AEROSPACE

APPLYING SPACE FFRDC EXPERTISE IN SUPPORT OF NNSA

Photo courtesy NNSA.

The Aerospace Corporation (Aerospace) is a nonprofit systems engineering and integration (SE&I) partner chartered to work in the national interest, operating the only federally funded research and development center (FFRDC) dedicated to the U.S. space enterprise and other complex systems. Key to supporting the National Nuclear Security Administration (NNSA) and Department of Defense (DOD) in the nation's deterrence mission—to protect our national security from adversarial threats and maintain nuclear deterrence—Aerospace leverages more than 60 years of experience gained from successful launch and deployment of space assets across the U.S. Air Force, Space Force, Intelligence Community (IC), and federal civil agencies.

Aerospace establishes strategic partnerships with our customers to enable enterprise-wide mission success. In this integrative role, Aerospace helps improve the flow of information, mature programs more quickly, and address complex problems across programs of national and international significance.

On demand and working shoulder-to-shoulder, Aerospace enables customers to tap our nationwide matrix of engineering and technology experts, leveraging the breadth of the corporation's world-class technical talent on critical and emerging capabilities to address national priorities.

VALUE OF WORKING WITH THE AEROSPACE FFRDC

FFRDCs provide technical expertise for science and technology efforts critical to national leadership. The Aerospace FFRDC provides independent, objective, unbiased analyses and recommendations with no conflicts of interest. Aerospace does not compete with industry and does not manufacture. As a strategic partner and trusted advisor to our government customers, Aerospace is uniquely positioned to complement industry's and academia's support to critical national programs, ensuring the highest levels of objectivity and technical excellence.

Core Competencies of the Aerospace FFRDC Applied to NNSA

1. System design and architecture development
2. System of systems engineering and integration
3. System design, development, acquisition, test, mission readiness, operations, and sustainment
4. Concept development and prototyping
5. Technology assessments, applications, and transitions
6. Decision support and integration and dissemination of industry best practice

The Aerospace Corporation NNSA Points of Contact

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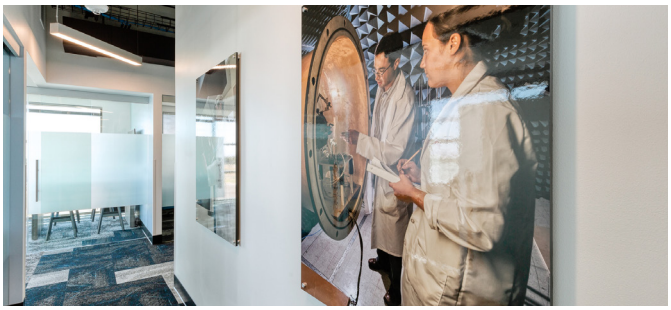
Aerospace Disciplines of Technical Excellence:

› Systems engineering
› Nuclear engineering
› Nuclear detection
› Cruise missiles
› Nuclear survivability
› Nuclear and threat deterrence
› Mission assurance
› Acquisition analyses and planning
› Digital Engineering
› Software engineering
› Integrated data and applications
› Space systems and satellites
› Launch and reentry vehicles
› Space materials
› Space science applications
› Sensor systems and signals
› Electronics
› Lasers
› Cyber

CURRENT SUPPORT TO THE NUCLEAR SECURITY ENTERPRISE



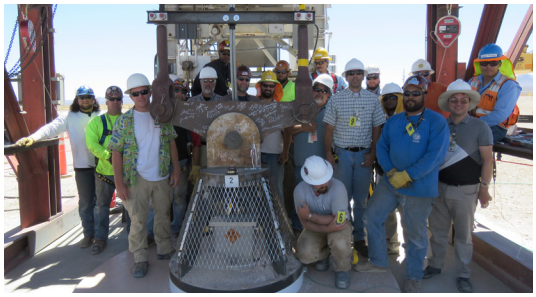
Aerospace's new 24,000 square-foot office at Hill Air Force Base in Utah enables up to 140 employees, customers, and contractors—including Aerospace's top engineers and scientists—to work side-by-side advancing capabilities that support the modernization of our nation's nuclear deterrence programs, including the Sentinel ICBM, and outpace adversarial nuclear threats.

Aerospace has provided core mission assurance to the Air Force Nuclear Weapons Center since 2008 and currently provides full lifecycle mission assurance to Nuclear Command, Control, and Communications (NC3) systems, intercontinental ballistic missiles (ICBMs), and nuclear technology assessments and roadmaps. We leverage digital engineering and model-based systems engineering tools to enhance our insight into enterprise supply chain problems and to support efficient design and enterprise integration of nuclear deterrence modernization programs.

