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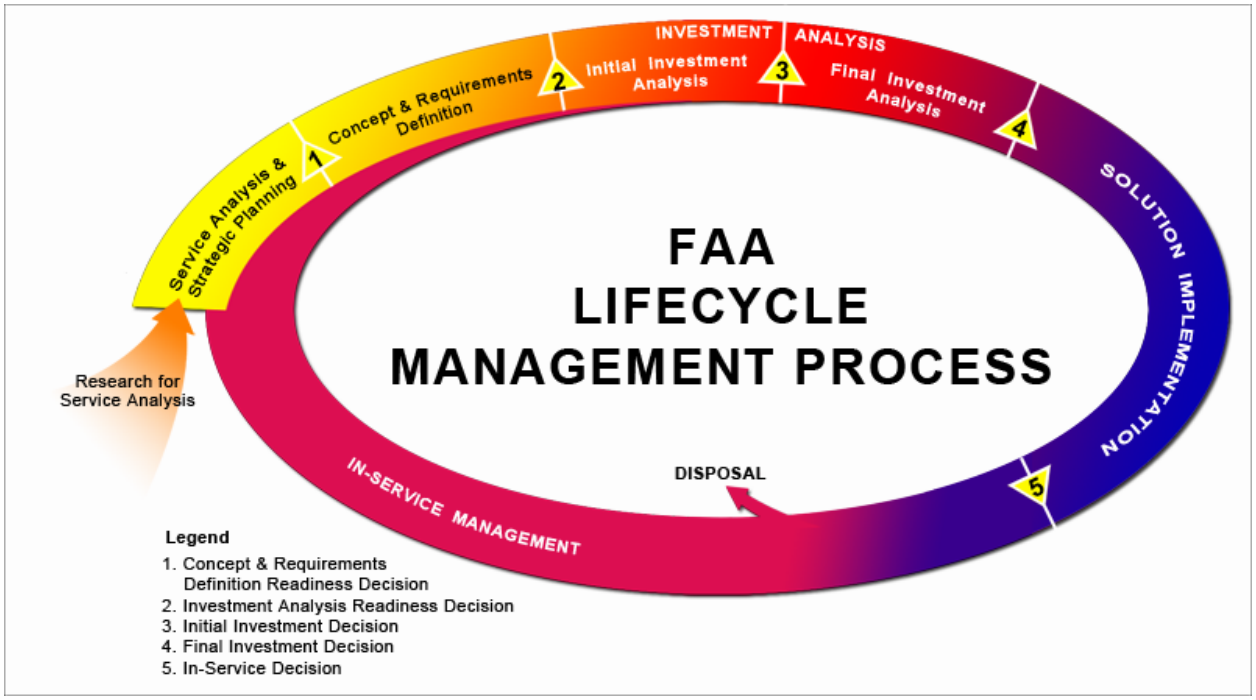
# 2 Lifecycle Acquisition Management Policy

## 2.1 Overview Revised 4/2013

Lifecycle acquisition management is built around a logical sequence of phases and decision points (see Figure 2.1-1). The FAA uses these phases and decision points to determine and prioritize its needs, make sound investment decisions, implement solutions efficiently, and manage services and assets over their lifecycle. The overarching goal is continuous improvement in the delivery of safe, secure, and efficient services over time. Application is flexible and may be tailored by the Acquisition Executive or Joint Resources Council.

The lifecycle management process is the FAA's Capital Investment Planning and Control Process. Service analysis and investment analysis constitute the select process. Solution implementation is the control process. In-service management is the evaluation process.

***Figure 2.1-1 The FAA Lifecycle Management Process***




### 2.1.1 Key Elements of Lifecycle Management Policy Revised 4/2013

FAA lifecycle management policy emphasizes the following:

- Service organizations are responsible and accountable for managing service delivery throughout the lifecycle;
- Service organizations manage fully integrated portfolios of investment and operational assets to optimize service delivery over time;
- Portfolio managers coordinate implementation of all materiel and non-materiel

investment increments necessary to obtain an operational capability;

- Service analysis is the foundation for long-range planning by service organizations and the FAA as a whole;
- Users, customers, and industry work together to define affordable and sufficient requirements so practical solutions can be developed;
- Investment decisions are based on the relative merit of different investment opportunities for satisfying priority service needs and FAA performance goals;
- Commercial and non-developmental solutions are preferred when they satisfy customer needs and make economic sense;
- Investment programs are approved and funded in manageable phases;
- Lifecycle supportability is designed into products and services to minimize both cost and risk;
- Investment programs are managed within approved cost, schedule, performance, and benefit baselines throughout their lifecycle;
- In-service decisions are based on demonstration that operational requirements and readiness are satisfied;
- Evolutionary improvement of service delivery and the quick insertion of productive new technology is encouraged; and
- Operational performance, costs, and benefits are evaluated periodically throughout in-service management as a basis for improving cost-effective service delivery.

### 2.1.2 Evolutionary Product Development Revised 4/2013

The FAA employs evolutionary product development to limit the design challenge for any one product development cycle by deferring risky technology and immature requirements to later updates. The objective is to minimize risk and facilitate the achievement of cost, schedule, and performance goals. Product development and implementation are appropriate when risk is low, requirements are known and stable, and resources are available.

Evolutionary product development begins during research for service analysis when the FAA develops and evaluates new concepts and technology for possible application to the aviation service environment. Only the best new concepts validated to be technically, operationally, strategically, and financially mature and beneficial enter into the NAS Concept of Operations as candidates for investment and deployment.

During concept and requirements definition, service teams conduct a final assessment of the maturity of marketplace technology and customer requirements. Only low-risk, high-value investment increments proceed to investment analysis and solution implementation. Higher risk concepts are deferred, terminated, or designated for additional research or technology development.

### 2.1.3 Knowledge-Based Decision-Making Revised 4/2013

The FAA employs knowledge-based decision-making throughout the lifecycle management process. Specific knowledge, as defined by decision criteria, must be achieved for entry into AMS decision points. These criteria are defined as entrance criteria in the AMS policy section

for each decision point. Investment programs that develop systems or software must capture additional design and manufacturing knowledge about their products as prescribed in Section 2.6.1, and base decisions on whether to proceed further in the lifecycle management process on that knowledge.

### 2.1.4 Investment Planning Revised 10/2014

Investment planning occurs throughout the AMS lifecycle management process (see Table 2.1.4-1). During service analysis and strategic planning, the focus is on defining corporate service needs and shortfalls and deciding when to seek solutions within realistic budgetary constraints. Investment planning during the remainder of the AMS lifecycle management process supports the definition, acquisition, deployment, and lifecycle support of affordable solutions to approved service needs. Throughout this management process, FAA service organizations employ standard scheduling practices, standard program milestones, and the standard lifecycle work breakdown structure.

**Table 2.1.4-1 Investment Planning During the AMS Lifecycle Management Process**

| Lifecycle Management Phase | Focus of Investment Planning |
|---|---|
| Service analysis and strategic planning | FAA service needs and service shortfalls |
| Concept and requirements definition | Program requirements and alternative solutions for approved service needs |
| Initial investment analysis | Business case analysis to determine the best overall solution |
| Final investment analysis | Final business case and implementation planning for the alternative selected for acquisition and deployment based on vendor proposals and operational support needs |
| Solution implementation | Program implementation consistent with the acquisition program baseline approved at the final investment decision |
| In-service management | Sustainment of operational assets including product improvements and technology upgrades as defined in the business case |

#### 2.1.4.1 FAA Scheduling Practices Revised 10/2014

Service organizations and program offices employ FAA scheduling best practices when planning

investment programs. This includes communicating up-to-date acquisition and site-specific waterfall deployment schedules to all key stakeholders by means of the corporate work plan. Guidance for FAA scheduling practices is located in FAST on the investment analysis page.

#### 2.1.4.2 Standard Program Milestones Revised 10/2014

Service organizations and program offices employ standard program milestones when planning, executing, and reporting progress on agency investment programs, including entries in the OMB Major IT Business Case (designated programs only) and acquisition program baseline. Standard milestones for system and facility investment programs are located in FAST on the decisions / reviews / standard milestones page.

#### 2.1.4.3 Standard Lifecycle Work Breakdown Structure Revised 10/2014

Service organizations and program offices employ the FAA standard lifecycle work breakdown structure when estimating total lifecycle cost and constructing initial program plans and schedules for each alternative solution during initial investment analysis. They use it during final investment analysis to develop a program work breakdown structure and implementation planning for the alternative approved by the Joint Resources Council.

### 2.1.5 Measurement and Analysis Revised 10/2014

Measurement and analysis is a management and control process applied throughout the lifecycle of an investment program or operational asset to assess progress, forecast performance, determine status, and define corrective action. Measurement and analysis provides information and visibility toward accomplishing program goals and supporting management information needs.

Each line of business or staff office institutes measurement and analysis processes in accordance with AMS policy and guidance that:

- Collect, store, analyze, and report data on seventeen standard measures defined in Standard Program Performance Measures;
- Collect, store, analyze, and report baseline performance data defined in the Acquisition Baseline Management Standard Operating Procedure for those programs with an approved Acquisition Program Baseline; and
- Provide early warning indicators of program issues before they become major problems.

  Measurement and analysis information needs include, but are not limited to:

- Contract information that supports management and executive monitoring of vendor performance;
- Contract information that supports acquisition quality assurance;
- Program, operational, risk, and contract information that supports monitoring of lifecycle cost, schedule, performance baselines, as well as benefits and technical progress;
- Program information that supports achievement of FAA strategic goals and alignment with the enterprise architecture; and
- Operational and business case information that supports investment decision-making.

### 2.1.6 Verification and Validation Revised 10/2014

The FAA employs verification and validation throughout the acquisition management lifecycle in accordance with AMS verification and validation guidelines to support investment decisions and approvals. Validation ensures the right product is built (fulfills its intended use). Verification ensures a product is built right (according to specifications). Verification and validation are performed early and incrementally throughout the lifecycle management process on select work products, product components, and products. Products are intended for delivery to a customer or end user. Product components are lower-level configuration items of the product. Work products represent, define, or direct product development. The following are sample work products, work components, and products subject to verification and validation:

- Operational concept or procedures
- Planning documents
- Requirement and specification documents
- Procurement and contractual documents
- Models, prototypes, and simulations
- Design documents
- Products and product components

## 2.2 Research for Service Analysis Revised 4/2013

Research and systems analysis are often required during service analysis to mature operational concepts, reduce risk, or define requirements before a decision is rendered to proceed further in the lifecycle management process. Research for service analysis (RSA) policy also applies when research and systems analysis are required to develop NAS architecture products to meet the criteria to enter concept and requirements definition. In addition, AMS portfolio management policy applies when alignment across related initiatives is necessary to mature concepts to move through the AMS lifecycle.

During RSA, the FAA engages in two general areas of applied research activity:

- Research, Engineering, and Development (RE&D)
- Concept Maturity and Technology Development (CMTD)

The RE&D process governs selection and execution of the RE&D portfolio. This portfolio includes systematic studies to gain knowledge or understanding of concepts, products, or procedures that could potentially benefit the aviation community with or without specific application or means by which a specific need may be met such as research related to materials and human factors. These activities inform FAA strategic planning, the NAS architecture, and CMTD activities, but do not lead directly to concept and requirements definition.

The CMTD process governs activities directed toward the production of useful materials, devices, systems, and methods, as well as advance the maturity of new concepts. Typical activities include concept feasibility studies, technical analysis, prototype demonstrations, and operational assessments that identify, develop, and evaluate opportunities for improving the delivery of NAS services. These efforts reduce risk, define requirements, demonstrate operational requirements,

inform concept and requirements definition activities, and generate information required to support agency investment decisions and product lifecycle management.

RSA activities related to the NAS are performed in coordination with the NextGen organization to ensure alignment with the enterprise-level technical strategy as reflected in the NAS architecture.

### 2.2.1 Research, Engineering, and Development Process Revised 4/2013

The RE&D process supports aspects of aviation with research on materials and human factors to support development of new products, services, and procedures. These aspects include regulation, certification, and standards for aircraft, air operators, manufacturers, aircrews, and other aviation personnel; airports; commercial space transportation; environment; modernization, operation, and maintenance of the NAS; and aerospace policy formulation, planning, and analysis.

RE&D activity across FAA is coordinated through the RE&D portfolio process. The RE&D executive board develops the RE&D portfolio each year using strategic planning in the National Aviation Research Plan as a guide. This plan links FAA research activities to broader strategic planning in the NAS ConOps, NextGen Implementation Plan, the NAS Architecture, and the Joint Planning Development Office. The RE&D executive board is supported by program planning teams assigned to prepare and manage specific research areas.

Program managers execute research programs. They work closely with research sponsors (business units that own or share the RE&D requirement) to ensure results meet customer needs.

Annual evaluations determine whether research results are meeting performance targets and supporting FAA strategic goals. Evaluations also determine whether FAA strategic planning is leading the RE&D portfolio in the right direction.

The RE&D Advisory Committee and its associated subcommittees review the RE&D portfolio twice a year, first during budget formulation and later during portfolio evaluation.

