STARDUST (NExT)

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

Mission Overview

The NASA "Stardust" spacecraft was launched on a Delta II rocket from KSC LC-17 Pad-A on 7th February 1999. It's mission was to collect and return to Earth samples from the coma of comet 81P_Wild2 and also interstellar dust particles. During it's mission it also performed a flyby of asteroid 5535_AnneFrank. The Sample Return Capsule was successfully returned to Earth on 15th January 2006, landing in the Utah Test Range, while the main spacecraft bus flew past Earth and was retargeted, via two more Earth gravity assists, to flyby comet 9P_Tempel1 in early February 2011.

More info:
http://stardust.jpl.nasa.gov/home/index.html
http://stardustnext.jpl.nasa.gov/
http://stardust.jpl.nasa.gov/news/presskits.html

Add-on Spacecraft Specifications and Controls

Main Bus

Spacecraft Mass	254.3 kg
Fuel Mass	85kg
Fuel ISP	2500 Ns/kg
RCS Engines	4N each

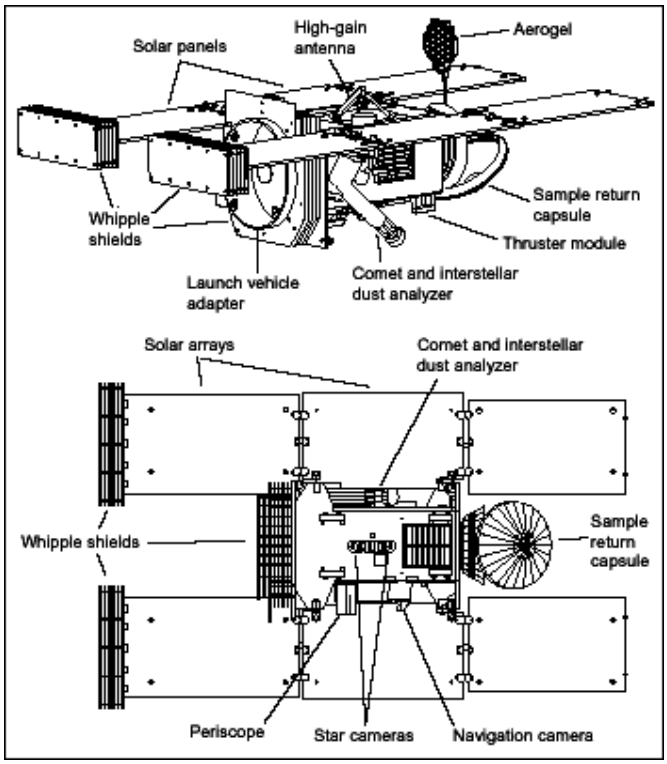
Controls:
[G] = Deploy Solar Panels & Periscope
[K] = Deploy/Stow Aerogel Particle Collector
[J] = Jettison Sample Return Capsule

Available commands and remaining dV capability are displayed on the HUD.

Sample Return Capsule (SRC)

Spacecraft Mass	45.7 kg

The SRC has no propulsion systems. The drogue and main parachutes will open automatically at 20 km and 3 km altitude respectively.



Launch

Launched 7th February 1999 at 21:04:15 UTC from LC-17A on a 91.6° azimuth,
185km x 189km 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.

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

Note: When planning the Earth orbit escape burn, it may be worth noting that the historical trajectory included a burn of aprox. 170m/s, roughly retrograde, at the first aphelion.

SRC Return

Target the Utah Test Range at Lat. 40.3° N, Long.113.5° for a night re-entry (prograde), around midnight local time. Suggested IMFD "Base Approach" settings: Alt 150km, ReA 9.1, Ant 9.3

Scenarios

Three scenarios are provided in the Scenarios/Stardust Mission/ folder.

