

# 7th International Conference on Astrodynamics Tools and Techniques (ICATT)



Contribution ID: 33

Type: **Oral presentation at the conference**

## OPTELEC - Constrained Low-Thrust Transfer Optimisation Tool applied in Operational Context

*Friday, 9 November 2018 11:30 (30 minutes)*

Traditionally, GTO to GEO transfers using chemical propulsion consist in optimising a rather limited number of manoeuvres. The compliance with the satellite platform and operational constraints are then guaranteed by the launch window design. On the contrary, low-thrust transfers of GEO satellites require very long thrust phases. The complex satellite platform and operational constraints induced by the use of EP and by long transfer durations need to be handled by a dedicated transfer optimisation software. This paper presents the development, validation and various uses of the in-house low-thrust transfer optimisation software, OPT-ELEC.

The development of OPTELEC was performed to serve a three-fold purpose:

- (i) Studies and mission analysis: to be used for system definition, that is transfer  $\Delta V$  budget and duration estimation, computation of satellite attitude guidance throughout the transfer and optimisation of a selection of injection orbit parameters. Minimum-time and minimum propellant mass low-thrust transfers are covered. Up to three levels of thrust are available (full thrust, reduced thrust and coast arc). The family of injection orbit is not limited to GTO but can typically span from LEO to SSTO.
- (ii) Operations: to be used during the Launch and Early Operation Phase (LEOP). This includes the development of high fidelity environment and satellite modelling, along with the satellite platform and operational constraints to be taken into account throughout the optimisation process. Also, real time operations require a fast-running software, without the need of an optimisation technics expertise.
- (iii) Versatility: to be developed to handle not only Electric Orbit Raising (EOR) transfers optimisations but also transfers with high thrust propulsion only - using the Liquid Apogee Engine (LAE) - and hybrid transfers including any combination of LAE burns, Reaction Control Thruster (RCT) burns and thrust with EP.

This paper shows how OPTELEC was designed in order to achieve these goals and the applications to a wide variety of missions.

### Summary

**Primary author:** LOCOCHE, Slim (Airbus Defence and Space)

**Presenter:** LOCOCHE, Slim (Airbus Defence and Space)

**Session Classification:** Low Thrust #2

**Track Classification:** 03: Low Thrust