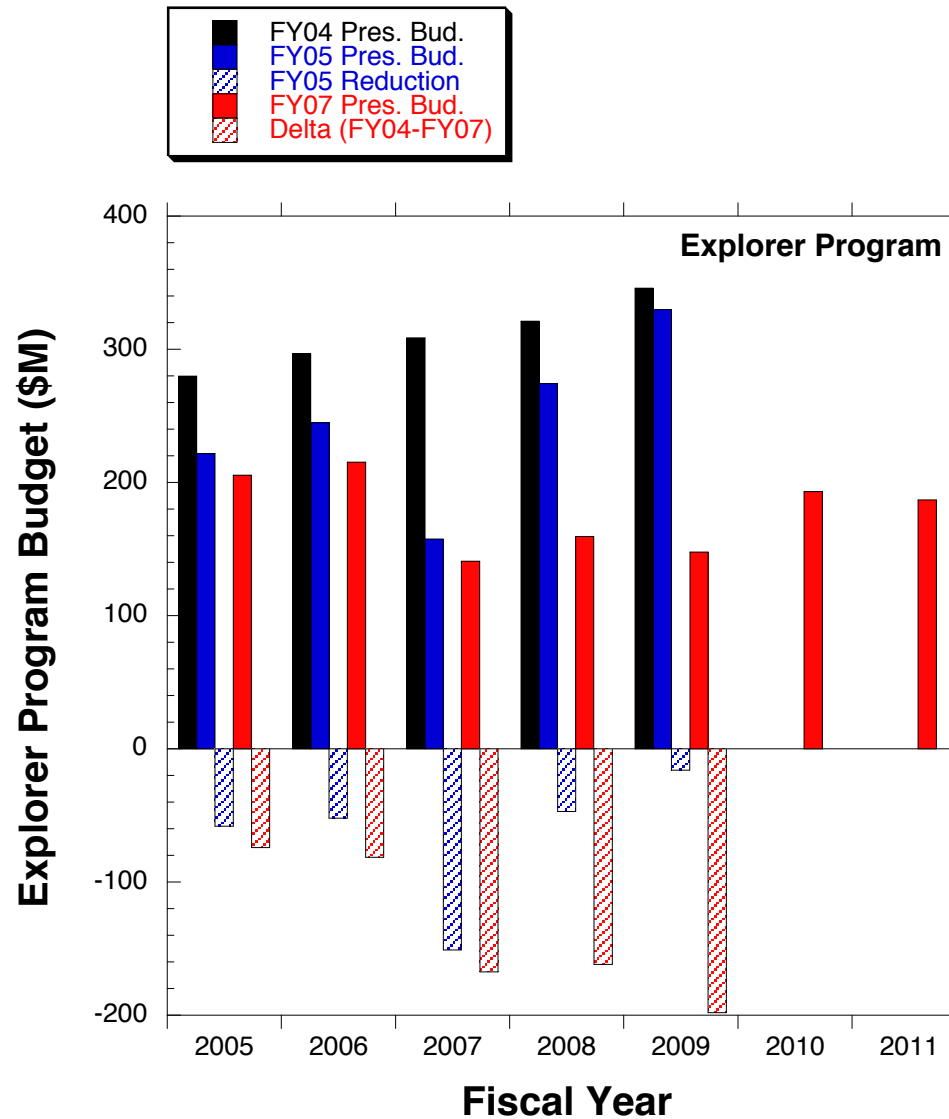
“Ground-based infrared astronomy is like observing stars in broad daylight with a telescope made out of fluorescent lights” — George Rieke.



40 cm WISE telescope in space equals six thousand 8-meter telescopes on the ground!



