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16. Abstract

The FAA established the Air Traffic Safety Oversight Service (AOV) to provide independent safety oversight of the Air Traffic Organization's (ATO's) provision of air traffic services. To support its mission, AOV initiated a research effort to develop a decision-making support tool, Integrated Domain Assessment of Future Systems (IDA-FS), to assist AOV with the review, evaluation, and approval of controls proposed to mitigate high-risk hazards associated with new or modified National Airspace Systems (NAS), given the introduction of multiple changes to the NAS. This document summarizes the results of research and interviews with AOV representatives to assess AOV needs with regard to ATO Safety Risk Management Document review and the approval of hazard controls. Preliminary functional needs are identified and will be used to support the development of the IDA-FS Concept of Operations.

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LIST OF ACRONYMS

AAC	Acceptance, Approval, and Concurrence
AAWG	AOV Approval Working Group
AIDS	Accident/Incident Data System
AMS	Acquisition Management System
AOV	Air Traffic Safety Oversight Service
ASIAS	Aviation Safety Information Analysis and Sharing System
ASRS	Aviation Safety Reporting System
ATC	Air traffic control
ATQA	Air Traffic Quality Assurance
ATO	Air Traffic Organization
AVS	Office of Aviation Safety
CEDAR	Comprehensive Electronic Data Analysis and Reporting
ConOps	Concept of Operations
CSA	Central Service Area
ESA	Eastern Service Area
HRH	High-risk hazard
HTS	Hazard tracking system
IDA-FS	Integrated Domain Assessment of Future Systems
IOT&E	Independent Operational Test and Evaluation
ISAA	Independent Safety Assessment
NAS	National Airspace System
OSA	Operational Safety Assessment
PHA	Preliminary Hazard Analysis
PI	Priority Index
PPI	Preliminary Priority Index
RAV	Risk Analysis Evaluation
REW	Request Evaluation Worksheet
SOC	Safety Oversight Circular
SMART	Safety Management Action Review Team
SMS	Safety Management System
SRM	Safety Risk Management
SRMD	Safety Risk Management Document
SRMDM	Safety Risk Management Decision Memo
SRMGSA	Safety Risk Management Guidance for System Acquisitions
SRMP	Safety Risk Management Panel
SRMTS	Safety Risk Management Tracking System
SSAR	System Safety Assessment Report
WSA	Western Service Area

EXECUTIVE SUMMARY

In accordance with the Air Traffic Organization (ATO) Safety Management System requirements, proposed National Airspace System (NAS) changes must be examined for system safety risk. Initial high risk must be mitigated to an acceptable level or eliminated before a change to the NAS is implemented. The ATO prepares Safety Risk Management Documents (SRMDs) to describe the safety analysis for a proposed change to the NAS and to document evidence justifying whether the proposed change is acceptable from a safety perspective. Among other scenarios, SRMDs are submitted to Air Traffic Safety Oversight Service (AOV) when the safety analysis identifies an initial or current high-risk hazard (HRH).

As part of AOV's air traffic safety oversight role described in FAA Order 1100.161, AOV must approve (or reject) controls for initial or current HRHs before the ATO can implement the proposed NAS change. To support its mission, AOV initiated a research effort to develop a decision-making support tool, Integrated Domain Assessment of Future Systems (IDA-FS), to support evaluation of controls proposed to mitigate HRHs associated with new and modified NAS systems. The tool is required to identify safety interactions among multiple changes to the NAS to provide context for AOV's review of SRMDs and HRH controls. This document summarizes the results of research and interviews conducted with AOV representatives to identify observed shortfalls in legacy processes and tools AOV uses for SRMD reviews and control approval decisions. These legacy processes and tools pre-date ongoing changes AOV is implementing to its Acceptance, Approval, and Concurrence (AAC) processes and resources. As a result, the aforementioned shortfalls are allocated to a combination of potential solutions, including IDA-FS and AOV's updated AAC process, and planned knowledge management infrastructure initiatives, such as AOV Connect (described in the final paragraph of section 2.2). Ultimately, this document establishes the mission-level need for the IDA-FS tool and a preliminary set of IDA-FS functional capabilities. These functional capabilities will be used to support the development of Concept of Operations for the IDA-FS tool.

1. INTRODUCTION

1.1 BACKGROUND

The FAA established the Air Traffic Safety Oversight Service (AOV) to provide independent safety oversight of Air Traffic Organization (ATO) air traffic services. FAA Order 1100.161 CHG 1 outlines the manner by which AOV conducts safety oversight, the respective responsibilities of ATO and AOV regarding National Airspace System (NAS) safety, and the requirements and safety standards under which the ATO will operate [1].

In accordance with FAA Order 1100.161 CHG 1, AOV's oversight of the ATO uses a systems safety approach in which ATO operational systems, policies, procedures, and practices are considered integral to NAS safety. The AOV oversight techniques include audits, document reviews, and inspections to monitor ATO compliance with safety standards. Safety and operational data are regularly analyzed for hazards, risk mitigation effectiveness, and safety trends. One of AOV's responsibilities defined in FAA Order 1100.161 CHG 1 is to approve the controls proposed by ATO for mitigating or eliminating initial or current high-risk hazards (HRHs) prior to system implementation.

In accordance with the ATO Safety Management System (SMS) requirements, proposed NAS changes must be examined for system safety risk. Initial high risk must be mitigated to an acceptable level or eliminated before a change to the NAS is implemented. The ATO prepares Safety Risk Management Documents (SRMDs) to describe the safety analysis for a proposed change to the NAS and to document evidence justifying whether the proposed change is acceptable from a safety perspective. All stakeholders involved in implementing the change to the NAS or related safety-risk controls must review and sign off on the SRMD, and the residual safety risk must be accepted by the appropriate authority before the change can be implemented.

Among other scenarios, SRMDs are submitted to AOV for approval when the safety analysis identifies an initial or current HRH. As part of AOV's air traffic safety oversight role described in FAA Order 1100.161 CHG 1, AOV must approve (or reject) controls for initial or current HRHs before the ATO can implement the proposed NAS change [1]. The AOV specialists review ATO-recommended controls for effectiveness in reducing or eliminating high risk.

The AOV Acceptance, Approval, and Concurrence (AAC) Work Instruction, previously known as the AAC Process Manual, defines a step-by-step process for AOV safety specialists to review and address the SRMD from request receipt to response. The AAC Work Instruction provides guidance for AOV's Request Evaluation Team (RET) to review ATO's SRMDs and to make an approval or rejection recommendation on the controls proposed by ATO for mitigating or eliminating HRHs identified in its SRMDs.

One of the major challenges that AOV faces through the review and approval process is that the current ATO Safety Risk Management (SRM) process focuses on individual changes to the NAS, which means that an SRMD and associated controls do not necessarily consider potential interactions with other changes in the NAS. In reality, however, multiple changes to the NAS often take place at the same time, which may collectively impact the safety of the NAS, either positively or negatively. The AOV's current AAC process, which also focuses on individual changes, will

not necessarily identify hazards created by unanticipated consequences of interactions between projects, between changes, or even between a change and legacy system. As a result, AOV has recognized a need for a methodology and tool to assist in assessing the potential safety risks of both individual and multiple changes to the NAS. The Integrated Domain Assessment of Future Systems (IDA-FS) is the decision-analysis support tool being developed to meet this need.

A comprehensive analysis of AOV's needs and expectations for the IDA-FS tool was performed as a first step toward defining the IDA-FS Concept of Operations (ConOps). A number of capability shortfalls related to AOV's SRMD review processes were identified. This report documents findings from a review of AOV processes for AAC decision making and interviews with AOV representatives. A subset of the identified AOV needs will be addressed by the IDA-FS tool, whereas others may be met by AAC process improvements or other AOV initiatives, such as AOV Connect.

1.2 OBJECTIVE AND SCOPE

The objective of this report is to identify AOV's needs for IDA-FS, a decision-making support tool that will support AOV's review and evaluation of SRMDs and approval of controls proposed to mitigate HRHs associated with proposed changes to the NAS.

This report examines legacy AOV processes and resources for evaluating SRMDs and making approval decisions regarding HRH controls. Shortfalls observed with these legacy processes and resources are allocated to a combination of solutions, including the IDA-FS tool and AOV's ongoing AAC enhancement, and AOV Connect, a planned advanced knowledge management infrastructure.

