DEEP IMPACT (EPOXI)

Add-on for Orbiter 2010 - P1
(build 100830)

Mission Overview

In January 2005, a Delta II rocket launched the combined Deep Impact spacecraft (Flyby Bus & Impactor) on a collison course with comet 9P_Tempel1. The combined spacecraft approached 9P_Tempel 1 and collected images of the comet before the impact. On 3rd July 2005, 24 hours before impact, the flyby spacecraft pointed high-precision tracking telescopes at the comet and released the impactor on a course to hit the comet's sunlit side. A camera on the impactor captured images of the comet's nucleus just seconds before collision. After release of the impactor, the flyby spacecraft maneuvered to a new path that passed 500 km from the comet. The flyby spacecraft observed and recorded data about the impact, the ejected material blasted from the crater, and the structure and composition of the crater's interior.

The Flyby Bus was then retargeted, via 3-close and 2-distant flybys of Earth, to intercept and observe comet 103P_Hartley2 in early November 2010.

More info:
http://nssdc.gsfc.nasa.gov/database/MasterCatalog?sc=2005-001A
http://deepimpact.jpl.nasa.gov/press/deep-impact-launch.pdf
http://epoxi.umd.edu/

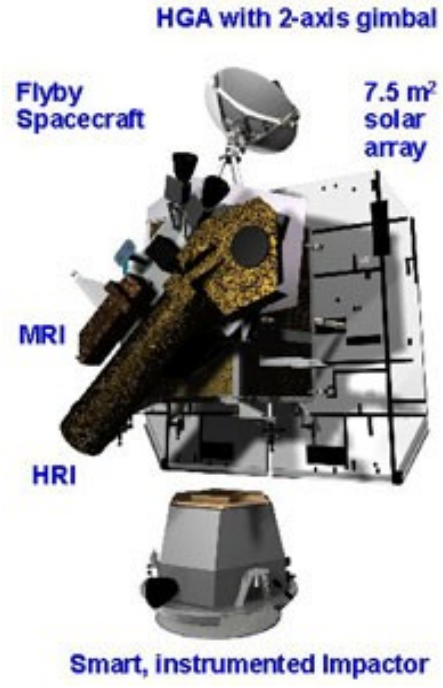
Add-on Spacecraft Specifications and Controls

Flyby Bus

Spacecraft Mass	515kg
Fuel Mass	86kg
Fuel ISP	2500Ns/kg
RCS Motors	10N each

Controls:
[G] = Deploy Solar panels
[K] = Deploy HGA
[J] = Jettison Impactor

Available commands and remaining dV capability are displayed on the HUD



Impactor

Spacecraft Mass	364kg
Fuel Mass	8kg
Fuel ISP	3000Ns/kg
RCS Motors	5N each

Launch

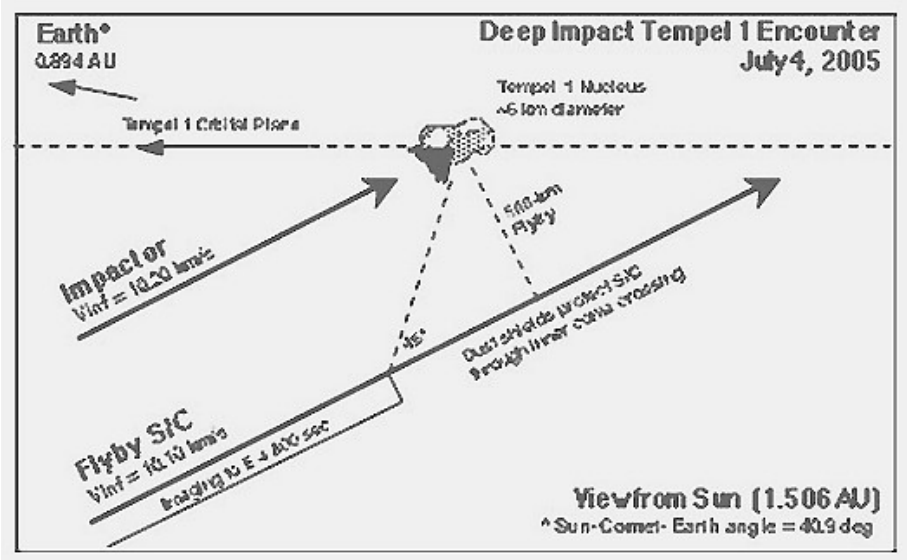
Launched 12th January 2005 at 18:47:08 UTC from LC-17B on a 99° azimuth, 167km circular parking orbit.

This add-on has a launch autopilot available. Press [P] at T-10s to activate the autopilot. The autopilot will make all the necessary burns to put the spacecraft on a usable trajectory to intercept the comet. For increased accuracy, you may like to disengage the autopilot during parking orbit and plan your own escape burn. Press [P] to disengage the autopilot (cannot be restarted). Final seperation of the spacecraft from the launcher 3rd stage must be made manually.

Delta II Launcher Controls
[P] = Engage/Disengage Autopilot
[F] = Jettison Fairing
[J] = Jettison Stage or Spacecraft

Encounter and Impact

The Flyby Bus released the Impactor 24hrs before impact, then made a divert maneuvre of aprox. dV 100m/s so that the closest approach to the comet would be 14 mins after impact, at a distance of 500km below (ecliptic South) the comet's orbital plane. The Impactor hit the sunlit side of the comet at aprox. 05:46:00 UTC, 4th July 2005.



During the encounter, the Flyby Bus continues imaging until aprox. 700 km altitude, at which time the spacecraft is reoriented so that the dust shielding provides protection during the crossing of the inner-coma.

