AEROSPACE

PHYSICAL SCIENCES LABORATORIES

The space enterprise is congested, contested, and growing at an unprecedented rate. Shorter acquisition timelines, increased proliferation of space assets, and an elevation of the space domain in national security have created a need for greater agility in development, procurement, fielding, and operating of systems to meet these new demands. Implementation of new, science-based, technologies and methodologies is imperative to making the leap to the next era in space. The Aerospace Physical Sciences Laboratories (PSL) provide the robust and innovative physical research backplane to achieve that implementation.

PSL's scientific impact is sustained and grown via a diverse research portfolio. Our work blends foundational scientific expertise with cutting-edge research to serve a broad customer base. PSL's exclusive ability to work with all stakeholders: (government, industry, and academia) enables us to provide novel solutions to the most challenging issues in current and future technologies. The strength of PSL comes from the combination of cutting-edge tools and facilities, a vast repository of space-system knowledge, and the extensive technical expertise of our people.

We harness these tools and expertise in 156 different laboratories to tackle the new challenges within the space enterprise. All PSL laboratories, capabilities, and personnel are aligned around four focus areas, each designed to tackle the new challenges of the space enterprise: Technology Development and Prototyping, Rapid and Agile Acquisitions, Resiliency and Space Warfighting R&D, Advanced Concepts.

PSL

PSL by the numbers:

- Over 250 employees
- Over 70% of technical staff have post-graduate degrees
- Disciplines of Technical Staff:
  - Physics: 30.1%
  - Chemistry: 26.1%
  - Engineering: 22.1%
  - Materials Science: 10.2%
  - Space Science: 4.0%
  - Other: 3.5%
  - Computer Science: 2.2%
  - Mathematics: 1.3%
  - Astrophysics: 0.4%

Technology Development and Prototyping

Development geared toward increasing the readiness of available technologies for adoption by the space community.

Rapid and Agile Acquisitions

Accelerating traditional acquisition cycles by using science to identify and exploit efficiencies in mission assurance.

Resiliency and Space Warfighting R&D

Research and development advancements to enable space-domain asymmetric advantage and space resiliency.

Advanced Concepts

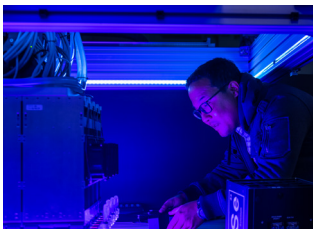
Application of unique Aerospace competencies to fulfill future customer needs.

Examples of PSL Expertise and Technologies

Technology Development and Prototyping: Innovative Replicated Optics. A PSL team has been using replication technology and lightweight materials to create high-precision optics free from traditional mirror grinding or polishing requirements and much lighter in weight. Scientists in our materials lab use lightweight composites and Aerospace-patented protocols to produce these mirrors and have conducted rigorous experimental investigations of stress relief and stabilization of the optics with extreme humidity exposure tests. This realistic handling and exposure has dramatically improved the confidence in mirror performance, cutting both weight and production times, and fundamentally improving acquisition tradeoffs for next-generation space systems.

Technology Development and Prototyping: Replicated composite optics are fabricated to be lightweight, reducing manufacturing time and cost.

Rapid and Agile Acquisition: Accurate Space Photovoltaics Characterization for Advanced Technology Infusion. Solar cells and solar arrays are among the most vulnerable and costly subsystems for a spacecraft. As acquisition cycles shorten and threats become more dynamic, Aerospace is responding with agile mission assurance processes supported by state-of-the-art solar cell characterization and prototyping. Our space photovoltaics expertise has been critical to the development of the Aerospace Measurement Unit, which combines high-precision zero-drift analog circuitry with low power digital electronics to allow for laboratory-grade measurements of current, voltage, temperature, and solar illumination angle at a fraction of the size of a traditional test setup. Customers can characterize the on-orbit performance of advanced solar cell technologies in the lab, allowing for quicker infusion of advanced technologies into space systems.

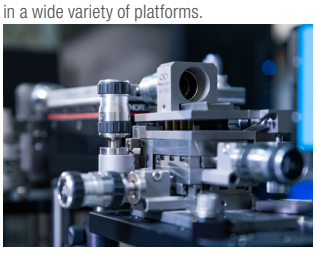


Rapid and Agile Acquisition: Aerospace has developed a miniaturized test platform to measure the performance of solar cells above the ozone layer to calibrate the solar simulator in the lab.

Resiliency and Space Warfighting Research and Development: Space Domain Awareness Enabled by Sensors on the Ground and in Space. The Remote Sensing Department has decades of experience in both developing sensors and collecting data in all wavelengths of light, from visible to infrared. Our sensors are embedded in a wide range of platforms, ranging from some of the largest telescopes on the planet to the smallest cubesats on orbit. These systems serve as testbeds, calibration sources, and data collection sources to enhance our customers' insights into operational environments and to provide options for mission execution.

Resiliency and Space Warfighting R&D: Our Hyperspectral Imaging lab sensors are embedded in a wide variety of platforms.

Advanced Concepts: Quantum Photonics Technologies. Quantum technologies use the properties of atoms and photons to measure or produce phenomena fundamentally inaccessible with classical systems. Quantum properties can be exploited to perform secure communications, signal-to-noise enhanced sensing and imaging, parallelized computing, and other applications that can significantly impact the implementation and operation of space assets. The quantum cryptographic lab features several custom analytical and numeric toolsets for the analysis of quantum photonics-based systems. The team has built multiple testbeds for the evaluation of photon sources and detectors integral to the implementation of photonics technology.



Advanced Concepts: Aerospace has built a fully functioning quantum cryptographic lab.

The Aerospace Corporation

The Aerospace Corporation is a national nonprofit corporation that operates a federally funded research and development center and has approximately 4,000 employees. With major locations in El Segundo, Calif., Albuquerque, N.M., Colorado Springs, Colo., and the Washington, D.C., region, Aerospace addresses complex problems across the space enterprise and other areas of national significance through agility, innovation, and objective technical leadership.

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