1.3 DEFINITIONS

Definitions for the following terms used throughout this report are from FAA Order 1100.161 Change 1 [1]:

- Acceptance–The process whereby the regulating organization has delegated the authority to the service provider to make changes within the confines of approved standards and only requires the service provider to notify the regulator of those changes within 30 days. Changes made by the service provider in accordance with its delegated authority can be made without prior approval by the regulator.
- Approval—The formal act of approving a change submitted by a requesting organization. This action is required prior to the proposed change being implemented.
- Control–A mitigation that exists or is proposed to prevent or reduce hazard occurrence or to mitigate the effect of a hazard. Examples of a control include design choices, additional systems, procedures, training, and warnings to personnel.
- Hazard–Any real or potential condition that can cause injury, illness, or death to people; damage to or loss of a system, equipment, or property; or damage to the environment. A hazard is a condition that is a prerequisite to an accident or incident.
- HRH–A hazard identified in a safety analysis that has an initial, current, or final risk rating of "High," as defined by the ATO SMS Manual.

- Oversight–To validate the development of a defined system and verify compliance to a predefined set of standards; regulatory supervision.
- Risk–The composite of predicted severity and likelihood of the potential effect of a hazard in the worst credible system state.

    - Initial risk–The severity and likelihood of a hazard when it is first identified and assessed. It is used to describe the severity and likelihood of a hazard in the beginning or very preliminary stages of a decision, program, or analysis. Initial risk is determined by considering both verified controls and assumptions made about system state. When assumptions are made, they must be documented as recommended controls. Once the initial risk is established, it is not changed.
    - Current risk–The predicted severity and likelihood of a hazard at the current time. When determining current risk, both validated controls and verified controls may be used in the risk assessment. Current risk may change based on the actions taken by the decision maker that relate to the validation or verification of the controls associated with a hazard.
    - Residual risk–The remaining risk that exists after all control techniques have been implemented or exhausted and all controls have been verified. Only verified controls can be used for the assessment of residual risk.

- SRMD–A document prepared by ATO to describe the safety assessment of a change to the NAS. An SRMD is prepared in accordance with the current version of the ATO SMS Manual.
- System safety–The application of technical and managerial skills to the systematic, forward-looking identification and control of hazards throughout the life cycle of a project, program, or activity.

1.4 DOCUMENT STRUCTURE

Section 2 outlines the policies and procedures that govern ATO development of SRMDs and AOV's oversight, review, and approval authority over ATO SRMDs. Section 2.1 focuses on the policies and procedures that were in effect during the development of this needs analysis, and section 2.2 addresses the updates to the AOV review and approval process that are being implemented after March 31, 2013. Section 3 describes the resources, tools, processes, and data that are currently available to AOV to support their review of SRMDs and proposed HRH controls. Section 4 describes the problems and capability shortfalls that AOV safety analysts have identified in performing their SRMD and HRH control reviews. Section 5 addresses the impact of the new AOV AAC processes on the identified capability shortfalls, and allocates each identified shortfall to process either the IDA-FS tool, AAC process updates, or other AOV programs or initiatives, such as AOV Connect (see section 2.2). Section 6 lists a set of proposed functional needs to address some of the identified capability shortfalls in section 4. The preliminary functions allocated to the IDA-FS tool with respect to HRH control review and approval are discussed, along with possible future development.

2. EXISTING POLICIES AND PROCESSES

A summary of AOV and ATO policies and processes for SRMD review and HRH control approval coordination is described below.

2.1 CURRENT AND LEGACY AOV POLICIES AND PROCESSES

The ATO is required to obtain AOV approval for proposed mitigations for initially identified HRHs. Approval is primarily based on SRMDs provided by the ATO. There is presently no requirement for ATO to consult with AOV at any point in the development of an SRMD before its completion. This means that if initial HRHs and corresponding mitigations are identified, AOV may not be aware of them until the ATO submits a request for control approval. When AOV reviews an SRMD after several months or years of work toward its development, AOV may reach different conclusions than the ATO regarding the evaluation of initial and residual risk, risk analysis methods, supporting data, and other safety analysis components. This could result in programmatic delays and may create additional work for both AOV and ATO to address fundamental issues that could have been resolved earlier in the risk-assessment process. To avoid this situation, AOV published Safety Oversight Circular (SOC) 07-02, "AOV Concurrence/Approval at Various Phases of Safety Risk Management Documentation and Mitigations for Initial High-Risk Hazards." SOC 07-02 provides the ATO guidance on a phased approach to obtaining AOV concurrence and approval on various aspects of ATO SRM, as shown in figure 1 [2].

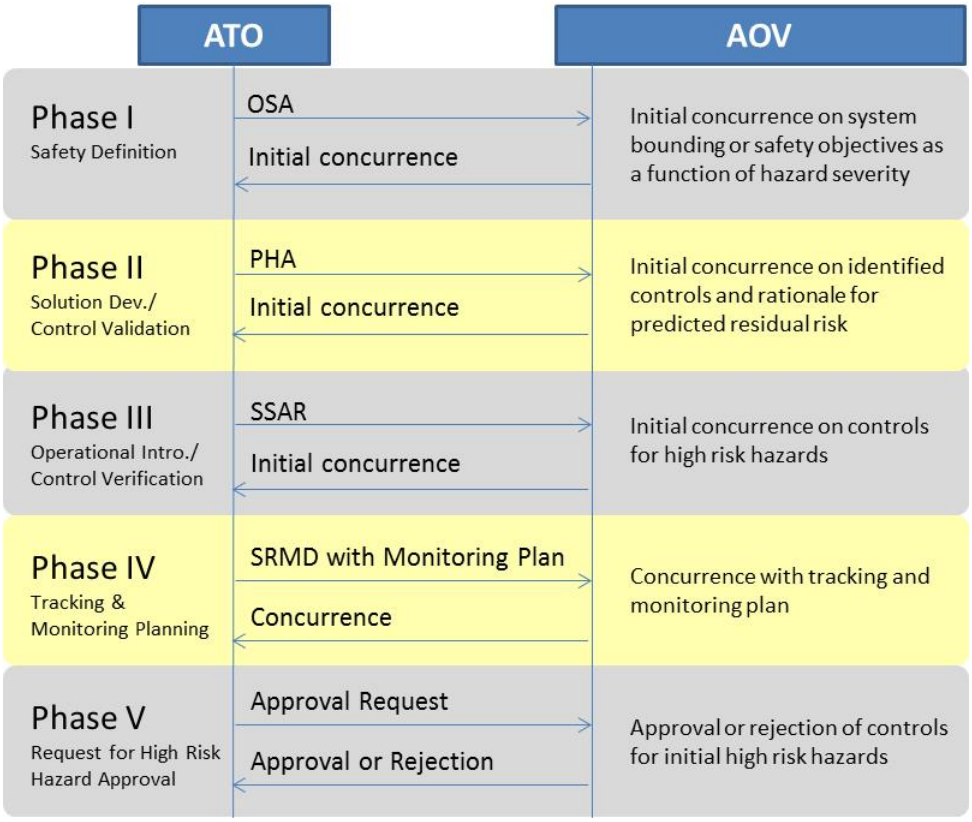

Figure 1. Phased SRMD review per SOC-07-02

Phase I (Safety Definition) takes place at the end of the Mission Need Analysis stage in the FAA's Acquisition Management System (AMS). An Operational Safety Assessment (OSA) or similar safety assessment is prepared to capture a description of the proposed NAS change, including planned systems and system interfaces. A Preliminary Hazard List is established along with the expected severity of each hazard. The safety assessment also identifies known safety requirements and an assessment of how safe the system or change needs to be, given the intended operating environment and any assumptions being made. The safety assessment may also identify human factors risks, system concept requirements, and preliminary safety objectives (i.e., target risk likelihoods given assessed severities). As part of Phase 1, AOV will review the OSA or safety assessment and provide an initial concurrence on the ATO's identified bounding of the system (i.e., the safety assessment scope) and recommended safety objectives.

