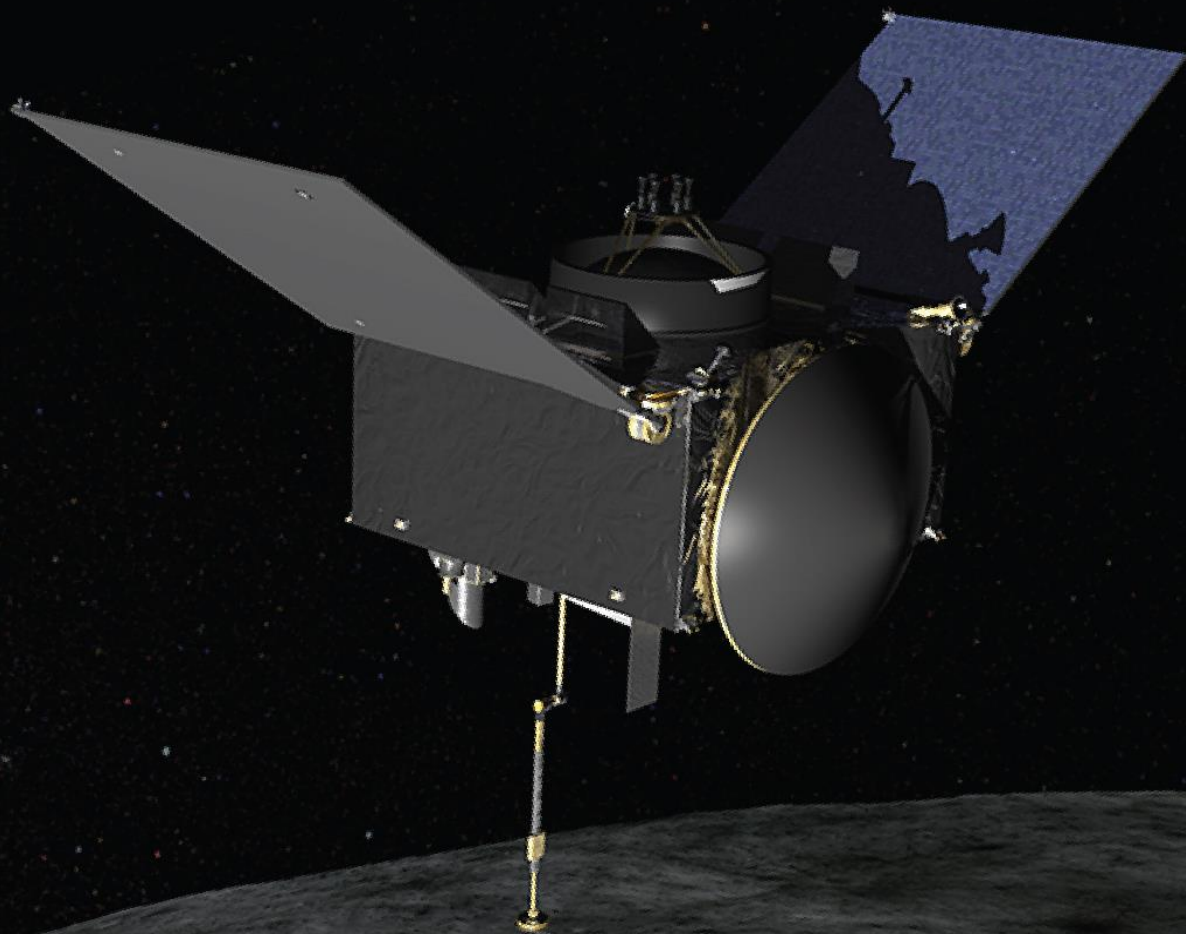




Daily Downlink Tagup

Thursday, September 27, 2018 (DOY 270)

OSIRIS-REX™
ASTEROID SAMPLE RETURN MISSION



Agenda & Logistics

- **Quicklook & Instrument Weekly 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

