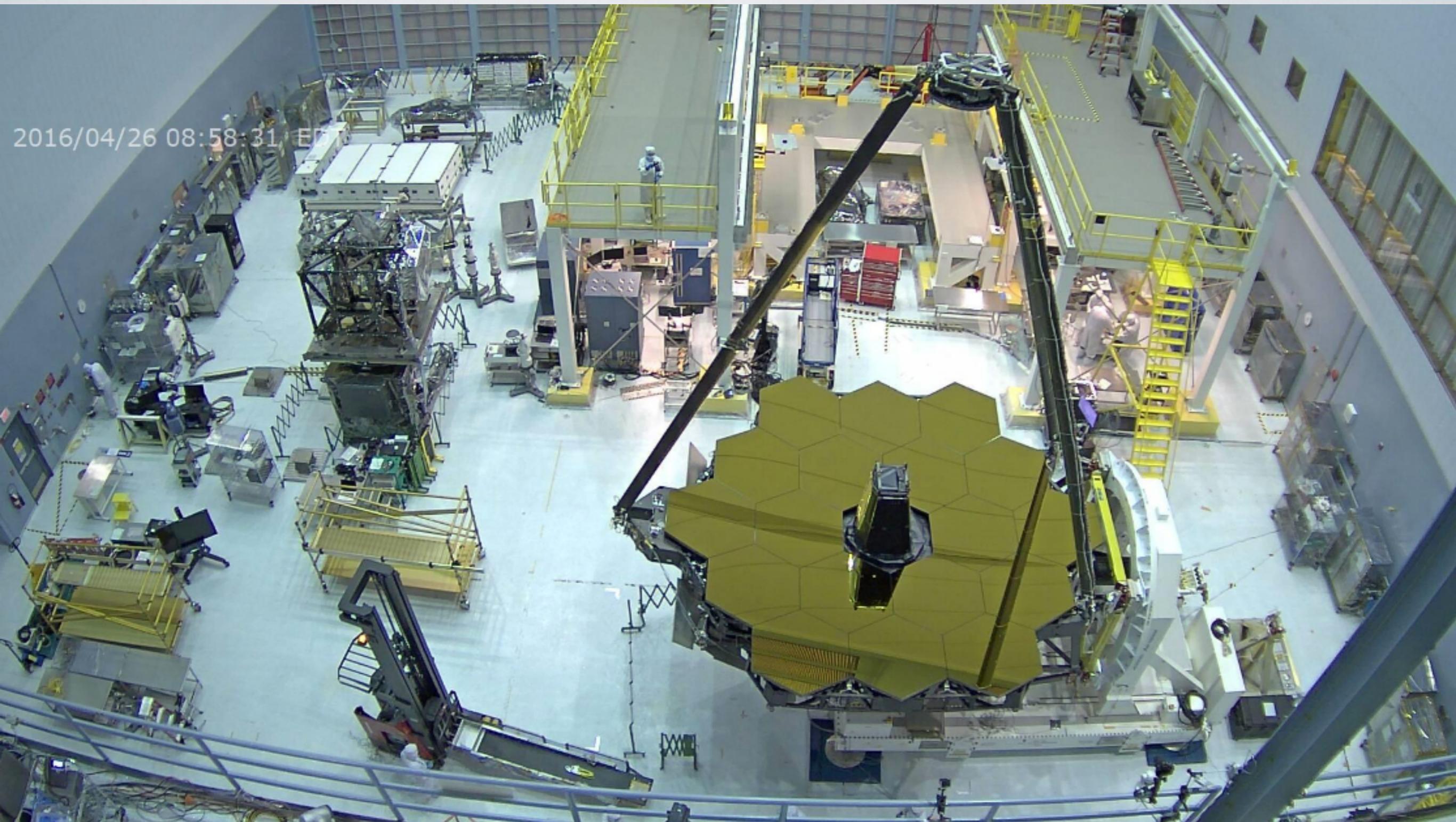


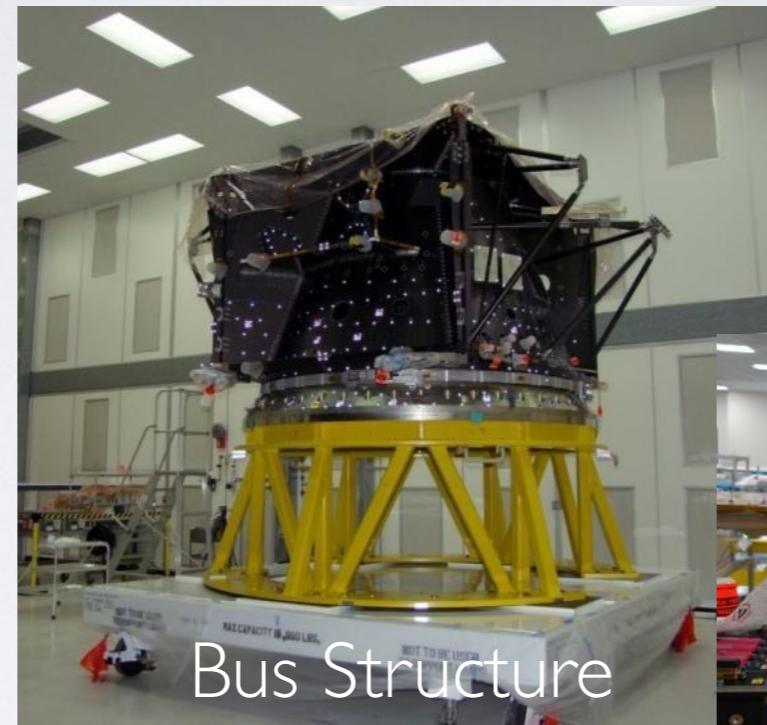
April 27, 2016  
Eric P. Smith  
JWST Program Director

