PI Perspective
Lessons Learned on WISE

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Note: FINESSE co-I

Project Overview

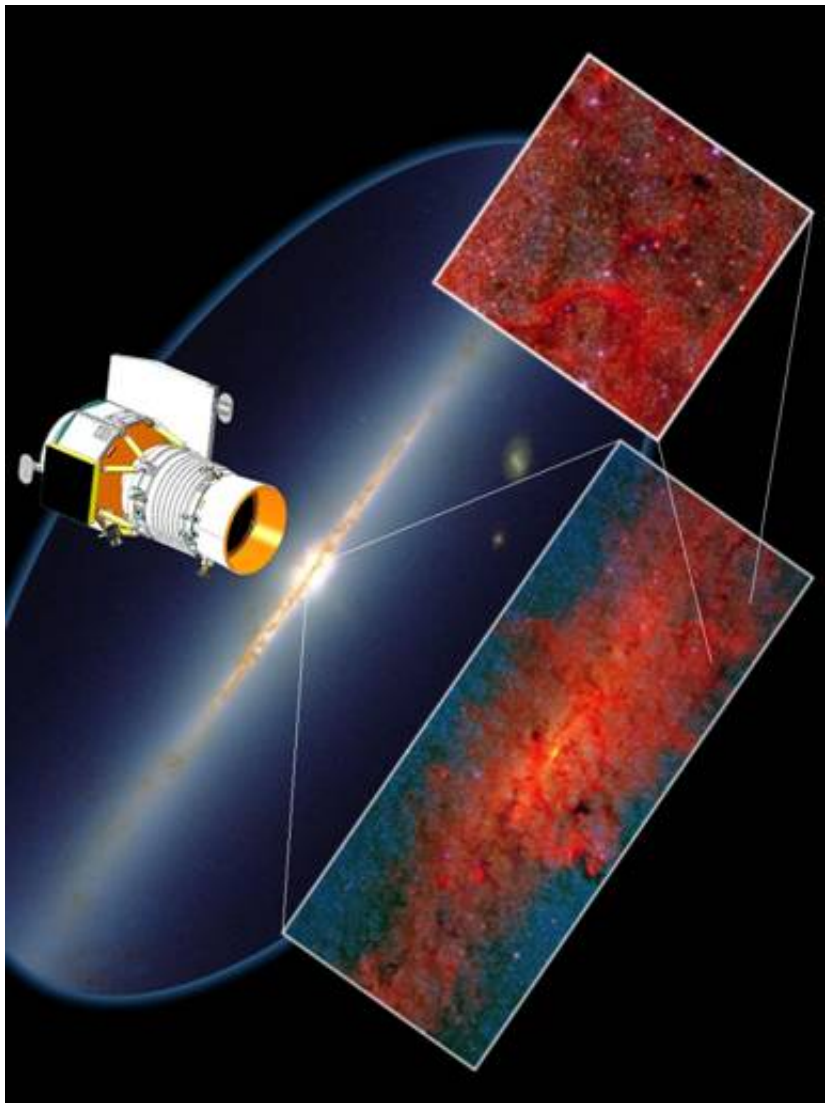
Science

- *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

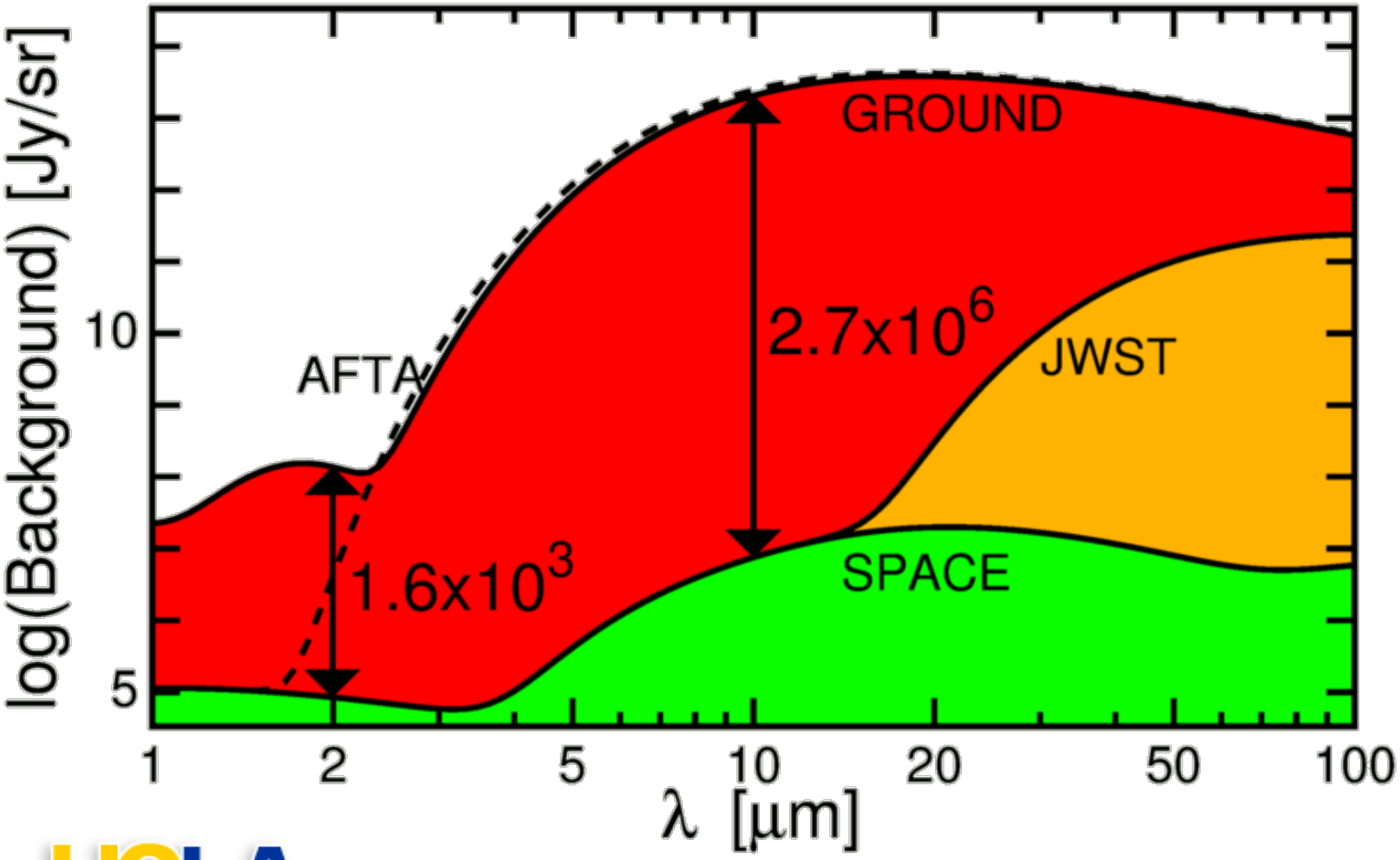
- *4 imaging channels covering 3 - 25 microns wavelength*
- *40 cm telescope operating at <17K*
- *Two stage solid hydrogen cryostat*
- *Delta launch from WTR: 14 Dec 2009*
- *Sun-synchronous 6am/6pm 500km orbit*
- *Scan mirror provides efficient mapping*
- *Expected life: 10 months*
- *4 TDRSS tracks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