Team	Status	Comment
Spacecraft	G	No issues
<i>Electrical Power System</i>	G	No issues
<i>Flight Software</i>	G	No issues
<i>Fault Protection</i>	G	No issues
<i>G&NC</i>	G	No issues
<i>Mechanisms</i>	G	No issues
<i>Propulsion</i>	G	No issues
<i>Telecom</i>	G	No issues
<i>Thermal</i>	G	No issues
<i>Payload Interfaces</i>	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
39	267	2018-09-24	15:30	2018-09-24	18:15	02:45	COMPLETE
39	268	2018-09-25	15:30	2018-09-25	17:30	02:00	COMPLETE
39	269	2018-09-26	15:30	2018-09-27	18:35	03:05	COMPLETE
39	270	2018-09-27	n/a	2018-09-27	n/a	00:00	<i>No scheduled DSN Pass</i>
39	271	2018-09-28	15:00	2018-09-28	20:00	05:00	
39	272	2018-09-29	14:20	2018-09-29	17:15	02:55	
39	273	2018-09-30	14:25	2018-09-30	20:00	05:35	

DSN Notes:

- RED EQUIPMENT STATUS: SPC/DSS EQUIPMENT ETRO -----
DSS25 AWVR 271/2300z
DSS43 S400KW 275/0630z
SPC60 VSR 300/1648z

Approach: OpNavs & MapCam Full Phase Function Part 1

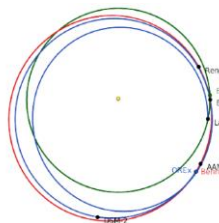
WOY 39

Monday (09/24) Template AP4: OpNav and/or Daily Phase Function Day																								Tuesday (09/25) Template AP4: OpNav and/or Daily Phase Function Day																								Wednesday (09/26) Template AP4: OpNav and/or Daily Phase Function Day																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
HGA Pass: 5-7 Hour																								DDOR window																								HGA Pass: 5-7 Hour																							
DSN 1530-1815 54																																																DSN 1530-1730 65 *2hr*																							
Earth Pt																								Earth Pt																								Earth Pt																							
OCAMS																																																opn_atl_18269a_01.af Start:07:10:22, End:07:46:00																							
OTES																																																																							
OVIRS																																																																							
OLA																																																																							
REXIS																																																																							
NAVCAM																																																																							

We are HERE

Thursday (09/27) AP1: Nominal Science Day																								Friday (09/28) Template AP4: OpNav and/or Daily Phase Function Day																								Saturday (09/29) Template AP4: OpNav and/or Daily Phase Function Day																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DDOR window																								HGA Pass: 5-7 Hour																								DDOR window																							
ATL: 6 Hour, includes OpNav																								NO DSN HGA TIME																								HGA Pass: 5-7 Hour																							
																																																DDOR 0110-0210 24/36 N/S																							
																																																DSN 1500-2000 65 AAM uplink opportunity																							
Phase Function																								sc1_atl_18270a_01.af Start 04:01:25, End 09:09:08																								Earth Pt																							
OCAMS																																																opn_atl_18269a_01.af Start:07:10:22, End:07:46:00																							
OTES																																																																							
OVIRS																																																																							
OLA																																																																							
REXIS																																																																							
NAVCAM																																																																							

Saturday (09/30)																								Sunday (09/30) Template AP4: OpNav and/or Daily Phase Function Day																								Monday (10/01) APS: Maneuver Day, with OpNav and/or Daily Phase Function																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
HGA Pass: 5-7 Hour																								DDOR window																								HGA Pass: 5-7 Hour																							
DSN 1420-1715 65 AAM uplink opportunity																								DDOR 0115-0215 14/34 N/S																								DSN 1425-2000 54																							
Earth Pt																								Earth Pt																								Earth Pt																							
OCAMS																																																opn_atl_18269a_01.af Start:06:55:00, End:07:31:00																							
OTES																																																Call ocams_pwr_off_iv_xfer_ep02_ocams+YES;XFER NET 11:00:11:130																							
OVIRS																																																																							
OLA																																																																							
REXIS																																																																							
NAVCAM																																																																							



