JPDO Paper

Phase 2 Aviation Safety Information Analysis and Sharing Concept of Operations

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Prepared by: Joint Planning and Development Office (JPDO), Safety Working Group

The Concept of Operations for Phase 2 of Aviation Safety Information Analysis and Sharing (ASIAS) describes an integrated, operational capability to proactively identify and evaluate safety issues through aggregation of data and sharing of analysis capabilities.

The aviation community has adopted a Safety Management System (SMS) approach to continuously improve aviation safety, as expected by the public and the U.S. Congress. Analysis and sharing of safety information are considered critical pieces of the SMS approach. Phase 1 ASIAS is currently operating with participation of the FAA, MITRE's Center for Advanced Aviation System Development NASA, and twelve Part 121 air carriers (as of September 2008). The vision for Phase 2 ASIAS is to expand the sharing and collaboration of Phase 1 to include other Federal government partner departments and agencies and additional industry stakeholders that volunteer to participate.

The organizational structure of Phase 2 ASIAS will have the same three basic components as Phase 1: an ASIAS Executive Board governing the activity, an Issue Analysis Team and its chartered Working Groups (WGs) performing the work of identifying systemic issues through analysis, and the Repository Integrator integrating and managing the flow of safety information among the participating organizations. The functions of Phase 2 ASIAS will include establishing stronger protections for data and information in ASIAS; sharing relevant safety information via net-centric approaches; sharing the development and use of advanced methods and tools for safety analysis; and supporting safety communities by providing information and methods and tools that can be used to identify and prioritize risk as well as design corrective actions. Phase 2 ASIAS will support SMS at the aggregate level in the study and evaluation of Air Transportation System (ATS) issues, and at the organization level by enabling access to ASIAS information and analysis methods and tools that can enhance safety.

To begin Phase 2 ASIAS implementation, the Safety WG requests that the Senior Policy Committee:

1. Endorse the Phase 2 ASIAS Concept described in this paper.
2. Identify a single lead department or agency to oversee the implementation, operation and continuous improvement of Phase 2 ASIAS and ensure that sufficient funding is provided to support this work; the FAA serves this role in Phase 1 and is prepared to continue serving in this capacity.
3. Ensure that JPDO member agencies currently conducting research relevant to aviation safety data sharing and analysis (such as automated knowledge-based aids, statistical analyses, information sciences, and other areas) coordinate on those projects.

Phase 2 Aviation Safety Information Analysis and Sharing Concept of Operations

Introduction

The Next Generation (NextGen) Integrated Plan of 2004 called upon the Joint Planning and Development Office (JPDO) Senior Policy Committee (SPC) to establish *"an on-going, integrated, operational data analysis capability to proactively identify and resolve safety concerns before incidents occur."* [1] This document presents a brief Concept of Operations for Phase 2 of the Aviation Safety Information Analysis and Sharing (ASIAS) to meet this requirement in the 2009 to 2013 timeframe. Further details of the planning and implementation of the Phase 2 ASIAS will be developed in FY09.

Phase 1 ASIAS is currently operating with participation of the FAA, MITRE's Center for Advanced Aviation System Development (CAASD, FAA's Federally Funded Research and Development Center), NASA and twelve Part 121 air carriers (as of September 2008) as described in the Aviation Safety Information Analysis and Sharing (ASIAS) Phase 1 Concept of Operations[2] and Procedures and Operations[3] documents. The vision for Phase 2 ASIAS is to expand the sharing and collaboration of Phase 1 to include other Federal government agencies and industry stakeholders that volunteer to participate. ASIAS data and information will not be used for purposes other than improvement of aviation safety, and stronger policies and procedures will be established to ensure the protection of data provided by participating organizations and the confidentiality of personnel in those organizations.

Phase 2 ASIAS will support the Safety Management System (SMS) Standard v1.4[4] by providing access to quality aviation safety information and analytical methods and tools to support two key principles: safety risk management (SRM) and safety assurance (SA). Phase 2 ASIAS will support the collective safety management effort for NextGen system safety, individual agencies, and private sector operators as they fulfill their individual safety responsibilities. This environment will create a powerful capability to access, share, search, and analyze aviation safety information among participating organizations and provide a distributed, secure, and trusted environment for transforming data into actionable information.

