Exploration of Mars (08)
Mars Sample Return and Human Exploration (2)

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AUTONOMOUS GNC ROADMAP FOR MARS SAMPLE RETURN MISSION

Abstract

In the last five years GMV, in collaboration with different partners, has performed multiple studies devoted to the design, development and validation of an autonmous GNC system tailored to a possible Mars Sample Return scenario. The MSR mission is conceptually separated in three main phases, which facilitate the logical subdivision at mission plan and GNC mode level: Long Range Phase: Orbiter and SC are at long distances (100s/1000s of km). Intermediate Range Phase: a final position of few km behind the SC in its V-bar direction is acquired Short Range Phase: the Orbiter starts the approach toward SC, completed with the final capture. Those activities, the most of them conducted under National and ESA's project anf founded by different schemes and programme, have all been conducted such to allow raising as much as possible the effective TRL of the analysed technologies. This paper intends to offer a outline of the achived results and methos used mainly fro what concern the Integrated Development, Verification and Validation (DVV) approach definition. Three incremental validations steps are applied: • Algorithms trade-off, definition, prototyping and validation supported by FES simulator è TRL 3 • HARVD SW Demonstrator building based on autocoding techniques and validation supported by RT test bench è TRL 4 • Delta-Validation supported by DYN test benches (2x6 DOF robotic arm, one of them mounted on a one dimensional linear track). è TRL 4/5 Finally an off line experiment on the OH Sweden Prisma Satellite has been conducted at the scope validating the transition beetwenn the different sensors