

NOVA-C

Add-on for Orbiter2016

REQUIREMENTS

Launch scenario requires:

Falcon9 for Orbiter2016

<https://www.orbiter-forum.com/resources/falcon9-for-orbiter2016.291/>

RECOMMENDED

LC39A SpaceX

<https://www.orbiter-forum.com/resources/lc39a-spacex.3092/>

InterplanetaryMFD

<https://www.orbiter-forum.com/resources/interplanetary-mfd.5500/>

LTMFD

<https://www.orbiter-forum.com/resources/lunartransfer-mfd-ltmfd.5501/>

PursuitMFD

<https://www.orbiter-forum.com/resources/pursuitmfd-2016.3096/>

INSTALLATION

Extract all files to the root of your Orbiter2016 program directory, preserving the directory structure. This should NOT overwrite anything in the standard Orbiter package.

WHAT'S IN THIS ADD-ON?

The Nova-C lunar lander, EagleCam cubesat, Doge1 cubesat.

Malapert_A_Rim lunar base for use as landing target.

Launch scenario for 15 Feb 2024.

MISSION

Nova-C is scheduled to land on the rim of Malapert A crater on the Moon.

EagleCam is a payload of Nova-C, to be deployed shortly before touchdown at an altitude of ~40m, to take the first "3rd person view" image of a spacecraft landing on the Moon.

Doge1 cubesat is a rideshare on Falcon9, going to lunar orbit via a WSB-Ballistic trajectory.

NOTES

Nova-C will spend one day in Lunar orbit before touchdown.

Landing site is in darkness until ~12:00 UTC, 18 Jan 2024, so don't land before then.

Launch date of 12 Jan 2024 requires an extended lunar transfer of ~5.5 days, or a phasing loop orbit of Earth before making final TLI burn.

My selected landing site is marked by lunar base "Malapert_A_Rim" at Longitude/Latitude -6.8123 -80.3596 .

Doge1 cubesat WSB-Ballistic trajectory to the Moon has not been considered for this add-on – may require further burn of Falcon9 upper stage after Nova-C release.

NOVA-C Descent Autopilot

Nova-C has an onboard autopilot that will deorbit and land the spacecraft.

Requires initial orbit between 100km x 100km and 100km x 20km (periapsis near target).
Maximum crossrange error 200km.

Enter landing site Long/Lat [V]

Engage autopilot [P] at ~1000km range to target (burn usually starts ~700km range)

At 5km altitude, autopilot will perform a search for flattest landing area within 500m, and set the new landing site target coordinates.

At 40m altitude, autopilot deploys EagleCam

Sequence:

100km to 15km : Deorbit and null crossrange error

15km to landing : Final approach phase

10km alt.: Orient solar panels South or North (depending on landing site latitude)

5km alt.: Search for flattest landing area within 500m and set as new target.

40m alt.: EagleCam jettisoned

NOVA-C Controls and Data

Nova-C has 3-axis rotation RCS (not balanced) and +/- Z axis linear RCS.

[V] Enter landing site longitude and latitude.

[P] Start/stop descent autopilot.

[B] Perform search for flattest area within 500m of landing site

[N] Use the search result long/lat as new landing target

[J] Jettison EagleCam

[E] Set cockpit view forward/back

[K] Lidar On/Off

Dry Mass	624 kg
Propellant	1284 kg
Main Engine Thrust	4000 N
Main Engine ISP	3600 Ns/kg
RCS Engine Thrust	10 N (x 16)
RCS Engine ISP	800 Ns/kg

EAGLECAM IMAGING (only with D3D9 Graphics Client 4.26 or later)

EagleCam cubesat is deployed from Nova-C at altitude ~40m before touchdown.

It will automatically take a series of 6 images, capturing the Nova-C landing.

Images are saved as .bmp in Orbiter/Images/EagleCam folder.

Imaging can be disabled by editing Orbiter/Config/Vessels/nova_c/eaglecam.cfg using "DisableImaging = true"

EAGLECAM Controls and Data

EagleCam has no propulsion or RCS, but does have Momentum Wheel attitude control.

[Shift]+[NumPad] Momentum Wheel rotation control
[Shift]+[NumPad5] Momentum Wheel Kill-Rotation
[B] Start/stop imaging (image every 2s)

Mass 1kg

DOGE1 Controls and Data

Doge1 has a small Ion engine and Momentum Wheel attitude control

[Shift]+[NumPad] Momentum Wheel rotation control
[Shift]+[NumPad5] Momentum Wheel Kill-Rotation

Dry Mass 13.7 kg
Propellant 0.3 kg
Main Engine Thrust 0.001 N
Main Engine ISP 20000 Ns/kg

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