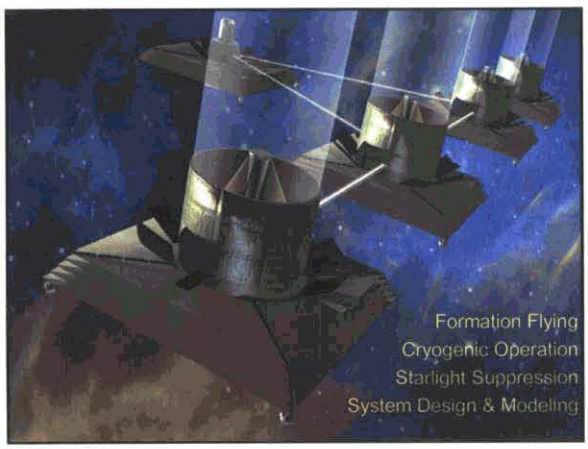
TPF Terrestrial Planet Finder Interferometer

Terrestrial Planet Finder Inteferometer 2005

Curt Henry
Jet Propulsion Laboratory

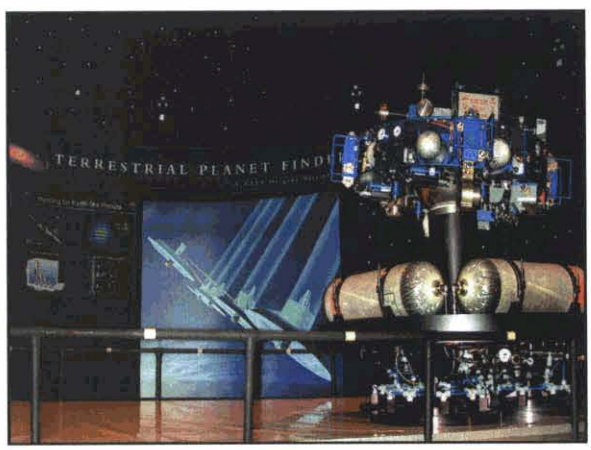


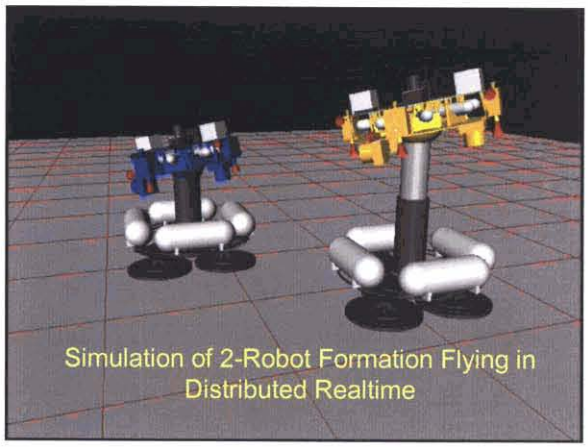
Activities Affected by Budget Adjustment

All, *but especially . . .*

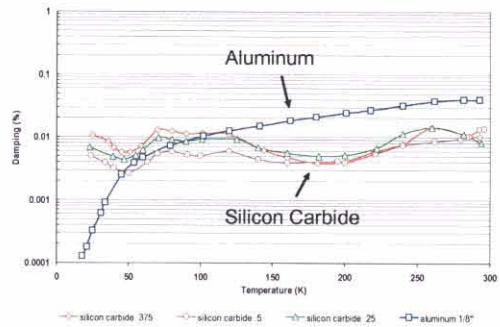
- Formation Acquisition Sensor
- Cyrostructures
- Cryo Delay Line
- Cryocooler
- Design Team
- System Modeling

Robot #1 in 2004

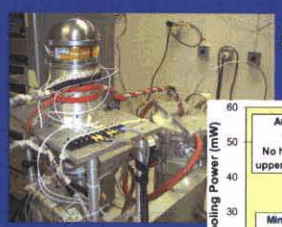




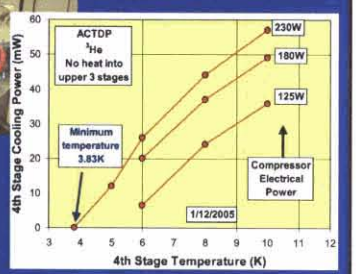
Damping vs. Temperature of a Potential Mirror Structure Material – *Chia-Yen Peng*



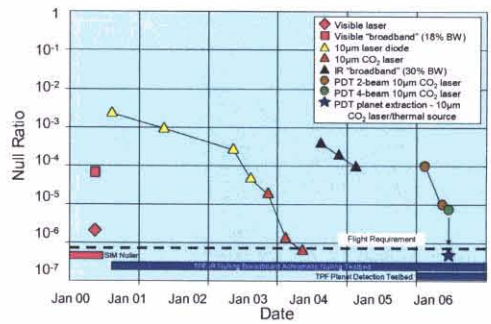
Lockheed Martin–ATC Four-Stage Pulse Tube Cryocooler



20mW at 6K & 150mW at 18K
~250 W input power



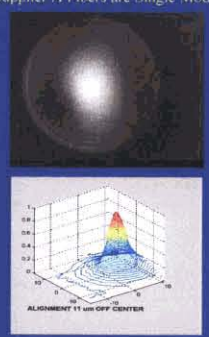
TPF-I Nulling Progress – *Kent Wallace, Rob Gappinger, Stefan Martin*



