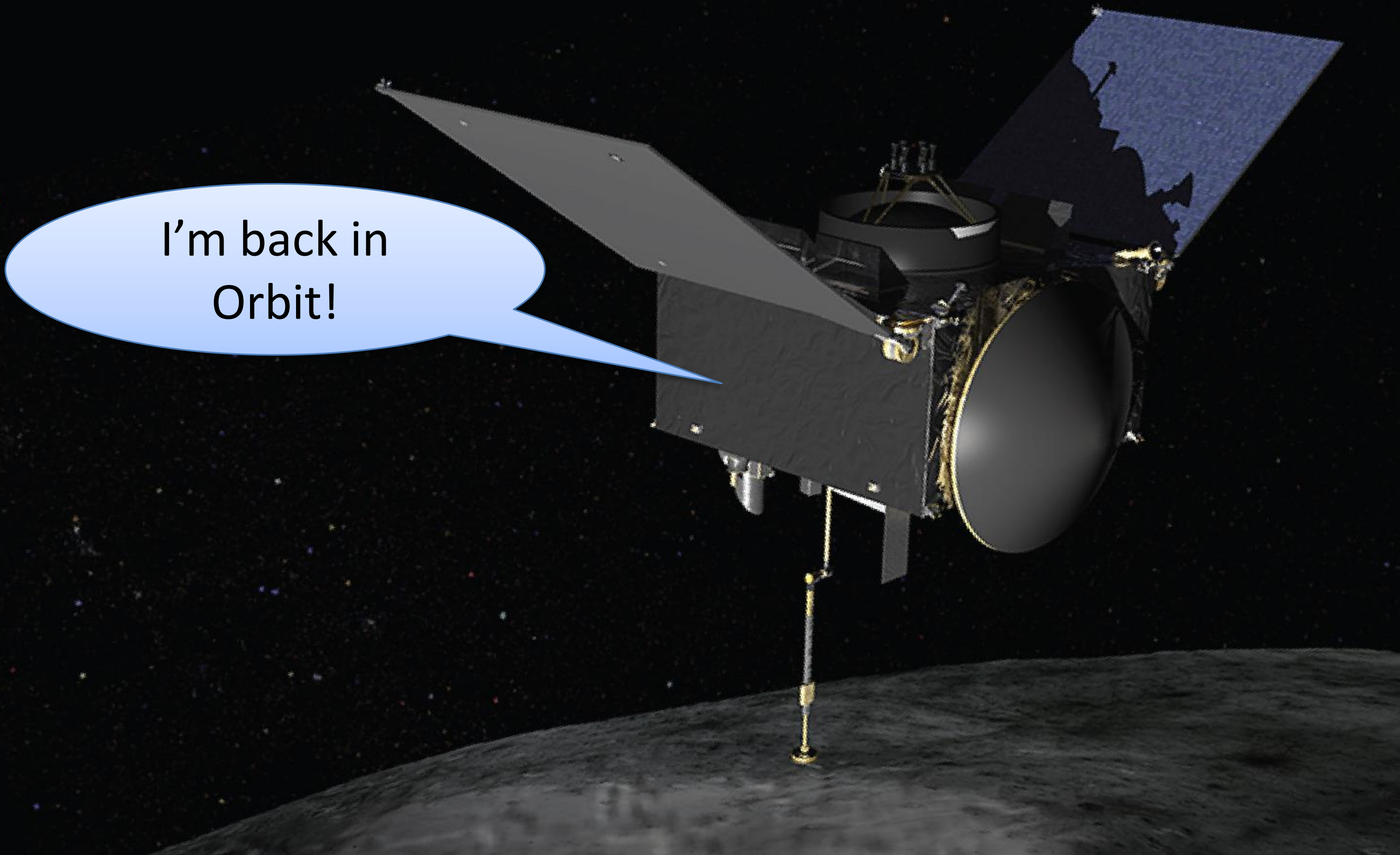
Daily Downlink Tagup

Friday, June 14, 2019 (DOY 165)

OSIRIS-REx™

ASTEROID SAMPLE RETURN MISSION



Agenda & Logistics

- **Quicklook**
- **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 Summaries available shortly after each Tagup at on the OREx Ops Wiki:
https://orexwiki.lpl.arizona.edu/wiki/Main_Page (LDAP login)