# WEBB'S SCIENCE PAYLOAD



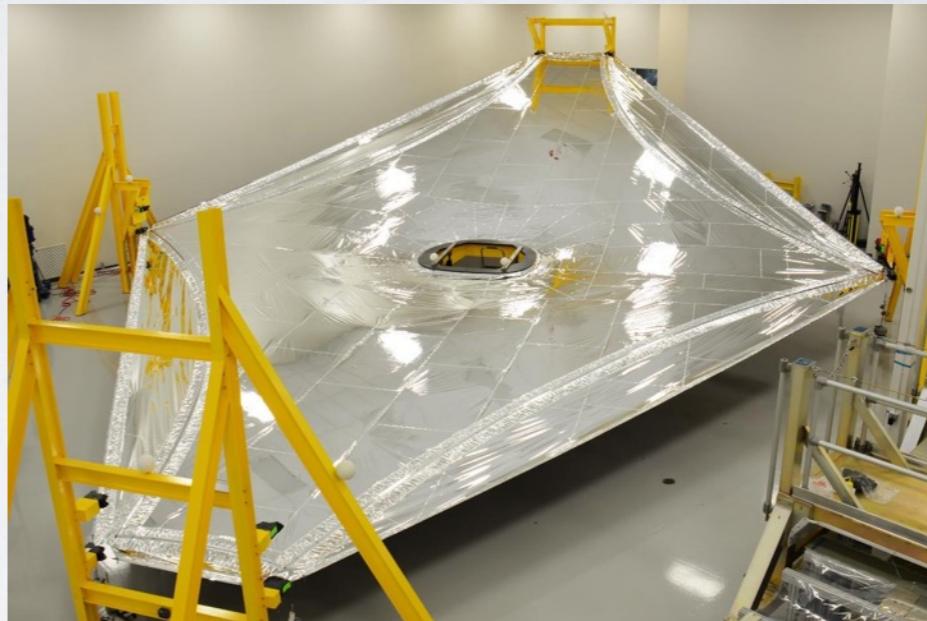
# SPACECRAFT

- Spacecraft Structure complete
- 50 of 53 Electronic units delivered
- All propulsion units completed and integration has begun
- Spacecraft electrical integration underway
- 1st Spacecraft power-on was March 29
- Scheduled for completion in August



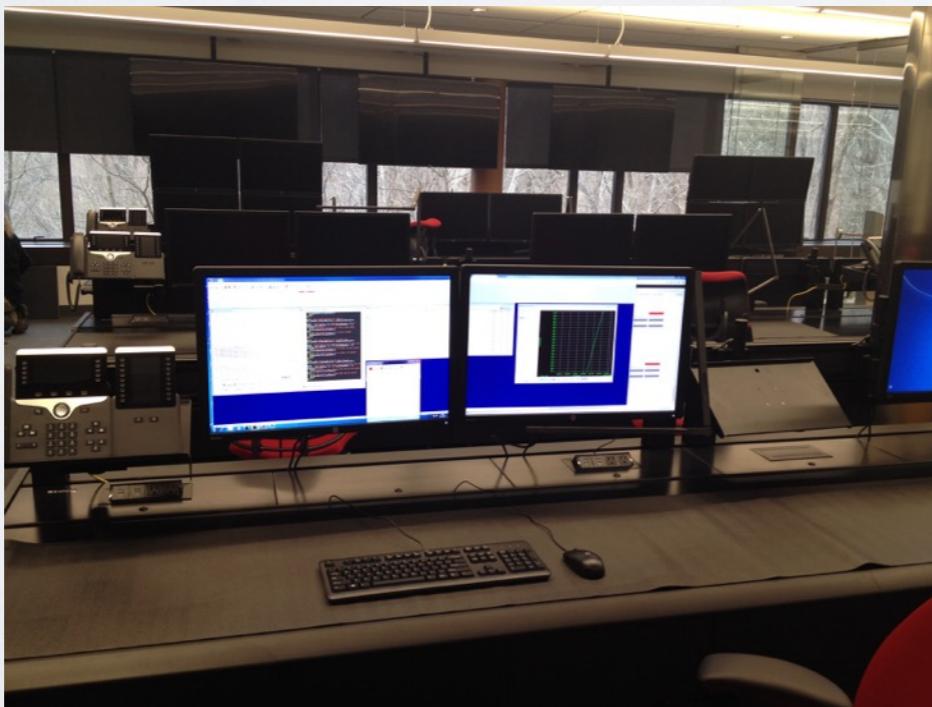
# SUNSHIELD

- 2 of 5 flight membranes completed
- 139 of 153 other components completed
- 80 of 215 tests completed through development, qualification and flight
- Forecast completion February 2017