Wide Field Infrared Survey Explorer



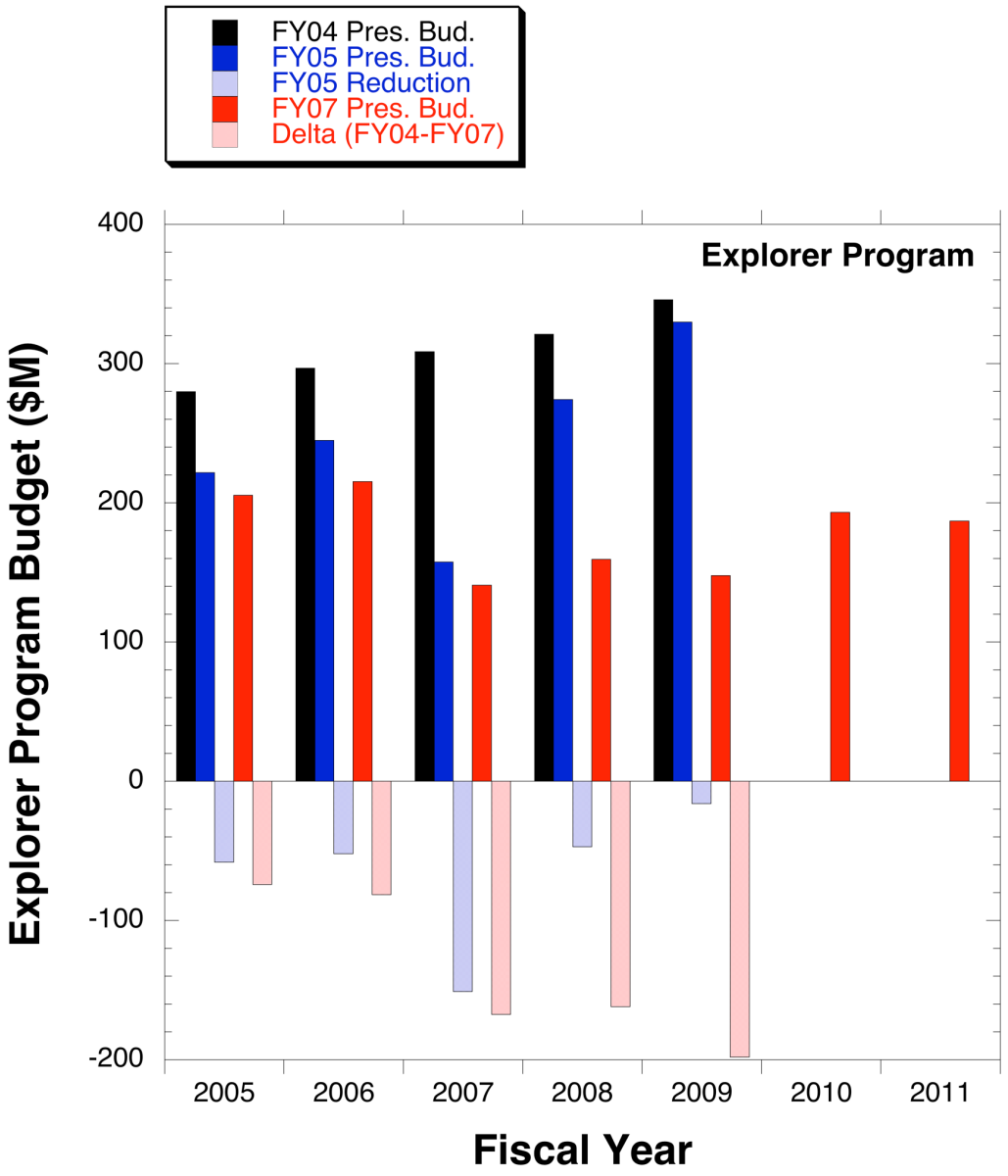
Be a Huge Advance

"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!

