

Missions To Jupiter

Alternative transfers to Jupiter can be compared. A Cassini-Huygens type of transfer opportunity is considered (terminating the route at Jupiter. Also, a Galileo type route is considered.

Transfers using purely impulsive manoeuvres are considered.

In the Cassini case, the spacecraft is launched in 1997, with a sequence of gravity assists at Venus, Venus, Earth.

A different transfer strategy can be considered. This uses a single Venus gravity assist, followed by two gravity assists at Earth, as performed by Galileo.

The following cases summarise these transfers:

1. V-V-E, free arrival
2. V-E-E, free arrival

The DeltaV calculations are based on initial and final target orbits.

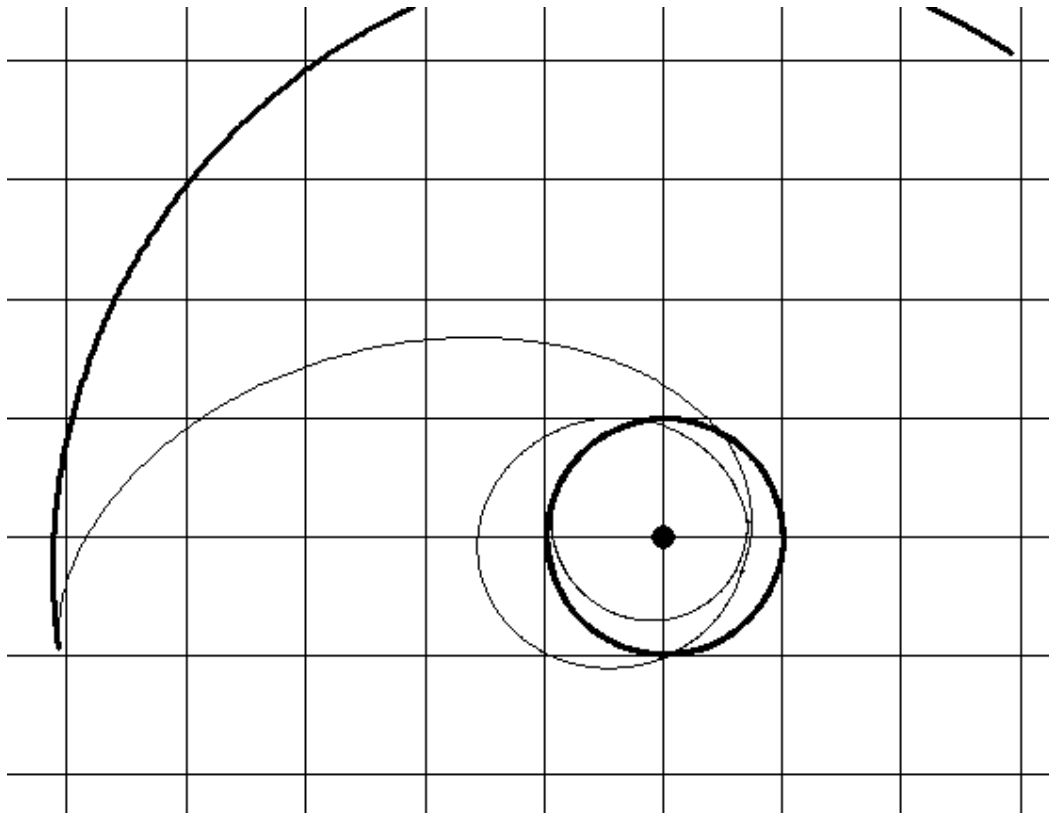
Initial orbit at Earth: Perigee radius 6578km	Apogee radius 42165 km
Final orbit at Jupiter: Pericentre radius 1000000km	Apocentre radius 20000000 km

Case 1

Route V-V-E Arrival epoch fixed

Vinfinity	DV	Apo	Peri	Inclin	Epoch:	Event
4001	1474	1.01	0.67	1.46	19-Oct-97	departure
6031		1.58	0.73	3.40	29-Apr-98	VGA
	276	1.57	0.70	3.39	26-Nov-98	
8246		2.18	0.73	0.58	30-Jun-99	VGA
14538		5.19	0.88	0.00	24-Aug-99	EGA
6079	1505	5.19	0.88	0.00	31-Dec-01	arrival

DV including insertion	3256	m/s
DV no insertion	1750	m/s
Transfer duration	4.2	years