Statistics as of September 26, 2018, L+748 days

- Days until Arrival: 68 days
- Earth Range = 126,000,000 km (0.84 AU) (↑)
- Sun Range = 174,000,000 km (1.16 AU) (↓)
- Bennu Range = 431,000 km (↓)
- Sun-Probe-Earth Angle = 56.3 deg (↓)
- One Way Light Time = 00:07:01 hh:mm:ss (↑)
- Round Trip Light Time = 00:14:03 hh:mm:ss (↑)
- (↑ increasing, ↓ decreasing)

Approach: AAM1, potential AAM1 C1, Daily Phase Function WOY 40

	Monday																							Tuesday																							Wednesday																						
	274 (1001) APS: Maneuver Day, with OpNav and/or Daily Phase Function																							275 (1002) Template AP4: OpNav and/or Daily Phase Function Day																							276 (1003) Template AP4: OpNav and/or Daily Phase Function Day																						
Template	HGA 5-7 Hr																							DDOR window																							DDOR window																						
Sci Plan	Burn																							A																							A																						
S/C Pointing																								Earth Pt																							Earth Pt																						
OCAMS																								ocams_ptr_on'03:50																							ocams_ptr_on'03:50																						
OTES																																																																					
OVIRES																																																																					
OLA																																																																					
REXIS																																																																					
NAVCAM																																																																					
	AAM1																							DSN 1530-1930 65																							DDOR 0100-0200 25/36 N/S																						
	1420-1955 55, Dual receivers																																														1415-2000 54																						
																								OCAMS MapCam Daily Phase Function (9 images)																							OCAMS MapCam Daily Phase Function (9 images)																						
																																															u/l ephem with AAM1 reconstruct, OpNav d/I for AAM2 prelim design																						

	Thursday																							Friday																						
	277 (1004) Template AP4: OpNav and/or Daily Phase Function Day																							278 (1005) Template AP4: OpNav and/or Daily Phase Function Day																						
Template	DDOR window																							DDOR window																						
Sci Plan	A																							A																						
S/C Pointing																								Earth Pt																						
OCAMS																								ocams_ptr_on'03:50																						
OTES																																														
OVIRES																																														
OLA																																														
REXIS																																														
NAVCAM																																														
	HGA Pass: 5-7 Hour																							HGA Pass: 5-7 Hour																						
	DSN 1500-1830 65																							DDOR 0200-0300 24/36 N/S																						
	AAM C1 u/l opportunity																																													
	OCAMS MapCam Daily Phase Function (9 images)																							OCAMS MapCam Daily Phase Function (9 images)																						
																								AAM1 backup mnvr, elevate to L3 if needed																						
																								u/l ephem with AAM1 reconstruct																						
																								Potential AAM1 C1																						

	Saturday											Sunday											Monday										
	279 (1006) Template AP4: OpNav and/or Daily Phase Function Day											280 (1007) Template AP4: OpNav and/or Daily Phase Function Day											281 (1008) Template AP4: OpNav and/or Daily Phase Function Day										
Template	DDOR window											DDOR window											DDOR window										
Sci Plan	A											A											A										
S/C Pointing												Earth Pt											Earth Pt										
OCAMS												ocams_ptr_on'03:50											ocams_ptr_on'03:50										
OTES																																	
OVIRES																																	
OLA																																	
REXIS																																	
NAVCAM																																	
	HGA Pass: 5-7 Hour											HGA Pass: 5-7 Hour											HGA Pass: 5-7 Hour										
	DSN 1610-2000 65											DDOR 0155-0255 25/35 N/S											DSN 1500-1955 55										
																							DDOR 0100-0135 25/34 N/S (truncated)										
	OCAMS MapCam Daily Phase Function (9 images)											OCAMS MapCam Daily Phase Function (9 images)											OCAMS MapCam Daily Phase Function (9 images)										
																							ocams_ptr_on'03:50										

Uplink Summary

UPLINK

WOY 39 (2018/267 – 2018/274)

- xm1839 BGSeq and Sci Genies [uplinked 2018-264/14:49](#)

WOY 40 (2018/274 – 2018/281)