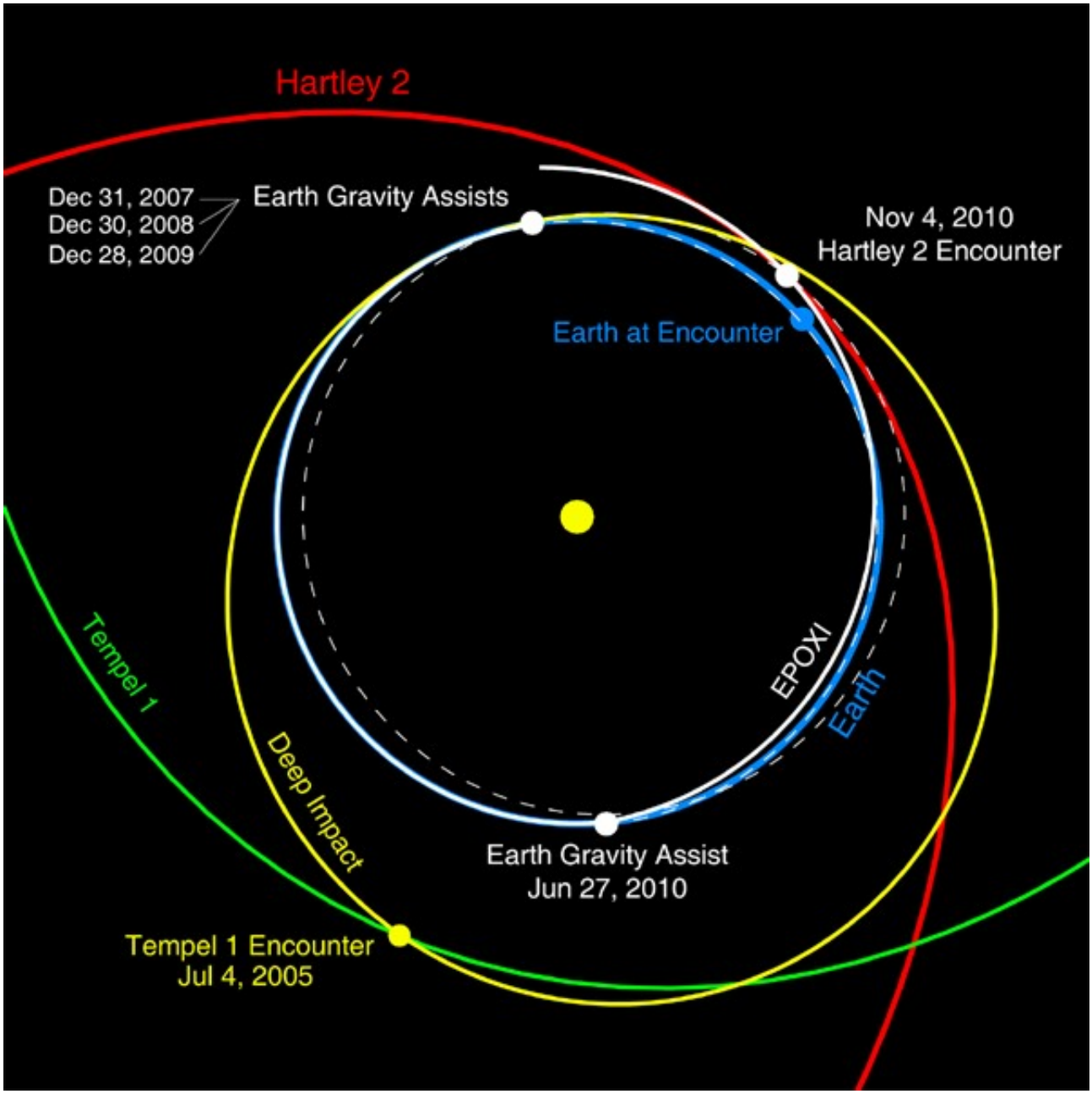
Add-On Notes

Three scenarios are provided in the Scenarios/DeepImpact/ folder:

1. Launch
2. 5 mins before impact
3. Flyby of 103P_Hartley2

All scenarios use their own system .cfg file – Sol_DI.cfg, which includes the comets and the standard Orbiter planets. The Delta II is controlled by Vinka's "multistage2.dll", all other vessels use their own .dll's. Special vessels for providing comet "outgassing" visual effects are already landed on the comets in each scenario.

DeepImpact (Epoxi) Trajectory



Quick Reference Info

Comet Names

9P_Tempel1	103P_Hartley2

Key Events Timeline

Launch 99° azimuth, 167km parking orbit	2005-Jan-12 18:47:08 UTC	MJD 53382.7827
Impactor release	2005-Jul-03 ~06:00:00 UTC	MJD 53554.2500
Flyby Bus divert maneuvre ~100m/s	2005-Jul-03 ~06:10:00 UTC	MJD 53554.2569
Impact (sunlit side)	2005-Jul-04 05:46:00 UTC	MJD 53555.2403
Flyby Bus closest approach – 500 km	2005-Jul-04 06:00:00 UTC	MJD 53555.2500
Earth flyby – 15,567 km alt	2007-Dec-31 19:29:20 UTC	MJD 54465.8120
Earth flyby – 43,450 km alt	2008-Dec-29 ?????? UTC	MJD 54829.????
Earth flyby – 1,336,703 km	2009-Jun-29 07:42:41 UTC	MJD 55011.3213
Earth flyby – 1,323,959 km	2009-Dec-28 10:19:45 UTC	MJD 55193.4304
Earth flyby – 30,496 km alt	2010-Jun-27 22:05:13 UTC	MJD 55374.9203
103P_Hartley2 flyby – 700 km	2010-Nov-04 13:50:57 UTC	MJD 55504.5770