#### 2.2.1.1 What Must Be Done Revised 4/2013

Service organizations:

- Identify, justify, and manage research, study, and analysis within their service area of responsibility;
- Prepare budget formulation documents for research programs approved for inclusion in the RE&D portfolio;
- Submit research, study, and analysis proposals to the RE&D portfolio development process for evaluation and possible inclusion in the RE&D portfolio;
- Facilitate peer reviews by subject-matter experts to improve the quality and timeliness of ongoing research programs; and
- Maintain documentation of research methodology, activities, and results.

NextGen organization:

- Manages the RE&D planning and budget process;
- Coordinates annual development of the National Aviation Research Plan;
- Ensures the RE&D portfolio is aligned with FAA strategic goals and the NAS architecture;
- Coordinates annual updates to the NAS architecture and ensures concept RE&D activities are properly depicted;
- Identifies and analyzes potential solutions to service need, including feasibility analyses;
- Evaluate prototypes and conducts feasibility demonstrations to validate and refine initial requirements, operational concepts, and potential solutions;
- Integrates FAA research activity with research sponsored or conducted by industry, universities, and other government organizations;
- Interfaces with Office of the Secretary of Transportation, OMB, Congress, trade associations, international organizations, and other state and federal government organizations for agency-level research issues; and
- Identifies, justifies, and manages research, study, and analysis programs.

RE&D Executive Board:

- Coordinates with the lines of business to develop the FAA RE&D portfolio each year;
- Reviews and approves the non-NextGen-funded portion of RE&D portfolio each year; and
- Coordinates sequential review of the RE&D portfolio with the Chief Operating Officer, Associate and Assistant Administrators, and Joint Resources Council.

#### 2.2.1.2 Outputs and Products Added 7/2010

- FAA RE&D portfolio;
- Budget formulation documentation;
- National Aviation Research Plan; and
- Research products addressing the needs of the FAA and aviation community.

#### 2.2.1.3 Who Approves? Revised 4/2013

Joint Resources Council approves the RE&D budget.

The Administrator approves the National Aviation Research Plan.

### 2.2.2 Concept Maturity and Technology Development Process Revised 4/2013

The concept maturity and technology development process governs conduct of NAS activities such as feasibility studies, technical analysis, prototype demonstrations, and operational assessments that identify, develop, and evaluate potential concepts for improving service delivery by the FAA. These activities may be for a single initiative or multiple initiatives related to a single concept (a portfolio, as described in section 1.2.4.2.). They may play a role in the development of service analysis products, as described in section 2.3.1. Key outputs are mature,

beneficial concepts that can progress toward entry into the NAS ConOps and NAS architecture and then into concept and requirements definition phase of AMS.

The CMTD process supports concept maturity through the following three stages:

- **Concept Exploration** identifies promising concepts with sufficient definition to begin development of a concept of operations and plan follow-on activities. Work starts with the collection of a broad and varied range of potential approaches for meeting agency strategic goals, objectives, and service needs, and organizes them into candidate concepts. Outputs are promising and feasible concepts that warrant further maturation and development.
- **Concept Development** matures and evaluates promising concepts to determine which should continue further development. Activities include modeling, simulation, and detailed analysis.
- **Concept Evaluation** confirms that a concept has great promise toward meeting the needs of the agency and begins to determine operational and technical feasibility. Concept evaluation can include concept integration, evolution, or scalability. Representative activities include prototyping and field demonstration.

Individual projects reside in one of the stages, but may not pass sequentially through each, depending on the maturity level of the concept and the progress of related initiatives.

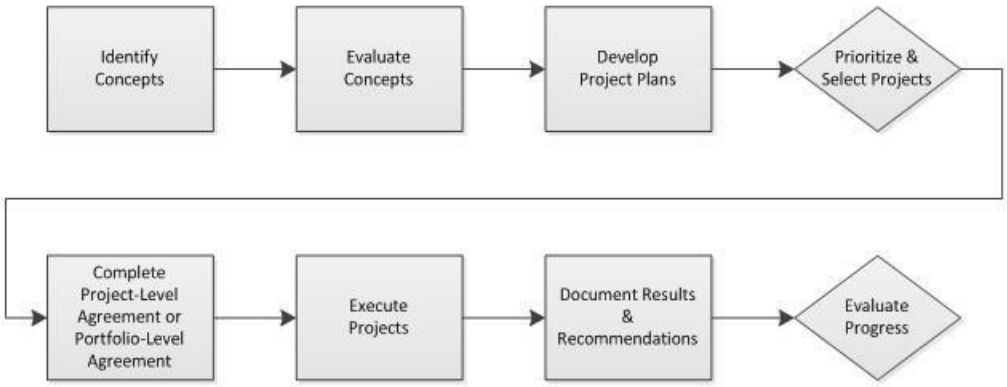
CMTD activities are selected according to their relative potential for achieving needed operational improvements identified in the NAS ConOps and NAS architecture. CMTD activities include development of mid-term operational concepts, concept evaluation studies, human factors analysis, preliminary requirements development for individual concepts, prototypes, demonstrations, and concept development. These activities generate information supporting the validity of identified capability shortfalls, future service needs, capability requirements, expectations of benefits, and design alternatives. See CMTD guidance for a list of products and how CMTD supports the development of those products.

### 2.2.2.1 What Must be Done? Revised 4/2013

CMTD encompasses activities designed to validate concepts for improving performance. A concept is a broad area of potential operational improvement to be explored for applicability to agency strategic goals and objectives. Concepts are evaluated for technical and operational feasibility as they progress through the CMTD process where they are prepared for entry into the NAS ConOps and NAS architecture, and eventually on to concept and requirements definition.

Individual projects are discrete efforts that evaluate specific aspects of the concept and provide data necessary to assess technical maturity and operational feasibility. The objective of each project must be defined, have definitive deliverables, and have clear success criteria. An individual project is most often completed during one stage of the CMTD process, and is always conducted in accordance with a project-level or portfolio-level agreement. Several CMTD projects may need to be completed for a concept to be deemed mature enough to continue with service analysis or enter concept and requirements definition.

The following flowchart describes the steps that projects move through during the CMTD process. The steps are cyclic and apply to each stage of the process.




- **Identify concepts.** All potential concepts for satisfying immediate or future priority service or performance needs are gathered and acknowledged. The FAA strategic plan, NAS architecture, NAS ConOps, NextGen Implementation Plan, and prior research are various sources from which to identify concepts.
- **Evaluate concepts.** Concepts are evaluated annually to determine which have the greatest potential for improving performance and service, and which need to mature in the near future. The NAS architecture links operational improvements to strategic goals and identifies when they are needed.
- **Develop project plans.** A project plan is completed for each potential project. The plan defines project goals and objectives; explains how it will mature the research concept; identifies interdependencies, related projects, risks, and safety concerns; and documents expected outputs and measures for success.
- **Prioritize and select projects.** The portfolio manager collects all project plans and prioritizes them based on immediate needs, dependencies, and projected results. Highest priority research projects are selected to be carried out based on available funding. Projects not selected return to the identify concepts step of the CMTD process for the next funding cycle.
- **Complete project-level agreement or portfolio-level agreement.** The project team completes the project-level or portfolio-level agreement, which is reviewed by the portfolio manager. This document builds on the project plan and defines project objectives, scope, schedule, deliverables, measures of success, and resources.
- **Execute projects.** The project team carries out the research in accordance with the project-level or portfolio-level agreement.
- **Document results and recommendations.** The project team documents all findings and products completed during the research. Depending on the stage, findings could be a refined concept of operations, preliminary requirements, the identification of alternative solutions, the analysis of multiple alternatives, the feasibility and scalability of a single alternative, or the demonstration of a proposed concept. The project team also recommends what should happen next based on the findings. Depending on which stage the concept is in, recommendations could consist of: continue working on the concept, the concept is mature, or terminate further consideration of the concept.
- **Evaluate progress.** Individual projects are evaluated periodically and project results are used to develop documentation for service analysis and concept and requirements

definition. Often, completion of multiple projects through many cycles will be required to mature a concept from exploration to evaluation. When a concept is deemed mature, the initiative may continue in service analysis or progress to concept and requirements definition as described in section 2.4.

#### 2.2.2.2 Outputs and Products Revised 4/2013

- Project plans and project level or portfolio level agreements
- Project research results and recommendations
- Information that validates new ideas and concepts strategically, operationally, technically, and financially for inclusion in the NAS ConOps

#### 2.2.2.3 Who Does It? Revised 4/2013

| Organization | Responsibilities |
|---|---|
| NextGen organization | Develops and maintains the NAS architecture;<br>Coordinates annual development of the NextGen Implementation Plan;<br>Manages the NextGen planning and budget process;<br>Defines project plan selection, management, and evaluation criteria for CMTD activities in coordination with project sponsors and stakeholders;<br>Assesses progress of research activities toward achievement of documented project plans and ensures documentation of results and recommendations;<br>Facilitates coordination with trade associations, international organizations, and other state and federal government organizations for agency-level research and concept development initiatives; and<br>Functions as the CMTD portfolio manager. |
| Service organizations | Identify service gaps and prepare research proposals for activities to identify and evaluate alternative solutions to eliminate service gaps;<br>Prepare budget formulation documentation for CMTD activities for which the organization serves as the performing organization;<br>Execute projects as documented in project-level agreements and project plans;<br>Document project results; and<br>Plan and obtain support for operational prototypes as specified in the Integrated Logistics Support Process Manual. This may include training, manuals, spare parts, repair, and support services, as well as decisions related to removing prototypes and restoring sites when activity is complete. |

#### 2.2.2.4 Who Approves? Revised 4/2013

| Artifact | Approval Authority |
|---|---|
| CMTD activities as part of the F&E budget | Joint Resources Council |
| Project-level agreements or portfolio-level agreements | NextGen organization or service organization portfolio manager |

## 2.3 Service Analysis and Strategic Planning Revised 4/2013

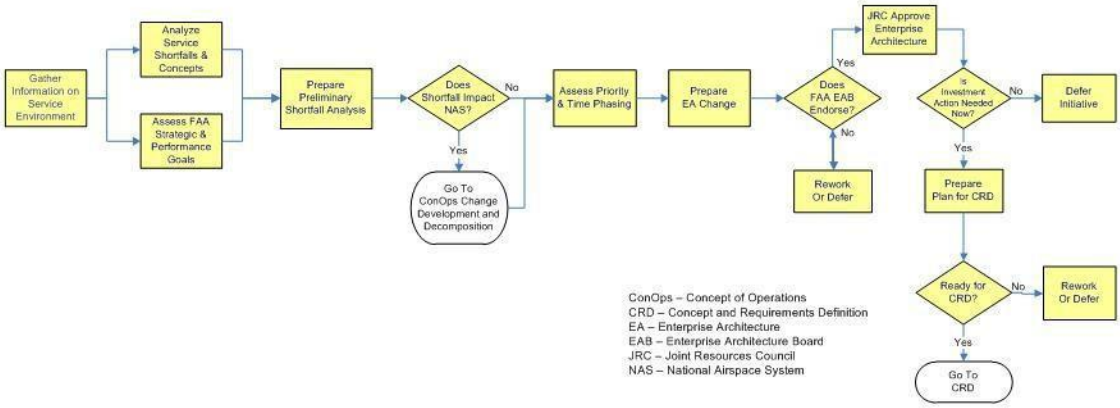
Service analysis and strategic planning determines what capabilities must be in place now and in the future to meet agency goals and the service needs of customers. Results are captured in the "as is" and "to be" states of the enterprise architecture, as well as the roadmaps for moving from the current to the future state. Results are also captured in line-of-business business plans and service organization operating plans, which specify how each will manage its RE&D, F&E, and OPS resources over time. These plans integrate new investment initiatives with the operation and support of fielded assets and other necessary actions to optimize service delivery. Continuing analysis keeps planning current with changes in the service and operational environment.

Industry best practices (e.g., technology and service demand forecasting, portfolio management, customer surveys) are employed during service analysis to align service outcomes with actions and activities necessary and sufficient to realize benefits for the FAA and its customers. Service analysis may lead to the refocus, reduction, or elimination of ongoing investment programs, and may identify new and more productive ways of doing business. It may also identify alternative paths for achieving service goals in a dynamic environment, and may identify opportunities for improving FAA strategic planning when the service environment evolves in ways not anticipated. Some investment opportunities may require research and development to demonstrate operational concepts, reduce risk, or define requirements before proceeding further in the lifecycle management process.

### 2.3.1 What Must Be Done Revised 10/2015

Figure 2.3-1-1 portrays the key activities of service analysis and strategic planning. These activities develop the information necessary for determining which service shortfalls or new ideas for improving service delivery are approved for inclusion in agency strategic planning documents. When a service shortfall impacts the National Airspace System, it enters the NAS ConOps change development and decomposition process (see Figure 2.3.1-2) to determine how it fits within the National Airspace System.

