Daily Downlink Tagup

Monday, May 4, 2020 (DOY 125)

Agenda & Logistics

- Quicklook + Weekly Instrument 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 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/2020

OCAMS Slides available at:
ODOCS at 7.0 Mission Operations System/SPOC/OCAMSFlightProducts/Downlink

Quicklook Status & Weekly Instrument 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
	Thermal	Power	Command Response	Alarms	Trending	Limited Life	Mechanisms	Data Completeness	Pipeline Status	Science Concurrence		
OCAMS											**ON**	**GO**
OLA											**OFF**	**GO**
OTES											**OFF**	**GO**
OVIRS											**OFF**	**GO**
REXIS											**OFF**	**GO**

Yellow Performance Status impacts LELT only

TR1R4 Quicklook Error Report

OSIRIS-REx Nav Team Maneuver Quick-look Error Report
Report Date: 30-Apr-2020 23:17:57 UTC
TR1R4

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Nominals:
Nav Design Times:
30-APR-2020 22:26:47.768 [UTC] Start time at spacecraft
30-APR-2020 22:26:54.559 [UTC] End time at spacecraft
30-APR-2020 22:39:36.011 [UTC] Start time at Earth
30-APR-2020 22:39:42.803 [UTC] End time at Earth
5.086 [cm/s] Total Magnitude
208.287 [deg] RA
-68.261 [deg] Dec
6.791 [s] Duration (Nav Design)
129.307 [deg] Look angle
59.552 [deg] Angle from heliocentric velocity vector
768.243 [s] One-way light time
8.446 [GHz] Received downlink frequency, 2-way tracking
0.056 [Hz per mm/sec] Conversion factor
-0.032 [m/s] Delta-range rate
-1.815 [Hz] Expected Doppler shift seen by DSN

Actuals:
-1.815 [Hz] Actual Doppler shift seen by DSN
5.085 [cm/s] Delta-V magnitude, given perfect pointing
-0.001 [cm/s] Delta-V magnitude error, given perfect pointing
-0.010 [%] Percentage Delta-V magnitude error, given perfect pointing
129.302 [deg] Look angle, given perfect magnitude
-0.005 [deg] Look angle error, given perfect magnitude

KinetX, Inc
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Downlink Schedule (times in UTC)

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

WOY	DOY	Start Date	HGA Start	End Date	HGA End	Duration	Note
18	125	5/4/2020	14:09	5/4/2020	18:43	4:34	
19	126	5/5/2020	14:18	5/5/2020	17:45	3:27	
19	127	5/6/2020	15:33	5/6/2020	20:22	4:49	
19	128	5/7/2020	14:09	5/7/2020	18:43	1:40	Science Downlink 30 minutes
19	129	5/8/2020	16:03	5/8/2020	18:43	2:40	
19	130	5/9/2020	14:10	5/9/2020	18:43	4:33	
19	131	5/10/2020	14:10	5/10/2020	18:43	4:33	
19	132	5/11/2020	14:10	5/11/2020	18:43	4:33	

SIGNIFICANT EVENTS:

- DSS-43, S-band High-Power XMTR Replacement, DOY 069/2100z-DOY 017/0500z

RED EQUIPMENT STATUS:

SPC/DSS	EQUIPMENT	ETRO
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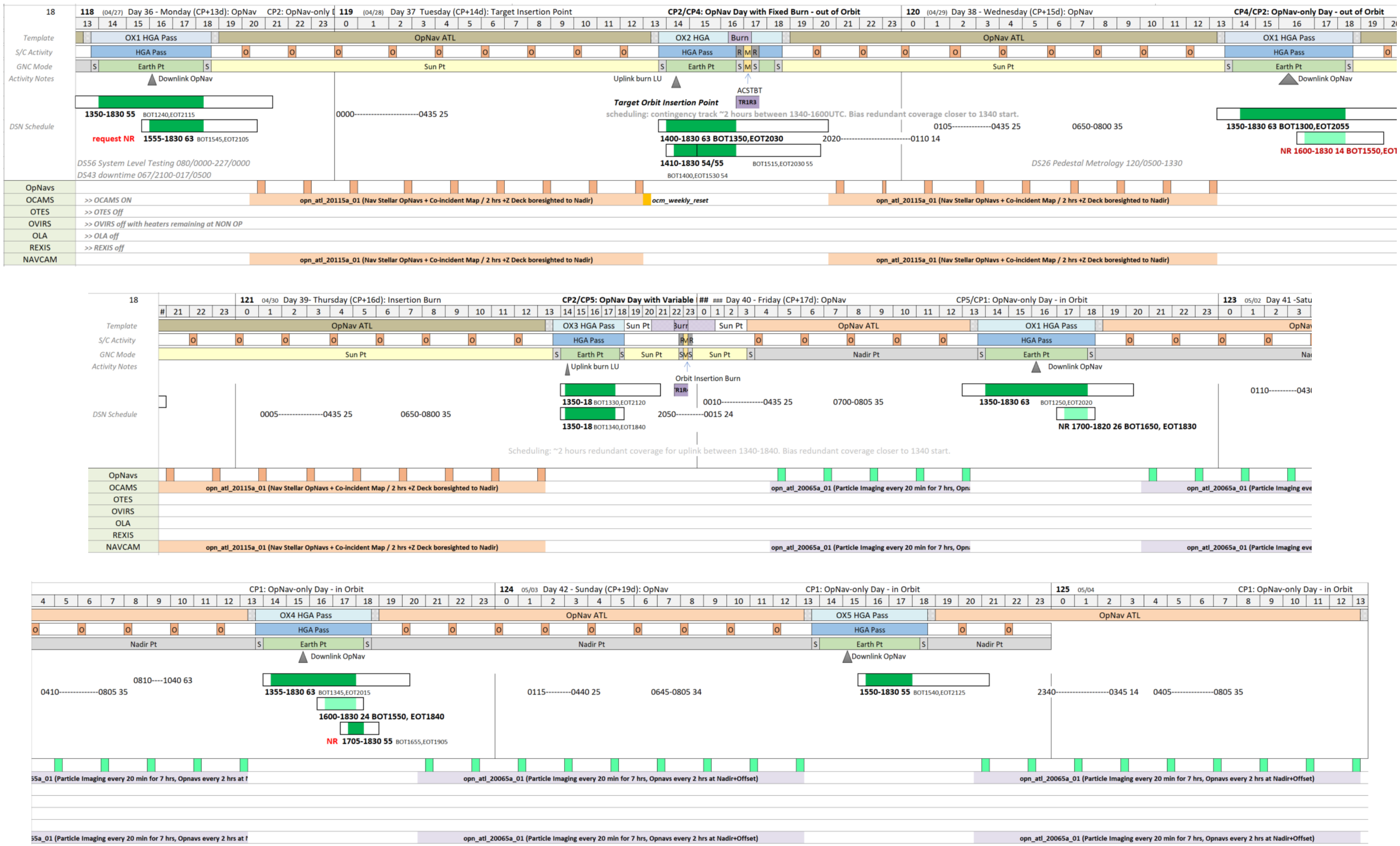
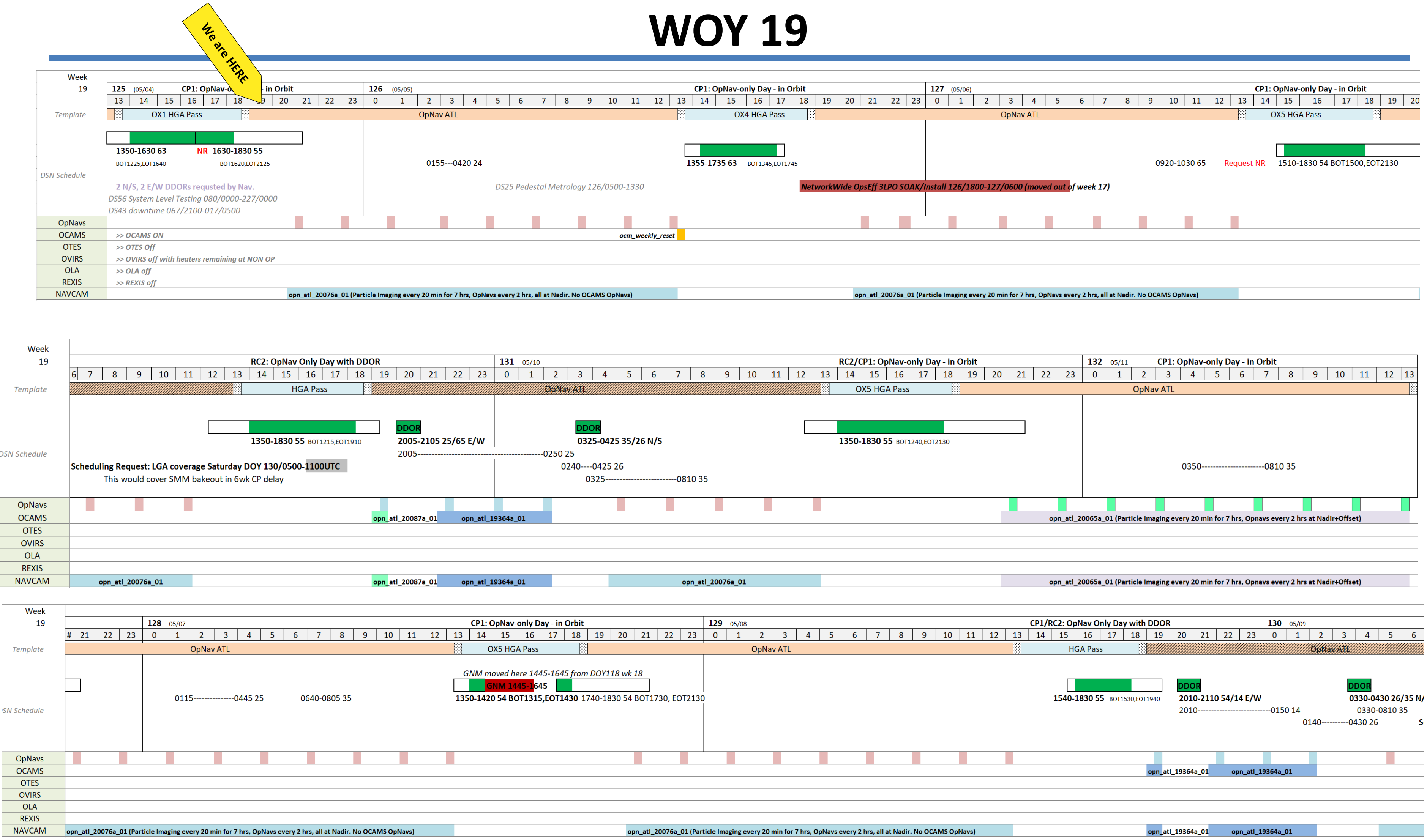
SPC60	NMC-SR1	126/1530z
DSS14	HEMT-S1	129/2300z
SPC60	DCC15	135/1400z
DSS54	NDA	135/1417z
SPC60	MCD3-2	135/1530z
SPC60	MCD3-1	135/1600z
DSS14	X500kw-R	143/2300z
SPC60	DCC1	148/1530z
DSS63	HEMT-L1	160/1500z
SPC40	SGA3	176/0000z
DSS63	EAC	180/1621z
SPC40	TLP15	220/0529z