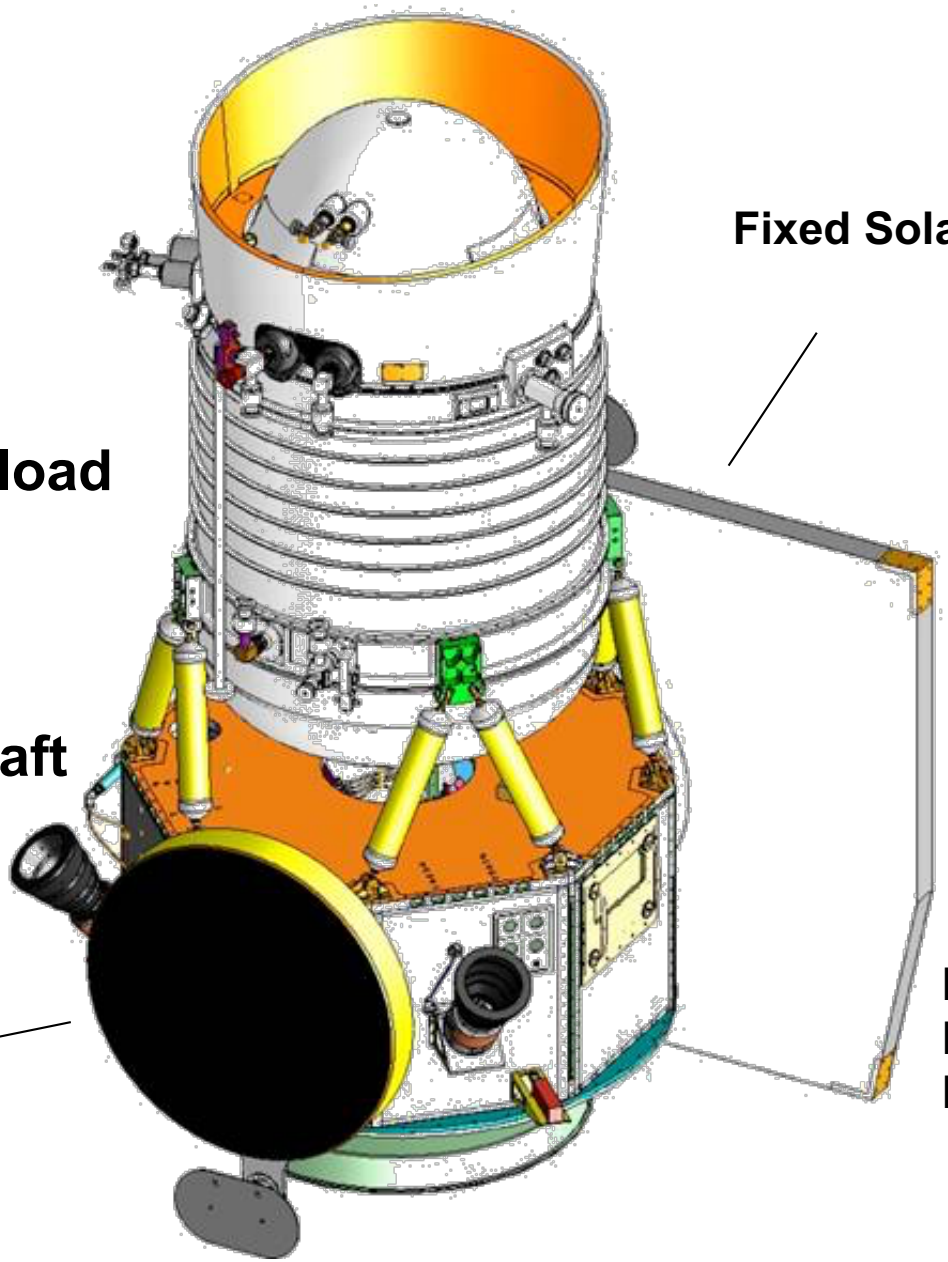
Be Ready for Budget Volatility



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

Have Well Understood Interfaces



Fixed Solar Arrays