# GROUND SEGMENT

- All Observatory control, science planning, and science data processing operation systems are on schedule
- Nominal and contingency operational product development is well underway
- Mission Operations Center at STScl construction complete



# SIMPLIFIED SCHEDULE

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

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

SC Assembly & Test

Spacecraft I & T

2

Sunshield Fabrication

Sunshield Integration

1.5

Spacecraft

Observatory I&T

3

OTIS = Optical Telescope + ISIM

OTIS

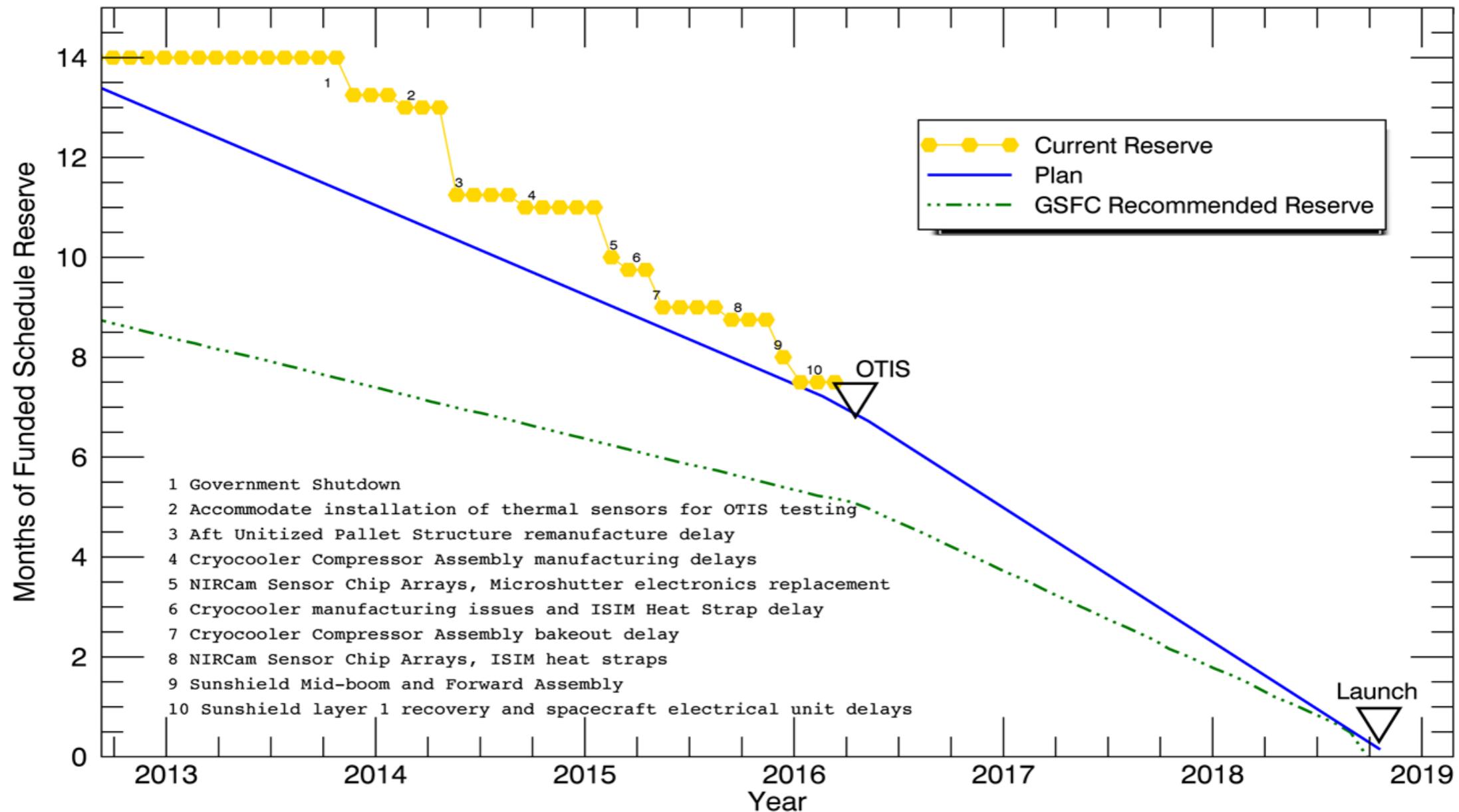
3.5

Telescope + Science Instruments

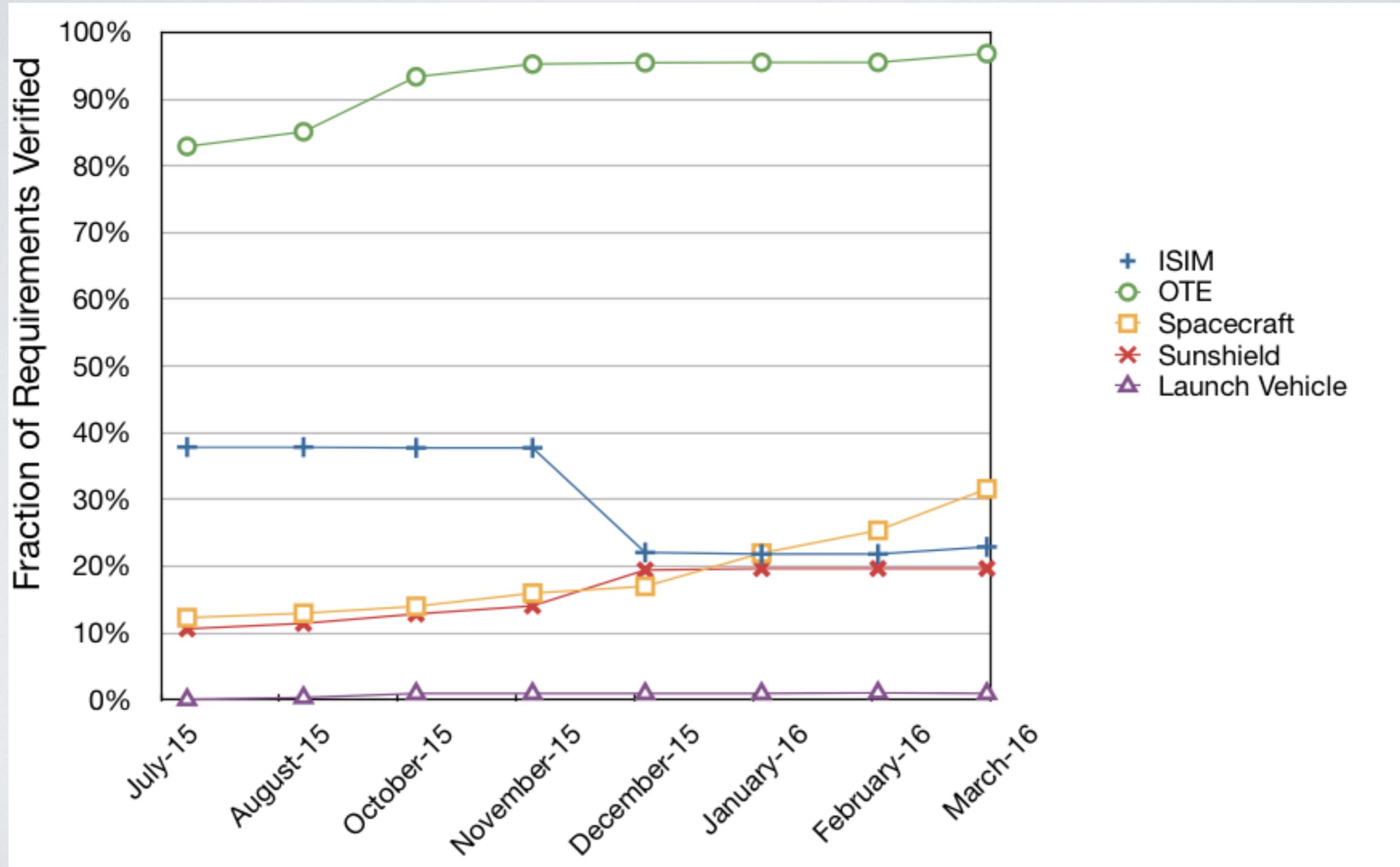
Red lines denote critical path



# FUNDED SCHEDULE RESERVE



# REQUIREMENTS VERIFICATION

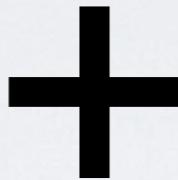


# TECHNICAL PERFORMANCE MEASURES

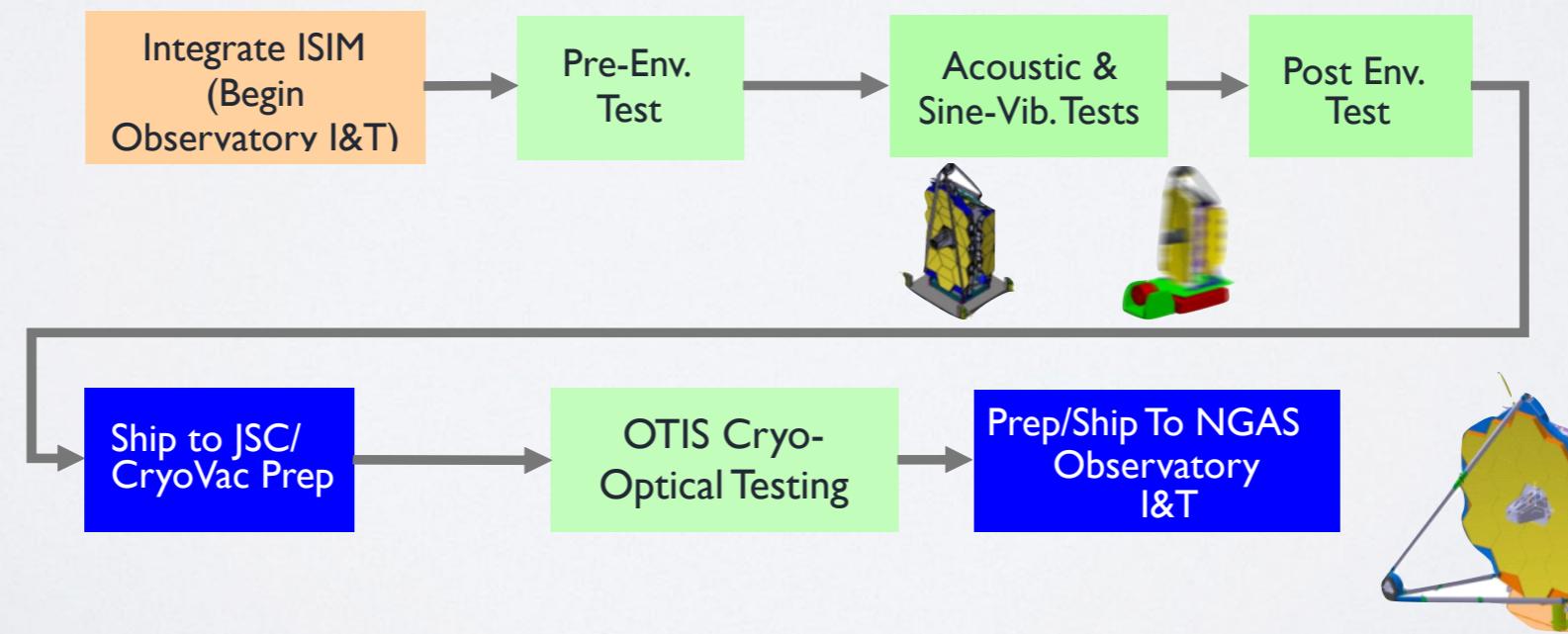
Performance / Resource Parameters	Capability / Requirement	Estimate or Predict 3-16	Comments
<b>Sensitivity Parameters</b>			
NIRCam SI Sensitivity @ 2 microns (nJy)	11.4	10..2	Prediction at EOL from 6-19-13 SI TPM Report
MIRI SI Sensitivity @ 10 microns (nJy)	700	679	Prediction at EOL from 6-19-13 SI TPM Report
Straylight (MJy/ster @ NIR 2 microns)	0.091	0.089	Prediction from 4-7-14 Integrated Modeling Review
Straylight (MJy/ster @ NIR 3 microns)	0.07	0.066	Prediction from 4-7-14 Integrated Modeling Review
Straylight (MJy/ster @ MIR 10 microns)	3.9	0.74	Predict from 3-9-15 AWG including LTO
Straylight (MJy/ster @ MIR 20 microns)	200	174	Predict from 3-9-15 AWG including LTO