Be Ready for Budget Volatility





Effect on WISE

- WISE included in the FY 2007 budget request
- Budget material listed WISE as spending \$70M in FY 2006
- But WISE was directed to spend only \$30M in FY 2006 in a letter dated 28 Feb 2006
 - After a similar drastic mid-FY cutback in March 2005
- This cutback slowed the development of the science payload and delayed the construction of the spacecraft
- In a letter dated 3 Aug 2006 WISE was directed to go back to the previous spending profile
- Launch readiness date was delayed by 5 months by this stop and go budgeting to Nov 2009
- Held Delta Mission Confirmation Review in Oct 2006



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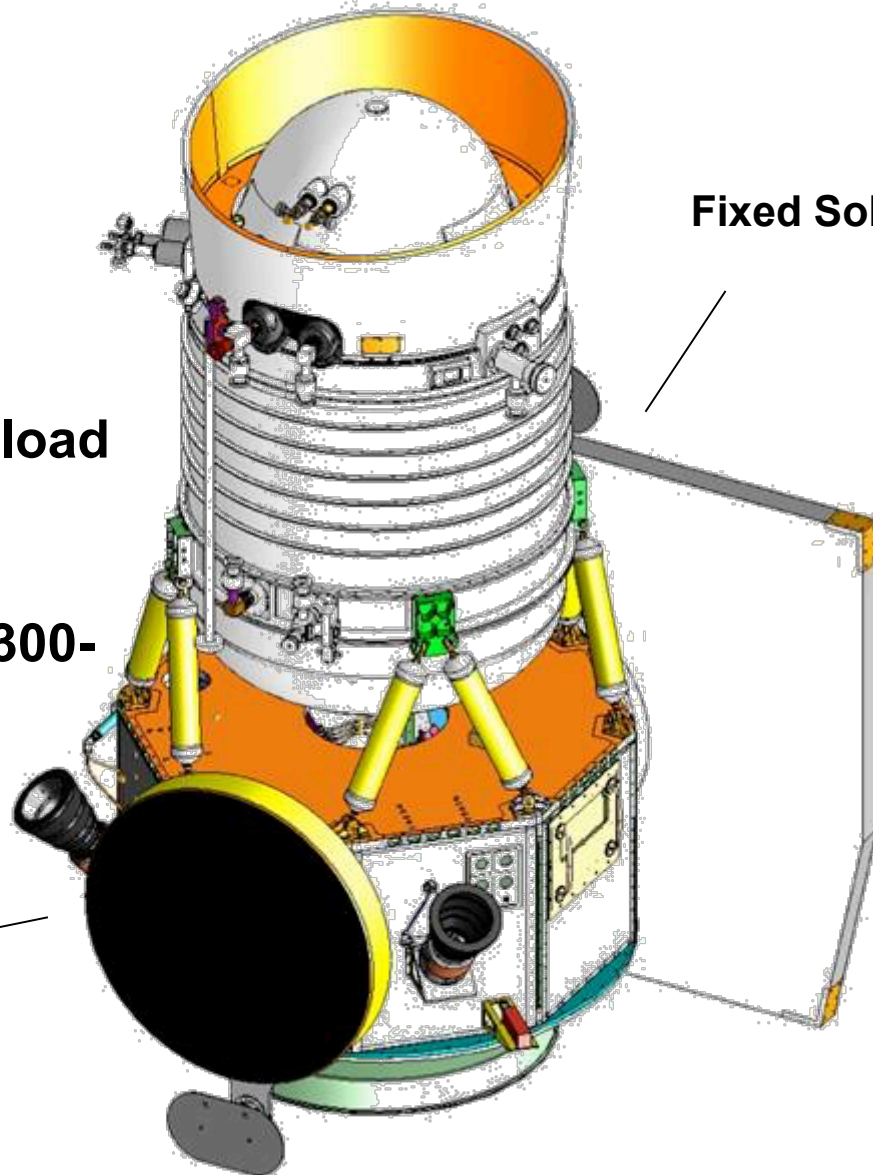
Have Well Understood Interfaces



