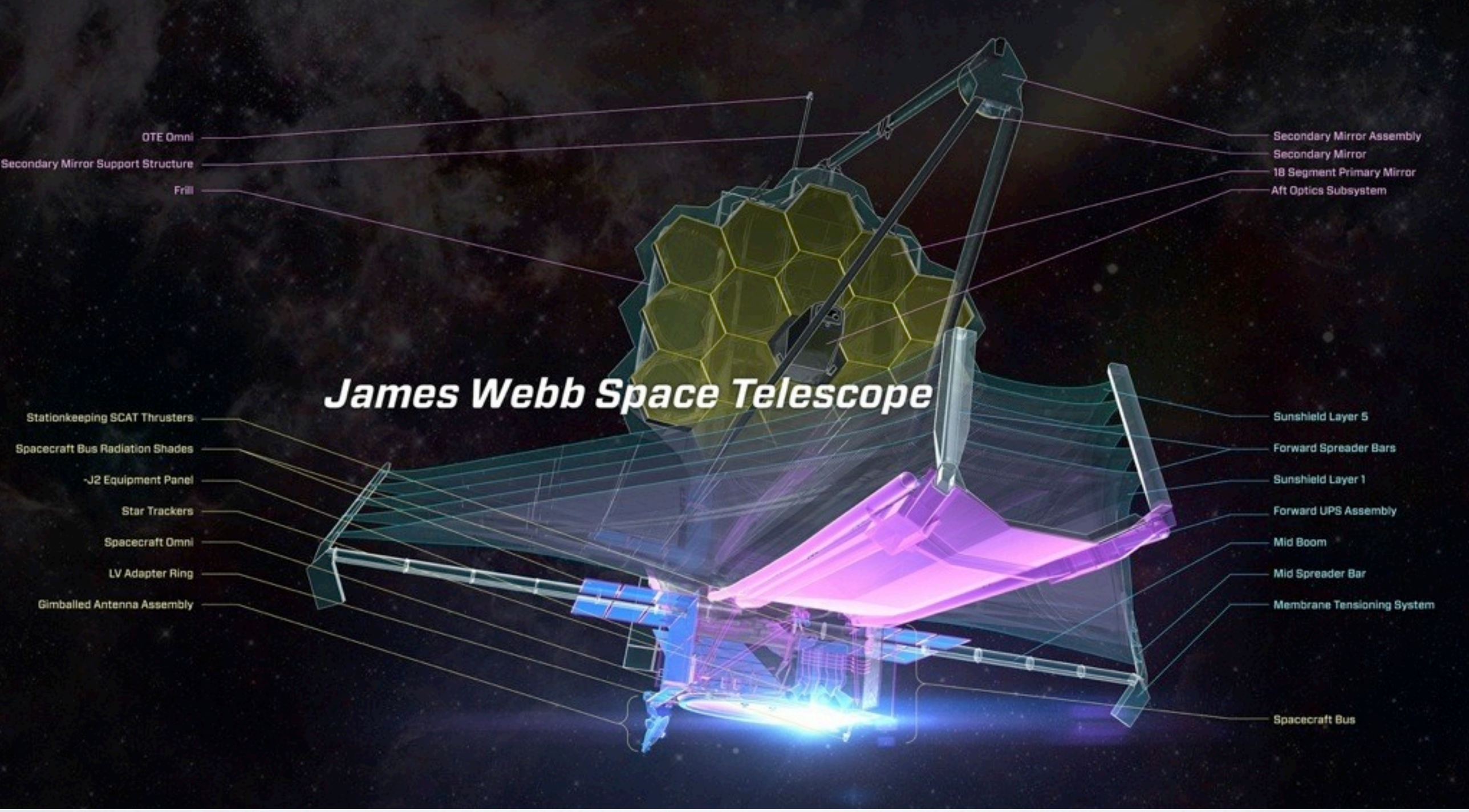


November 3, 2014

Eric P. Smith
JWST Program Office

SINCE LAST CAA MEETING...

- Completed 2 of 3 recommended GAO schedule risk analyses for this year. Mutually agreed to drop 3rd. Will perform cost-risk study in lieu of GAO-NGAS doing so.
- Completed GAO exit conference for FY2014 activity, draft report received
- Completed testing of all flight instruments in ISIM cryo-vacuum test #2
- NIRCam DC-DC converter rework for Focal Plane Electronics boxes completed
- New focal plane arrays assembled for NIRSpec and FGS (will install after ISIM cryo-vacuum test #2 [CV2] per plan), new NIRSpec microshutters ready for installation
- Flight Backplane center section and wings assembled at NGAS
- Pathfinder backplane populated with spare mirror segments and secondary mirror for 2015 testing
- Full-scale engineering sunshield deployment test at NGAS successful
- Ground support equipment for 2016 OTIS at JSC cleanroom/chamber completed cryo-proof test and bake out, Chamber A, with all ground support equipment for 2015 testing is undergoing commissioning testing
- Star Tracker Assembly, Enclosure, ¾" NEA and spacecraft radiator elements being worked
- Space Telescope Science Institute passed System Design Review for all software components save flight ops. Will occur in FY2015.
- Aft Sunshield Unitized Pallet Structure (UPS) manufactured and Forward UPS being manufactured
- Flight Sunshield layer 3 complete, layers 4 & 5 well into manufacturing
- Spacecraft bus and many components being built and/or delivered
- MIRI Cryocooler flight spare Cold Head Assembly and flight electronics delivered to JPL for test program
- Cryocooler Compressor Assembly is now on the critical path.

SIMPLIFIED SCHEDULE

2015												2016												2017												2018											
J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D

