

MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Microgravity Sciences onboard the International Space Station and Beyond (6)

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DECLIC A FACILITY FOR THE STUDY OF CRYSTAL GROWTH AND CRITICAL FLUIDS

Abstract

1. Introduction

DECLIC, a joint CNES/NASA research program, is a multi-user facility to investigate low and high temperature critical fluids behaviour and directional solidification of transparent alloys. The payload will be operated in an EXPRESS RACK onboard the International Space Station (ISS) starting August 2009 (17A Shuttle flight). It is basically designed for tele-science and so will give the scientists the possibility to remotely control the experiment conditions on board the International Space Station.

2. The DECLIC instrument

DECLIC instrument will be accommodated in two Single Stowage Lockers (SSL) of an EXPRESS rack. One of the lockers holds the DECLIC computers and the associated functions (power distribution to subsystems, commands interpreting, telemetry formatting, high precision temperature measurement, thermal regulation algorithms, etc. . .) and shares with the EXPRESS rack its 28V power supply, and Ethernet data and NTSC video links. The other locker receives the insert (in which the experiment cell and the front-end electronics associated with user dedicated sensors are accommodated) and provides the

optical diagnostics. For the time being, 3 inserts have been built respectively dedicated to the study of SF6 as a near-ambient temperature critical fluid (ALI), of pure water as a high-temperature critical fluid (HTI), and of succinonitrile based transparent alloys (DSI).

3. The operations concept

The DECLIC facility will be operated from the CADMOS, the French User Support Operation Centre located at CNES Toulouse, France. The crew will have minimal intervention to set up the facility with the insert, and the operations monitoring is made from the ground. In order to cope with communication limitations onboard the ISS, the DECLIC facility is designed to run automatically thanks to its on-board resident experimental programs. Data transmission to ground is currently the limiting resource, so data storage on removable hard-disk drives will allow the scientist to recover the whole data when those hard disks are returned to ground.

4. Program status

After having been submitted to a whole test campaign in order to optimize the scientific scenario, the DECLIC Flight Model has been sent to KSC where online testing will be performed mid of March 2009. It will then to be launched on 17A shuttle flight in August of 2009. Payload commissioning will start at the end of August 2009 and a first set of results for HTI insert will be available for the IAC.