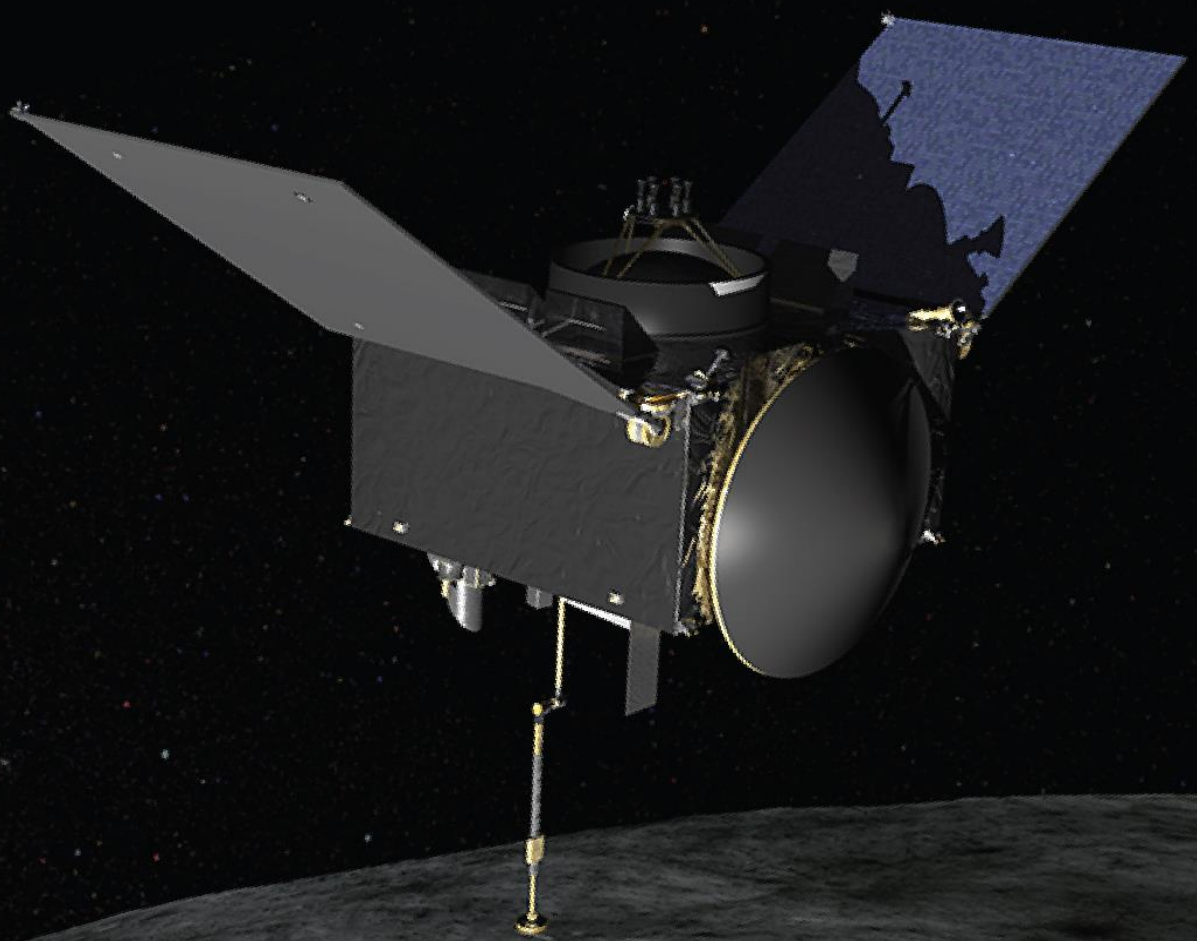
Daily Downlink Tagup

Friday, September 21, 2018 (DOY 264)

OSIRIS-REx™

ASTEROID SAMPLE RETURN MISSION



Agenda & Logistics

- **Quicklook Status**
- **DSN Schedule**
- **Observation Timeline**
- **Uplink/Execution/Downlink Summary**
- **Alarms, Watch items, ISAs, PFRs**
- **Need for Retransmit, need for Replay?**
- **Science / PI Comments**
- **Go-backs / Additional Comments**

Daily Downlink Slides available shortly after each Tagup at:

OSIRIS-REx Bennu Proximity Operations\Science Implementation\Downlink_Daily_Summary

Quicklook Status

Team	Status	Comment
Spacecraft	G	No issues
Electrical Power System	G	No issues
Flight Software	G	No issues
Fault Protection	G	No issues
G&NC	G	No issues
Mechanisms	G	No issues
Propulsion	G	No issues
Telecom	G	No issues
Thermal	G	No issues
Payload Interfaces	G	No issues

	Health				Safety		Performance			Powered State	GO/NO-GO
OCAMS										**ON**	**GO**
OLA										**OFF**	**GO**
OTES										**OFF**	**GO**
OVIRS										**OFF**	**GO**
REXIS										**OFF**	**GO**
	Thermal	Power	Command Response	Alarms	Trending	Limited Life & Mechanisms	Data Completeness	Pipeline Status	Science Concurrence		