Daily Downlink Slides available shortly after each Tagup at:
OSIRIS-REx Bennu Proximity Operations/Science Implementation/Downlink_Daily_Summary/2019

Quicklook & Weekly 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										**OFF**	**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
23	160	2019-06-09	14:20	2019-06-09	20:37	6:17	***Crit 2 OpNavs COMPLETE***
24	161	2019-06-10	14:05	2019-06-10	20:37	6:32*	***IN PROGRESS*** *M2B will reduce downlink duration by 1 hour
24	162	2019-06-11	14:44	2019-06-11	19:30	4:32	***Crit 2 OpNavs COMPLETE***
24	163	2019-06-12	14:05	2019-06-12	20:37	6:32*	*M3B will reduce downlink duration by 1 hour ***COMPLETE***
24	164	2019-06-13	14:05	2019-06-13	20:35	6:30	***Crit 3 OpNavs COMPLETE***
24	165	2019-06-14	14:05	2019-06-14	20:15	6:10	***IN PROGRESS***
24	166	2019-06-15	14:05	2019-06-15	18:37	4:32	
24	167	2019-06-16	N/A	2019-06-16	N/A	0:00	
24	168	2019-06-17	20:10	2019-06-17	20:37	0:27	*Madrid Asbestos Mitigation – No Science Downlink

DSS35/ORX 165/0855Z DR C114334 Unknown/RRT8 Entered 165/0903Z 0008 Originating Site:MDSCC

- Difficulties achieving 1 way carrier after dropping lock from 2 way. No signal present in the FFT. Several carrier loop resets, reloaded predicts to no avail until 090342z.

  DOP1 LOST 8

RED EQUIPMENT STATUS:

SPC/DSS	EQUIPMENT	ETRO
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SPC60	MCD3-1	169/1428z
DSS54	NDA	169/1530z
SPC60	DCC5	169/1837z
DSS14	X500kw-R	172/2300z
SPC10	RSR2	172/2300z
SPC60	VSR	350/1648z
DSS63	EAC	355/1621z

Transition to Orbital B – OpNav Imaging, M2B, M3B
WOY 24

Mission stats as of 2019-06-05 (L+1001):

- Earth Range: 0.96 AU (↑)
- Sun Range: 1.27 AU (↑)
- Bennu Range: 8.9 km (Starting 6:00pm Equatorial Station)
- One Way Light-Time: 7’59” (↑)

Particle Imaging and OpNavs
WOY 25

June 12, 2019
L+1007 days
Earth Range = 151,000,000 km (1.01 AU) (↑)
Sun Range = 192,000,000 km (1.28 AU) (↑)
Bennu Range = 4.3 km (Transitioning to ~1km circular orbit)
Sun-Probe-Earth Angle = 50.8 deg (↓)
One Way Light Time = 00:08:25 hh:mm:ss (↑)
Round Trip Light Time = 00:16:50 hh:mm:ss (↑)

Uplink Summary

UPLINK

WOY 25 (2019-168 – 2019-175)

- BG Seq, Sci Genies, Payload Sequences uplinked 2019-165

Ephemeris Updates

- Ephemeris Update: od153 uplinked 2019-165

Other Files

M3B Quicklook Report

OSIRIS-REx Nav Team Maneuver Quick-look Error Report
Report Date: 12-Jun-2019 21:52:12 UTC
M3B

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Nominals:
Nav Design Times:
12-JUN-2019 19:31:42.111 [UTC] Start time at spacecraft
12-JUN-2019 19:31:50.678 [UTC] End time at spacecraft
12-JUN-2019 19:40:09.537 [UTC] Start time at Earth
12-JUN-2019 19:40:18.104 [UTC] End time at Earth
6.494 [cm/s] Total Magnitude
312.739 [deg] RA
60.853 [deg] Dec
8.567 [s] Duration (Nav Design)
111.310 [deg] Look angle
89.164 [deg] Angle from heliocentric velocity vector
507.426 [s] One-way light time
8.446 [GHz] Received downlink frequency, 2-way tracking
0.056 [Hz per mm/sec] Conversion factor
-0.024 [m/s] Delta-range rate
-1.330 [Hz] Expected Doppler shift seen by DSN

