EARTH-JUPITER-EARTH TRAJECTORIES AND THE EUROPA 1 CE CLIPPER MISSION*

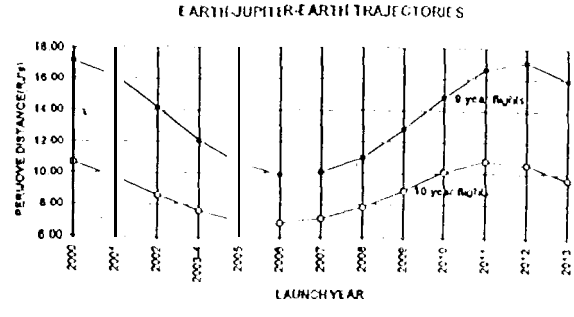
David F. Render, Jet Propulsion Laboratory, California Institute of Technology

The nature of Earth-Jupiter - Earth trajectories that can flyby close to Europa is described and details of opportunities with launches from 2000 through 2003 are presented. Flights of four years duration are possible with type 1 trajectories (central angle less that 180 degrees) both outbound and return. But. these go around Jupiter in the opposite direction to the motion of the moons. To fly around Jupiter in the same direction as Europa requires type 2 trajectory es both outbound and return.

The figure below show the key parameter for selecting the Europa trajectories, namely the perijove distance at Jupiter for nine and ten year flights which have minimum launch requirements and minimum return speeds at Earth. Europa orbits at 9.4 RJ and it is seen that launches to reach Europa on these trajectories can only occur on ten year flights from 2001 (just barely possible) through 2009. For the study results presented here the periapse altitude at Europa has been set at 50 km. and targeting at Europa is varied by changing the targeting (B) plane angle.

The flyby speed at Europa varies from 8 to 10 km/sec and at 50 km. periapse altitude there occurs a bend of about 5 degrees. This effect must be utilized in the trajectory or else corrected by an impulse so that the trajectory returns to Earth . As a result of this and the sight out of ecliptic positions of Jupiter, Europa, and the spacecraft. there are significant variations in the impulses needed close to Jupiter as a function of the target plane angle to yield both the chosen Europa flyby and the Earth return trajectory.

Finally the launch energy (C3) of these trajectories at 88 to 90 km^2/sec^2 is too high for launch with the Delta 1 I (7924) system. Thus a two year Earth gravity assist.. with an Earth flyby at. 300 km. altitude has been introduced. The launch energy is thus reduced to 28 to 30 km^2/sec^2 , but with an impulse of about 700 m/sec., and the flight time is now about. two months over 12 years.



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