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EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

JWST Science & Operations Center

Massimo Stiavelli, JWST Mission Head

September 9th, 2019

Proposal Preparation

Proposal Submission

Proposal Selection

On-Board Script Subsystem (OSS)
Wavefront Sensing & Control (WFSC)

Science Planning

Flight Operations Subsystem (FOS)

Operations Scheduling

Flight Operations

Data Management Subsystem (DMS)

Data Processing and User Tools

Data Archiving

Science Community and Public Outreach

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S&OC & Subsystem Status

Subsystem	Build	Development Completion Date	I&T Completion Date	Status	% of Requirements Delivered to Date	% of Requirements Verified to Date
Data Management Subsystem (DMS)	7.2.3	May 2019	June 2019	Completed I&T	100%	91%
	7.3	June 2019	February 2020	Testing		
	7.3.1	September 2019	October 2019	In Development		
	7.4	November 2019	February 2020	In Development		
Proposal Planning Subsystem (PPS)	14.6	March 2019	May 2019	Completed I&T	99%	97%
	14.7	May 2019	December 2019	Testing		
	14.8	September 2019	December 2019	In Development		
Wavefront Sensing & Control (WFS&C) Software Subsystem	6.3	October 2019	November 2019	In Development	100%	100%
Flight Operations Subsystem (FOS)	6.3	November 2018	April 2019	Completed I&T	98%	93%
	6.4	September 2019	November 2019	In Development		
	6.4.1	February 2020	April 2020	In Development		
Operations Scripts Subsystem (OSS)	8.0	October 2018 – Level 1 testing complete	June 2019	Completed I&T	99% (Level 1)	90%/63% (Level 2/Level 3)
	8.1	August 2019	December 2019	In Development		
Project Reference Database Subsystem (PRDS)	4.17	September 2019	September 2019	Sustaining Engineering Release	100%	100%
S&OC Builds	4.3	April 2019	July 2019	Completed I&T	88%	86%

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S&OC & Subsystem Status						
Subsystem	Build	Development Completion Date	I&T Completion Date	Status	% of Requirements Delivered to Date	% of Requirements Verified to Date
Data Management Subsystem (DMS)	7.2.3			Testing on-going. Working on DMS extensions		
	7.3					
	7.3.1					
	7.4					
Proposal Planning Subsystem (PPS)	14.6			ready		
	14.7					
	14.8					
Wavefront Sensing & Control (WFS&C) Software Subsystem	6.3			ready		
Flight Operations Subsystem (FOS)	6.3			ready, working on a hardware refresh		
	6.4					
	6.4.1					
Operations Scripts Subsystem (OSS)	8.0			OTB flight software fixed installed. It allows for testing of all OSS capabilities		
	8.1					
Project Reference Database Subsystem (PRDS)	4.17			ready		
S&OC Builds	4.3	April 2019	July 2019	Completed I&T	88%	86%

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HQ Milestones

- Conduct Wavefront rehearsal #2   Oct 2018
- Deliver Science and Operations Center build 4.2   Nov 2018*
- Conduct Science Operations Rehearsal #4   Dec 2018
- Conduct Early Commissioning Exercise #2   March 2019**
- Conduct Wavefront rehearsal #3   April 2019
- Received Updated Proposals from GTOs   July 2019
- Deliver Science and Operations Center build 4.3   July 2019
- Conduct Science Operations Rehearsal #5   July 2019
- Conduct Contingency Planning Rehearsal #3   Sep 2019

*Completed early

** postponed due to Gov shutdown

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STScI talks on specific topics

Cycle 1 capabilities – Jeff Valenti

JWST software tools – Klaus Pontoppidan

Science policies and Science Timeline – Amaya Moro-Martin

Cycle 1 community engagement plan – Bonnie Meinke & Antonella Nota

JWST Data analysis tools – Harry Ferguson

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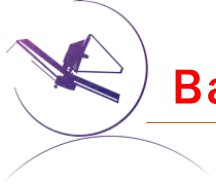
Background: Subsystem Highlights