Fixed Solar Arrays

SDL provides the payload

**BATC provides the RS300-
based spacecraft**



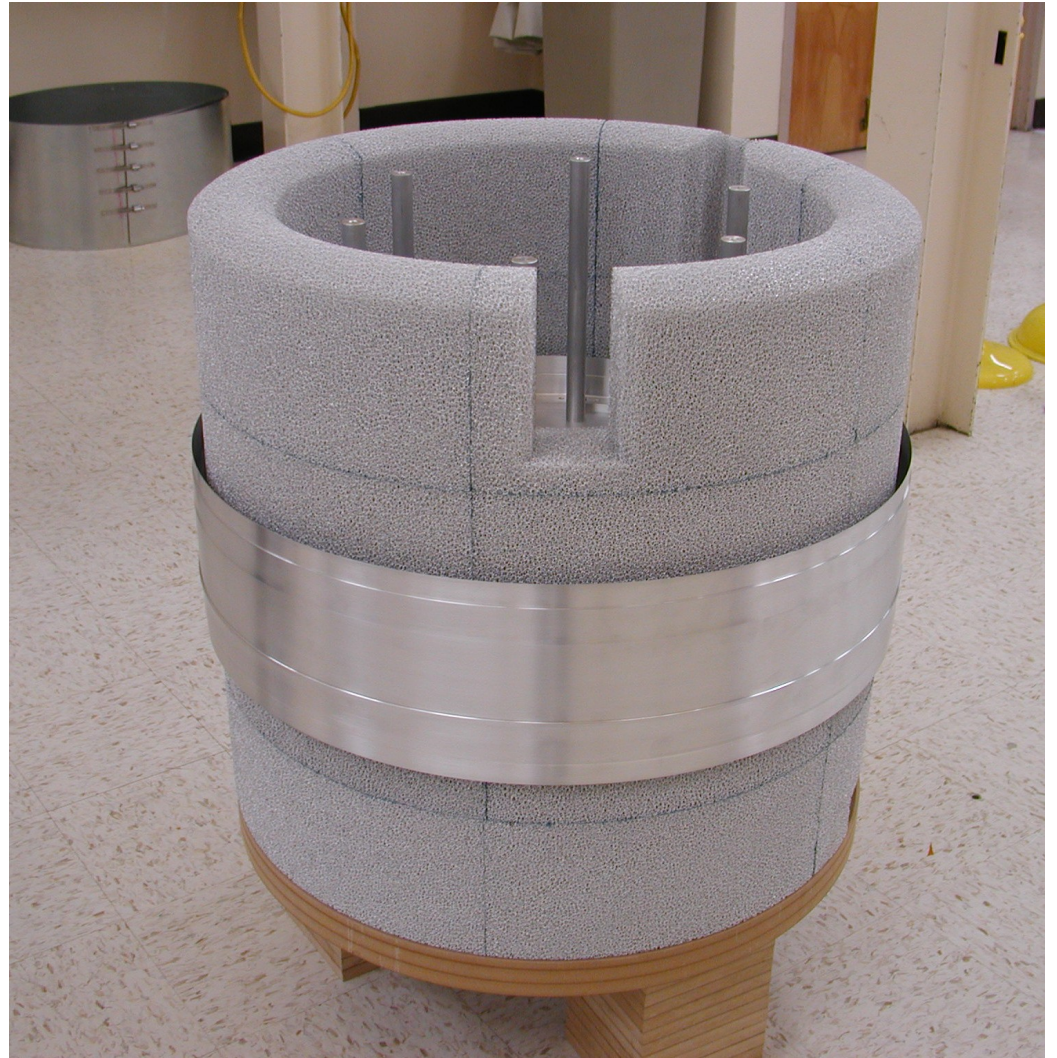
**Mass: 663 kg
Power: 335 W
Data Rate: 78 GB/d**