Downlink Schedule (times in UTC)

- ***Current Data Rate: 916 kbps***

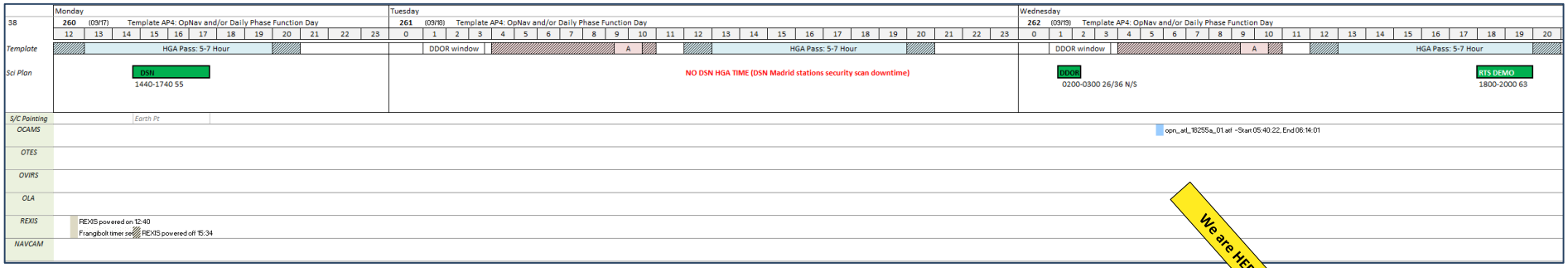
WOY	DOY	Start Date	HGA Start	End Date	HGA End	Duration	Note
38	260	2018-09-17	14:40	2018-09-17	17:40	03:00	***COMPLETE***
38	261	2018-09-18	n/a	2018-09-18	n/a	0:00	*No scheduled downlink 261 due to scheduled Station maintenance*
38	262	2018-09-19	18:00*	2018-09-19	20:00*	02:00	**RTS Demo-DSN pass is non-committed*
38	263	2018-09-20	14:45	2018-09-20	17:30	02:45	***COMPLETE***
38	264	2018-09-21	14:30	2018-09-21	16:50	02:20	***COMPLETE***
38	265	2018-09-22	14:30	2018-09-22	20:00	05:30	
38	266	2018-09-23	14:30	2018-09-23	17:30	03:00	

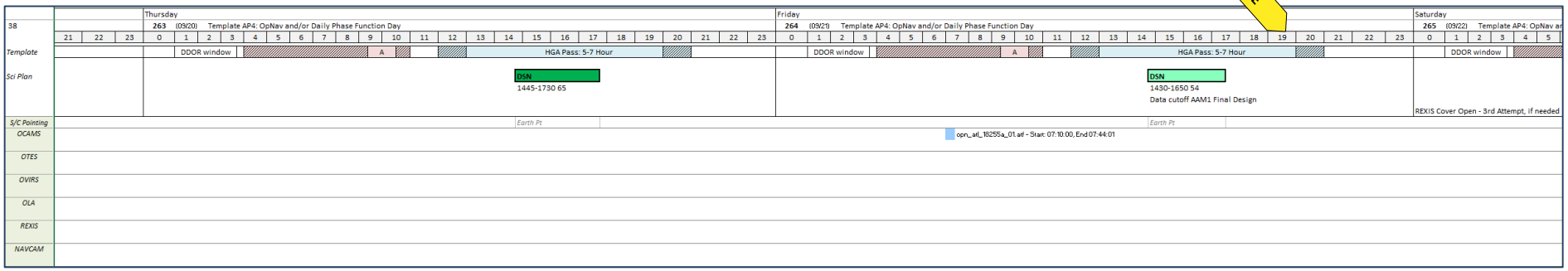
DSN Notes:

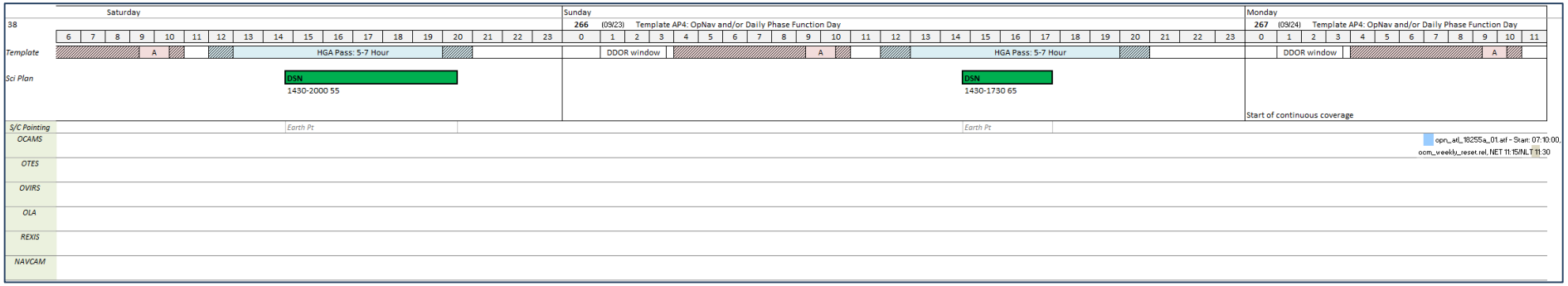
DSS65/ORX 263/1445Z DR M110828 Software/ULC Entered 263/1730Z 0165
No monitor data from UPL. UPL stop/start and reboot to no avail. TMC swapped by M&I to no avail. TXR local panel showed beam voltage and 17 KW output. FEM disabled in order to provide CMD capability.
MON LOST 165