Phase II (Mitigation/Solution Development/Control Validation) is concurrent with the final investment decision stage in the AMS. A Preliminary Hazard Analysis (PHA) is developed to identify hazards associated with system use and the initial and predicted residual risk for each hazard. The PHA also identifies mitigations to meet the safety objectives established in Phase I and derives recommended safety requirements. During Phase II, AOV reviews the PHA or similar safety analysis and provides initial concurrence with the identified mitigations or controls and rationale for the predicted residual risk. The AOV's feedback indicates whether the predicted residual risk and corresponding mitigations appear reasonable and valid.

Phase III (Operational Introduction/Control Verification) occurs during the in-service decision stage in the AMS. A System Safety Assessment Report (SSAR) provides objective evidence that the system or change can be safely introduced into the NAS and that all risk mitigations have been validated and verified. The SSAR includes an updated safety analysis and addresses how the system or change will be introduced to the NAS, including transition from/integration with legacy systems. As part of Phase III, AOV reviews the SSAR or similar safety assessment and provides initial concurrence with the proposed controls or mitigations for initial HRHs.

Phase IV (Tracking and Monitoring Planning) also occurs during the in-service decision stage in the AMS. During this stage, the ATO provides a plan for monitoring the continued safety of the change to the NAS. The monitoring plan is included in an SRMD and addresses system-performance monitoring, incident investigation, and hazard-mitigation tracking. During Phase IV, AOV reviews the ATO'S SRMD and provides concurrence with the ATO's tracking and monitoring plan. The plan must address all HRH mitigations and how ATO intends to track and monitor the safety effects of NAS changes as a condition of AOV's HRH approval.

Phase V (Request for HRH Approval) also occurs during the AMS in-service decision stage and is the point at which the ATO formally seeks AOV's approval of HRH controls. The AOV's approval or rejection of HRH controls requires that all preceding stages of the SRM process are complete.

2.1.1 The AOV-002-T02-PM AAC Process Manual

The current AAC Process Manual describes AOV's roles, responsibilities, and workflow for review and feedback to the ATO regarding various ATO packages, such as SRMDs and waivers. Figure 2 shows a graphical overview of the AOV process for ATO SRMD and HRH control review

and approval [3]. This diagram is based on the AAC Process Manual and feedback from interviews with AOV service area representatives.

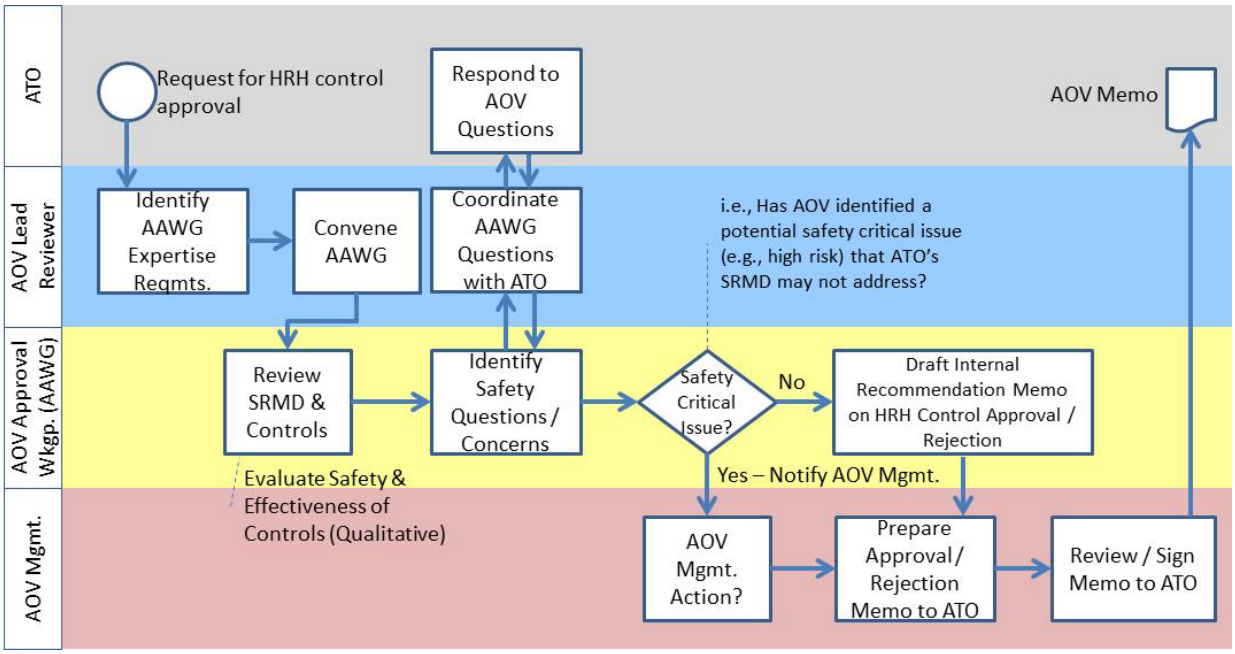

Figure 2. The AOV SRMD review swim lane chart

The AOV process of reviewing and approving SRMDs containing HRH controls can be divided into four stages:

1. Preliminary review
2. AOV Approval Working Group (AAWG) review
3. Memo coordination (review close-out)
4. Post-review followup

The Preliminary review phase consists of assembling the SRMD, attachments, and background documents for review. When ATO transmits an SRMD to AOV, the lead reviewer determines whether the SRMD package is complete. The SRMD should include all relevant sections and all identified appendices. Supplemental documents or materials may also need to be included for completeness. If the lead reviewer identifies any discrepancies, he or she will contact ATO to resolve the shortfall. After verifying the completeness of the SRMD package, the lead reviewer will identify AAWG members to perform the next review phase. The AAWG members are typically selected based on their background, experience, availability, and familiarity with the system, procedure, or domain addressed by the proposed change and SRMD.

The second phase of the process is the AAWG review. Each member of the AAWG examines the SRMD and evaluates it based on the AAC checklist and that member's individual subject-matter expertise. Each reviewer identifies comments and safety concerns and brings them to the AAWG meetings for discussion and evaluation. If comments and concerns cannot be resolved within the AAWG, the lead reviewer will coordinate with ATO to obtain additional

information or explanations; the ATO may elect to revise the SRMD to address AOV concerns, though AOV does not necessarily require this. The AAWG evaluates whether the SMS process was adequately followed. Example considerations include whether all necessary stakeholders participated in the Safety Risk Management Panel (SRMP), if all relevant hazards were identified, and whether proposed mitigations to HRHs include implementation and monitoring details.

The third phase of the process is memo coordination. The AAWG prepares an AAWG internal recommendation memo to AOV management. The memo includes a summary of the proposed change and the SRMD. It also includes an evaluation of whether the SRMD complies with the ATO SMS process and whether approval of the proposed HRH controls is recommended. The memo may also identify comments or concerns that the AAWG or individual reviewers have regarding the hazard assessment or proposed controls. The AAWG internal recommendation memo is transmitted to AOV management for review. The AOV management then prepares an AOV Approval Memo or an AOV Rejection Memo as appropriate for the decision being made. The memo may identify follow-up actions or reports that ATO needs to provide regarding mitigation and control implementation or hazard monitoring. The approval (or rejection) memo is circulated to AAWG members for review and then formally transmitted to ATO.

The last phase of AOV SRMD and HRH control review is post-review follow up. If any AOV comments were made to the ATO regarding the SRMD/controls, follow-up actions may be necessary to resolve those comments. If a contingent approval was given to ATO that requires verification of certain controls or actions, AOV coordinates with the ATO to monitor that the necessary evidence and analysis is provided. Finally, AOV monitors ATO implementation of hazard-tracking mitigation-monitoring plans and confirms that results of the monitoring do not indicate safety issues.

2.1.2 Basis for Control Approval/Rejection Decisions

The AOV uses an AAC checklist to review SRMDs for compliance with the AOV-approved ATO SMS Manual. The checklist provides the following guidance regarding items that result in AOV rejection of HRH controls or delayed approval until the item is resolved:

- Red–The actions required by the AAWG or the SRMD panel will be to either disapprove the waiver request or withhold approval of the high-risk mitigation strategy while waiting for the non-compliance to be rectified.
- Yellow–Caution should be exercised prior to any approval/acceptance action until either the area can be explained or the non-compliance rectified in some manner by the originating office. If non-compliance is noted in multiple yellow-coded requirements, close examination of the total system is warranted and consideration should be given to disapproval of the waiver request or high-risk mitigation strategy until the issues can be resolved [4].