1. Current State of Aviation Safety Information Analysis and Sharing

Aviation safety management and oversight programs at most JPDO member agencies are just starting to implement SMS approaches. Most aviation safety information collection and analysis is currently conducted with little collaboration between JPDO partner departments and agencies. The various agencies with aviation operations or regulatory roles have disparate policies, rules, standards, taxonomies, architectures and systems to analyze safety information, assess findings

[1] Next Generation Air Transportation System Integrated Plan, December 2004
[2] Aviation Safety Information Analysis and Sharing Phase 1 – Concept of Operations, August 2007
[3] Aviation Safety Information Analysis and Sharing Procedures and Operations Plan, Final v 6.2, Sept. 20, 2007
[4] Safety Management System (SMS) Standard v1.4, JPDO Paper 08-007, July 30, 2008

and create corrective actions. Most tend to conduct analysis focused on known causes and incidents only within their area of primary responsibility. Further, there is often very little interaction on safety issues within agencies, such as groups in the FAA and among defense services.

When cross-agency collaboration occurs, it tends to be informal and issue-driven, rather than systematic and comprehensive. Most sharing among agencies is limited to direct human-to-human communication networks, use of web sites and forums, and some Federal groups with specific and limited missions such as the Interagency Committee for Aviation Policy (ICAP) and the DoD Policy Board on Federal Aviation. Senior agency leaders generally inform one another of aviation safety issues common to both organizations through direct contacts. The Aviation Safety Reporting System, administered by NASA and coordinated with the FAA, issues alerts and reports at aviation safety forums on emerging issues. Government technical staff and military services alert colleagues at other agencies of key issues or problems through groups such as the Commercial Aviation Safety Team (CAST) and ICAP.

In 2007 the FAA, NASA, and industry partners of CAST joined together to form Phase 1 ASIAS based on the earlier collaborative Voluntary Aviation Safety Information System (VASIS): a systematic, integrated, trusted, collaborative environment in which the commercial flight operations community could discover and resolve commercial aviation system safety issues. The ASIAS organizational structure has three basic components:

- The ASIAS Executive Board (AEB) which manages activity and coordination
- The Issue Analysis Team (IAT) which identifies shared issues, and forms Working Groups (WGs) to assess particular issues (such as wrong runway departures and collision alerts) and perform benchmarking analyses
- The Repository Integrator which integrates and manages the flow of safety information between and among the participating organizations.

The current AEB is comprised of representatives from member organizations and governs ASIAS processes. Specifically, the AEB consists of officials from FAA, NASA's Aviation Safety Program, several commercial flight operators, employee groups (Air Line Pilots Association), trade associations (Air Transport Association and Aerospace Industries Association) and manufacturers (Boeing). The AEB does not answer to a higher oversight body, but relies on mutual accountability among its member organizations. The functions of the AEB are to:

- Develop, establish, and maintain policies and procedures to ensure shared information is protected and is used for safety management purposes only
- Sets direction for inter-organization information sharing agreements
- Manage the IAT, receive its analysis products, and decide how to distribute their findings to appropriate aviation organizations for action
- Direct the activities of the Repository Integrator
- Prioritize stakeholder's needs by initiating studies and sharing analysis of aviation safety information within ASIAS
- Advocate for budget and labor resources to support ASIAS operations.

The IAT is a subcommittee of the AEB and is comprised of airline and labor Flight Operations Quality Assurance (FOQA) and/or Aviation Safety Action Programs (ASAP) specialists,

analysis experts in areas such as data mining and statistics, and operational experts in areas such as flight operations, maintenance, and air traffic control procedures. The IAT is responsible for conducting data analysis as directed by the AEB.

The functions of the IAT are to:

- Identify additional appropriate participants from the FAA, airline, labor, and other stakeholders for specific issues.
- Perform directed studies to proactively identify or analyze particular safety issues.
- Develop and conduct the corrective action effectiveness tracking analysis as directed by the AEB.
- Determine the appropriate data sets and the correct analysis methods and tools to apply to properly address a particular issue.
- Guide the development of new analysis tools, methods, and processes as needed.
- Develop the appropriate data de-identification methodology.

