



# Daily Downlink Tagup

Friday, September 6, 2019 (DOY 249)

**OSIRIS-REX™**  
ASTEROID SAMPLE RETURN MISSION



# *Remember when...*

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**OSIRIS-REx Launch Day was 3 years ago this Sunday**

**September 8, 2016**



# Agenda & Logistics

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- 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](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

Team	Status	Comment
<b>Spacecraft</b>	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&amp;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										<b>OFF</b>	<b>GO</b>
OLA										<b>OFF</b>	<b>GO</b>
OTES										<b>OFF</b>	<b>GO</b>
OVIRS										<b>OFF</b>	<b>GO</b>
REXIS										<b>OFF</b>	<b>GO</b>
	Thermal	Power	Command Response	Alarms	Trending	Limited Life & Mechanisms	Data Completeness	Pipeline Status	Science Concurrence		

# Downlink Schedule (times in UTC)

- Current Data Rate: 917 Mbps**

WOY	DOY	Start Date	HGA Start	End Date	HGA End	Duration	Note
36	246	2019-09-03	15:24	2019-09-03	16:35	1:11	Complete
36	247	2019-09-04	18:19	2019-09-04	19:30	1:11	Complete
36	248	2019-09-05	14:10	2019-09-05	19:30	5:20	Complete
36	249	2019-09-06	14:59	2019-09-06	19:00	4:01	Complete
36	250	2019-09-07	14:10	2019-09-07	18:10	4:00	600 kbps rate
36	251	2019-09-08	14:14	2019-09-08	18:55	4:41	600 kbps rate
36	252	2019-09-09	16:19	2019-09-09	18:42	2:23	

## SIGNIFICANT EVENTS:

MAVEN has entered Safe Mode, DOY 248/1415z

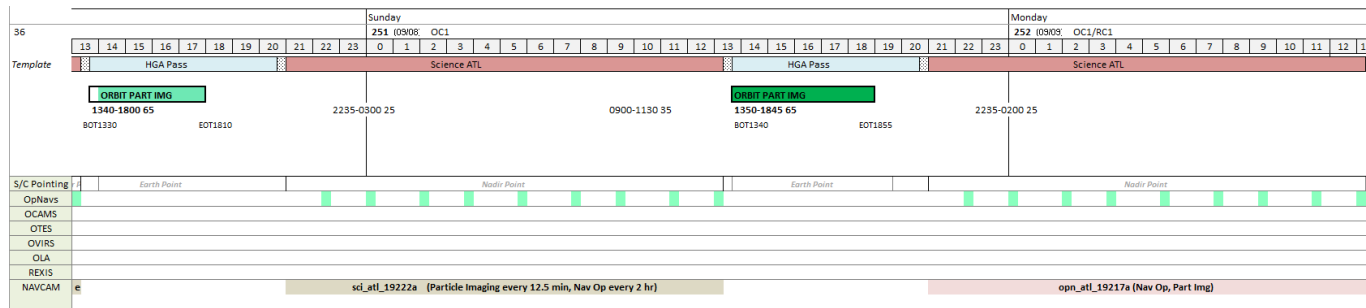
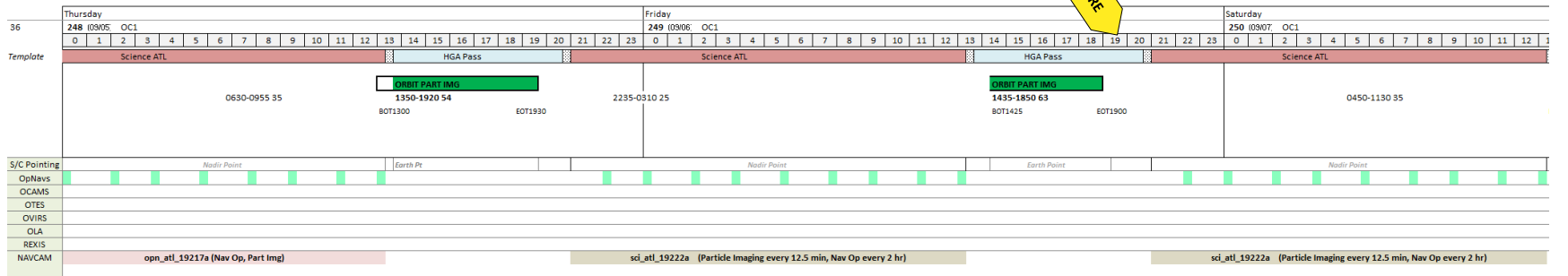
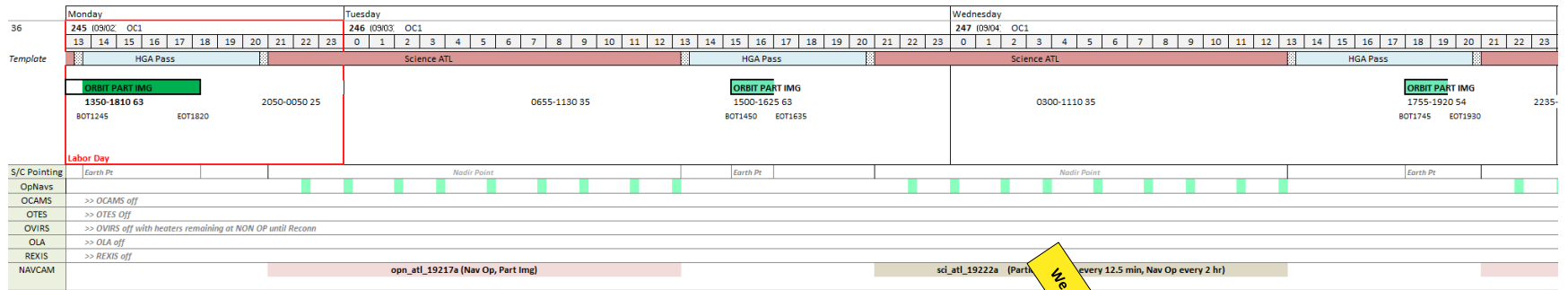
On DOY 248/1415z, To inform the Network that the MAVEN spacecraft is currently in the safe mode in a nominal safe mode configuration in conjunction with command freeze (SEM Angle <2 degrees) until DOY 250. The Project is in the process of updating the DKF to include all changes required. Reference OPD-MVN-040 Safe-Mode table(s) use for all supports until DOY 250. No exact ETRO reported.

