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AUTOMATED AND MANUAL APPROACH TO RUSSIAN ORBITAL STATION: REASONABLE
COMPROMISE

Abstract

At present, the final approach of Russian spacecraft to the International Space Station (ISS) is carried out in automatic mode. To decrease the relative velocity, several braking burns are done to ensure "passive safety", when a free flying vehicle does not collide with the ISS. Under this approach, the implemented trajectories do not provide the crew with complete information about the relative motion, making manual control complicated. For this reason switching to manual mode is allowed only at the final stage of braking, flying around or docking. In other cases, it may require shifting the docking and repeating the rendezvous that increases the risk of mission failure. In order to improve the docking reliability during low-Earth orbit missions and, eventually, lunar missions, it is required to provide convenient manual control at all stages of approach in compliance with safety requirements. The authors have reviewed the manual approach heritage from the flights to the Salyut and Mir orbital stations as well as from the Space Shuttle missions. The paper proposes the technique that allows expanding the application of manual control by selecting a convenient approach trajectory with complete information about the relative motion. This technique is expected to be implemented during missions to the Russian Orbital Station.