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International Earth Science Constellation

Mission Operations Working Group

June 02-04, 2015

Aqua and Aura Results from Spring 2015 IAM Campaign

(as of 4/14/2015)

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- Aqua has performed **3** of the **5** planned inclination maneuvers from March **18th** to April **22rd** prior to final slide review (4/14/2015)
 - Updates will be provided to MOWG for the last two Aqua Inc maneuvers and the total Delta-Inc/RAAN/Delta V and predicted MLT prior to the 2016 IAM series
- After three Aqua Inc maneuvers, the total inclination change was **0.88% cold** compared to the latest 2015 IAM predictions delivered to MOWG members
 - Assuming the last two Aqua Inc maneuvers perform exactly as predicted

Inc #	Date	Burn Duration (sec)	Predicted Delta - Inc (deg)	Achieved Delta-Inc (deg)	Predicted Delta - RAAN (deg)	Achieved Delta - RAAN (deg)	Predicted Delta - V (m/s)	Achieved Delta - V (m/s)
43	18-Mar-15	550	-0.00879	-0.00871	0.00099	0.00110	1.167	1.155
44	25-Mar-15	550	-0.00879	-0.00875	0.00051	0.00050	1.162	1.153
45	1-Apr-15	550	-0.00877	-0.00866	0.00005	0.00006	1.158	1.141
46	15-Apr-15	550	-0.00870	-	-0.00084	-	1.152	-
47	22-Apr-15	550	-0.00862	-	-0.00123	-	1.147	-
Totals:			-0.04367	-0.02612	-0.00052	0.00166	5.787	3.449
			delta-I difference:	0.00023	deg			
			percent error:	0.88%	COLD			

- Aura has performed **3** of the **5** planned inclination maneuvers from March **19th** to April **23rd** prior to final slide review (4/14/2015)
 - Updates will be provided to MOWG for the last two Aura Inc maneuvers and the total Delta-Inc/RAAN/Delta V and predicted MLT prior to the 2016 IAM series
- After three Aura Inc maneuvers, the total inclination change was **0.71% cold** compared to the latest 2015 IAM predictions delivered to MOWG members
 - Assuming the last two Aqua Inc maneuvers perform exactly as predicted

Inc #	Date	Burn Duration (sec)	Predicted Delta - Inc (deg)	Achieved Delta-Inc (deg)	Predicted Delta - RAAN (deg)	Achieved Delta - RAAN (deg)	Predicted Delta - V (m/s)	Achieved Delta - V (m/s)
40	19-Mar-2015	397.5	-0.00949	-0.00939	0.00061	0.00075	1.247	1.230
41	26-Mar-2015	397.5	-0.00950	-0.00949	0.00009	0.00025	1.242	1.244
42	02-Apr-2015	397.5	-0.00946	-0.00937	-0.00042	-0.00025	1.236	1.225
43	16-Apr-2015	397.5	-0.00931	-	-0.00136	-	1.231	-
44	23-Apr-2015	397.5	-0.00921	-	-0.00178	-	1.226	-
Totals:			-0.04697	-0.02825	-0.00287	0.00075	6.182	3.699
			delta-I difference:	0.00020	deg			
			percent error:	0.71%	COLD			

- Aqua has **4** inclination maneuvers planned for Spring 2016
 - Aqua's predicted ideal burn date occurs on **Apr 1, 2016**
 - **4** maneuvers will occur after the ideal burn date
- Aura has **4** inclination maneuvers planned for Spring 2016
 - Aura's predicted ideal burn date occurs on **Mar 26, 2016**
 - **4** maneuvers will occur after the ideal burn date

Note: performing maneuvers off of the ideal date slightly decreases burn efficiency

- Approach inclination maneuvers similarly to the 2009-2015 series
 - Aqua/Aura utilizing historical performances of yaw angles to aid in the WRS-2 control strategy
 - Aqua's maneuvers now have a more accurately predicted SMA change based on a new trending method, implemented in the 2014 series



