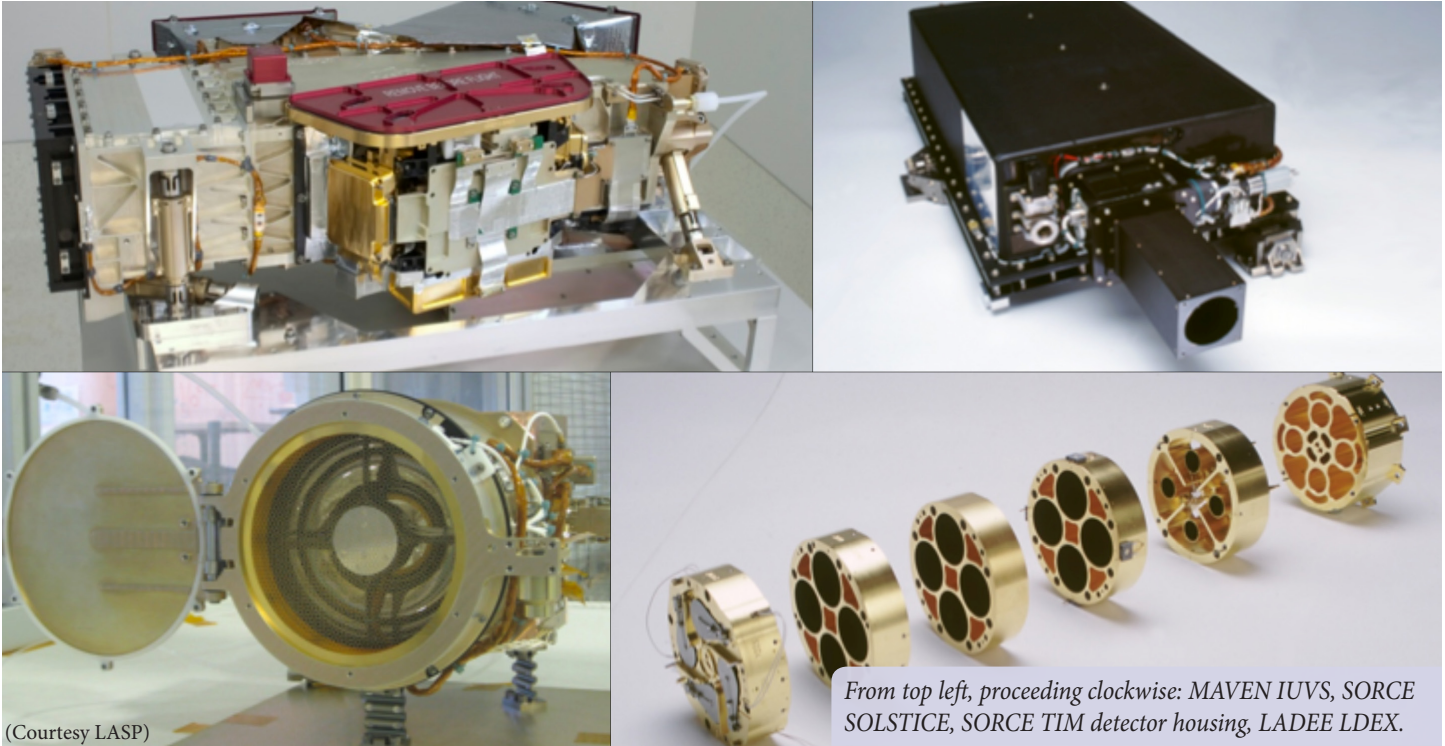


Mechanical Engineering & Thermal Group



The Mechanical Engineering (ME) & Thermal Group at LASP has a broad range of technical expertise in the design, development, and test of space-flight, suborbital, and ground-based mechanical systems.