OTE Transmission* Ap m <sup>2</sup>	22	22.219	2013 03 20 Transmission X Budget - RevE.xlsx predictions at 2 microns min margin wavelength
<b>Image Quality Parameters</b>			
Strehl (NIR 2 microns)	0.80	0.853	Strehl at $\lambda = 2.0 \mu\text{m}$ From 9-28-15 AWG
Strehl (MIR 5.6 microns)	0.80	0.938	Strehl at $\lambda = 5.6 \mu\text{m}$ from 9-28-15 AWG
NIRCam ChannelWavefront Error (nm)	150	129	From 9-28-15 AWG
NIRSpec Channel Wavefont Error (nm)	238	221	From 9-28-15 AWG
NIRISS Channel Wavefront Error (nm)	180	139	From 9-28-15 AWG
MIRI Channel Wavefront Error (nm)	421	226	From 9-28-15 AWG
EE Stability at 2 microns Over 24 hours	2.30%	0.40%	From 9-28-15 AWG
EE Stability at 2 microns Over 14 days	3.00%	2.40%	From 9-28-15 AWG
Image Motion rms for 15 sec Slideng Window for NIRCam (mas)	6.6	5.3	From SLR
<b>Operations Parameters</b>			
Observing Efficiency	70%	77.0%	From "Observation Efficiency Allocations Report JWST-RPT-004166, Revision F"
Slew Time for 90 Degree Slew with 5 RWAs (min)	60.0	57.3	Prediction as cited in Pointing Budget D36177 RevH Para 5.1
Momentum Accumulation LV1 (Nms/d)	22	18.10	Updated on 8-1-2013 (13-JWST-207D) from Torque Tables for SC Bus IM Cycle (Nom+rss)*MUF
Momentum Accumulation LV4 (Nms/d)	23	18.50	Updated on 8-1-2013 (13-JWST-207D) from Torque Tables for SC Bus IM Cycle (Nom+rss)*MUF
<b>Thermal Parameters</b>			
Cryo Parasitic Margin (NIRCam)	60%	78.3%	Predicts with Liens and Accepted Opportunities per 2015.03.04_Obs_v5.3m_LTO-P2_v65.xlsx