The Repository Integrator is an organization trusted by the AEB that has information technology capabilities and aviation safety expertise. (MITRE is serving as Repository Integrator for Phase 1 ASIAS.) The Repository Integrator manages the integration of current, relevant safety information held by ASIAS stakeholders as well as publicly available sources. The functions of the Repository Integrator are to:

- Advocate for the updating, expanding, and/or normalizing of data standards, event classification system, and data dictionaries as needed to permit the sharing of safety-relevant information
- Integrate safety information from multiple, disparate, decentralized sources
- Identify and develop needed improvements in ASIAS tools, methods, and processes
- Develop and manage role-based access to aviation safety information
- Develop and maintain standard operating procedures including data management, quality, security, strategy, and access plans.

There are five types of data analyses being conducted under Phase 1 ASIAS: Benchmark Analysis, Safety Metrics Monitoring, Vulnerability Discovery, Data-Mining Method and Tool Development, and Rapid Response (Thread) Study.

Various aviation safety "communities" external to ASIAS interact with ASIAS and benefit from its products. At present, three specific communities interact with ASIAS: CAST, the International Helicopter Safety Team (IHST), and the General Aviation Joint Steering Committee (GAJSC). Each of these communities consists of volunteer stakeholders from various organizations involved with aviation safety, such as operators, regulators, employee groups, trade associations and original equipment manufacturers (OEMs) and government agencies. These communities work together to assess risk, prioritize issues for risk reduction, and develop recommendations for corrective actions. Corrective actions are implemented voluntarily by operators, regulators, and OEMs, with informal collaboration by the community (such as CAST, IHST, and GAJSC).

2. Justification for Change

The potential for significant growth and increased complexity in the air transportation system requires a fundamental change in the way the air transportation community manages safety. The safety programs of the future will evolve from reactive data analysis to a preventive approach that integrates historical and prognostic evaluation and management of hazards and their safety risk, to prevent future accidents and incidents.[5] The aviation community has adopted an SMS approach to help achieve this goal. The approach consists of four pillars: Safety Policy, SRM, SA, and Safety Promotion. Phase 2 ASIAS is expected to primarily support the SRM and SA processes. The steps in those processes are similar to each other, and, in a simplified view, consist of:

1. Information acquisition in a just culture
2. Analysis of that information to identify hazards or issues
3. Assessment of the risk posed by the hazard
4. Development and implementation of preventive or corrective actions and then monitor the effect of those actions on the safety of the system.

A collaborative approach among JPDO departments, agencies and other aviation stakeholders is required to maximize safety gains. Working independently, each stakeholder receives limited information, and discovers correlations in the context of a partial view of events. This gives little understanding of "normal performance" for the community at large and restricts the ability to "benchmark" against others. Organizations often develop their own analysis methods and tools, identifying safety issues and hazards using organizationally unique taxonomies. Therefore, issues identified through one stakeholder's efforts may be difficult to communicate to others without having a common frame of reference for assessing the findings. Figure 1 depicts the "as is" view of aviation safety management in the Air Transportation System (ATS).