1. Stardust Launch
2. Stardust post launch
3. SRC Jettison (approaching Earth)

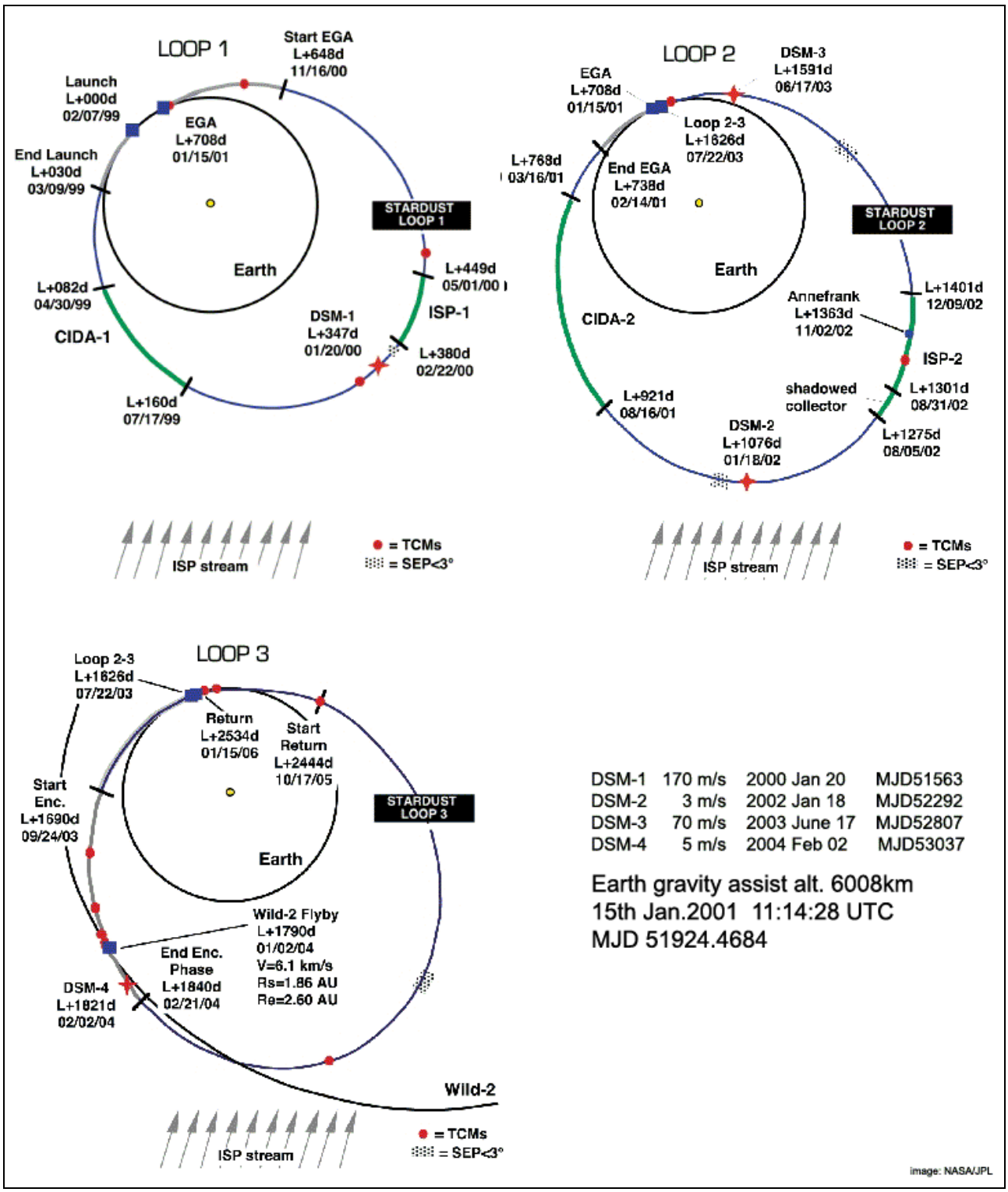
Add-on Notes

The Delta II launcher is controlled by Vinka's "multistage2.dll", all other vessels have their own custom .dll's.