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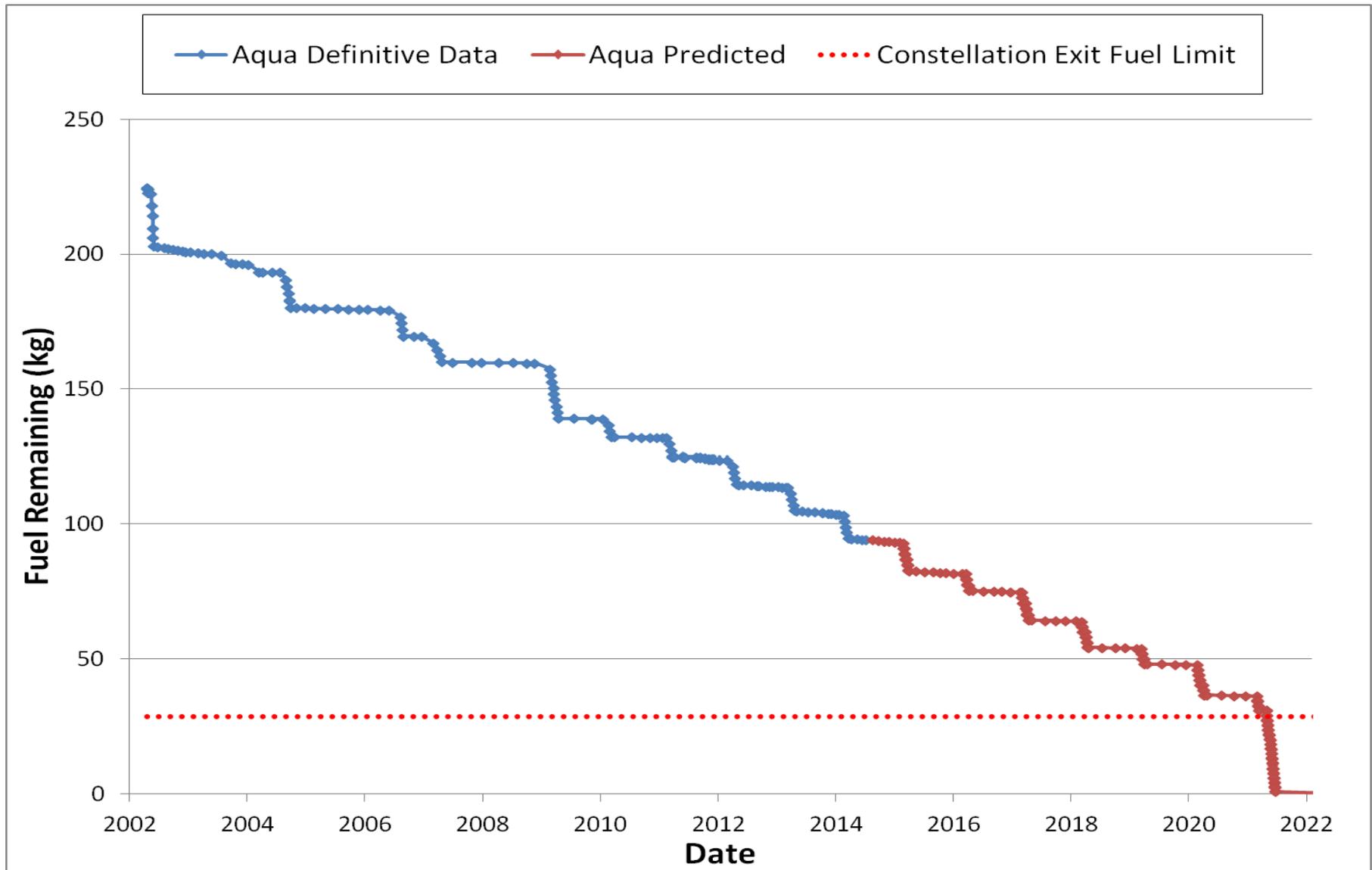
Aqua/Aura Maneuver Schedule (Pre-2015 IAM Series)



Tentative Aqua/Aura 2016 Inclination Maneuver Series Schedule						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
March 27 Easter	28	29	30	31	April 1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20 Aqua IAM#48	21 Aura IAM#45	22	23
24	25	26	27 Aqua IAM#49	28 Aura IAM#46	29	30
May 1	2	3	4	5	6	7
8	9	10	11 Aqua IAM#50	12 Aura IAM#47	13	14
15	16	17	18 Aqua IAM#51	19 Aura IAM#48	20	21
22	23	24	25 Aqua Backup	26 Aura Backup	27	28