Actuals:
-1.319 [Hz] Actual Doppler shift seen by DSN
6.442 [cm/s] Delta-V magnitude, given perfect pointing
-0.051 [cm/s] Delta-V magnitude error, given perfect pointing
-0.792 [%] Percentage Delta-V magnitude error, given perfect pointing
111.133 [deg] Look angle, given perfect magnitude
-0.177 [deg] Look angle error, given perfect magnitude

Execution Summary

Executed (times in UTC):

- 2019/161 (Monday, June 10)
  - Nadir+1-deg Offset OpNav Only (One NavCam pair + One MapCam Opnav/ 2 hrs)
    - » # of NavCam images expected/**received** : 24 / **24**
    - » # of MapCam images expected/**received** : 8 / **8**
- 2019/162 (Tuesday, June 11)
  - Nadir+1-deg Offset OpNav Only (One NavCam pair + One MapCam Opnav/ 2 hrs) **Criticality 2 OpNavs**
    - » # of NavCam images expected/**received** : 16 **/ 16**
    - » # of MapCam images expected/**received** : 8 **/ 8**
- 2019/163 (Wednesday, June 12)
  - M3B begins at 20:00:00 UTC
  - Nadir+1-deg Offset OpNav Only (One NavCam pair + One MapCam Opnav/ 2 hrs)
    - » # of NavCam images expected/**received** : 16 **/ 16**
    - » # of MapCam images expected/**received** : 8 **/ 8**
    - » **OCAMS Powered OFF**
- 2019/164 (Thursday, June 13)
  - Nadir+1-deg Offset OpNav Only (3x1 Tagcams Landmark OpNavs/ 2 hrs)
    - » # of NavCam images expected/**received** : 21 / **21**
- 2019/165 (Friday, June 14)
  - Nadir+1-deg Offset OpNav Only (3x1 Tagcams Landmark OpNavs / 2 hrs)
    - » # of NavCam images expected/**received** : 24 / **24**

Up Next (times In UTC):

- 2019/166 (Saturday, June 15)
  - Nadir+1-deg Offset OpNav Only (Nadir Tagcams Landmark OpNavs/ 2 hrs)
    - » # of NavCam images expected/**received** : 9
  - LIDAR Limb Crossing Calibration pt 1
- 2019/167 (Sunday, June 16)
  - Nadir+1-deg Offset OpNav Only (Nadir Tagcams Landmark OpNavs/ 2 hrs)
    - » # of NavCam images expected/**received** : 7
  - LIDAR Limb Crossing Calibration pt 2
- 2019/168 (Monday, June 17)
  - Nadir+1-deg Offset OpNav Only (Nadir Tagcams Landmark OpNavs / 2 hrs)
    - » # of NavCam images expected/**received** : 7

Downlink Summary

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

Downlink

- Today's Partition Status :

	Part. Start Vol (MB)	New Data Vol (MB)	Partition Fill (MB)	Expected Partition Fill (%)	Current End Partition (%)	Comments
OpNav	0.00	265.00	265.00	37.86%	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	0.00	0.00	0.00%	0.00%	
Tagcams/Overflow	0.00	0.00	3.51	0.44%	0.00%	

Downlink Summary

- ***Tomorrow's Data Rate: 916 kbps***

Downlink

- Tomorrow's Expected Partition Status :

	Part. Start Vol (MB)	New Data Vol (MB)	Partition Fill (MB)	Expected Partition Fill (%)	Expected End Partition (%)	Comments
OpNav	0.00	99.37	99.37	14.20%	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	0.00	0.00	0.00%	0.00%	
Tagcams/Overflow	0.00	0.00	3.51	0.44%	0.00%	

Downlink Summary

- ***Sunday's Data Rate: No Science Downlink***

Downlink

- Sunday's Expected Partition Status :

	Part. Start Vol (MB)	New Data Vol (MB)	Partition Fill (MB)	Expected Partition Fill (%)	Expected End Partition (%)	Comments
OpNav	0.00	77.29	77.29	11.04%	11.04%	
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	0.00	0.00	0.00%	0.00%	
Tagcams/Overflow	0.00	0.00	3.51	0.44%	0.44%	

Need for Retransmit? Need for Replay?

