

The Idea to In-Service Verification and Validation (V&V) Process Description

July 19, 2012

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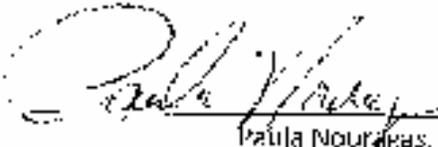
APPROVAL SIGNATURES



John Frederick, ANG-E72

Acting Manager, Verification & Validation Strategies & Practices Branch

7/17/2012
Date



Paula Nourgas, ANG-E5

Manager, Test & Evaluation Services Division

7-19-2012
Date



Wilson M. Felder, ANG-E

Executive Director, William J. Hughes Technical Center

24 Jul 2012
Date

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0.1	Initial Draft Briefed to CLT Sub-Team	03/26/2012
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0.0 PROCESS OVERVIEW

This process description addresses how verification and validation (V&V) will be integrated into the Ideas to In-Service (I2I) process. For the purposes of I2I, we are only addressing technical performance and not cost and schedule V&V activities. Here, all V&V activities are driven by technical/system documents (i.e. CONOPS and Requirements, etc.) and work products that are generated from specific I2I processes and sub-processes as identified in the process description. The associated location of an identified work product forms the V&V process “touch points” to the I2I process. Great care was given to limit the effort and energy of the V&V process so that it does not become overwhelming and slow the overall I2I process. Each V&V activity described in this document is performed against specific criteria to ensure the quality and effectiveness of NextGen work products. The output of each V&V activity supports specific processes and sub-processes as indicated in the process description.

0.1 Background

V&V is a critical process that helps acquisition programs early in a program lifecycle ensure that the technical value of the system is identified and well documented. This effort helps to reduce excessive defects in requirements, architecture, and design, early in the program lifecycle. Finding defects late in the lifecycle can be significantly more costly in terms of both time and money. Good V&V processes can help reduce large disconnects in operational capability before the system enters test or the field.

V&V is conducted to achieve quality and effective work products. This process description is based on the following definitions of V&V:

Verification - Ensures that selected work products meet their specified requirements

Validation - Confirms whether a product will fulfill its stated purpose

The overall strategy of V&V is to start with the strategic documents that outline the agencies' future goals and verify work products continually against the evolving vision and the preceding documentation of a program. If a program needs to deviate, then preceding documentation needs to be updated as it takes a new path.

Figure 0.1 illustrates how work products are verified and validated throughout the V&V lifecycle process.

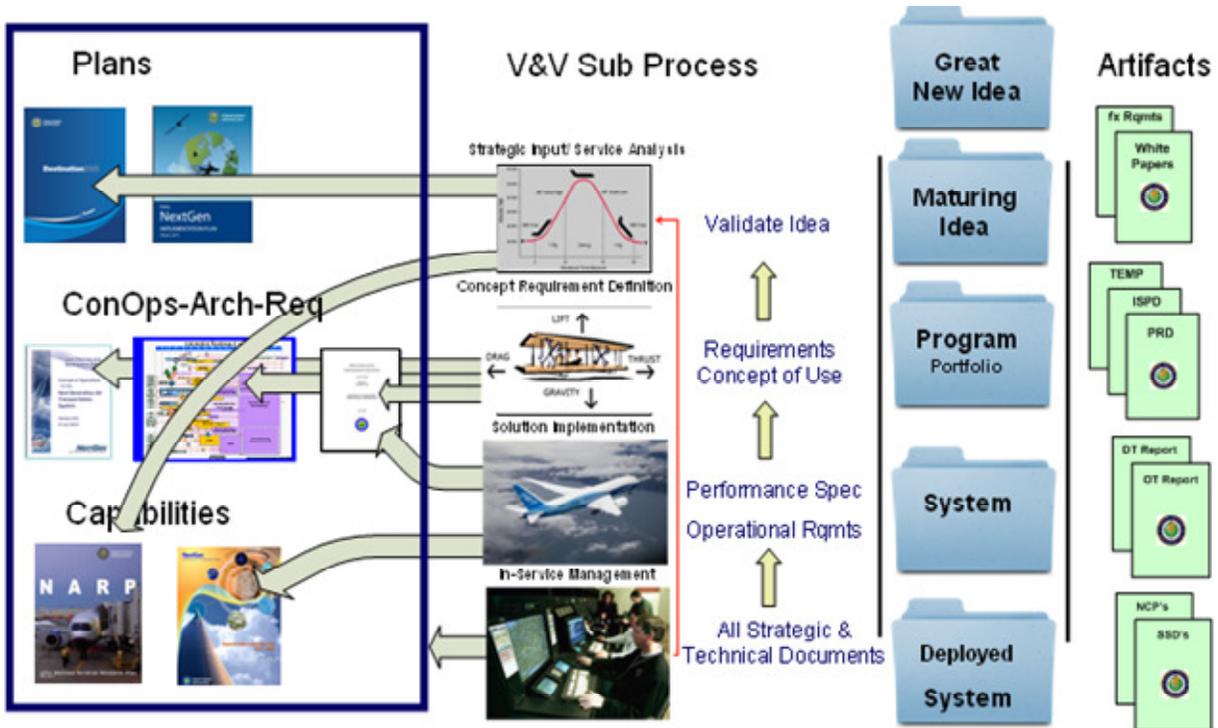


Figure 0.1 - V&V Lifecycle Process

0.2 Approach

The strategy used for the V&V sub-processes was to first identify work products in the lifecycle that are sufficiently mature to conduct V&V activities. These work products and their position in the lifecycle form the V&V touch points to the I2I process. V&V activities are then defined for each touch point with criteria that the work product is verified and validated against. In some cases, the work products represent the output of an internal validation or verification systemic to the I2I process. In these cases, the V&V activity may be limited to an observation and/or documentation effort. In addition, there are existing V&V activities currently addressed in the Acquisition Management System (AMS) that will not be duplicated by new I2I V&V activities detailed in this document. Those existing AMS V&V activities and the new I2I V&V activities are identified in the Appendix.

The V&V process outputs, in general, are the original work product which becomes a validated or verified work product. A V&V Record will be generated as an output for each V&V activity conducted and will serve as an artifact for that activity. Figure 0.2 depicts the V&V process flow and its relationship to the I2I process.

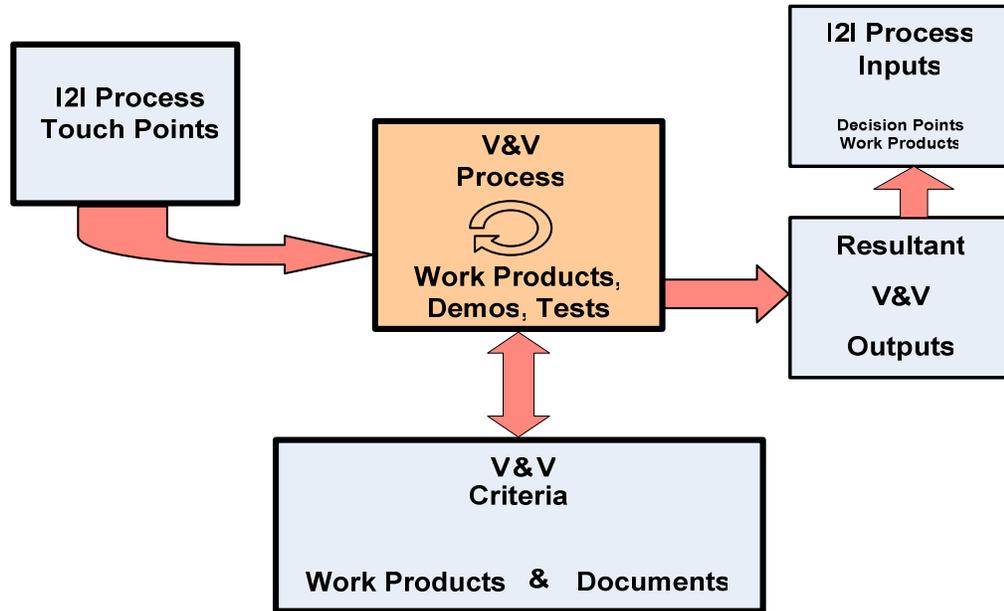


Figure 0.2 – V&V Flow Process

The overall V&V process is pictured in Figure-0.3. The body of this document delineates the details of each touch point in the I2I V&V process.

0.3 Pre-Requisite V&V Activities

Critical technical documents that form the basis for future work products during a programs lifecycle must be verified and validated prior to use in the I2I process. The critical technical documents include: the National Airspace System (NAS) Concept of Operations, NAS Requirements Document, and the Enterprise Architecture. This pre-requisite activity is necessary to ensure a valid basis for programs, that no service gaps exist, and that programs are in line with the overall goals of the agency. The criteria used for the V&V of these technical documents should be the Destination 2025 Document and all applicable standards associated with the document (i.e. manuals, handbook, templates, and guidance documents).