Cryo Parasitic Margin (NIRSpec FPA)	60%	69.8%	Predicts with Liens and Accepted Opportunities per 2015.03.04_Obs_v5.3m_LTO-P2_v65.xlsx
Cryo Parasitic Margin (FGS/NIRISS)	60%	65.8%	Predicts with Liens and Accepted Opportunities per 2015.03.04_Obs_v5.3m_LTO-P2_v65.xlsx
ISIM Cavity Temperature (K)	41K (TBR)	41.5	Predicts with Liens and Accepted Opportunities per 2015.03.04_Obs_v5.3m_LTO-P2_v65.xlsx
Cryo-Cooler Line Load Margin (Pinch Point / Steady State)	83%	113%/146%	Cryo-Cooler Predicts from K. Banks and S. Thomson Mar 2015 Predict + Liens)
Cryo-Cooler OM Load Margin (Pinch Point / Steady State)	83%	114%/55%	Cryo-Cooler Predicts from K. Banks and S. Thomson Mar 2015 Predict + Liens)
<b>Data and Link Parameters</b>			
S-Band Uplink Margin (dB)	3.00	5.80	Adverse Margin From 2013.11.01 S-Band Link (SC CDR).pdf (SC Omni at 2000 bps)
S-Band Downlink Margin (dB)	3.00	3.90	Adverse Margin From 2013.11.01 S-Band Link (SC CDR).pdf (Both Omni's at L2 at 200 bps)
Ka-Band Downlink Margin (dB)	3.00	4.44	Adverse Margin From 2013.10.31 Ka-band Link (SC CDR).pdf (28 Mbps)
<b>Observatory Resources</b>			
Observatory Wet Mass (kg)	6620	6063	Estimate with Pending From 2-11-16 Mass Report
Observatory CG Offset (mm)	Area in DCI	36.5	CG uncertainty ellipse to 5 mm margin Ariane Static Unbalance Domain with Pending (2-11-16)
Observatory Power Load (W)	1808	1501	Estimate + Pending, 1-14-16 Power Report vs SA at 6 years
Observatory Power Generation (W)		2055	Power Generation at 6 Years, 1-14-16 Power Report
<b>I&amp;T Parameters</b>			
JSC Timeline (Days)	120	95	12-2105 Monthly Report