Trans to Orbit (TR1R3 and TR1R4), Opnavs, & High Cadence Particle Imaging WOY 18 (COMPLETE)



April 22, 2020
Earth Range = 230,000,000 km (1.54 AU) (↓)
Sun Range = 139,000,000 km (0.93 AU) (↑)
Bennu Range = 36.5 km (after Checkpoint Rehearsal and TR1R1)
Sun-Probe-Earth Angle = 39.0 deg (↑)
One Way Light Time = 00:12:48 hh:mm:ss (↓)

OpNavs and Particle Imaging
WOY 19



April 29, 2020
L+1329 days
Earth Range = 230,000,000 km (1.53 AU) (↓)
Sun Range = 141,000,000 km (0.95 AU) (↑)
Bennu Range = 9.8 km
Sun-Probe-Earth Angle = 39.4 deg (↑)
One Way Light Time = 00:12:47 hh:mm:ss (↓)

Uplink Summary

UPLINK

WOY 19 (DOY 125-132 / May 4 – May 11, 2020)

- BG Seq, Sci Genies, ATFs, Payload Sequences uplinked 2020-123

Ephemeris Updates

- OD-245 uplinked on 2020-119
- OD-246 uplinked on 2020-121
- OD-247 uplinked on 2020-123

Other Files

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Execution Summary

Executed (times In UTC):

- 2020/118 (Monday, April 27) – 2020/119(Tuesday, April 28)
  - Navcam / MapCam OpNav
    - # of NavCam OpNav images expected/**received** : 36 **/ 36**
    - # of OCAMS OpNav images expected/**received** : 18 **/ 18**
  - TR1R3 occurs during the HGA Pass. Burn targets the orbit insertion

- 2020/119 (Tuesday, April 28) – 2020/120 (Wednesday, April 29)
  - Navcam / MapCam OpNav
    - # of NavCam OpNav images expected/**received** : 36 **/ 36**
    - # of OCAMS OpNav images expected/**received** : 18 **/ 18**

- 2020/120 (Wednesday, April 29) – 2020/121 (Thursday, April 30)
  - Navcam / MapCam OpNav
    - # of NavCam OpNav images expected/**received** : 36 **/ 36**
    - # of OCAMS OpNav images expected/**received** : 18 **/ 18**

- 2020/121 (Thursday, April 30) – 2020/122 (Friday, May 1)
  - TR1R4, Orbit Insertion Maneuver, places spacecraft in frozen orbit. Burn occurs at ~23:00, during a variable burn window. Transitions S/C to a quiescent Nadir-pt attitude
  - Navcam / MapCam OpNav, Navcam Particle Images
    - # of NavCam OpNav images expected/**received** : 5 **/ 5**
    - # of OCAMS OpNav images expected/**received** : 5 **/ 5**
    - # of NavCam particle img expected/**received** : 42 **/ 42**

- 2020/122 (Friday, May 1) – 2020/123 (Saturday, May 2)
  - Navcam / MapCam OpNav, Navcam Particle Images
    - # of NavCam OpNav images expected/**received** : 9 **/ 9**
    - # of OCAMS OpNav images expected/**received** : 9 **/ 9**
    - # of NavCam particle img expected/**received** : 42 **/ 42**

- 2020/123 (Saturday, May 2) – 2020/124 (Sunday, May 3)
  - Navcam / MapCam OpNav, Navcam Particle Images
    - # of NavCam OpNav images expected/**received** : 9 **/** 9
    - # of OCAMS OpNav images expected/**received** : 9 **/ 9**
    - # of NavCam particle img expected/**received** : 42 **/ 42**

- 2020/124 (Sunday, May 3) – 2020/125 (Monday, May 4)
  - Navcam / MapCam OpNav, Navcam Particle Images
    - # of NavCam OpNav images expected/**received** : 9 **/ 9**
    - # of OCAMS OpNav images expected/**received** : 9 **/ 9**
    - # of NavCam particle img expected/**received** : 42 **/ 42**

Execution Summary

Up Next (times In UTC):

