Memorandum SRP-03-2006 rev
14 April 2006

**Subject:**      MESSENGER Mission Phase Definitions
**From:**         R. L. McNutt, Jr.
**To:**           Distribution

This memorandum documents names and time boundaries for MESSENGER mission phases. These identified phases will be used by the MESSENGER Science Team for the submission of all instrument and spacecraft data to the Planetary Data System (PDS), as required. It is expected that these phases will also be used in the science operations planning process for the MESSENGER mission.

The mission phases are defined naturally by the various planetary encounters and their intervening cruise periods. Given the short encounter times for each MESSENGER flyby, we define encounter phases on a ±2 week basis centered on the closest approach to each target body and separate such encounter segments by cruise phases. Nominal orbital phase will thus begin 2 weeks prior to the Mercury Orbit Insertion (MOI) maneuver and continue through to the end of the nominal (controlled) part of the mission.

A launch phase has been defined to capture instrument data produced between launch and the beginning of Phase E.

These definitions were motivated in part by a request from the Planetary Data System (PDS) that Experimental Data Records (EDRs) include "MISSION_PHASE_NAME" as part of data record header information. The PDS has requested further that mission phases be defined to the nearest second. Given actual planning and timing uncertainties, the approach adopted is to identify Universal Time Coordinated (UTC) times that are *approximately* 2 weeks from the defined events and then *define* these times as mission phase boundaries for the future of the mission, regardless of whether the "2-week rule" continues to hold precisely or not. This procedure will allow population of the PDS files irrespective of any relatively small (~days) time shifts in nominal events as now planned.

The cruise-segment naming convention includes the upcoming target in the name for easy identification. This convention as adopted is shown in Table 1. Input information is taken from http://messweb.jhuapl.edu/MD/servlet/Trajdb.

N.B. Two weeks = 14 days; "Start Time" is assumed to be on the given day at 00:00:00.000 UTC; "End time" is assumed to be on the given day at 23:59:59.0 UTC for the PDS and 23:59:59.999 for other purposes for which a quoted time to the nearest millisecond is appropriate. In each entry the corresponding day of year (DOY) is given in parentheses.

For the nominal mission now being flown, there are fourteen (14) named mission phases. These mission phase names will be used henceforth in all PDS deliveries and in all mission planning and flight documents, as appropriate.

**Table 1. MESSENGER Mission Phase Definitions**

| Phase Event | Event Date and Time (DOY) hh:mm:ss.s UTC | Phase Name | Start time Date (DOY) | End time Date (DOY) |
|---|---|---|---|---|
| Launch | 3 Aug 2004 (216) 06:15:56.537 | Launch | 3 Aug 2004 (216) | 12 Sep 2004 (256) |
| Phase E start | 13 Sep 2004 (257) 00:00:00.0 | Earth_Cruise | 13 Sep 2004 (257) | 18 Jul 2005 (199) |
| Earth flyby | 2 Aug 2005 (214) 19:13:08.4 | Earth_Flyby | 19 Jul 2005 (200) | 16 Aug 2005 (228) |
|  |  | Venus_1_Cruise | 17 Aug 2005 (229) | 9 Oct 2006 (282) |
| Venus flyby 1 | 24 Oct 2006 (297) 08:31:26.3 | Venus_1_Flyby | 10 Oct 2006 (283) | 7 Nov 2006 (311) |
|  |  | Venus_2_Cruise | 8 Nov 2006 (312) | 22 May 2007 (142) |
| Venus flyby 2 | 6 Jun 2007 (157) 00:12:36.9 | Venus_2_Flyby | 23 May 2007 (143) | 20 Jun 2007 (171) |
|  |  | Mercury_1_Cruise | 21 Jun 2007 (172) | 30 Dec 2007 (364) |
| Mercury flyby 1 | 14 Jan 2008 (014) 20:14:22.5 | Mercury_1_Flyby | 31 Dec 2007 (365) | 28 Jan 2008 (28) |
|  |  | Mercury_2_Cruise | 29 Jan 2008 (29) | 21 Sep 2008 (265) |
| Mercury flyby 2 | 6 Oct 2008 (280) 13:39:08.2 | Mercury_2_Flyby | 22 Sep 2008 (266) | 20 Oct 2008 (294) |
|  |  | Mercury_3_Cruise | 21 Oct 2008 (295) | 15 Sep 2009 (258) |
| Mercury flyby 3 | 30 Sep 2009 (273) 01:33:50.9 | Mercury_3_Flyby | 16 Sep 2009 (259) | 14 Oct 2009 (287) |
|  |  | Mercury_4_Cruise | 15 Oct 2009 (288) | 3 Mar 2011 (62) |
| MOI | 18 Mar 2011 (077) 07:30:00.0 | Mercury_Orbit | 4 Mar 2011 (63) | 18 Mar 2012 (77) |

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