		Strategic Input		Service Analysis			CRD, Solution Development & Commitment					SI	ISM
	Touch Points	1.1.1 Develop & Manage Strategic Plans (Dist 2025) & Business Plan	1.1.2 Generate Ideas & Requests for Changing the NAS	2.1.1 Assess Validity of Ideas	2.1.2 Decompose ConOps into Service Needs	2.1.3 Prepare CRD Plan	3.1.3 Update Segment EA Products	3.1.4 Validation of Technical Inputs	3.2.3 Develop Alternative Products	3.7 Conduct Initial Investment Analysis	3.9 Conduct Final Investment Analysis	4.1.3 Verify Operational Readiness	5.1.1 Service Management
	1.1.1 Activity	1.1.2 Activity	2.1.1 Activity	2.1.2 Activity	2.1.3 Activity	3.1.3 Activity	3.1.4 Activity 1	3.2.3 Activity 1	3.7 Activity	3.9 Activity 1	4.1.3 Activity 1	5.1.1 Activity 1	
	1.1.1 Criteria	1.1.2 Criteria	2.1.1 Criteria	2.1.2 Criteria	2.1.3 Criteria	3.1.3 Criteria	3.1.4 Activity 2	3.2.3 Activity 2	3.7 Criteria	3.9 Activity 2	4.1.3 Activity 2	5.1.1 Activity 2	
Blue - New	V&V Activity & V&V Criteria Documents	1.1.1.1 Verify Business Plan against the Strategic Plan, National Aviation Research Plan, EA	1.1.2.1 V&V documented research issues & write papers against the Strategic Plan	2.1.1.1 Document the Basis for the Decision	2.1.2.1 Validate the Service Needs Statement against the NAS ConOps, EA, NAS R&D Portfolio, NAS Rgmt's Doc	2.1.3.1 Validate CRD Plan against the CRD AMS Guidance, EA, NAS Rgmt's Doc, NextGen Implementation Plan, NSIP, Solution Level ConOps, NAS ConOps, NAS ConOps CR Assessment Report, Initial Operational Rgmts	3.1.3.1 Validate EA Products against the Solution i.e. EA, NAS ConOps, NAS Rgmts, Doc, Initial Operational Rgmts, NextGen Implementation Plan and NSIP	3.1.4.1 V&V the Solution Level ConOps against the EA, NAS ConOps, NAS Rgmts, Doc, Initial Operational Rgmts, NextGen Implementation Plan and NSIP	3.2.3.1 Validate the updated Functional Rgmts against the Solution Level ConOps, Initial Operational Rgmts and the updated EA	3.7.1 Validate the updated Prgm Rgmts Doc against the EA, NSIP, Solution Level ConOps, Functional Assessments, NAS Rgmts Docs, Functional Requirements, Functional Analyses Products	3.9.1 Validate the final PRD against the EA, Solution Level ConOps, Functional Assessments, NAS Rgmts Docs, Contract, final PRD, Solution Level ConOps, NAS Requirements Doc	4.1.3.1.1 Verify the contract against the final PRD and the results of negotiations with contractor	5.1.1.1 Validate updates to EA products against the EA, NSIP & NAS Rgmts Doc
Green - Existing/Needs Enhancement		1.1.1.2 National Aviation Research Plan - EA	1.1.2.2 V&V documented research issues & write papers against the Strategic Plan	2.1.1.2 Valices Assessment Report against the basis for the decision (validity & feasibility); issues should be noted & accurate	2.1.2.2 Valices Assessment Report against the basis for the decision (validity & feasibility); issues should be noted & accurate	2.1.3.2 Valices the CRD Plan for assessing the operational rgmts	3.1.3.2 Valices the CRD Plan for assessing the operational rgmts	3.1.4.2 Verify that they meet "standards"	3.2.3.2 Verify that they meet the "standards"	3.7.2 Validate APB against the EA, Solution Level ConOps, Functional Analyses Products, Functional Requirements, final PRD	3.9.2 Validate APB against the EA, Solution Level ConOps, Functional Analyses Products, Functional Requirements, final PRD	4.1.3.1.2 Validate the Design Documents against the system specification and final PRD	5.1.1.2 Validate NAS change proposals/changed rgmts against the Post Implementation Reviews, Operational Analyses, final PRD
Pink - Existing		1.1.1.3 Strategic Plan (2025)	1.1.2.3 Strategic Plan (2025)	2.1.1.3 NAS ConOps EA NAS R&D Portfolio NAS Rgmt's Doc	2.1.2.3 NAS ConOps EA NAS ConOps Service Need Statement	2.1.3.3 Validates that the CRD Plan indicates an effective strategy for assessing the operational rgmts	3.1.3.3 Validates the effectiveness, usability and sufficiency of the CRD Plan	3.1.4.3 EA NAS ConOps NAS Rgmts, Doc Initial Operational Rgmts NextGen Implementation Plan NSIP Solution Level ConOps	3.2.3.3 Verify the updated system rgmts against EA	3.7.3 Validate the ISPD against the EA, final PRD	3.9.3 Validate the ISPD against the EA, final PRD	4.1.3.1.3 Verify & validate the system/service against system specification and/or lower-level specifications, Safety Risk Management Doc, Contract, final PRD, Solution Level ConOps, NAS Requirements Doc	5.1.1.3 Validate implemented changes to the baseline system/service against final PRD, NCP, Functional description doc, system specification and/or lower level specifications
Strategic Basis For IZI Process - Strategic Plan (2025)			2.1.1.4 Decision Basis Document	2.1.2.4 Decision Basis Document	2.1.3.4 Validates the effectiveness, usability and sufficiency of the CRD Plan	3.1.3.4 Validates the effectiveness, usability and sufficiency of the CRD Plan	3.1.4.4 EA NAS ConOps NAS Rgmts, Doc Initial Operational Rgmts NextGen Implementation Plan Updated EA NSIP Solution Level ConOps	3.2.3.4 Verify the updated system rgmts against EA	3.7.4 Validate the ISPD against the EA, final PRD	3.9.4 Validate the ISPD against the EA, final PRD	4.1.3.1.4 Verify & validate the system/service against system specification and/or lower-level specifications, Safety Risk Management Doc, Contract, final PRD, Solution Level ConOps, NAS Requirements Doc	5.1.1.4 Validate implemented changes to the baseline system/service against final PRD, NCP, Functional description doc, system specification and/or lower level specifications	
National AV Research - NAS ConOps - NAS Req Doc - EA - Business Plan	Resulting V&V Outputs	1.1.1 Output - Validated Business Plan - V&V Record	1.1.2 Output - Validated Documented Research Issues and White Papers - V&V Records	2.1.1 Output - Validated Decision Basis Document - V&V Record	2.1.2 Output - Validated Service Needs Statement - V&V Record	2.1.3 Output - Validated CRD Plan - V&V Record	3.1.3 Output - Validated EA Products - V&V Record	3.1.4 Output - Validated initial operational rgmts - Validated Solution Level ConOps - V&V Record	3.2.3 Output - Validated Functional Rgmts - Validated Final OCP - Validated System Requirements - V&V Record	3.7 Output - Validated PRD - V&V Record	3.9 Output - Validated final PRD - Validated APB - Validated Despy Document - Validated ISR Dist - Validated SIR - Validated TEMP - V&V Record	4.1.3 Output - Validated Contract - Validated Contract Specifications - Validated Despy Document - Validated Safety Risk Management Document - Validated & Validated System Service - Validated In-Service Review Checklist - V&V Record	5.1.1 Output - Validated updates to EA Products - Validated NAS Change Proposals - Validated implemented changes to the baseline system/service - Validated System Support Directives - Validated updates to the ISPD - V&V Record
	Comments	1.1.3 Comments - Why are we documenting an idea as a "NAS ConOps Change Request?" hasn't passed laugh test. (input to 2.1.1) Doesn't match write-up	1.1.3 Comments - Why are we documenting an idea as a "NAS ConOps Change Request?" hasn't passed laugh test. (input to 2.1.1) Doesn't match write-up	2.1.1 Comments - States to initiate R&D as needed but there is no mention of R&D efforts in sub-processes (2.1.2, 2.1.5) - A "maturity assessment" should be done at this point in the process	2.1.1 Comments - Are you reintroducing Service Needs Statement into NAS?	2.1.3 Comments - What about the NSIP & the Solution Level ConOps? These documents should be addressed at this point.	3.1.3 Comments - Where is the program ConOps document?	3.1.4 Comments - The SIR, ISR, Checklist, PRD, ISPD & APB are missing from the CRD, Solution Development & Commitment phase	3.2.3 Comments - Does the solution level ConOps equal the Concept of Use?	3.7 Comments - How & when are the portfolios updated & maintained?	3.9 Comments - How & when are the portfolios updated & maintained?	4.1.3 Comments - Will NAS Products & EA Products continue to be updated as they are implemented?	5.1.1 Comments - When you get to the end of the IZI process, what happens next? What is the feedback loop?