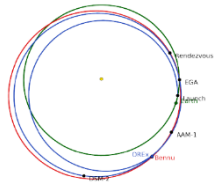
- RED EQUIPMENT STATUS: SPC/DSS EQUIPMENT ETRO ------- --------- ----
  DSS25 AWVR 264/2300z
  SPC40 DCC1 269/0023z
  DSS43 S400KW 275/0630z
  SPC60 VSR 300/1648z

Approach: OpNavs & REXIS Cover Open Attempt 2 & 3
WOY 38





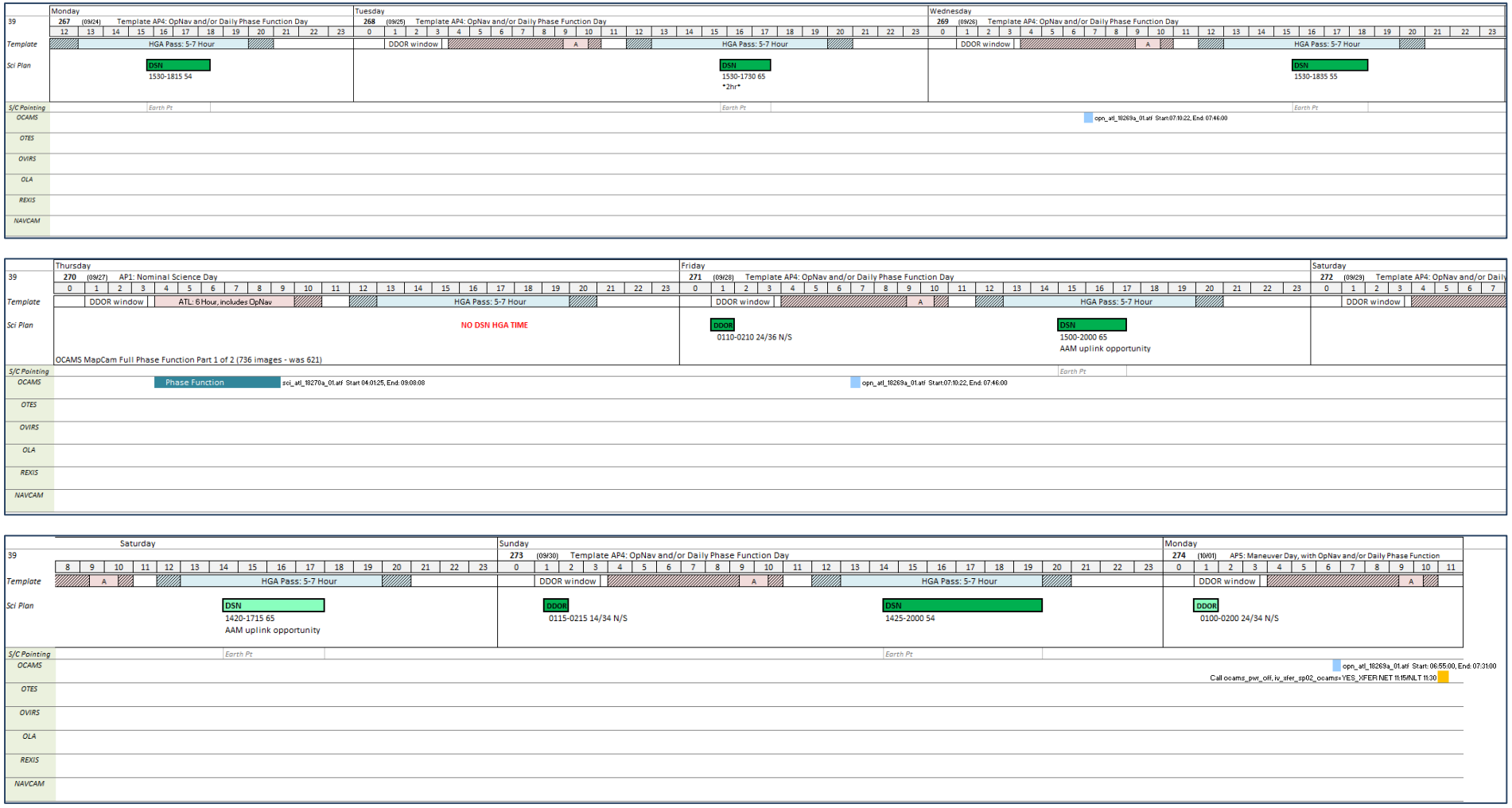




Statistics as of September 19, 2018, L+741 days

Days until Arrival: 75 days
Earth Range = 124,000,000 km (0.83 AU) (↑)
Sun Range = 177,000,000 km (1.18 AU) (↓)
Bennu Range = 729,000 km (↓)
Sun-Probe-Earth Angle = 56.7 deg (↑)
One Way Light Time = 00:06:52 hh:mm:ss (↑)
Round Trip Light Time = 00:13:45 hh:mm:ss (↑)
(↑ increasing, ↓ decreasing)

Approach: OpNavs & MapCam Full Phase Function Part 1
WOY 39



Uplink Summary

UPLINK

WOY 38 (2018/260 – 2018/267)

- xm1838 BGSeq and Sci Genies uplinked 2018-257/15:20:49
  - xm1838 will re-use the xm1837 OpNav-only ATF and sequence
- ctrl_htr_pwr.rexis_cover-primary-off uplinked 2018-262/18:16:09
  - SPOC verified cover heater turned off
- hlfp_spm_safe_rexis.mod uplinked 2018-262/18:32:36
  - Safing REXIS will now no longer enable the cover heater

WOY 39 (2018/267 – 2018/274)

- xm1839 BGSeq and Sci Genies uplinked 2018-264/14:49

Execution Summary

- **Instrument Status:**
  - OCAMS is powered-on
  - All other payloads remain powered off

Executed (times in UTC):

- **2018/260 (Monday, Sept 17)**
  - 10 PolyCam opnav images
  - 11:15 ocams_weekly_reset
  - 11:30 rex_cover_open_seq2
  - Transition to xm1838
  - REXIS powered Off using call_rexis_pwr_off.lgo at ~15:34 UTC
- **2018/261 (Tuesday, Sept 18)**
  - No scheduled activities
- **2018/262 (Wednesday, Sept 19)**
  - 10 PolyCam opnav images
  - DSN pass prioritized for RTS Demo. Downlink of OpNavs and Engineering data is non-committed
- **2018/263 (Thursday, Sept 20)**
  - No scheduled activities
- **2018/264 (Friday, Sept 21)**
  - OpNav ATF kicked off at 07:10
  - 10 PolyCam opnav images **(# of images expected=10 / # of images received= 10)**
  - These OpNavs from today are the last set that will be folded in to the Nominal OD corresponding to the AAM1 final design

Up Next (times in UTC):

- **2018/265-266 (Saturday, Sept 22 & Sunday, Sept 23)**
  - No scheduled activities