***Figure 2.3-1-1 Key Activities of Service Analysis and Strategic Planning***



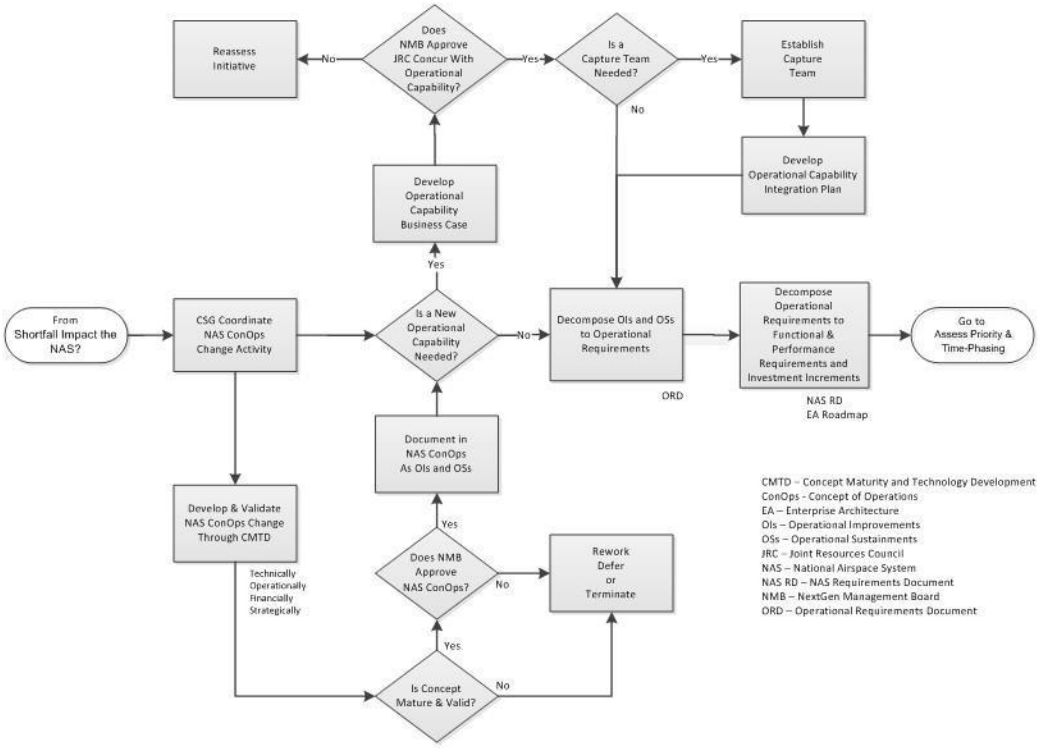

- **Gather Information on the Service Environment.** Service organizations analyze forecasts for aviation service needs and stay abreast of opportunities for improving service delivery as a basis for determining and prioritizing service needs and shortfalls. A continuing dialog with and feedback from customers (e.g., commercial air carriers, general aviation, air transport industry, state and local airport authorities) and users (air traffic and technical operations) are crucial, as is the supportability and operational outlook for fielded assets.
- **Analyze Service Shortfalls and Concepts.** Lines of business use service environment performance information to identify shortfalls and ideas for improving service delivery within their domain. Aviation research by NASA and other industry and government organizations may also identify emerging service shortfalls or technological opportunities for improving service delivery. This activity identifies business, technology, organizational, process, and personnel issues that affect service outcomes, as well as assumptions, risks, and dependencies.
- **Assess FAA Strategic and Performance Goals.** Service shortfalls or new ideas for improving service delivery should support current services or fulfillment of FAA strategic and performance goals. When they do not, the shortfall or new idea must be shown to have sufficient merit to warrant inclusion in agency strategic planning documents. Agency strategic plans and performance goals may also define service shortfalls that must be addressed in lower-level agency planning.
- **Prepare Preliminary Shortfall Analysis.** The service organization analyzes the shortfall or new idea as a foundation for understanding the problem and its urgency and impact. The shortfall is the difference between future service need and current capability. A service shortfall is usually addressed by a sustainment action for existing assets or a new service delivery idea including cloud services for predicted gaps. A new idea or concept should deliver existing services more efficiently or provide new services of value to the FAA and aviation industry. At this stage, the service shortfall is expressed as levels of service improvement, not by specific performance values.
- **Does Shortfall Impact the National Airspace System?** A new service need or shortfall that impacts the National Airspace System is assessed by means of the NAS ConOps Change Development and Decomposition Process (see Figure 2.3.1-2) to determine whether or how the NAS ConOps should be changed. Once NAS needs or shortfalls have been appropriately included in the NAS ConOps as operational improvements or sustainments, they move forward with non-NAS shortfalls to determine how they should be integrated within the FAA enterprise architecture.
- **Assess Priority and Time-phasing.** A new service shortfall or need must be shown to

have sufficient merit to warrant inclusion in the enterprise architecture when evaluated against other service needs of the agency. The line of business works with the Technical Review Board (NAS) or the Architecture Review Board (non-NAS) and other lines of business to determine how a new service need, technology refresh, or sustainment activity should be planned, time-phased, and integrated within the architecture relative to all other agency service needs. This activity may require rework of existing shortfalls and improvements already in the architecture.

- **Prepare Enterprise Architecture Change.** The service organization prepares change documents reflecting the service need or shortfall and submits them to the FAA Enterprise Architecture Board for endorsement. NAS service needs and shortfalls are expressed as operational improvements and operational sustainments.
- **Does FAA Enterprise Architecture Board Endorse the Change?** The FAA Enterprise Architecture Board determines whether and how to integrate new service needs within the enterprise architecture and its roadmaps. In making this determination, the board analyzes and assesses the new service need against all other service needs of the FAA using such criteria as contribution to agency strategic goals, monetary or performance benefits, compatibility with the enterprise architecture, risk, and political sensitivity. The decision to endorse and place a new service need, improvement, or sustainment within the enterprise architecture validates that this service need is an agency priority and warrants further action.
- **Joint Resources Council Approves the Enterprise Architecture.** The Joint Resources Council approves the FAA Enterprise Architecture annually. No service need can proceed further in the AMS lifecycle management process unless it is in the enterprise architecture approved by the JRC. Emergency needs not contained in the JRC-approved architecture may be presented to the FAA Enterprise Architecture Board by exception.
- **Rework or Defer.** Service needs, shortfalls, improvements, and sustainments not approved for inclusion in the enterprise architecture are reworked or deferred according to the direction of the FAA Enterprise Architecture Board or Joint Resources Council, as appropriate.
- **Is Investment Action Needed Now?** The investment increment enters concept and requirements definition at the appropriate time as determined by its time-phasing in the appropriate enterprise architecture roadmap.
- **Defer Initiative.** Investment action is deferred when action is not needed now to meet agency plans and schedules.
- **Prepare Plan for Concept and Requirements Definition.** NAS Systems Engineering Services (NAS) or Office of Information & Technology, Strategy & Performance Service, EA Division (non-NAS) works with the implementing and operating service organizations to prepare a plan for concept and requirements definition. This plan (1) specifies how tasks will be accomplished; (2) defines roles and responsibilities of participating organizations; (3) defines outputs and exit criteria; (4) establishes a schedule for completion; and (5) specifies needed resources. By signing the plan for concept and requirements definition, organizations that will do the work agree to provide the necessary resources.
- **Ready for Concept and Requirements Definition?** The FAA Enterprise Architecture Board makes the decision to enter concept and requirements definition or directs other action.
- **Rework or Defer.** The investment initiative is reworked or deferred when planning or organizational support is not sufficient to enter concept and requirements definition.

***Figure 2.3.1-2 NAS ConOps Change Development and Decomposition Process***

*(Applies to the NAS only)*




- **Concept Steering Group Coordinates NAS ConOps Change Activity.** The Concept Steering Group reviews the preliminary shortfall analysis to determine whether the service shortfall or new idea is addressed in the NAS ConOps. New shortfalls or ideas that are already within the scope of the NAS ConOps move to decomposition into operational requirements and investment initiatives after determining whether they should be incorporated into a new or existing operational capability. For shortfalls and ideas not addressed in the NAS ConOps, the Concept Steering Group coordinates discussion with the sponsor and the lines of business to determine what development or validation activity is needed.
- **Develop and Validate NAS ConOps Change Through Concept Maturity and Technology Development.** New ideas for improving NAS service or eliminating a shortfall must be validated to be technically and financially feasible, strategically aligned with agency goals and objectives, and have significant operational benefit to warrant inclusion in the NAS ConOps. The Concept Steering Group coordinates activity to develop and validate new ideas and concepts. Typically, the concept maturity and technology development process is applied to the point where technical risk is sufficiently low and potential benefits sufficiently high to justify inclusion. This activity includes safety and security assessments to identify and characterize any safety hazards and information security factors associated with the idea or concept.
- **Is Concept Mature and Valid?** The NAS ConOps is a stable document that evolves over time. Only the best high-value new concepts and ideas are added. The Concept Steering Group assesses development and validation results and records their findings

and recommendations in a memorandum to the NextGen Management Board, which approves all changes to the NAS ConOps.

- **Does NextGen Management Board Approve NAS CONOPS?** The NextGen Management Board approves changes to the NAS ConOps. Changes are presented to the Joint Resources Council. Any JRC concerns or issues are resolved to ensure approved concepts are beneficial *and* affordable and supported by both management bodies.
- **Document Changes in NAS ConOps as Operational Improvements or Sustainments.** Service shortfalls and new concepts are documented in the NAS ConOps as operational improvements and operational sustainments.
- **Is a New Operational Capability Needed?** Grouping and managing operational improvements and sustainments with a high degree of interdependency may result in a high-value operational capability for the agency and aviation community. In such cases, one or more operational improvements will be organized and managed as a portfolio to ensure all essential elements of the operational capability are obtained and deployed.
- **Develop Operational Capability Business Case.** Advanced Concepts and Technology Development works with the ATO Program Management Office and Investment Planning & Analysis to develop a business case for the operational capability. The business case contains a rough estimate of the costs and benefits associated with developing and deploying the operational sustainments and improvements necessary to enable the operational capability. The PMO coordinates with ATO service organizations to derive rough cost estimates for the work required to develop and deploy the investment increments necessary to achieve the operational capability. These same organizations derive a rough monetized estimate of benefits that will accrue to the FAA and aviation community when the operational capability is fully deployed. A preliminary assessment of risk, priority, affordability, and political sensitivity complete the business case.
- **Does NMB Approve and JRC Concur With the Operational Capability?** The NextGen Management Board decides whether to approve and establish the operational capability. The decision is based on the business case, contribution to agency strategic and performance goals, and affordability. The operational capability is implemented through its constituent investment increments approved and baselined individually by the Joint Resources Council. Obtaining these capabilities may require establishment of a capture team to integrate and coordinate activity by multiple program offices or service organizations providing the investment increments necessary to achieve the overall operational capability. By concurring with the NextGen Management Board decision, the Joint Resources Council acknowledges the operational capability and its constituent investment increments are agency priorities. The business case for the operational capability is a determining factor at future investment decisions for increments necessary to achieve the operational capability.
- **Reassess Initiative.** If the NextGen Management Board does not approve the operational capability, it may terminate the effort or recommend other activity to amend the concept or reduce risk. Any issues or concerns of the Joint Resources Council must be resolved before the operational capability is implemented.
- **Is a Capture Team Needed?** The NextGen Management Board decides whether to establish a capture team to coordinate the development, integration, and deployment of investment increments necessary to achieve an operational capability. In making this decision, the board evaluates the complexity and risk associated with the operational capability and the availability of resources. The capture team brings together cross-agency empowered representatives from each organization that must develop and deploy

an investment increment to achieve the operational capability. The objective is informed, integrated, and coordinated decision-making by all parties.

- **Establish Capture Team.** Each line of business that must contribute to achieve the operational capability provides an empowered representative to the capture team. The capture team monitors development, integration, and deployment of all elements of the operational capability, as well as plan and oversee a post-implementation evaluation to confirm that forecast benefits are being achieved or to define and implement corrective action when they are not.
- **Develop Operational Capability Integration Plan.** The team works with the portfolio manager to develop an Operational Capability Integration Plan (OCIP) that specifies responsibilities and agreements among all team members and organizations. The OCIP also defines the lifecycle plan, performance goals and measures, and operational benefits that will accrue from implementation of the operational capability.
- **Decompose Operational Improvements and Operational Sustainments to Operational Requirements.** A cross-organizational team with members from all lines of business and led by Advanced Concepts and Technology Development decomposes the NAS ConOps narrative of operational improvements and operational sustainments into NAS operational requirements. These requirements are recorded in the NAS Operational Requirements Document.
- **Decompose Operational Requirements to Functional and Performance Requirements and Investment Increments.** A cross-organizational team decomposes NAS operational requirements to NAS functional and performance requirements. These requirements are specified with sufficient detail for allocation to investment increments that will be undertaken to achieve the operational improvements and sustainments in the NAS ConOps. The goal is clear and unambiguous traceability of requirements from the NAS ConOps to the NAS Operational Requirements Document to the NAS Requirements Document and then to the program requirements document of specific investment increments. Each investment increment enters concept and requirements definition at the appropriate time as determined by their time-phasing in the enterprise architecture roadmap.

### 2.3.2 Outputs and Products Revised 4/2013

#### 2.3.2.1 Service Analysis and Strategic Planning Revised 4/2013

- Preliminary shortfall analysis that describes qualitatively the service need, shortfall, and legacy assets;
- Enterprise architecture change notices, products, and amendments;
- Updates to the enterprise architecture; and
- Plan for concept and requirements definition.