No impact to OSIRIS-REx DSN Station time currently identified

## RED EQUIPMENT STATUS:

SPC/DSS	EQUIPMENT	ETRO
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SPC10	RSR2	249/2300z
DSS14	X500kw-R	310/2300z
SPC60	VSR	350/1648z
DSS63	EAC	355/1621z

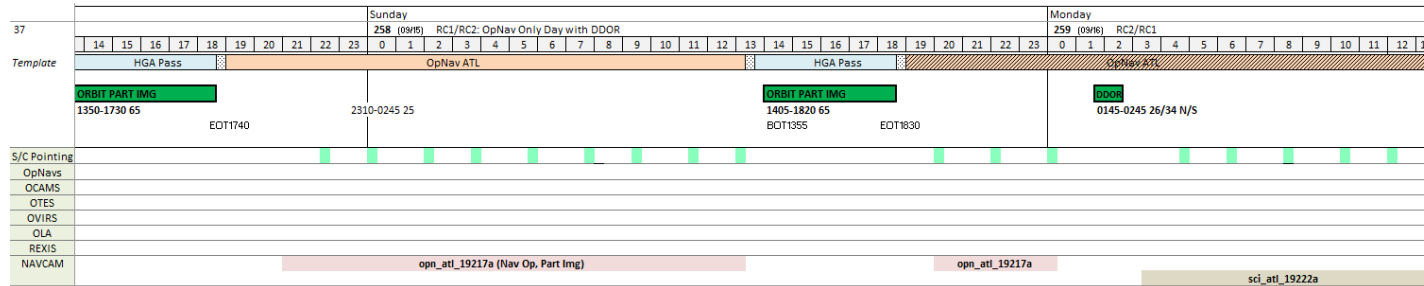
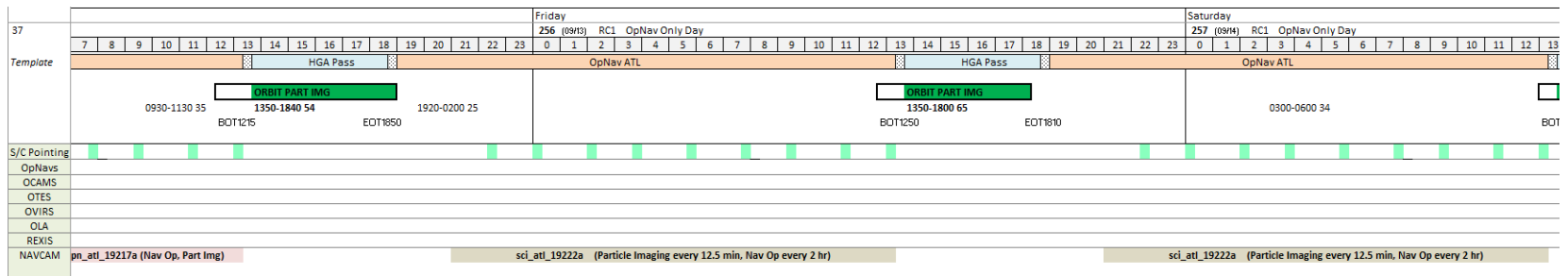
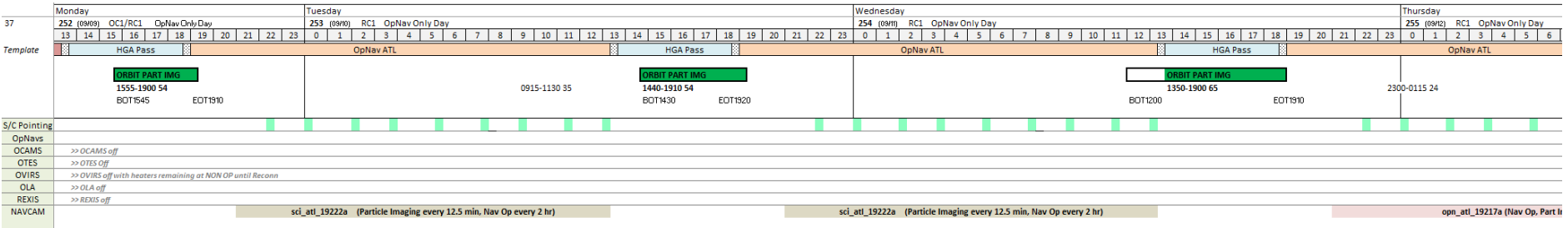
# Dedicated NavCam Particle Monitoring WOY 36



## Mission Statistics as of 08/28/19 (L+1084 days)

- Earth Range = 230,000,000 km (1.54 AU) (↑)
- Sun Range = 202,000,000 km (1.35 AU) (↓)
- Bennu Range = 1.79 km (in orbit)
- Sun-Probe-Earth Angle = 40.3 deg (↓)

# Dedicated NavCam Particle Monitoring WOY 37



## Mission Statistics as of 09/04/19 (L+1091 days)

- Earth Range = 236,000,000 km (1.58 AU) (↑)
- Sun Range = 202,000,000 km (1.35 AU) (↓)
- Bennu Range = 1.91 km (in orbit)
- Sun-Probe-Earth Angle = 39.4 deg (↓)

# Uplink Summary

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## UPLINK

### WOY 37 (DOY 252 – 259 / Sept 9-16,2019)

- BG Seq, Re-usable Sci Genie and Sci-Genie GV, Payload Sequences [uplinked 2019-249](#)

## Ephemeris Updates

- OD-177 [uplinked on DOY 2019-241](#)

## Other Files

# Execution Summary

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## Executed (times in UTC):

- 2019/247 (Wednesday, September 4)
  - OpNav with particle imaging riding along
    - # of NavCam OpNav images expected/received : 9 / 9
    - # of NavCam Particle images expected/received: 156 / 156
- 2019/248 (Thursday, September 5)
  - OpNav with particle imaging riding along
    - # of NavCam OpNav images expected/received : 9 / 9
    - # of NavCam Particle images expected/received: 18 / 18
- 2019/249 (Friday, September 6)
  - OpNav with particle imaging riding along
    - # of NavCam OpNav images expected/received : 9 / 9
    - # of NavCam Particle images expected/received:156 / 131

## Up Next (times In UTC):

- 2019/250 (Saturday, September 7)
  - OpNav with particle imaging riding along
    - # of NavCam OpNav images expected/received : 9 /
    - # of NavCam Particle images expected/received:156 /
- 2019/251 (Sunday, September 8)
  - OpNav with particle imaging riding along
    - # of NavCam OpNav images expected/received : 9 /
    - # of NavCam Particle images expected/received:156 /
- 2019/252 (Monday, September 9)
  - OpNav with particle imaging riding along
    - # of NavCam OpNav images expected/received : 9 /
    - # of NavCam Particle images expected/received:18 /