Denotes Level 1 requirement Meets requirement, but small margin

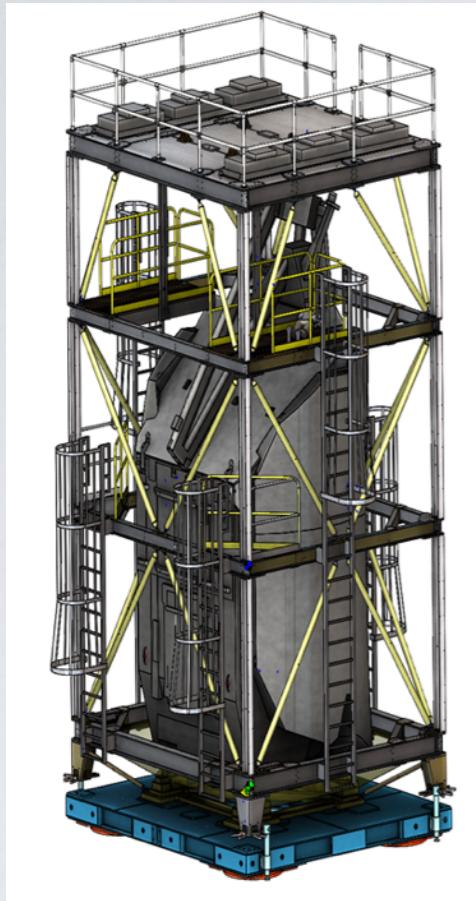
# TELESCOPE + SCIENCE INSTRUMENTS = OTIS