Flight Operations System

- MOC regularly used for testing and rehearsals
- FOS Build 6.4 delivered and installed
- Completed hardware refresh of MOC computer displays
- Observatory Visualization tool early release planned for use during ECE #3
- Certification Lab delivered to STScI and installed
- Work on power and cooling infrastructure has started

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Background: Subsystem Highlights

Proposal and Planning System

- PPS Build 14.7 was delivered on May 20, 2019
- Many improvement to PPS scheduling coming in PPS Build 14.8
- Work on PPS Build 14.8 is in progress; due September 12, 2019

WFS&C Software Subsystem

- WSS Build 6.2.1 was successfully used in WFR3
- WSS Build 6.3 accelerated to include fixes and updates from Ball and to be used in WFR4

Background: Subsystem Highlights

Data Management Subsystem

- Delivered Build 7.3 July 26, 2019; completes baseline requirements, with associations implemented as specified (i.e. implemented without real data samples)
- With a working OTB, DMS will soon acquire flight-like data to validate its work
- OTB now producing good data; challenge is getting time to generate the needed data
- Data Analysis now working on the DMS Launch Delay Extensions; first delivery expected September 2019

Operations Script Subsystem

- OSS Build 8.0 deployed; OSS Build 8.1 undergoing certification, and OSS 8.2 is in planning
- OTB FSW now updated and can support Moving Targets, to be tested with OSS 8.1 in September 2019

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Background: Rehearsal update

Completed:

Early Commissioning Exercise 2, March 4-5

- Planned and unplanned anomalies successfully circumvented. Anomaly process exercised. MCC-1a go/no-go decision. bMOC supported MCC CONOPS. Introduction of electronic logs and console handbooks.

Deployment Rehearsal 1, March 6-8

- Exercised deployments from MOC with full deployment team. Exercised 24/7 operations. Shifts handovers successfully practiced.

Wavefront Rehearsal 3, April 9-12

- Communication channels and team interactions demonstrated. Maturity of wavefront procedures demonstrated. Light travel time included. Coordination needed with PPS regarding better time estimates for mirror move observations near DSN handovers.

Science Instrument Rehearsal 2, May 13-17

- Familiarized NIRSpec and MIRI personal with MOC operations. Exercised SOC handling NIRSpec flat field update and preparation of upload. Practiced anomaly response including Anomaly Coordinator. Data processing better but still had problems with NIRSpec data (problem understood).

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Background: Rehearsal update

Completed:

Mirror Deployment Rehearsal 1, June 10-12

- Exercise mirror deployments including through DSN and shift handovers. Pause and start of realtime commanding good but improvements needed. The need for better definition of responsibilities between Ball and WF team identified; improvements are being implemented.

Upcoming rehearsals:

- Midcourse Correction Mini-Rehearsal, Sept 17-18

- Contingency Planning Rehearsals 2 & 3, Sept 23-26

- Science Instrument Mini-Rehearsal, Sept 27

- Mirror Deployment Rehearsal, Oct 8-10

- Early Commissioning Exercise 3, Nov 5-7

- Wavefront Rehearsal 4, Dec 9-11

- Science Instrument Rehearsal 2.5, Dec 12-13

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Astronomical Community Outreach

- Planning for user engagement and training leading up to and during open GO Call for Proposals:
  - Engagement at Conferences:
    - AAS Division for Planetary Sciences (DPS) Meeting joint with European Planetary Science Conference (Sept 2019)
    - American Astronomical Society (AAS) 235th Meeting (Jan 2020)
  - Master Class program
    - Workshop Nov 18-22 at STScI
    - 28 programs across US, Canada, Mexico, Brazil, and Chile
    - Local training events to be held Jan –Apr 2020 timeframe
  - Video Tutorial – 14 new videos will be released by Sept 30, including curated collections such as the "Getting Started" playlist.

