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MOSQUITO, MARS ORIGINAL SYSTEM FOR QUALITATIVE IMAGING AND TACTICAL OPERATIONS: SYSTEM AND ARCHITECTURE ANALYSIS

Abstract

Within the PRAGMATIC program ("Projects of Generic Analysis of Advanced Missions utilizing Technologies of Information and Communication") the CNES seeks a close cooperation with French educational institutions by proposing different specific and futuristic space projects to work on, to encourage future engineers to pursue careers in the space sector. One of those projects is DREAM ("Drone for Recognition, Exploration and Analysis of Martian samples"), which proposes the use of a rotary wing UAV to serve as a support for a rover on Mars (e.g. Curiosity) and looks for the development of a family of solutions capable of supporting payloads between 0 and 4 kg to allow missions ranging from a simple onboard camera, the collection of large samples or the carrying of large scientific instruments.

We have studied the aerodynamic feasibility of the drone demonstrating with simulations that, despite of the much more difficult flight conditions (high Mach number, low Reynolds number, compressible airflow), it is possible to fly a rotary wing drone in the Martian atmosphere. To experimentally validate our simulations, we have designed and optimized a rotor which we are planning to test in an environmental chamber under realistic Martian conditions. In parallel we are performing many simulations and system analysis to characterize the complex relations between the different parameters and to be able to rapidly respond to different mission specifications and choose the more optimal drone architecture and configuration under different criteria.

Our perspectives for the near future are to keep working on the system and aerodynamic aspects, and later to move on to the mechanic, electric and flight control aspects, with the idea of having a first operational model the next year. Our conclusions are this stage are that flying a rotary wing UAV on Mars is possible a would be highly beneficial to use it as a support for a surface rover, exploring their surrounding terrains and even collecting samples and transferring them to their advanced rover instruments.