Key work products are verified and validated according to the FAA AMS Verification and Validation Guidelines before the CRD readiness decision.

#### 2.3.2.2 NAS ConOps Change Development and Decomposition Revised 4/2013

- White papers, research reports, and outputs from concept maturity and technology

development;
- Updates to the NAS ConOps;
- Operational capability business case;
- Operational capability;
- Capture team;
- Operational Capability Integration Plan;
- Updates to the NAS Operational Requirements Document; and
- Updates to the NAS Requirements Document.

Key work products are verified and validated according to the FAA AMS Verification and Validation Guidelines before the CRD readiness decision.

### 2.3.3 Who Does It? Revised 4/2013

#### 2.3.3.1 Service Analysis and Strategic Planning Revised 1/2015

| Organization(s) | Responsibilities |
|---|---|
| Service organizations | Conduct service analysis<br>Prepare preliminary shortfall analysis reports<br>Prepare EA change notices, products, and amendments |
| Advanced Concepts and Technology Development Office (ANG-C), NextGen Lifecycle Integration Office (ANG-D) | Assists NAS service organizations when preparing service analysis outputs and products |
| Office of Information & Technology, Strategy & Performance Service, EA Division (non-NAS) | Assists non-NAS service organizations when preparing service analysis outputs and products |
| Lines of Business | Prioritize LOB service shortfalls and new ideas<br>Determine whether a service shortfall impacts the National Airspace System<br>Work with the Technical Review Board to time-phase operational improvements and operational sustainments in the NAS architecture roadmaps |
| Technical Review Board | Works with the lines of business to time-phase operational improvements and operational sustainments in the NAS architecture roadmap |
| Architecture Review Board | Works with the lines of business to prioritize non-NAS service shortfalls and needs |
| FAA Enterprise Architecture Board | Manages the FAA Enterprise Architecture |

#### 2.3.3.2 NAS ConOps Change Development and Decomposition Revised 4/2013

| Organization(s) | Responsibilities |
|---|---|
| Service organization with shortfall/concept, Advanced Concepts and Technology Development Office (ANG-C), NextGen Lifecycle Integration Office (ANG-D) | Develop information needed to assess impact of shortfall/concept on the NAS ConOps |
| Service organization with shortfall/concept, Advanced Concepts and Technology Development Office (ANG-C), Investment Analysis and Planning (IP&A) | Develop and validate shortfalls and new concepts technically, operationally, strategically, and financially |
| Advanced Concepts and Technology Development Office (ANG-C), CSG, service organization with shortfall/concept | Present shortfall/concept to the NextGen Management Board for inclusion in the NAS ConOps |
| NAS Systems Engineering Services Office (ANG-B), Advanced Concepts and Technology Development Office (ANG-C), NextGen Lifecycle Integration Office (ANG-D) | Document shortfall as operational improvements or sustainments in the NAS ConOps |
| ANG-B/C/D, PMO/LOB | Determine need for new operational capability |
| ANG-C, ANG-5, PMO/LOB, IP&A | Develop operational capability business case<br>IP&A reviews the business case for the Joint Resources Council |
| ANG-C, ANG-5, PMO/LOB | Contribute to and participate in the decision to create a new operational capability |
| ANG-C/D, PMO/LOB | Determine the need for a capture team to plan and oversee a new operational capability |
| ANG-C/D, PMO/LOB, operating organization | Contribute to and establish a capture team |
| ANG-C, AJV-7, LOBs, service organizations | Decompose operational improvements and sustainments in the NAS ConOps into operational requirements and investment increments |
| ANG-B/C/D, operating organization, capture team (if applicable) | Decompose NAS operational requirements into NAS functional and performance requirements |

### 2.3.4 Who Approves? Revised 4/2013

#### 2.3.4.1 Service Analysis and Strategic Planning Revised 4/2013

| Artifact | Approval Authority |
|---|---|
| Preliminary shortfall analysis | NextGen Lifecycle Integration Office, Director of the service organization with the need |
| Enterprise architecture products and amendments | FAA Enterprise Architecture Board |
| Plan for concept and requirements definition | Vice Presidents (ATO) or Directors (non-ATO) of the service organization with the service need and the operating service organization and the FAA Enterprise Architecture Board chairperson |
| FAA Enterprise Architecture | Joint Resources Council |

#### 2.3.4.2 NAS ConOps Change Development and Decomposition Revised 4/2013

| Artifact | Approval Authority |
|---|---|
| NAS ConOps | NextGen Management Board |
| Operational Capability Business Case | NextGen Systems Analysis and Modeling (ANG-5) |
| Operational capability | NextGen Management Board (JRC concurs) |
| Capture team | NextGen Management Board |
| Operational Capability Integration Plan | NextGen Management Board |
| NAS Operational Requirements Document | ATO Operational Concepts, Validation & Requirements (AJV-7) |
| NAS Requirements Document | NAS Systems Engineering Service (ANG-B) |

### 2.3.5 Concept and Requirements Definition Readiness Decision Revised 4/2013

The concept and requirements definition readiness decision occurs when an enterprise architecture roadmap indicates action must be taken to address a critical service shortfall or opportunity. At this decision, the FAA Enterprise Architecture Board verifies: (1) the service shortfall, operational improvement, or operational sustainment is in an enterprise architecture roadmap; and (2) planning and resources for concept and requirements definition are in place. The readiness decision is the gateway between service analysis and strategic planning and concept and requirements definition.

#### 2.3.5.1 Entrance Criteria Revised 4/2013

The following are required for the concept and requirements definition readiness decision:

- Service shortfall, operational improvement, or sustainment is in an enterprise architecture roadmap and represents a compelling need of the FAA; and the
- Plan for concept and requirements definition is approved by the FAA Enterprise Architecture Board.

### 2.3.5.2 Decision Actions Revised 4/2013

The FAA Enterprise Architecture Board makes the decision to enter concept and requirements definition.

## 2.4 Concept and Requirements Definition Revised 10/2015

All investment opportunities that require funding outside the scope of an approved acquisition program baseline undergo concept and requirements definition. This includes upgrades or replacements to existing capability without approved investment funding.

Concept and requirements definition translates priority operational needs in the enterprise architecture into preliminary requirements and a solution concept of operations for the capability needed to improve service delivery. It also quantifies the service shortfall in sufficient detail for the definition of realistic preliminary requirements and the estimation of potential costs and benefits. Finally, concept and requirements definition identifies the most promising alternative solutions able to satisfy the service need, one of which must be consistent with the conceptual framework in the enterprise architecture.

Planning for concept and requirements definition begins when a roadmap in the enterprise architecture specifies action must be taken to address a priority service or infrastructure need. These needs typically relate to existing or emerging shortfalls in the “as is” architecture or essential building blocks of the “to be” architecture. Should a service organization wish to pursue an investment opportunity not in an enterprise architecture roadmap, it must first develop architectural change products and amendments and get endorsement from the FAA Enterprise Architecture Board and approval by the Joint Resources Council.

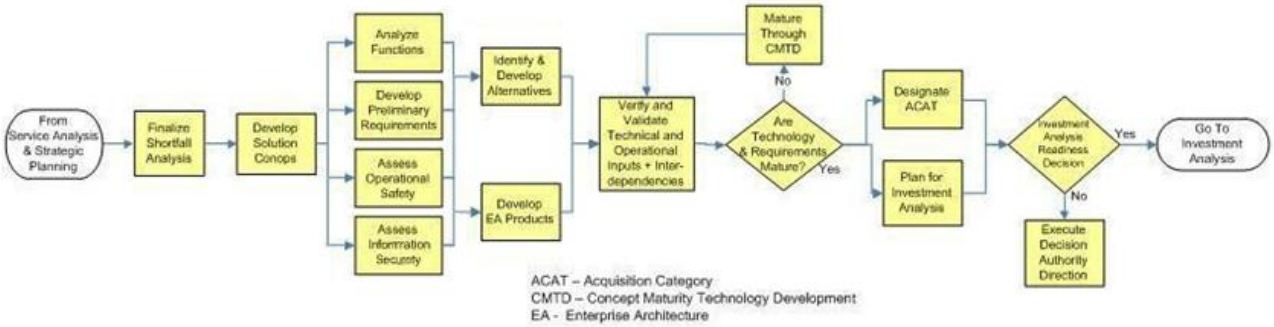
The FAA may undertake research activity or employ research by other agencies or industry to define the operational concept, develop preliminary requirements, demonstrate and refine computer-human interfaces, reduce risk, or achieve customer buy-in to potential solutions to service need.

When the investment initiative entering concept and requirements definition is an element of an operational capability (NAS only), the capture team responsible for achieving the operational capability (if established) participates in and contributes to CRD activity. The capture team is populated with representatives from each service team or program office that will provide an increment of the overall operational capability. These team members ensure all preliminary alternatives emerging from concept and requirements definition for each investment increment fit within the strategy for obtaining the capability and can provide the necessary performance and functionality.

A nonmateriel solution that emerges during concept and requirements definition may proceed to solution implementation upon approval of implementation and resource planning, provided it satisfies the need, can be achieved within approved budgets, and is acceptable to users and customers. This determination is made by the Vice President or Director of the service organization with the service need with the concurrence of the FAA Enterprise Architecture Board.

The key activities of concept and requirements definition are shown in Figure 2.4-1. They apply to all investment initiatives seeking investment funding, whether a stand-alone investment initiative or an element of a complex operational capability.

***Figure 2.4-1 Key Activities of Concept and Requirements Definition***




### 2.4.1 What Must Be Done Revised 10/2015

NOTE: The plan for concept and requirements definition must be approved by the Vice Presidents (ATO) or Directors (non-ATO) of the service organization with the service need and the operating service organization and by the FAA Enterprise Architecture Board chairperson before the start of any CRD activity (see AMS Section 2.3.1). Roadmap planning in the enterprise architecture specifies when concept and requirements definition activity must begin.

- **Finalize Shortfall Analysis.** The service organization or program office updates, refines, and quantifies the preliminary shortfall identified during service analysis in sufficient detail to serve as the basis for (1) clearly understanding the nature, urgency, and impact of the service need; (2) defining preliminary requirements; (3) determining realistic and economic alternative solutions; and (4) quantifying likely program costs and benefits.
- **Develop Solution Concept of Operations.** The solution concept of operations describes how users will employ the new capability within the operational environment and how it will satisfy service need. The solution ConOps defines the roles and responsibilities of key participants (e.g., controllers, maintenance technicians, pilots); explains operational issues that system engineers must understand when developing requirements; identifies procedural issues that may lead to operational change; and establishes a basis for identifying alternative solutions and estimating their likely costs and benefits. More than one solution concept of operations may be required if proposed alternative solutions differ significantly from each other.
- **Analyze Functions.** The service organization or program office translates stakeholder

needs in the shortfall analysis, solution concept of operations, and NAS Requirements Document (NAS only) into high-level functions that must be obtained to achieve the desired service outcome. These are then decomposed into sequentially lower level functions. For NAS investment initiatives, this decomposition may have been done during service analysis when operational improvements and sustainments in the NAS ConOps were decomposed into functional and performance requirements and investment increments.

- **Perform Preliminary Information System Security (ISS) Assessment.** Service organizations assess the investment initiative to determine: (1) ISS risk factors for input to the ACAT determination, (2) ISS requirements for the preliminary program requirements document, (3) a rough ISS cost estimate for each alternative solution, and (4) a rough estimate of annual operational benefits gained from implementing security requirements.
- **Develop Preliminary Requirements.** The service organization prepares preliminary requirements in consultation with the NAS Systems Engineering Services organization (NAS) or the Office of Information & Technology, Strategy & Performance Service, EA Division (non-NAS). Preliminary requirements specify only function and performance, and do not define a solution. They must be expressed such that the degree to which different solutions satisfy them can be measured and evaluated. Research and analysis or even prototyping during service analysis may be necessary to define preliminary requirements adequately. When the investment increment is an element of an operational capability, preliminary program requirements must be derived from and traceable to operational capability requirements, when applicable.
- **Identify and Develop Alternatives.** The service organization or program office surveys the marketplace to identify feasible and economic solutions. Both material and non- material alternatives are evaluated. One candidate solution must be the hypothesized "best" alternative in the enterprise architecture. Key factors are safety, security, operational cost efficiencies, technological maturity, and impact on the workforce and enterprise architecture. Alternatives should be qualitatively different from each other. Low risk, cost-effective, and operationally suitable commercial or non-developmental solutions are preferred. Alternatives may not meet 100 percent of preliminary requirements. Rough lifecycle costs are developed for each alternative and compared to the monetized shortfall as a basis for determining whether it should be retained or eliminated from consideration. Rough lifecycle costs are also calculated for sustaining the legacy case in service. When a new capability involves information processing and storage, use of cloud computing is considered and results of the cloud suitability assessment are documented.
- **Assess Operational Safety.** The service organization works with ATO Safety and Technical Training to assess operational safety of the proposed initiative. This assessment identifies, assesses, and documents operational hazards and risks associated with alternative solutions. No alternative is pursued whose operational risk cannot be mitigated to an acceptable level at affordable cost.
- **Develop Enterprise Architecture Products.** The service organization engages with the appropriate architecture organization to develop required products and amendments. These include the operational (business rule) and systems (engineering) view families.
- **Verify and Validate Technical and Operational Inputs and Interdependencies.** Key technical and operational work products are verified and validated to be complete and mature as the basis for proceeding to the investment analysis readiness decision. This

includes the solution ConOps, preliminary requirements document, safety and security risk assessments, architecture products, and interdependencies with other investment increments.

