Delta2 and SLC-17

Add-On for Orbiter 2016 (v. 160828)

INSTALLATION
Extract all files to the root of your Orbiter program directory, preserving the directory structure. This should NOT overwrite anything in the standard Orbiter package.

WHAT'S IN THIS ADD-ON?
The Delta2 launcher and launchpad SLC-17.
Delta2 variants 7320,7325,7326,7420,7425,7426,7920,7925,7926,7920H,7925H,7926H

Features optional ascent-to-orbit autopilot, 2nd stage spin-table, 3rd stage burn-to-depletion and yoyo de-spin system, large or small fairing, custom payload adaptor option. Various test-launch scenarios for each variant.

Launchpad SLC-17 features LOX vent and launch effects, automatic night lights. Includes three Earth Elev_mod layer tiles at Levels 13,14,15 for flatter terrain in SLC-17 area.

SCENARIOS
Test launch scenarios are in the "Delta2 SLC17" folder, payload masses are nominal maximum for 185km, 28.7deg.inc. LEO (two stage variants) or GTO (three stage variants, LEO + 2600m/s dV)

LAUNCH SCENARIO SETUP
For launch smoke and LOX vent effects, the Delta2 is attached to SLC-17 (see scenarios included).
For Pad A use   Attached 0:0, SLC17
For Pad B use   Attached 0:1, SLC17

DELTA 2 CONTROLS
[V] = Start ascent autopilot at T-10s.
[P] = Attach payload (enter vessel name)
[N] = Jettison 1st Stage (and SRB's)
[J] = Jettison fairings/payload
[G] = Spin-up and Jettison 3rd Stage
[L] = Enter target orbit Inclination (deg., equatorial)
[M] = Enter target orbit Perigee alt. (km) (orbit insertion alt.)
[K] = Enter target orbit Apogee alt. (km)
[E] = Set camera view forward/back
Available commands, target orbit parameters and dV are displayed on the HUD.

DELTA 2 CONFIG FILE OPTIONS (.cfg)
Add the following to your Delta2 launcher .cfg file for fairing and custom adaptor options:
LargeFairing = TRUE   (uses large 10' fairing, default FALSE)
Adaptor = <path to payload adaptor mesh>   (e.g. Adaptor = Delta2/adaptor_36)
The adaptor mesh is added at the payload interface, the bottom of the adaptor should coincide with the mesh origin (0,0,0).

PAYLOAD MANAGEMENT

The Delta 2 has three payload attachment points, mass of attached vessels is added.
Attachment points are located at the centre of the payload interface ring.
Attachment can be made in the scenario file (see examples included).
Any existing vessel can be added by name (press [P], enter name). The first available attachment point on the payload will be used for the attachment.
Payloads are jettisoned in reverse order (3,2,1).

SPIN-TABLE and 3rd STAGE

For three-stage configurations, the 3rd Stage (either Star37FM or Star48B) uses solid propellant and will burn-to-depeletion at 100% throttle once ignited. The 3rd Stage has no RCS and relies on spin-stabilisation provided by the spin-table. When the 3rd stage is depleted, the yoyo de-spin system will activate and remove most of the rotation before payload separation. The dV that will be supplied by 3rd Stage is displayed on the HUD.

Since the dV supplied by the 3rd Stage is *fixed*, the final 2nd Stage burn should be cut when there is still dV required equivalent to 3rd Stage capability.

AUTOPILOT SEQUENCE

You can fly the Delta2 manually or use the optional ascent-to-parking-orbit autopilot.
The autopilot will place the Delta2 in the specified parking orbit, from where you can use the MFD of your choice to calculate the final escape burn for your mission (if required).

Enter the target orbit parameters (inclination, perigee and apogee).
Press [V] at T-10s to activate the autopilot.
Stage and fairing jettison are also carried out by the autopilot.

T-10s	Countdown
T-2s	Engine throttle up to 100%
Alt.50m	Roll to launch azimuth and initial pitch over
Alt.200m	Follow gravity turn
Alt.40km(or final SRB sep.)	Active steering
MECO+20s	Fairing separation
Target orbit reached	Autopilot off

SPENT STAGE CLEANUP

All Delta2 parts (spent stages, fairings, yoyos, etc.) except for the final stage, will self-delete after 5 or 10 mins.

DELTA2 VARIANT NAMING KEY

The various Delta2 configurations of SRB's, stages and fairings are denoted by the naming convention "Delta7x2y" where:
x = Number of SRB's (3,4 or 9)
y = 0 = No 3rd stage
y = 5 = Star48B 3rd stage
y = 6 = Star37FM 3rd stage
For the larger GEM46 SRB's, an **H** is appended e.g. Delta7920**H** ("Heavy" variant)
For the large 10' fairing, a **_10** (or **_10L**) is appended e.g. Delta7920H**_10**

DELTA 2 ADD-ON DATA

SRB's (GEM40)   (each)
Empty Mass	1102kg
Propellant Mass	11766kg
Thrust(Vac)	460350N
ISP(Vac)	2539.5Ns/kg

SRB's (GEM46 - Delta79xxH only)   (each)
Empty Mass	1880kg
Propellant Mass	16880kg
Thrust(Vac)	549900N
ISP(Vac)	2445Ns/kg

1st STAGE
Empty Mass	5680kg
Propellant Mass	96120kg
Thrust(Vac)	1055000N
ISP(Vac)	2965Ns/kg

2nd STAGE
Empty Mass	900kg
Propellant Mass	6000kg
Thrust(Vac)	43655N
ISP(Vac)	3443Ns/kg
RCS Propellant Mass	50kg
RCS Thrust(Vac)	200N
RCS ISP(Vac)	800Ns/kg

3rd STAGE(Star48B)
Empty Mass	132kg
Propellant Mass	2012kg
Thrust(Vac)	68309N
ISP(Vac)	2886Ns/kg

3rd STAGE(Star37FM)
Empty Mass	82kg
Propellant Mass	1067kg
Thrust(Vac)	48506N
ISP(Vac)	2864Ns/kg

FAIRINGS
Small 9'	880kg
Large 10'	980kg

SLC-17 CONTROLS
[V] = LOX vent effects on/off
[K] = Night lights on/off
[G] = Retract/engage MSS Pad A
[B] = Retract/engage Umbilicals Pad A
[Shift]+[G] = Retract/engage MSS Pad B
[Shift]+[B] = Retract/engage Umbilicals Pad B

SLC-17 OPERATION
The launchpad has attachment points located at the centre of the hold-down points on Pads A & B. If the launcher is attached to the pad, LOX vent and launch effects are automatic.

Launcher attachment is released when main engine reaches 95% throttle.
Pad will self-delete 5mins. after launch (unless another launcher remains attached to pad).
Automatic night lights.

Happy orbits :-)
BrianJ
October 2017