## Downlink Summary

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- **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 Partition Fill (%)	Comments
<i>OpNav</i>	0.00	99.37	99.37	14.20%	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	1722.47	1722.47	46.64%	3.87%	<i>Status as of 19:00</i>
<i>Tagcams/Overflow</i>	0.00	0.00	0.00	0.00%	0.00%	

## Downlink Summary

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- **Tomorrow's Data Rate: 600 kbps**  
Downlink

- Tomorrow's Expected Partition Status :

	Part. Start Vol (MB)	New Data Vol (MB)	Partition Fill (MB)	Expected Partition Fill (%)	Expected End Partition Fill (%)	Comments
<i>OpNav</i>	0.00	99.37	99.37	14.20%	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>	171.73	1722.47	1894.21	51.29%	30.40%	
<i>Tagcams/Overflow</i>	0.00	0.00	0.00	0.00%	0.00%	

## Downlink Summary

- **Sunday's Data Rate: 600 kbps**

### Downlink

- Tomorrow's Expected Partition Status :

	Part. Start Vol (MB)	New Data Vol (MB)	Partition Fill (MB)	Expected Partition Fill (%)	Expected End Partition Fill (%)	Comments
<i>OpNav</i>	0.00	99.37	99.37	14.20%	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>	1122.76	1722.47	2845.23	77.04%	49.96%	
<i>Tagcams/Overflow</i>	0.00	0.00	0.00	0.00%	0.00%	

# Need for Retransmit? Need for Replay?

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None

# List of Unexpected Alarms

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## Unexpected Alarms –

DOY 249: 19-249-14:32:16.990 [ACPM\_YCE\_CUM] = (1) is now **RED HIGH**. (at 19-249-14:18:11.805)  
19-249-14:32:16.990 [ACPM\_XCE\_CUM] = (1) is now **RED HIGH**. (at 19-249-14:18:11.805)  
19-249-16:17:17.259 [ACPM\_YCE\_CUM] = (1) is now **Green**. (at 19-249-16:03:11.973)  
19-249-16:17:17.259 [ACPM\_XCE\_CUM] = (1) is now **Green**. (at 19-249-16:03:11.973)

## Summary of Issue:

- Attitude Control Performance Monitor and the check reporting a count is the control error for X and Y.
- These appeared to have occurred when the ephemeris file was initialized
- GNC analysis shows a large change in the reference attitude rate at the point of the ephemeris transition from OD177 to OD178. Commanded rates temporarily reached values of approximately 30 deg/s for one 10 Hz cycle.
- Cause appears to be DOY 248 ephemeris was built to the older OD solution, causing Nadir to jump from the old ephemeris solution to the new ephemeris solution
- MSA indicates there are no S/C safety concerns
- ISA # 11263 has been opened to track the root cause and ISA action for this issue

# ISAs, PFRs, Watch Items

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

- **ISA # 11263 – ACPM Count from Ephemeris Transition**
  - ISA Status: New
  - ISA Type: Spacecraft Minor
  - ISA Criticality: 4 – No significant impact
- **ISA # 11196 – TAGCAMS: (09/02/19) Aliveness and Low Speed Sync Search**
  - ISA Status: In Progress
  - ISA Type: Ground Minor
  - ISA Criticality: 4 – No significant impact
- **ISA # 11154 – TAGCAMS DOY 2019-238/239 DVR stopped processing commands**
  - ISA Status: In Progress
  - ISA Type: Ground Minor
  - ISA Criticality: 3 – minimal impact
- **ISA # 10979 – Delayed reconstructed CK delivery on a Crit 2 OpNav Downlink Day**
  - ISA Status: In Progress
  - ISA Type: Ground Minor
  - ISA Criticality: 3 – minimal impact
- **ISA # 10939 – REXIS SXM recording significantly fewer counts**
  - ISA Status: In Progress
  - ISA Type: Spacecraft minor
  - ISA Criticality: 3 – minimal impact
- **ISA # 10702 – ORX MSA Flight Machines Frozen on 2019-197**
  - ISA Status: In Progress
  - ISA Type: Ground Major
  - ISA Criticality: 2 – Significant 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 # 8767 - Re-occurrence: STL intermittent downlink issues during setup**
  - ISA Status: In Progress
  - ISA Type: Ground minor
  - ISA Criticality: 3 – minimal impact
- **ISA # 8672 - JPL Firewall Config Changed without LM Notification - affected Matlab license access/use and Maneuver Automation**
  - ISA Status: In Progress
  - ISA Type: Ground minor
  - Criticality: 2 – significant impact

