

IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)

Flight & Ground Operations aspects of Human Spaceflight - Joint Session of the IAF Human Spaceflight and IAF Space Operations Symposia (4-B6.4)

Author: Dr. Rafail Murtazin

Rocket Space Corporation Energia, Russian Federation, Rafail.Murtazin@rsce.ru

Mr. Nikita Chudinov

Rocket Space Corporation Energia, Russian Federation, chudo-26@yandex.ru

Prof.Dr. Vladimir Soloviev

Korolev RSC Energia, Russian Federation, Vladimir.soloviev@rsce.ru

PARRYING OF CONTINGENCY IN FAST RENDEZVOUS WITH ISS

Abstract

The existing rendezvous profiles of Russian crew vehicle in some flight phases are not adapted to the contingency that can be caused by an automatic rendezvous system failure. If it occurs, the crew can complete the docking in manual mode only from a range of less than a kilometer. However, at long range, the rendezvous in manual mode is complicated because the onboard algorithm of the motion control system realizes free trajectories which don't provide the crew with convenient control of the spacecraft. As a rule, in this case the repeating of the rendezvous is required with a delaying of the docking to the next day. In the case of fast rendezvous profiles (which allow to get to the ISS in 3 hours) the repeating of the docking should be scheduled only after two days because of the crew adaptation to the weightlessness. To allow the crew to complete the rendezvous in manual mode without delaying the docking, it is required to create a more simple procedure for the transfer burns calculating and performing. From Gemini, Apollo and ATV spaceflight experience, there is a method of approach to a target from a coelliptical orbit is known, which provides a uniform motion and convenient control of the crew vehicle in manual mode. The paper proposes the fast rendezvous profile with insertion of the crew vehicle into an intermediate orbit coelliptical with the target orbit. Using of a profile with a coelliptical rendezvous in the automatic segment will allow the crew in case of contingency to complete the rendezvous in manual mode without increasing the duration of the flight till the docking, and in perspective it will be possible to reduce the rendezvous duration to a single orbit.