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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.

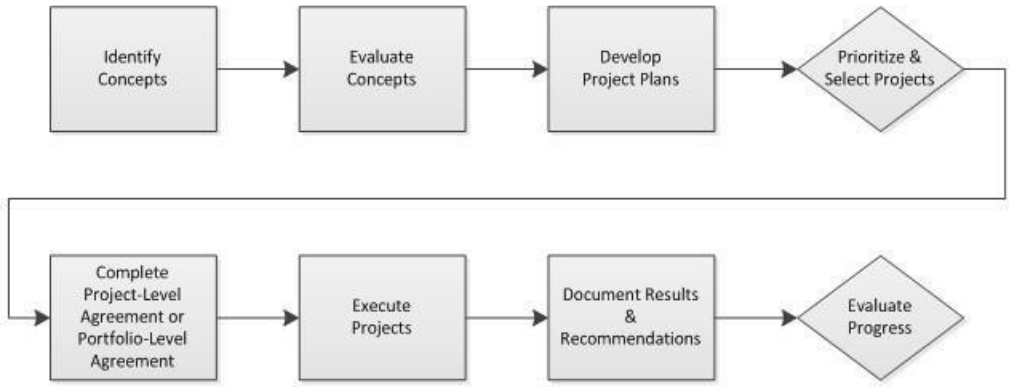
CMTD activities are selected according to their relative potential for achieving needed operational improvements identified in the NAS ConOps and NAS architecture. CMTD activities include development of mid-term operational concepts, concept evaluation studies, human factors analysis, preliminary requirements 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; Coordinates annual development of the NextGen Implementation Plan;

	Manages the NextGen planning and budget process; Defines project plan selection, management, and evaluation criteria for CMTD activities in coordination with project sponsors and stakeholders; Assesses progress of research activities toward achievement of documented project plans and ensures documentation of results and recommendations; Facilitates coordination with trade associations, international organizations, and other state and federal government organizations for agency-level research and concept development initiatives; and 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; Prepare budget formulation documentation for CMTD activities for which the organization serves as the performing organization; Execute projects as documented in project-level agreements and project plans; Document project results; and 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