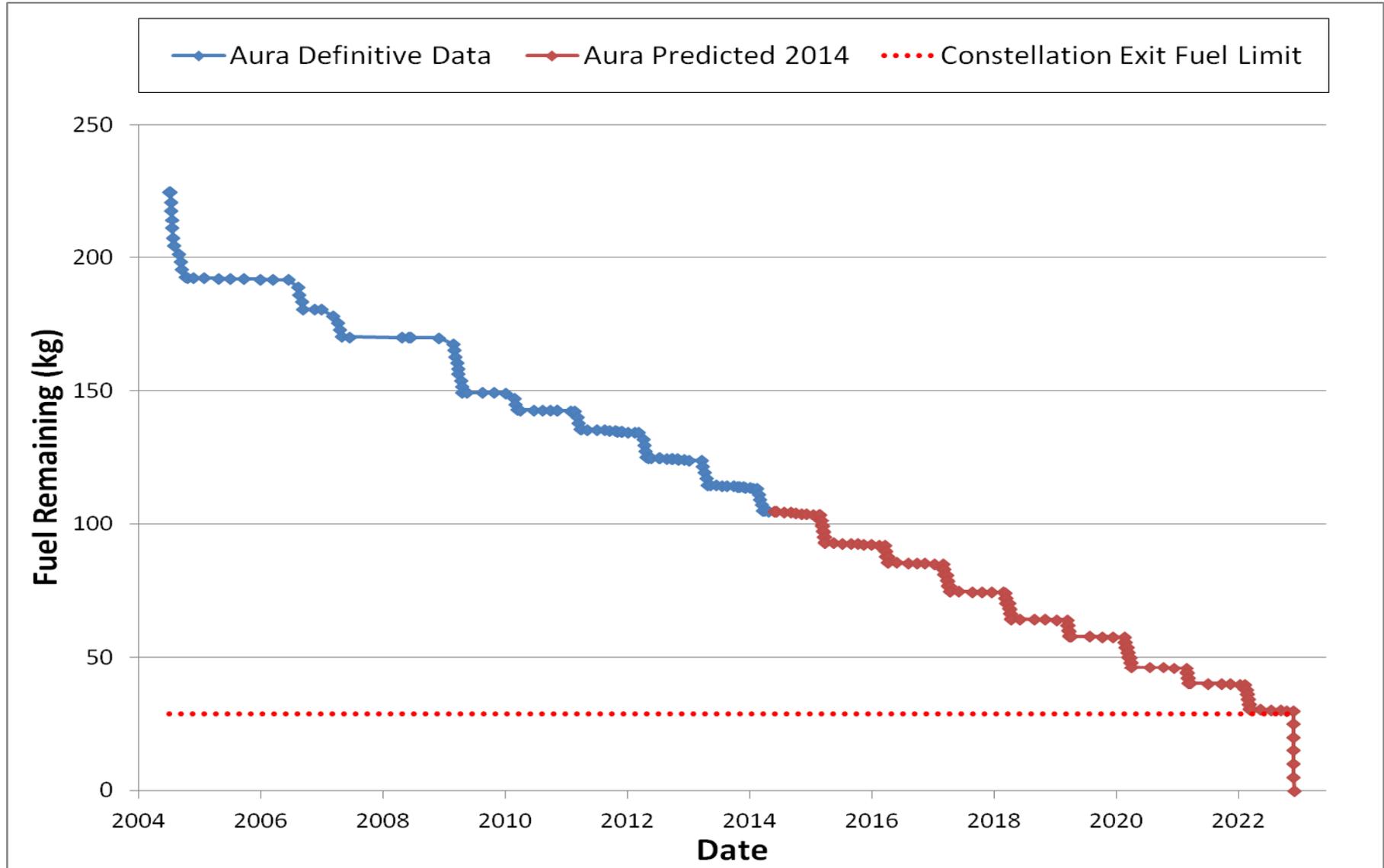
- From 2014 Aqua Lifetime Report, Aqua has enough fuel to complete full inclination series through **2020**, assuming no unusable fuel in the lines and **28.4** kg fuel remaining for constellation exit