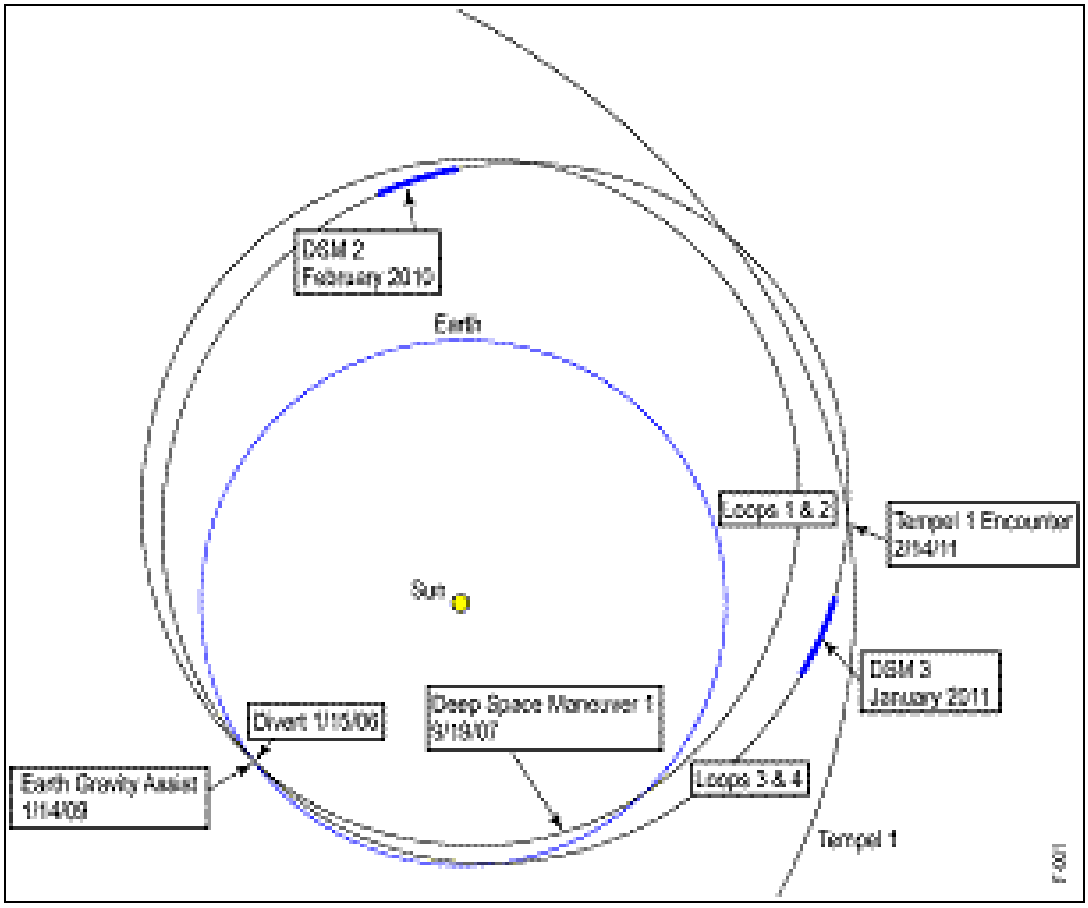
Two special vessels for providing the comet "outgassing" visual effects are already landed on their respective comets in each scenario.

The provided scenarios use a custom solar system .cfg file: Config/Sol_SD.cfg, which includes the two comets 81P_Wild2 and 9P_Tempel1, asteroid 5535_AnneFrank, together with the default Orbiter planets and moons.

Stardust Trajectory (prime mission)



Stardust Trajectory (extended mission NExT)



Quick Reference

Comet Names

81P_Wild2	9P_Tempel1

Timeline

Event	Date	MJD
Launch, 91.6° azimuth	07 Feb 1999 21:04:15 UTC	51216.8779
DSM-1, dV 170m/s, (~retrograde)	20 Jan 2000 ???????? UTC	51563
Earth Flyby, 6008 km	15 Jan 2001 11:14:28 UTC	51924.4684
5535_AnneFrank Flyby, 3000 km	02 Nov 2002 04:50:00 UTC	52580.2014
DSM-3, dV 70m/s	17 Jun 2003 ???????? UTC	52807
81P_Wild2 Flyby, 240 km	02 Jan 2004 19:45:00 UTC	53006.8229
Jettison SRC / Bus Divert Maneuvre	15 Jan 2006 05:57:00 UTC	53750.2479
SRC Atmosphere Reentry	15 Jan 2006 09:56:00 UTC	53750.4139
Earth Flyby, 258 km	15 Jan 2006 10:00:00 UTC	53750.4167
Earth Flyby, 9200 km	14 Jan 2009 19:40:?? UTC	54845.819?
9P_Tempel1 Flyby, 200 km	15 Feb 2011 04:42:00 UTC	55607.1958

SRC Trajectory – IMFD “Base Approach” Settings

Target	Lat. 40.3 N, Long. 113.5 W
Entry Alt.	150 km
ReA	9.1
Ant	9.3