- xm1840 BGSeq and Sci Genies to be uplinked NET [2018-271](#)

Execution Summary

- **Instrument Status:**

- OCAMS is powered-on
- All other payloads remain powered off

Executed (times in UTC):

- **2018/269 (Wednesday, Sept 26)**
 - 18 PolyCam opnav images (# of images expected=18 / # of images received=18)
- **2018/270 (Thursday, Sept 27)**
 - Full Phase Function
 - Cycling through the Pan & Color filters for 4.5 hours
 - 735 MapCam Images

Up Next (times in UTC):

- **2018/271 (Friday, Sept 28)**
 - 18 PolyCam opnav images
- **2018/274 (Monday, Oct 1)**
 - 18 PolyCam opnav images
 - OCAMS powered off for AAM1

Downlink Summary

Current Data Rate: 916 kbps

DOWNLINK

- Expected Partition Fill going into next scheduled pass (DOY 271)

	Part. Start Vol (MB)	New Data Vol (MB)	New Data Vol (Mb)	Expected Partition Fill (%)	Current Partition Fill (%)	Comments
<i>OpNav</i>	0.00	40.32	322.56	5.76	0.00	
<i>OTES</i>	0.00	0.00	0.00	0.00	0.00	
<i>REXIS</i>	0.00	0.00	0.00	0.00	0.00	
<i>OLA</i>	0.00	0.00	0.00	0.00	0.00	
<i>OVIRS</i>	0.00	0.00	0.00	0.00	0.00	
<i>OCAMS</i>	0.00	1740.00	13920.00	47.0	0.00	We expect that this data should be down by end of pass 9/29
<i>Tagcams/Overflow</i>	0.00	0.00	0.00	0.00	0.00	

List of Unexpected Alarms, Watch Items, ISAs, PFRs

Alarms

Watch Items, ISA's and PFR's

- **PFR-27:**
 - Title: OpNav Image Processing Failure
 - Description: The DOY 267 OpNav images that were expected to be received were not immediately processed by Ingest. When Ingest attempted to insert an OCAMS Image Header line, the relevant database index failed, causing all of the image header packets to be marked in the ERROR state.
 - Status: In Work

Need for Retransmit? Need for Replay?

- **DOY 270**
 - No downlink

Science Status and/or PI Status

Looking Ahead

	2018																											
	39							40							41							42						
	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294
	9/24	9/25	9/26	9/27	9/28	###	###	10/1	10/2	10/3	10/4	10/5	###	###	10/8	10/9	10/10	10/11	10/12	###	###	10/15	10/16	10/17	10/18	10/19	###	###
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	xm1847							xm1848							xm1849 - Pre Surv Wk 1							xm1850 - Pre Surv Wk 2						
Week 7 - SOS	xm1846							xm1847							xm1848							xm1849 - Pre Surv Wk 1						
Week 6 - J-A 1	xm1845							xm1846							xm1847							xm1848						
Week 5 - J-A 2	xm1844							xm1845							xm1846							xm1847						
Week 4 - TCR approval, Handshake	xm1843							xm1844							xm1845							xm1846						
Week 3 - FA Kickoff	xm1842							xm1843							xm1844							xm1845						
Week 2 - Final Build/Delivery/Test	xm1841							xm1842							xm1843							xm1844						
Week 1 - Review/Uplink	xm1840							xm1841							xm1842							xm1843						
Week 0 - Execution	xm1839							xm1840							xm1841							xm1842						
Activities Currently Executing	Pol OpNav		Pol OpNav	Phase Function	Pol OpNav			Pol OpNav	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	Pol OpNav, Daily Phase Function, REX CXB Cal	Pol OpNav, Daily Phase Function, REX CXB Cal	Pol OpNav, Light Curve	Pol OpNav, Light Curve	Pol OpNav, Daily Phase Function	Pol OpNav, Daily Phase Function	Msp OpNav, Phase Function	Msp 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	AP-18	142a		9/11/2018	37	Yes - All 93 images received
Dust Plume Search: MapCam Images	AP-18	142a		9/12/2018	37	Yes - All 93 images received
Phase Function: MapCam Images	AP-14, AP-15, AP-19, IP-13	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	In Progress
Dust Plume Search: MapCam Images validated		142a	9/12/2018	9/19/2018	38	In Progress

