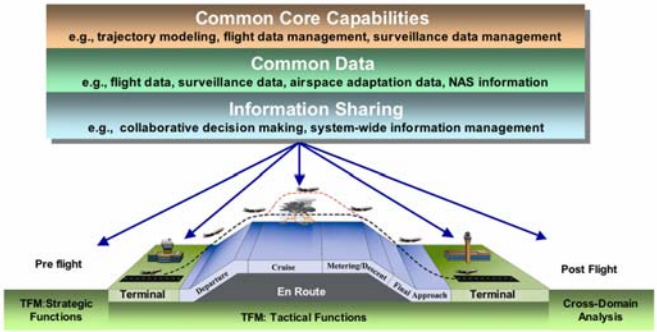
Integrating Common Flight Data Processing in the National Airspace System

To address the future needs of the Federal Aviation Administration's (FAA) National Airspace System (NAS) infrastructure, The MITRE Corporation's Center for Advanced Aviation System Development (MITRE/CAASD) has employed a standardized architecture analysis technique to define a potential evolution of NAS Flight Data Processing (FDP) capabilities. Taking advantage of its broad aviation expertise, MITRE/CAASD analyzed and documented the current FDP architecture encompassing major FDP systems across the domains of the NAS, assessed the impact of future concepts on this architecture, and is taking steps to define a more cost-effective and efficient integrated Air Traffic Management system for handling future air traffic demands.

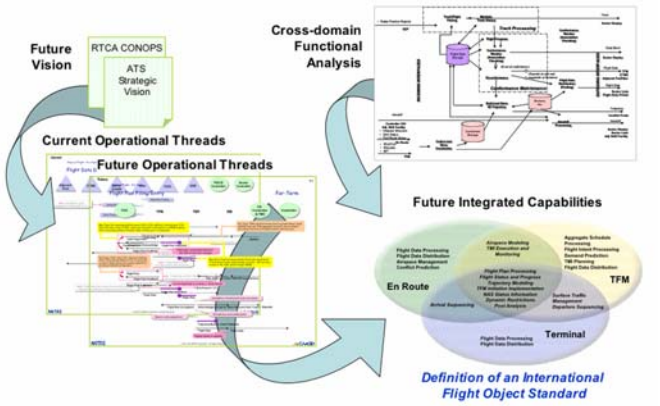
Integrated NAS Infrastructure Goal. The figure below depicts the goal of data and function commonality across domains, including improved information exchange. In addition, a wide-range of new capacity enhancing capabilities are being planned that will rely on uniformly consistent and accurate flight information, at a level that does not exist in today's NAS. It is vital that FDP capabilities evolve in a way that enables the FAA to continue delivering services effectively in the face of increasing and changing demand. This evolution must be coordinated with flight data initiatives within the NAS domains and around the world to ensure interoperability, both domestically and globally.



Assessing Today's Architecture for Tomorrow's Solutions. MITRE/CAASD captured current FDP operations in a series of system threads that depict information and activity flows between automation systems and system users in all phases of flight, from pre-flight through post-analysis. Additional threads were developed to reflect the impact on operations resulting from the FAA's vision for the future. The future threads can be used in two principal ways. First, analyzing how these functions serve the domains will help determine which FDP functions are common across multiple domains. Second, the threads can serve to validate future architectural approaches for implementing specific improvements in NAS operations.

Applying an Architecture Framework to Evaluate Commonality. As shown in the figure below, the thread definition was augmented with a functional analysis of common FDP capabilities, leading to a definition of a future integrated NAS architecture. Using an architecture framework approach, that has been adopted by government agencies and commercial industries as a methodology to develop large scale systems, MITRE/CAASD developed a set of architecture framework products:

- Operational Activity Models—used as the standard notation to model the hierarchy of actions and activities of NAS service providers in all phases of flight.
- System Functionality Descriptions—functional decomposition of current system functions, system context diagrams, and functional flow diagrams for internal and external data flows.
- Operational Activity-to-System Function Correlation Matrices—describe how FDP functions in each of the current systems relate to one another in supporting the operational mission within and across domains.



Defining Common FDP Capabilities for the Future. By using these architectural products to focus the analysis, common FDP capabilities were identified across systems. A comparative analysis highlighted the potential areas of future commonality. Finally, a set of characteristics was identified for future common FDP capabilities which could serve all of the applications embodied in the current systems while supporting the operational mission. MITRE/CAASD is continuing this analysis with an examination of systems planned for the future, incorporating their capabilities in the FDP architecture definition, and evaluating potential evolutionary steps.

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