[5] Safety Management System Standard V1.4, JPDO Paper No.: 08-007

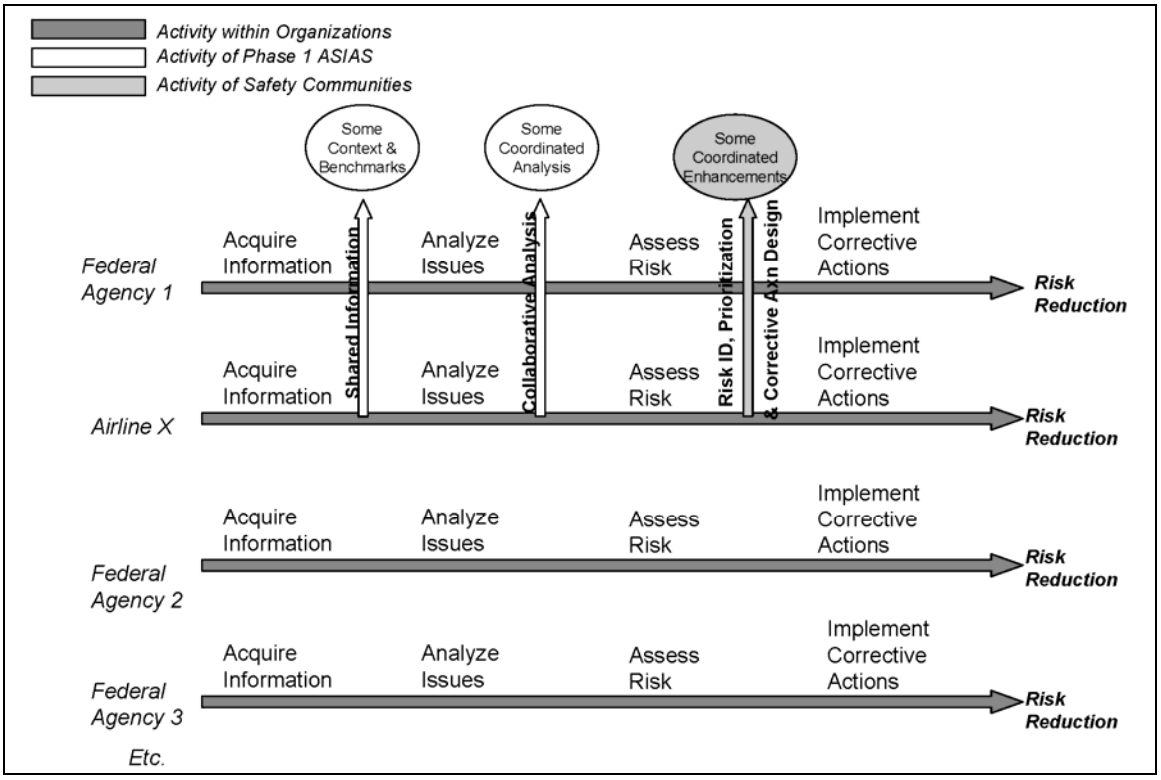

Figure 1 – Current Safety Management ("As Is")

To fully realize the benefits of the SMS approach and reach the safety levels demanded by the public, it will be necessary to address shortcomings in the current aviation system by:

- Replacing limited, informal communication with prompt and comprehensive exchanges of protected aviation safety information
- Coordinating and sharing the resources required to maximize the effectiveness of method development and issue analysis
- Establishing a collaborative approach to identifying and mitigating system safety issues posing the highest risks.

2.1 Limited, Informal Information Sharing Among JPDO Partner Departments and Agencies

Sharing safety information through informal inter-agency coordination currently allows only limited identification of common issues and limited exchange of supporting data.[6] ASRS is one of few known examples of current collaboration -- other opportunities for collaboration exist. A broader source of systemic information would benefit every aircraft operator and aviation regulator. For example, DHS (Customs and Border Protection and Coast Guard), DoD (Air Force, Army, Navy, and Marines) and FAA are all working on emerging safety issues for unmanned aircraft systems (UAS). C-130 operations are common to DHS/USCG and DoD's Air Force, Navy, Marines and industry as L-100 aircraft. FAA regulates operations such as medical evacuation flights and oil rig helicopters, which may derive benefit from knowledge of similar

[6] FAA and DOD Response to Similar Safety Concerns, January 2002; U.S. GAO, GAO-02-77; Recent conversations among individuals involved in NextGen activities indicate little change in status since 2002.

high risk operations by Coast Guard and Army helicopters. FAA has weather and operational information from joint use airports that would be useful to military operators. Furthermore, there are ever-increasing capabilities to collect additional safety-relevant information under proper protections, from pilots, controllers, maintainers, airport operators and others operating in the aviation system.

2.2 Inefficiency in Developing Parallel Methods, Tools and Analyses

Safety organizations have expressed a need for more advanced methods and tools that will permit more efficient and deeper analyses. NASA has a long history of developing data mining tools and methods, making them available to the aviation community, and continues to have a charter and budget to continue these efforts. In addition, safety groups are very interested in looking forward and predicting the implication of changes to complex, system-wide issues. If, as provided in the National Aviation Safety Strategic Plan, the United States aviation community pools its resources to develop more effective and efficient analysis techniques and shared methods and tools, a common basis and methodology will emerge for issue and hazard identification. Not all JPDO partner departments and agencies have aviation safety research and development budgets. In these cases, agencies with similar missions would have the opportunity to participate in the joint development and use of ASIAS prognostic analytical methods and tools. Joint method development also will generate a set of common definitions that can serve as the framework for prioritizing issues and communicating assessments and findings.