k months of project funded critical path (mission pacing) schedule reserve

Spacecraft panels to I&T

Spacecraft Fabrication & Assembly

Flight Sunshield Fabrication

Panel Integration

2

Spacecraft I & T

2

Sunshield Integration

Observatory I&T

3

1

Spacecraft

Cryocooler Assembly & Test

3

Cryocooler

Detector Changeout &
ISIM Cryovacuum Test #3

Science Instruments

OTIS

OTIS = Optical Telescope + ISIM

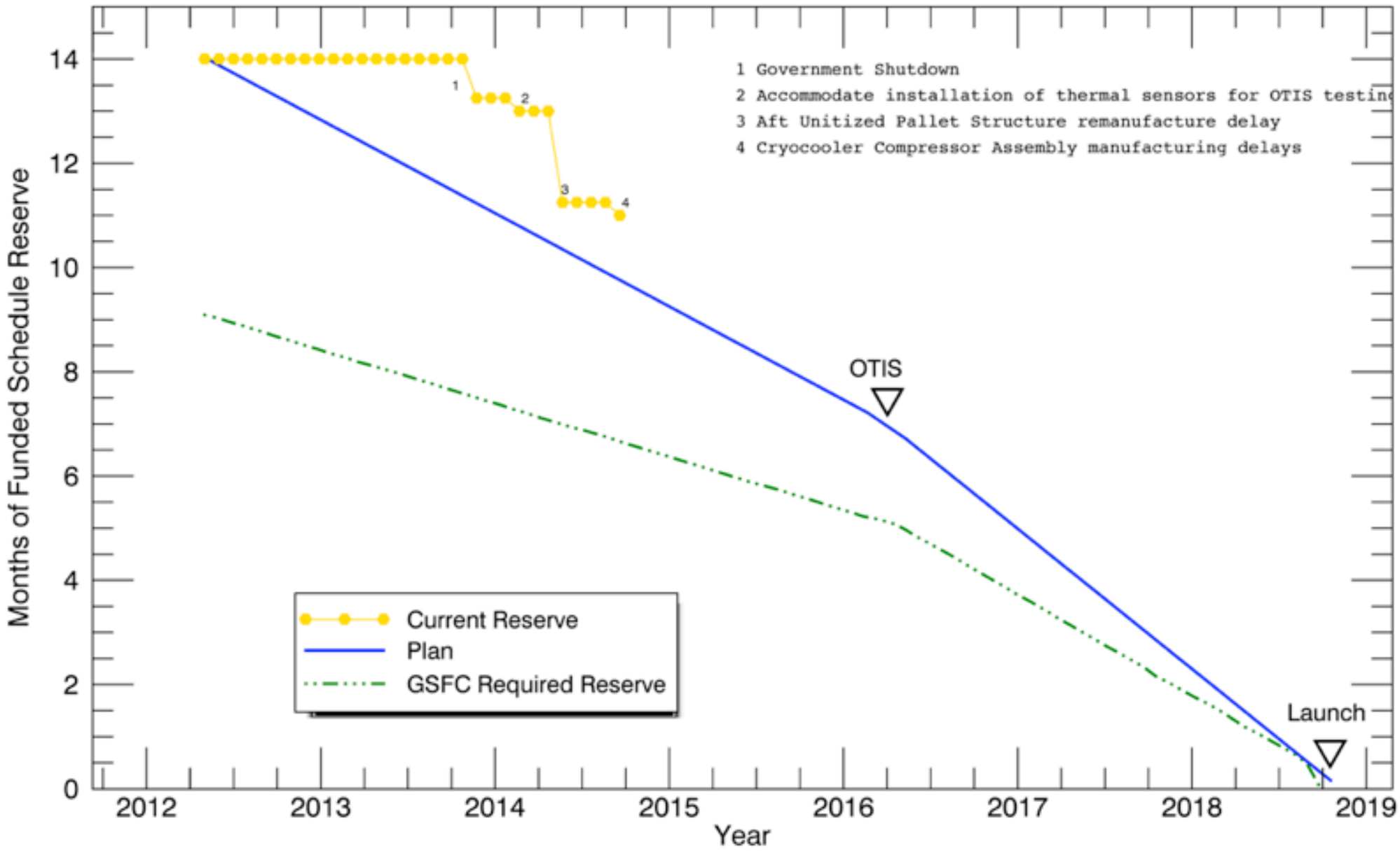
Backplane Assembly

Optics Integration

Telescope

- Northrop-Grumman
- Goddard Space Flight Center
- Johnson Space Center
- Guiana Space Center

FUNDED SCHEDULE RESERVE



SIMPLIFIED SCHEDULE

2015												2016												2017												2018											
J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D

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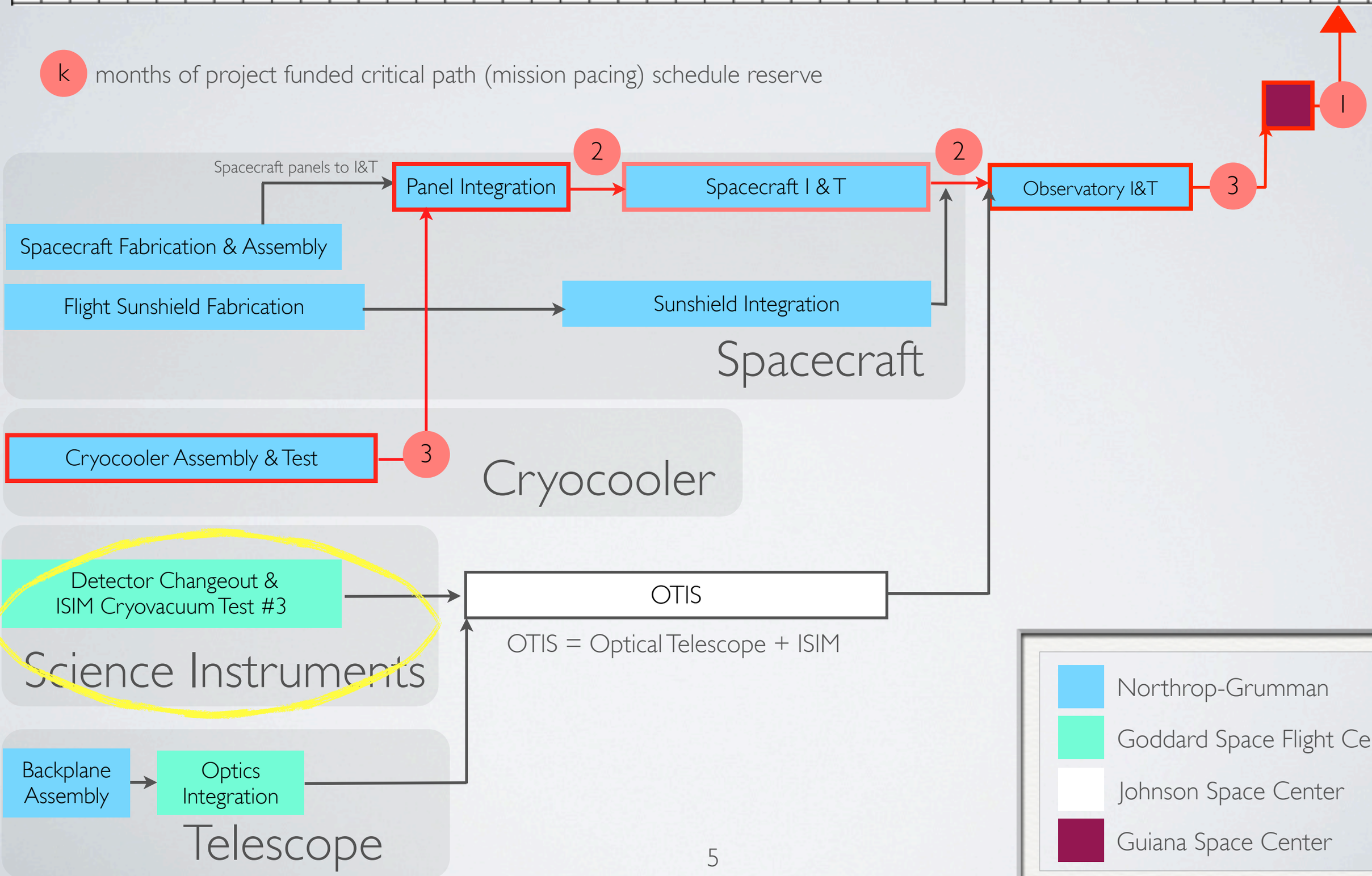