- None

List of Unexpected Alarms, Watch Items, ISAs, PFRs

Unexpected Alarms

- None

New or Updated Watch Items, ISA's and PFR's

- **ISA # 10201 - RW3 Digital Tach Variance & Low Voltage Red Alarms**
  - ISA Status: In Progress
  - ISA Type: Spacecraft minor
  - ISA Criticality: 3 – minimal impact
- **ISA #10004 - 1923 ote_spacecal_002 missing from payload bundle and weeklong softsim**
  - ISA Status: In Progress
  - ISA Type: Ground Minor
  - ISA Criticality: 3 – minimal impact
- **ISA # 9931 – TAGCAMS safed on DOY 142 (2019)**
  - ISA Status: **Resolved**
  - ISA Type: Spacecraft minor
  - ISA Criticality: 3 – minimal impact
- ~~**ISA # 9895 – SPOC systems down 5/20/19**~~
  - ~~ISA Status: Closed~~
  - ~~ISA Type: Ground Major~~
  - ~~ISA Criticality: 2 – significant impact~~
- **ISA # 9704 - 4 Uplinks Failed in Full-Duration SS Test**
  - ISA Status: **Monitor**
  - ISA Type: Ground Minor
  - ISA Criticality: 4 – no significant impact
- **ISA # 9628 – Red alarm notifications were not received by MSA personnel for the TAGCAMS safing event**
  - ISA Status: In Progress
  - ISA Type: Ground Minor
  - ISA Criticality: 3 – minimal impact
- ~~**ISA # 9318 – OCAMS OpNavs in WOY 16 Science ATF had Wrong Exposure Time**~~
  - ~~ISA Status: Closed~~
  - ~~ISA Type: Ground Minor~~
  - ~~ISA Criticality: 4 – no significant impact~~
- **ISA #8913 – Products Sent Outside Uplink Window (preceding the window start)**
  - ISA Status: Resolved
  - ISA Type: Ground minor
  - ISA Criticality: 4 – no significant impact
- **ISA # 8809 – SPOC FEDS to SPOCFLIGHT data delivery drop outs**
  - ISA Status: In Progress
  - ISA Type: Ground minor
  - ISA Criticality: 3 – minimal impact
- **ISA # 8767 - Re-occurrence: STL intermittent downlink issues during setup**
  - ISA Status: In Progress
  - ISA Type: Ground minor
  - ISA Criticality: 3 – minimal impact

Science Status and/or PI Status

Looking Ahead

24							25							26							27						
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188
6/10	6/11	6/12	6/13	6/14	###	###	6/17	6/18	6/19	6/20	6/21	###	###	6/24	6/25	6/26	6/27	6/28	###	###	7/1	7/2	7/3	7/4	7/5	7/6	7/7
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

xm1929 - Orbit B Global Week 3	xm1930 - Orbit B Global Week 4	xm1931 - Orbit B Global Week 5	xm1932 - Orbit C (Opnav, Particle Img Only)
xm1928 - Orbit B Global Week 2	xm1929 - Orbit B Global Week 3	xm1930 - Orbit B Global Week 4	xm1931 - Orbit B Global Week 5
xm1927 - Orbit B Global Week 1	xm1928 - Orbit B Global Week 2	xm1929 - Orbit B Global Week 3	xm1930 - Orbit B Global Week 4
xm1926 - Orbit B Particle Imaging 2	xm1927 - Orbit B Global Week 1	xm1928 - Orbit B Global Week 2	xm1929 - Orbit B Global Week 3
xm1925 - Orbit B Particle Imaging 1	xm1926 - Orbit B Particle Imaging 2	xm1927 - Orbit B Global Week 1	xm1928 - Orbit B Global Week 2
xm1924 - OpNav, PMon Only (3x1 mosaics)	**xm1925 - Orbit B Particle Imaging 1**	**xm1926 - Orbit B Particle Imaging 2**	**xm1927 - Orbit B Global Week 1**

Looking Ahead – Science Observation Forecast

https://orexwiki.lpl.arizona.edu/wiki/Detailed_Survey

Task Name	Related DP #	MRD	Baseline Finish	WOY BL Finish
No Science Observations in Timeframe				2019-24
No Science Observations in Timeframe				2019-25
No Science Observations in Timeframe				2019-26

Go Backs / Additional Comments

- STM 15 starts Monday. This is the most critical STM yet for OSIRIS-REx.
- There will be no Daily Downlink Tagup on Wednesday, 6/19, but we will plan to tagup briefly on Monday and Friday
- See many of you next week!