Figure 0.3 Illustrative View of the V&V Process

1.0 STRATEGIC INPUTS

Overview

The FAA's strategic plan (Destination 2025) sets the context for the FAA Enterprise Architecture (EA) and all lower-level plans and budgets within the agency. The Strategic Inputs section of the I2I process includes references to Destination 2025 plan goals and objectives representing the first step on the path to identifying the need for a change and gaining upfront operational buy-in on shortfalls and mission needs.

FAA lines of business align their planning to the goals and objectives in the Destination 2025 plan. Service organizations within the lines of business, in turn, align their business and operating plans to lines-of-business planning. As a result of business alignment, strategic inputs have the potential to trigger a series of events that drive important resource allocation and programmatic decisions later in the lifecycle.

1.1 V&V Touch Points in the I2I Process

For Strategic Inputs, the following touch points were selected as key V&V activities for this phase. These two V&V touch points are listed below and depicted on the I2I process Flowchart for Strategic Inputs in Figure 1.1:

- a. Develop & Manage Strategic Plans (Destination 2025) & Business Plan, 1.1.1
- b. Generate Ideas & Requests for Changing the NAS, 1.1.3

**1.1
Generate Ideas/
Requests for
Changes to
the NAS**

1.1 Actors
ANG, Ops (AVS,
AST, ARP, APL,
ATO), JPDO Industry
input (e.g. RTCA,
NASA, International
Harmonization)

New V&V
Activity - Blue

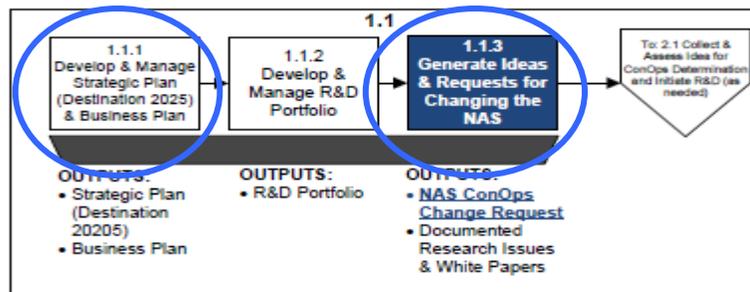


Figure 1.1 - I2I Process Flowchart for Strategic Inputs

The following sub-processes describe the V&V activity that will be performed for each touch point identified in this phase. The inputs (e.g. documents, work products, or test activity) for each sub-process will be verified and validated against the specified criteria. The validated outputs specified in the tables will become artifacts as a result of each sub-process.

1.2 V&V Process Descriptions

Develop & Manage Strategic Plan (Destination 2025) & Business Plan, 1.1.1

Development of the Strategic and Business Plans will take into consideration US Aviation customers, users, FAA organization, governance, personnel resources, related assumptions, architectural and operational risks, and internal and external dependencies.

The V&V activity for I2I sub-process 1.1.1 will be the verification of the FAA Business Plan. The Business plan will be verified against Strategic Plan (Destination 2025), National Aviation Research Plan and the Enterprise Architecture to ensure consistency and succinct interpretation of goals and objectives identified.

Who is Responsible (Draft)?

Activity	Who's Responsible	Role
Implements V&V	Developer of Work Product	<ul style="list-style-type: none">- Plans and Ensures V&V Occurs- Recommends V&V Agent- Retains and Posts V&V Artifacts
Supports Activity	Independent V&V Agent	<ul style="list-style-type: none">- Performs V&V
Facilitates V&V Process	Appropriate Organization Providing V&V Maintenance and Support	<ul style="list-style-type: none">- Maintains V&V Standards and Repositories- Spot Checks V&V Process- Concurs on V&V Agent- Approves V&V Approach

Artifacts (Inputs/Outputs)

<p>Inputs</p> <p>V&V Work Product(s):</p> <ul style="list-style-type: none">a. Business Plan <p>V&V Criteria:</p> <ul style="list-style-type: none">a. Strategic Plan/Destination 2025b. National Aviation Research Planc. Enterprise Architecture <p>Outputs</p> <ul style="list-style-type: none">a. Validated Business Planb. V&V Record
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Generate Ideas/Requests for Changes to the NAS, 1.1.3

During this I2I sub-process, customers, users, FAA research partners, and FAA employees are able to insert a documented new idea with supporting analysis. These ideas are assessed with an enterprise-view by the Concept Steering Group (CSG).

The V&V activity for I2I sub-process 1.1.3 will be the validation of documented research issues and white papers. The documented issues and white papers will be validated against the Strategic Plan (Destination 2025) to ensure the idea supports a single or multiple goals and objectives contained in the Strategic Plan (Destination 2025).

Who is Responsible (Draft)?

Activity	Who's Responsible	Role
Implements V&V	Developer of Work Product	<ul style="list-style-type: none">- Plans and Ensures V&V Occurs- Recommends V&V Agent- Retains and Posts V&V Artifacts
Supports Activity	Independent V&V Agent	<ul style="list-style-type: none">- Performs V&V
Facilitates V&V Process	Appropriate Organization Providing V&V Maintenance and Support	<ul style="list-style-type: none">- Maintains V&V Standards and Repositories- Spot Checks V&V Process- Concurs on V&V Agent- Approves V&V Approach

Artifacts (Inputs/Outputs)

Inputs

V&V Work Product(s):

- a. Documented Research Issues and White Papers

V&V Criteria:

- a. Strategic Plan/Destination 2025

Outputs

- a. Validated Documented Research Issues and White Papers
- b. V&V Record

2.0 SERVICE ANALYSIS

Overview

During the initial part of the Service Analysis, ideas/requests for changes to the National Airspace System (NAS) are collected and assessed for inclusion in the NAS-wide Concept of Operations (ConOps). The ideas/requests that are selected for inclusion are documented in the ConOps and then decomposed into service needs and allocated to Operational Improvements (OIs), Operational Sustainments (OSs), and Operational Capabilities (OCs).

Next, the portfolio allocation activities begin, including decomposing service needs into operational requirements, creating initial Segment Enterprise Architecture (EA) products, and preparing a Concept and Requirements Definition (CRD) plan.

During the final part of Service Analysis, a determination is made if a Capture Team is needed to support the concept & requirements definition, solution development, and solution implementation phases.

2.1 V&V Touch Points in the I2I Process

For Service Analysis, the following touch points were strategically selected as key V&V Activities for this phase. These V&V touch points are listed below and depicted on the I2I Process Flowchart for Service Analysis in Figure 2.1.

- a. Assess Validity of Idea, 2.1.1
- b. Complete Assessment Report, 2.1.5
- c. Decompose ConOps into Service Needs, 2.4.1
- d. Decomposition of Service Needs into Operational Requirements, 2.6.1
- e. Prepare CDR Plan, 2.6.3