PRELIMINARY CV2 RESULTS

116 day test, 70 at temperature, >35,000 images acquired

Accomplished essentially all test goals defined before the test, investigated issues that arose in test

Obtained excellent data in support of all optical and thermal test goals, preliminary results look very good in both areas

Very few flight hardware/software issues to be addressed

- Electrical short in 1 of 10 NIRCam detectors (harness or SCA: all spares in hand)
- Ghost in one NIRISS grism (spare in hand)
- Onboard data handling when running many detectors, mostly cleaned up during the test, some additional investigation to understand exact limits to make the software as robust as possible.

ISIM TESTING

2013

MIRI FGS
Cryo-Vac
Test # 1

Tests procedures, MIRI, FGS/NIRISS performance

Swap NIRCam detectors

2014

Install NIRCam, NIRSpec

MIRI FGS
Cryo-Vac
Test # 2
NIRCam NIRSpec

Test verifies NIRCam & NIRISS, ISIM pre-vibration measurement baseline

Swap out remaining NIR detectors

2015

Swap out remaining NIR detectors

Vibration Test

Acoustics Test

Electromag. Tests

MIRI FGS
Cryo-Vac
Test # 3
NIRCam NIRSpec

Measures post-vibration ISIM performance

= Ambient Temperature Metrology

SIMPLIFIED SCHEDULE

2015												2016												2017												2018											
J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D

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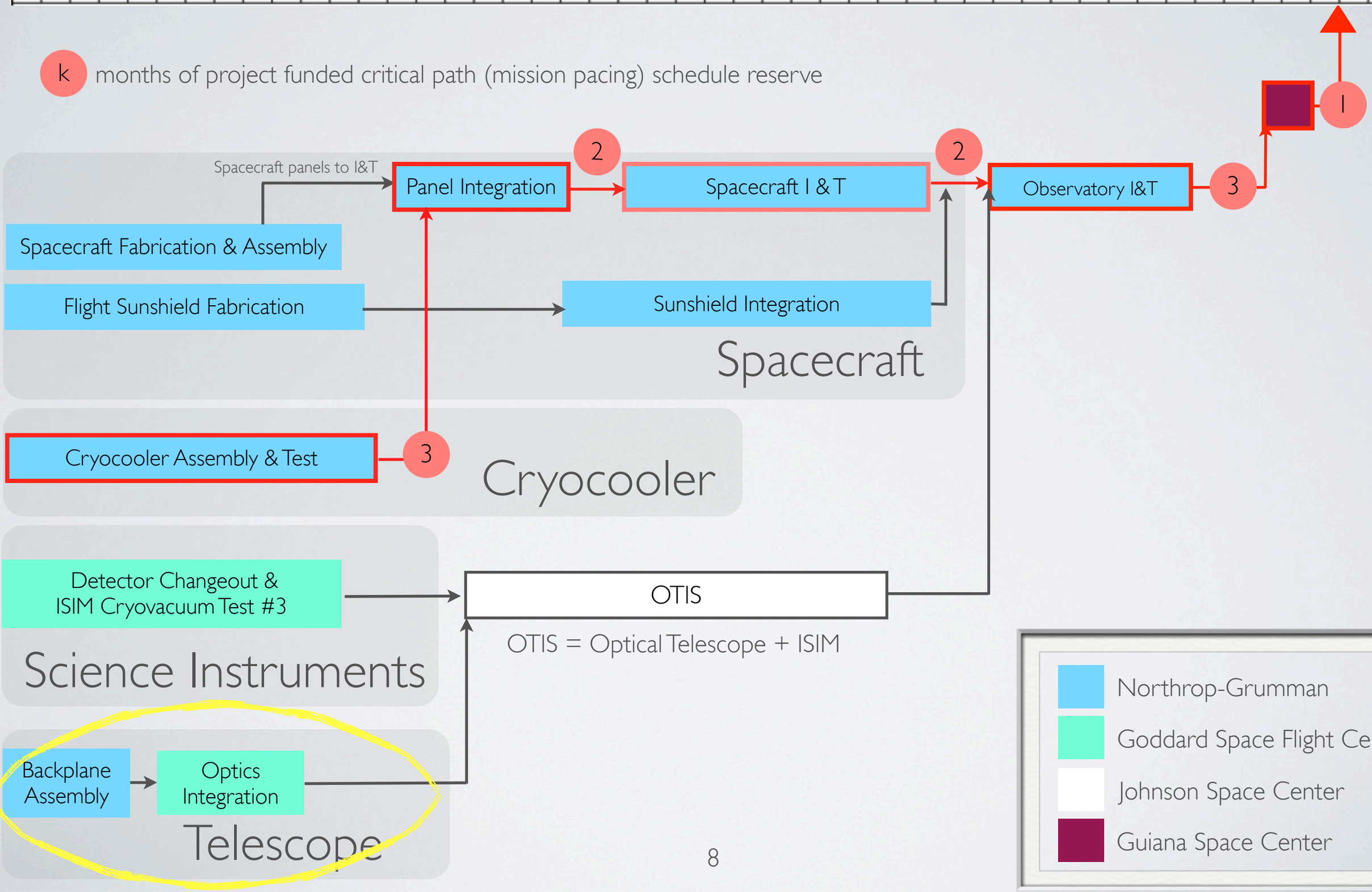

TELESCOPE: PATHFINDER

Pathfinder with Two Flight
Spare Mirror Segments and
spare Secondary Mirror at GSFC

TELESCOPE: BACKPLANE

Backplane Center Section and Wings assembled at NGAS

SIMPLIFIED SCHEDULE

2015												2016												2017												2018											
J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D