Instrument Design

Building on decades of design experience that has evolved with the complexity of instrument design demands, LASP mechanical engineers develop advanced instrumentation on time and in budget while meeting design requirements. Engineers support a project from initial concept through delivery. With an extensive history of successful optical instrument designs, the ME & Thermal Group has specialized knowledge in the areas of:

- Opto-mechanical and integrated detector/electronics implementations
- One-time and extended life mechanisms
- Spacecraft structures
- Thermal control design of detector, payload, and spacecraft systems
- Mechanical static, dynamic, and thermal/optical integrated structural analysis and testing
- Gimballed platforms and stowed capture for single and dual axis pointing systems
- Kinematic mounts and custom vibration isolation
- Electronics packaging including GEO installations and high voltage accommodations

LASP's in-house expertise includes on-site mechanical fabrication

and materials specialists who are an integral part of the design process. LASP performs in-house thermal balance and thermal vacuum qualification testing of payloads. The LASP ME & Thermal Group is available to provide the expertise you need to solve your mechanical engineering design challenges.

Mechanical Analysis

The LASP ME & Thermal Group has strong capabilities in mechanical analysis. LASP's mechanical analysts provide end-to-end support for the development of flight hardware.

The mechanical analysis software suite includes: ANSYS, Matlab, MathCAD, FEMAP, and NASTRAN. Mechanical analyses performed include:

- Static stress analysis
- Modal simulation
- Frequency response analysis (random and sine vibration)
- Dynamic simulation

LASP's mechanical analysts also lead mechanical verification testing including: random vibration, force and response limiting, sine vibration, and strength testing.

Thermal Design and Analysis

LASP's ME & Thermal Group has experience with a broad range of spaceflight missions including LEO, GEO, and interplanetary environments. We provide quick turn-around trade study results that help expedite the design process.



(Courtesy LASP)

Glory TIM on dual-axis gimbal platform

The Thermal group has implemented solutions to a range of thermal design challenges such as:

- Cooled CCD detector systems down to 150 K
- Dual-axis gimballed systems with variable heat loading
- Lightweight components subject to high thermal transients
- Optical systems requiring better than 0.5°C/orbit stability

The ME & Thermal Group has a strong analytical background with the following capabilities:

- Thermal Desktop and SINDA/FLUINT software with an extensive import and export capability
- Analyses involving finite element and finite difference model combinations
- STOP (Structural, Thermal, and Optical Performance) analyses of optical systems

Thermal engineers lead thermal balance and thermal vacuum qualification testing; responsibilities include: pre-test analyses, procedure generation, test conduct, and post-test thermal model correlation.

Mechanisms

Reliable mechanism design is a critical element of instrument design. LASP mechanism designs are simple, use selectively redundant components, and undergo extensive pre-flight testing. Since 1998, LASP's mechanical engineers have designed over 60 unique mechanisms. These mechanisms range in size from 100 grams to 100 kilograms. The mechanisms have provided launch

protection and instrument functionality by moving optics, filters, apertures in addition to entire instrument suites. Mechanisms that we design include:

- One shot covers
- Arc-second scan mechanisms
- Reciprocating vacuum sealed doors
- Bi-stable flip mechanisms
- Multi-axis pointing platforms
- Filter wheels
- Launch locks
- Shutter mechanisms
- Deployable antennas

Electronics Packaging

The ME & Thermal Group provides decades of experience for robust electronics packaging designed to accommodate single PWBA and multi-board microprocessor units in card slot architectures. Typical development includes:

- Board- & box-level thermal analysis
- Passive thermal control
- EMI/EMC tight enclosures
- Launch loads analysis
- Radiation shielding
- Flex circuit design
- Harness termination

For more information about LASP mechanical engineering capabilities, visit <http://lasp.colorado.edu/home/engineering/engineering-capabilities/mechanical/> or contact Heather Reed at 303-492-0976 or heather.reed@lasp.colorado.edu.



(Courtesy LASP)

SORCE Microprocessor Unit in mother/daughterboards configuration

The Laboratory for Atmospheric and Space Physics (LASP) combines all aspects of space exploration through our expertise in science, engineering, mission operations, and data management. As an institute at the University of Colorado Boulder, LASP includes students throughout our activities. Learn more at <http://lasp.colorado.edu>.