Team 9

Moscow State University

Department of Mechanics and Mathematics

zaplet@mail.ru iliagri@mail.ru

- Optimal control problem ->

-> *maximum principle* ->

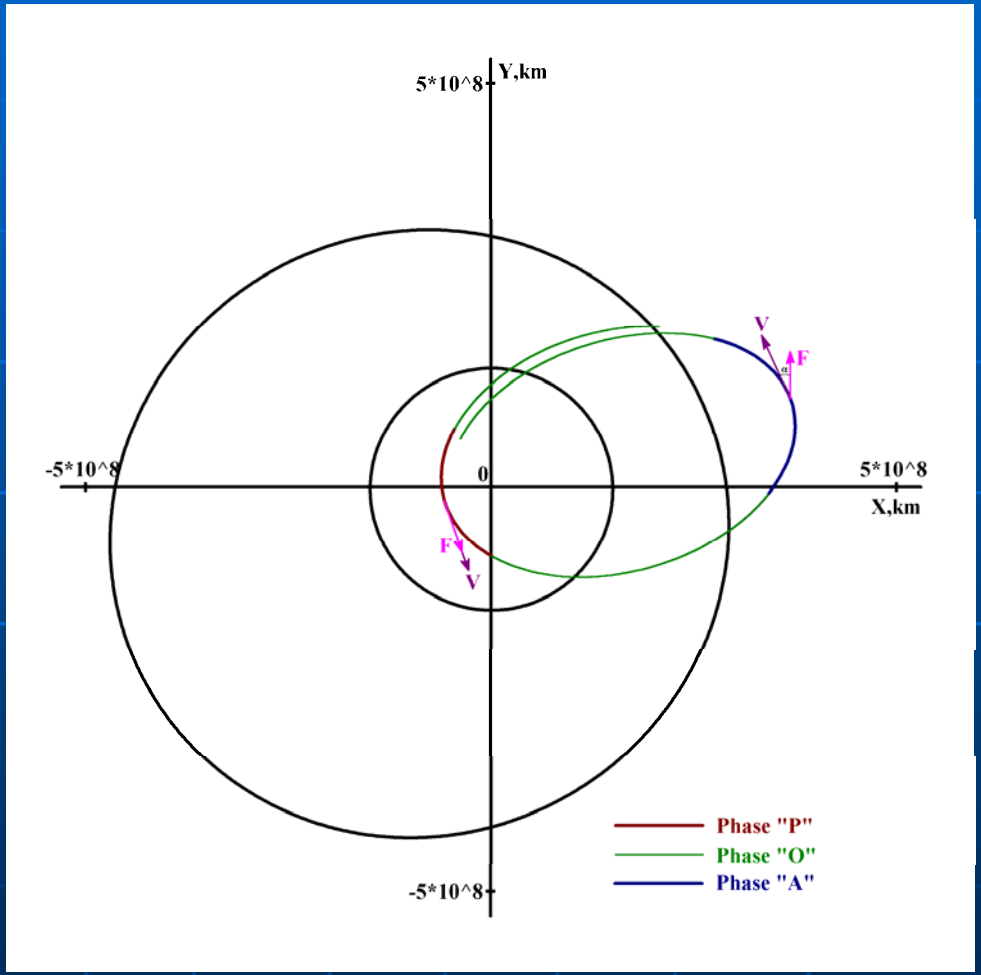
- Boundary value problem ->

-> *shooting method* ->

- System of nonlinear algebraic equations

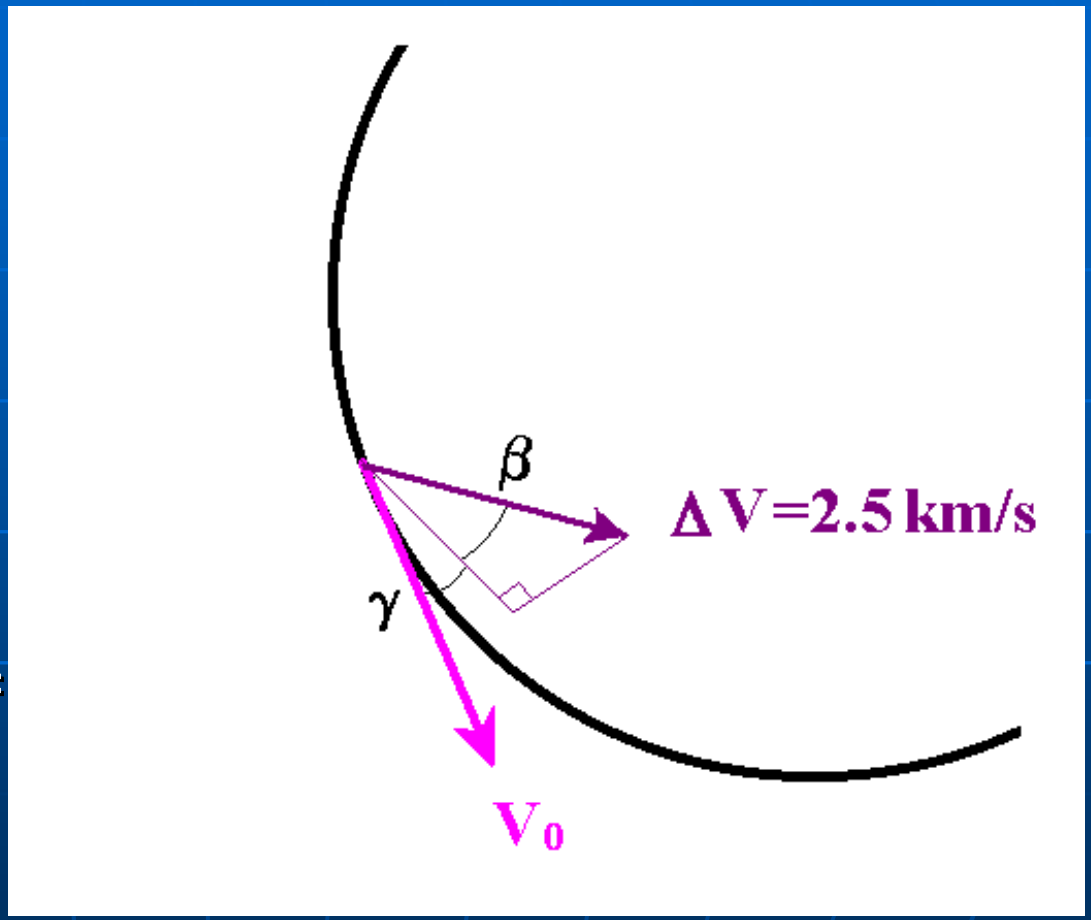
- α - the angle between the thrust vector and the SC velocity vector
- θ_a, θ_π - limits of instant true anomaly

  $|\theta| \le \theta_\pi$, $|\theta| \ge \theta_a$
- T_0, T_1 – the start time and the finish time



Impulse parameters

β,γ - the angles which define direction of an initial impulse



Conditions

$$\vec{R}_{SC}(T_1) = \vec{R}_{AS}(T_1)$$

$$\min R_{SC} = 0{,}2AU$$

Parameters to meet the conditions:

$\alpha, \beta, \gamma, T_1$

parameters value

$\alpha = 2.8110$

$\beta = 0.1106$

$\gamma = -0.0410$

$\theta_a = 2.8349$

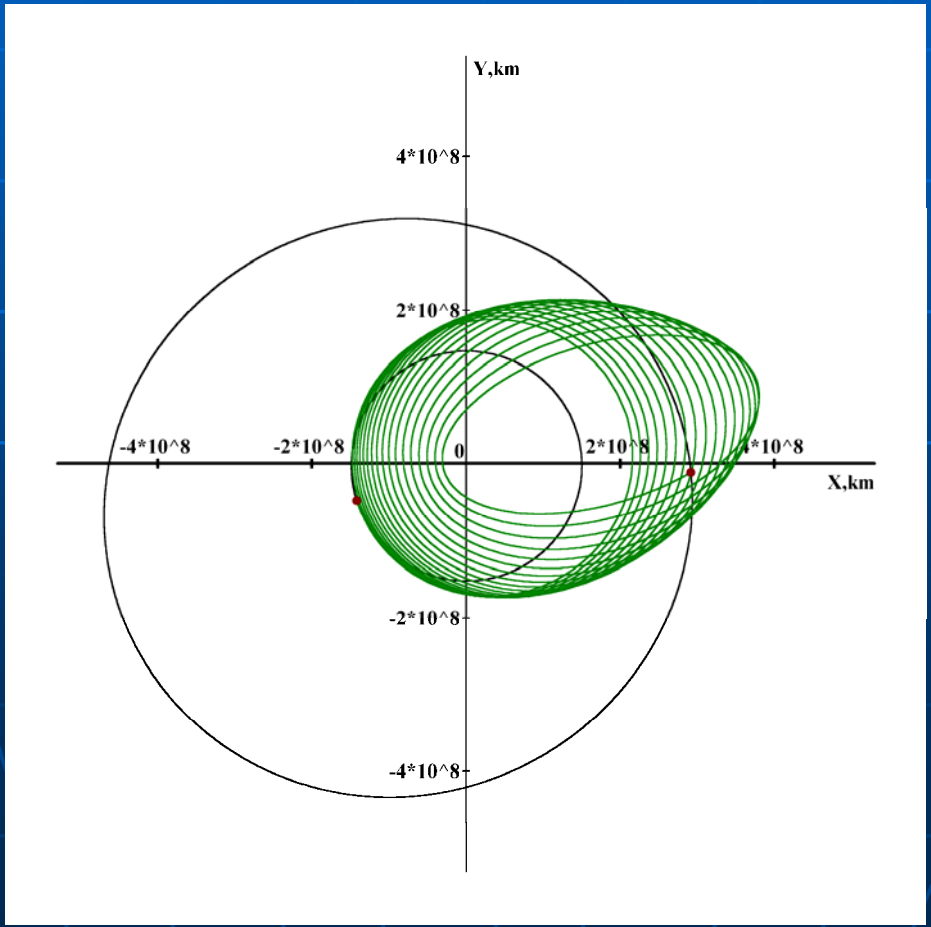
$\theta_\pi = 1.2993$

$T_0 = 7038\ MJD$

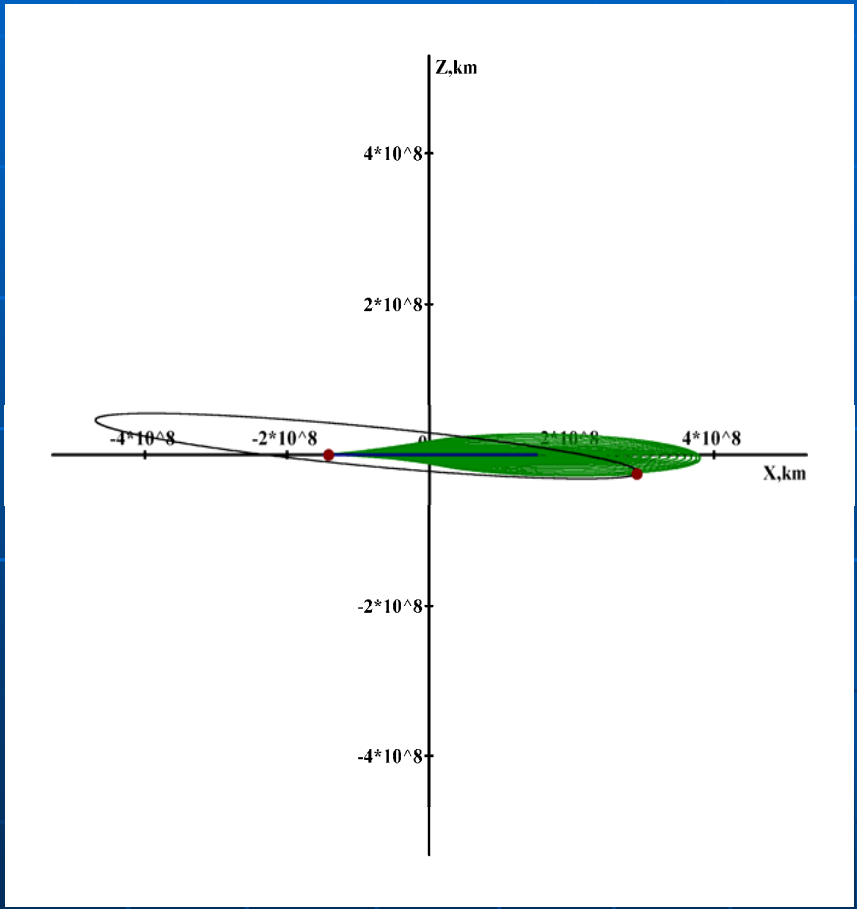
$T_1 - T_0 = 10323.3\ D$

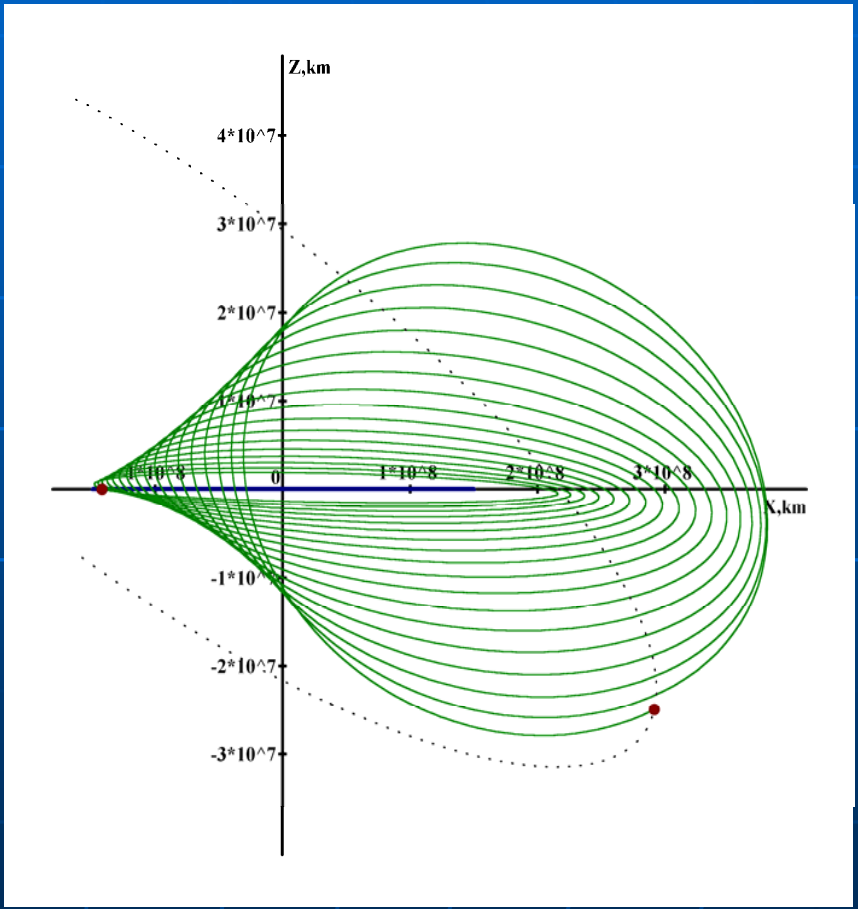
Trajectory projection to Sxy - plane

J=351152

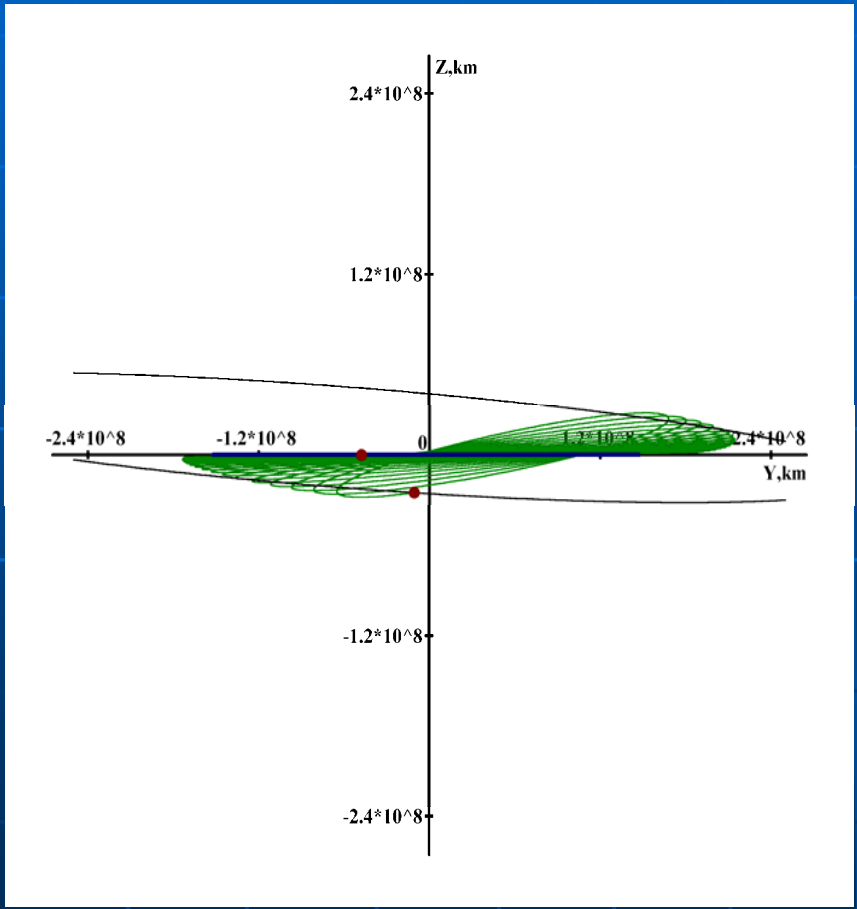


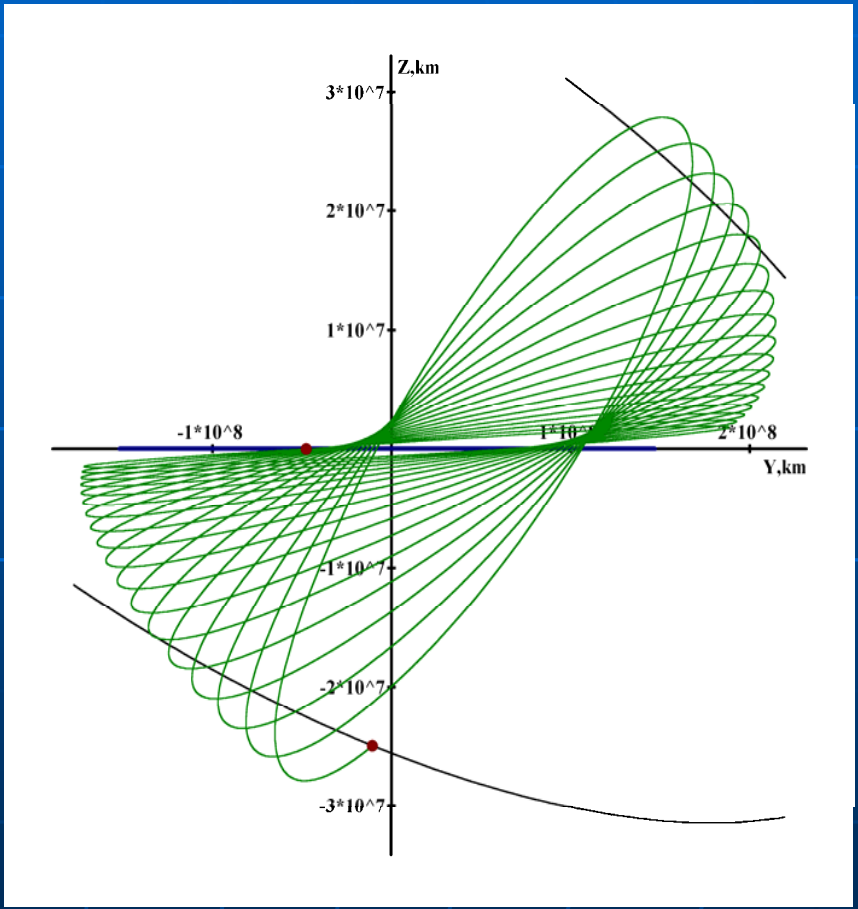
Trajectory projection to Sxz - plane





Trajectory projection to Syz - plane





Main publications (in “Cosmic Research”)