- 2020/125 (Monday, May 4) – 2020/126(Tuesday, May 5)
  - Navcam OpNav, Navcam Particle Images
    - » # of NavCam OpNav images expected/received : 9 /
    - » # of NavCam particle img expected/received : 42 /
- 2020/126 (Tuesday, May 5) – 2020/127 (Wednesday, May 6)
  - Navcam OpNav, Navcam Particle Images
    - » # of NavCam OpNav images expected/received : 9 /
    - » # of NavCam particle img expected/received : 42 /
- 2020/127 (Wednesday, May 6) – 2020/128 (Thursday, May 7)
  - Navcam OpNav, Navcam Particle Images
    - » # of NavCam OpNav images expected/received : 9 /
    - » # of NavCam particle img expected/received : 42 /
- 2020/128 (Thursday, May 7) – 2020/129 (Friday, May 8)
  - Navcam OpNav, Navcam Particle Images
    - » # of NavCam OpNav images expected/received : 9 /
    - » # of NavCam particle img expected/received : 42 /
- 2020/129 (Friday, May 8) – 2020/130 (Saturday, May 9)
  - Navcam / MapCam OpNav, Navcam Particle Images
    - » # of NavCam OpNav images expected/received : 8 /
    - » # of OCAMS OpNav images expected/received : 4 /
    - » # of NavCam particle img expected/received : 50 /
- 2020/130 (Saturday, May 9) – 2020/131 (Sunday, May 10)
  - Navcam / MapCam OpNav, Navcam Particle Images
    - » # of NavCam OpNav images expected/received : 9 /
    - » # of OCAMS OpNav images expected/received : 4 /
    - » # of NavCam particle img expected/received : 48 /
- 2020/131 (Sunday, May 10) – 2020/132 (Monday, May 11)
  - Navcam / MapCam OpNav, Navcam Particle Images
    - » # of NavCam OpNav images expected/received : 9 /
    - » # of OCAMS OpNav images expected/received : 9 /
    - » # of NavCam particle img expected/received : 42 /

Downlink Summary

- ***Today's (Monday) Data Rate: 916 kbps***

Downlink

- Current Partition Status :

	Part. Start Vol (MB)	New Data Vol (MB)	Partition Fill (MB)	Expected Partition Fill (%)	Expected End Partition Fill (%)	Comments
OpNav	0.00	120.47	120.47	17.21%	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	463.74	470.80	12.75%	0.00%	
Overflow	0.00	0.00	0.00	0.00%	0.00%	

Downlink Summary

- ***Tomorrow's (Tuesday) Data Rate: 916 kbps***

Downlink

- Expected Partition Status :

	Part. Start Vol (MB)	New Data Vol (MB)	Partition Fill (MB)	Expected Partition Fill (%)	Expected End Partition Fill (%)	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	463.74	470.80	12.75%	0.00%	
Overflow	0.00	0.00	0.00	0.00%	0.00%	

Downlink Summary

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

Downlink

- Expected Partition Status :

	Part. Start Vol (MB)	New Data Vol (MB)	Partition Fill (MB)	Expected Partition Fill (%)	Expected End Partition Fill (%)	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	463.74	470.80	12.75%	0.00%	
Overflow	0.00	0.00	0.00	0.00%	0.00%	

Downlink Summary

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

Downlink

- Expected Partition Status :

	Part. Start Vol (MB)	New Data Vol (MB)	Partition Fill (MB)	Expected Partition Fill (%)	Expected End Partition Fill (%)	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	463.74	470.80	12.75%	9.85%	
Overflow	0.00	0.00	0.00	0.00%	0.00%	

Downlink Summary

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

Downlink

- Expected Partition Status :

	Part. Start Vol (MB)	New Data Vol (MB)	Partition Fill (MB)	Expected Partition Fill (%)	Expected End Partition Fill (%)	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	463.74	470.80	12.75%	0.00%	
Overflow	0.00	0.00	0.00	0.00%	0.00%	

Downlink Summary

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

Downlink

- Expected Partition Status :

	Part. Start Vol (MB)	New Data Vol (MB)	Partition Fill (MB)	Expected Partition Fill (%)	Expected End Partition Fill (%)	Comments
OpNav	0.00	97.72	97.72	13.96%	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	552.08	559.13	15.14%	0.00%	
Overflow	0.00	0.00	0.00	0.00%	0.00%	

Downlink Summary

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

Downlink

- Expected Partition Status :

	Part. Start Vol (MB)	New Data Vol (MB)	Partition Fill (MB)	Expected Partition Fill (%)	Expected End Partition Fill (%)	Comments
OpNav	0.00	108.76	108.76	15.54%	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	529.99	537.05	14.54%	0.00%	
Overflow	0.00	0.00	0.00	0.00%	0.00%	

Need for Retransmit? Need for Replay?

