SCIENCE AND ENGINEERING SERVICES
Cost-Effective, Comprehensive, Cutting-Edge Solutions
Established in 1998, Sigma Space Corporation provides its customers with pioneering aerospace technology solutions. We produce next-generation lidar, laser ranging, attitude determination, spectroscopy, and radiometry instrumentation for remote sensing and defense applications.

Sigma Space also offers advanced science and engineering services to private and government clients, including NASA and DOD. Supporting these efforts is our world-class staff of engineers, technicians, and scientists.

We provide technical services at customer locations and at Sigma Space. Our facilities feature state-of-the-art CAD tools, optical and electronic laboratories, a computer-controlled machine shop, class 10,000 clean rooms, and fiber splicing and assembly areas to offer our customers exceptional on-demand design and manufacturing services.

Our efficient corporate structure ensures fast delivery of high-quality services and products—at a lower cost.

As a result, we are growing rapidly and received the NASA GSFC Contractor of the Year Award. We enjoy an outstanding reputation among our customers, and are dedicated to providing innovative, cost-effective results.

Sigma Space is an ISO 9001:2008 certified provider of professional support services. Our expert scientists and engineers are team players, collaborating with clients to meet their goals quickly, efficiently, and affordably. We have the expertise to work with clients at any stage in the science or engineering life cycle to make each project a success.

Sigma Space sells sophisticated lidar and electronics products, supplying scientific, defense, and federal and local government markets. Our products are developed internally and can be customized to meet client needs. Among our most popular instruments is our efficient Micro Pulse Lidar (MPL) laser remote sensing system, which provides continuous, unattended monitoring of atmospheric cloud and aerosol profiles.

Aerospace hardware personnel develop custom instrumentation for aerospace and terrestrial applications. They have expertise in designing, analyzing, fabricating, assembling, and testing aerospace instrument systems. Sigma Space has proven success on multiple programs, including the patented Single Photon Lidar, or HRQLS (High Resolution Quantum Lidar System), which generates foliage-penetrating, 3-D aerial maps of terrain and infrastructure—at industry-leading speeds.
SCIENCE SERVICES

Research and Analysis
- Concept development and literature reviews
- Hypothesis development and verification
- Proposal development and support
- Research planning and execution
- Empirical and theoretical modeling
- Data processing and analysis
- Algorithm and software development
- Remote sensing applications
- Publications, presentations, and peer reviews

Verification and Validation Services
- Verification and validation of science data systems and products
- Vicarious calibration and validation
- Instrument characterization and modeling
- Instrument algorithm and software development
- Laboratory and field support

Computational Services
- Scientific computing (algorithm and application development)
- Data visualization
- Operational computing (system development and operations)
- Data archiving
- Configuration management
- Database design and maintenance

ENGINEERING SERVICES
- Science requirements analysis
- Requirements translation and flowdown
- Instrument design and engineering
- Software development
- Instrument integration and testing (I&T)
- Reference calibration and maintenance
- Mission planning and operations
- Systems engineering

From Science to Engineering-
A WIDE SPECTRUM OF SERVICES
SCIENCE SERVICES
QUALITY RESEARCH AND CUSTOMIZED DATA SOLUTIONS

Sigma Space is poised to help clients address some of today’s most pressing scientific challenges, from climate change to resource management. Drawing from a broad range of expertise, we deploy small, efficient teams that understand each customer’s mission, communicate well, and deliver excellent products. These teams are supported by value-added management and are responsive to evolving customer needs.

To accelerate exploration, we offer a full suite of research and analysis services, including hypothesis generation and data collection and analysis.

Since results and models are only as accurate as the data on which they’re based, Sigma Space personnel, with decades of combined experience, calibrate instruments to exacting standards and monitor performance throughout data acquisition. We also develop custom software and manage, integrate, and visualize data for superior outcomes.

With our background in remote sensing, we bring a unique perspective to each project we support, attending to every detail while never losing sight of the big picture.

Breakthroughs are waiting to be made, and Sigma Space provides the know-how to transform data into discoveries.