- **Are Technology and Requirements Mature?** NAS Systems Engineering Services (NAS) or Office of Information & Technology, Strategy & Performance Service, EA Division (non-NAS) evaluates preliminary requirements and the technology base of alternative solutions to ensure they are sufficiently mature for further progression in the AMS lifecycle management process. The objective is to have only low-risk investment initiatives entering investment analysis and solution implementation. Additional research and development may be prescribed when technological risk is too high or when requirements are not mature or the investment initiative may be deferred or terminated.
- **Mature Through Concept Maturity and Technology Development (NAS only).** The Technical Review Board recommends further development for NAS initiatives when technological risk is too great or requirements are not sufficiently known. Prescribed activity may take the form of simulation, analysis, operational prototyping, or field demonstration in a controlled operational environment. See the Guidelines for Concept Maturity and Technology Development for more information.
- **Designate Acquisition Category.** The service team or program office prepares an acquisition category determination request based on preliminary financial data, as well as subjective assessments of complexity, risk, political sensitivity, safety, and security. The request is vetted through NAS Systems Engineering Services (NAS) or Office of Information & Technology, Strategy & Performance Service, EA Division (non-NAS) and submitted to the Acquisition Executive Board for a designation.
- **Plan for Investment Analysis.** The plan for investment analysis: (1) defines scope and assumptions; (2) describes alternatives and their associated rough lifecycle costs; (3) describes planned activities and specifies how tasks will be accomplished; (4) defines output and exit criteria; (5) establishes a schedule for completion; (6) defines roles and responsibilities of participating organizations; and (7) estimates resources needed to complete the work. By signing the plan for investment analysis, the organizations that will conduct the analysis agree to provide the resources necessary to complete the work. This activity includes development of the investment analysis readiness decision package and pre-briefings to decision-makers.

### 2.4.2 Outputs and Products Added 4/2013

- Solution concept of operations;
- Preliminary program requirements document;
- Architecture products and amendments;
- Realistic alternatives with rough cost estimates;
- Detailed shortfall and functional analyses;
- Safety risk assessment;
- Shortfall analysis report;
- Acquisition category designation request; and
- Investment analysis plan.

Key work products are verified and validated according to the FAA AMS Verification and Validation Guidelines before the investment analysis readiness decision.

### 2.4.3 Who Does it? Added 1/2015

| Organization(s) | Responsibilities |
|---|---|
| Implementing service organization | Leads and completes all activities and outputs of concept and requirements definition unless otherwise specified in the plan for CRD<br>Prepares the acquisition category designation request |
| NAS Systems Engineering Services Office (ANG-B), Office of Information & Technology, Strategy & Performance Service, EA Division (non-NAS) | Provides engineering services in such areas as specialty engineering, safety and security analysis, and architecture products<br>Validates technical and operational products of CRD<br>Assesses maturity of solution technology and requirements |
| NAS Lifecycle Integration Office (ANG-D), Program Management Office, lines of business, operating service organization, Office of Information & Technology, Strategy & Performance Service, EA Division (non-NAS) | Assists the implementing service organization in completing CRD activities<br>Maintains guidance and acquisition aids for service analysis and concept and requirements definition |
| Capture team (NAS only) | • Monitors and oversees CRD activity when the investment initiative is an element of an operational capability<br>• Ensures alternatives can provide the performance and functionality necessary to achieve the overall operational capability |

Detailed roles and responsibilities of participating organizations for each CRD activity and output or product are found in the Service Analysis and Concept and Requirements Definition Guidelines.

### 2.4.4 Who Approves? Added 4/2013

| Artifact | Approval Authority |
|---|---|
| Acquisition category | Acquisition Executive Board approves, JRC concurs |
| CRD outputs and products | Approval authorities are found in the Service Analysis and Concept and Requirements Definition Guidelines. |

### 2.4.5 Investment Analysis Readiness Decision Added 4/2013

The investment analysis readiness decision determines whether the solution ConOps, preliminary requirements, architecture products and amendments, and preliminary alternatives are sufficiently mature to warrant entry into investment analysis. The decision is made within context of all ongoing and planned investment activities to sustain and improve service delivery. It ensures proposals for new investment are consistent with overall corporate needs and planning.

#### 2.4.5.1 Entrance Criteria Added 4/2013

The following are required for the investment analysis readiness decision:

- Preliminary program requirements document;
- Realistic alternative solutions;
- Architecture products and amendments;
- Approved shortfall analysis report;
- Signed plan for investment analysis.

The full list of work products that may be required for the investment analysis readiness decision is found on the JRC Secretariat website.

#### 2.4.5.2 Joint Resources Council Actions Added 4/2013

The Joint Resources Council makes the decision to enter investment analysis.

### 2.5 Investment Analysis Revised 4/2013

Investment analysis is a disciplined process that supports sound capital investment decisions. Investment analysis is conducted in the context of the enterprise architecture and FAA strategic goals and objectives. Such plans serve as guides to prioritize current and future investment analyses. Investment analyses, in turn, help to refine and mature those plans by providing decision-makers with a clear picture of investment opportunities and their risks and value.

NAS and non-NAS roadmaps in the enterprise architecture establish when an operational capability or service need must be in place. This, in turn, determines when investment analysis should be complete to allow sufficient time to acquire and deploy a suitable solution. The key is to balance timeliness, complexity, and size of the investment analysis with the rigorous development of quantitative data needed by the Joint Resources Council to make an informed investment decision.

Affordability and accurate cost and schedule estimates are important factors in the decision to approve a new investment program. The results of investment analysis help the Joint Resources Council determine which potential investments will improve operations across the air transportation system and by how much. The outcome of investment analysis can be used to make individual, portfolio, and prioritization decisions.

When the investment initiative is an element of an operational capability (NAS only), the capture

team for the capability (if established) participates in and contributes to investment analysis activity. The capture team is populated with representatives from each service team or program office that will provide an increment of the overall operational capability. They ensure the alternative emerging from initial investment analysis for each increment fits within the strategy for obtaining the operational capability and can provide the necessary performance and functionality.

A nonmateriel solution that emerges during investment analysis may proceed to solution implementation upon approval of solution requirements and implementation and resource planning, if it meets the following criteria:

- Satisfies the need;
- Can be achieved within approved budgets; and is
- Operationally acceptable to the user.

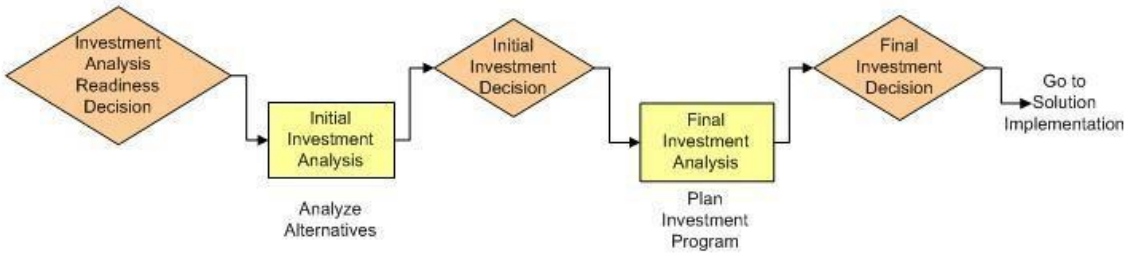
This determination is made by the Vice President or Director of the service organization with the service need with the concurrence of the FAA Enterprise Architecture Board.

All proposed investments must answer the same basic questions:

- What is the problem that needs to be addressed or resolved?
- What is the range of alternatives that could address this problem?
- What are the costs, benefits, and risks associated with each alternative?
- Based on the above, what is the recommended course of action?

Figure 2.5-1 illustrates the phases and decision points of investment analysis. Initial investment analysis evaluates alternative solutions to service needs, and recommends the most promising for further development. Final investment analysis develops detailed cost and benefits estimates, detailed plans, and final requirements for the most promising alternative.

***Figure 2.5-1 Phases and Decision Points of Investment Analysis***




The level of activity required during investment analysis is based on the acquisition category assigned to the investment opportunity. In general, the larger and more complex an investment, the greater the level of effort required during investment analysis.

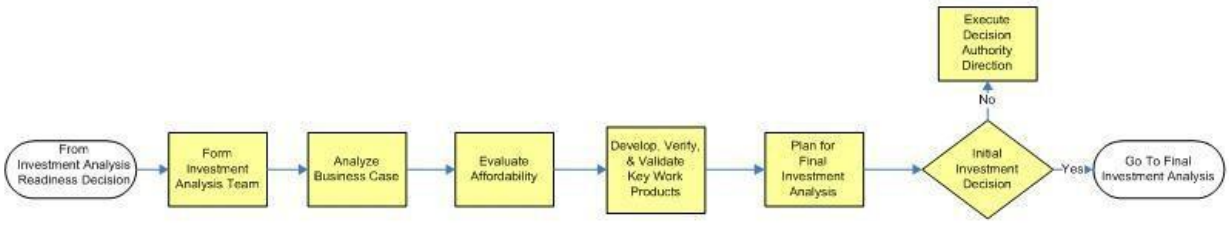
Very complex investment programs are structured into manageable, lower-risk segments and approved incrementally by the Joint Resources Council. When sequential segments are required to fully implement an investment opportunity, the service organization conducts final investment

analysis for each segment and brings planning and baseline documents to Joint Resources Council for approval.

### 2.5.1 What Must Be Done Revised 7/2015

Figure 2.5.1-1 defines the key activities that must be completed during initial investment analysis. The Investment Analysis Process Guidelines on FAST describe the full range of activities that may be required.

**Figure 2.5.1-1 Key Activities of Initial Investment Analysis**

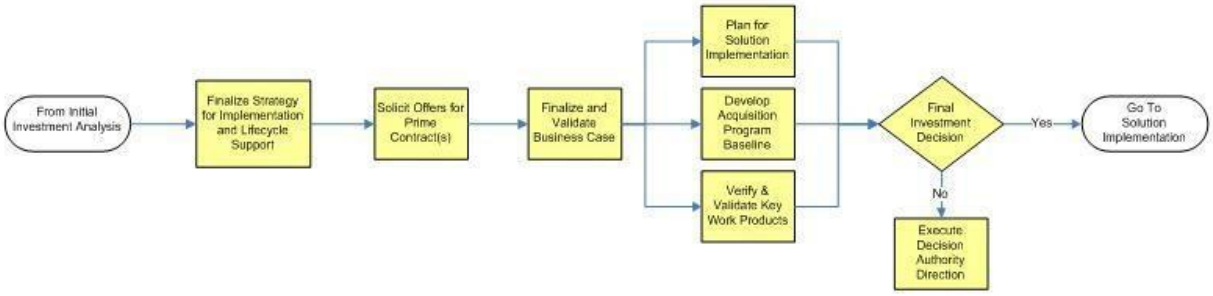



- **Form Investment Analysis Team.** An investment analysis team is formed and scaled to the size and complexity of the analysis. Team membership is flexible depending on the needs of the analysis, but typically includes system, technical, logistics, specialty engineering, testing, and operational subject-matter experts, and business case analysts. Security and regulatory specialists are team members when potential solutions involve facility, asset, personnel, or information security; hazardous materials; emergency operations; or when they impact aircraft, airspace, or the public.
- **Analyze Business Case.** The business case focuses on those key factors that demonstrate value and worth of a proposed investment initiative to the FAA and the aviation industry. This includes updating the preliminary requirements document to reflect any changes resulting from the investment analysis. For new investments (in accordance with the ACAT determination form), the test organization develops a preliminary test and evaluation master plan based upon the concepts and functions documented in the preliminary requirements document to support the initial investment decision. When the investment initiative is an increment necessary to achieve an operational capability, the impact on achieving the capability is also a key factor of the business case. See the Business Case Analysis Guidance for more details.
- **Evaluate Affordability.** FAA Finance assesses the budget impact and relative contribution to agency goals of each alternative against other ongoing and proposed investment programs in the FAA financial baseline. The impact assessment may shape subsequent deliberations of the investment analysis team.
- **Develop, Verify, and Validate Key Work Products.** Validation of the business case is described in the Business Case Evaluation and Assessment Guide. Verification and validation for all other documentation is described in the FAA AMS Lifecycle Verification and Validation Guidelines. The full list of work products that may be required for the initial investment decision is found on the JRC Secretariat website.
- **Plan for Final Investment Analysis.** The plan for final investment analysis defines work activities, resources, schedules, roles and responsibilities, and products. It also specifies exit criteria and a planning date for the final investment decision. See Investment

Analysis Plan Guidance and Template for more details.

Figure 2.5.1-2 defines the key activities that must be completed during final investment analysis. The Investment Analysis Process Guidelines on FAST describe the full range of activities that may be required.

