

Light Microscopy Module (LMM)



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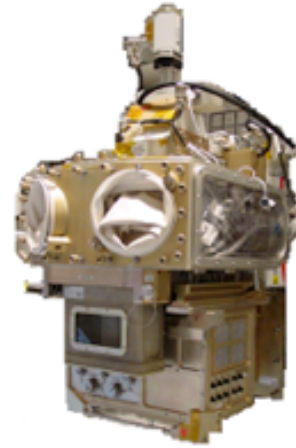
Objective:

- ◆ Develop a microscope mini-facility for fluids physics, material science and biological research in support of the NASA Exploration Program.
- ◆ **Relevance/Impact:**
- ◆ Addresses boiling heat transfer, liquid vapor interface control, and multiphase flow as they relate to the technology needs of various exploration spacecraft subsystems.
- ◆ Conduct commercial experiments to model the shelf life of common colloidal products (\$100M industry).
- ◆ Material science experiments for liquid crystal and colloids research.
- ◆ LMM provides capabilities to identify microorganisms with a broad suite of optical diagnostics including fluorescence microscopy.
- ◆ Serves as a platform for experiments that address human health and performance, medical technologies and biosciences.

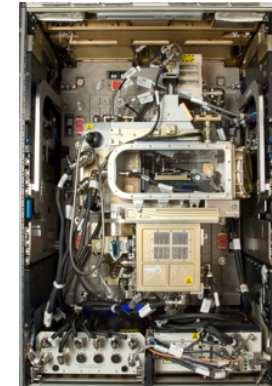
Development Approach:

- ◆ The LMM flight hardware was developed under a proto-flight approach, a engineering model was completed in June 2008, spare hardware will be kitted and assembled as required.
- ◆ The LMM is designed for autonomous operation through scripts and ground commanding. Crew time is required for initial installation and check out in the Fluids Integrated Rack (FIR), sample change out, and removal from FIR.
- ◆ The LMM is designed to utilize the FIR capabilities to the maximum extent possible.

Glenn Research Center



LMM Rotates 90° and slides Into FIR rack



ISS Resource Requirements

Accommodation (carrier)	Fluids Integrated Rack (FIR)
Upmass (kg) (w/o packing factor)	157 Kg for LMM
Volume (m³) (w/o packing factor)	0.08 LMM
Power (kw) (peak)	1.1 kw for FIR/CVB/LMM (1st experiment), tested to 2.6 kw
Crew Time (hrs) (installation/operations)	34 Hours (CVB), Installation 16 hours
Autonomous Operations	Checkout 20 hours
Launch/Increment	19A/Increment 21-22

Project Life Cycle Schedule

Milestones	SCR	RDR	PDR	CDR	VRR	Safety	FHA	Launch	Ops	Return	Final Report
Actual/ Baseline	9/97 CVB	12/98 CVB	2/02 LMM/CVB	12/03 LMM/CVB	8/04 LMM/CVB	Phase III 11/05	10/08	8/2009 (start)	Inc. 21-22	N/A	2012 (1st experiment)
Documentation	Website: eRoom:				SRD: EDMP:		Project Plan: SEMP:				

Revision Date: 9/18/2008