SCIENCE

Research and Analysis
Customer-focused support, from hypothesis to publication

From hypothesis and proposal development to field mission planning, data collection and analysis, and publication of results, Sigma Space scientists, programmers, and data analysts support the complete research life cycle. Areas of expertise include

- Hydrology
- Ecology
- Climate science (including carbon cycle, polar and glacial ice, and atmospheric research)
- Geography
- Planetary science

We further excel in developing new algorithms and software to meet research requirements. Using languages such as MATLAB, C, and C++, as well as data analysis and manipulation tools like ENVI and IDL, Sigma Space delivers client-driven solutions and quality research results.
**Verification and Validation Services**

Carefully calibrated instruments are crucial to mission success. To meet this need, Sigma Space offers its clients a diverse array of verification and validation services, such as:

- Performing radiometric calibration of instruments and illumination sources
- Maintaining laboratory equipment to established NIST standards
- Providing vicarious instrument calibration through detailed modeling of spatial and radiometric instrument responses over time
- Collaborating with operational systems and science teams to develop calibration tools—and monitor and diagnose instrument performance while on orbit

These capabilities are exemplified in our many verification and validation activities, including:

- Ongoing support and improvement of NASA GSFC calibration labs
- Prelaunch support of the NPP VIIRS and the LDCM OLI and TIRS instruments
- Support of operations for EO-1, Landsat, MODIS, and VIIRS

As demonstrated by Sigma Space’s success on current and past projects, our verification and validation staff have the expertise to ensure that customer data systems and instruments function optimally—returning reliable, high-quality data.

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**Computational Services**

Sigma Space offers comprehensive computational services to ensure high-quality data management and visualization. Working synergistically with instrument calibration and science teams, our staff:

- Tests, verifies, and implements software to ensure the production of exceptional image products for research
- Monitors multiple operational data streams to minimize processing delays and problems via automated software, manual checks, and reporting
- Performs ongoing quality assessments and evaluates potential improvements

Our capability in the area of computational services is illustrated by our support of the MODIS Adaptive Processing System (MODAPS), the processing system for key spectroradiometers aboard NASA’s Terra and Aqua satellites.

Sigma Space personnel perform comprehensive development, integration, and testing of MODAPS software, in addition to routine operation of the MODAPS system—which annually ingests 50 terabytes, produces 140 terabytes of data products, and distributes 1.5 petabytes of data.

From the smallest project to the largest mission, we have the expertise to provide our clients with end-to-end data services.

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Sigma Space provides expert science support to clients who never stop exploring.
Sigma Space employs a team of discipline-focused professionals who are well respected and recognized in the aerospace industry. Our instrument systems engineers form the core of our engineering services project teams, providing the leadership and technical expertise to help customers develop effective instrumentation solutions. Our other discipline engineering teams form our matrix organization, using their specialized skills to deliver outstanding project support.

**Instrument Systems** Comprehensive support for the complete project life cycle

With an overarching background in aerospace, our multidisciplinary instrument systems engineers (ISEs) are dedicated to helping clients manage the development and operation of successful instruments, including:
+ Instrument concept and design
+ Requirements derivation and tracking
+ Risk management
+ Project and program management
+ Cost, schedule, and technical performance monitoring

From concept development through mission operations, Sigma Space ISEs keep projects on time, on target, and in budget.

**Optical** Full-service optical design, analysis, and integration

Sigma Space designs and analyzes optical systems to ensure optimal performance of customer instruments. We specify custom optics and coatings for complex optical systems in UV, visible, and near-, mid-, and far-infrared spectrums, and are experienced in:
+ Modeling complex optical systems
+ Conducting trade studies
+ Developing first-order and detailed designs
+ Analyzing optical designs, including optical tolerance and error budgeting, stray light analysis, illumination analysis, and radiometric analysis
+ Specifying and selecting hardware for spaceflight, airborne, and ground applications

Additionally, we offer optical integration services to assemble, align, calibrate, and test instruments and components—meeting the full range of customer needs.

**Thermal** Tailored temperature control solutions

We conduct thermal design and analysis for spaceflight and airborne platforms. We are experienced in:
+ Designing, specifying, and analyzing active heating and cooling elements (e.g., strip heaters, thermoelectric coolers) and passive thermal systems (e.g., coolers, radiator plates, and heat pipe radiator systems)
+ Tailoring instrument thermal systems for temperature-sensitive optical detectors, with a focus on thermal isolation of hardware and techniques to minimize parasitic losses
+ Utilizing computational fluid dynamics software, as well as Femap and Pro/ENGINEER Mechanica
Research collection and analysis. To accelerate exploration, we offer responsive to evolving customer needs. Sigma Space is poised to support the complete research life cycle. Areas of expertise include planning, data collection and analysis, and field mission pressing scientific challenges, from climate change to that understand each provides the know-how to transform data into discoveries. Breakthroughs are waiting to be made, and Sigma Space provides the know-how to transform data into discoveries.