- **2018/267 (Monday, Sept 24)**
  - 10 PolyCam opnav images
  - 11:15 ocams_weekly_reset
  - Transition to xm1839
- **2018/261 (Tuesday, Sept 25)**
  - No scheduled activities

Downlink Summary

Current Data Rate: 916 kbps

DOWNLINK

- **Partition Status as of 19:00 UTC:**

	Part. Start Vol (MB)	New Data Vol (MB)	New Data Vol (Mb)	Expected Partition Fill (%)	Current Partition Fill (%)	Comments
OpNav	0.00	22.40	179.20	3.20	0.00	
OTES	0.00	0.00	0.00	0.00	0.00	
REXIS	0.00	0.00	0.00	0.00	0.00	
OLA	0.00	0.00	0.00	0.00	0.00	
OVIRS	0.00	0.00	0.00	0.00	0.00	
OCAMS	0.00	6.70	53.60	0.18	0.00	
Tagcams/Overflow	0.00	0.00	0.00	0.00	0.00	

List of Unexpected Alarms, Watch Items, ISAs, PFRs

Alarms

- DOY 260
  - Yellow high alarm on the Cumulative OCAMS Low Speed Sync Search Channel (OCM1LSSS_CUM). This is a S/C channel. Count currently 5.
  - Runs a counter on any interruptions to the sync of engineering data transfer since the last interface set. So we've regularly seen this count increase when we have been running the OCAMS reset weekly, and this week hit the Yellow Limit = 5
  - MSA will be removing the alarm from this channel, but will add a yellow limit to its associated _MAX channel in case of extended sync loss

Watch Items, ISA's and PFR's

- A note on Watch Item #1 – REXIS CCD Hot Pixels
  - REXIS team noted that they saw higher Event Count rates on DOY 257 during the slew from Sun Point to Earth Point at the end of their Cover Open activity
  - We believe this high Event Count is the result of the REXIS detector seeing Stray Light
  - REXIS detector includes an OBF, which is supposed to filter out light, but the OBF can generate pin holes that create hot pixels (resulting in higher Event Counts).
  - Event Count Rates during this time were below what we're considering the "Yellow" threshold (~4000 Counts) and well below the "Red" threshold (~6000 Counts) where we saw the Filter disabled during L+18
  - REXIS CXB Cal will remain unchanged (since today marks the Final Build). We may see some higher counts in the DOY 286 data.
  - REXIS team is discussing possible mitigations for the Crab Calibration
  - We will continue to monitor the hot pixels after the CXB Cal

Need for Retransmit? Need for Replay?