2.2 NEW AOV AAC PROCESSES

The AOV is in the process of implementing a revised AAC workflow. The AOV-100 provided a briefing on the revised AAC workflow and processes on March 29, 2013 [5]. The new guidance moves AOV toward a more score-based and data-driven process for SRMD reviews and AAC

decisions. Updates will be made to the AAC Process Manual and other related documentation upon full implementation of the processes described below. Note that this updated workflow process just enhances the current AAC process; it does not replace all existing AOV requirements and guidance documents. For example, SOC 07-02 (described in section 2.1) continues to govern the process of phased AOV approvals.

First, an SRMD is sent from ATO to AOV with an AAC request. The AAC request is sent concurrently to a safety specialist and to the appropriate AOV Division Manager. The safety specialist calculates a Preliminary Priority Index (PPI) for the SRMD, which determines if the package is complete and the review can continue. If the PPI score indicates a shortfall in the package, the safety specialist will coordinate with ATO to resolve the discrepancy. Meanwhile, the Division Manager will notify the Branch Manager of the SRMD and AAC review.

After calculating the PPI, if the score indicates that the SRMD review can continue, the safety specialist will calculate the Priority Index (PI) for the SRMD. The PI is a quantitative assessment of the level of difficulty involved in or resources needed to complete review of the SRMD. The safety specialist will use the PI score to make a recommendation to the branch manager of the number of personnel needed for the RET. The branch manager will then assign a request lead and an RET to review the SRMD.

Once the RET is convened, the members will use the Request Evaluation Worksheet (REW) to conduct the SRMD evaluation. The REW is a score-based checklist that will help the RET to objectively evaluate the SRMD and associated hazard controls. Decisions on each REW item will be primarily based on the subject-matter expertise of each member of the RET, though future enhancements to the REW will include additional guidance on evaluation criteria and decision making.

A final decision on AOV approval, acceptance, or concurrence of/with the SRMD will be based on the computed REW score for the SRMD. The REW documents the rationale for each checklist decision and score, provides guidance on when approvals are needed from other Office of Aviation Safety (AVS) Services, and gathers feedback and lessons learned from the SRMD and the review process. All of this REW information can be used to provide supplemental information on the recommendations of the REW. Once the score is computed, the request lead will compose a recommendations memo to AOV management. The recommendations memo will address the proposed change; provide an overview of the hazards and the associated mitigations; and give a rationale for the RET's recommendation (whether positive or negative). The recommendation memo will be used by AOV management to prepare the AOV AAC decision memo that is sent to ATO.

This new AOV AAC process will be supported by a new software tool called AOV Connect. AOV Connect is an online data construct that is being developed to help to manage and track data on ATO SRMDs and hazards and controls; to document the PPI, PI, and REW scores and comments; and to track actions related to the AAC request. AOV Connect is intended to provide sorting and searching capabilities based on keywords or issues of interest and is expected to link AAC data with data captured via other SRMD reviews or other AOV oversight activities. The AOV Connect tool is undergoing a phased implementation that will incrementally add functionality based on feedback from AOV users and refinements to the AAC process and guidance.

2.3 ATO POLICIES AND PROCESSES

2.3.1 SMS Manual

In accordance with FAA Order 1100.161, ATO issued Order JO 1000.37, which defines the roles and responsibilities of ATO with respect to SRM [6]. The ATO is responsible for implementing SRM for any proposed change to the NAS and any safety risks identified within ATO's span of control. To implement and promote SRM processes in all ATO systems, the ATO developed the SMS Manual. The ATO SMS Manual documents the policies that govern ATO safety and provides guidance on the SRM process that must be used to identify, analyze, assess, and treat safety risks [7]. The AOV approves the ATO SMS Manual and ensures that its guidance is followed in all ATO SRMDs. The ATO SMS Manual undergoes regular revisions and version updates, though it should be noted that certain legacy ATO programs may operate under prior versions of the SMS Manual.

The ATO SMS Manual describes the methods and activities that must be used to identify and treat safety risks in the NAS. When a change to the NAS is proposed, a SRMP is convened to identify hazards related to the change. Risks associated with the hazards are analyzed in terms of severity and likelihood. The hazards are then treated by developing controls to mitigate the effects or reduce the likelihood of each hazard. According to the SMS Manual, hazards that are classified as having high risk must be treated to reduce the risk to medium or low. The results of the formal safety assessment are documented in an SRMD, which must be approved by the appropriate stakeholders and authorities. The SMS Manual defines who must approve SRMDs and accept the risks identified for the NAS change. The SRMDs that contain HRHs must be submitted to AOV for review and approval of the proposed hazard controls.

2.3.2 Safety Risk Management Guidance for System Acquisitions

Policies and procedures regarding the application of SRM to new systems and ATO acquisitions are found in the Safety Risk Management Guidance for System Acquisitions (SRMGSA) [8]. The SRMGSA supplements the ATO SMS Manual and provides specific guidance on assessing and treating safety risks. Safety analysis tools and methods are applied during each phase of system development to identify and treat hazards as early in the process as possible. Several SRMDs are developed prior to final implementation of a system, and those SRMDs may require AOV approval, acceptance, or concurrence, as specified in the SMS Manual and SRMGSA.

3. EXISTING RESOURCES AND CAPABILITIES

The AOV has a number of resources to assist its decision making in their reviews of SRMDs. Some tools are developed and maintained by AOV, whereas others may be under the purview of the ATO or other organizations, but still accessible to AOV personnel. The following sections give an overview of the resources AOV currently uses to assist with SRMD reviews. An overview of ATO resources referenced in AOV's SRMD review processes are also summarized below.

3.1 THE AOV RESOURCES

The AOV has resident expertise in air traffic control (ATC), engineering, NAS equipment, and technical operations with approximately 130 personnel. When AAWGs are convened to review an

SRMD, the lead AOV reviewer is able to draw from headquarters and service area expertise applicable to the change to the NAS under review. The AOV inspectors or analysts with ATC experience are involved in SRMD reviews for ATC procedure waivers. The AOV representatives with NAS Technical Operations experience participate in SRMD reviews on new and modified NAS equipment and related procedures. The AOV engineers and operations research analysts may review technical components of a safety assessment, such as fault tree analyses, as needed or when requested by an AAWG. In addition, AOV has access to Aircraft Certification Services and Flight Standards expertise within AVS to support SRMD reviews for NAS changes impacting aircraft equipage, flight procedures, or separation standards, for example.

The AOV has established a Safety Management Action Review Team (SMART) to monitor NextGen initiatives and facilitate collaborative communications with ATO to research AOV's questions and concerns regarding SRMDs. There are five SMART teams, led by AOV-330, including navigation; surveillance; weather and facility; automation; and communications teams. Each team has a contact in the ATO and engages with both the ATO Office of Safety and the program office (or change proponent) responsible for SRM. Though there are no documented procedures for SMART activities or ATO coordination, SMART meets bi-weekly and sets up technical interchange sessions with ATO programs or NextGen portfolio managers to obtain information on planned NAS changes in advance of ATO SRMD submittals to AOV.

The AOV maintains various databases and websites to support its safety oversight activities related to SRMD reviews. The AOV maintains an AAC tracker to record meetings, discussions, emails, and phone conversations with personnel in AOV, ATO, or other organizations. The AOV also maintains a correspondence tracker to process and coordinate draft AOV memos, including an AOV-internal recommendation memo from the AAWG regarding HRH control approval (or rejection) and AOV approval memos to the ATO. The AOV also retains a record of all ATO SRMDs and Safety Risk Management Decision Memos (SRMDMs) received in the correspondence tracker. Finally, AOV maintains checklists for AAC process activities and templates for AAWG recommendation and AOV approval memos on a SharePoint website.