SDL provides the payload

BATC provides the RS300-based spacecraft

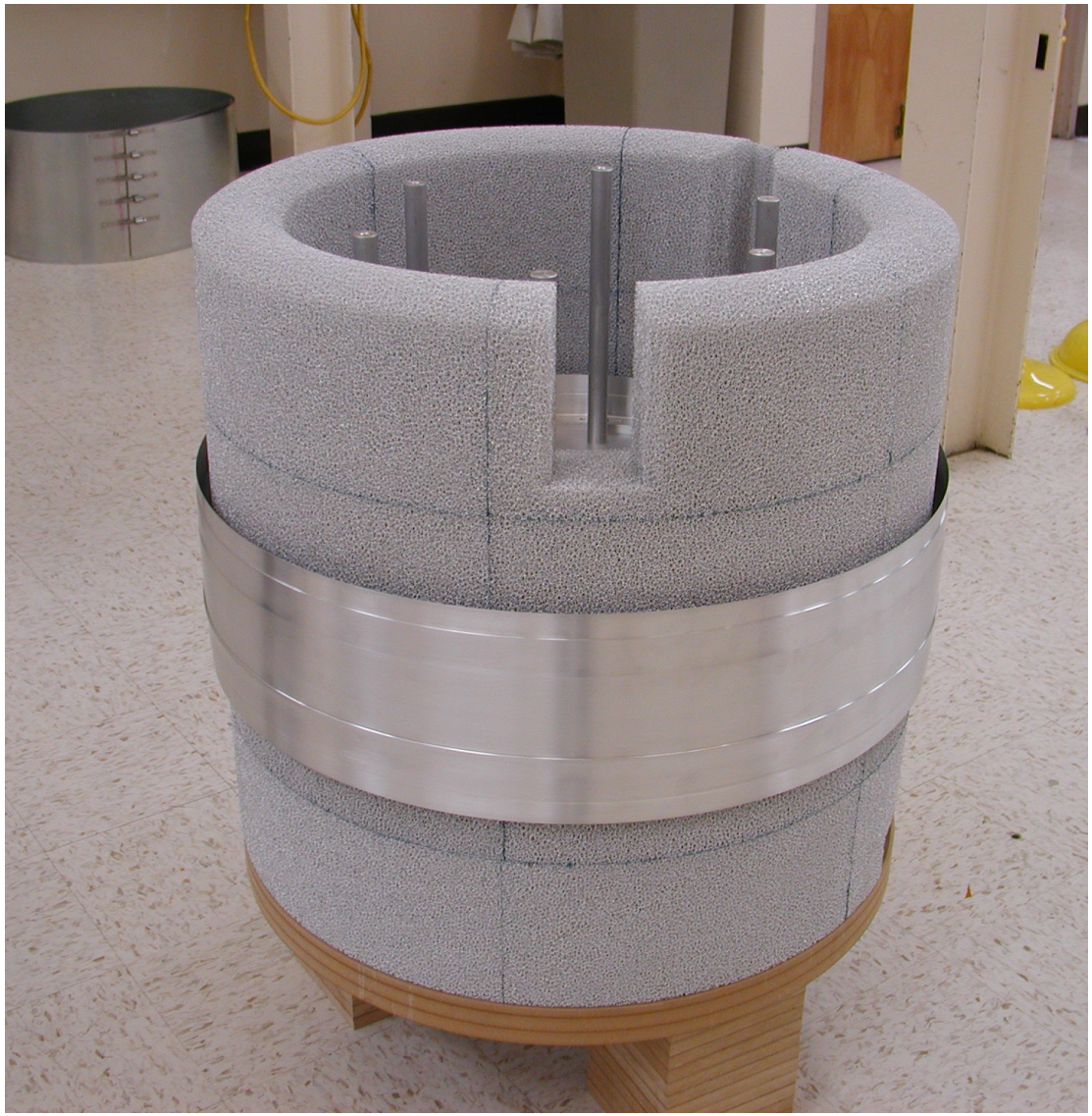
Fixed High Gain Antenna

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