Fixed High Gain Antenna



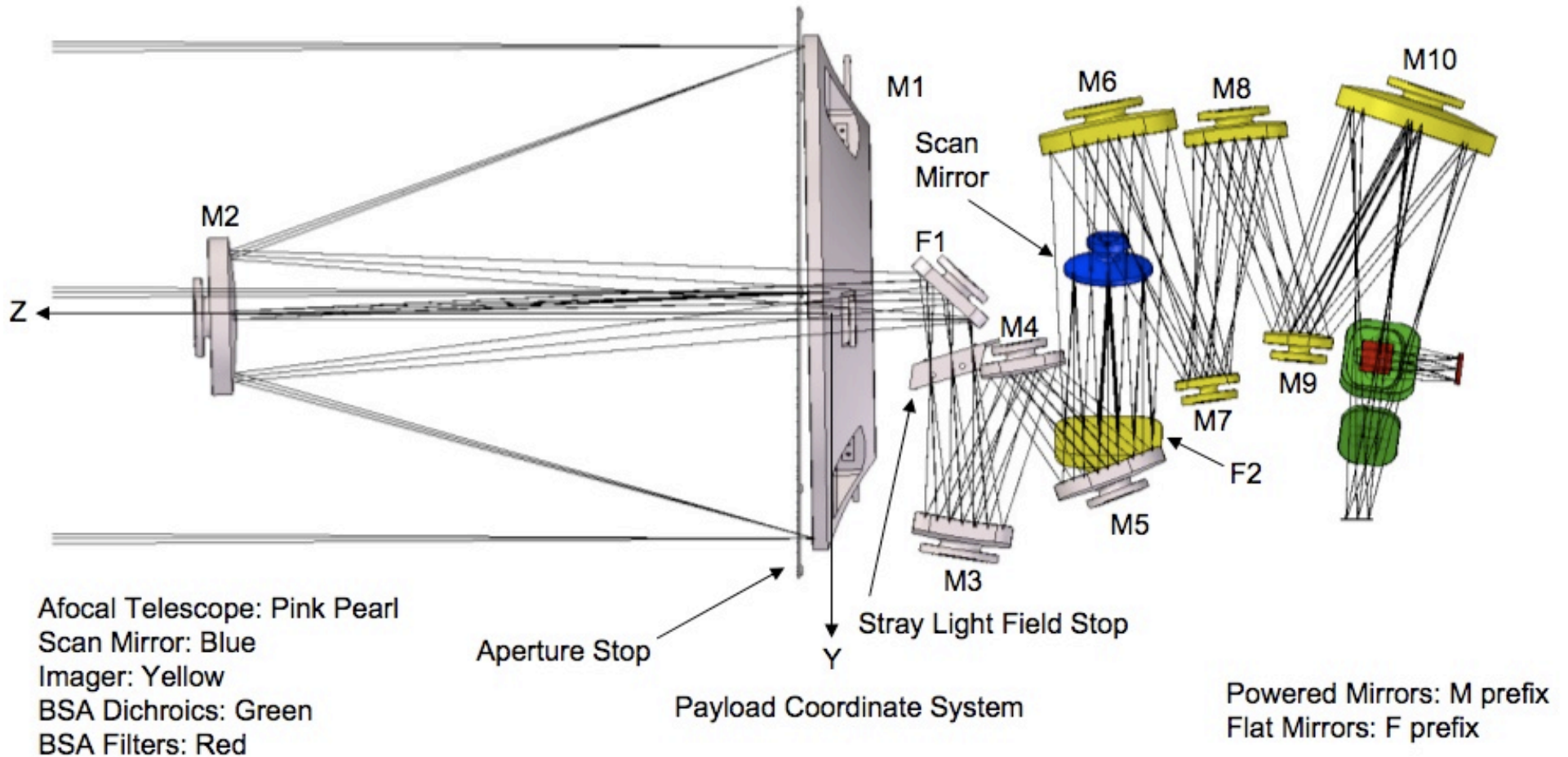
Cryostat Long Lead Time

- Solid hydrogen cryostat is filled with aluminum foam to conduct heat from the instrument to the solid cryogen
- This foam takes a long time to make
- The foam for the WISE outer tank is shown at right