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	

*AP-14, AP-15, AP-19 scheduled to complete 11/22/18

*IP-13 scheduled to complete in Orbital B 6/28/19

Go Backs / Additional Comments

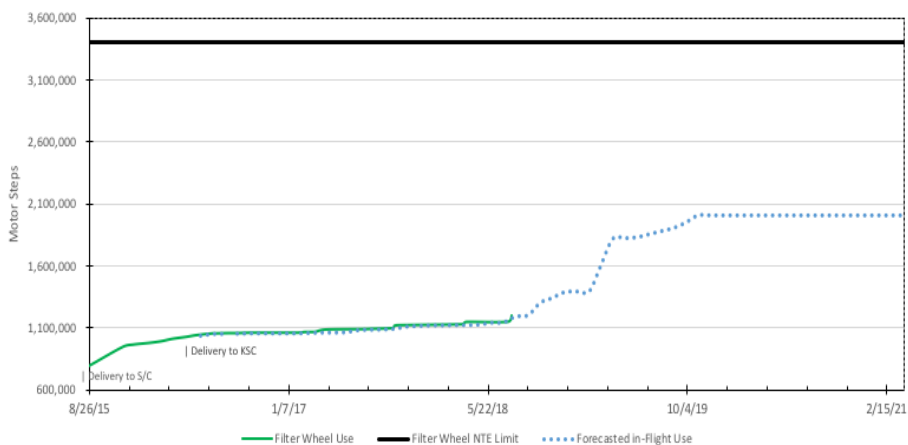
- **Next Daily Downlink Tagup is tomorrow (9/28) at 19:30 UTC.**