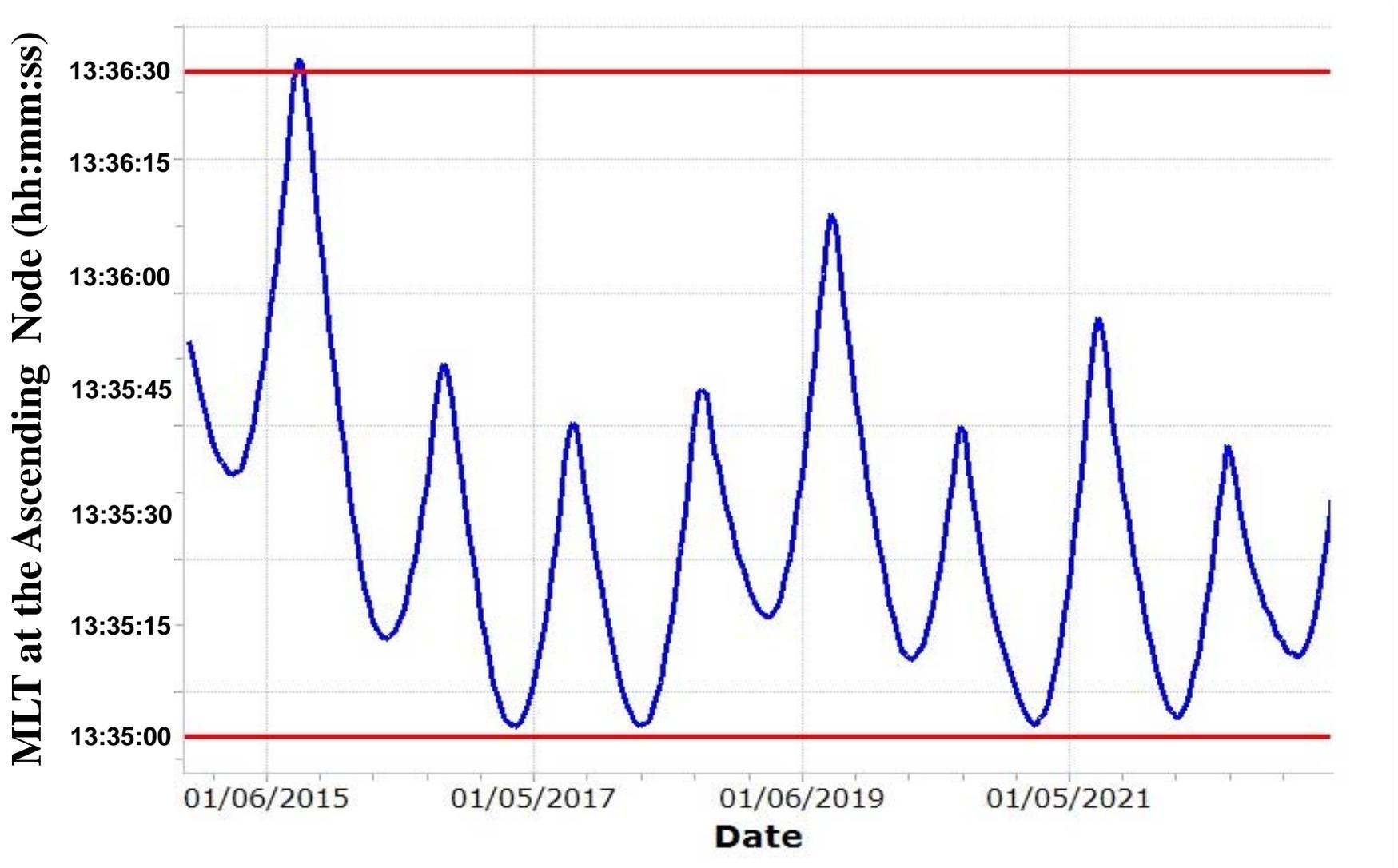
Inclination Series	Number of Maneuvers	Burn Duration (s)	Total delta-l (deg)	Total delta-v (m/s)
Spring 2015	5	550	-0.0454	6.025
Spring 2016	4	550	-0.0349	4.722
Spring 2017	4	550	-0.0348	4.644
Spring 2018	4	550	-0.0345	4.572
Spring 2019	5	550	-0.0423	5.622
Spring 2020	4	550	-0.0331	4.427



- From 2014 Aura Lifetime Report, Aura has enough fuel to complete full inclination series through **2022**, assuming no unusable fuel in the lines and **28.5** kg fuel remaining for constellation exit

Inclination Series	Number of Maneuvers	Burn Duration (sec)	Total Delta - Inc (deg)	Total Delta - V (m/s)
Spring 2015	5	405	-0.0489	6.445
Spring 2016	4	405	-0.0369	5.005
Spring 2017	4	410	-0.0374	5.009
Spring 2018	4	410	-0.0376	4.929
Spring 2019	5	415	-0.0465	6.141
Spring 2020	4	405	-0.0356	4.704
Spring 2021	3	425	-0.0269	2.616
Spring 2022	5	410	-0.0425	6.050





Aqua's MLT requirement is $13:30 \pm 15$ minutes. The mission has agreed to fly within tighter bounds for improved science data collection, as well as, more repeatability of delta-I maneuvers from year to year.