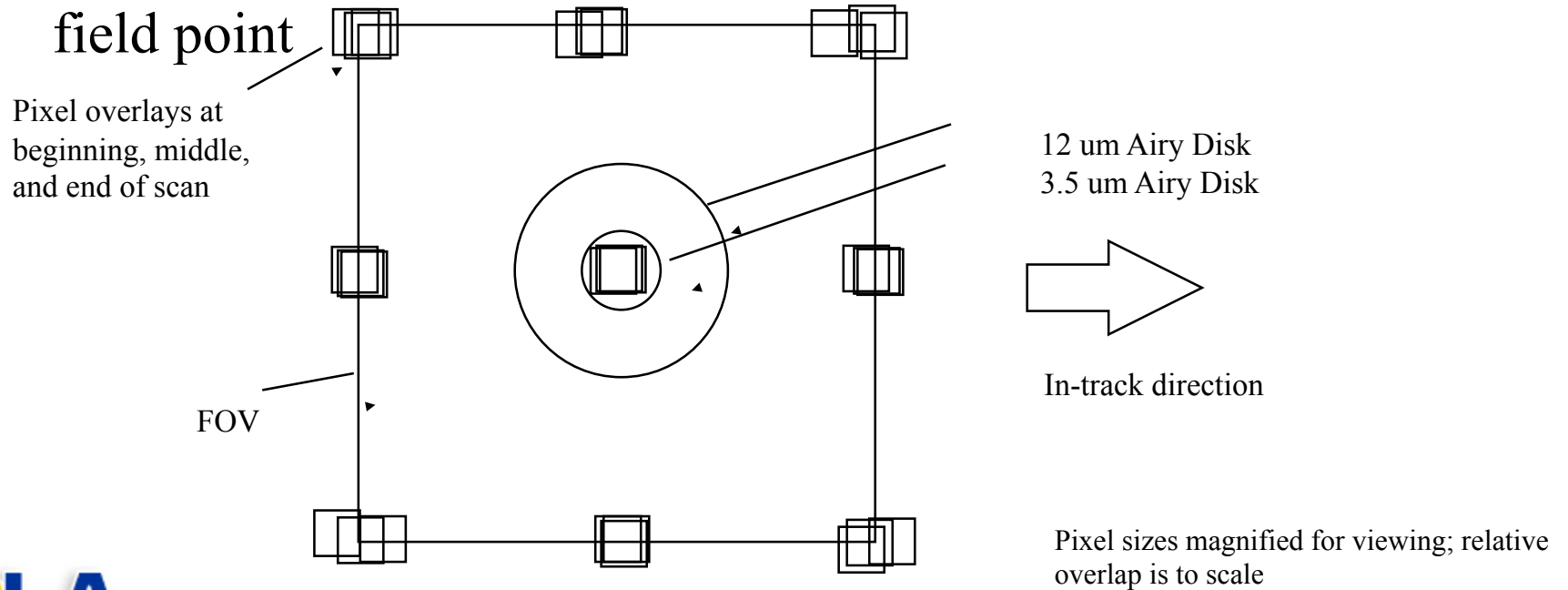
WISE Optical Diagram





Distortion Discussion & Results

- Distortion is the dominating constraint in the afocal telescope design
 - Dictates the design form & number of optics
 - Requires trade-off with image quality (design residuals)
- Allocation is based on the current design results at worst case field point