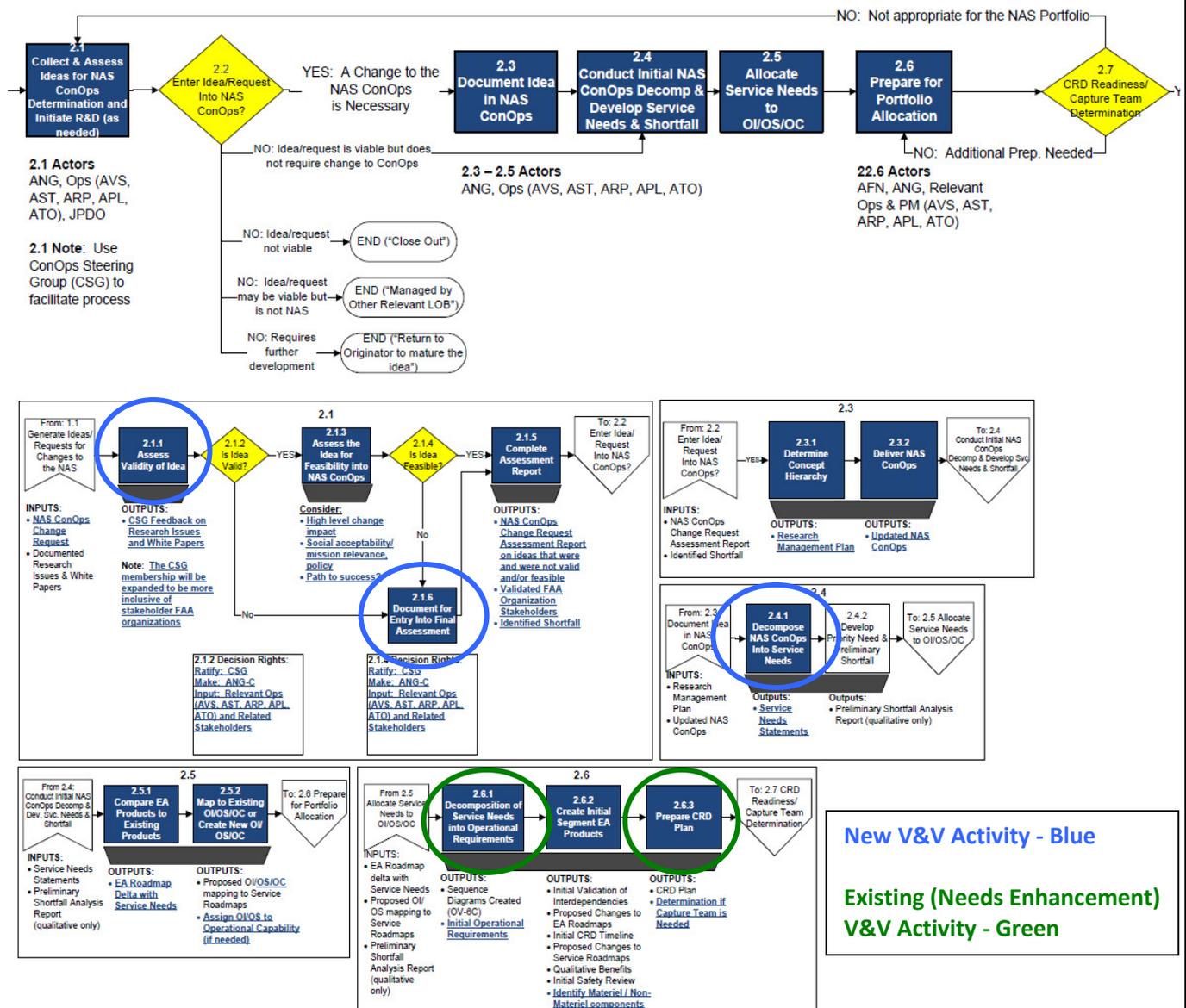


Figure 2.1 – I2I Process Flowchart for Service Analysis

The following sub-processes describe the V&V activity that will be performed for each touch point identified in this phase. The inputs (e.g. documents, work products, or test activity) for each sub-process will be verified and validated against the specified criteria. The validated outputs specified in the tables will become artifacts as a result for each sub-process.

2.2 V&V Process Descriptions

Access Validity of Idea, 2.1.1

Assessing the validity of ideas involves the collection and tracking of new ideas and requests for changes to the NAS. Researchers present ideas and preliminary approaches to the Concept Steering Group (CSG) in the form of white papers, documented research, or other technical

means to further research and concept development. Ideas submitted not requiring research are reviewed by the CSG and assessed based on the information provided. If necessary, research identified by the CSG is pursued to better understand the proposed change.

This V&V activity validates the Decision Basis Document. This validation ensures that the Decision Basis Document is consistent, logical, and in accordance with the FAA’s strategic plan (Destination 2025).

Who is Responsible (Draft)?

Activity	Who’s Responsible	Role
Implements V&V	Developer of Work Product	<ul style="list-style-type: none"> - Plans and Ensures V&V Occurs - Recommends V&V Agent - Retains and Posts V&V Artifacts
Supports Activity	Independent V&V Agent	<ul style="list-style-type: none"> - Performs V&V
Facilitates V&V Process	Appropriate Organization Providing V&V Maintenance and Support	<ul style="list-style-type: none"> - Maintains V&V Standards and Repositories - Spot Checks V&V Process - Concurs on V&V Agent - Approves V&V Approach

Artifacts (Inputs/Outputs)

<p>Inputs V&V Work Product(s): a. Decision Basis Document V&V Criteria: a. Strategic Plan/Destination 2025 Outputs a. Validated Decision Basis Document b. V&V Record</p>
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Complete Assessment Report, 2.1.5

An Assessment Report containing the feasibility analysis and issues to consider for entry of the ideas/requests into ConOps is developed. A list of the individuals that signed-off on the Operational Concept documents will be included.

The V&V activity that needs to be performed is to validate the Assessment Report against the basis for decision. In addition, the validity and feasibility of the issues should be noted and accurate. This validation ensures that the Assessment Report is logical and consistent with the Basis for Decision.

Who is Responsible (Draft)?

Activity	Who's Responsible	Role
Implements V&V	Developer of Work Product	<ul style="list-style-type: none">- Plans and Ensures V&V Occurs- Recommends V&V Agent- Retains and Posts V&V Artifacts
Supports Activity	Independent V&V Agent	<ul style="list-style-type: none">- Performs V&V
Facilitates V&V Process	Appropriate Organization Providing V&V Maintenance and Support	<ul style="list-style-type: none">- Maintains V&V Standards and Repositories- Spot Checks V&V Process- Concurs on V&V Agent- Approves V&V Approach

Artifacts (Inputs/Outputs)

Inputs

V&V Work Product(s):

- a. NAS ConOps Change Request Assessment Report

V&V Criteria:

- a. Decision Basis Document

Outputs

- a. Validated NAS ConOps Change Request Assessment Report with basis for decision
- b. V&V Record

Decompose ConOps into Service Needs, 2.4.1

The ConOps narrative is decomposed into Operational Requirements (ORs), which are documented in the Operational Requirements Document (ORD). This I2I sub-process decomposes the proposed ConOps changes into Operational Needs Statements to enable a Shortfall Analysis to be performed.

The V&V Activity that needs to be performed is to validate the Service Needs Statement against the NAS ConOps, the Enterprise Architecture, the NAS Research and Development Portfolio and the NAS Requirements Document. This V&V activity ensures that the Service Needs Statement is well defined and consistent with all NAS technical documents.

Who is Responsible (Draft)?

Activity	Who's Responsible	Role
Implements V&V	Developer of Work Product	<ul style="list-style-type: none">- Plans and Ensures V&V Occurs- Recommends V&V Agent- Retains and Posts V&V Artifacts
Supports Activity	Independent V&V Agent	<ul style="list-style-type: none">- Performs V&V
Facilitates V&V Process	Appropriate Organization Providing V&V Maintenance and Support	<ul style="list-style-type: none">- Maintains V&V Standards and Repositories- Spot Checks V&V Process- Concurs on V&V Agent- Approves V&V Approach

Artifacts (Inputs/Outputs)

<p>Inputs</p> <p>V&V Work Product(s):</p> <ul style="list-style-type: none">a. Service Needs Statement <p>V&V Criteria:</p> <ul style="list-style-type: none">a. NAS ConOpsb. Enterprise Architecturec. NAS Research & Development Portfoliod. NAS Requirements Document <p>Outputs</p> <ul style="list-style-type: none">a. Validated Service Needs Statementb. V&V Record

Decomposition of Service Needs into Operational Requirements, 2.6.1

At this step, the service needs are decomposed into operational requirements, the initial segment EA products are created, the Concept and Requirements Definition (CRD) plan is created, and the determination is made if a Capture Team is required. This I2I sub-process documents new operational requirements or changes existing requirements based on the ConOps changes.

The V&V process for the Decomposition of Service Needs into Operational Requirements verifies and validates the initial Operational Requirements against NAS ConOps, the Enterprise Architecture, the NAS Requirements Document and the Service Needs Statement. This V&V activity ensures that the initial Operational Requirements are defined correctly and satisfy service needs.

Who is Responsible (Draft)?

Activity	Who's Responsible	Role
Implements V&V	Developer of Work Product	<ul style="list-style-type: none"> - Plans and Ensures V&V Occurs - Recommends V&V Agent - Retains and Posts V&V Artifacts
Supports Activity	Independent V&V Agent	<ul style="list-style-type: none"> - Performs V&V
Facilitates V&V Process	Appropriate Organization Providing V&V Maintenance and Support	<ul style="list-style-type: none"> - Maintains V&V Standards and Repositories - Spot Checks V&V Process - Concurs on V&V Agent - Approves V&V Approach

Artifacts (Inputs/Outputs)

<p>Inputs</p> <p>V&V Work Product(s):</p> <ul style="list-style-type: none"> a. Initial Operational Requirements <p>V&V Criteria:</p> <ul style="list-style-type: none"> a. NAS ConOps b. Enterprise Architecture c. NAS Requirements Document d. Service Needs Statement <p>Outputs</p> <ul style="list-style-type: none"> a. Validated Initial Operational Requirements b. V&V Record
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Prepare CRD Plan, 2.6.3

The CRD Plan is developed and analysis is conducted to determine if a Capture Team is needed. Service organizations assist to prepare the CRD Plan. The plan 1) specifies how the tasks of CRD are accomplished, 2) defines the roles and responsibilities of participating organizations, 3) defines outputs and exit criteria, 4) establishes a schedule for completion, and 5) specifies needed resources.