- Continued updates to the community
  - Distributed the bimonthly JWST Observer News Roundup: February, April, June, and August 2019
  - Regular JWST Observer news items

- Scientific Community Engagement Plan evolves to meet audience needs and timeline:
  - Includes long-range plan for prioritizing community engagement activities over the next three years, rather than just next fiscal year
  - Includes expanded video tutorials, symposia, community-lead support, and local workshops

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Communications and Outreach

- News Releases are planned on a monthly basis until launch. Recent ones on:
  - NASA's Webb to Explore Galaxies from Cosmic Dawn to Present Day
  - A New View of Exoplanets with NASA's Upcoming Webb Telescope
  - NASA's Webb Telescope Will Study an Iconic Supernova
  - NASA's Upcoming Webb Telescope will Survey Saturn and Titan
  - A 'Jellyfish' Galaxy Swims into View of NASA's Upcoming Webb Telescope

- Multimedia Products:
  - Moons: Active Worlds (link)
  - What is a Galaxy? (link)
  - Gravity: Nature's Magnifying Glass (link)
  - Massive Stars: Engines of Creation (link)

- Public Outreach Events:
  - May 2019 – Center for Science and Industry Science Festival, >10,000 attendees
  - July 2019 – Apollo 50th Anniversary on the National Mall, >50,000 attendees

- Initiated Launch Engagement Working Group to prepare for launch and commissioning activities.

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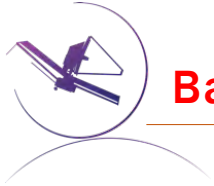
Background: Risks
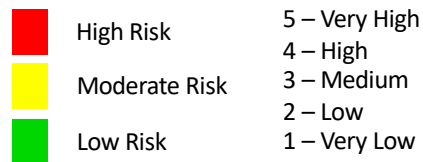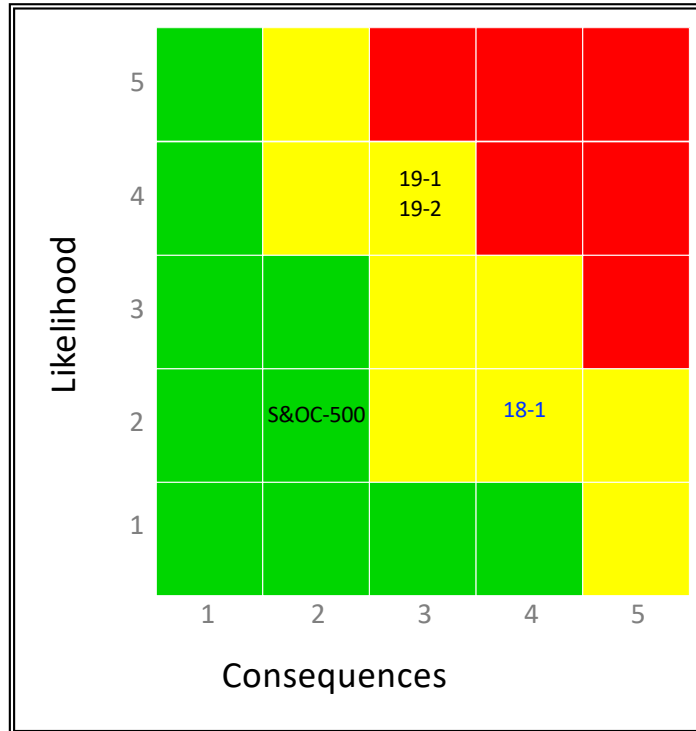
ID	Δ	Risk Title
S&OC-500	→	Early Termination of HST Mission (in Project MSE Risk Database)
18-1	→	OTB Reliability/availability for Mission Operations
19-1	→	ISIM Software Simulators
19-2	→	Uncertified data in PRD

High Risk
Moderate Risk
Low Risk

5 – Very High
4 – High
3 – Medium
2 – Low
1 – Very Low

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Concerns

Vehicle Dynamics Simulator issues in Observatory Test Bed:

The OTB VDS flight software fix has been successfully implemented. This fix allows us to move on to a more detailed testing of the Fine Guiding function.

DMS Verification:

With the OTB successful fix, DMS verification can continue. This is no longer a concern.

Communications:

Communications continue to be a priority. The Interaction between HQ, NASA GSFC, and STScI is continually improving.

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