TMDS Vibration Test Rig

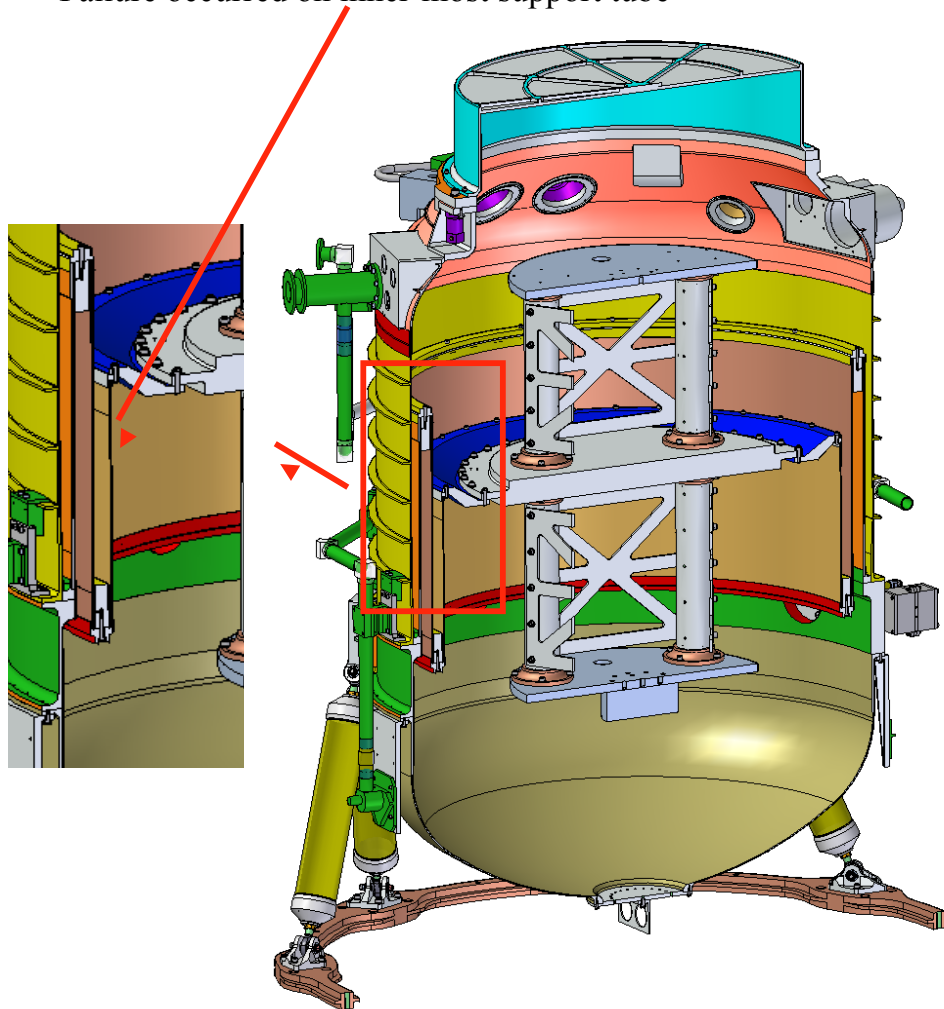
- Thermal Mass Dynamics Simulator was used instead of hydrogen-filled cryostat during the system level “shake and bake”.
- TMDS vibration test completed successfully on the second try.
- Measured responses matched predictions well.



Wide-field Infrared Survey Explorer (WISE)
Brief Status Update—WISE TMDS
12 February 2008