The V&V process for the preparation of the CRD Plan verifies and validates the CRD Plan against the NAS ConOps, Solution Level ConOps, NextGen Implementation Plan, NextGen Segment Implementation Plan, NAS ConOps Change Request Assessment Report, initial Operational Requirements, Enterprise Architecture, NAS Requirements Document, and AMS Policy/Guidance. This V&V activity ensures that the CRD Plan is effective, sufficient, developed correctly, and satisfies service needs.

Who is Responsible (Draft)?

Activity	Who's Responsible	Role
Implements V&V	Developer of Work Product	<ul style="list-style-type: none">- Plans and Ensures V&V Occurs- Recommends V&V Agent- Retains and Posts V&V Artifacts
Supports Activity	Independent V&V Agent	<ul style="list-style-type: none">- Performs V&V
Facilitates V&V Process	Appropriate Organization Providing V&V Maintenance and Support	<ul style="list-style-type: none">- Maintains V&V Standards and Repositories- Spot Checks V&V Process- Concurs on V&V Agent- Approves V&V Approach

Artifacts (Inputs/Outputs)

Inputs

V&V Work Product(s):

- a. CRD Plan

V&V Criteria:

- a. NAS ConOps
- b. Solution Level ConOps
- c. NextGen Implementation Plan
- d. NextGen Segment Implementation Plan
- e. NAS ConOps Change Request Assessment Report
- f. Initial Operational Requirements
- g. Enterprise Architecture
- h. NAS Requirements Document
- i. AMS Policy/Guidance

Outputs

- a. Validated CRD Plan
- b. V&V Record

3.0 CRD, SOLUTION DEVELOPMENT AND COMMITMENT

Overview

During this section of the process, Operational Improvements (OIs), Operational Sustainments (OSs), and Operational Capabilities (OCs) are matured through the Concept and Requirements Definition. After CRD, the investment analysis takes place.

Prior to Initial Investment Decision (IID), V&V activities will focus on verifying and validating the:

- a. Updated EA Products
- b. Solution Level Concept of Operations (ConOps)
- c. Operational Capability Integration Plan (OCIP)
- d. Functional Requirements, System Requirements
- e. Updated Program Requirements Document (PRD)

Prior to Final Investment Decision (FID), V&V activities will focus on verifying and validating the:

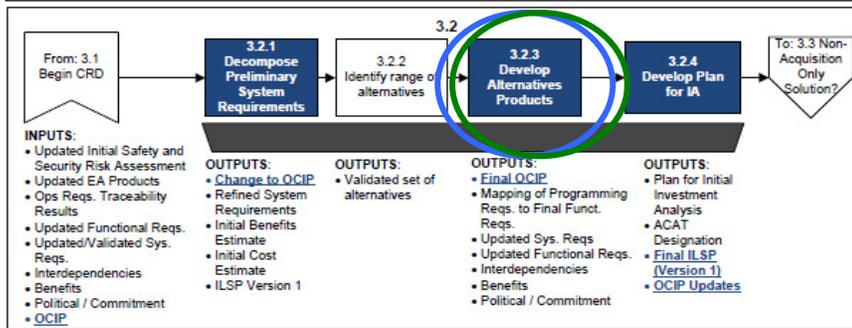
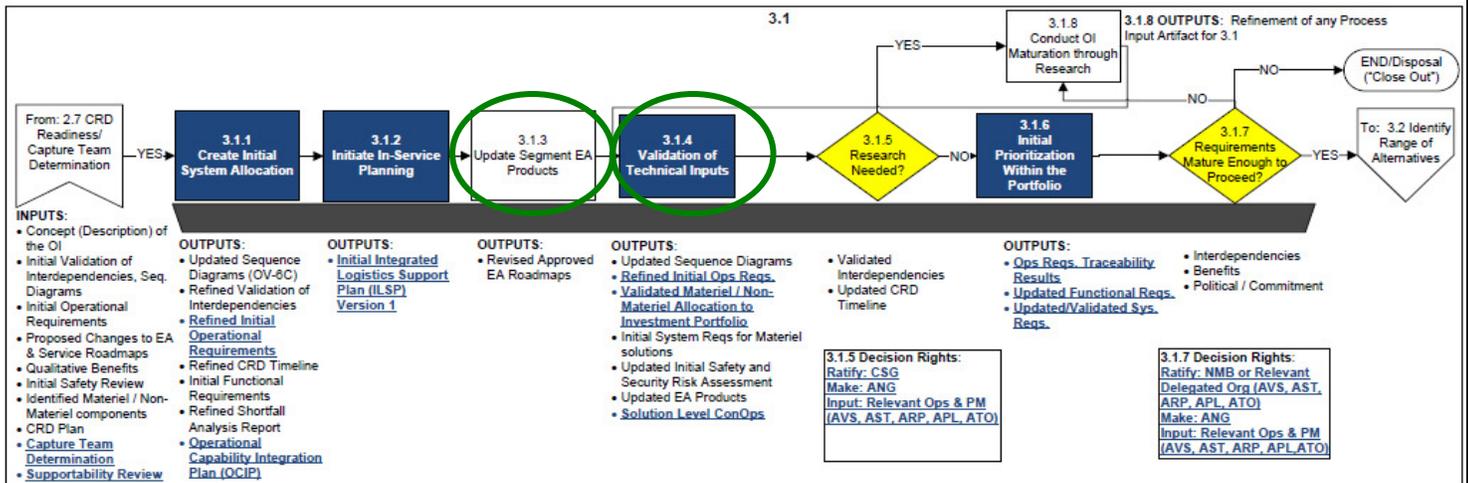
- a. Final Program Requirements Document (PRD)
- b. Acquisition Program Baseline (APB)
- c. Implementation Strategy and Planning Document (ISPD)
- d. In-Service Review Checklist
- e. Screening Information Request (SIR)
- f. Test and Evaluation Master Plan (TEMP)

3.1 V&V Touch Points in the IZI Process

The following are V&V touch points that will require V&V activities:

- a. Update Segment EA Products, 3.1.3
- b. Validation of Technical Inputs, 3.1.4
- c. Develop Alternative Products, 3.2.3
- d. Conduct Initial Investment Analysis, 3.7
- e. Conduct Final Investment Analysis, 3.9

The following flow charts in Figure 3.1 show the V&V touch points in the I2I process.



New V&V Activity - Blue

Existing (Needs Enhancement) V&V Activity - Green

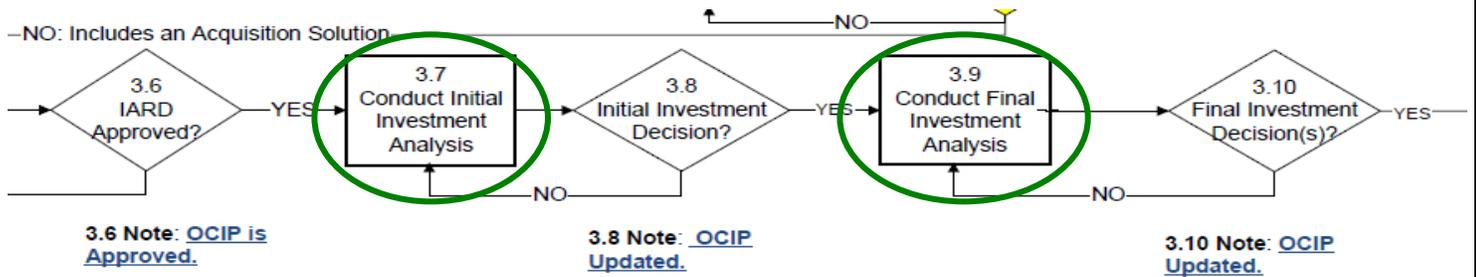


Figure 3.1 – I2I Process Flowchart for CRD, Solution Development, and Commitment

The following sub-processes describe the V&V activity that will be performed for each touch point identified in this phase. The inputs (e.g. documents, work products, or test activity) for each sub-process will be verified and validated against the specified criteria. The validated outputs specified in the tables will become artifacts as a result for each sub-process.

3.2 V&V Process Descriptions

Update Segment EA Products Descriptions, 3.1.3

The V&V process for the Update Segment EA Products addresses sub-process 3.1.3 in the I2I process flow. This process validates the updates to the EA products against the baseline EA, initial Operational Requirements, NAS ConOps, Solution Level ConOps, NextGen Segment Implementation Plan, preliminary Program Requirements Document and NAS Requirements Documents to ensure that the EA changes are applied correctly and integrate with the NAS.