***Figure 2.5.1-2 Key Activities of Final Investment Analysis***




- **Finalize Strategy for Implementation and Lifecycle Support.** The implementing service organization or program office develops a detailed strategy for procuring, implementing, and supporting the solution over its service life with input from the investment analysis team. This strategy is the foundation for a request for offer to industry for procurement of the solution and all subsequent program planning. For new investments, in support of the final investment decision, the test organization develops an initial test and evaluation master plan (in accordance with the ACAT determination form) that is based on the final requirements document, describes the test program for the investment program, establishes the basis for test requirements in the request for offer to industry, and establishes test costs/schedules in the acquisition program baseline.
- **Solicit Offers For Prime Contract(s).** The implementing service organization or program office prepares an independent government cost estimate, releases a request for offers, and evaluates industry responses for completeness, technical suitability, and compliance with the statement of work. The most acceptable industry response forms the basis for the final business case and acquisition program baseline.
- **Finalize and Validate Business Case.** The business case and supporting documents are prepared according to the ACAT designation for the solution. These requirements are found in the appropriate business case template located on the investment analysis page in FAST. This includes preparation of the final requirements document.
- **Plan for Solution Implementation.** The investment analysis team develops realistic plans for solution implementation using the FAA standard work breakdown structure and a tailored in-service review checklist. Planning must cover all key aspects of obtaining the solution so costs are reflected in resource documents and the acquisition program baseline. The program implementation strategy is recorded in the implementation strategy and planning document. The program management plan specifies how the service organization or program office will execute the implementation strategy and defines the roles and responsibilities of key stakeholders.
- **Develop Acquisition Program Baseline.** The acquisition program baseline establishes the cost, schedule, and key performance baselines for the investment initiative. It is the agreement between the implementing service organization or program office and the Joint

Resources Council concerning the performance that will be obtained and the timeframe and resources agreed to by the agency. For some investment types (e.g., facilities, service contracts, variable quantities), an execution plan is developed in lieu of an acquisition program baseline.

- **Verify and Validate Key Work Products.** Investment Planning and Analysis validates the business case as described in Business Case Evaluation and Assessment Guide. Verification and validation for all other program work products is according to the FAA AMS Lifecycle Verification and Validation Guidelines. The full list of work products that may be required for the final investment decision is found on the JRC Secretariat website.

See detailed guidance for investment analysis. In all cases, organizations conducting investment analysis must apply the standard processes and guidelines located in the investment analysis section of FAST.

### 2.5.2 Outputs and Products Revised 1/2010

#### 2.5.2.1 Initial Investment Analysis Revised 4/2013

The principal output for initial investment analysis is information that enables the Joint Resources Council to select the best alternative that meets the required performance and offers the greatest value to the FAA and its customers. The following are required products:

- Updated program requirements document;
- Initial business case;
- Initial implementation strategy and planning documents for each alternative; and
- Plan for final investment analysis.

Key work products are verified and validated according to the FAA AMS Verification and Validation Guidelines before the initial investment decision.

#### 2.5.2.2 Final Investment Analysis Revised 1/2015

The principal output for final investment analysis is detailed planning for the alternative selected for implementation. The following are required products:

- Acquisition program baseline;
- Final program requirements document;
- Final business case;
- Final implementation strategy and planning document;
- Program management plan; and
- Updated architecture products and amendments.

Key work products are verified and validated according to the FAA AMS Verification and Validation Guidelines before the final investment decision.

### 2.5.3 Who Does It? Revised 7/2015

| Organization | Responsibilities |
|---|---|
| Investment analysis team | Performs the activities and prepares the outputs and products of investment analysis |
| Implementing service organization or program office | Typically leads the investment analysis team<br>Coordinates with stakeholders throughout investment analysis |
| Investment Planning and Analysis | Provides standards, guidance, training, and consulting services to ensure consistency in the conduct of investment analyses<br>Provides analysts who may lead, conduct, or review business cases as agreed to in the investment analysis plan<br>Verifies and validates the business case for both NAS and non-NAS investments |
| Stakeholder organizations | Participate as team members throughout investment analysis |
| Capture team (NAS only) | Contributes to investment analysis activity when the investment initiative is an element of an operational capability<br>Ensures the recommended alternative can provide the performance and functionality necessary to achieve the overall operational capability |
| Test service organization | Develops the preliminary and initial test and evaluation master plan |

### 2.5.4 Who Approves? Revised 4/2013

Approval authorities for the products of investment analysis are found in AMS Appendix B, Acquisition Planning and Control Documents.

### 2.5.5 Initial Investment Decision Added 4/2013

At the initial investment decision, the Joint Resources Council selects the best alternative for implementation or rejects all alternatives and specifies what action is needed next.

If the Joint Resources Council approves an alternative, it:

- Selects an alternative for implementation;
- Approves entry into final investment analysis;
- Approves funding for any analytical or developmental work related to the selected alternative; and
- Designates a service organization to lead final investment analysis and be responsible for solution implementation.

Alternatives can be rejected if the technology is not mature or when requirements are not sufficiently defined. If rejected, the Joint Resources Council can approve such actions as research, further analysis, development, or termination.

When the initial investment decision involves an investment initiative that is an element of an operational capability, the portfolio manager attends to explain the interrelationships among capability elements and the impact of not approving the initiative on the overall operational capability.

The Joint Resources Council uses the following standard selection criteria when making the investment decision:

- Lifecycle costs;
- Benefits;
- Risk;
- Benefit to cost ratio;
- Consistency with the FAA enterprise architecture; and
- Impact on FAA strategic goals.

### 2.5.6 Final Investment Decision Added 4/2013

The Joint Resources Council makes the final investment decision. If the Joint Resources Council disapproves the recommendation, it returns the investment package with specific instructions for further work or terminates the effort. If the Joint Resources Council accepts the recommendations, it:

- Approves the investment program for implementation and delegates responsibility to the appropriate service organization or program office;
- Approves the final program requirements document, final business case, and the implementation strategy and planning document;
- Approves the acquisition program baseline;
- Commits the FAA to funding the program segment, as specified in the acquisition program baseline;
- Approves updated architecture products and amendments; and
- Approves adjustments to FAA plans and budgets to reflect the investment decision.

Before the Joint Resources Council approves documents at the initial or final investment decisions, the documents require approval from other officials, as can be found in AMS Appendix B, Acquisition Planning and Control Documents.

When a final investment decision involves an investment initiative that is an element of an operational capability, the portfolio manager attends to explain the interrelationships among capability elements and the impact of not approving the initiative on the overall operational capability.

## 2.6 Solution Implementation Revised 4/2013

Solution implementation begins at the final investment decision when the Joint Resources Council approves and funds an investment program or segment, establishes the acquisition

program baseline for variance tracking, and authorizes the service organization to proceed with implementation. Solution implementation ends when a new service or capability is commissioned into operational use at all sites.

Detailed program planning, including the solicitation and evaluation of offers for prime contract(s), occurs during final investment analysis and before the final investment decision. This ensures accurate contract costs, risks, and schedules are reflected in the acquisition program baseline and program planning documents. These plans and baselines are revalidated, and updated if necessary, after contract award to ensure they can realistically serve as the management construct for program implementation. They are kept current throughout solution implementation.

The overarching goal of solution implementation is to satisfy requirements documented in the final requirements document and achieve the benefit targets in the business case. To achieve this, the service organization must work with users and stakeholders throughout solution implementation to resolve issues as they arise. Actions outside the direct control of the service organization (e.g., regulatory changes) are recorded in the implementation strategy and planning document and tracked at program reviews throughout solution implementation.

The activities undertaken during solution implementation vary widely and are tailored for the solution or capability being implemented. FAST contains tailored process flowcharts for representative types of investment program (systems and software, facilities, services) and functional disciplines (e.g., human factors, information systems security, configuration management, integrated logistics support). These flowcharts identify actions and activities the service organization may need to execute to achieve projected capability, value, and benefits. Instructions, templates, best practices, good examples, and lessons-learned are attached to many activities in the flowcharts to assist lifecycle management specialists as they plan and execute activities that make sense for their investment program.

Although service organizations are empowered to implement investment programs and manage them over their lifecycle, they must adhere to built-in checks and balances. The acquisition program baseline establishes the performance, cost, schedule boundaries within which the service organization is authorized to operate. The service organization must report all negatives variance from cost, schedule, and performance baseline measures and undertake corrective action in accordance with AMS Section 1.2.3. The assessment of critical performance requirements must be regularly reported during solution implementation and at completion.

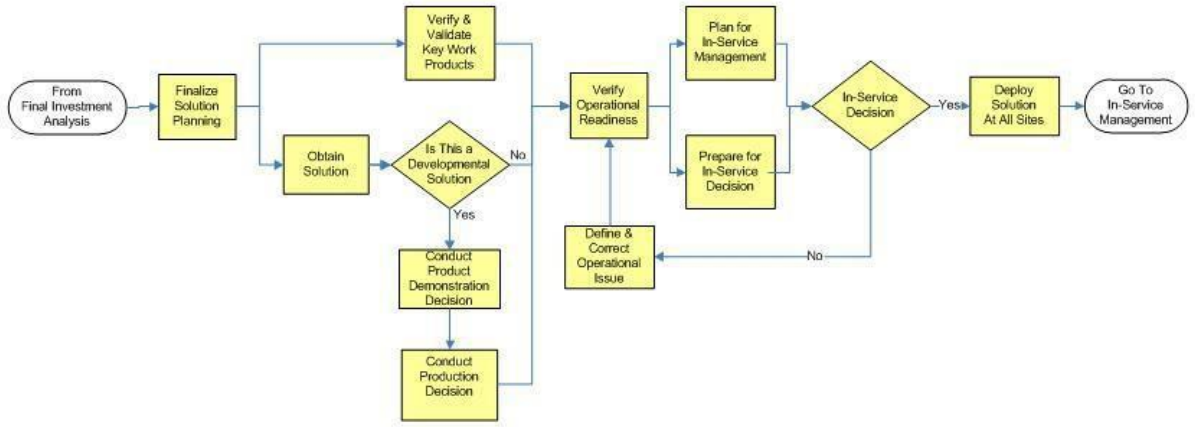
The service organization monitors cost, schedule, and performance status against targets in the acquisition program baseline on a continuing basis, and takes corrective action when variances from planning objectives arise. The service organization also reports program status at acquisition quarterly program reviews. The focus of these reviews is to identify high-risk issues requiring resolution and to ensure all actions necessary to achieve projected value and benefits are being executed satisfactorily, particularly those outside the control of the service organization. The service organization applies the principles of earned value management to development, modernization, and enhancement investment programs, and when applicable, uses audits to ensure contract costs are proper and allowable.

The service organization captures expenditures consistent with the program baseline work breakdown structure fashioned during final investment analysis.

For those NAS investment programs progressing through solution implementation as elements of an operational capability, capture team members assess and report progress of each investment increment monthly to the portfolio manager. The portfolio manager reports status of the overall capability to the NextGen Management Board quarterly. These reviews focus on cost, schedule, or performance issues associated with every element of the operational capability. The portfolio manager recommends action for correction of cost, schedule, or performance shortfalls, and may propose the transfer of funding from one investment increment to another when necessary to improve the health and prognosis of the overall capability. The Joint Resources Council evaluates proposed baseline changes among investment increments at acquisition quarterly program reviews. Each service team or program office works with the capture team to ensure each investment increment provides the functionality and performance necessary to achieve the operational capability.

Solution implementation is organized into the activities shown in Figure 2.6-1.These activities are tailored to the special requirements of each investment program.

***Figure 2.6-1 Key Activities of Solution Implementation***



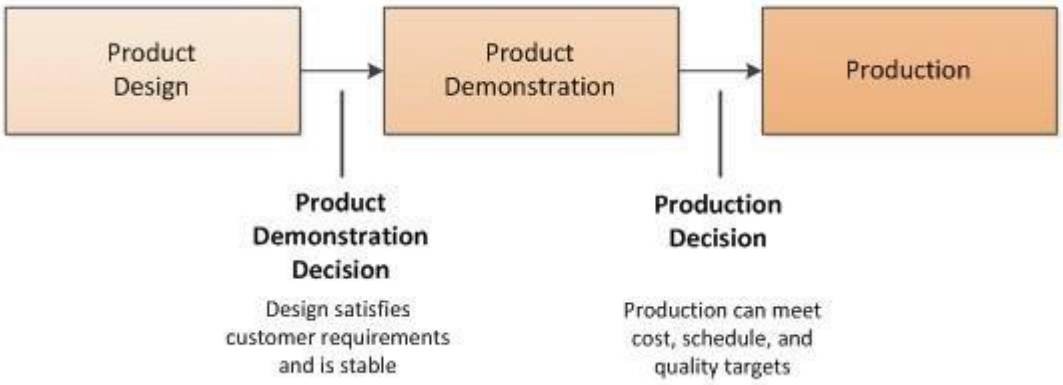

### 2.6.1 What Must Be Done Revised 4/2013

- **Finalize Solution Planning.** The service organization or program office reviews and updates program planning completed during final investment analysis (i.e., implementation strategy and planning document, work breakdown structure, ISR checklist). Key stakeholders participate in this activity to ensure planning is complete and realistic. For example, if new systems are to be installed or existing facilities modified, service organization planners work with service-area offices so people and resources will be available when needed.
- **Obtain the solution**. The service organization or program office oversees and coordinates execution of tasks and activities necessary to achieve the benefits projected for the investment program within approved cost and schedule baselines. This includes such activities as contract award, contract administration, program management, resource management, risk management, systems engineering, logistics support, test and evaluation, and site acquisition and adaptation. It may involve developing operational procedures and

standards; obtaining physical, personnel, and information security; modifying the physical infrastructure; and coordinating collateral action by the aviation industry.