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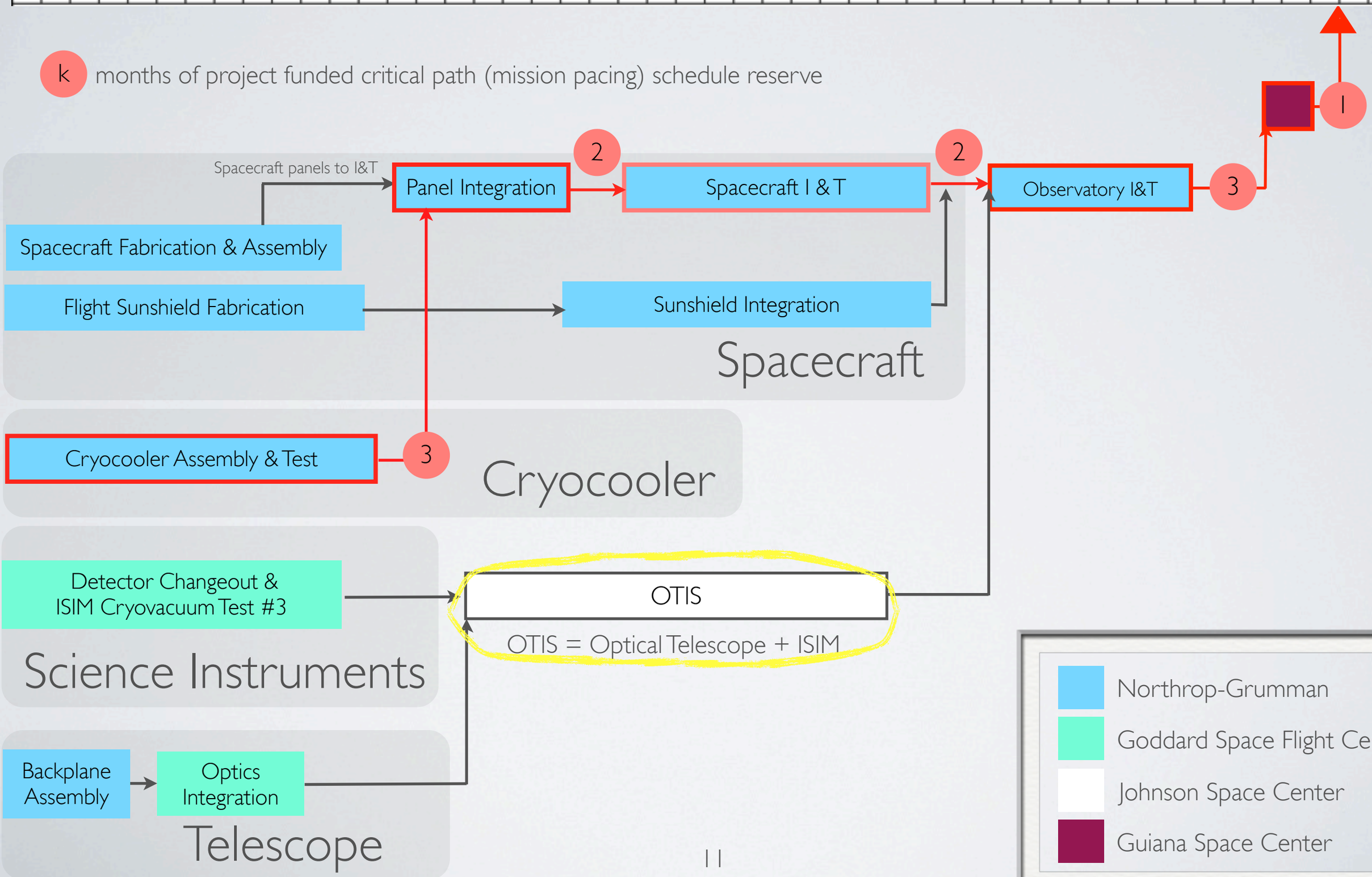
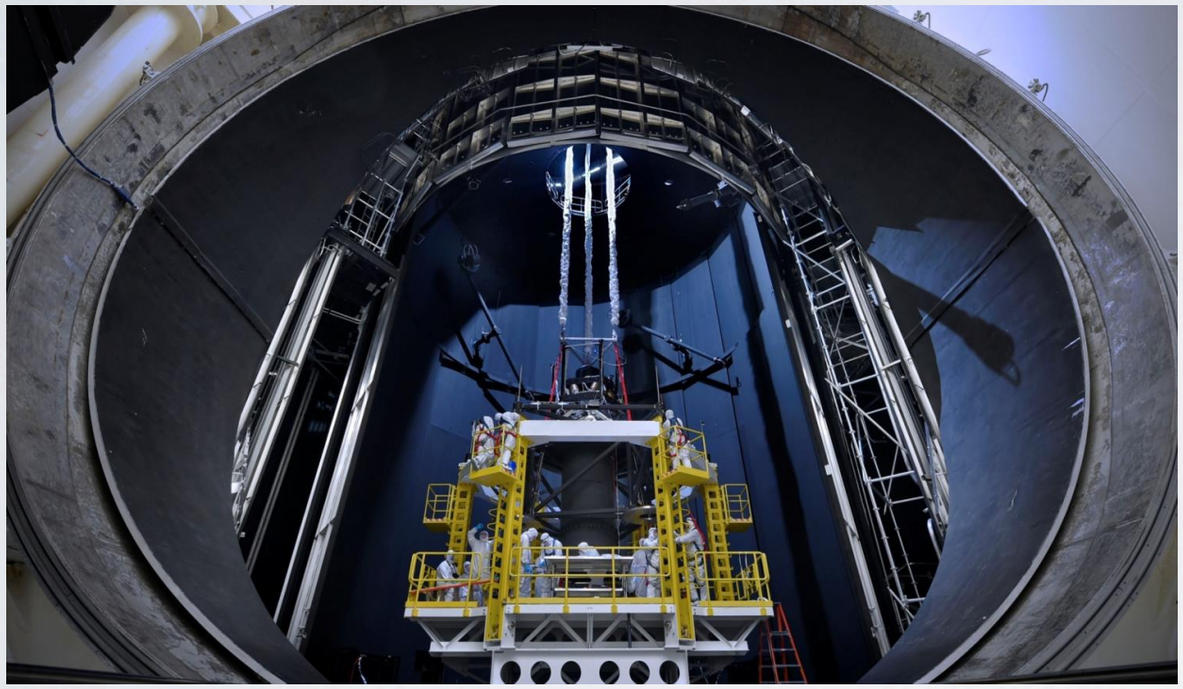
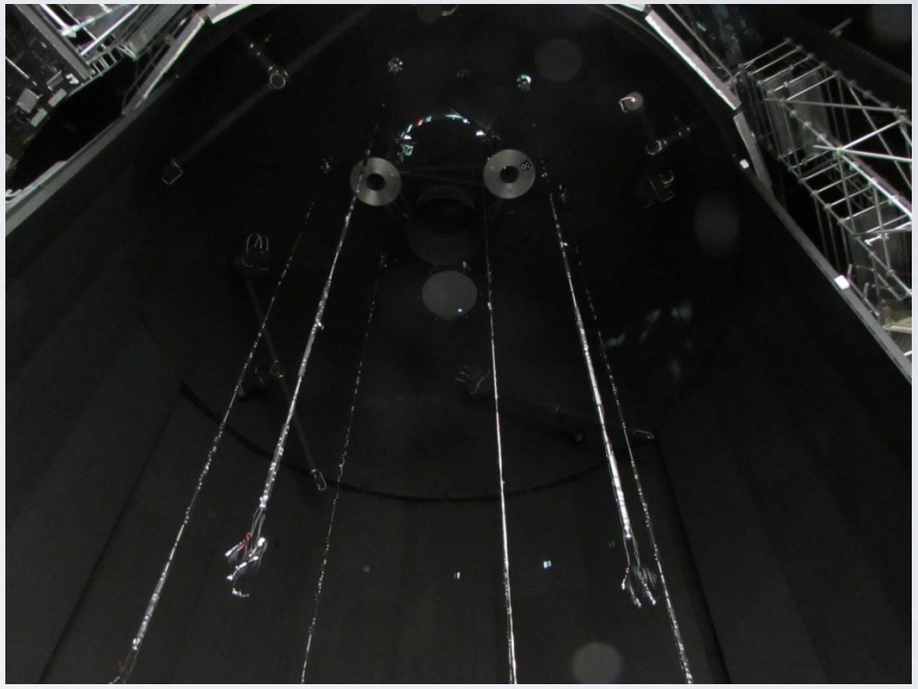