Who is Responsible (Draft)?

Activity	Who's Responsible	Role
Implements V&V	Developer of Work Product	<ul style="list-style-type: none">- Plans and Ensures V&V Occurs- Recommends V&V Agent- Retains and Posts V&V Artifacts
Supports Activity	Independent V&V Agent	<ul style="list-style-type: none">- Performs V&V
Facilitates V&V Process	Appropriate Organization Providing V&V Maintenance and Support	<ul style="list-style-type: none">- Maintains V&V Standards and Repositories- Spot Checks V&V Process- Concurs on V&V Agent- Approves V&V Approach

Artifacts (Inputs/Outputs)

Inputs

V&V Work Product(s):

- a. Updates to the EA products

V&V Criteria:

- a. EA (baseline)
- b. Initial Operational Requirements
- c. NAS ConOps
- d. Solution Level ConOps
- e. NextGen Segment Implementation Plan
- f. Preliminary Program Requirements Document
- g. NAS Requirements Documents

Outputs

- a. Validated EA Products
- b. V&V Record

Validation of Technical Inputs, 3.1.4

The V&V process for the Validation of Technical Inputs addresses sub-process 3.1.4 in the I2I process flow. This process verifies and validates the Solution Level ConOps against the EA, NAS ConOps, NAS Requirements Documents, NextGen Implementation Plan, NextGen Segment

Implementation Plan and initial Operational Requirements. Also, new Operational Requirements or changes to existing requirements that are documented based on changes to the ConOps are validated against the Solution Level ConOps, NAS ConOps, and NAS Requirements Documents. These V&V activities ensure that the Solution Level ConOps and associated requirements changes are defined correctly and satisfy service needs.

Who is Responsible (Draft)?

Activity	Who's Responsible	Role
Implements V&V	Developer of Work Product	<ul style="list-style-type: none"> - Plans and Ensures V&V Occurs - Recommends V&V Agent - Retains and Posts V&V Artifacts
Supports Activity	Independent V&V Agent	<ul style="list-style-type: none"> - Performs V&V
Facilitates V&V Process	Appropriate Organization Providing V&V Maintenance and Support	<ul style="list-style-type: none"> - Maintains V&V Standards and Repositories - Spot Checks V&V Process - Concurs on V&V Agent - Approves V&V Approach

Artifacts (Inputs/Outputs):

<p><u>Inputs</u> V&V Work Product(s):</p> <ol style="list-style-type: none"> a. Solution Level ConOps b. Operational Requirements <p>V&V Criteria:</p> <ol style="list-style-type: none"> a. Enterprise Architecture b. NAS ConOps c. NAS Requirements Documents d. NextGen Implementation Plan e. NextGen Segment Implementation Plan f. Solution Level ConOps g. Initial Operational Requirements <p><u>Outputs</u></p> <ol style="list-style-type: none"> a. Validated Solution Level ConOps b. Validated Initial Operational Requirements (if changed) c. V&V Record

Development of Alternative Products, 3.2.3

The V&V process for the Development of Alternative Products addresses sub-process 3.2.3 in the I2I process flow. This process verifies and validates updated Functional Requirements, updated System Requirements, and Operational Capability Integration Plan (OCIP) against the EA, Initial Operational Requirements, Solution Level ConOps and NextGen Segment Implementation Plan (NSIP). These V&V activities ensure that the associated requirements and plans are defined correctly and satisfy service needs.

Who is Responsible (Draft)?

Activity	Who's Responsible	Role
Implements V&V	Developer of Work Product	<ul style="list-style-type: none">- Plans and Ensures V&V Occurs- Recommends V&V Agent- Retains and Posts V&V Artifacts
Supports Activity	Independent V&V Agent	<ul style="list-style-type: none">- Performs V&V
Facilitates V&V Process	Appropriate Organization Providing V&V Maintenance and Support	<ul style="list-style-type: none">- Maintains V&V Standards and Repositories- Spot Checks V&V Process- Concurs on V&V Agent- Approves V&V Approach

Artifacts (Inputs/Outputs)

<p>Inputs</p> <p>V&V Work Product(s):</p> <ul style="list-style-type: none">a. Updated Functional Requirementsb. Updated System Requirementsc. Operational Capability Integration Plan <p>V&V Criteria:</p> <ul style="list-style-type: none">a. Enterprise Architectureb. Initial Operational Requirementsc. Solution Level ConOpsd. NextGen Segment Implementation Plan <p>Outputs</p> <ul style="list-style-type: none">a. Validated Updated Functional Requirementsb. Validated Updated System Requirementsc. Validated Operational Capability Integration Pland. V&V Record
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Conduct Initial Investment Analysis, 3.7

The V&V process for the Conduct of Initial Investment Analysis addresses sub-process 3.7 in the I2I process flow. This process verifies and validates the updated Program Requirements Document (PRD) against the EA, NSIP, Functional Requirements, Solution Level ConOps, NAS Requirements Document, Functional Analyses Products, and Results of Assessment (if available). These V&V activities ensure that the requirements in the updated Program Requirements are defined correctly, are testable, and satisfy service needs.

Who is Responsible (Draft)?

Activity	Who's Responsible	Role
Implements V&V	Developer of Work Product	<ul style="list-style-type: none">- Plans and Ensures V&V Occurs- Recommends V&V Agent- Retains and Posts V&V Artifacts
Supports Activity	Independent V&V Agent	<ul style="list-style-type: none">- Performs V&V
Facilitates V&V Process	Appropriate Organization Providing V&V Maintenance and Support	<ul style="list-style-type: none">- Maintains V&V Standards and Repositories- Spot Checks V&V Process- Concurs on V&V Agent- Approves V&V Approach

Artifacts (Inputs/Outputs)

Inputs

V&V Work Product(s):

- a. Program Requirements Document

V&V Criteria:

- a. Enterprise Architecture
- b. NextGen Segment Implementation Plan
- c. Functional Requirements
- d. Solution Level ConOps
- e. NAS Requirement Documents
- f. Functional Analyses Products
- g. Results of Assessment (if available)

Outputs

- a. Validated Program Requirements Document
- b. V&V Record

Conduct Final Investment Analysis, 3.9

The V&V process for the Conduct of Final Investment Analysis addresses sub-process 3.9 in the I2I process flow. This process verifies and validates the:

- a. Final Program Requirements Document (PRD) against the EA, Functional Requirements, Solution Level ConOps, NAS Requirement Documents, Functional Analyses Products, and Results of Assessments to ensure that the requirements are defined correctly and satisfy service needs
- b. Acquisition Program Baseline (APB) against the EA, Solution Level ConOps, Functional Analyses Products, Functional Requirements, and final PRD to ensure that the baseline is defined correctly and it satisfies service needs
- c. Implementation Strategy and Planning Document (ISPD) against the EA and final PRD to ensure that the plan is developed correctly and it satisfies service needs
- d. In-Service Review Checklist against the ISPD, final PRD, and Solution Level ConOps to ensure that the checklist is developed and supports the implementation of service needs

- e. Screening Information Request (SIR) against the ISPD and final PRD to ensure that it is defined correctly and satisfies service needs
- f. Test and Evaluation Master Plan (TEMP) against the ISPD, final PRD, and Solution Level ConOps to ensure that the plan is developed correctly and supports the implementation of service needs

Who is Responsible (Draft)?

Activity	Who's Responsible	Role
Implements V&V	Developer of Work Product	<ul style="list-style-type: none"> - Plans and Ensures V&V Occurs - Recommends V&V Agent - Retains and Posts V&V Artifacts
Supports Activity	Independent V&V Agent	<ul style="list-style-type: none"> - Performs V&V
Facilitates V&V Process	Appropriate Organization Providing V&V Maintenance and Support	<ul style="list-style-type: none"> - Maintains V&V Standards and Repositories - Spot Checks V&V Process - Concurs on V&V Agent - Approves V&V Approach

Artifacts (Inputs/Outputs)

Inputs
V&V Work Product(s):

- a. Program Requirements Document
- b. Acquisition Program Baseline
- c. Implementation Strategy and Planning Document
- d. In-Service Review Checklist
- e. Screening Information Request
- f. Test and Evaluation Master Plan

V&V Criteria:

- a. Enterprise Architecture
- b. Functional Requirements
- c. Solution Level ConOps
- d. NAS Requirement Documents
- e. Functional Analyses Products
- f. Results of Assessments
- g. Final Program Requirements Document
- h. Implementation Strategy and Planning Document

Outputs

- a. Validated Program Requirements Document
- b. Validated Acquisition Program Baseline
- c. Validated Implementation Strategy and Planning Document
- d. Validated In-Service Review Checklist
- e. Validate Screening Information Request
- f. Validated Test and Evaluation Master Plan
- g. V&V Record

4.0 SOLUTION IMPLEMENTATION

Overview

Solution Implementation begins at the Final Investment Decision (FID) when the Investment Decision Authority (IDA) approves and funds an investment program or segment, establishes the Acquisition Program Baseline (APB) 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.