# Science Status and/or PI Status

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# Looking Ahead

36							37							38							39						
245	246	247	248	249	###	###	252	253	254	255	256	###	###	259	260	261	262	263	###	###	266	267	268	269	270	###	###
9/2	9/3	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	###	###	9/16	9/17	9/18	9/19	9/20	###	###	9/23	9/24	9/25	9/26	9/27	###	###
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
														xm1946 - Orbital R - Global Mapping													
xm1943 - High FB4 - DL15																					xm1946 - Orbital R - Global Mapping						
xm1942 - High FB3 - CQ13							xm1943 - High FB4																				
xm1941 - High FB2 - DL06							xm1942 - High FB3 - CQ13							xm1943 - High FB4							xm1944 - Transit to Orbital R						
xm1940 - High FB1 - EX07							xm1941 - High FB2 - DL06							xm1942 - High FB3 - CQ13							xm1943 - High FB4						
xm1939 - DS Flyby 2 Redux							xm1940 - High FB1 - EX07							xm1941 - High FB2 - DL06							xm1942 - High FB3 - CQ13						
xm1938 - Transition to Reconn A							xm1939 - DS Flyby 2 Redux							xm1940 - High FB1 - EX07							xm1941 - High FB2 - DL06						
xm1937 - TBD - Transition to Reconn A							xm1938 - Transition to Reconn A							xm1939 - DS Flyby 2 Redux							xm1940 - High FB1 - EX07						
xm1936 - Orbit C (Opnav, Particle Img)							xm1937 - TBD - Transition to Reconn A							xm1938 - Transition to Reconn A							xm1939 - DS Flyby 2 Redux						

# Go Backs?

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- **Daily Downlink Tagup Schedule**
  - Tagups will continue to run on a M/W/F schedule thru September 23<sup>rd</sup>
  - Beginning Wednesday, September 24<sup>th</sup>, we will return back to a M-F schedule ahead of the Detailed Survey BBD2 Refly thru the end of Recon A

# Backup

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# Instrument Weekly Status

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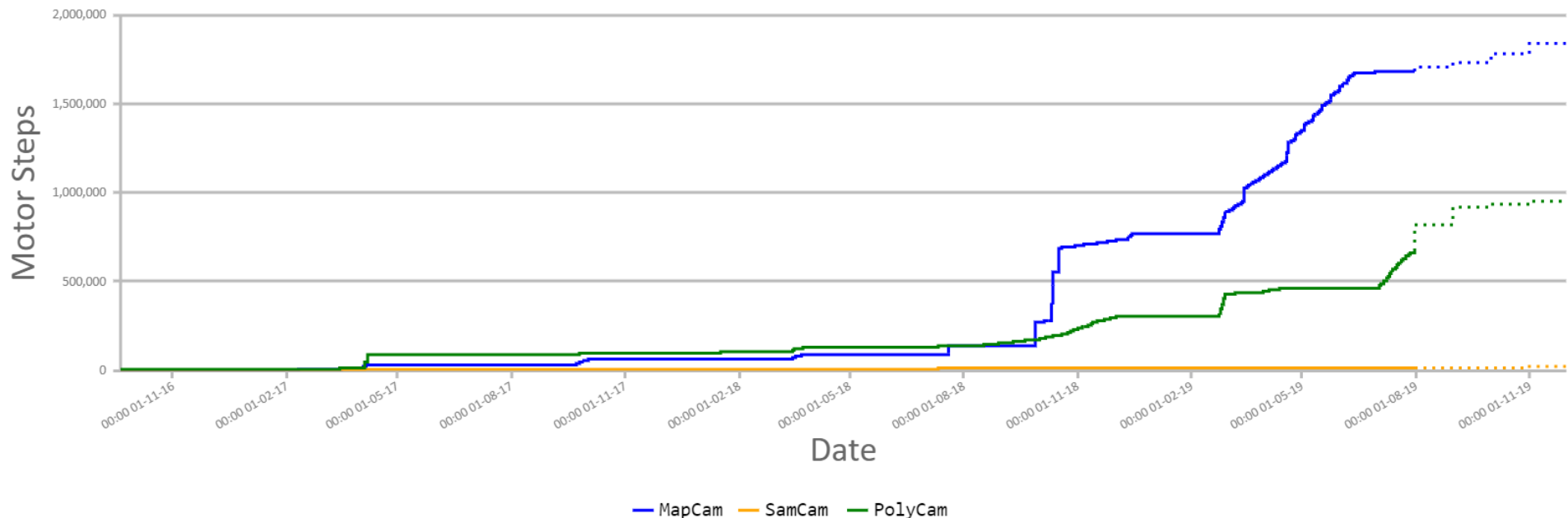
- **OCAMS – OFF and nominal.**
- **OLA – OFF and nominal**
- **OTES – OFF and nominal.**
- **OVIRS – OFF and nominal.**
- **REXIS – OFF and nominal.**