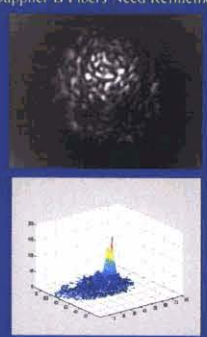
Nulling @ Cryogenic Temperatures

Spatial Filters

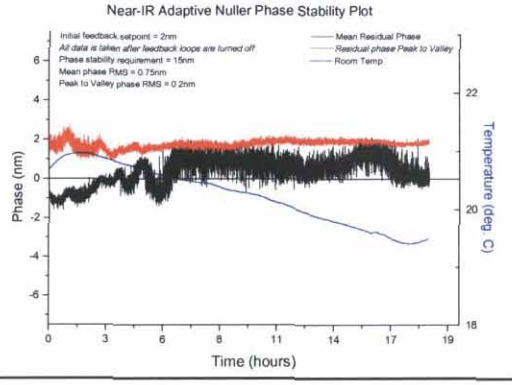
Supplier A Fibers are Single Mode



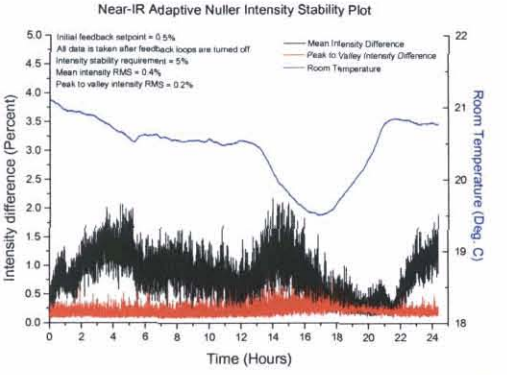
Supplier B Fibers Need Refinement

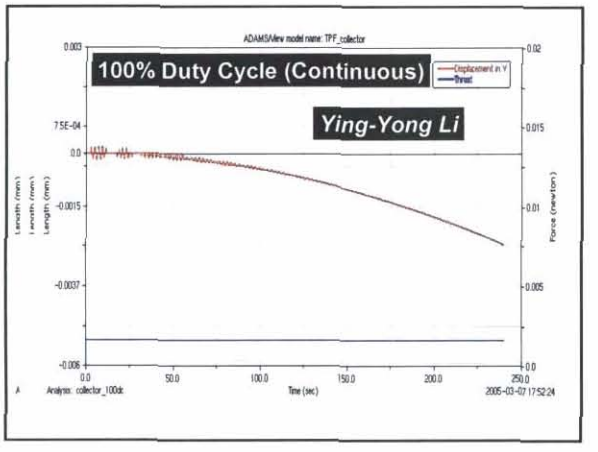


< 15 nm Phase Control – *Robert Peters*



< 5% Intensity Control – *Robert Peters*

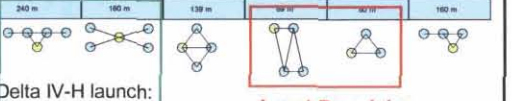




Architecture Trade – *Oliver Lay*

Single Delta IV-H launch

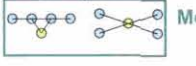
Name	Linear DCB	X-Array	Diamond DCB	Z-Array	Triangle	Linear 3
# launches	1	1	1	1	1	1
Aperture	3.8 m	3.8 m	4.1 m	4.1 m	4.1 m	4.1 m
Min size	60 m	66 m	35 m	66 m	30 m	40 m
Max size	240 m	160 m	139 m	99 m	92 m	160 m



Least Promising

Dual Delta IV-H launch:

Linear DCB	X-Array
2	2
4.1 m	4.1 m
60 m	66 m
240 m	160 m



Most Promising

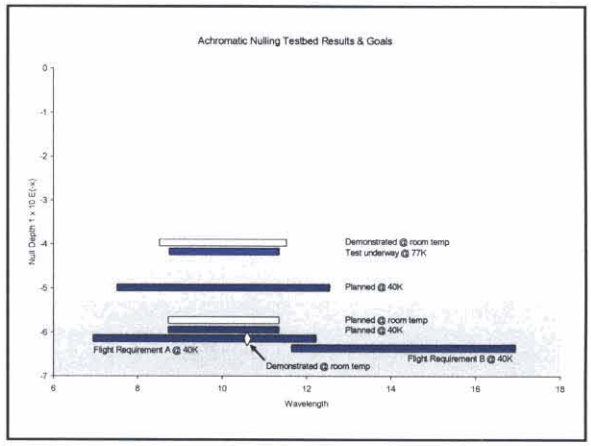
Other Papers Featuring TPF-I Sponsored Work

Stefan Martin – Flight Instrument Design
Charley Noecker – Beam Transport
Daniel Kwon – Electromagnetic Formation Flight

Looking Ahead to Orlando (May 2006)

- 2 robots (maybe) and a big floor
- Deeper broadband nulls (10^{-6}, 25% BW)
- 4-beam nulling with phase chopping at 10^{-6} null depths
- Adaptive phase and amplitude control in the IR
- Coefficients of friction at cryogenic temperatures of multiple materials
- Progress in optical components (beamsplitters, spatial filters, adaptive nuller)

Thank You


Achromatic Nulling Testbed Results & Goals
Null Depth 1 x 10 E(-x)
0
-1
-2
-3
-4
-5
-6
-7
6
8
10
12
14
16
18
Wavelength
Demonstrated @ room temp
Test underway @ 77K
Planned @ 40K
Planned @ room temp
Planned @ 40K
Flight Requirement A @ 40K
Flight Requirement B @ 40K
Demonstrated @ room temp