4.1 V&V Touch Points in the I2I Process

The portion of the I2I process flowchart in Figure 4.1 depicts the Solution Implementation actions and activities the service organization needs to execute. The V&V touch point in this phase is: Verify Operational Readiness, 4.1.3

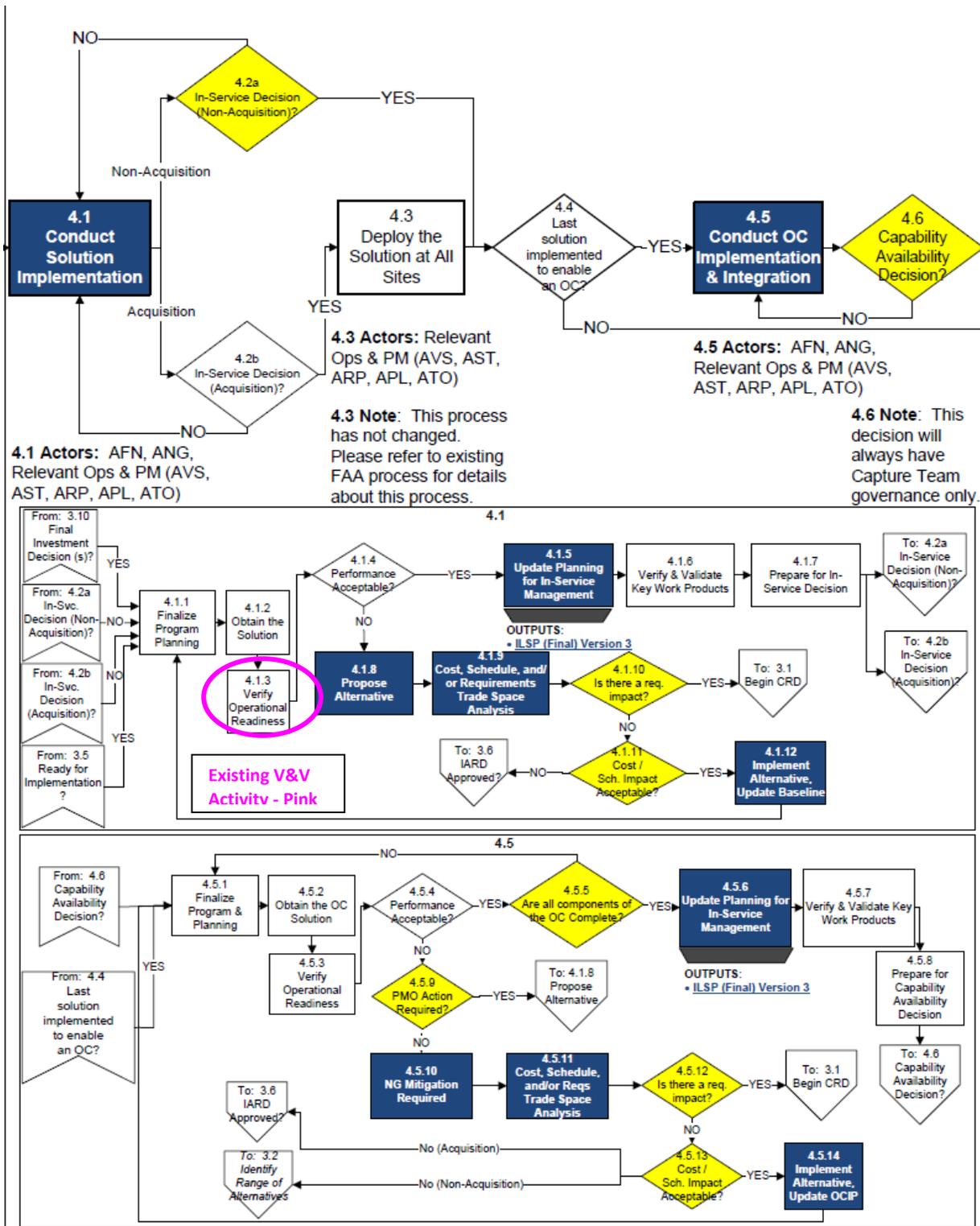


Figure 4.1 - I2I Process Flowchart for Solution Implementation

The following sub-process describes the V&V activity that will be performed for each touch point identified in this phase. The inputs (e.g. documents, work products, or test activity) for

each sub-process will be verified and validated against the specified criteria. The validated outputs specified in the tables will become artifacts as a result for each sub-process.

4.2 V&V Process Descriptions

Verify Operational Readiness, 4.1.3

The service organization manages all activities necessary to install the solution at a designated site(s) and test it thoroughly to verify operational readiness. Operational readiness encompasses operational effectiveness and suitability. Operational effectiveness measures how well the solution satisfies the service need and operational requirements. Operational suitability measures how well a product can be integrated and employed for field use. To verify operational readiness, it is key to perform V&V activities of DT and OT test documentation to ensure that requirements specified in these technical documents have been satisfied and that the system is ready for operational use.

The V&V process to Verify Operational Readiness addresses sub-process 4.1.3 in the I2I process flow. This process verifies and validates:

- a. The contract against the final PRD, the ISPD, and the results of negotiations with the Contractor
- b. The contract specifications against the FAA system specification and the contract
- c. The design documents against the system specification and the final PRD
- d. The Safety Risk Management Document or System Safety Assessment Report against known safety issues/vulnerabilities, Solution Level ConOps, and the final PRD
- e. The system/service against the system specification and/or the lower-level specifications, Safety Risk Management Document, contract, final PRD, Solution Level ConOps, and the NAS Requirements Document
- f. The completed In-Service Review (ISR) Checklist against the results of program implementation

These V&V activities ensure that the solution is built correctly, the solution integrates into the NAS, the program baseline objectives are achieved, and the service needs established for the solution have been satisfied.

Who is Responsible (Draft)?

Activity	Who's Responsible	Role
Implements V&V	Developer of Work Product	<ul style="list-style-type: none"> - Plans and Ensures V&V Occurs - Recommends V&V Agent - Retains and Posts V&V Artifacts
Supports Activity	Independent V&V Agent	<ul style="list-style-type: none"> - Performs V&V
Facilitates V&V Process	Appropriate Organization Providing V&V Maintenance and Support	<ul style="list-style-type: none"> - Maintains V&V Standards and Repositories - Spot Checks V&V Process - Concurs on V&V Agent - Approves V&V Approach

Artifacts (Inputs/Outputs)

Inputs

V&V Work Product(s):

- a. Contract
- b. Contract Specifications
- c. Design Documents
- d. Safety Risk Management Document or System Safety Assessment Report
- e. System/Service
- f. In-Service Review Checklist

V&V Criteria:

- a. Final Program Requirements Document
- b. Implementation Strategy and Planning Document
- c. Results of negotiations with contractor
- d. System Specification
- e. Lower-level Specifications
- f. Safety Risk Management Document
- g. Contract
- h. Known safety issues/vulnerabilities
- i. Solution Level ConOps
- j. NAS Requirements Document
- k. Results of program implementation

Outputs

- a. Validated Contract
- b. Validated Contract Specification
- c. Validated Design Documents
- d. Validated Safety Risk Management Document or System Safety Assessment Report
- e. Verified and Validated System/Service
- f. Validated In-Service Review Checklist
- g. V&V Record

5.0 IN-SERVICE MANAGEMENT

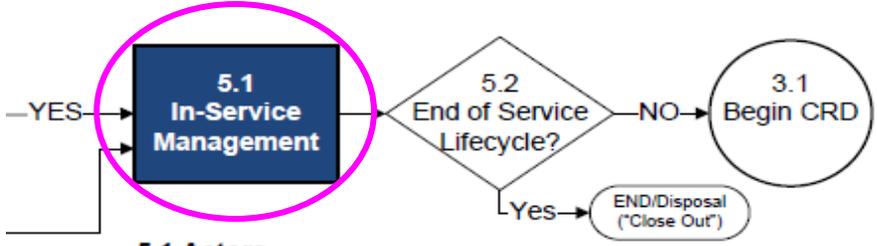
Overview

Activity during In-Service Management (ISM) 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 mission and investment analysis as the basis for revalidating the need to sustain deployed assets or taking other action to improve service delivery.

