# Mission Design for Non-Nuclear Earth to L2 Payload Transfer and Deployment

- Small amplitude L2 libration point orbit could be achieved using Lunar swingby
- Would require launch vehicle C3 of app. –1.9 km^2/s^2 (without phasing loops)
- Launch vehicle 3 sigma velocity errors are app. 6.5 m/s for Delta 4, 2.3 m/s for Atlas 5
- Carrier vehicle would use chemical propulsion to correct errors (launch vehicle, propulsion system, etc.) and would require a delta_v capability of app. 50-75 m/s

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- Transfer from Earth to the small amplitude libration point orbit would take app. 5-6 months (with a Lunar swingby)
- The observatory payload will be deployed in a small amplitude libration point orbit
- The observatory payload will use the low thrust electric propulsion system to attain the mission orbit (same system to be used for stationkeeping)
- Transfer from the small amplitude libration point orbit to the mission orbit will require app. 3 additional months and will require a delta_v of app. 100 m/s

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- Navigation during the transfer from the small amplitude libration point orbit to the mission orbit may be challenging if orbit determination arcs need to include low thrust periods and would require data from spacecraft sensors (for example, optical sensor, IMU) in addition to DSN tracking data
- Small amplitude libration point orbit should require stationkeeping app. every 3 months in the event deployment is delayed (more stable than mission orbit)
- After the mission orbit is attained frequent stationkeeping maneuvers will be required

# Mission Design for Non-Nuclear Earth to L2 Payload Transfer and Deployment

- A direct transfer trajectory using Solar Electric Propulsion (SEP) was briefly analyzed
- Large amplitude L2 libration point orbit would not require a Lunar swingby but would require a launch vehicle C3 of app. –0.6 km^2/s^2 and an increased delta_v for transfer from the large amplitude libration point orbit to the mission orbit

# Sample Transfer Trajectory from MAP Orbit with Lunar Swingby to Mission Orbit

(low thrust periods in red using a thrust/mass ratio which approximates the minimum required for stationkeeping)