

Flame Extinguishment Experiment-2 (FLEX-2)



Glenn Research Center

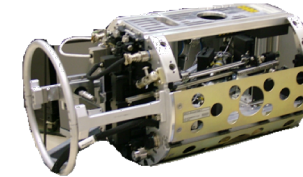


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(Left) FLEX Chamber Insert Assembly Apparatus.
 (Right) Mike Fincke operating the CIR.

Objective:

- ◆ Extend the results of FLEX-1 to fuels and environmental conditions that mimic real combustor conditions.
 - Investigate bi-component fuels – real fuels are multi-component.
 - Examine the influence of sub-buoyant convective flows – real combustors involve gas/droplet relative motion.
 - Study practical fuels and fuel surrogates.
 - Study binary droplet arrays – real combustors have droplet-droplet interactions.
 - Develop and validate detailed and reduced-order transport, chemistry and soot models that are the foundation for real engine simulations.

Relevance/Impact:

- ◆ The combustion of liquid fuels is the overwhelming energy source in the transportation sector.
 - Design future combustors to minimize carbon footprint (maximize fuel efficiency) and minimize pollutant emissions.
 - The development of surrogates (mixtures of pure fuels that simulate the behavior of real fuels) will allow quantitative evaluation of the performance of future fuels (e.g., oil shales, biofuels, etc.) in combustors.
 - Prior droplet results helped validate jet engine models by engine manufacturers.

Development Approach:

- ◆ Flight design leverages off previous flight design heritage (MDCA/FLEX).
- ◆ Multi-user, re-usable apparatus using CIR, minimizing up-mass/volume, costs, and crew involvement.

ISS Resource Requirements

Accommodation (carrier)	CIR
Upmass (kg) (w/o packing factor)	200 kg
Volume (m³) (w/o packing factor)	0.08 m ³
Power (kW) (peak)	1.5 kW
Crew Time (hrs) - Initial configuration of CIR Rack - Change-outs during experiment	8.5 hrs 8.3 hrs
Autonomous Ops (hrs)	300 hrs
Launch/Increment	ULF-5, ULF-7, 45P Inc. 27-28 & 29-30

Project Life Cycle Schedule

Milestones	SCR	RDR/PDR	CDR	VRR	PH-3 Safety	PSR	Ship	Launch	Ops Start	Ops End	Final Report
Actual/ Baseline	Nov 2007	Oct 2008	Feb 2010	—	Nov 2009	Jun 2010	Jun 2010	Feb 2011	Jan 2012	May 2015	May 2016