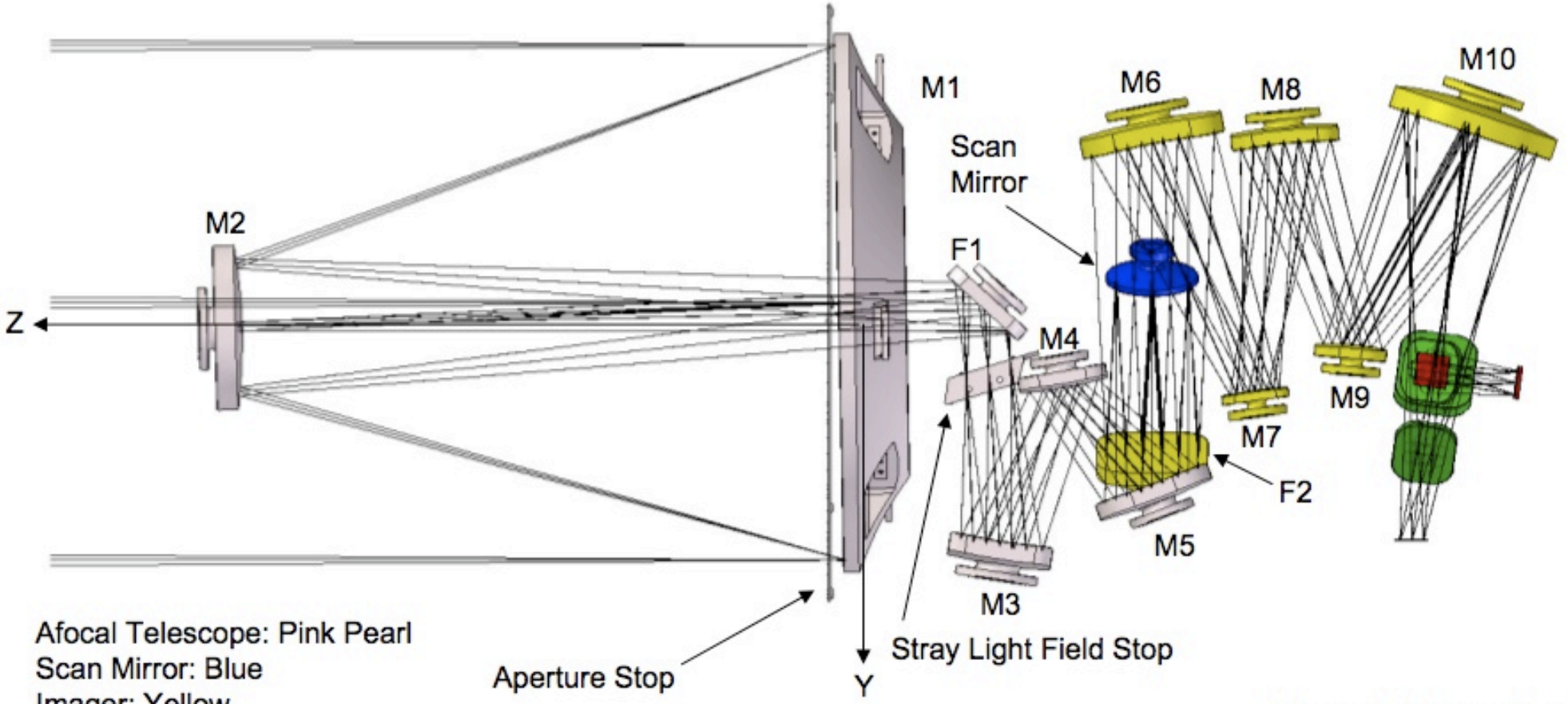
UCLA

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

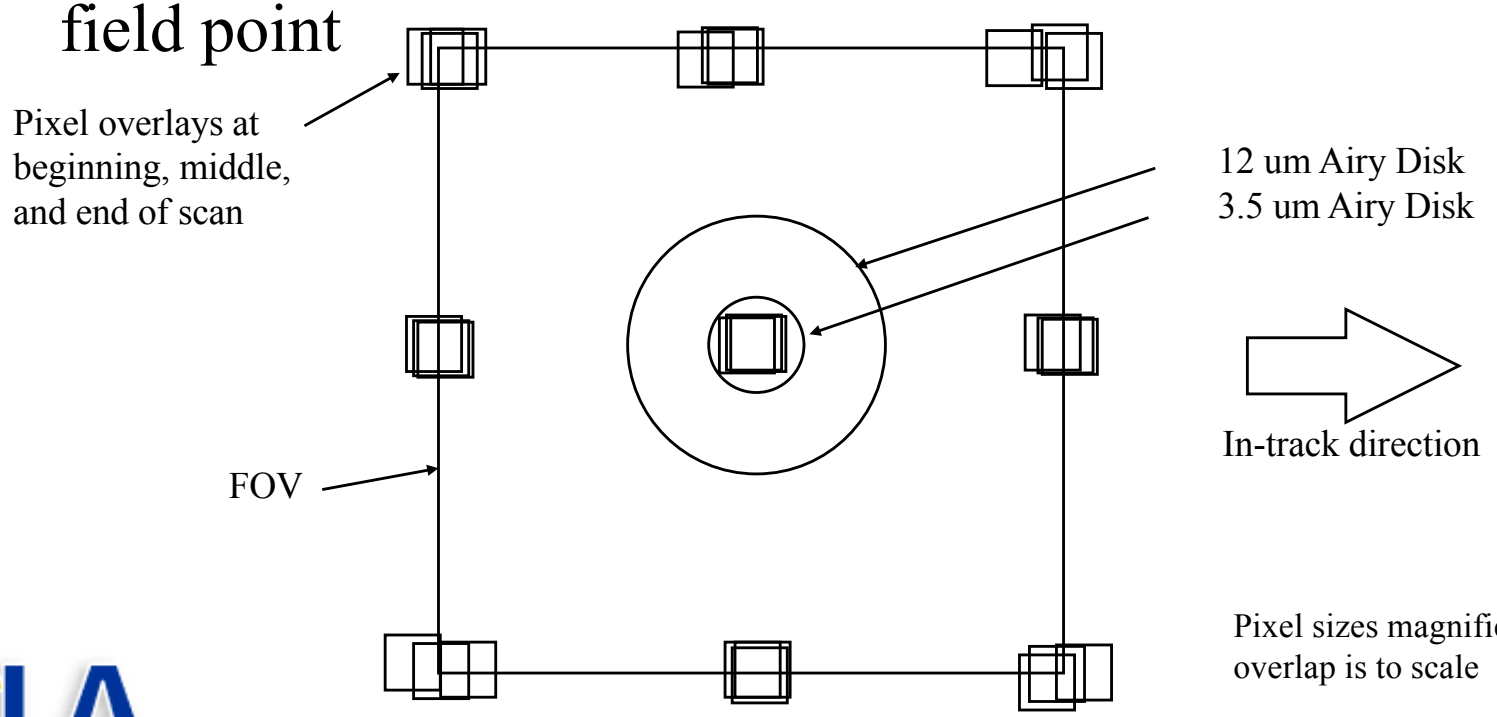