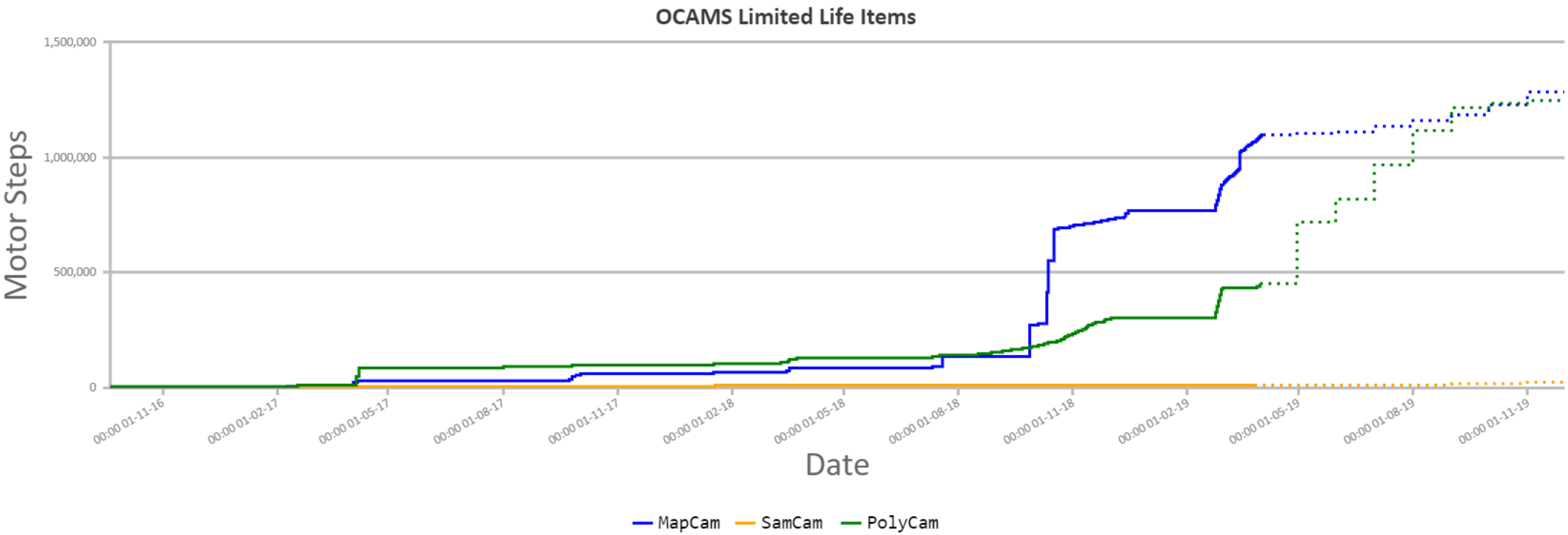
Instrument Weekly Status

- **OCAMS (Bashar) - everything’s nominal**
- **OLA (Emily) - off, nominal**
- **OTES (Chris) - off, nominal**
- **OVIRS (Amy) - off, nominal**
- **REXIS (Maddie) - off, nominal**

OCAMS Mechanism Life Tracking

	Launch (steps)	Flight (steps)	NTE (steps)
MapCam	1057475	1583532	3400320
SamCam	738110	15246	958384
PolyCam	1775496	462567	8876160