OTIS TESTING

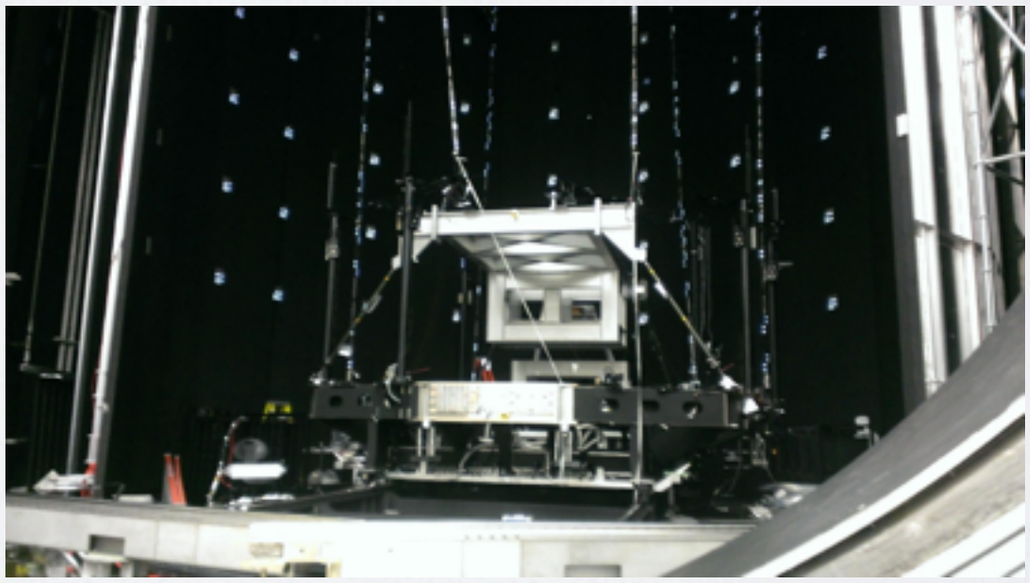
- Chamber A & Ground Support Equipment Commissioning underway



Interferometer being lifted to chamber top



Interferometer, autocollimating flat + mass dummies



Telescope offloader + 2x JWST mass simulator

SIMPLIFIED SCHEDULE

2015												2016												2017												2018											
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Flight Sunshield Fabrication

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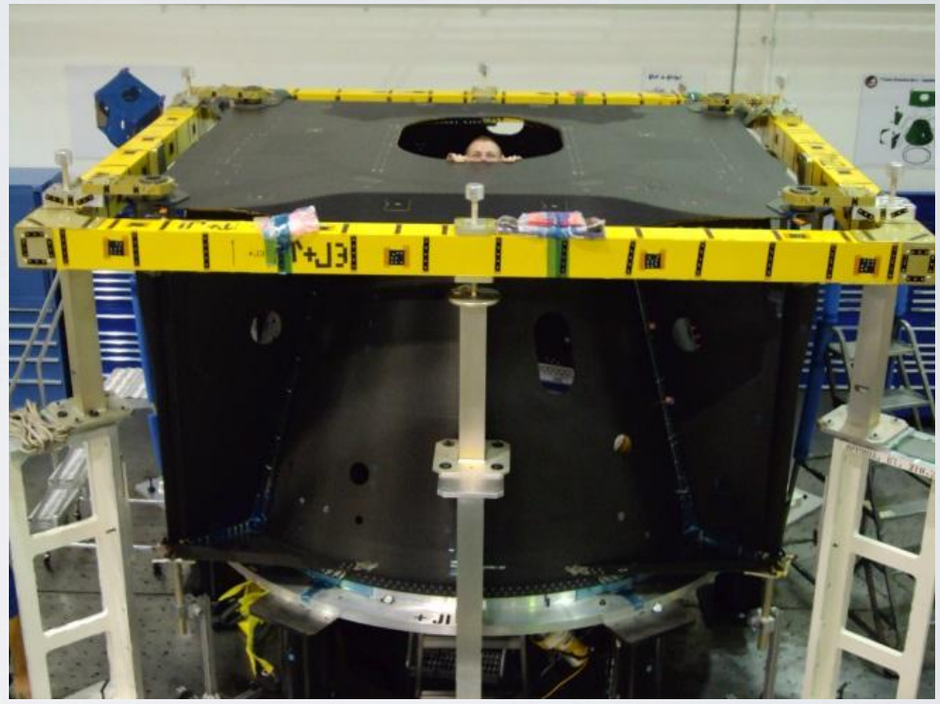
Goddard Space Flight Center

Johnson Space Center

Guiana Space Center

SPACECRAFT

- Spacecraft build proceeding well
- >99% of Observatory, by mass, now built, in fabrication, or ready for fabrication, >60% of Observatory mass is measured mass



Flight Spacecraft Bus

Complete High Gain Antenna

Complete Equipment Panel

Spacecraft Mock Star Tracker Mockup Cone Hanger

SPACECRAFT: SUNSHIELD

All full-scale engineering deployment testing successful

Flight Sunshield manufacturing underway: Layer 3 complete, Layer 4 seemed, Layer 5 in process