2.3 Inability to Identify and Mitigate System Risks Collaboratively

In general, aviation organizations in the United States do a good job of analyzing safety information in their own operations to identify and then mitigate hazards, resulting in the low current accident rate in the ATS. However, current analysis functions tend to focus on discrete mishaps that occur or hazards known to only the respective stakeholder. Agencies internally prioritize risks to determine the most pressing issues to mitigate.

Collaborating on the identification and mitigation of system risk should result in greater efficiency and accuracy in risk management. Collaboration increases efficiency when multiple stakeholders participating in an analysis share lessons learned from previous analyses rather than conducting their own independent analyses. Collaboration increases accuracy because all pertinent data and perspectives from the various stakeholders can be incorporated into the analysis and diverse perspectives contribute to the development of successful risk mitigations. CAST participants have been collaborating for nearly 10 years to identify the highest-risk safety issues, develop and prioritize possible mitigations, implement the best mitigations, and monitor their effectiveness. This process is believed to be a major contributor to the large reduction in the U.S. commercial aviation fatal accident rate during CAST's tenure[7]. The ICAP has been performing similar functions and achieved measurable success among the Federal agencies that operate aircraft. The success of these efforts are reasons to expand collaboration for risk identification and mitigation.

[7] "Process for Conducting Joint Implementation Measurement and Data Analysis Teams (JIMDATs)," Analysis of CAST Safety Enhancement 10, "Institute proactive safety plans: Flight Operations Quality Assurance (FOQA) and Aviation Safety Action Programs (ASAP)," June 2004 (draft).

2.4 Need for High Return on Investment in Safety Management

The calculated financial benefits of collaborating on the acquisition of safety information and proactive safety analysis are significant. CAST, through its rigorous evaluation of possible safety enhancements, estimated the potential annual savings attributable to data sharing and analysis at $114 million due to accidents prevented through identification and mitigation of previously unknown safety issues[8]. Evaluating a possible Military Flight Operations Quality Assurance program to perform proactive analysis of flight data to detect accident precursors, the Air Force Safety Center predicted at least a 441 percent return on investment (based on a conservative assessment)[9]. The European Union analyzed a recent accident and determined that an accident costing millions of dollars to the industry could have been avoided if information on certain hazards had been shared among aviation organizations in Europe and in the U.S. In short, there is evidence of the potential benefits of Phase 2 ASIAS relative to the cost of accidents that could be avoided.

3. Proposed Concept for Phase 2 ASIAS that Supports Safety Management Systems

The vision for Phase 2 of ASIAS:

> **The Phase 2 ASIAS will be an integrated, operational capability to support aviation safety management systems, and proactively identify and evaluate safety issues through aggregation of data and sharing of analysis capabilities, based on trusted partnerships among Federal government agencies and industry stakeholders that volunteer to participate.**

The proposed Phase 2 ASIAS of 2009 to 2013 will expand Phase 1 ASIAS to include JPDO partner departments and agencies; interested industry stakeholders such as airlines, original equipment manufacturers (OEMs), repair stations and others; and government agencies not in JPDO such as the National Transportation Safety Board (NTSB) and the Department of the Interior. Participation in ASIAS will be voluntary for all participants.

Phase 2 ASIAS will have the same three basic components as Phase 1: an AEB managing the activity, an IAT and its chartered WGs performing the work of identifying safety issues through analysis, and the Repository Integrator which will manage the flow of safety information among the participating organizations. Lessons learned from ASIAS Phase 1 regarding structure and processes will be incorporated into Phase 2. The organizations participating in Phase 2 ASIAS are expected to expand the scope of ASIAS beyond the focus on commercial flight operations in Phase 1 to encompass other types of aviation operations. A stakeholder will participate in ASIAS and in safety communities of interest to that stakeholder. At the same time, the various components of ASIAS will interact with each safety community, as shown in Figure 2.

[8] Unpublished CAST Cost Benefit Analysis; 2004

[9] Military Flight Operations Quality Assurance (MFOQA) Decision Brief, Everett Smith, AFSC/SEF, DSN 246-1173, October 4, 2004.