Afocal Telescope: Pink Pearl
Scan Mirror: Blue
Imager: Yellow
BSA Dichroics: Green
BSA Filters: Red

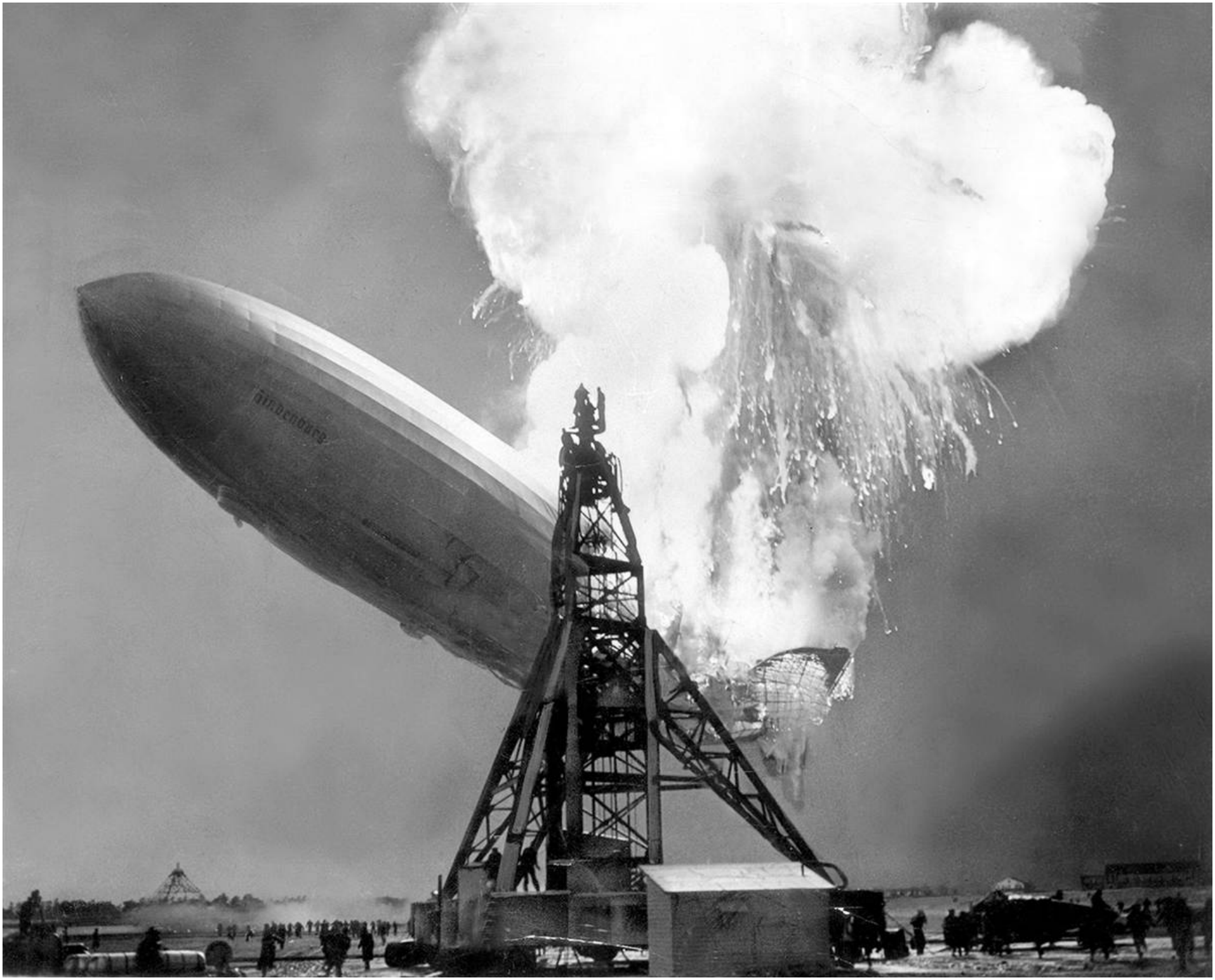
Powered Mirrors: M prefix
Flat Mirrors: F prefix