None

List of Unexpected Alarms, Watch Items, ISAs, PFRs

Unexpected Alarms:

- There were no Unexpected alarms

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

- **ISA #14398: Checkpoint Reconstruct SPK did not match OIA-010a naming convention**
  - ISA Status: In Progress
  - ISA Type: Ground Minor
  - ISA Criticality: 3 – Minimal Impact
- **ISA #14358: NavCam 1 4-pixel Repeating Pattern**
  - ISA Status: In Progress
  - ISA Type: Spacecraft Minor
  - ISA Criticality: 4 – No Significant Impact
- **ISA # 13071: STL invalid CRCs problem caught in action**
  - ISA Status: Monitor
  - ISA Type: Ground Minor
  - ISA Criticality: 3 – Minimal Impact
- **ISA # 12293: Ambiguity between Bennu Shape Model Scale, GM, and Space craft Orbital Radius**
  - ISA Status: In Progress
  - ISA Type: Ground Minor
  - ISA Criticality: 2 – Significant Impact

Science Status and/or PI Status

Looking Ahead

	18							19							20							21						
	118	119	120	121	122	##	#	125	126	127	128	129	##	##	132	133	134	135	136	##	138	139	140	141	142	143	##	##
	4/27	4/28	4/29	4/30	5/1	##	#	5/4	5/5	5/6	5/7	5/8	##	##	5/11	5/12	5/13	5/14	5/15	##	5/17	5/18	5/19	5/20	5/21	5/22	##	##
	M	T	W	R	F	Sa	S	M	T	W	R	F	Sa	Sa	M	T	W	R	F	Sa	Sa	M	T	W	R	F	Sa	Sa
Week 7 - SOS																												
Week 6 - J-A 1																												
Week 5 - J-A 2	xm2023 - OpNav							xm2024 - Opnavs							xm2025 - Opnavs, Orbit Depart.							xm2026 Reboot, Reboot Recovery						
4 - TCR approval, Handshake	xm2022 - Low Sortie #2 (Osprey)							xm2023 - OpNav							xm2024 - Opnavs							xm2025 - Opnavs, Orbit Depart.						
Week 3 - FA Kickoff	xm2021 - OpNav							xm2022 - Low Sortie #2 (Osprey)							xm2023 - OpNav							xm2024 - Opnavs						
2 - Final Build/Delivery/Test	xm2020 - OpNav							xm2021 - OpNav							xm2022 - Low Sortie #2 (Osprey)							xm2023 - OpNav						
Week 1 - Review/Uplink	xm2019 - OpNav							xm2020 - OpNav							xm2021 - OpNav							xm2022 - Low Sortie #2 (Osprey)						
Week 0 - Execution	**xm2018 - Opnav, Trans to Orbit**							**xm2019 - OpNav**							**xm2020 - OpNav**							**xm2021 - OpNav**						

Reminders, Go Backs…

- **Upcoming Daily Downlink Tagups:**
  - Monday, 05/11
  - Monday, 05/18
  - Monday, 05/25
  - Wednesday, 05/27
  - Friday, 05/29

Backup

Meetings will continue to be held virtually

- If you need a WebEx set up for a meeting, please contact Nancy Ramos or Michael Lujan and they can set one up for you

- If you are having issues connecting to the NASA Teleconference number 844-467-6272 prefix, there is a local call-in number that can also be used to access the same bridge:
  - Dial-in: 1-844-467-6272
backup “local” dial-in: 720-259-6462
  - If you still encounter a busy signal, keep trying.