- SPOCFlight Reports showing we have all data down through DOY 263

Science Status and/or PI Status

Looking Ahead

	37							38							39							40						
	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280
	9/10	9/11	9/12	9/13	9/14	###	###	9/17	9/18	9/19	9/20	9/21	###	###	9/24	9/25	9/26	9/27	9/28	###	###	10/1	10/2	10/3	10/4	10/5	###	###
	M	T	W	R	F	Sa	Su	M	T	W	R	F	Sa	Su	M	T	W	R	F	Sa	Su	M	T	W	R	F	Sa	Su
Week 8 - Tactical kickoff	xm1845 + Preliminary Survey Phase Kickoff							xm1846							xm1847							xm1848						
Week 7 - SOS	xm1844							xm1845							xm1846							xm1847						
Week 6 - J-A 1	xm1843							xm1844							xm1845							xm1846						
Week 5 - J-A 2	xm1842							xm1843							xm1844							xm1845						
Week 4 - TCR approval, Handshake	xm1841							xm1842							xm1843							xm1844						
Week 3 - FA Kickoff	xm1840							xm1841							xm1842							xm1843						
Week 2 - Final Build/Delivery/Test	xm1839							xm1840							xm1841							xm1842						
Week 1 - Review/Uplink	xm1838							xm1839							xm1840							xm1841						
Week 0 - Execution	xm1837 / REX Cover Open							xm1838							xm1839							xm1840						
Activities Currently Executing	Pol OpNav	Dust Plume Search PolyCam	Pol OpNav, Dust Plume Search MapCam		Pol OpNav, REX Cover Open Att. 1			Pol OpNav	REX Cover Open Att. 2	Pol OpNav		Pol OpNav	REX Cover Open Att. 3		Pol OpNav		Pol OpNav	Phase Function	Pol OpNav			Pol OpNav AAM1	Pol OpNav, Daily Phase Function	Pol OpNav, Daily Phase Function	Pol OpNav, Daily Phase Function	Pol OpNav, Daily Phase Function	Pol OpNav, Daily Phase Function	Pol OpNav, Daily Phase Function

Observation completion forecast dates:

Task Name	DP#	MRD	Start	Finish	WOY 2018 Finish	Completed?
Dust Plume Search: PolyCam Images		142a		9/11/2018	37	
Dust Plume Search: MapCam Images		142a		9/12/2018	37	
Phase Function: MapCam Images		149abc, 158		9/27/2018	39	

Validated L2 Data available forecast dates (includes 1 weekday for Downlink)

Task Name	DP#	MRD	Start	Finish	WOY 2018 Finish	Completed?
Dust Plume Search: PolyCam Images validated		142a	9/11/2018	9/18/2018	38	
Dust Plume Search: MapCam Images validated		142a	9/12/2018	9/19/2018	38	

Science Data Product completion forecast dates:

Task Name	DP#	MRD	Start	Finish	WOY 2018 Finish	Completed?
Dust Plume Image (AP-18)	AP-18	142a	9/19/2018	9/20/2018	38	

