

Subject: MADCAP -- Mars -- Summary -- 0 Red

Date: Tuesday, April 6, 2021 at 4:17:42 PM Pacific Daylight Time

From: JPL MDNAV

To: mars_madcap_monitor@jpl.nasa.gov

Analysis Time: 2021-04-06 22:21:25 UTC

RED Threshold Updates: 0

ALL Threshold Updates: 0

Ephemeris Updates: 0

Conjunction Assessment Bodies and Types

<u>Body</u>	<u>Name</u>	<u>Type</u>
1	Odyssey	Active
1r	Odyssey	Active/Reference
2	Mars_Express	Active
3	MRO	Active
4	MAVEN	Active
5	MOM	Active
6	TGO	Active
7	EMM	Active
8	Phobos	Natural
9	Deimos	Natural
10	Viking1	Inactive
11	Viking2	Inactive
12	MGS	Inactive

Red (Conjunction Data < 'Red' Thresholds and Event < 14 days from Analysis Time)

<u>Bodies</u>	<u>OXD</u> <u>value/limit</u> <u>.(km)</u>	<u>OXT</u> <u>value/limit</u> <u>.(sec)</u>	<u>CAD</u> <u>value/limit</u> <u>.(km)</u>	<u>Collision Probability</u>	<u>CA Epoch (UTC-SCET)</u>
None					

All (Conjunction Data < 'All' Thresholds for <= 100 days)

<u>Bodies</u>	<u>OXD (km)</u>	<u>OXT (sec)</u>	<u>CAD (km)</u>	<u>CA Epoch (UTC-SCET)</u>
4-6	9.2	181.5	1649.4	2021-04-11 20:59:47
4-6	9.2	181.5	576.6	2021-04-11 21:43:26
1-6	9.6	4.4	40.3	2021-04-17 18:23:46
1-6	9.6	4.4	10.5	2021-04-17 19:22:58
1-6	9.5	38.0	19.0	2021-04-17 20:22:02
1-6	9.5	38.0	36.8	2021-04-17 21:21:14
1-4	-3.0	1013.7	551.6	2021-05-09 05:52:48
1-4	6.2	2240.8	979.4	2021-05-09 09:38:28

Notes

OXD means "Orbit Crossing Distance". OXT means "Orbit Crossing Timing". CAD means "Close Approach Distance".

Data for active spacecraft and natural bodies are displayed in the tables above. Data for inactive spacecraft are not displayed, but they are available in the conjunction metric tables and plots, which have been stored in the output directory listed below. Data for reference trajectories are not considered for Red events, but are considered in the All section for events not covered by the predicts file. Reference trajectories use the same thresholds as the nominal trajectories.

The note after the probability value listed for RED events refers to the source of covariance data used for the probability calculation, with the following definitions:

C - Covariance data provided by the mission in OEM format.

P - A covariance converted from the RED threshold polynomial coefficients listed below.

N - No covariance data, worst case covariance assumed for this body.

No Data - Probability could not be calculated due to a lack of covariance data from both bodies.

For more information, please see the point of contact listed below.

Analysis time: 2021-04-06 22:21:25 UTC

Active spacecraft: Odyssey, Mars Express, MRO, MAVEN, MOM, TGO, EMM

Natural bodies: Phobos, Deimos

Inactive spacecraft: Viking1, Viking2, MGS

Output directory: /nav/home/jplmnav/MADCAP/Mars/archive

Point of contact: MADCAP_Mars@jpl.nasa.gov

MADCAP build: 3.1.2

Red Thresholds -- Polynomial Coefficients

<u>Body</u>	<u>Name</u>	<u>OXD0 (km)</u>	<u>OXD1 (km/t)</u>	<u>OXD2 (km/t^2)</u>	<u>OXT0 (sec)</u>	<u>OXT1 (sec/t)</u>	<u>OXT2 (sec/t^2)</u>
1	Odyssey	0.0050	0.0013	0.0000	0.0705	-0.0411	0.0096
2	Mars_Express	1.0000	0.0000	0.0000	10.0000	0.0000	0.0000
3	MRO	0.0877	-0.0315	0.0040	0.0100	0.4939	0.0765
4	MAVEN	0.5000	0.1000	0.0030	2.1000	0.4000	0.3300
5	MOM	0.2498	0.0014	0.0012	0.0100	33.0089	0.3246
6	TGO	1.0000	0.0000	0.0000	10.0000	0.0000	0.0000
7	EMM	1.0000	0.0000	0.0000	10.0000	0.0000	0.0000
8	Phobos	30.0000	0.0000	0.0000	15.0000	0.0000	0.0000
9	Deimos	40.0000	0.0000	0.0000	20.0000	0.0000	0.0000

