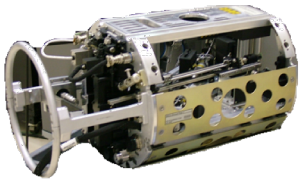
FLEX Italian Combustion Experiment – Green Air (FLEX-ICE-GA)

PI Team: Patrizio Massoli, Istituto Motori of Italian National Research Center (CNR), Napoli
PS: Dr. Daniel Dietrich, NASA GRC
PM: J. Mark Hickman, NASA GRC
Engineering Team: ZIN Technologies, Inc.

Glenn Research Center



(Left) FLEX Chamber Insert Assembly Apparatus. (Right) Mike Fincke operating the CIR.

Objective:

- Determine the evaporation and burning regimes of biologically derived oil (bio-oil) droplets in a high-pressure condition
  - Use the Multi-user Droplet Combustion Apparatus (MDCA) FLEX-2 hardware to suspend bio-oil droplets in a fixed position and measure their size by imaging techniques during combustion.

Relevance/Impact:

- The generation of fundamental combustion data will enable the development of combustion computer models that will help select new fuels for the future. The computer models will reduce costs to industries and will benefit the general public by accelerating the adoption of renewable fuels that are environmentally friendly.

Development Approach:

- Utilize FLEX-2 hardware and diagnostics already on-orbit in CIR and add specific ICE-GA components.
  - Flight hardware specific to FLEX-ICE-GA:
    - CIR manifold bottle (4)
    - Fuel Reservoirs (2)
    - Fuel Needle Pair Assembly (1)

ISS Resource Requirements

Accommodation (carrier)	CIR
Upmass (kg) (w/o packing factor)	10.02 kg
Volume (m^3) (w/o packing factor)	0.011 m^3
Power (kw) (peak)	1.5 kW
Crew Time (hrs) - Initial configuration of CIR Rack - Change-outs during experiment	6 hrs 0 hrs
Autonomous Ops (hrs)	936 hrs
Data Points	50

DIAPASON is an ASI contribution to NASA particle studies as part of quid pro quo for NASA's contribution to FLEX-ICE-GA. DIAPASON will capture particles from 1 μm to 1/1000 μm that are subsequently analyzed on the ground by transmission electron microscope. It is a small, self-powered instrument designed for monitoring combustion-generated pollution, hostile environments, and atmospheric contaminants.

Project Life Cycle Schedule

Milestones	Reqmts Due	SRR	Safety ϕ3	PSR	Ship	Launch	Ops	Ops End	Final Report
Actual/ Baseline	**Apr 2012**	**Jul 2012**	**Nov 2012**	**Jan 2013**	**Feb 2013**	Jun 2013	Jun 2013	Nov 2013	Nov 2014