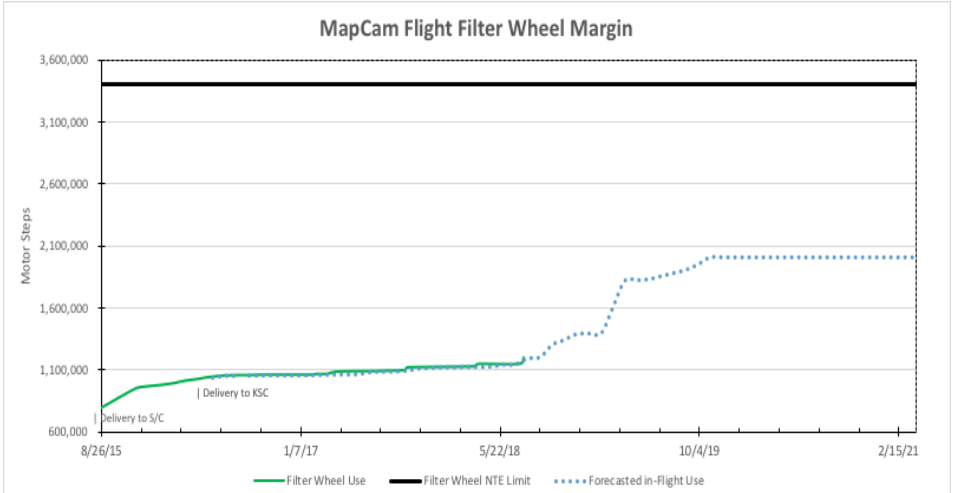
Go Backs / Additional Comments

- **Next Daily Downlink Tagup Monday (9/24).**

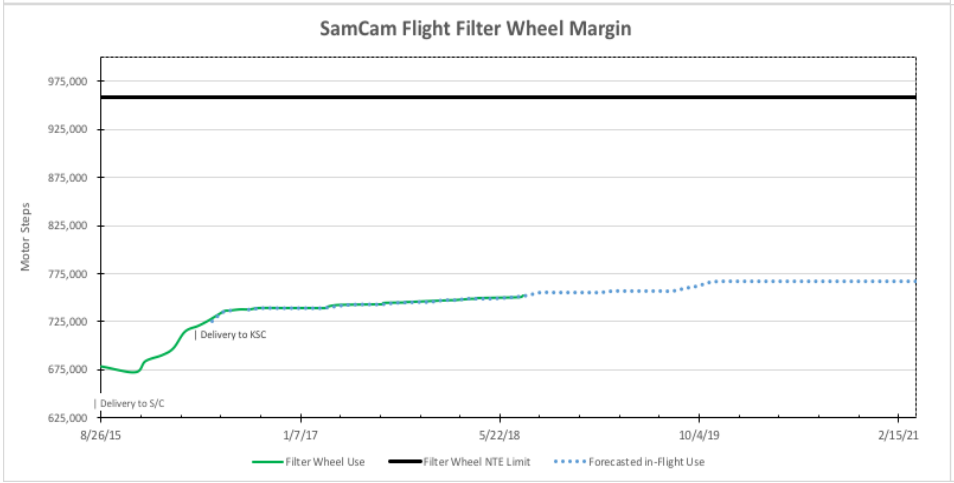
Backup

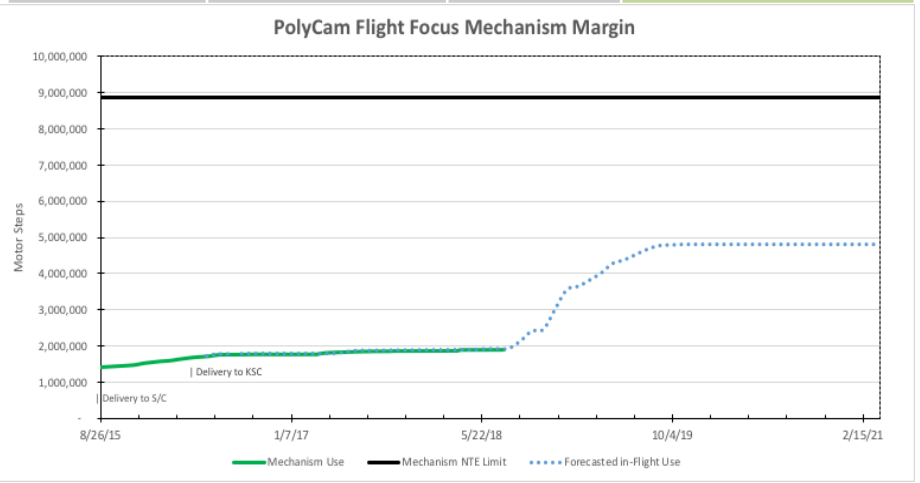
OCAMS Mechanism Life Tracking

Status as of September 14, 2018



	Launch (steps)	Flight (steps)	NTE Margin (steps)
MapCam	1,057,475	139,099	2,464,384
SamCam	738,110	14,525	265,526
PolyCam	1,775,496	167,855	6,982,365