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



Pixel sizes magnified for viewing; relative overlap is to scale

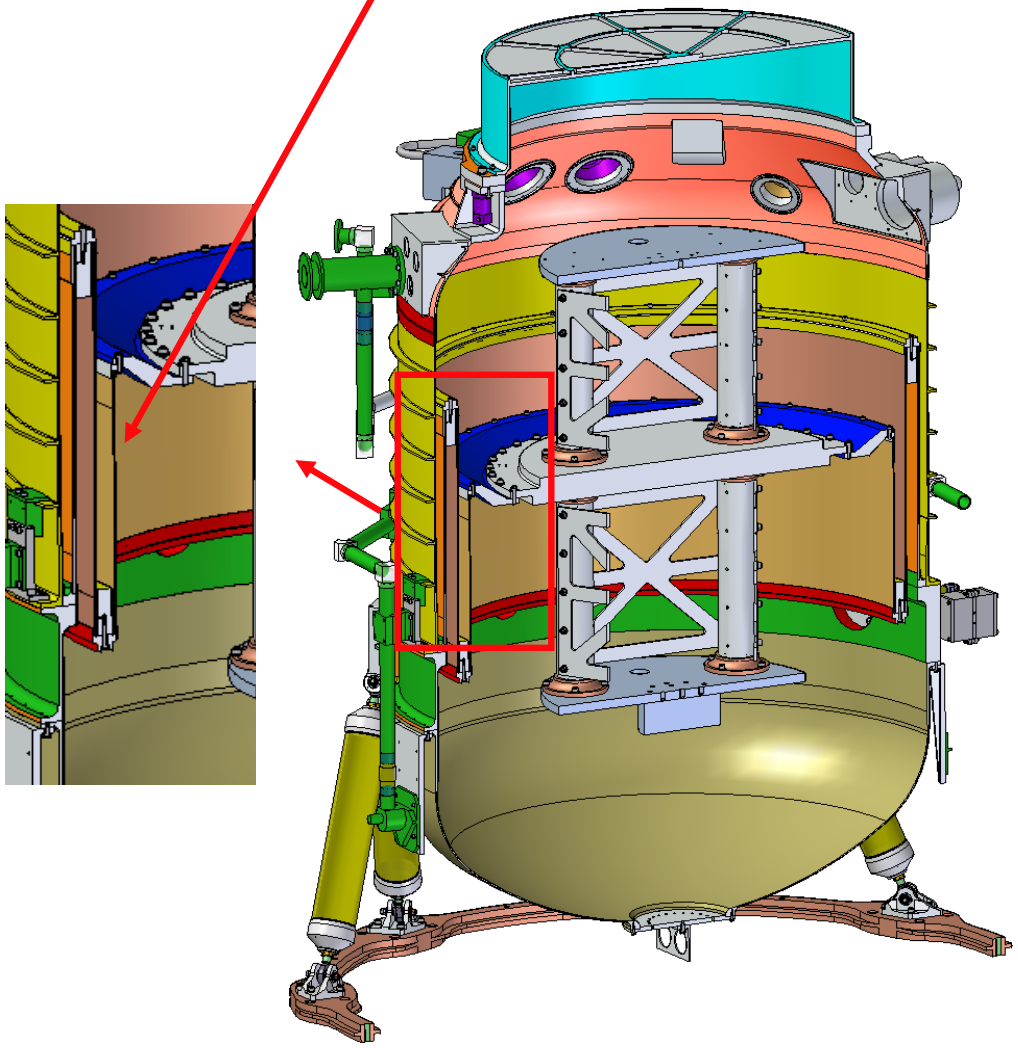


TMDS Vibration Test Rig

- 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.