# OCAMS Mechanism Life Tracking

	Launch (steps)	Flight (steps)	NTE (steps)
MapCam	1057475	1688326	3400320
SamCam	738110	15246	958384
PolyCam	1775496	671821	8876160

Status as of July 31, 2019

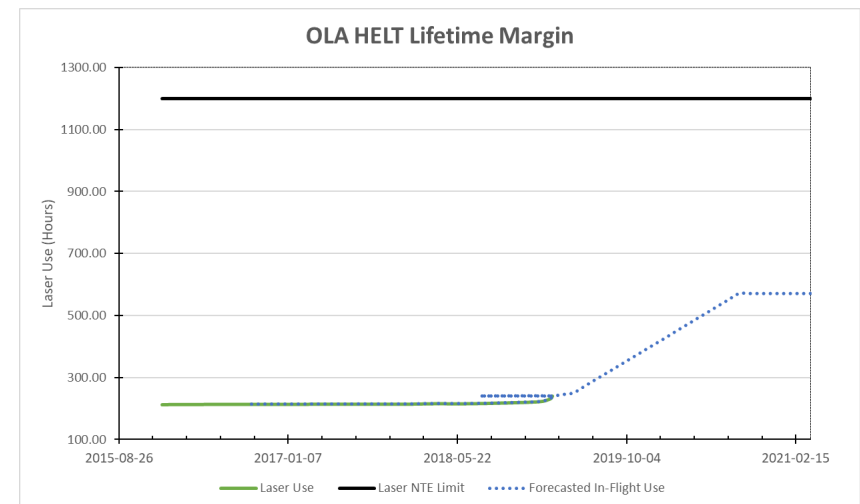
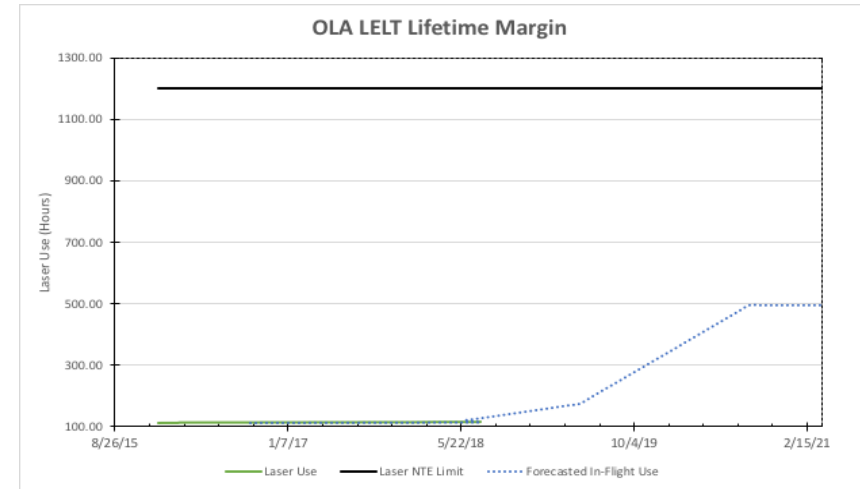
OCAMS Limited Life Items



# OLA Limited Life Laser Tracking

	Launch (hours)	Flight (hours)	NTE Margin (hours)
LELT	110.70	82.81	1,085.01
HELT	212.50	108.43	983.80