Sunshield Flight Layer 3

Full-scale Engineering Sunshield

SIMPLIFIED SCHEDULE

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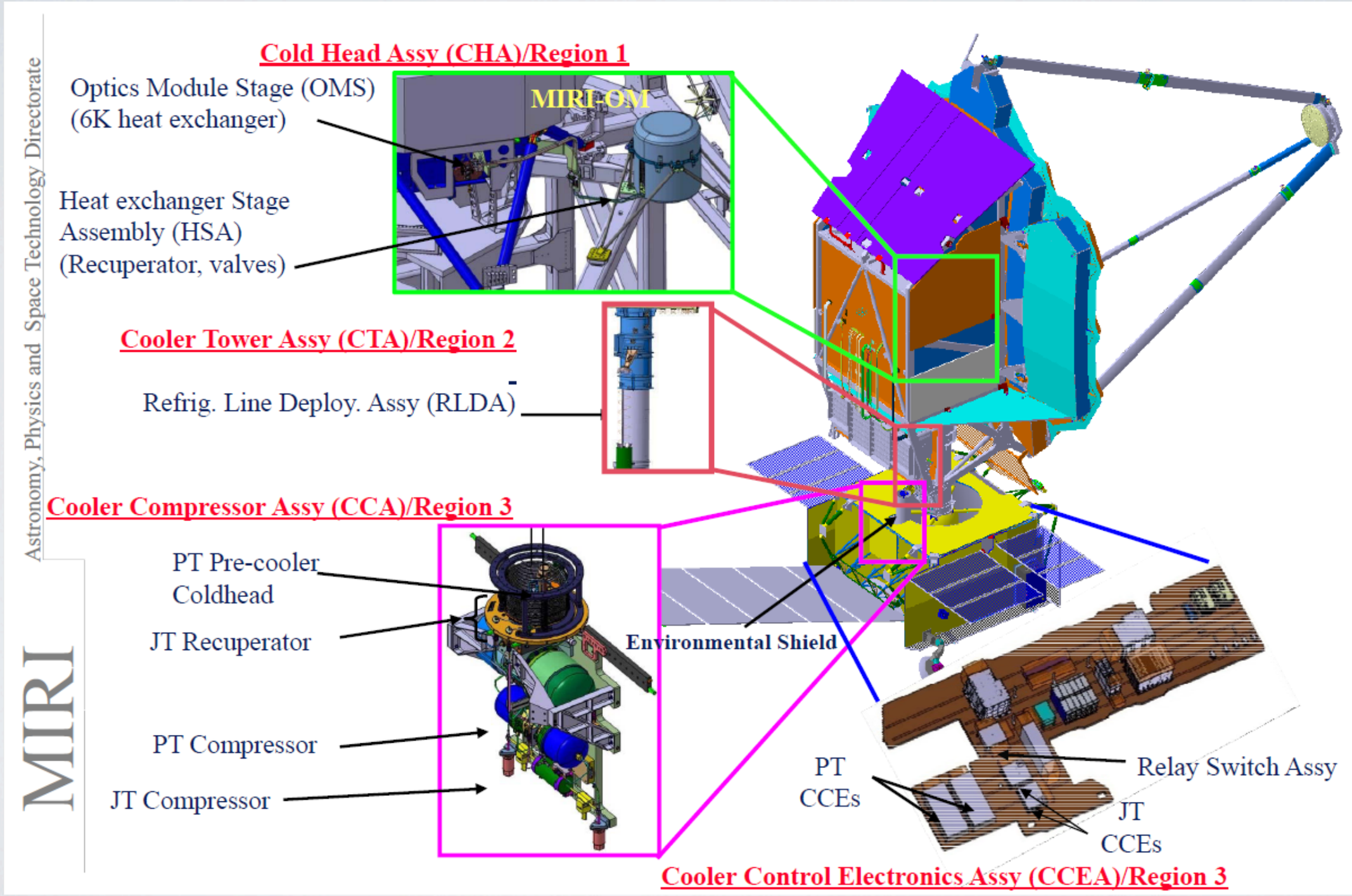
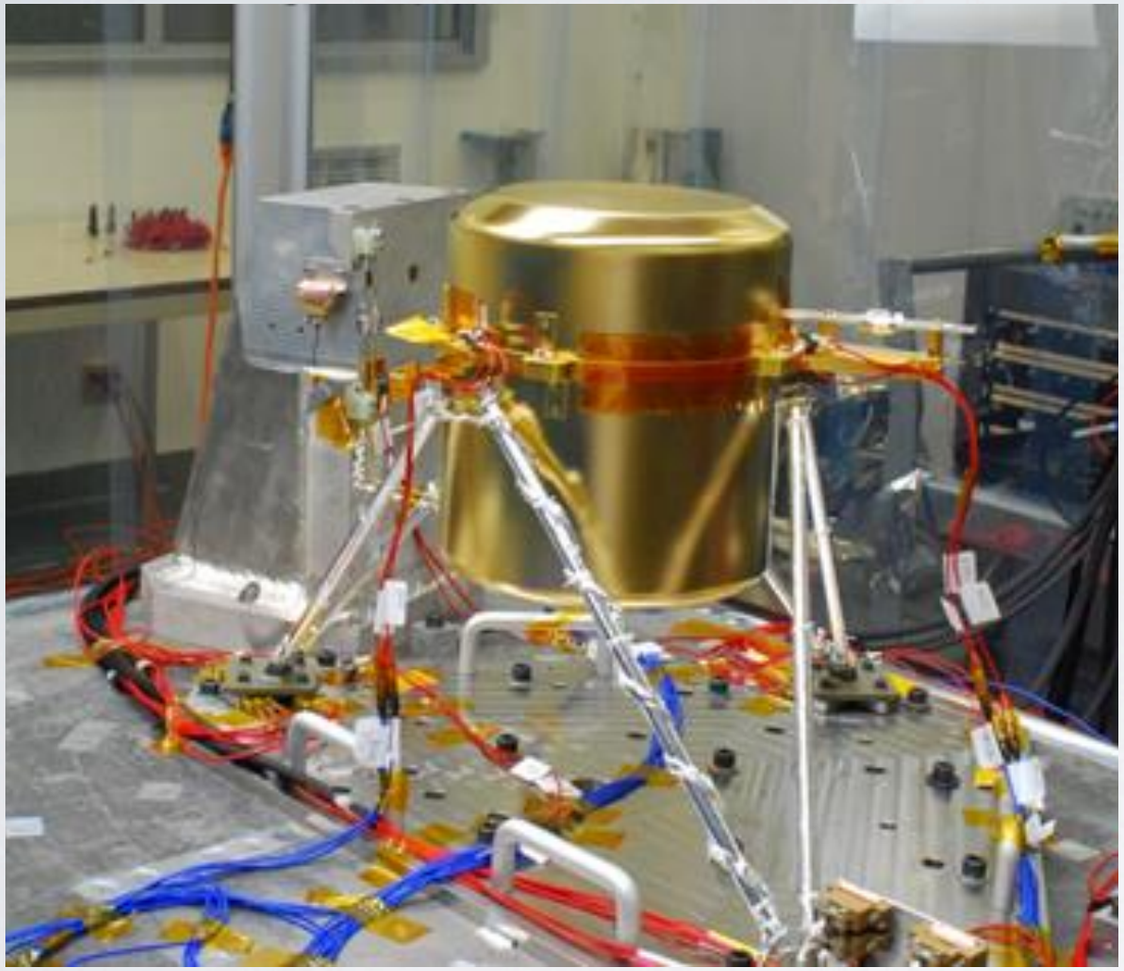
CRYOCOOLER HARDWARE

