Key Technology of Space Exploration (8)
Key Technology of Space Exploration (2)

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IRENA : DEMONSTRATING AEROCAPTURE FOR EXPLORATION

Abstract

Missions to Mars, and more generally to a body with an atmosphere, aerocapture is an efficient, quick, almost fuel-less solution to insert a space vehicle close to its operational orbit. This technique would, for instance, be extremely advantageous to deploy around Mars the support infrastructure needed by future human missions. However, aerocapture has not been used yet on a Mars mission, and a technological demonstration would be essential before it can be applied more extensively.

IRENA (for International Re-Entry demoNstrator Action) is an action performed by an international consortium aiming at defining technology demonstrator projects to validate advanced entry/re-entry technologies. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 640277. It started in January 2015, and was finished in April 2016. To achieve its objectives, IRENA relied on an international and complementary team: three major European and international space agencies (CNES, DLR, JAXA), the two European industry leaders in entry/re-entry and space exploration (Airbus Space and Defence, Thales Alenia Space) and a research institute expert in materials (Demokritos). NASA was also invited as observer. To maximise the chances of the projected demonstrators materialising in the future, the international dimension is essential, which explains why non-European actors have been invited to join a team based otherwise on the most prominent European actors in the field.

After an extensive survey of the needs for future exploration missions, three flight demonstrators have been studied thoroughly within the frame of IRENA: - Aerodynamic decelerator, based on moveable and foldable systems, - Earth aerocapture demonstrator, in preparation to Mars aerocapture, - Mars aerocapture demonstrator, at Mars. We will first how and why these three demonstrators were selected amongst a large number of candidates within the frame of a trade-off that was work carried out at a workshop in the Concurrent Design Facility of CNES, Toulouse. We will then focus on the 2 demonstrators aiming at Mars aerocapture, discuss their relative merits in terms of demonstration scope and elaborate on their technical design. Finally, we will expose the way forward defined by the IRENA team to implement them in terms of governance, funding, and international cooperation.