- **Is This a Developmental Solution?** Investment programs that develop, modernize, or enhance systems or software follow the knowledge-based product development process shown in Figure 2.6.1-1. The following two decisions are intended to ensure the knowledge base is sufficiently mature to warrant proceeding to the next stage of implementation.

***Figure 2.6.1-1 FAA Knowledge-Based Product Development Process***




- **Conduct Product Demonstration Decision.** Table 2.6.1-1 defines the timing, decision authority, and decision criteria for authorizing full development and demonstration of the product.

***Table 2.6.1-1 Timing, Decision Authority, and Decision Criteria for the Product Demonstration Decision***

| Timing | Decision Authority | Decision Criteria |
|---|---|---|
| After critical design review | Vice President or Director of the implementing service organization | Key product characteristics are defined<br>Stakeholders agree that product design and functionality satisfy program requirements<br>System design reviews are complete<br>Engineering drawings are complete<br>Detailed software/firmware design is complete, including critical software processes and threads<br>RMA goals are defined and planning is complete<br>Failure modes and effects analysis is complete<br>Critical manufacturing processes are identified |

- **Conduct Production Decision.** Table 2.6.1-2 defines the timing, decision authority, and decision criteria for authorizing full production of the product.

*Table 2.5.1-2 Timing, Decision Authority, and Decision Criteria for the Production Decision*

| Timing | Decision Authority | Decision Criteria |
|---|---|---|
| After completion of operational testing | Vice President or Director of the implementing service organization * | First-article satisfies program requirements in an operational environment<br>Data demonstrate that critical manufacturing processes and components will achieve RMA goals<br>• First-article achieves contract RMA requirements<br>• Stakeholders agree design is producible |

***** Unless otherwise designated by the Joint Resources Council at the final investment decision.

- **Verify and Validate Key Work Products and Products.** The service organization or program office incrementally verifies and validates key work products and products of solution implementation, including the contract to obtain the capability, design documents, specifications, and actual product/product components. Verification and validation activity supports contract award, product demonstration decision, production decision, product acceptance, and the in-service decision.
- **Verify Operational Readiness.** The service organization or program office manages all activities necessary to install the solution at a designated test site(s) and test it thoroughly to verify operational readiness. Operational readiness encompasses operational effectiveness and operational suitability. Operational effectiveness measures how well the solution satisfies mission need and operational requirements. Operational suitability measures how well a product can be integrated and employed for field use, considering such factors as compatibility, reliability, human performance factors, maintenance and logistics support, safety, and training. For designated programs, operational readiness is also assessed by an independent operational assessment. The solution may be installed, as necessary, at the FAA Academy, FAA Logistics Center, and William J. Hughes Technical Center before the in-service decision. In rare cases and with proper justification, the service organization may request authority to install at other specific sites. This authorization does not affect the regular in-service review process culminating in a final in-service decision, which must be adhered to before a product can be placed into operational service through the declaration of operational readiness date (ORD) and commissioning.
- **Plan for In-Service Management**. The service organization or program office plans how it will sustain and manage deployed assets throughout their full lifecycle. This includes in-service logistics support, post implementation review, and other evaluations of operational assets to measure performance, collection of performance data in support of acquisition quarterly program reviews, product sustainment strategy and actions, service- life extension, and eventual removal from service including site restoration.
- **Prepare for In-Service Decision.** The service organization or program office completes all activities necessary for the in-service decision. This includes resolution of all support issues identified by the operating service organization and integrated logistics management team; completion of management actions arising from the in-service review checklist and the independent operational assessment report (designated programs only);

resolution of stakeholder issues; development of the in-service decision briefing and action plan; and concurrence of key stakeholders.

- **In-Service Decision Approved?** The in-service decision authority reviews operational test results, the status of in-service checklist items, the independent operational assessment (designated programs only), the perspective of key stakeholders, and other information deemed relevant to the in-service decision. If the in-service request is approved, deployment of the solution may begin. If the request is not approved, the service organization must correct any deficiency and return for the in-service decision upon verification that all outstanding issues have been resolved.
- **Define and Correct Operational Issues.** The service organization or program office takes whatever corrective action is necessary to resolve all remaining operational issues. This may involve a return to concept and requirements definition if correcting the issue involves a change to program requirements or to investment analysis if operational issues require a change to the acquisition program baseline.
- **Deploy the Solution at All Sites.** The service organization or program office manages all activities necessary to deploy the solution at each site. This includes transportation and delivery of equipment, installation and checkout, contractor acceptance and inspection, integration, field familiarization, declaration of initial operational capability, joint acceptance and inspection, dual operations, declaration of operational readiness, and removal and disposal of obsolete equipment. Post implementation reviews are conducted at deployment sites to ensure user needs are satisfied, identify systemic problems that must be corrected, and determine whether cost, schedule, and benefits objectives are being achieved. The transition from solution implementation to in-service management extends over time, occurring at each site upon declaration of operational readiness or commissioning.

### 2.6.2 Outputs and Products Revised 4/2013

The primary outcome of solution implementation is a fully deployed and supported operational capability that satisfies requirements (including program requirements and designated specifications), is accepted by users, is compatible with other products and services in the field, and realizes the benefits in the final business case by fully addressing requirements in the final program requirements document. The following are typical products of solution implementation that support the fielding of a satisfactory operational capability:

- Annual updates of the OMB Major IT Business Case for designated programs;
- Continuous evaluation of progress against targets in the acquisition program baseline (including status of critical performance requirements);
- Contracts that achieve investment objectives (i.e., cost, schedule, performance, and benefits);
- Successful operational test and evaluation including a final report on the status of critical operational issues and requirements in the final program requirements document, and passing status of critical performance requirements;
- Successful independent operational assessment and report for designated programs;
- In-service decision, including the in-service decision briefing and action plan;
- Declaration of operational readiness and commissioning at each site;
- Program reviews and reports (e.g., baseline management, variance tracking; financial,

schedule, performance; earned value, logistics measures, and risk management);

- In-service management plan;
- Monthly capture team assessments, when applicable; and
- Acquisition quarterly program reviews.

Key work products are verified and validated according to the FAA AMS Verification and Validation Guidelines before the in-service decision.

### 2.6.3 Who Does It? Revised 1/2015

| Organization | Responsibilities |
|---|---|
| Performing service organization or program office | Manages all activities necessary to plan, obtain, and deploy the solution, and to obtain the in-service decision. This includes the award and management of contracts, continuing review and evaluation of progress relative to plan, and corrective action to achieve cost, schedule, and performance targets in the acquisition program baseline.<br>Updates program planning to address how the newly fielded capability will be sustained throughout in-service management<br>Reports status of the investment program to the Joint Resources Council at acquisition quarterly program reviews |
| Operating service organization | Conducts joint acceptance and inspection or service acceptance (service contracts) at each site<br>Declares operational readiness and commissions the solution into operational use |
| Key stakeholder organizations | Work with service organizations to identify and resolve all issues and concerns during solution implementation up to and including the in-service decision |
| Vice President of the service organization | Notifies the Vice President of ATO Safety and Technical Training when the product is ready for independent operational assessment via the independent operational assessment readiness declaration (designated programs only) |
| Director of Policy and Performance, ATO Safety and Technical Training | Evaluates operational readiness of the product and reports findings to the in-service decision authority (designated programs only) |
| Information Technology Shared Services Committee | Annually reviews OMB Major IT Business Cases for designated programs as part of the annual budget process |
| Office of Information & Technology, Strategy & Performance Service, Investment Portfolio & | Independently scores all OMB Major IT Business Cases that will be submitted to the Office of Management and Budget through the Office of the Secretary of Transportation |

| | |
|---|---|
| CPIC Branch | |
| Capture team members | Assess and report monthly to the portfolio manager the status of each investment increment contributing to an operational capability |
| Portfolio manager | Reports status of the operational capability to the NextGen management Board (NAS only)<br>Recommends corrective action for cost, schedule, or performance shortfalls within all investment increments contributing to an operational capability |

### 2.6.4 Who Approves? Revised 4/2013

| Artifact | Approval Authority |
|---|---|
| Acquisition program baseline changes | Joint Resources Council |
| OMB Major IT Business Case (designated information technology programs)<br><br>OMB Major IT Business Case (designated non-information technology capital investments) | Chief Information Officer, Chief Financial Officer, Acquisition Executive<br><br>Chief Financial Officer, Acquisition Executive |
| Product demonstration decision (if applicable) | Vice President or Director of the implementing service organization |
| Production decision (if applicable) | Vice President or Director of the implementing service organization, unless otherwise designated by the Joint Resources Council at the final investment decision |

### 2.6.5 In-Service Decision Revised 7/2015

The in-service decision (ISD) authorizes deployment of a solution into the operational environment. It occurs after demonstration of initial operational capability at the key test site(s) and before initial operational capability at any non-key site or waterfall facility. The decision is made following completion of the certification of compliance with testing, information security, and safety requirements. It establishes the foundation for operational readiness to be declared at subsequent sites. The ISD uses results from test and evaluation that report on the verification and validation of performance requirements, critical performance requirements, critical operational issues, and operational readiness (e.g., safety, effectiveness, and usability). The in-service review (ISR) checklist is used by the service organization to identify and resolve readiness issues before the ISD and to obtain concurrence from stakeholder organizations.

The Joint Resources Council is the ISD authority. At the final investment decision, the Joint Resources Council may delegate ISD authority to appropriate FAA officials. For any solutions or products that affect multiple organizations, a joint ISD authority may be designated. This decision is documented in the final investment record of decision.

Depending on the implementation strategy of the solution (e.g., phased implementation, segments,

multiple releases, several smaller programs executed separately as a part of one solution), multiple ISDs may be required to ensure the operational readiness of each specific component of the overall solution. The ISD strategy is developed by the service team with help from the ISD Executive Secretariat, approved by the Joint Resources Council and documented in the implementation strategy and planning document. Follow-on revisions to the ISD strategy must be approved by the ISD authority.

The ISD is recorded in the record of decision. Action plans for resolving remaining operational readiness issues are included as an attachment to the record of decision. Status of action plans is tracked and reported to the ISD Executive Secretariat until all issues are resolved. Once all action plans are satisfactorily completed, the ISD Executive Secretariat provides a close-out memorandum.

Non-NAS and Non-NAS IT initiatives do not require an in-service decision nor a waiver from the In-Service Decision Executive Secretariat. Acceptance criteria will be agreed upon by the customer and the service delivery organization.

#### 2.6.5.1 Entrance Criteria Revised 7/2013

The following artifacts are required for each in-service decision:

- Operational test report(s);
- Independent Operational Assessment Report for designated programs;
- ISR Checklist completed or action plans for those remaining open;
- Safety Risk Management Document approved;
- Information security certification and authorization or certification and authorization;
- Stakeholder concurrence on readiness for the ISD; and
- ISD briefing and action plans.

#### 2.6.5.2 In-Service Decision Authority Actions Added 4/2013

The ISD Authority:

- Approves the ISD strategy for phased or segmented deployments;
- Agrees to the action plans;
- Makes the ISD; and
- Approves the Record of Decision.

### 2.7 In-Service Management Revised 4/2013

Activity during in-service management supports execution of the FAA mission of providing air traffic control and other services. This entails operating, maintaining, securing, and sustaining systems, products, services, and facilities in real time to provide the level of service required by users and customers. It also entails periodic monitoring and evaluation of fielded products and services, and feedback of performance data into service and investment analysis as the basis for

revalidating the need to sustain deployed assets or taking other action to improve service delivery.

Service organizations are responsible and accountable for managing service delivery within their area of responsibility throughout in-service management. They bring together the multiple engineering, logistics, and other management specialists necessary to operate and sustain fielded systems, services, products, and facilities. This includes managing resources within specific geographic areas, and may involve emergency sustainment actions in response to natural disasters or other unanticipated events.

Service organizations have flexibility to sustain and enhance fielded capability. They may implement pre-planned product improvements or block upgrades as stipulated at the investment decision, and may use sustainment resources to upgrade components of fielded products as needed (e.g., printers or processors).

In-service management planning documents focus on actions and activities that support continued operation and maintenance of deployed assets. The documents clearly define in-service management activities such as configuration management, preventive and corrective maintenance, training, infrastructure support and logistics support, along with planned activities to support post implementation reviews and operational analyses.

Service organizations evaluate the safety, efficiency, and effectiveness of operational assets throughout in-service management as a basis for improving service delivery over time. This process begins with a post implementation review at one or more early operational sites to determine whether a new investment program is achieving its performance and benefit targets and whether it is meeting the service needs of customers. The primary objective is useful information on how best to eliminate flaws and optimize performance and benefits before deployment at additional sites. This evaluation process continues throughout in-service management with the periodic evaluation of operational assets to determine whether they are continuing to contribute to agency safety, performance, and cost goals or whether they should be modernized, replaced, or removed from service. These operational analyses are the basis for out- year planning in the service organization business plan, which integrates ongoing and planned investment activity with resources for the operation and sustainment of fielded assets over their service life. The overarching goal is the continued best use of agency resources to achieve FAA strategic and performance goals. Click here for links to post implementation review and operational analysis policy and guidance.