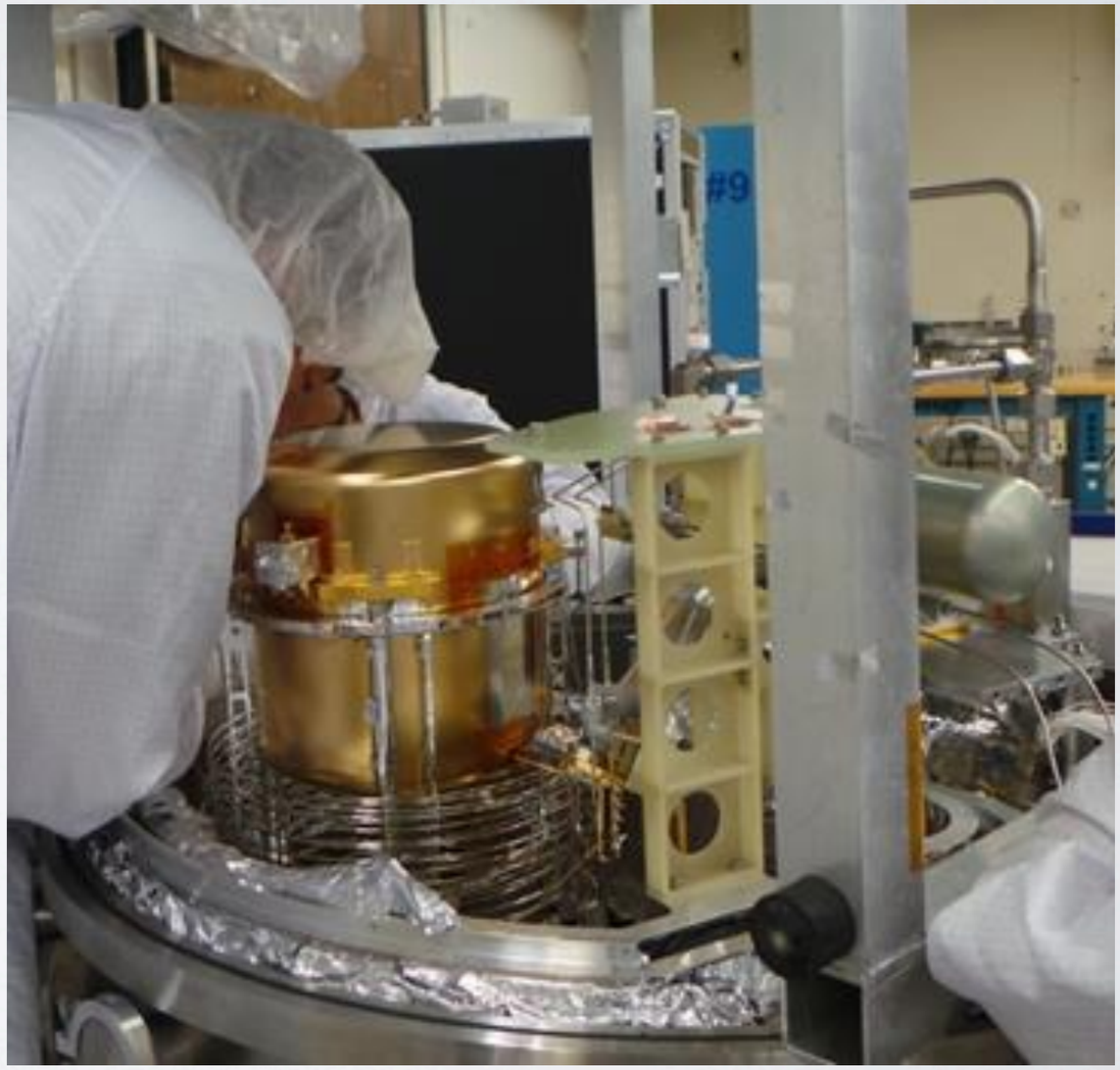


COLD HEAD ASSEMBLY



Flight Spare CHA at JPL

Flight CHA at NGAS*

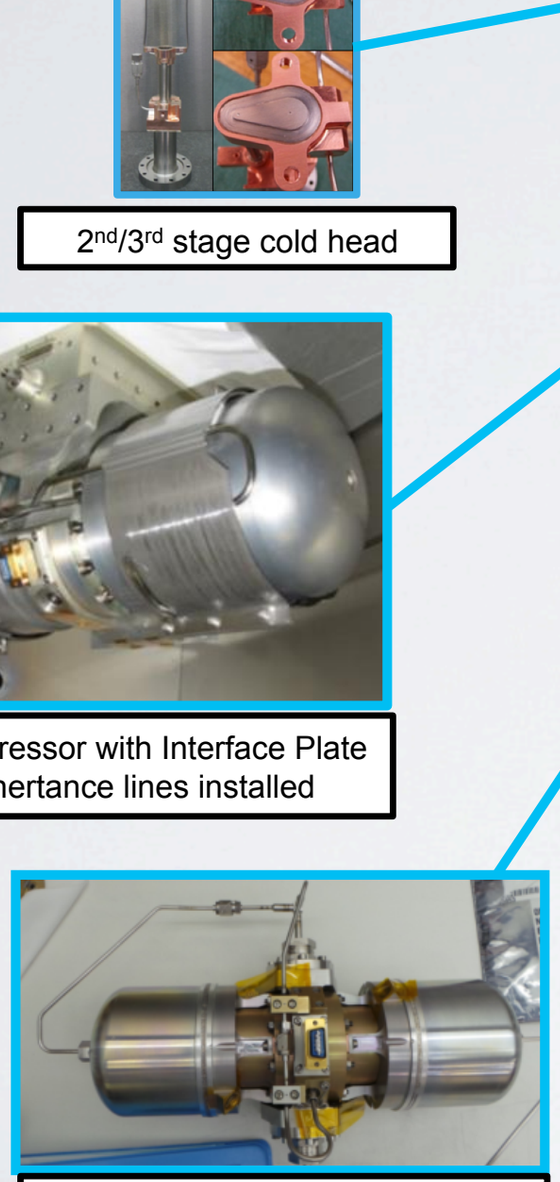


*Currently in shipping container for transport to GSFC

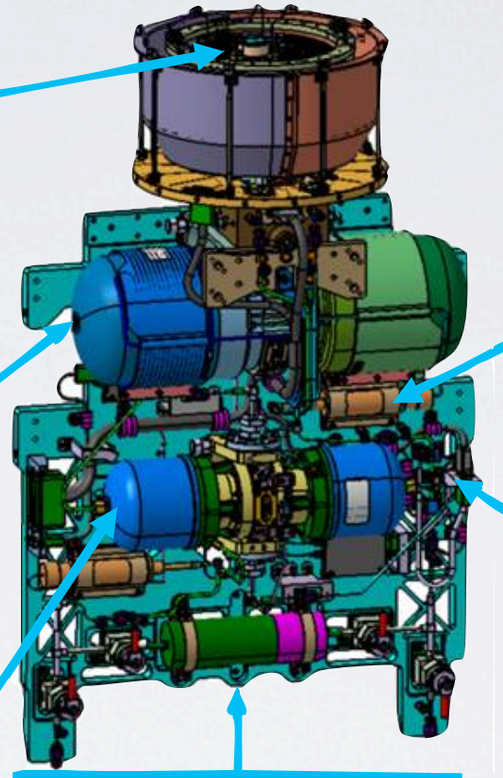
CCA COMPONENTS

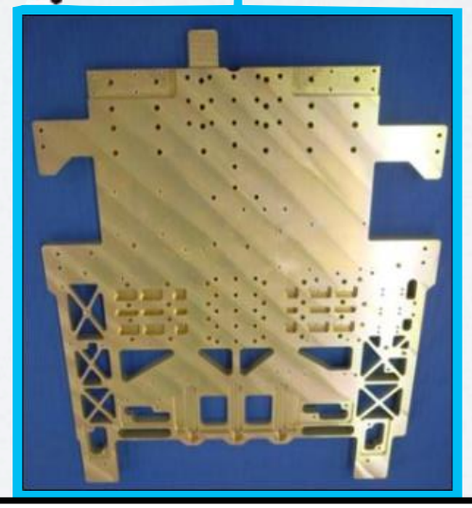
2nd/3rd stage cold head

PT Compressor with Interface Plate
And Inertance lines installed

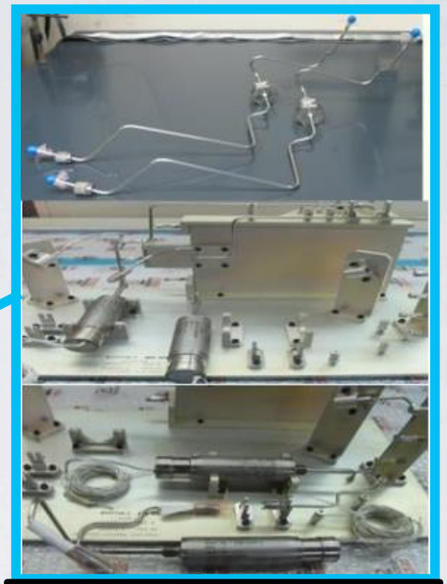


Both JT Compressors
ready for Exported Force Test





Thermal Interface Plate
(CCA1, CCA2 and SM Complete)



CCA1 and CCA2 Low and
High Pressure Manifolds

Mass Flow Sensor EM

WATCH LIST UPDATE

items from last CAA presentation

Issue	Trend	Comment
• Cryocooler Cost, Schedule		Cryocooler compressor cost and schedule performance has placed this subsystem on the critical path
• Low FY2014 UFE		Project managed reserves well enough to carry some through into FY15
• ¾" NEA, StarTracker, Spacecraft Radiator		StarTracker and Spacecraft Radiator work progressing on schedule. ¾" NEA redesigned, working to show sufficient margin.
• Observatory Mid-IR Stray Light		Level 1 requirements in good shape, Level 2, longest wavelengths will need waiver, but discrepancy has been determined acceptable by Science Working Group
• Resolution of FGS-ISIM comm issue		New FPGA developed at to correct problem. One mounted on flight board, second in progress, third awaiting software update for validation prior to installation.

PROGRAM WATCH LIST

- FY15 project reserves tight, starting year at approximately the same percentage as last year.

- Critical path funded schedule reserve decreased from 11.25 to 11 months due to cryocooler compressor assembly (CCA). Cryocooler now on critical path.

- Cryocooler (schedule, technical, cost).
- 3/4" Non Explosive Actuator, qualification
- Sunshield rim hoop assembly component strength