Status as of July 31, 2019





# SPOC Watch Item List

Todays Date: 09/06/2019		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	521		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	will occur. 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	366		Watch	Will monitor for future occurrences 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
11196	9/2/19	Spacecraft Minor	Normal	TAGCAMS: (09/02/19) Aliveness and Low Speed Sync Search	Approximately 35 minutes after the weekly power-cycle completed on DoY 2019-245 several counts on were taken on the TAGCAMS low speed sync search. These errors resulted in an aliveness count. As this error occurred after the nominal daily TAGCAMS DVR management and prior to any nominal usage there should be no missing or corrupted image data due to this upset (from the prior day, and none expected for the upcoming day).		In Progress	TBD	TBD
11154	8/27/19	Spacecraft Minor	Normal	TAGCAMS: (08/27/19) DOY 2019-238/239 DVR stopped processing commands	The spacecraft recorded an additional 165 counts of TAGCAMS_IMAGE_NOT_RECORDED_CNT (I-0129 = TGM_ImNotRec) and a single aliveness count. This DVR stopped processing time updates at ~19/238-20:04. No commanding was processed until an internal DVR reset at ~19/239-13:20. The internal reset resulted in the DVR processing commands and returning housekeeping packets. None of the planned images were taken between DOY 238/239 due to the DVR not processing the commands.		In Progress	TBD	TBD
10979	8/7/19	Ground Minor	Normal	Delayed reconstructed CK delivery on a Crit 2 OpNav Downlink day	There was a delay in receipt of the reconstructed CK on DOY 217 08/05/19 during a Criticality 2 OpNav Downlink day.		In Progress	TBD	TBD
10939	8/2/19	Spacecraft Minor	Normal	REXIS SXM recording significantly fewer counts	During Orbital B operations (starting Jul 1 2019) the REXIS Solar X-ray Monitor (SXM) All ORX MSA Flight Machines were observed to be frozen on 2019-197 (16-July-2019).		In Progress	TBD	TBD
10702	7/16/19	Spacecraft Minor	Normal	ORX MSA Flight Machines Frozen on 2019-197	Flight LAN was observed to be working around 11:30:00 UTC (Systems engineer successfully built a flight product through SCUM Bucket), but by 12:30:00 UTC, all machines were down and unresponsive. Initial investigation appears to have uncovered an issue with the JPL ORX mount concerning missing data and directories.		In Progress	TBD	TBD
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
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

# Anomaly Response & Status

ISA #	Date Created	Type	Priority	Title	Detailed Description - Action Plan	Notes	Status	Resolved Date	Need Date
7518	1/4/19	Ground Major	High	CenturyLink National Outage	<p>A nationwide CenturyLink outage did not allow normal ground activities for OSIRIS-REx including uplink, downlink, and moving data between elements.</p> <p>Outage Start December 27, 2018 08:40 GMT Outage Stop December 29, 2018 10:12 GMT Approximately 50 hours</p>		Monitor	TBD	TBD
7246	12/6/18	Ground Minor	High	FOB connection down	<p>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.</p>		In Progress	TBD	TBD

# Current ISA Status

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#	Status	Priority	Subject	Assignee	Updated
11263	New	Normal	ACPM Count from Ephemeris Transition		9/6/19 9:30
11196	In Progress	Normal	TAGCAMS: (09/02/19) Aliveness and Low Speed Sync Search	Brent Bos	9/4/19 8:38
11180	In Progress	Normal	orxmsanfs System Patching Issue with ZFS	Lance Tanaka	8/29/19 10:36
11154	In Progress	Normal	TAGCAMS: (08/27/19) DOY 2019-238/239 DVR stopped processing commands	Brent Bos	8/29/19 11:08
10979	In Progress	Normal	Delayed reconstructed CK delivery on a Crit 2 OpNav Downlink day	Nayi Castro	8/23/19 8:27
10939	In Progress	Normal	REXIS SXM recording significantly fewer counts	Karl Harshman	8/16/19 16:43
10702	In Progress	Normal	ORX MSA Flight Machines Frozen on 2019-197	Paul Falkenstern	9/3/19 6:34
10004	In Progress	Normal	1923 ote_spacecal_002 missing from payload bundle and weeklong softsim	OSIRIS-REx Operations	7/3/19 17:14
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	Monitor	Normal	Uplink Products Could not be Radiated due to SEQ Configuration Change	Mark Fisher	8/21/19 8:41
7994	Monitor	Normal	ACSTBT Overburn	Ryan Olds	9/4/19 8:36
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	7/10/19 15:14
7246	In Progress	High	FOB connection down	Paul Falkenstern	9/3/19 6:37