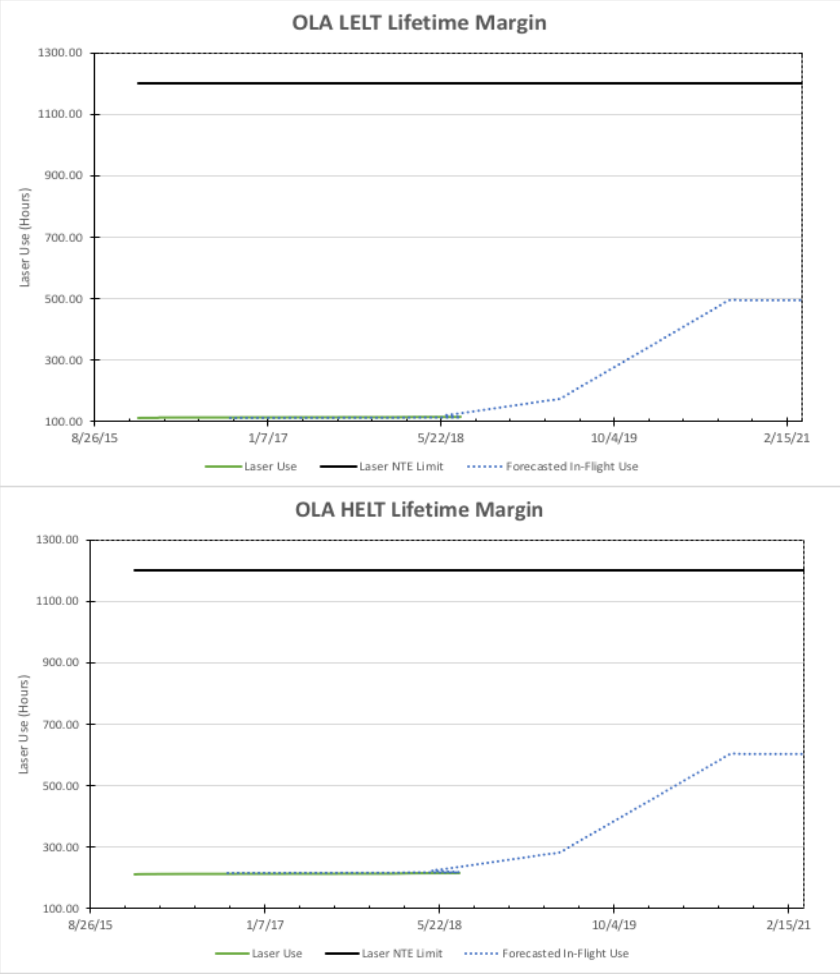




OLA Limited Life Laser Tracking

	Launch (hours)	Flight (hours)	NTE Margin (hours)
LELT	110.70	4.29	1,085.01
HELT	212.50	3.70	983.80

Status as of September 14, 2018



SPOC Watch Item List

Todays Date:	9/07/2018	SPOC Watch Item List									
Status	Date Added	Date Removed	Item ID	Instrument	Title	Watch Item Description	Impact Type	Watch Item Age	ISA # or TCR #	Watch Item Action	Watch Item Action Plan
Open	9/30/16		Item1	REXIS	CCD Hot Pixels	Some hot pixels were noted on the CCD array.	Hardware Performance	707		Watch	None as of now. If this item trends up, an assessment of masking pixels will need to be made. Update 08/06/2018: REXIS team reports that no additional hot pixels have been noted since the opening of this item, but they will continue to monitor.
Open	4/3/18		Item10	OLA	OLA T0 Intensity	L+10 day, L+6 mo, and L+10 mo On-orbit checkouts showed that OLA's T0 signal intensity (Return Intensity) is an order of magnitude lower than expected as compared with pre-launch spacecraft and stand-alone test data. The L+18 calibrations revealed that the T0 intensity is at pre-launch levels on both the Gold and Silver sides of OLA. SPOC has opted to close ISA 2257 and continue to monitor T0 intensity as a watch item.	Instrument Performance	157		Watch	Monitor the T0 Intensity at the L+22 and L+30 OLA checkouts Update 08/06/2018: Based on results from L+18 and L+22, OLA has not been able to discern a temperature dependency with t0 Intensity value. We will continue to watch, but may never fully understand the cause. OLA can still operate as expected despite the inconsistency seen in the t0 value.
Open	9/5/18		Item11	OCAMS	OCAMS Error on Polycam Startup	During power on of the OCAMS cameras there is the possibility of a 4 byte packet being created due to line noise. SPOCFLIGHT is unsure what to do with this packet, so flags it as an error. So far this has only occurred twice during flight, both times with Polycam but it is possible this could occur with any of the OCAMS cameras. As OCAMS has only been used sparingly during Cruise, it is not certain how frequently this error will occur.	Instrument Performance	2		Watch	Will monitor for future occurrences across all of the OCAMS cameras and assess if any action is warranted.