- Star Tracker Strut Assembly

MILESTONE PERFORMANCE

Since the September 2011 replan JWST reports high-level milestones monthly to numerous stakeholders

	Total Milestones	Total Milestones Completed	Number Completed Early	Number Completed Late	Deferred to Next Year
FY2011	21	21	6	3	0
FY2012	37	34	16	2	3
FY2013	41	38	20	5	3
FY2014 ❖	36	23	10	8	11
FY2015	48				

7 of 11 deferred FY2014 milestones on cryocooler components

- ❖ Milestone accounting in FY2014 was complicated by the government shutdown and multicomponent milestones

YEARLY THEMES

- 2013: Instrument Integration: The Science instruments will be finished and begin their testing as an integrated science payload
- 2014: Manufacturing the Spacecraft: Construction will commence on the spacecraft that will carry the science instruments and the telescope
- 2015: Assembling the Mirror: The mirror segments, secondary mirror and aft optics will all be assembled into the telescope
- 2016: Observatory Assembly: The three main components of the observatory will be completed (instruments, telescope, spacecraft)
- 2017: Observatory Testing: The three main components of the observatory will be tested and readied for assembly (instruments, telescope, spacecraft) into a single unit
- 2018: Kourou Countdown: All parts of the observatory will be brought together, tested and readied for launch in Kourou, French Guiana

SUMMARY

Challenges arising in critical manufacturing and I&T phases.

- UFE tight in FY15 will require prudent fiscal control.
- NGAS being proactive on main contract manufacturing and process issues.
- MIRI Cryocooler Compressor cost and schedule performance have placed it on the critical path
- ISIM team performed great in cryovacuum test #2. Will have lots of activity after the test and before cryovacuum test #3.

JWST team continues to execute to our Launch Readiness Date commitments within budget.