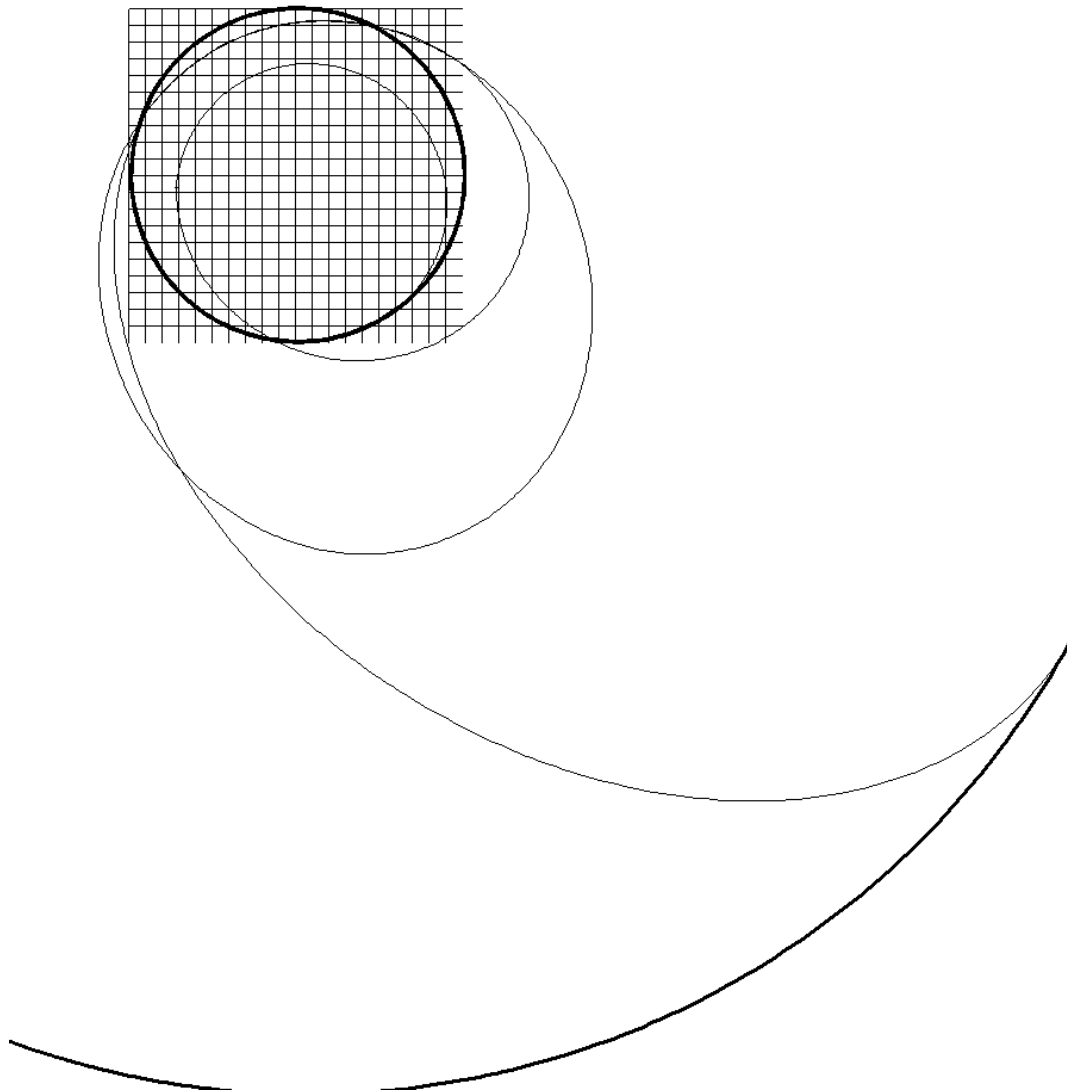
VVE transfer with free arrival. Orbits of Earth and Jupiter shown. Grid size is 1AU squares

Case 2

Route V-E-E Arrival epoch optimal

Vinfinity	DV	Apo	Peri	Inclin	Epoch:	Event
3385	1278	1.01	0.65	1.25	21-Apr-12	departure
6980		1.42	0.71	1.37	09-Oct-12	VGA
9812		2.35	0.89	0.00	25-Aug-13	EGA
	22	2.35	0.89	0.00	16-Apr-14	
9682		5.38	0.98	4.46	02-Dec-15	EGA
5545	1322	5.38	0.98	4.46	26-Sep-18	arrival

DV including insertion	2622	m/s
DV no insertion	1300	m/s
Transfer duration	6.43	years



These transfers show that the Cassini VVE route is less efficient in achieving a transfer to Jupiter. It does, however, reach Jupiter two years earlier than the Galileo like transfer