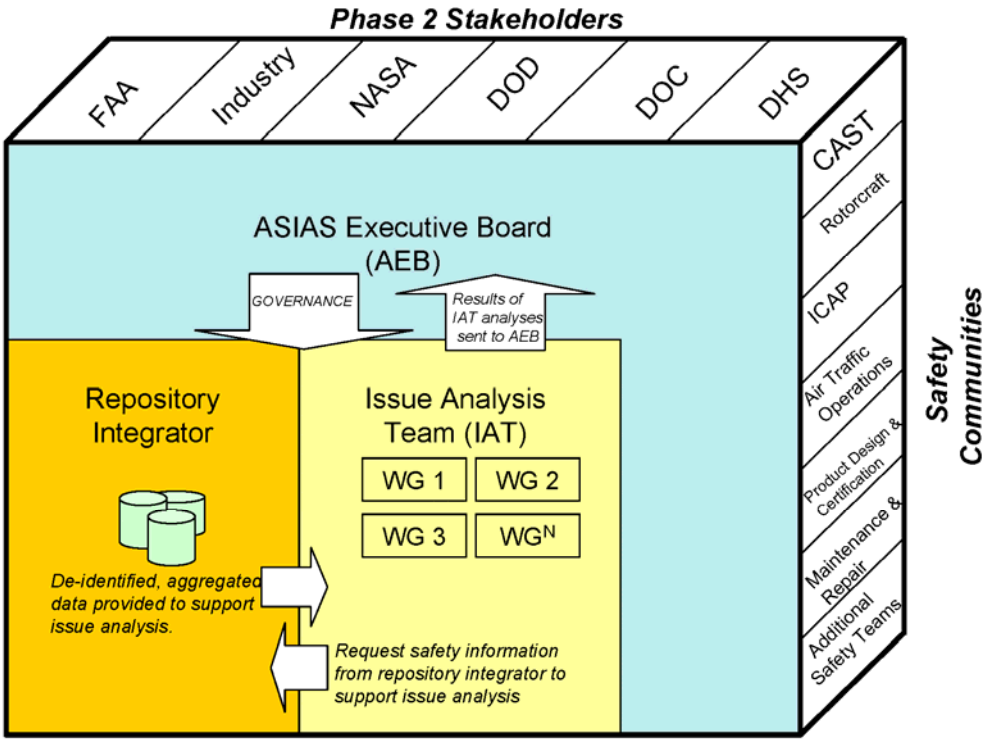

Figure 2 – Proposed Phase 2 ASIAS --Participation by Stakeholders in ASIAS and Various Communities

Phase 2 ASIAS will support SMS at two levels: (1) at the aggregate level, ASIAS participants will collaborate to study and evaluate system issues within the ATS; (2) at the organization level, participants will be able to access ASIAS information and analysis methods and tools to support their individual operations. Collaborative ASIAS activities allow stakeholders to draw on more information in context, to raise issues to be worked by the larger community, and to share their assessments with others. The aggregation of information and the sharing of benchmarks, analysis methods and tools, and issues create a context and framework for individual stakeholders' SMS activities.

The functions of Phase 2 ASIAS will include:

- Ensuring strong policies and procedures are in place, and advocating for appropriate regulations and/or laws,to protect the data and information shared within ASIAS.
- Expanding the sharing of relevant safety information that can be used within stakeholder organizations and by ASIAS to permit the setting of system-wide benchmarks
- Sharing the development and use of advanced methods and tools for safety analysis
- Supporting safety communities by providing information and methods and tools that can be used to identify and prioritize risk and design corrective actions.

Figure 3 shows the concept for how Phase 2 ASIAS will benefit safety management at the aggregate level while also enhancing the ability of the stakeholders to manage safety within their organizations. The functions of Phase 2 ASIAS are discussed in more detail in the following sections.