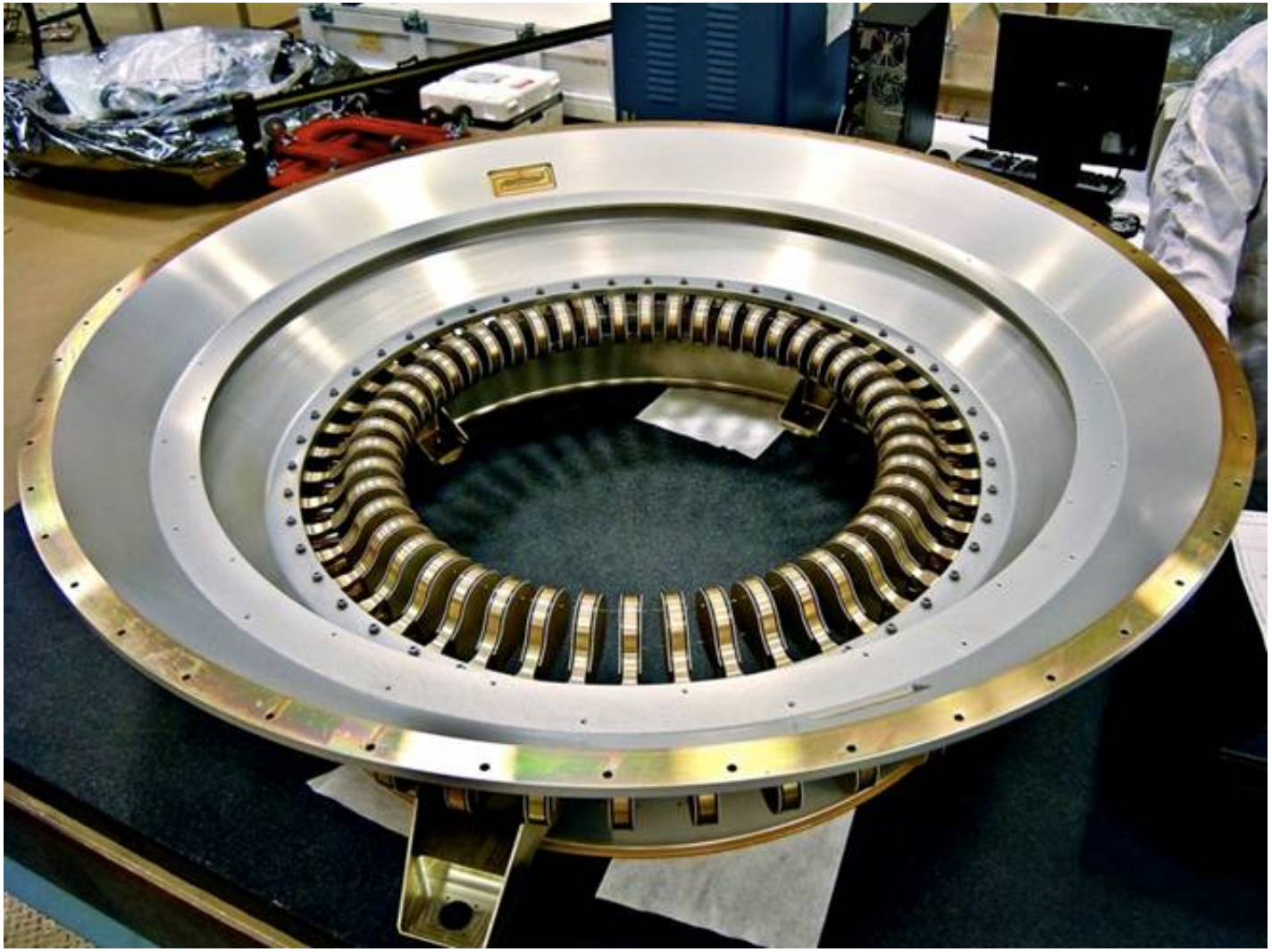
Brief Status Update—WISE TMDS
12 February 2008

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

Added a Soft Ride



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

TMDS+S/C Vibe Test

S/C+Instrument

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. Suppliers that did a great job 5 years ago may have lost the personnel that had the know-how.
- 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 lets you stay on budget.