5.1 V&V Touch Points in the I2I Process

The portion of the I2I process flowchart in Figure 5.1 depicts the ISM actions and activities the service organization needs to execute. The V&V touch point in this phase is: In-Service Management, 5.1

Existing V&V Activity - Pink



5.1 Actors
 AFN, ANG, Relevant Ops & PM (AVS, AST, ARP, APL, ATO)

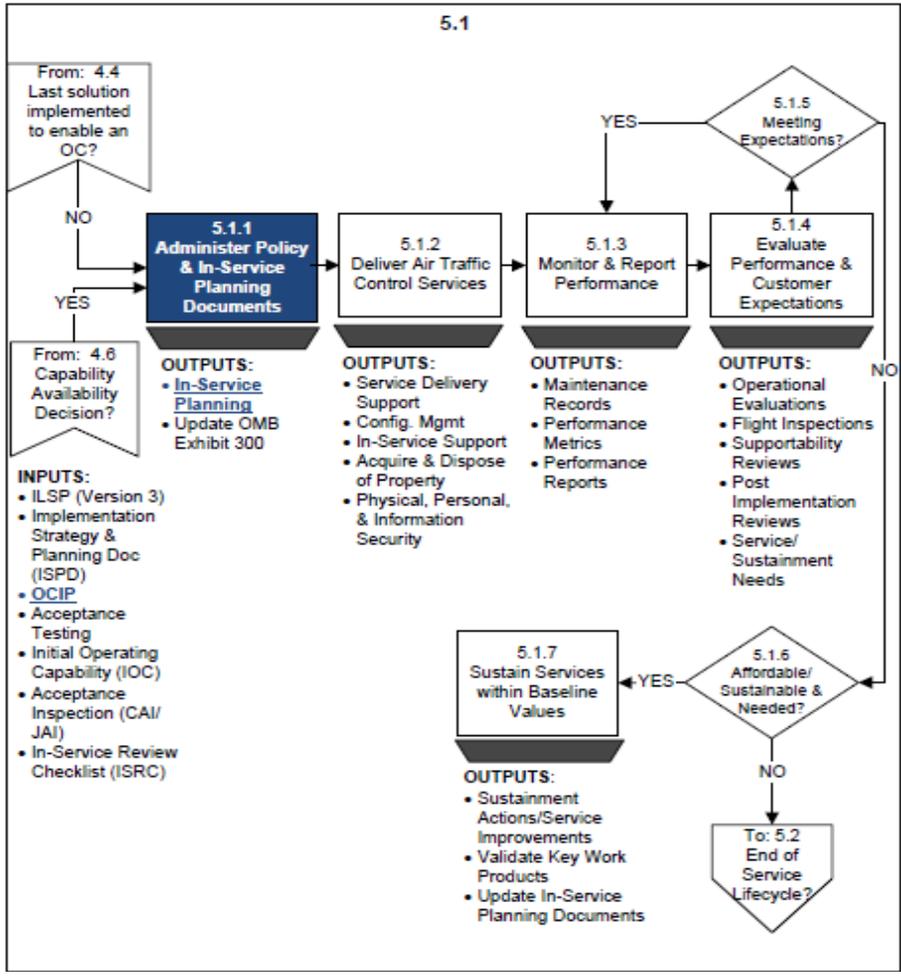


Figure 5.1 - I2I Process Flowchart for In-Service Management

The following process describes the V&V activities that will be performed for each touch point identified in this phase. The inputs (e.g. documents, work products, or test activity) for each process will be verified and validated against the specified criteria. The validated outputs specified in the tables will become artifacts as a result for each process.

5.2 V&V Process Descriptions

In-Service Management, 5.1

The V&V process for In-Service Management addresses sub-process 5.1 in the I2I process flow. This process verifies and validates:

- a. Updates to the Enterprise Architecture (EA) Products against the EA, NSIP, and the NAS Requirements Document
- b. NAS Change Proposals (NCPs)/Changed Requirements against the Post Implementation Reviews, operational analyses, and the final PRD
- c. Implemented changes to the NAS baseline system/service against the final PRD, NCP(s), system specification and/or lower-level specifications, and Functional Description Document(s)
- d. System Support Directives (SSDs) against system/service procedures
- e. The updates to the ISPD against the EA, Solution Level Concept of Operations (ConOps), functional analyses, updated PRD, and detailed strategy for procuring, implementing, testing, and supporting the solution

These V&V activities ensure that the changes to the NAS are built correctly, the changes integrate into the NAS, program objectives are achieved, and the service needs established for NAS changes have be satisfied.

Who is Responsible (Draft)?

Activity	Who's Responsible	Role
Implements V&V	Developer of Work Product	<ul style="list-style-type: none"> - Plans and Ensures V&V Occurs - Recommends V&V Agent - Retains and Posts V&V Artifacts
Supports Activity	Independent V&V Agent	<ul style="list-style-type: none"> - Performs V&V
Facilitates V&V Process	Appropriate Organization Providing V&V Maintenance and Support	<ul style="list-style-type: none"> - Maintains V&V Standards and Repositories - Spot Checks V&V Process - Concurs on V&V Agent - Approves V&V Approach

Artifacts (Inputs/Outputs)

Inputs

V&V Work Product(s):

- a. Updates to the Enterprise Architecture products
- b. NAS Change Proposals
- c. Implemented changes to the baseline system/service
- d. System Support Directives
- e. Updates to the Implementation Strategy and Planning Document

V&V Criteria:

- a. Enterprise Architecture
- b. NextGen Segment Implementation Plan

- c. NAS Requirements Document
- d. Post Implementation Reviews
- e. Operational analyses
- f. Final Program Requirements Document
- g. NAS Change Proposals
- h. System Specification
- i. Lower-level Specifications
- j. Functional Description Document
- k. System/Service procedures
- l. Solution Level Concept of Operations
- m. Functional analyses
- n. Updated Program Requirements Document
- o. Detailed strategy for procuring, implementing, testing, and supporting the solution

Outputs

- a. Validated updates to EA Products
- b. Validated NAS Change Proposals
- c. Validated changes to the baseline system/service
- d. Validated System Support Directives
- e. Validated updates to the Implementation Strategy and Planning Document
- f. V&V Record

6.0 Appendix

6.1 Touch Points and New or Existing V&V Activities

Lifecycle Phase	Touch Points & V&V Activities	Work Products	New or Existing V&V Activities
Strategic Inputs	1.1.1	Business Plan	New
	1.1.3	Documented Research Issues & White Papers	New
Service Analysis	2.1.1	Decision Basis Document	New
	2.1.5	Assessment Report	New
	2.4.1	Service Needs Statement	New
	2.6.1	Initial Operational Requirements	Existing (Needs Enhancement)
	2.6.3 Activity 1	Concept and Requirements Definition (CRD) Plan	Existing (Needs Enhancement)
	2.6.3 Activity 2 2.6.3 Activity 3	CRD Plan CRD Plan	Existing (Needs Enhancement) Existing (Needs Enhancement)
CRD, Solution Development, & Commitment	3.1.3	EA Products	Existing (Needs Enhancement)
	3.1.4 Activity 1	Solution Level Concept of Operations	Existing (Needs Enhancement)
	3.1.4 Activity 2	Initial Operational Requirements	Existing (Needs Enhancement)
	3.2.3 Activity 1	Updated Functional Requirements	Existing (Needs Enhancement)
	3.2.3 Activity 2	Updated System Requirements	Existing (Needs Enhancement)
	3.2.3 Activity 3	Final Operational Capability Integration Plan	New
	3.7	Updated Program Requirements Document (PRD)	Existing (Needs Enhancement)
	3.9 Activity 1	Final PRD	Existing (Needs Enhancement)
	3.9 Activity 2	Acquisition Program Baseline	Existing (Needs Enhancement)
	3.9 Activity 3	Implementation Strategy and Planning Document (ISPD)	Existing (Needs Enhancement)
3.9 Activity 4	In-Service Review (ISR) Checklist	Existing (Needs Enhancement)	
3.9 Activity 5	Screening Information	Existing (Needs Enhancement)	

Lifecycle Phase	Touch Points & V&V Activities	Work Products	New or Existing V&V Activities
	3.9 Activity 6	Request (SIR) Test and Evaluation Master Plan (TEMP)	Existing (Needs Enhancement)
Solution Implementation	4.1.3 Activity 1 4.1.3 Activity 2 4.1.3 Activity 3 4.1.3 Activity 4 4.1.3 Activity 5 4.1.3 Activity 6	Contract Contract Specifications Design Documents Safety Risk Management Document or System Safety Assessment Report System/Service Completed ISR Checklist	Existing Existing Existing Existing Existing Existing
In-Service Management	5.1 Activity 1 5.1 Activity 2 5.1 Activity 3 5.1 Activity 4 5.1 Activity 5	Updates to the EA Products NAS Change Proposals/ Changed Requirements Implemented changes to the Baseline System/Service System Support Directives Updates to the ISPD	Existing Existing Existing Existing Existing