3.2 THE ATO RESOURCES

The AOV coordinates with the ATO to obtain hazard data, SRMDs, and safety event data as needed to support SRMD reviews. Per FAA Order 1100.161 CHG 1 and the ATO SMS Manual, the ATO has a requirement to maintain a database for tracking identified hazards. The ATO-wide implementation of such a database is ongoing. Previously, the ATO had implemented a web-based hazard tracking system (HTS) for system acquisitions and operational changes to the NAS. Certain ATO acquisition programs and ATC facilities with ATC procedure waivers used the HTS between 2005 and 2011; however, HTS was not used ATO-wide for all hazard tracking activities. In 2007, the ATO began planning a replacement to the HTS called the Safety Risk Management Tracking System (SRMTS). SRMTS implementation has been deferred while the ATO re-evaluates hazard tracking, monitoring requirements, and database implementation needs. Currently, there is no ATO-wide database of hazard and mitigation monitoring data. The ATO programs and facilities may maintain individual databases or other means of tracking hazards and mitigations in compliance with the SMS.

In addition, the AOV can request SRMDs and SRMDMs from ATO, regardless of whether associated HRHs were identified. Similarly, AOV may request reports on system, hazard, or mitigation data stored in ATO databases, though AOV does not have direct access to those databases.

The ATO also has databases that individual AOV representatives indicated were used occasionally to cross-check assumptions and data presented in ATO safety analyses. Though AOV's access to ATO's databases is limited, AOV can request specific database reports from the ATO as needed. Until 2012, the ATO maintained the Air Traffic Quality Assurance (ATQA) database on safety events involving air traffic operational errors and deviations, near-midair collisions, pilot deviations, vehicle/pedestrian deviations, and runway incursions among other events. Though the ATO has discontinued ATQA, AOV may still consult ATQA to review historical safety events. In 2011, the ATO established the Comprehensive Electronic Data Analysis and Reporting (CEDAR) database. The CEDAR maintains "occurrence reports" involving air traffic services; example mandatory occurrence reports include airborne losses of separation, airport surface losses of separation, and airborne ATC anomalies (airspace/altitude/route/speed) not involving losses of separation.

3.3 OTHER RESOURCES

The FAA maintains other databases that may be of use to AOV safety analysts in reviewing SRMDs. These resources are used by AOV when researching similar systems and historical incidents related to hazards identified in SRMDs under review:

- Accident/Incident Data System (AIDS)–AIDS contains data records for general aviation and commercial air carrier incidents since 1978.
- Aviation Safety Information Analysis and Sharing System (ASIAS)–ASIAS enables users to perform queries across multiple databases on aviation accidents, incidents, and pilot reports of near mid-air collisions.
- NASA Aviation Safety Reporting System (ASRS)–ASRS contains voluntary reports on safety incidents and concerns identified primarily by flight crews, though air traffic controllers may also voluntarily report ATC-related safety events.

Finally, AOV receives Independent Operational Test and Evaluation (IOT&E) or Independent Safety Assessment (ISA) documentation and feedback on new system acquisitions. The IOT&E or ISA reports are prepared to identify safety concerns, operational problems, and technical documentation deficiencies associated with new systems before those systems are authorized for in-service operational use. The AOV reviews these reports to cross-check the hazards and safety risk assessments presented in ATO SRMDs prior to a system in-service decision.

4. CURRENT PROBLEM/CAPABILITY SHORTFALL

4.1 ASSESSMENT APPROACH

The IDA-FS research team interviewed representatives from AOV headquarters and each of the AOV Area Operations branches to better understand their processes for SRMD review and to capture the shortcomings identified in their current tools and processes. Representatives from AOV-210 (Seattle), AOV-220 (Fort Worth), and AOV-230 (Atlanta) provided input, as did AOV-

120, AOV-320, and AOV-330 representatives in Washington, DC. Table 1 lists a series of interview meetings between the IDA-FS team and AOV representatives.

Table 1. The AOV needs analysis interviews

Organization	Date	Purpose
AOV-320 and AOV-330	Feb. 20, 2013	Initial meeting to establish IDA-FS scope and objectives
AOV-210 and AOV-330	Mar. 5, 2013	Needs analysis interview with Western Service Area AOV representatives
AOV-230 and AOV-330	Mar. 12, 2013	Needs analysis interview with Eastern Service Area AOV representatives
AOV-120 and AOV-330	Mar. 18, 2013	Needs analysis interview with headquarters AOV representatives
AOV-210 and AOV-330	Mar. 18, 2013	Needs analysis interview with Central Service Area AOV representatives
AOV-320, AOV-330, and AOV-120	Mar. 29, 2013	AOV presentation on AAC process changes and review of needs analysis findings

For each interview, the IDA-FS research team presented an overview of the AOV AAC process and asked the representatives to comment on the accuracy of the description. The subject matter experts were then asked about each process step, what tools or methods they used in their reviews, and what functions would be useful in improving their review. The team then solicited feedback on approaches to evaluating hazard controls proposed in SRMDs to understand how AAWGs make decisions regarding hazard control effectiveness and approval.

It should be noted that the interview and assessment findings were primarily based on AOV feedback on the current/legacy AAC process. Some of the AOV capability shortfalls identified in section 4.2 are expected to be addressed by the revised AAC process, whereas others may be addressed by other AOV initiatives.

4.2 ASSESSMENT FINDINGS

Interviews with AOV representatives revealed the following shortfalls in AOV capabilities and tools. The assessment findings were primarily based on review and analysis of the current/legacy AAC processes and guidance. Section 5 discusses the impact of the revised AAC processes on these assessment findings. It should be noted that these shortfalls are not ranked in terms of criticality or priority, but are numbered in terms of a notional SRMD review flow:

1. The lack of a standardized methodology and toolset for AOV to perform SRMD review and approval in a consistent manner across the organization.

   The AOV's current SRMD review and approval evaluation relies heavily on the background and expertise of individual members of the AAWG performing the review. Though all AOV safety analysts use their best judgment to assess SMS compliance and HRH control effectiveness, there are few standard data sources that can help analysts consider all relevant systems, interactions, and lessons learned regardless of the particular experience of a reviewer. Though AOV has an AAC process manual and checklist, AOV lacks a common tool to manage a standardized review process for SRMDs that includes HRH controls. Analysts are reliant on personal experience, knowledge, and judgments to evaluate the effectiveness of proposed controls, and there is no formal process to determine whether proposed controls introduce additional safety risk. The AOV does not have a tool to track safety verification tasks that are requested from or required of ATO as part of the review and approval process.
2. The lack of AOV guidance in information searching and assembling.

   One of an AOV safety analyst's tasks when reviewing an SRMD to approve proposed controls is to obtain and analyze information that is relevant or similar to the proposed change and associated hazards and controls. Currently, AAWG members collect this information based on their personal experience and knowledge. There is no standard guidance on how or where to search and assemble this information. There is also no central data source that can be queried for information on hazards or controls.

   The AOV would benefit from the ability to search for a hazard (e.g., loss of separation) and see how it was handled in different systems at different facilities. Analysts might also want to search by existing hazards, related systems, or existing controls. If a control is proposed for multiple facilities but implemented in phases, it would be beneficial to search for information on mitigation implementation at a facility and whether any hazards were introduced before the change is deployed at other facilities. The AOV may also want to search for mitigations that worked for past hazards that are similar to those in an SRMD under review.
3. The lack of shared awareness on SRMDs between different AAWGs within AOV.

   AAWGs do not typically coordinate with other AAWGs to determine whether (or how) SRMDs under review may be inter-related. The AOV does hold quarterly Safety Management Review (SMR) meetings to outline all known SRMDs planned or under review, which are open to all AOV personnel. However, there is no centralized channel for different AAWGs to share their experiences, concerns, what SRMDs they work on, what

areas the SRMD affects, and so forth, especially between AAWGs located in different service areas. This information would be valuable to AOV in reviewing and approving the proposed controls in an SRMD.

4. The lack of methodology and tools to identify the interactions between multiple changes to the NAS.

   The AOV uses ATO's SRMDs as the primary source for hazard and control identification and analysis in their review and approval of proposed controls. Because the current ATO SMS process is based on analysis of an individual NAS change without considering potential interactions with other changes in the NAS, it is difficult for AOV to understand the potential connections between multiple changes. In addition, many SRMDs are facility-centric in scope, and may not consider NAS interdependencies and legacy system interfaces across multiple facilities. This situation is complicated by the fact that ATO informs AOV only of SRMDs with HRHs, unless AOV requests other SRMDs; therefore, AOV analysts may not have sufficient information to judge whether proposed changes addressed in an SRMD will affect other areas of the NAS.