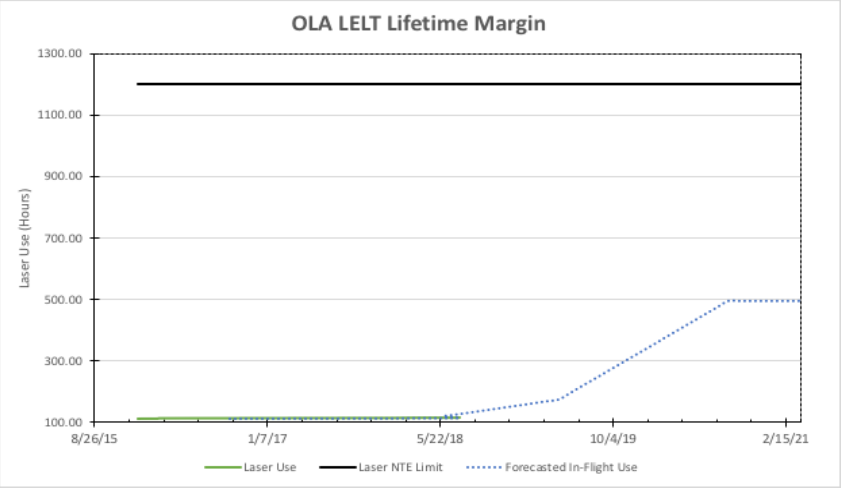
Status as of May 31, 2019

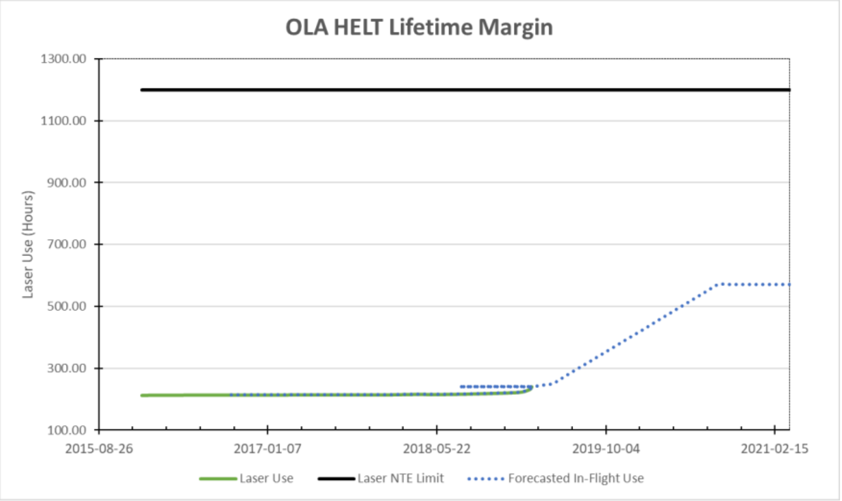


OLA Limited Life Laser Tracking

	Launch (hours)	Flight (hours)	NTE Margin (hours)
LELT	110.70	4.29	1,085.01
HELT	212.50	87.83	983.80

Status as of May 31, 2019
OLA Downlink Report WOY 21





SPOC Watch Item List

Todays Date:	06/10/2019	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	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	433		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. Update 5/9/2019: The OLA Team continues to monitor the T0 intensity. Since it was first detected, the behavior of the HELT laser has remained constant through Orbital A and Detailed Survey. At this time, our recommendation is to maintain this item on the watch list through (at least) Orbital-B so as to observe behavior of the second laser (LELT).
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	278		Watch	Will monitor for future occurances across all of the OCAMS cameras and assess if any action is warranted. Update 5/7/2019: We are continuing to monitor this behavior. We have seen this issue crop up all when powering on PolyCam.

