**DRAFT OF THE PRELIMINARY DESIGN OF INTERPLANETARY EXPLORER**

DEPARTURE WINDOW CHOICE:

DEP PLANET: Neptune

FLYBY PLANET: Venus

ARR PLANET: Mercury

EARLIEST DEP: 2031/02/01

LATEST ARR: 2071/02/01

* TIMES FOR HOHMANN TRANSFERS -> Neptune -Venus about 30.1 years with a dv of about 18 km/s
* USE SYNODIC PERIODS OF THE PLANETS
* ? Use the porkchop plot, starting with going from planet A -> B, then for going from B -> C (**Porkchop plots for each arc are still a useful design tool,** as they provide information about the minimum possible Δ𝑣, or high-Δ𝑣 regions to be

avoided.)

* Refine the initial guesses using the genetic algorithm and then the fmincon constrained optimization functions

DEPARTURE CONSTRAINTS:

* Maximum *hyperbolic excess velocity* C3 = vinf^2 (from launcher & maybe probe)
* Falcon Heavy: 5t probe v\_inf max 6km/s

ARRIVAL CONSTRAINTS:

* Maximum delta V from the probe

POWERED FLYBY CONSTRAINTS:

(The required powered GA to connect the incoming and outcoming arcs

may require too high a Δ𝑣 (or just pierce through the planet).

**CONSTRAINTS**:

-minimum altitude of fly-by

-maximum DELTA-V given by the probe

The constraints can be imposed easily in the fmincon and genetic algorithm functions simply using the nonlinear constraint parameter function and in the “classical way” for the 3D grid using “min\_DV0 = min(DV(DV1 < vinf && *OTHER\_CONSTRAINTS*));