   Note that AOV may need to consider timing with regard to the schedule of proposed NAS modifications. NAS changes or new system implementations may impact the effectiveness (or validity) of a control. For example, controls which require a particular NAS as a backup during primary system failure may not be effective (or valid) if the FAA plans to modify or decommission the backup system. In such cases, AOV may benefit from a better understanding of the deployment schedule for NAS changes.

5. The lack of information sharing between AOV and ATO regarding NAS changes and hazards.

   It is essential that AOV have access to information about all proposed NAS changes and associated hazards before AOV assesses and approves the controls proposed for an individual change. However, AOV has limited access to the ATO's SRM tracking system, particularly at the level of Service Area personnel. Because ATO is in the process of transitioning its SRM tracking system to a new platform, it is even more difficult for AOV to obtain this information. This puts AOV in a vulnerable position of reliance on ATO's willingness to provide access to NAS change and hazard information.

   The AOV does not receive all SRMDs that the ATO generates but can request SRMDs from ATO as needed. To date, AOV has received reports from the ATO (e.g., every 60 to 90 days) on all hazards to meet a reporting requirement in the ATO SMS. Whether the ATO continues to issue a report on all hazards and how frequently the ATO generates such a report are to be determined.

6. The lack of tracking capability for AOV to consistently monitor follow-up actions on SRMDs.

   The SRMDs must address hazard tracking and monitoring plans, including plans for implementing controls and monitoring the continued effectiveness in controlling risk. The ATO must provide verification of control implementation and ongoing monitoring data. The AOV's processes for checking ATO hazard and control tracking and monitoring vary, and there is no standard tool to track monitoring activities. In addition, AOV sometimes

issues contingent approvals that specify follow-up verification actions for safety requirements and hazard or control monitoring actions. In many cases, AOV also identifies internal follow-up actions to validate the ATO's hazard data and control implementation. Because there is no tool to track such follow-up actions, AOV may not always be aware of ATO progress in resolving contingent approval actions, particularly if the ATO does not provide the required reports in a timely fashion.

In addition to tracking the hazard monitoring plans, AOV representatives expressed a desire for a tool to provide a record of AOV's due diligence in reviewing SRMDs. In the event of an audit of AOV activities, such functionality would provide objective evidence of AOV analysts' actions, by documenting AOV comments and status on coordinating requests for information with the ATO.

7. The lack of a web-based tool to support the AOV AAC process.

   The AOV AAC process is currently conducted manually without a specific tool support. All AAWG members document their concerns, comments, or recommendations in their own way before they participate in the AAWG review meetings, via telecon in most cases. A web-based supporting tool is needed to facilitate and enhance information sharing through the life cycle of the AAC process. In addition, because an SRMD may be reviewed by AOV representatives in more than one geographic location, any tool developed to assist with the AAC process should be accessible from remote locations. The AOV branch offices are located at FAA headquarters in Washington, DC; the Eastern Service Area (ESA) in Atlanta, Georgia; the Central Service Area (CSA) in Ft. Worth, Texas; and the Western Service Area (WSA) in Seattle, Washington. A web-based tool may also improve the information sharing between different offices and AAWGs around the country.

8. The lack of well-defined criteria to assist AOV in HRH control effectiveness.

   Though AOV has an AAC checklist, evaluation of control effectiveness is still reliant on AOV personal experience and judgment and knowledge of similar SRMDs. The AOV AAWGs (REWs) do evaluate existing and recommended controls in terms of validity, proper requirements for language phrasing, and overall feasibility. The stability, or long-term applicability of a control (e.g., a facility standard operating procedure), may be considered when approving or rejecting HRH controls. The current checklist provides guidance to determine whether the SRMD content meets the SMS Manual requirements but does not give criteria to aid the AAWG with determining if controls are expected to be effective in reducing initial high risk.

9. The lack of guidance on SRMD compliance with multiple SMS Manual versions.

   The ATO system acquisition programs are baselined under a specific version of the SMS Manual and not necessarily the current version. The AOV's AAC checklist provides guidance on checking compliance with only the current SMS Manual.

The problems and capability shortfalls detailed above are a summary of findings from research and interviews with AOV management and safety specialist representatives without considering on-going AOV AAC changes. Initial implementation of AOV's revised AAC process began on

March 31, after the shortfall analysis was completed. Section 5 addresses the new AAC process and its impact on the IDA-FS tool.

5. NEW AAC PROCESS AND ITS IMPACT ON IDA-FS

The AOV is implementing a score-based and data-driven AAC process to replace the legacy process. The revised AAC process introduces the concepts of a PPI, PI, and Risk Analysis Valuation (RAV) to score certain factors associated with SRMDs to help AOV determine the number and type of resources to manage SRMD reviews. The new AAC process uses an AAC REW that replaces the current AAC Checklist. The AAC REW contains a Feedback/Lessons Learned section to gather data for future improvement, guidance on when approvals are necessary from other AVS services/offices, a "Rationale" section to capture information regarding how decisions were determined, and SRMDM and Corrective Action Plan Assessment sections. The AOV plans to continue refining the specific criteria that the RET should use in conducting analyses, such as SRMD review [5].

The AOV is also implementing an advanced knowledge management infrastructure named AOV Connect to record, track, and link AAC and other data for the Safety Compliance Information Tracking System, correspondence, SMRs, audits, etc. The AOV plans to use AOV Connect to capture ATO safety hazards, RAV, PPI, PI, and type of request, among other data, and provide a sorting/searching capability for keywords, issues of interest, RAV scores, etc. AOV Connect, which will be used AOV-wide, is also intended to record, prioritize, and track AOV observations on a variety of topics, including safety hazards and controls [9].

The new AAC process and AOV Connect capabilities are expected to address some of the shortfalls identified in section 4.2. Table 2 allocates each shortfall to the IDA-FS or other AOV initiatives, such as AOV Connect. This allocation is proposed based on the current understanding of ongoing AOV initiatives with limited information.

Table 2. Capability shortfall allocation matrix

Shortfall (from section 4.2)	IDA-FS	Revised AAC Process	AOV Connect	Other AOV Initiative
1. The lack of a standardized methodology and toolset for AOV to perform SRMD review and approval in a consistent manner across the organization	TBD*	X	X	
2. The lack of AOV guidance in information searching and assembling	TBD*		X	
3. The lack of shared awareness on SRMDs between different AAWGs within AOV			X	
4. The lack of methodology and tools to identify the interactions between multiple changes to the NAS	X			
5. The lack of information sharing between AOV and ATO regarding NAS changes and hazards			X	
6. The lack of tracking capability for AOV to consistently monitor follow-up actions on SRMDs			X	
7. The lack of web-based tools to support the AAC process	X		X	
8. The lack of well-defined criteria to assist AOV in HRH control effectiveness	X	X		
9. The lack of guidance on SRMD compliance with multiple SMS Manual versions	TBD*	X		X

*Note: Once implementation details on AOV's revised AAC process and AOV Connect are known, certain shortfall allocations may need to be revisited. The IDA-FS may be used to address some aspects of these shortfalls, if directed by AOV management.

6. AOV NEEDS

Interviews with AOV service area safety personnel identified several functional needs that are currently unmet by existing AOV tools and processes. The following sections detail the set of potential functional needs that were identified by the needs analysis, grouped by the AOV capability shortfalls identified in section 4.2. Based on the shortfall analysis (see table 2), certain needs are allocated to the IDA-FS solution, whereas others are expected to be addressed by other AOV processes/initiatives. The mission-level goals, functional needs, and operational needs for the IDA-FS tool are outlined in section 6.2. Potential future enhancements to the IDA-FS tool are summarized in section 6.2.4.

6.1 OVERALL NEEDS

Interviews with AOV service area safety personnel identified several functional needs that are currently unmet by existing AOV tools and processes. These functional needs are grouped by the AOV capability shortfalls identified in section 4.2. It should be emphasized that these functional needs are preliminary and do not necessarily address every shortfall identified in section 4, but only those associated with SRMD review and HRH control evaluation.