Instrument Weekly Status

- **OCAMS (Bashar) -**
- **OTES (Chris) - Off and nominal**
- **OLA (Jessa) - Off and nominal**
- **OVIRS (Amy) - Off and nominal**

SPOC Watch Item List

Todays Date:	5/1/2020	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	759		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	604		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
14398	4/22/20	Ground minor	Normal	Checkpoint Reconstruct SPK did not match OIA_010a naming convention	The SPK delivered on April 22, 2020 as the Reconstructed Checkpoint kernel did not match the naming convention established in OIA_010a. Due to this the SPOC was unable to process any data with the delivered kernel.		In Progrss	TBD	TBD

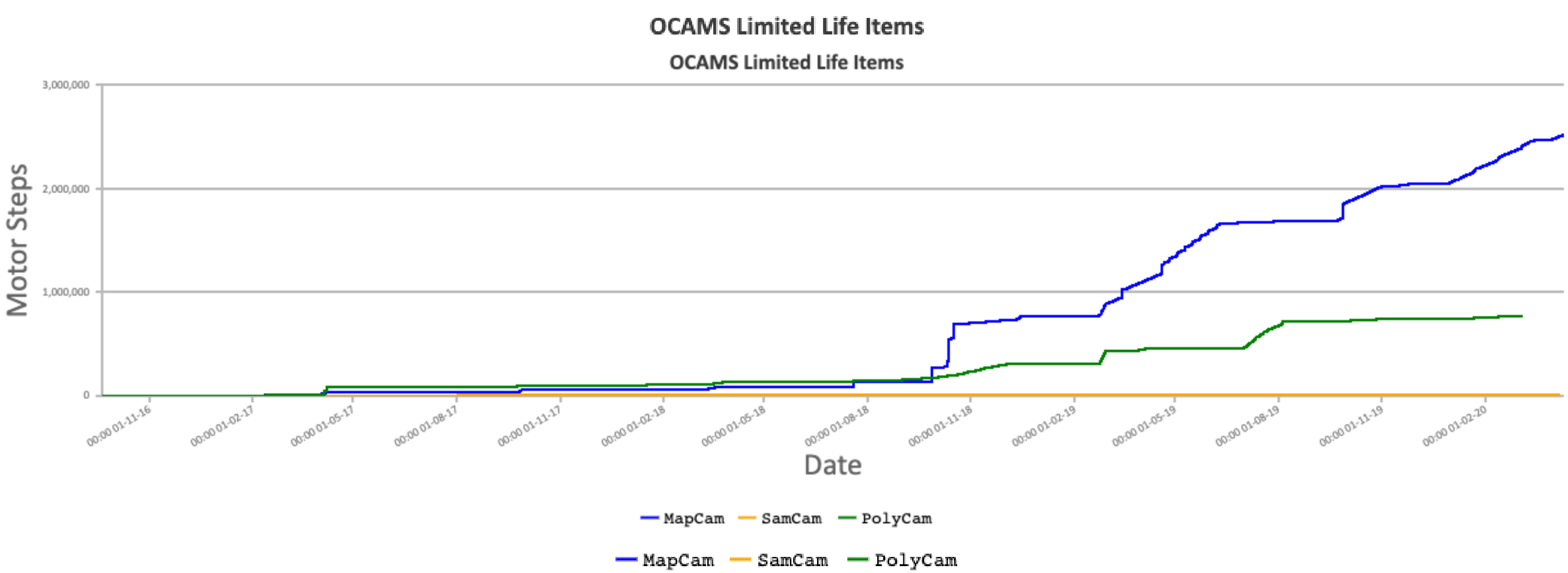
Current ISA Status

#	Status	Priority	Subject	Assignee	Updated
14398	In Progress	Normal	Checkpoint Reconstruct SPK did not match OIA_010a naming convention	Andy Calloway	4/30/20 12:47
14358	In Progress	Normal	TAGCAMS: (04/24/2020) NavCam 1 4-pixel Repeating Pattern	Brent Bos	4/27/20 20:49
13071	Monitor	Normal	STL invalid CRCs problem caught in action	Amir Mirfakhrai	4/1/20 8:43

OCAMS Mechanism Life Tracking

	Launch (steps)	Flight (steps)	NTE (steps)
MapCam	1057475	2585121	5000000
SamCam	738110	16929	958384
PolyCam	1775496	783277	8876160

Status as of April 24, 2020



OLA Limited Life Laser Tracking

	Launch (hours)	Flight (hours)	NTE Margin (hours)
LELT	110.70	106.88	1,085.01
HELT	212.50	119.93	983.80

Status as of March 3rd, 2020