With our background in remote sensing, we bring a unique perspective. We analyze data for superior outcomes. We also develop custom software and standards and monitor performance throughout data acquisition and analysis optimally. As demonstrated by Sigma Space’s success on current and past projects, these capabilities are exemplified in our many verification and validation projects. These capabilities are exemplified in our many verification and validation projects.

Services

- **Verification and Reporting**
  - Tests, verifies, and implements software to ensure the production of high-quality data.
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- **Mechanical**
  - Creating hardworking instrument systems
    - When customers need help designing, analyzing, or assembling instrument systems, our mechanical engineers deliver. Capabilities include:
      - Mechanical, optomechanical, and electromechanical design and analysis for instrument systems using the latest CAD modeling and structural FEM tools, such as I-DEAS, ProE, and AutoCAD
      - Assembly and I&T of spaceflight, airborne, and ground-based instrument systems
      - Development of ground support equipment

- **Electrical**
  - Design and development of high-performance, rugged electronics
    - Sigma Space develops electronics and instrument systems for spaceflight, airborne, and ground-based applications, incorporating high-speed digital electronics, low-noise analog electronics, and power electronics. We specialize in field-programmable gate array (FPGA)-based designs and laser-based imaging instrument systems. Our instruments have been used in many NASA high-altitude airborne environments, and in ground-based products autonomously running with continuous data collection. Our expertise in spaceflight electronics design includes:
      - Design for radiation, vacuum, and high-vibration environments
      - Reliable, synchronous FPGA design techniques
      - Communication protocols such as SpaceWire and 1553B
      - Embedded processors with real-time algorithms

- **Software**
  - Customized programs for mission success
    - Customers that need reliable software solutions for data acquisition and analysis, modeling, or instrument control turn to Sigma Space. Our software team focuses on systems for airborne and spaceflight instruments, and has expertise in:
      - Architectural definition
      - Algorithm design and analysis
      - Model-driven software development
      - Formal modeling-analysis-verification
      - Design for test
      - I&T of software-hardware systems

- **Instrument I&T Fabrication, Assembly, and Testing**
  - Transition from design to finished product—seamlessly
    - Sigma Space’s mechanical, electrical, and systems engineers efficiently transition instruments from final design to manufacturing and assembly. Our advanced fabrication facilities include:
      - A spaceflight-certified CNC machining center with fundamental metrology capability
      - Multiple ESD-certified laboratories
      - Class 10,000 clean spaces
      - A comprehensive suite of tools, including collimators, interferometers, thermal vacuum chambers, and electrical analysis equipment

    - Among our expert I&T staff are:
      - GSFC Basic Adhesive Bonding-certified technicians with expertise in optical component bonding
      - Electrical technicians certified to NASA-STD-8739 series
      - Mechanical technicians experienced in assembling precision optical instruments

From cutting-edge facilities to exceptional professionals, Sigma Space is fully equipped to help customers create mission-ready instruments.
Mission-Ready Infrastructure

- Government-compliant property tracking system and processes
- Government-compliant procurement processes
- Deltek Costpoint financial management system
- ISO 9001:2008 certified (Services Division)

Customers

- NASA (GSFC, GISS, HQ, LaRC)
- DOD
- Universities
- Industry
- International

Examples of Current and Previous Programs

- Hydrospheric and Biospheric Sciences (HBS) (Prime)
- Information System and Technology (IS&T) (Prime)
- Heliophysics Science Division (HSD) (Prime)
- Goddard Institute for Space Studies (GISS)
- Mechanical Systems Engineering Services II/A (MSES II/A)
- Environmental Test and Integration Services (ETIS)
- Electrical Systems Engineering Services (ESES)
- Multi-Disciplinary Engineering and Technology II (METS II)
- Government-Wide Acquisition Contract (GWAC)
  NIH Chief Information Officer – Solutions and Partners (CIO-SP3)

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