Red OX Distance Threshold = $OXD0 + (OXD1 * t) + (OXD2 * t^2)$ [km]

Red OX Timing Threshold = $OXT0 + (OXT1 * t) + (OXT2 * t^2)$ [sec]

where t = CA Epoch - Ephemeris File Submit Time (in days)

Red thresholds are based on 3-sigma values. Thresholds listed as "P" are based on a quadratic fit of the 3-sigma values as a function of time to the event. The polynomial coefficients used are listed in the table above. Lines for coefficients which have been updated since the last run are colored blue, and each line's body is marked with an "*". Thresholds listed as "C" are based on 3-sigma covariance data provided by the mission.

All Thresholds -- Constants

<u>Body</u>	<u>Name</u>	<u>OXD (km)</u>	<u>CAD (km)</u>
1	Odyssey	10	100
2	Mars_Express	10	100

3	MRO	10	300
4	MAVEN	10	3000
5	MOM	20	100
6	TGO	10	100
7	EMM	10	100
8	Phobos	45	100
9	Deimos	60	200

All OX Distance Threshold = OXD

All CA Distance Threshold = CAD

All thresholds are always constants. The constants used are listed in the table above. Lines for constants which have been updated since the last run are colored blue, and each line's body is marked with an "*".

Ephemerides

<u>Body</u>	<u>Ephemeris</u>	<u>Submitted</u>	<u>Begin</u>	<u>End</u>
1	p_m_od85638-85643_87123_v1.bsp	2021-04-05 23:26:25 UTC	04-APR-2021 17:03:50 UTC	04-AUG-2021 23:58:50 UTC
1r	p_m_od85470-85472_86783_v1.bsp_V0.1	Analysis Time	21-MAR-2021 21:30:50 UTC	07-JUL-2021 23:58:50 UTC
2	MOEM_210329OAS_PREDICT__0001.CR.bsp	2021-03-29 10:18:32 UTC	18-MAR-2021 21:43:09 UTC	27-APR-2021 16:50:31 UTC
3	pf_psp_rec68817_68812_69588_p-v1.bsp	2021-04-01 16:20:06 UTC	01-APR-2021 04:03:50 UTC	31-MAY-2021 14:43:50 UTC
4	trj_orb_13694-13696_13949_v1_mvn.bsp	2021-04-05 16:20:26 UTC	04-APR-2021 20:08:50 UTC	13-MAY-2021 06:03:50 UTC
5	ISRO-MOM-2021-03-24-OD2708-096-v1.xsp.bsp	2021-04-06 10:33:15 UTC	24-MAR-2021 00:00:00 UTC	29-APR-2021 00:10:00 UTC
6	TOEM_210329OAS_PREDICT__0001.CR.bsp	2021-03-29 13:24:25 UTC	26-FEB-2021 23:58:50 UTC	08-MAY-2021 15:22:52 UTC
7	62_pred_20210330_20210709_od038_noburn_v1.xsp.bsp	2021-03-31 23:53:21 UTC	30-MAR-2021 15:33:50 UTC	09-JUL-2021 00:00:50 UTC
8	mar097.2010-2029.bsp	Analysis Time	29-DEC-2009 23:58:53 UTC	01-JAN-2030 23:58:50 UTC
9	mar097.2010-2029.bsp	Analysis Time	29-DEC-2009 23:58:53 UTC	01-JAN-2030 23:58:50 UTC

10	Viking1_210101_220101.boa	Analysis Time	01-JAN-2021 11:58:50 UTC	01-JAN-2022 11:58:50 UTC
11	vikings2_210101_220101.boa	Analysis Time	01-JAN-2021 11:58:50 UTC	01-JAN-2022 11:58:50 UTC
12	p_201029-211029-061215_10yr_nominal.nio	Analysis Time	29-OCT-2020 05:28:50 UTC	29-OCT-2021 06:28:50 UTC

Ephemeris files for the bodies analyzed are listed in the table above. Lines for files which have been updated since the last run are colored blue, and each line's body is marked with an "*".