Maintaining the Nuclear Stockpile

Aerospace supports NNSA defense programs, providing independent reviews and assessments of life-extension programs, warhead integration for the Sentinel ICBM replacement program, digital engineering and material supply chain modeling, and other initiatives. Aerospace support to NNSA defense programs includes:

- Weapon System Integration Support
- NNSA Enterprise Integration Processes
- DOD/NNSA Integration
- Systems Engineering
- Mission Assurance Assessments



Nuclear Nonproliferation

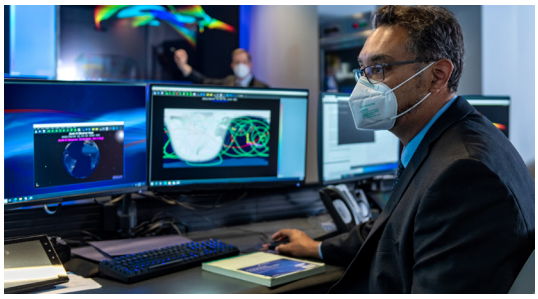
Aerospace supports the integration of the Space-Based Nuclear Detonation Detection (SNDD) program for DNN R&D incorporating the NNSA components with both the DOD Nuclear Detection System and the systems engineering and technical analyses of the DNN Proliferation Detection programs. Aerospace support to the U.S. nuclear nonproliferation mission includes:

- Independent Systems Engineering and Integration
- Independent Assessments of the Nuclear Nonproliferation Enterprise, Portfolios, and Technologies
- Assuring the Future Nuclear Nonproliferation Workforce Through the Nonproliferation Stewardship Program
- Facilitating Nuclear Technology Transitions in Support of the Nation's Nuclear Monitoring and Verification Missions

Photo courtesy USAF.

DELIVERING IMPACT THAT MATTERS

Digital Engineering and Data Visualization

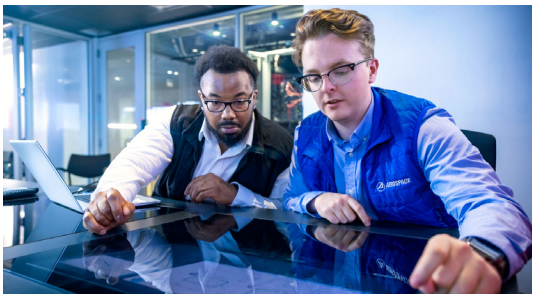


Digital engineering is necessary to manage and structure large, diverse, and distributed data of complex and evolving technologies across the nuclear enterprise amid high demand and limited resources. Aerospace combines our technical and programmatic experience to forge custom digital engineering and data visualization solutions for NNSA, applying tools such as heatmaps, artificial intelligence, machine learning, Natural Language Processing, and relational databases to quickly process and analyze large quantities of data.

Tools built for NNSA have quickly satisfied Congressional interest of key acquisition programs and enhanced risk decision-making by federal leaders. These custom solutions to complex data questions helped weapon program offices manage requirements, costs, and schedules by identifying key data sources, restraints, management inconsistencies, and other issues within processes. For our direct support to NNSA's Low Yield Nuclear Monitoring Program, Aerospace added two new digital engineering tools to our internally developed software suite for natural language processing. This software and associated data visualization techniques enhance federal program managers' abilities to understand the research publications produced with funding from NNSA Defense Nuclear Nonproliferation as well as relevant documents available in open scientific literature.

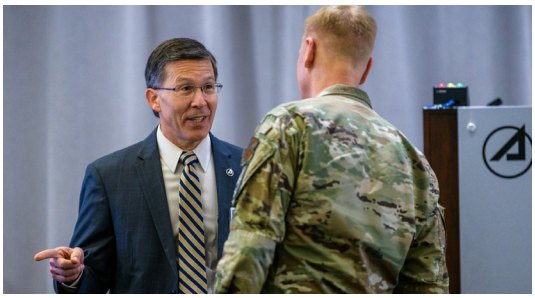
Independent Assessments and Peer Reviews

Aerospace leads the Independent Assessment Program to conduct scientific and programmatic assessments of the entire scientific research portfolio of the Office of Defense Nuclear Nonproliferation Research and Development (DNN R&D). In each project's second year, Aerospace leads panels of subject matter experts to ensure project milestones set forth in the project's Life Cycle Plan are met. Panel chairs deliver reports that address concerns and provide recommendations, which are used by federal program managers to redirect projects as necessary and by DNN R&D as a reporting mechanism to NNSA management and Congress.