Anomaly Response & Status

ISA #	Date Created	Type	Priority	Title	Detailed Description - Action Plan	Notes	Status	Resolved Date	Need Date
10004	5/24/19	Ground minor	Normal	1923 ote_spacecal_002 missing from payload bundle and weeklong softsim	The 1923 SS test revealed ote_spacecal_002 was missing from our uplink product set for the week. As we started digging, we noticed it was not explicitly included in the UPBL under “Previously delivered sequences”. This has been true for the past couple of weeks, and somehow the engineers added it without the explicit call out in the UPBL. Unfortunately, this time it did not get included in the payload bundle for the week.		In Progress	TBD	TBD
9931	5/22/19	Spacecraft Minor	Normal	TAGCAMS Safed on DOY 142 (2019)	TAGCAMS was marked failed and powered off by the aliveness Fault Protection check on DOY 142. Below are the times associated with the failure: 19/142-12:40:14 - First aliveness count 19/142-12:42:15 - Persistence of 3 reached, TAGCAMS marked failed and safing block loaded (NFT was also marked failed as a side effect) 19/142-12:42:25 - TGM_MAIN_PWR off		In Progress	TBD	TBD
9895	5/21/19	Ground Major	High	SPOC systems down 5/20/2019	SPOC servers went down due to an unknown reason at approximately 20:40 on 5/2/19. This caused email and all other systems to cease functioning.		In Progress	TBD	TBD
9628	5/4/19	Ground minor	Normal	Red alarm notifications were not received by MSA personnel for the TAGCAMS safing event	Red alarm text messages and/or e-mails were not received for any of the red alarms that occurred on board due to the TAGCAMS safing event on DOY 124.		In Progress	TBD	TBD
8809	3/25/19	Ground minor	Normal	SPOC FEDS to SPOCFlight data delivery drop outs	OPnav group has reported: Data delivery drop outs for NavCam OpNavs from 3/24 2300 and 3/25 0100 epochs, and MapCam OpNavs from 3/24 2300 and 3/25 0100 and 0300 epochs. This data showed up on the SPOC FEDS but not on SPOCFlight. Initial replays were attempted but did not resolve the issue, which is expected given that the data was on the FEDS.		In Progress	TBD	TBD
7704	1/10/19	Spacceraft Major	Normal	Potential particles detected in NavCam images while in Bennu Orbit-A Phase	Investigation and detailed image analysis are underway to determine if particles detected in a pair of NavCam images taken on 01/06/19 may have originated from Bennu (or from other causes such as cold traps on the spacecraft, cosmic rays, etc.) MPB convened to determine if it was safe for the spacecraft to remain in orbit and agreed to remain in orbit but to collect more data for the remaining weeks of the orbit phase as a precaution. The details of the additional and more efficient and targeted observations are being worked.		In Progress	TBD	TBD
7518	1/4/19	Ground Major	High	CenturyLink National Outage	A nationwide CenturyLink outage did not allow normal ground activities for OSIRIS-REx including uplink, downlink, and moving data between elements. Outage Start December 27, 2018 08:40 GMT Outage Stop December 29, 2018 10:12 GMT Approximately 50 hours		Monitor	TBD	TBD
7246	12/6/18	Ground Minor	High	FOB connection down	A FOB connectivity issue was discovered when team members were looking for the 12/06/18 downlink of OpNav images (criticality 3) on the FOB. The OpNav images were obtained via SpocFlight. Investigation ongoing.		In Progress	TBD	TBD

Current ISA Status

#	Status	Priority	Subject	Assignee	Updated
10201	In Progress	Normal	RW3 Digital Tach Variance & Low Voltage Red Alarms	Mark Fisher	6/6/19 15:36
10004	In Progress	Normal	1923 ote_spacecal_002 missing from payload bundle and weeklong softsim	OSIRIS-REx Operations	6/7/19 8:56
9931	In Progress	Normal	TAGCAMS Safed on DOY 142 (2019)	Brent Bos	5/28/19 10:22
9704	Monitor	Normal	1921: 4 Uplinks Failed in Full-Duration SS Test	Mark Fisher	5/24/19 9:50
9628	In Progress	Normal	Red alarm notifications were not received by MSA personnel for the TAGCAMS safing event	Paul Falkenstern	5/28/19 10:37
8913	In Progress	Normal	Products Sent Outside Uplink Window (preceding the window start)	Mark Fisher	5/24/19 9:54
8809	In Progress	Normal	SPOC FEDS to SPOCFlight data delivery drop outs	Karl Harshman	5/10/19 9:58
8767	In Progress	Normal	Re-occurrence: STL intermittent downlink issues during setup	Mike Skeen	3/29/19 14:44
8672	In Progress	Normal	JPL Firewall Config Changed without LM Notification - affected Matlab license access/use and Maneuver Automation	Andy Calloway	5/24/19 9:56
8542	In Progress	Normal	Uplink Products Could not be Radiated due to SEQ Configuration Change	Mark Fisher	5/24/19 10:03
7994	Monitor	Normal	ACSTBT Overburn	Ryan Olds	5/10/19 9:45
7704	In Progress	Normal	Potential particles detected in NavCam images while in Bennu Orbit-A Phase	Ron Mink	3/28/19 12:37
7518	Monitor	High	CenturyLink National Outages	Andy Calloway	4/17/19 14:04
7246	In Progress	High	FOB connection down	Paul Falkenstern	5/21/19 14:27