Failure occurred on inner-most support tube



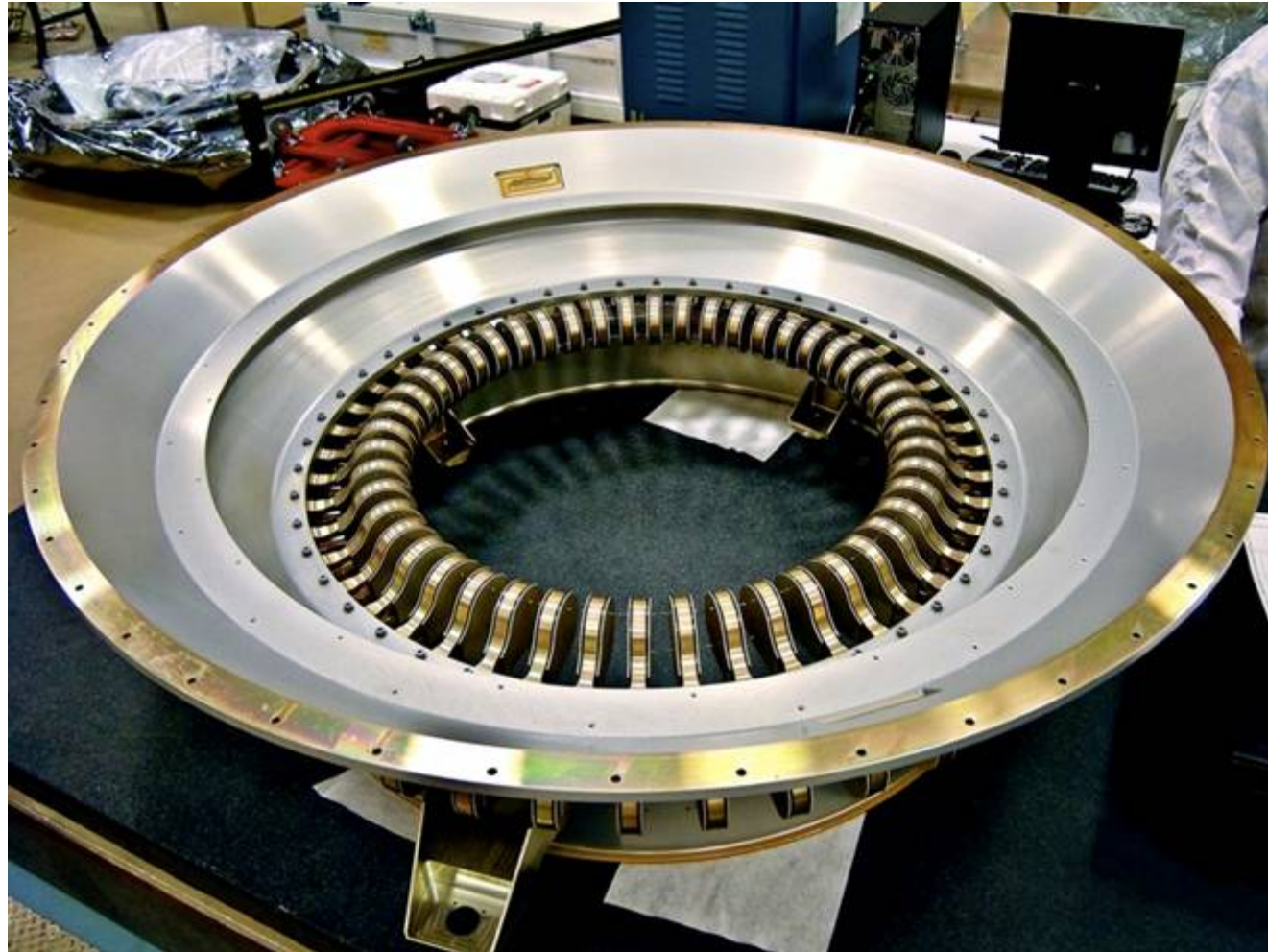
- During the TMDS structural testing there was an anomaly and a failure of the TMDS that is of significant concern.
 - The first lateral mode was 27 Hz vs the 37 Hz predicted
 - During the second lateral axis test the inner support tube failed
 - Note: We need to remember that this is not the flight cryostat or flight instrument. There are significant differences in how they are designed and fabricated since the TMDS is a “test” simulator.
- SDL has convened a team to evaluate the failure and then will prepare a plan to move forward after sufficient information is given
 - Review team:
 - SDL: Glen Hansen, Brett Lloyd
 - Consultant: Scott Schick
 - LMATC: Larry Naes
 - LMATC Structural (Dario Traveranos)
 - The hardware is not yet back at SDL so direct examination of the failure is not possible at this time.
 - Data collecting and analysis is being performed to address the first anomaly



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Added a Soft Ride



- Delivered on time and on budget by CSA, Inc.

UCLA

ELW - 12
26 Jan 16



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Wide-field Infrared Survey Explorer (WISE)

TMDS+S/C Vibe Test



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ELW - 13
26 Jan 16

S/C+Instrument





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Arriving at VAFB right on time





Conclusions

- Propose a mission that is a huge advance over previous capability.
- Be ready for budget profile changes.
- The stuff you know is hard will get done, but watch out for the simple stuff like cables and valves.
- Have realistic costs for all mission components and a good reserve on top of that. You don't know what you will need it for but you probably will need it.
- Keeping on schedule let's you stay on budget.