Flight OTIS  
Integration Has  
Begun



# OTIS AT GSFC



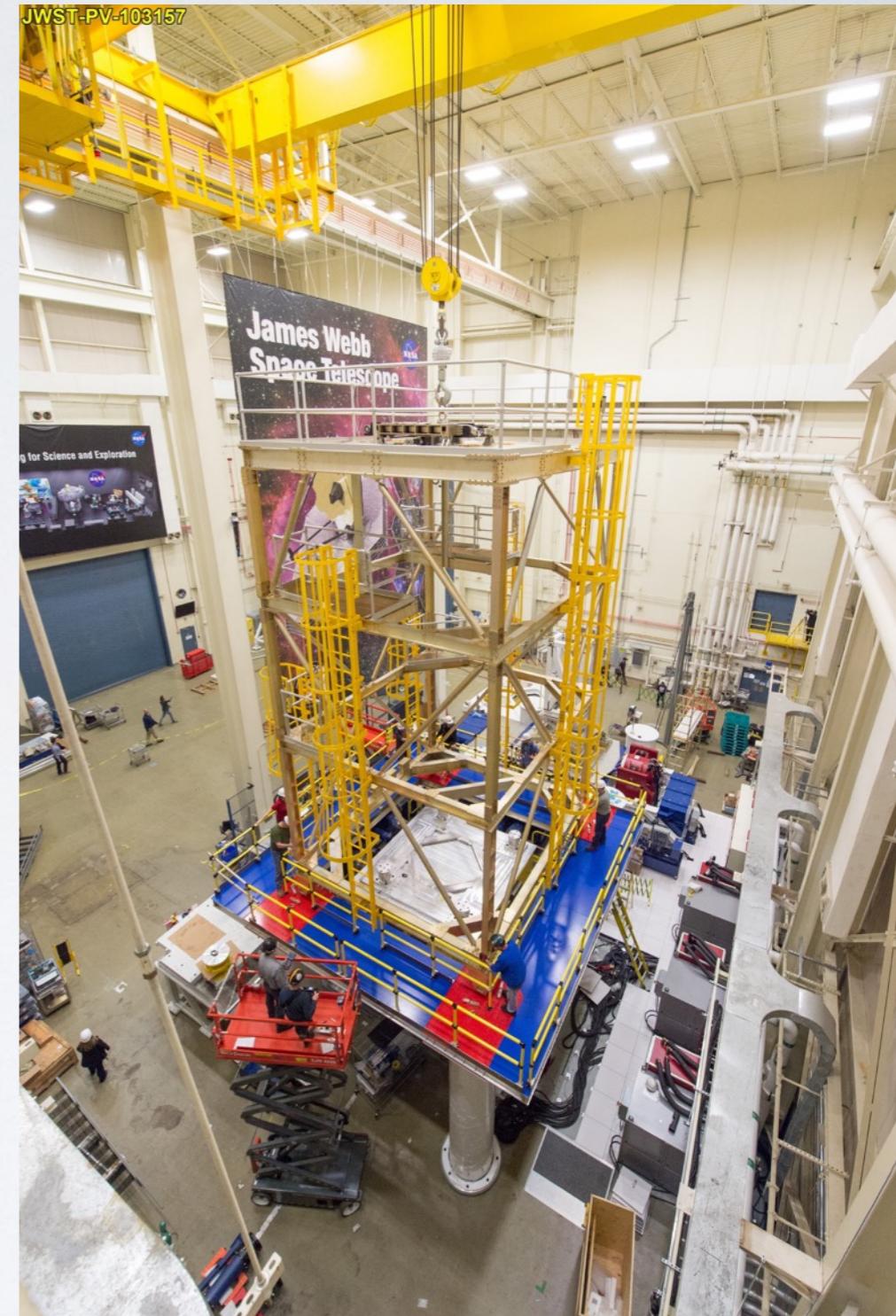
Portable Clean Room



New Vibration Tables

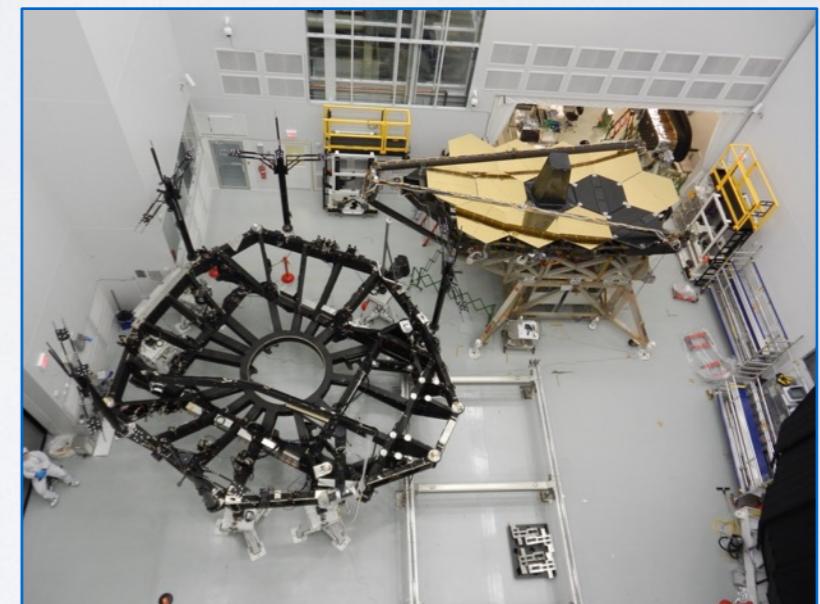
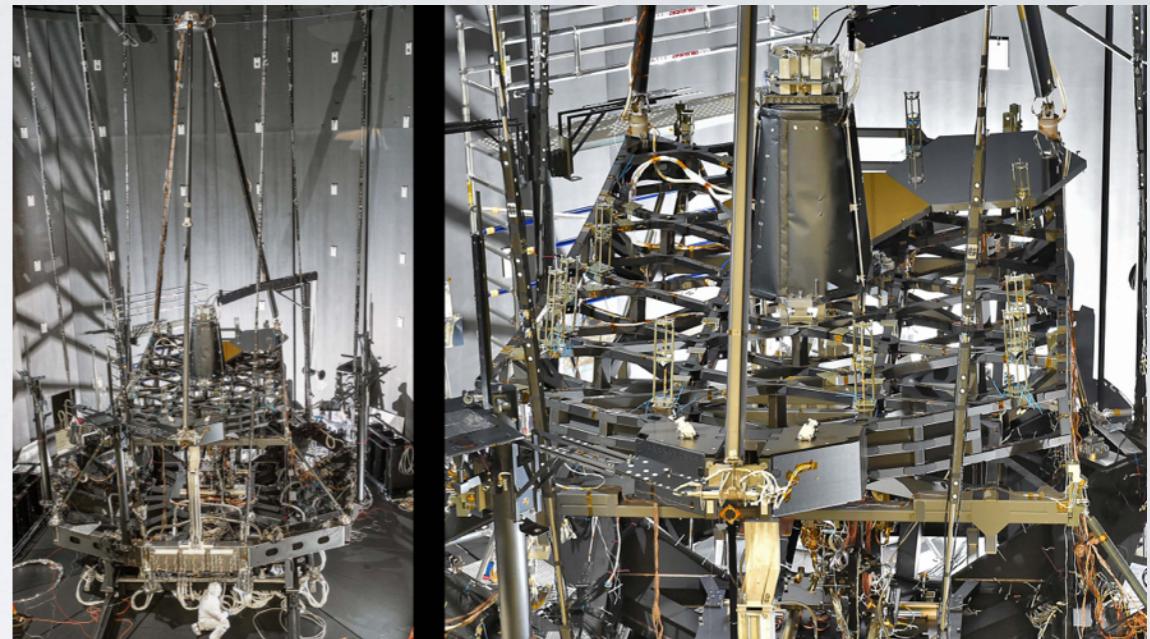
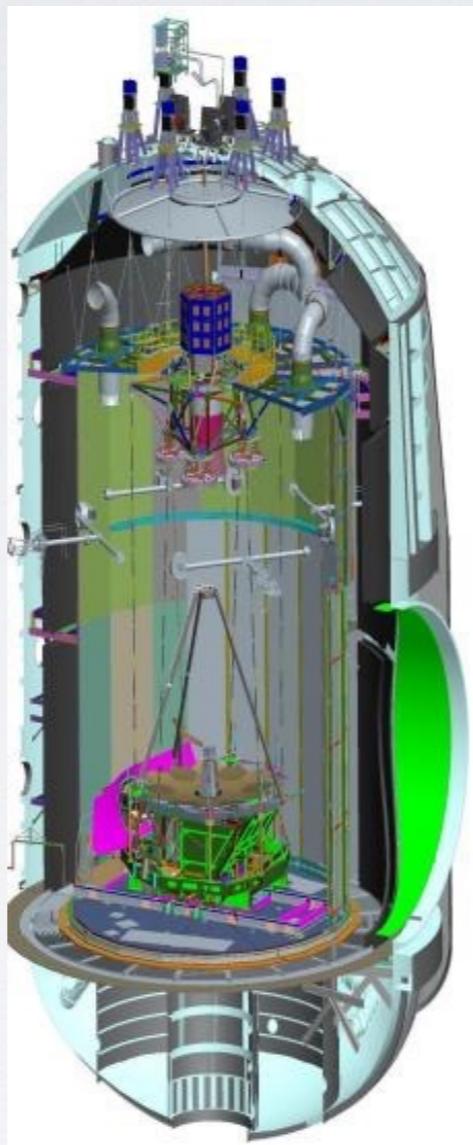


Radiator Installation



Cleanroom atop vertical shaker

# JSC OTIS CRYO-OPTICAL TESTING



OTIS risk reduction testing has been underway for over a year – 2 tests successfully completed  
3<sup>rd</sup> and final risk reduction test this Summer  
Flight OTIS arrives at JSC in Jan. 2017

# SUMMARY

- Project is performing within the budget, to its 2018 launch date.
- Integration and test activities will present their own challenges.
  - Continued vigilance on cost and schedule mandatory
- Key remaining 2016 events: Completion of OTIS integration and ambient testing, continued spacecraft integration, completion of sunshield manufacturing, *Exploring the Universe with JWST*, 24-28 October, Montréal

