

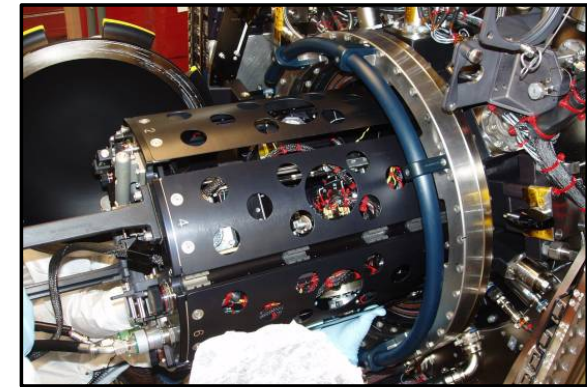
Cool Flames Investigation (CFI) Overview

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NASA Customer: HEOMD/Space Life and Physical Sciences



The MDCA will be used with specialized diagnostics and fuels for the Cool-Flames Investigation.

Objective:

To investigate the structure and dynamics of the cool flame mode of burning during the second stage of a non-premixed droplet flame – an environment in which the cool flame mode was not previously expected to occur. Understanding this phenomena may fundamentally enhance the current understanding of cool flame chemistry and modeling.

- Investigation Strategy:
- Straight-chained alkanes and some isomers of these alkanes to see how the fuel structure influences cool flame formation
- Mixtures of fuels that can suppress or enhance the cool flame formation.
- Higher pressure tests with n-alkanes to see how pressure influences the Negative Temperature Coefficient (NTC) region and re-ignition of cool flames

Relevance/Impact:

- Fundamental Science – cool flame chemistry not well understood; current modeling does not accurately predict cool flame mode of combustion
- Efficiency - Advanced low temperature combustion engines
- Reduce emissions - Advanced reduced emission cool combustion burners
- Safety - Terrestrial fire safety; spacecraft fire safety

Development Approach:

- Experiment takes advantage of MDCA CIA with experiment specific fuels
- MDCA will be enhanced with experiment specific diagnostics – intensified camera and auto-gained radiometer array
- ISSPO OB is funding hardware development.

MSI Monthly Status Review – March 2017

ISS Resource Requirements

Accommodation (carrier) (CIR, FIR, MSG, MWA,.....)	CIR/MDCA
Upmass (kg) (Per Flight w/o packing factor)	OA-6/OA-5: 80.0 Kg
Volume (m³) (w/o packing factor)	0.04
Power (kw) (peak)	192 mW
US Crew Time (hrs)	Configure: 22:25 Sustainment: 18:35 (29:55*) * Including alignment guides
Ops Activities & Detailed (Preparation, Installation, Operation, Change-outs,.....)	<ul style="list-style-type: none"> - Replace MDCA radiometer - Modify MDCA pressure switch - Replace fiber arm assembly - Replace Igniters/Needles - Bottles/Reservoir changes
Autonomous Ops (hrs)	576
Launch/Operating Increment	OA-5 / 49-50
Unique Payload Requirements	N/A
Down Mass of Samples/Data	Data Only