



# SYSTEMS ENGINEERING LIFECYCLE

Systems Engineering (SE) is the technical partner of acquisition management, providing analytic foundations at each stage in the acquisition lifecycle. The overall cost of the SE process is typically a fraction of total project cost, but early SE investments can have a big impact. Studies consistently show fixing errors found during system implementation is over 100x more expensive than errors addressed at earlier requirements and design stages.

As a non-profit organization dedicated to the success of government programs, we can provide objective insights with no conflict of interest.

## OUR APPROACH

CNA tailors the systems engineering process to meet each project's unique features, balancing performance, cost, and schedule requirements to meet real-world operational needs. We take a holistic view, identifying how a new system fits into the existing framework, analyzing upstream and downstream effects of changes, and understanding impacts on all stakeholders. We support programs from the earliest stages of mission analysis through implementation, and are often called on to turn around programs in progress.

## SYSTEM REQUIREMENTS

CNA translates user functional requirements into the technical requirements and specifications needed for detailed design. We develop tradeoff models to help program managers choose between different performance features, costs, time to completion, and other program options.

## SYSTEM ARCHITECTURE AND DETAILED DESIGN

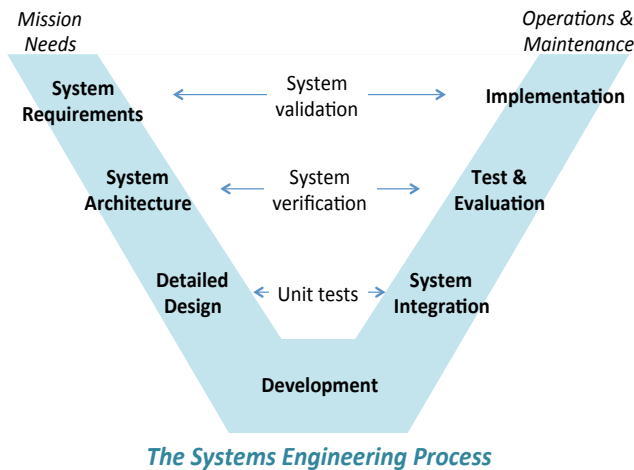
CNA is often asked to develop and compare alternative architectures to fulfill requirements. Architecture includes interfaces with legacy systems and new systems being developed in parallel. Detailed design provide the specifications needed by developers and typically includes Life Cycle Cost Estimates from development through in-service management and disposal.

## TEST & EVALUATION

Close connections with the operators and users is the hallmark of CNA projects. Our test and evaluation work draws on these connections, built at the earliest mission analysis and requirement stages, to form test scenarios that are grounded in reality. CNA also provides Independent Verification and Validation (IV&V) services to ensure that systems fulfill their original requirements.

## IMPLEMENTATION

Preparing for implementation begins during architecture and design stages. Training, integrated logistics support, and ongoing configuration management are aspects of the solution design so that implementation is less likely to surface costly rework.



**Selected Clients:** Federal Aviation Administration • Department of Homeland Security • United States Navy • United States Marine Corps

# FEATURED EXPERIENCE

## FEDERAL AVIATION ADMINISTRATION

### *Notice to Airmen Modernization*

CNA tailors our approach to systems engineering to meet the unique needs of each project. One example of this has been our involvement with the development of the Federal NOTAM System (FNS), which is at the forefront of the Federal Aviation Administration's (FAA's) modernization efforts for Notices to Airmen (NOTAMs). FNS began with an operational need to create digital NOTAMs through the use of the Aeronautical Information Exchange Model (AIXM) and has expanded to the point where it now has over 20 systems and services in production that work together to support the origination, management, and distribution of approximately a million NOTAMs on an annual basis. To reach this state has required detailed planning and multiple iterative cycles of stakeholder coordination, functional analysis, requirements development, enterprise architecture/business processes development and oversight of development/operational implementation. From these various tasks, CNA analysts and systems engineers created products that were consistent, complete, unambiguous, and verifiable such that they could be acted upon by a development team to create a system that has met or exceeded the client's requirements.

### *Special Activity Airspace Modernization*

CNA has provided systems engineering support to the FAA across several airspace programs, including the Special Activity Airspace (SAA) System Wide Information Management (SWIM) Implementing Program and the Sector Design and Analysis Tool (SDAT). CNA supported development of a National SAA Program Concept, developed functional, system and data requirements, and oversaw program development and fielding. CNA is now supporting the Aeronautical Information Management Modernization Segment 3 acquisition where knowledge about those programs is being applied to address stakeholder needs, meet operational constraints, and identify other factors to develop the concept of a consolidated airspace tool.

## ABOUT CNA CORPORATION

CNA is a not-for-profit research and analysis organization with 75 years of experience providing government agencies with data-driven insights and real-world, actionable solutions grounded in our direct experience with the operational environments where these solutions are applied. CNA developed the foundational techniques for operational analysis to address complex challenges facing government programs. We have applied these techniques successfully in areas ranging from defense to aviation, education, justice, and homeland security.

## FEDERAL EMERGENCY MANAGEMENT AGENCY

### *Grants Management Modernization*

CNA supports FEMA's Grants Management Modernization (GMM) program with operational analyses, systems engineering studies, and data analytics that inform program planning and acquisition decisions. The GMM program is a DHS Level II acquisition program that will replace FEMA's nine current grants-management systems with a new, unified IT platform to standardize business operations across FEMA's 40+ grants programs.

CNA has developed the Concept of Operations, Operational Requirements Document, Test and Evaluation Master Plan, and Integrated Logistics Support Plan for GMM. CNA has also established an overarching agile approach to requirements definition, working with stakeholders across the grants management lifecycle in dedicated user sessions to understand their operational shortfalls and requirements, identify system transformation opportunities, and prioritized user stories for agile increments for the GMM program.

## UNITED STATES COAST GUARD

### *Coast Guard Cutter Fleet*

The USCG needed to recapitalize its aging fleet of large cutters. CNA conducted an Analysis of Alternatives that identified the technical requirements, assessed alternative platform mixes, and estimated their lifecycle costs. CNA evaluated three groups of trade-offs using a modeling approach that computed relative operational effectiveness. CNA also assessed total ownership costs and risk. The USCG used the results to optimize their acquisition strategy.

CNA also developed options that will optimize the life-cycle maintenance cost of the USCG fleet as part of the acquisition strategy. The analysis considers Operational and Depot levels of maintenance; parts management; dry dock availabilities; and maintenance staffing.

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