Note that some identified functional needs may be associated with more than one identified capability shortfall. In these cases, bracketed numbers are used to identify any other places where the function may appear:

1. The lack of a standardized methodology and toolset for AOV to perform SRMD review and approval in a consistent manner across the organization

    a. Record and track AOV safety concerns and comments [7.a].
    b. Help AOV verify that ATO completed the SRMD content required per the SMS Manual.

        i. Identify SRMD content requirements by SMS Manual version (ATO programs may operate under multiple versions) [10.a.1].

    c. Identify NAS equipment and facilities impacted by the change to the NAS in the SRMD under review [4.a].
    d. Help analysts to verify that:

        1. Stakeholders were adequately represented on ATO SRMP.
        2. The identified hazard list is comprehensive and sufficient for the change to the NAS.
        3. All potential hazard causes were identified.
        4. Existing controls are actually “in-place.”

    e. Help AOV validate that the SRMD has sufficient information to substantiate the assessed risk:

        1. Verify that objective evidence is provided for initial/current risk assessment.
        2. Assess the objective evidence provided for predicted residual risk assessment (depending on implementation phase).
        3. Assess the explanation and application of risk assessment tools or techniques explained.

    f. Assist AOV with memo development and processing:

        1. Generate content for AAWG internal recommendation memo.
        2. Generate content for AOV approval memo.

3. Track AOV coordination activities for memo development, review, finalization, and signatures.
4. Implement measures to reduce timeline for memo review and signature coordination where practical.

2. The lack of AOV guidance in information searching and assembling

   a. Provide query capabilities (e.g., keyword searches) on hazard/mitigation data to check how hazards and controls are addressed in other systems or at different facilities [3.a].

3. The lack of shared awareness on SRMDs between different AAWGs within AOV

   a. Provide query capabilities (e.g., keyword searches) on hazard/mitigation data to check how hazards and controls are addressed in other systems or at different facilities [2.a].

4. The lack of methodology and tools to identify the interactions between multiple changes to the NAS

   a. Identify NAS equipment and facilities impacted by the change to the NAS in the SRMD under review.
   b. Identify potential interactions of proposed changes in a SRMD with other changes in the NAS.

5. The lack of information sharing between AOV and ATO regarding NAS changes and hazards

   a. No specific functions identified at this time.

6. The lack of tracking capability for AOV to consistently monitor follow-up actions on SRMDs

   a. Provide reminders on comments and actions requiring follow-up AOV attention.
   b. Help AOV to validate controls and verify that mitigation monitoring plans are adequate.

      1. Verify that all monitoring tasks and actions are identified with the responsible organization and the due dates for implementing and verifying each control [8.a.3].
      2. Verify that post-implementation tasks and actions identify specific metrics (or data collection) to monitor the control effectiveness. [8.a.4].

   c. Track the status of mitigation monitoring plans over the life cycle of change to the NAS.

7. The lack of a web-based tool to support the AAC process

    a. Provide centralized information sharing and supporting for AAC process.

8. The lack of well-defined criteria to assist AOV in HRH control effectiveness

    a. Help AOV to validate controls and verify that mitigation monitoring plans are adequate.

        1. Validate the effectiveness of proposed controls.
        2. Verify that all proposed controls are addressed.
        3. Verify that all monitoring tasks and actions are identified with the responsible organization and the due dates for implementing and verifying each control [6.b.1].
        4. Verify that post-implementation tasks and actions identify specific metrics (or data collection) to monitor control effectiveness [6.b.2].

9. The lack of guidance on SRMD compliance with multiple SMS Manual versions

    a. Help AOV verify that ATO completed the SRMD content required per SMS Manual [1.b].

        1. Identify SRMD content requirements by SMS Manual version (ATO programs may operate under multiple versions) [1.b.1].

The IDA-FS tool is not expected to provide all of the functionality identified above. The complete list of potential functions identified through the AOV needs interviews has been documented in such a way that a function may be reallocated to (or away from) IDA-FS if new guidance is given from management. Table 3 shows the current allocation of the identified AOV function needs to the IDA-FS tool, the revised AAC process, and the AOV Connect or other as yet unidentified AOV initiatives. Again, this allocation is proposed based on the IDA-FS research team's current understanding of the revised AOV AAC process and AOV Connect with limited information.

Table 3. Functional need allocation

ID	Functional Need	Functional Allocation			
		IDA-FS	Revised AAC Process	AOV Connect	Other AOV Initiative
1.a	Record and track AOV safety concerns and comments.		X	X	
1.b	Help AOV verify that ATO completed the SRMD content required per SMS Manual.		X		
1.b.1 9.a.1	Identify SRMD content requirements by SMS Manual version.		X		
1.c 4.a	Identify NAS equipment and facilities impacted by the change to the NAS in the SRMD under review.	X	X		
1.d.1	Help analysts to verify that stakeholders were adequately represented on ATO SRMP.		X	X	
1.d.2	Help analysts to validate that the identified hazard list is complete for the change to the NAS.	X	X		
1.d.3	Help analysts to validate that all potential hazard causes were identified.	X	X	X	
1.d.4	Help analysts to verify that existing controls are actually “in-place.”		X	X	X
1.e	Help AOV validate that the SRMD has sufficient information to substantiate the assessed risk.	X	X		
1.e.1	Verify that objective evidence is provided for initial/current risk assessment.	X	X		
1.e.2	Assess the objective evidence provided for predicted residual risk assessment (depending on implementation phase).	X	X		
1.e.3	Assess the explanation and application of risk assessment tools or techniques explained.		X		
1.f	Assist AOV with memo development and processing.		X	X	
1.f.1	Generate content for AAWG internal recommendation memo.		X	X	

Table 3. Functional need allocation (continued)

ID	Functional Need	Functional Allocation			
		IDA-FS	Revised AAC Process	AOV Connect	Other AOV Initiative
1.f.2	Generate content for AOV approval memo.		X	X	
1.f.3	Track AOV coordination activities for memo development, review, finalization, and signatures.			X	
2.a 3.a	Provide query capabilities (e.g., keyword searches) on hazard/mitigation data to check how hazards and controls are addressed in other systems or at different facilities.	X		X	X
4.b	Identify potential interactions of proposed changes in an SRMD with other changes in the NAS.	X			
6.a	Provide reminders on comments and actions requiring follow-up AOV attention.			X	
6.b.1 8.a.3	Verify that all monitoring tasks and actions are identified with the responsible organization and the due dates for implementing and verifying each control.		X	X	
6.b.2 8.a.4	Verify that post-implementation tasks and actions identify specific metrics (or data collection) to monitor the control effectiveness.		X	X	
6.c	Track the status of mitigation monitoring plans over the life cycle of change to the NAS.			X	
7.a	Provide centralized information sharing and support for the AAC process.		X	X	
8.a.1	Assist AOV with validating the effectiveness of proposed controls.	X	X		
8.a.2	Verify that all proposed controls are addressed in the hazard tracking and monitoring plan.	X	X		

6.2 IDA-FS SPECIFIC NEEDS

6.2.1 AOV Goals for IDA-FS

The overall mission for the IDA-FS tool is as follows:

> *IDA-FS shall support AOV's decision-making process for approving controls proposed to mitigate or eliminate initial or current high-risk hazards identified in ATO SRMDs.*

Accordingly, AOV has outlined the following key objectives for the IDA-FS tool:

- Support the validation of SRMD content and compliance with approved SMS processes.
- Support the assessment of control effectiveness in mitigating HRHs.
- Qualitatively identify the interactions between multiple changes to the NAS.
- Organize information on NAS systems and the changes to the NAS.

6.2.2 Functional Needs for IDA-FS

Table 4 shows the list of preliminary functional needs from section 6.1 that are allocated to IDA-FS. A unique identifier has been defined for each of these functions, as shown in the ID field.

Table 4. IDA-FS preliminary functional needs

ID	Preliminary Functional Need
F1	Identify NAS equipment and facilities impacted by the change to the NAS in the SRMD under review.
F2	Help analysts to validate that the identified hazard list is complete for the change to the NAS.
F3	Help analysts to validate that all potential hazard causes were identified.
F4	Help AOV validate that the SRMD has sufficient information to substantiate the assessed risk.
F5	Verify that objective evidence is provided for initial/current risk assessment.
F6	Assess the objective evidence provided for predicted residual risk assessment (depending on implementation phase).
F7	Provide query capabilities on hazard/mitigation data to check how hazards and controls are addressed in other systems or at different facilities.
F8	Identify potential interactions of proposed changes in a SRMD with other changes in the NAS.
F9	Assist AOV with validating the effectiveness of proposed controls.
F10	Verify that all proposed controls are addressed in the hazard tracking and monitoring plan.

