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STATUS ON THE DEVELOPMENT OF A GAS CHROMATOGRAPH FOR THE DRAGONFLY MISSION

Abstract

Dragonfly is a NASA mission managed by the Johns Hopkins University's Applied Physics Laboratory (APL), to send a relocatable lander to Saturn's moon Titan. The rotorcraft will be able to sample surface materials and determine the chemical composition at multiple locations. It will launch in 2028 for an arrival on Titan in 2034.

The main questions to which Dragonfly will try to help us give an answer are:

- What makes a planet or moon habitable?
- What chemical processes led to the development of life?
- Has life developed elsewhere in our solar system?

To do so, a suite of four instruments will be onboard the Dragonfly rotorcraft:

- DraGMet: Geophysics Meteorology Package
- DragonCam: Camera Suite
- DraGNS: Gamma-ray Neutron Spectrometer

- DraMS: Mass Spectrometer suite

CNES, together with several French laboratoriess (LATMOS, LIRA and LGPM), is providing the Gas Chromatograph (DraMS-GC) to be integrated into the DraMS instrument led by NASA's Goddard Space Flight Center (GSFC).

DraMS is a central element of the payload. It is a highly capable mass spectrometer instrument, with two separate front-end sample processing modes: the laser desorption, to detect high molecular-weight materials and the gas chromatography, to separate the molecules and identify molecules of prebiotic interest.

The system has elements from the highly successful Sample Analysis at Mars (SAM) instrument on Curiosity, which led to the first detection of organic molecules on Mars, and also draws on developments for the ExoMars/ Mars Organic Material Analyser (MOMA) instrument). Both SAM and MOMA have a GC-MS.

However, the design of DraMS-GC cannot be fully inherited from the previously developed GCs as it has to be compatible to the Dragonfly mission's interfaces, environment, and scientific objectives. At this step of the program, the DraMS-GC Engineering Model has been successfully integrated and tested and the CDR, held in November 2024, was successful. The team has started the integration of the Flight Model for a delivery later this year.

After introducing the Dragonfly mission and its objectives, and an overview of the DraMS instrument, the paper will focus on the development of the GC.