Responding to NA-10 direction, Aerospace provides timely, impactful Independent Peer Reviews for NNSA to evaluate the performance of the management and operation contractor roles. When Aerospace performed a commercial off-the-shelf (COTS) assessment for the W80-4 Life Extension Program, our analysis identified systemic concerns with the selection of COTS parts and highlighted potential repeat problems identified in the B61-12 and W88 Alt 370 programs. Results were briefed to NA-10 and Sandia National Laboratories, where they drove corrective actions.

Tailored Mission Assurance



Mission assurance is the disciplined application of proven scientific, engineering, quality, and program management principles toward the goal of achieving mission success. Mission assurance follows a general systems engineering framework, using risk management and independent assessment as cornerstones throughout program life cycles. Aerospace's proven track record of support to Space Systems Command—an early adopter of mission assurance principles—spans over two decades, and we continue to tailor these processes to strike optimal balance between performance, risk, schedule, and cost for specific missions, systems, or programs.

Aerospace has created a tailored version of the Aerospace Mission Assurance Baseline for NNSA, which captures the unique processes and products NNSA requires for its acquisition programs. This tailored approach to mission assurance is being applied to the new W93 warhead program. Its implementation will include Aerospace's development and execution of a digital engineering ecosystem and tools to facilitate task management, task execution, data synthesis, and visualization.

TECHNICAL EXPERTISE

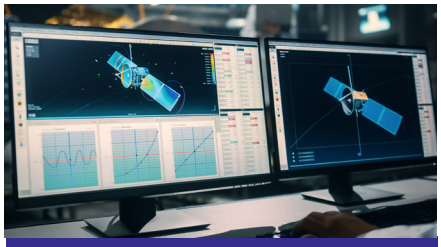
Aerospace's Engineering and Technology Group (ETG) is a nationally recognized space systems and technology resource comprising six specialty organizations equipped with state-of-the-art computing, testing, diagnostic, research, simulation, and laboratory facilities, as well as unique databases that have evolved since the beginning of the space era.

Electronics and Sensors

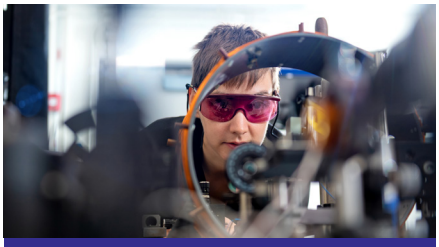
Information Systems and Cyber

Communication Technologies and Engineering

Vehicle Systems



Systems Engineering



Physical Sciences Laboratories

Our Commitment to Mission Success

The hard problems of the modern space domain are increasingly too big and too complex for any one organization or system designer to address on their own, and there are commonalities to many of the NNSA programs. Aerospace provides an unparalleled advantage that leverages the collective strength and perspective of the nation's space enterprise to inform on the best course of action for high-impact decisions to solve complex problems across diverse mission areas. Aerospace brings deep technical, objective perspective to aid NNSA programs.

Lead From the Front

- Proactive problem-solving
- Anticipate mission needs
- Inspire innovative approaches

Collaborate Across the Enterprise

- Integrate the best ideas
- Bridge across boundaries
- Solve hard problems together

Operate with Agility and Speed

- Thrive in uncertainty
- Embrace learning and experimentation
- Pivot with urgency when needed

Nationwide Support

Our company maintains world-class laboratory facilities with a structure that enables maximum customer responsiveness. Aerospace brings expertise and insight from our nationwide locations to provide independent, objective technical analyses, systems and enterprise engineering, and innovative technology solutions to the nuclear security enterprise. In addition to NNSA, our customers include NASA, NOAA, FAA, and other federal civil agencies, national security space agencies, the IC, commercial space companies, and international customers—all of whom benefit from our deep technical knowledge. As operator of an FFRDC, Aerospace delivers reach back expertise beyond the individual credentials of a program office interface.

The Aerospace Corporation

The Aerospace Corporation is a national nonprofit corporation that operates a federally funded research and development center and has more than 4,600 employees. With major locations in Chantilly, Virginia; El Segundo, California; Albuquerque, New Mexico; and Colorado Springs, Colorado, Aerospace addresses complex problems across the space enterprise and other areas of national and international significance through agility, innovation, and objective technical leadership. For more information, visit www.aerospace.org.

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