Figure 3 shows a preliminary notional functional architecture for the IDA-FS tool based on the findings of the needs analysis. The system architecture and the specific functionality is further refined and developed during the IDA-FS ConOps development performed in fiscal year 2013.

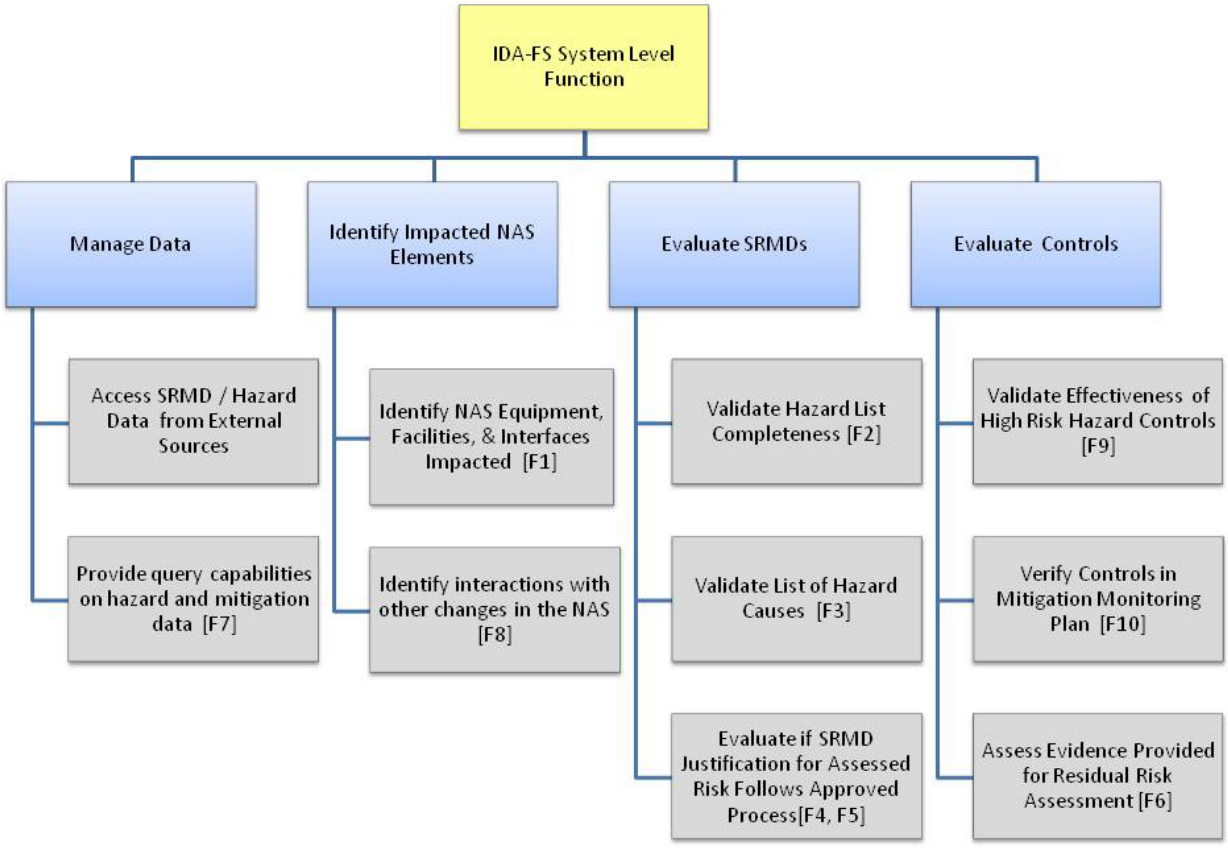

Figure 3. The IDA-FS preliminary functional architecture

6.2.3 Operational Needs

Operational needs are defined by user constraints, environmental considerations, implementation guidelines, and performance requirements as opposed to new function definitions. Preliminary operational needs for the IDA-FS tool were identified during the AOV interview process; namely:

- IDA-FS should support multiple, concurrent users and at least 130 AOV personnel.
  - Because an SRMD may be reviewed by more than one AOV representative during the review cycle, the tool should support multiple concurrent users. An AAWG convened to review a single SRMD typically consists of 4–5 AOV representatives. However, multiple AAWGs may be active at the same time to process different SRMD reviews.
- IDA-FS should provide a platform that can be accessed by remotely distributed users.
  - Because an SRMD may be reviewed by AOV representatives in more than one geographic location, the tool should be accessible from remote locations. The AOV branch offices are located at FAA headquarters in Washington, DC; the ESA in Atlanta, Georgia; the CSA in Ft. Worth, Texas; and the WSA in Seattle, Washington. The AOV representatives may also be on travel while participating in an AAWG.

6.2.4 Future Enhancements

In the future, IDA-FS should support AOV review processes for other types of SRMDs and controls addressed in FAA Order 100.161 CHG 1, including:

- SRMDs with medium risk controls
- Controls that span multiple FAA lines of business
- SRMDs for changes to provisions of handbooks, orders, and documents, including Order 7110.65, that pertain to separation minima
- SRMDMs for proposed waivers to provisions of FAA publications (e.g., 7110.65) for which AOV approval is required

Other IDA-FS functions that may be addressed in future development include:

- Identify ATC and Tech Ops procedures that are impacted by a proposed change to the NAS.
- Assess the safety impact of HRH controls on other systems.
- Support AOV analysts in assessing SRMDMs, by comparing SRMDM rationales to SMRDs for similar changes to the NAS.

To further improve AOV's oversight mission, AOV may need to understand the integrated risk changes of the NAS. As ATO continues to develop and implement systems as part of the NextGen effort, a number of new technologies, equipment, and systems will be integrated into the NAS, and new policies and operational procedures will also be introduced to the NAS. How those changes

will cumulatively impact the safety of the NAS as a whole is still an open question. Though the FAA has initiated some efforts to address this issue, no clear picture has yet emerged. This is beyond the scope of the current IDA-FS, which focuses on the support of the AOV AAC process. This is listed here for AOV's consideration of a future project.

7. CONCLUDING REMARKS

The mission for the IDA-FS tool is to support the AOV's decision-making process for approving controls proposed to mitigate or eliminate initial or current HRHs identified in the ATO SRMDs. The tool must also identify safety interactions among multiple changes to the NAS to provide context for AOV's review of SRMDs and HRH controls. This document summarizes the results of research and interviews conducted with AOV representatives to identify observed shortfalls in legacy processes and tools AOV uses for SRMD reviews and control approval decisions. Because these legacy processes and tools predate ongoing AAC changes AOV is implementing, certain shortfalls are expected to be addressed by these changes and AOV's planned knowledge management infrastructure. Shortfalls allocated to the IDA-FS solution were used to establish functional needs for the IDA-FS tool as bounded by the mission-level need for the tool. Preliminary functional needs for IDA-FS are as follows:

- Identify NAS equipment and facilities impacted by the change to the NAS in the SRMD under review.
- Help analysts to validate that the identified hazard list is complete for the change to the NAS.
- Help analysts to validate that all potential hazard causes were identified.
- Help AOV validate that the SRMD has sufficient information to substantiate the assessed risk.
- Verify that objective evidence is provided for initial/current risk assessment.
- Assess the objective evidence provided for predicted residual risk assessment (depending on implementation phase).
- Provide query capabilities on hazard/mitigation data to check how hazards and controls are addressed in other systems or at different facilities.
- Identify potential interactions of proposed changes in an SRMD with other changes in the NAS.
- Assist AOV with validating the effectiveness of proposed controls.
- Verify that all proposed controls are addressed in the hazard tracking and monitoring plan.

This preliminary list of IDA-FS functional capabilities will be refined and organized to support development of a ConOps for the IDA-FS tool. The ConOps will explore scenarios for AOV's use of IDA-FS and in turn will be used to derive additional IDA-FS functional capabilities. The ConOps will help to guide the development of final requirements for the tool.

8. REFERENCES

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