When a fielded capability is projected to be unable to satisfy service demand or when another solution offers improved safety, lower cost, or higher performance, the service organization initiates action to enter the service analysis process leading to a new investment decision. The key is to look far enough into the future so there is enough time to approve and implement a solution before the existing capability fails or becomes obsolete.

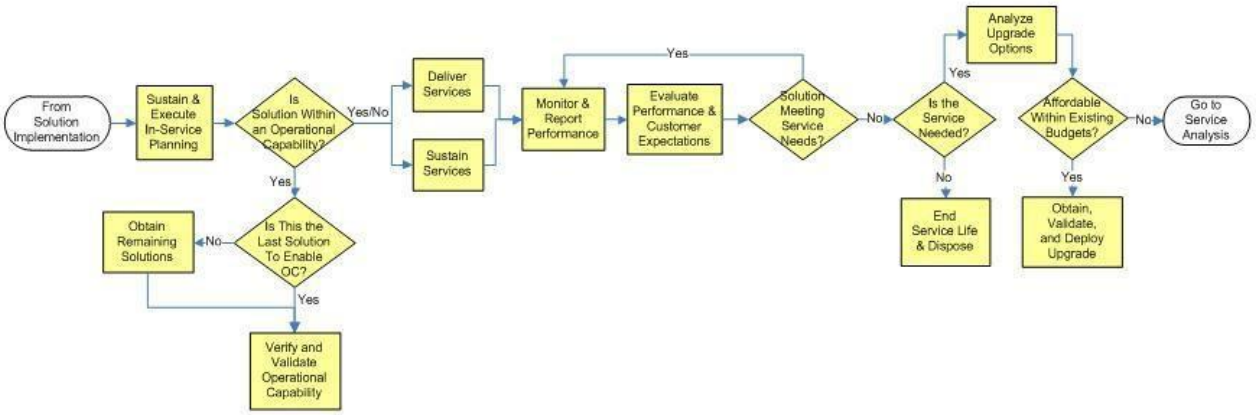
Service organizations must remove and dispose of fielded assets and services when they are no longer needed. This includes restoration of sites where obsolete products or services were deployed, disposal of government property, recovery of precious metals, and cannibalization of useful assets. The cost of removal and restoration is included in the acquisition program baseline of the replacement program. If there is no replacement program, the cost must be otherwise

factored into the service-area operating plan.

### 2.7.1 What Must Be Done Revised 4/2013

Figure 2.7.1-1 portrays the activities undertaken during in-service management. They are organized to deliver, sustain, and evaluate operational assets, and to take corrective action when they are projected to be unable to satisfy the service needs of users and customers or when they are becoming unsupportable or obsolete. The work flow includes actions to verify and validate achievement of projected benefits from an operational capability resulting from completion and integration of multiple investment increments.

***Figure 2.7.1-1 Key Activities of In-Service Management***




**Sustain and Execute In-Service Planning.** Service organizations review and update in-service planning documents as needed. This includes updating the OMB Major IT Business Case each year for designated programs. Annual updates reflect program changes and move the budget submission forward one year. The OMB Major IT Business Case must continue to achieve a passing score from the Office of Management and Budget.

- **Is Solution Within an Operational Capability?** When a recently deployed solution is not an increment necessary to achieve a complex operational capability, it is operated and sustained during in-service management as a stand-alone capability. When it is part of an operational capability, the agency validates that the projected benefits of the operational capability are being achieved once all supporting investment increments are in service.
- **Is This the Last Solution to Enable an Operational Capability?** If the recently deployed solution is the last investment increment necessary to implement an operational capability, a post implementation review is planned and executed to determine whether the performance and benefits projected for the operational capability are being achieved and to identify what corrective action is needed when they are not.
- **Obtain Remaining Solutions.** All investment increments necessary to achieve the operational capability are obtained and deployed before verifying and validating that the performance and benefits of the operational capability are being realized.
- **Verify and Validate Operational Capability.** When the last investment increment of an

operational capability is deployed and approved for operational service, the capture team oversees the integration of investment elements necessary to achieve the operational capability and verifies achievement of operational and performance benefits in the operational capability business case. Typically, a post implementation review will be planned and executed for this purpose. Results are presented to the NextGen Management Board, which determines whether performance of the operational capability meets agency expectations or whether further action is necessary.

- **Deliver Services.** The operational workforce provides air traffic control and other business services using infrastructure, procedures, and other assets as assigned and funded. This includes all safety-related quality assurance actions such as flight inspection, aircraft certification, establishing safety standards for operations, monitoring safety performance, issuing and maintaining certificates and licenses, and developing and revalidating procedures such as approach and landing procedures. Emergency sustainment actions are planned and executed whenever required. During emergencies, highest priority services are sustained even if performance goals for lower priority services cannot be met. In addition, physical, personnel, and information security is maintained at all FAA facilities. This includes environmental threat and facility assessment and accreditation in accordance with FAA internal security planning.
- **Sustain Services.** A variety of actions are undertaken by the FAA workforce during in-service management to ensure operational assets remain in good working order. These include:
  - Corrective and preventive maintenance, supply support, second-level engineering, depot-level repair, modification of hardware and software to improve performance, test and support equipment, and transportation of supplies.
  - Management and engineering actions to sustain and improve service delivery, correct deviations from cost and performance standards, and improve quality. These actions include modifications to hardware and software to solve latent or discovered technical problems, process changes to improve performance, planned block upgrades and product improvements, and sustainment actions that lower operating costs. It involves the management of personnel, information systems, money, logistics support, spare parts, technical resources, and other assigned assets. Management techniques include fiscal and workforce planning, contract award and administration, fiscal and program control, and process management to achieve cost, performance, and benefit objectives. All modifications to fielded assets must be in accordance with the enterprise architecture. If a planned modification requires a change to the architecture, appropriate amendments and products must be developed and approved.
  - Management and control of the configuration of all services and service components. This includes submission of NAS change proposals to the appropriate approval board to baseline, install, and manage changes to NAS systems, software, and equipment. It requires coordination with the appropriate systems engineering organization to ensure changes are compatible with and reflected in the enterprise architecture.
  - Sustainment of utilities, buildings, grounds, structures, roads, telecommunications, handling of hazardous materials, lightning protection, bonding, grounding, heating, cooling, and special access.
  - Participation in cross-organizational planning to review, integrate, and prioritize the allocation of operational resources to fielded services and assets. The objective is to

continue support for high-ranking service needs and reduce or terminate support for low-value or redundant assets. Recommendations are presented to the Joint Resources Council for approval.

- Acquisition and management of FAA-owned and leased properties, as well as management of non-federal facilities with external sponsors. This activity may involve the purchase or lease of buildings, structures, and grounds, as well as removal and disposal of no longer used equipment, systems, services, products, facilities, real property, and resources.

- **Monitor and Report Performance.** Post implementation review(s) at early deployment sites help determine whether performance and benefits are being achieved. When projections are not being realized, corrective action is planned and implemented. Periodic operational evaluations of fielded assets continue throughout in-service management to identify performance shortfalls, determine trends in the cost of ownership, identify adverse support trends, and solve systemic operational or support problems.
- **Evaluate Performance and Customer Expectations.** Operational evaluations are the basis for revalidating the merit of sustaining investment assets or the need for other action. Findings are fed back into service analysis, where it is determined whether to continue to sustain existing assets or recommend new investments to solve systemic problems in the service environment.
- **Solution Meeting Service Needs?** If the solution is meeting service needs and no supportability issues have emerged, the operational workforce continues to operate and sustain the solution, as well as monitor and evaluate it periodically. If supportability issues are emerging or the solution is projected to be unable to satisfy the service need, corrective action is initiated once it is verified the service is supported by the NAS ConOps during timeframe in question.
- **Is the Service Needed?** The operating service organization determines whether the service provided by the solution is still needed. In making this determination, the service organization reviews the NAS ConOps and enterprise architecture roadmaps to confirm the service will continue to be required in the timeframe any upgrade to the operational asset would cover.
- **End Service Life and Dispose of Unneeded Assets.** When an operational asset is replaced by new capability, the program office installing the new capability removes and disposes of replaced assets. When there is no replacement asset, the operating service organization removes and disposes of unneeded assets. Removal and disposal includes decommissioning, dismantling, and demolishing of systems and equipment; restoring sites including environmental cleanup and disposal of hazardous materials; disposing of government property; recovering precious metals; and reusing surplus assets.
- **Analyze Upgrade Options.** When the service is still needed, the service organization investigates ways to upgrade at-risk assets within existing operating budgets and determines whether additional investment funds are needed.
- **Affordable Within Existing Budgets?** When the operational asset can be modernized within existing budgets (e.g., a planned and funded product improvement, operational funds), the upgrade is obtained, validated, and deployed. When new funds outside the scope of available resources are needed, the service shortfall enters service analysis to begin the search for a solution.
- **Obtain, Validate, and Deploy Solution Upgrade.** Any modification to fielded assets (e.g., block upgrade, planned product improvement, problem correction) must be accompanied by concomitant changes to key elements of the support infrastructure such as

training, documentation, spare parts, and engineering support. This includes training for personnel who directly operate, maintain, or provide support functions. All key work products and products of in-service management, including NAS change proposals (includes actual changes/improvements to products and product components) and system support directives are verified and validated before an upgrade enters operational service. This includes the modified content of key work products and products that originate in other phases of the lifecycle, but are intended for use during in-service management. Verification and validation activity supports decisions to implement and deploy procedural or product improvements.

### 2.7.2 Outputs and Products Revised 4/2013

- Delivery of FAA enterprise services;
- Post implementation reviews and corrective action as needed to achieve investment performance and benefits;
- Periodic operational analysis of fielded assets including the effectiveness and efficiency of supply chain management;
- Periodic revalidation of the need to sustain fielded assets;
- Enforcement actions, baseline changes, and investment recommendations to maintain or improve service delivery;
- Change proposals to install systems, software, and equipment and to improve capability, safety, or efficiency in accordance with the enterprise architecture;
- Program technical reports and hardware discrepancy reports to correct hardware and software problems;
- Annual OMB Major IT Business Case submissions (designated programs only);
- Emergency sustainment actions to sustain high-priority capabilities and services;
- Up-to-date configuration records for fielded equipment;
- Annual report on critical operational needs;
- Periodic assessment of facility security enhancements;
- Action plans to remedy cost and performance shortfalls;
- Updated in-service management planning documents if needed; and
- Flight inspections, aircraft certification, and regulatory actions.

### 2.7.3 Who Does It? Revised 1/2015

| Organization | Responsibilities |
|---|---|
| Service organization or program office | Provides and sustains services<br>Manages resources to sustain fielded assets<br>Manages preplanned product improvements<br>Updates OMB Major IT Business Cases for the annual budget cycle (designated programs only);<br>Reviews in-service management planning and updates as needed<br>Manages the configuration of fielded assets consistent with FAA policy and the enterprise architecture<br>Develops infrastructure for modifications to fielded assets, including training, documentation, spare parts, and repair |

| | |
|---|---|
| | Periodically assesses customer satisfaction as the foundation for improving service delivery<br>Monitors quality, assesses performance, tracks cost, and identifies adverse support trends for fielded assets<br>Periodically revalidates the need to sustain fielded assets or recommends other action such as upgrade, replacement, or decommissioning and removal<br>Assesses the impact on sustainment of fielded assets resulting from delays in fielding a new capability<br>Sustains the physical infrastructure |
| Office of Information & Technology, Strategy & Performance Service, Investment Portfolio & CPIC Branch | Reviews and scores OMB Major IT Business Cases as part of the annual budget cycle (designated programs only) |
| PIR Quality Officer | Oversees the quality, planning, conduct, and reporting of post implementation reviews |
| Integrated Logistics Management Team | Assesses the effectiveness of supply chain management and the support concept<br>Recommends changes to logistics management to optimize service delivery at best value |
| ATO Technical Operations | Keeps operational assets in good working condition<br>Conducts operational analyses periodically and feeds results into service analysis |
| William H. Hughes Technical Center | Designs, develops, tests, and fields changes to operational assets that correct recurrent trouble reports and other operational issues<br>Provides second-level engineering |
| Mike Monroney Aeronautical Center | Provides supply chain management, depot support, logistics services, and training for operational assets<br>Provides second-level engineering services |
| Capture team | Integrates investment increments necessary to obtain an operational capability<br>Assists in the planning and verification that an operational capability is achieving the benefits specified in the operational capability business case |

### 2.7.4 Who Approves? Added 4/2013

| Artifact | Approval Authority |
|---|---|
| OMB Major IT Business Cases | Chief Information Officer, Chief Financial Officer, Acquisition Executive |

| | |
|---|---|
| (designated information technology capital investments | |
| OMB Major IT Business Cases (designated non-information technology capital investments | Acquisition Executive, Chief Financial Officer |
| In-service management planning documents | Vice President (ATO) or Director (non-ATO) of the operating service organization |