Anomaly Response & Status

ISA #	Date Created	Type	Priority	Title	Detailed Description - Action Plan	Notes	Status	Resolved Date	Need Date
5708	8/22/18	GroundMinor	Normal	FEDS not reconstructing packets that encounter a frame counter rollover	SPOC noticed a missing image line for one image. The image line had a packet in it which one of the frames within rolled over the frame counter. The packet was not reassembled and was not available from the FEDS at both LM and the SPOC.		In Progress	TBD	TBD
5855	9/5/18	Spacecraft Minor	Normal	OCAMS settings for OpNavs in Approach	The OCAMS performance specific to early Approach at low DN values warranted updates to previously delivered exposure settings in several OpNav Requests that was not necessarily expected or anticipated. This is relatively easily accommodated but is being captured more as a 'surprise' in the ISA then an anomaly or a problem, and as a place to capture the changes, the rationale for the changes, and any other implications or analyses that go with the exposure setting updates for posterity.		Draft	TBD	TBD
5854	9/5/18	Spacecraft Minor	Normal	Previously known OCAMS 'finger regions' implications on Nav solutions	Although this is not an issue for science because nominal observations are planned with pointing to avoid the finger regions when targeting or it's N/A due to the nature of the target and the scene entropy, there could be low probability but non-zero situations where the dispersion following a maneuver places Bennu in one of these less desirable locations overlapping a finger region causing bright blooming issues which can affect the center-finding algorithms. The project will likely document an acceptance of this low probability risk but the ISA is a logical place to capture any extra work, analysis, or implications this phenomenon can cause with other elements, particularly navigation.		Draft	TBD	TBD
5380	7/20/18	Ground Minor	Normal	SCLK SCET file error in rev 31	The SCLK SCET file released on July 10 (rev 31) has an error in it that results in a 5 second offset due to an incorrect incorporation of the DUT. Rev 32 is in work to replace this file and remove the incorrect entry from the sclk-scet interpolation history. On Friday, 7/20 the SPOC was notified that the SCLKSCET kernel delivered on July 10, 2018 (FILENAME: ORX_SCLKSCET.00031), did not have the inclusion of Leap Seconds, therefore resulting in an ~5 second shortage in timing. This kernel had been applied to all the L+22 data up until notification late Friday afternoon. A new SCLKSCET has been released as of this morning 07/23/18 (FILENAME: ORX_SCLKSCET.00032) with this issue corrected. Please Note: SPOC will be kicking off reprocessing of all L+22 data using ORX_SCLKSCET.00032 after the conclusion of today's DSN pass (at ~21:00 UTC) 07/23/18.		In Progress	TBD	TBD
5285	6/11/18	Ground Minor	Normal	OVIRS encountered two missed aliveness checks after a RESET	During the OVIRS L+22 BPM and LUT loads and checkouts OVIRS experience two instances of two missed Aliveness Checks. Three would have safed the instrument. This occurred after the RESET post loading of the BPM and LUT files. It did not occur after the first RESET prior to loading the files. It was consistent for both the Super Pixel 2 and 8 loads.		In Progress	TBD	9/7/18

Anomaly Response & Status

ISA #	Date Created	Type	Priority	Title	Detailed Description - Action Plan	Notes	Status	Resolved Date	Need Date
4861	5/12/18	Ground Minor	Normal	Planning Complications with Early ATL Stop	During ORT 4/5, we ran into a previously unrecognized complication of stopping a re-usable ATL early. As it processes the ATL, the FSW will load each next target at the end of the current target. The result is that if an ATL is stopped before the end of the full target list, there will be one more target loaded that will execute after the stop. (The original design of the ATL was based on absolute times so there was no plan to stop a running ATL outside of Safe Mode.) If we want to be able to stop an ATL early, the MSA needs to send the ATL Stop command in the window between the load of the last desired target (4 seconds before the target time of the penultimate target) and the load of the next target (4 seconds before the target time of the last target). This time cannot be calculated by the MSA until the MSA has received the ATF and UPBL so the load times can be resolved. Alternatively, the relative ATL could be truncated at the appropriate times to avoid this.	7/19/18: MSA has identified all needed apps, they will require implentation to close this ISA.	In Progress	TBD	TBD
4762	5/3/18	Ground Minor	Normal	JAsteroid and ATARPS FOV disagreement	JAsteroid did not show that Bennu was in the star tracker field of view but ATARPS did, even when using the same initial conditions. There is concern that this may also extend past just the ST FOV. This needs further investigation.	6/15/18: All data has been provided to MSA for analysis	In Progress	TBD	TBD

Current ISA Status

#	Status	Priority	Subject	Assignee	Updated
5855	Draft	Normal	OCAMS settings for OpNavs in Approach		9/5/18 22:07
5854	Draft	Normal	Previously known OCAMS 'finger regions' implications on Nav solutions		9/5/18 21:55
5786	In Progress	High	Corruption of local disk and OS on NavMSA iMac workstations	Michael Moreau	9/5/18 21:44
5708	In Progress	Normal	FEDS not reconstructing packets that encounter a frame counter rollover	Mark Fisher	8/23/18 12:31
5701	In Progress	Normal	Missing Downlink Table during Station 55 pass on 18229	Andy Calloway	8/23/18 12:54
5506	In Progress	Normal	TAGSAM Convoluted Tube (flex hose)	Beau Bierhaus	8/9/18 7:15
5380	In Progress	Normal	SCLK SCET file error in rev 31	Mark Fisher	7/23/18 9:48
5285	In Progress	Normal	OVIRS encountered two missed aliveness checks after a RESET	Allen Lunsford	7/19/18 9:48
4868	In Progress	Normal	Dropped data during STL run	Mike Skeen	5/25/18 9:45
4861	In Progress	Normal	Planning Complications with Early ATL Stop	Olivia Billett	8/3/18 14:40
4762	In Progress	Normal	JAsteroid and ATARPS FOV disagreement	Sandy Freund	9/5/18 21:42