- K.G. Grigoriev, M.P. Zapletin and D.A. Silaev
  Optimal Insertion of a Spacecraft from the Lunar Surface into a Circular Orbit of a Moon Satellite,1991, vol. 29, no. 5.
- K.G. Grigoriev, E.V. Zapletina and M.P. Zapletin
  Optimum Spatial Flights of a Spacecraft between the Surface of the Moon and Orbit of Its Artificial Satellite, 1993, vol. 31, No. 5.
- K.G. Grigoriev and I.S. Grigoriev
  Optimal Trajectories of Flights of a Spacecraft with Jet Engine of High Limited Thrust between an Orbits of Artifical Earth Satellites and Moon, 1994, vol. 31, No. 6.
- K.G. Grigoriev and M.P. Zapletin
  Vertical Start in Optimization Problems of Rocket Dynamics , 1997, vol. 35, no. 4.
- K.G. Grigoriev and I.S. Grigoriev
  Solving Optimization Problems for the Flight Trajectories of a Spacecraft with a High-Thrust Jet Engine in Pulse Formulation for an Arbitrary Gravitational Field in a Vacuum, 2002, vol. 40, No. 1.
- K.G. Grigoriev and I.S. Grigoriev
  Conditions of the Maximum Principle in the Problem of Optimal Control over an Aggregate of Dynamic Systems and Their Application to Solution of the Problems of Optimal Control of Spacecraft Motion, 2003, vol. 41, No. 3.