



Multi-Domain System Concepts Group (A4D)

Developing Multidomain System Solutions

WHO WE ARE

The Multi-Domain System Concepts Group (A4D) is a team of highly talented engineers, physicists, and mathematicians with expertise in modeling, simulation, and analysis of air defense capabilities, gaps, and advanced new concepts. We value working in collaborative teams and strive to bring together capabilities from all across the organization. We prioritize working side by side, mentoring and developing each other as we continually learn new technologies, algorithms, and best practices.



WHAT WE DO

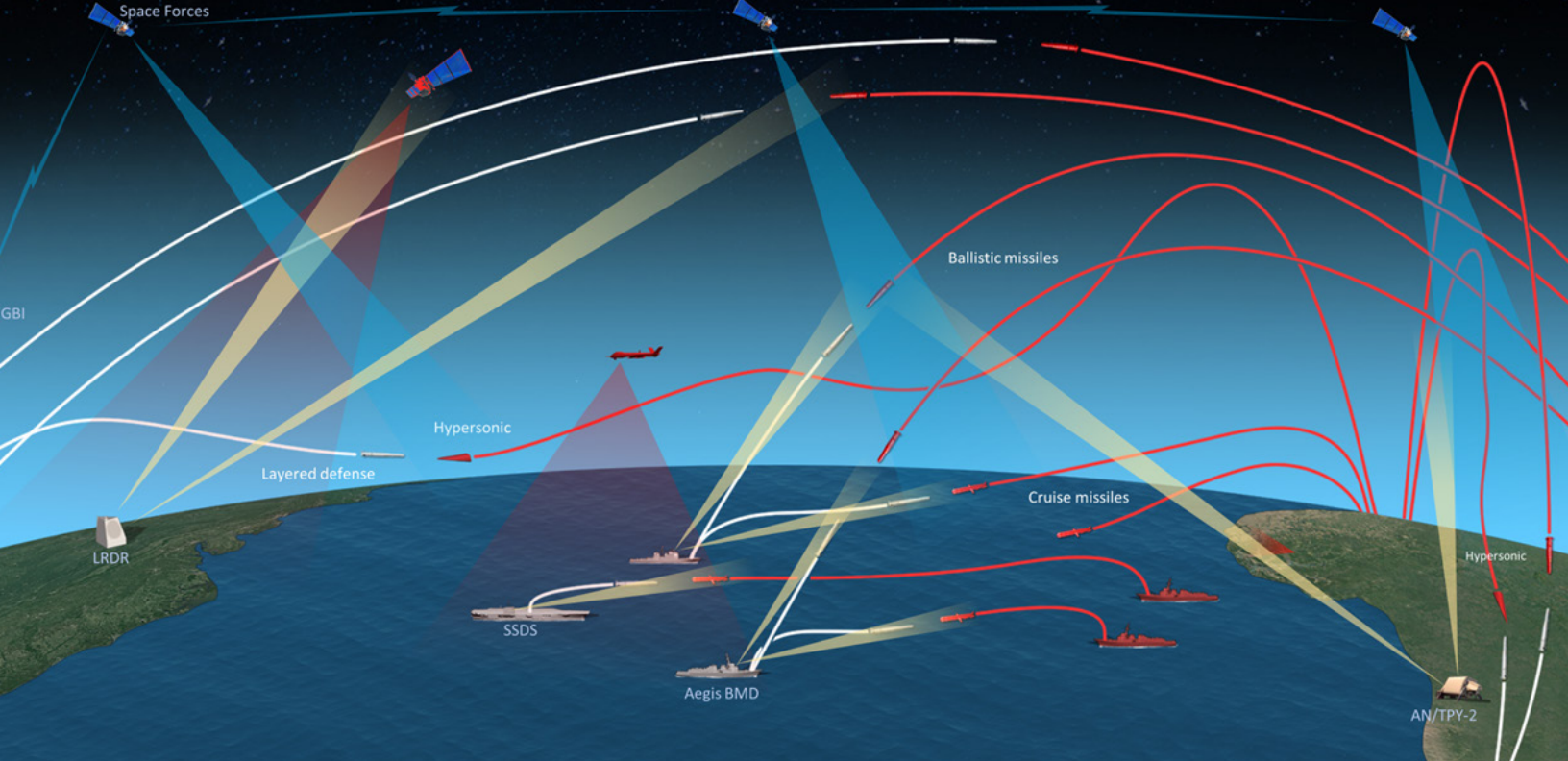
Our mission is to determine what gaps exist in the end-to-end air defense system capability and develop concepts that could close the gaps and revolutionize the overall defensive capability. We specialize in applying high-performance computing for simulation and analysis of multidomain defensive systems to provide our sponsors an understanding of individual and overall system performance and performance trades.

FOCUS AREAS

- » **Missile Defense Engagement Systems**
- » **Homeland Defense**
- » **Hybrid Defense Architectures**
- » **Global Networked Multidomain Systems**
- » **Hybrid Naval Defense Systems**
- » **System Prototyping and Demonstrations**
- » **High-Performance Computing**

OUR RESEARCH

We provide end-to-end analysis of multidomain defensive systems to our sponsors that describes individual and overall system performance in the context of many interacting elements in dynamic threat environments. We develop and use different kinds of models (physics-based, functional, algorithmic) in large-scale simulations involving sensors, command and control,



communication, terminal-defense systems, hypersonic and missile defense systems, kinetic and non-kinetic effectors, and space systems to answer our sponsors' questions. These questions often explore the application and effectiveness of new technologies and concepts to fill critical defensive gaps against emerging threats.

We analyze current and future missile defense engagement concepts and determine requirements for systems, including Aegis Ballistic Missile Defense, Theater High Altitude Air Defense, and Ground-based Missile Defense, as well as the associated sensors and global command and control systems for theater and homeland defense. We develop and analyze joint hybrid defensive architectures of sensors and effectors, and we applied this capability most recently to analyze the defense of Guam. We create concepts for global networked multidomain systems—for example, optimizing future space-based infrared sensing constellations for missile tracking. We support various Navy organizations and lead analytical studies for the Navigation Plan Implementation Framework – Terminal Defense and related concepts that drive Navy acquisition and budget decisions. We also support concept development, including prototyping, field testing, and developing real-world capabilities for advanced science and technology programs.

Our work spans all phases of the threat's detect-track-engage sequence and across the domains of land, sea, air, and space. This breadth is instrumental to bringing an end-to-end system-level understanding across organizations within the Department of Defense community while influencing major investment, acquisition, development, and operational decisions for our national defense. Our work is sponsored by a variety of Missile Defense Agency, Navy, and Space Force organizations. We lead internal APL activities associated with simulation development practices and high-performance computing, and we manage multiple large classified computing labs for the Air and Missile Defense Sector.

A4D CONTACT



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