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AN EXPLORATION OF A PROSPECTIVE FLIGHT SCHEME TO VENUS ASSOCIATED WITH AN  
ASTEROID FLYBY**Abstract**

Study of the trajectories of a spacecraft to Venus followed by the passage of asteroids was conducted. To do this, an analysis of a prospective flight scheme to Venus including a gravity assist maneuver to make a landing at any desired point on the surface of Venus was made. In the frame of this scheme, it is shown that its implementation can be greatly expanded by an impulse-free flyby of an asteroid by the spacecraft on its route to landing on the Venus surface. A total of 53 mission scenarios to Venus in the framework of the abovementioned scheme accompanied by an asteroid flyby have been found within the 2029-2050 launch date interval. For these scenarios, 35 asteroids were found out of 117 selected. The main criteria for selection was the object's average diameter, which was supposed to be bigger than 1 km. It is shown that a free-impulse asteroid encounter is possible only in the gravity assist scenario and almost impossible in the direct flight i.e. the Earth-Venus case. Among the 53 scenarios, the most notable were the ones with the flyby of the M-class asteroids 3554 Amun; 3753 Cruithne, which are in an 1:1 orbital resonance with the Earth, and 5731 Zeus, which is one of the largest objects among the selected ones. It is shown that in the framework of the developed schemes it is possible to perform the free-impulse encounter with the 2P/Encke comet for launch in 2032 or in 2044. The link between attainable landing points and the possibility of a free impulse flyby of an asteroid by a spacecraft moving in a resonant orbit was established.