Backup

OCAMS Mechanism Life Tracking

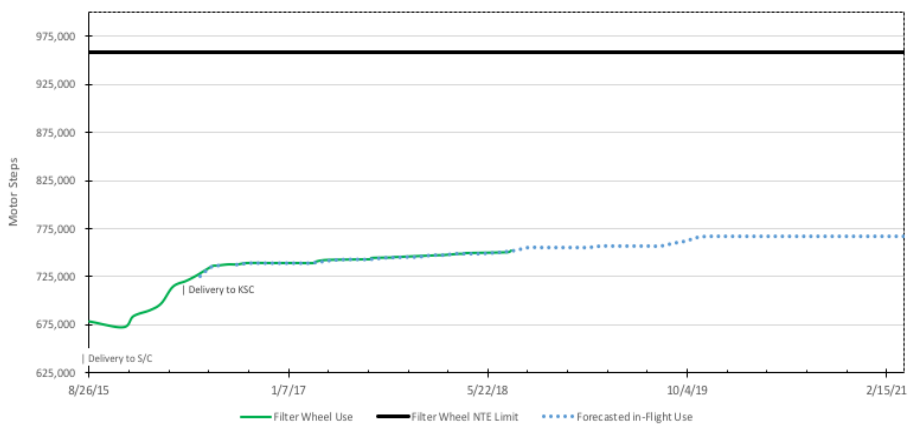
Status as of September 21, 2018

MapCam Flight Filter Wheel Margin

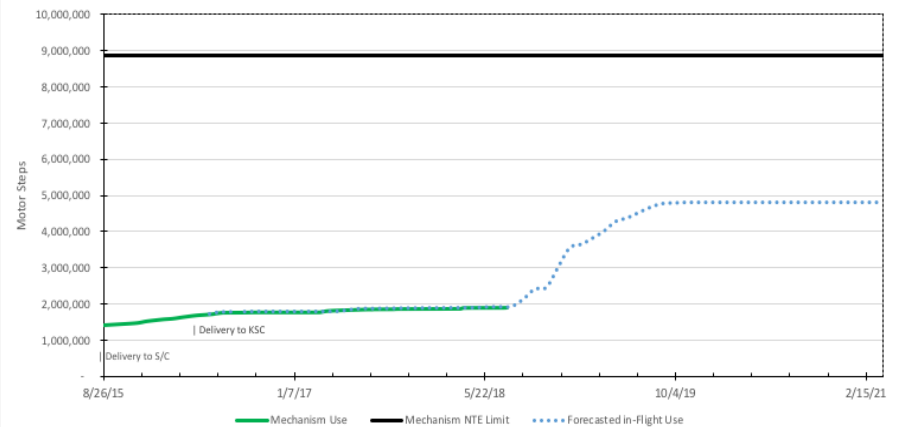


	Launch (steps)	Flight (steps)	NTE Margin (steps)
MapCam	1,057,475	139,099	2,464,384
SamCam	738,110	14,525	265,526
PolyCam	1,775,496	172,723	6,977,497

SamCam Flight Filter Wheel Margin



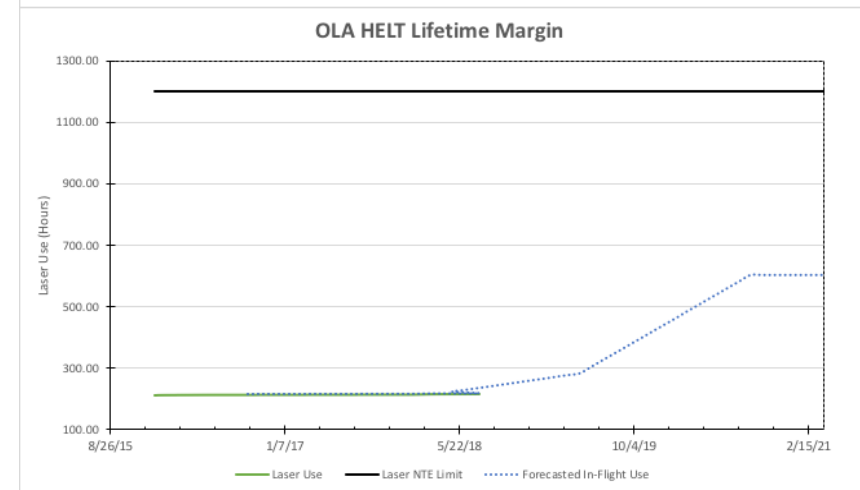
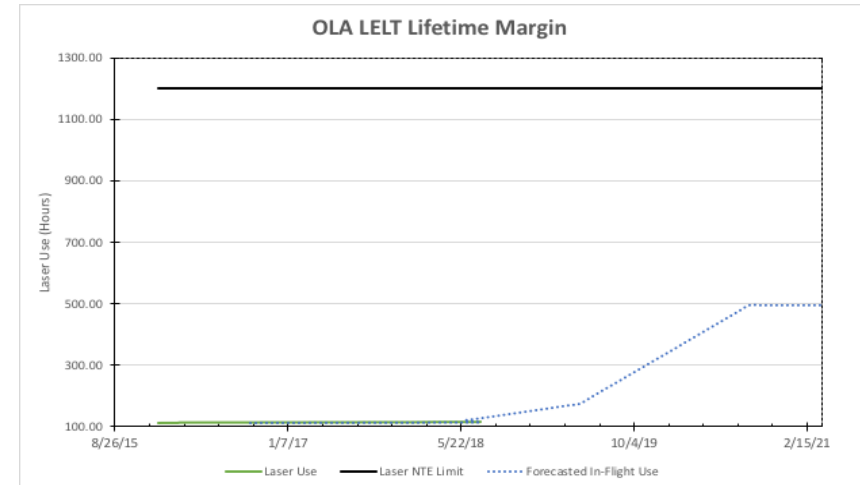
PolyCam Flight Focus Mechanism Margin



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 21, 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	Ground/Minor	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	<p>During ORT 4/5, we ran into a previously unrecognized complication of stopping a re-usable ATL early.</p> <p>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.)</p> <p>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.</p>	7/19/18: MSA has identified all needed apps, they will require implementation 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