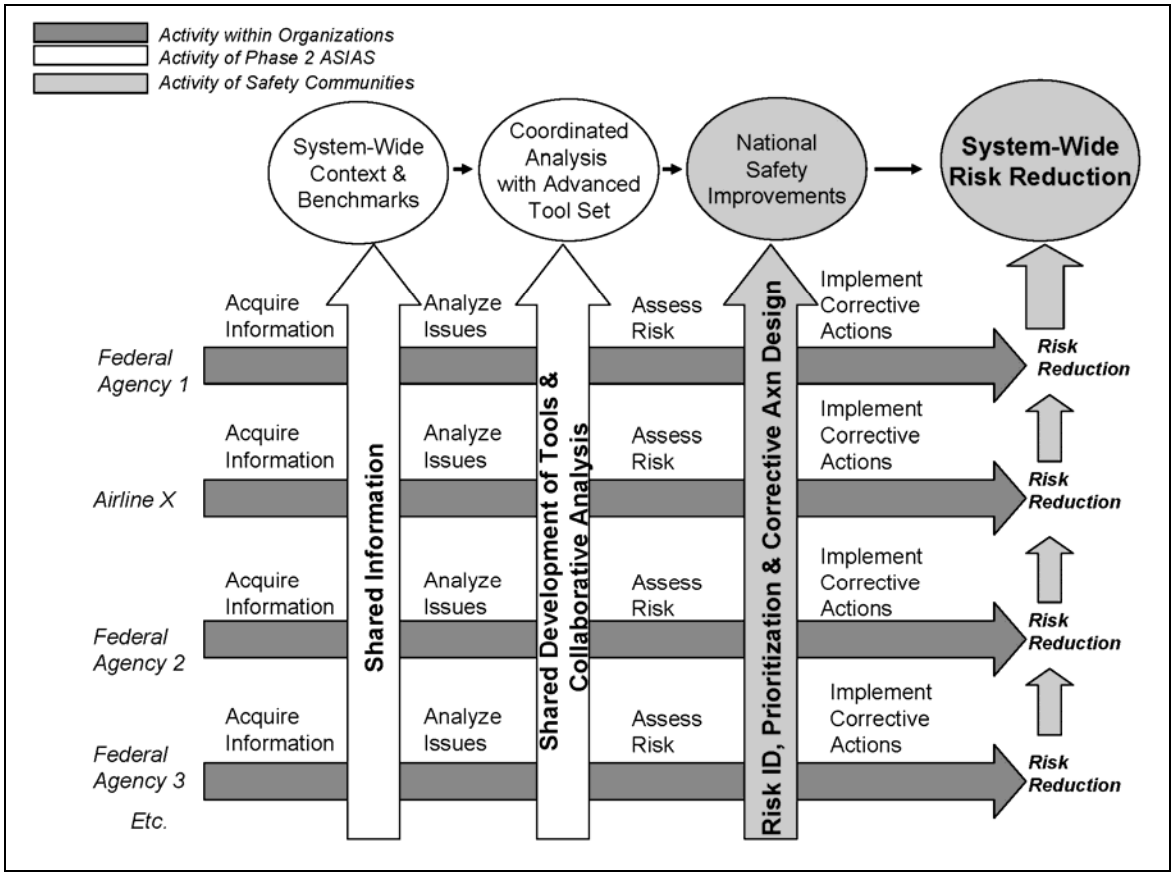

Figure 3 – Phase 2 ASIAS - Benefits to Air Transportation System

3.1 Ensuring Protections for Data and Information in ASIAS

One of the tenets most important to the success of ASIAS is to ensure that no ASIAS data or information will be used for purposes other than improvement of aviation safety. Organizations with sensitive or proprietary safety information will not agree to participate in ASIAS unless they are confident that their participation will not lead to negative consequences such as enforcement action, exposure to the media, or litigation. For example, DoD Instruction 6055.7 prohibits the release of safety investigation reports in their entirety to agencies outside the DoD. Likewise, private entities including airlines, manufacturers and aircraft owners have strong interests in protecting their sensitive and proprietary data. Since JPDO partner departments and agencies currently use several mechanisms to protect certain sensitive safety information from release, it will be necessary to develop strong new legal and procedural protections for safety data before most organizations will have the confidence to modify their internal protections and share their sensitive safety data. For Phase 2 ASIAS to be successful, stronger protections for safety data must be implemented that negate the fear that sensitive safety data could be used for any purpose other than directly improving aviation safety. Most likely, rule making and legislative action by Congress will be needed to ensure that data shared through ASIAS will be appropriately protected.

In addition to establishing various regulatory or legal protections, the Phase 2 AEB will develop procedures to ensure that each participating organization will be able to maintain control over their own data. This approach is consistent with that used in Phase 1 ASIAS. Organizations will

have the ability to grant access to their data on a case-by-case basis to support particular safety studies and to share their data only with particular organizations with approved access. For example, the U.S. Army might be willing to share certain safety data with organizations in the United States, but not with those outside the United States for strategic reasons and/or due to restrictions under the International Traffic in Arms Regulations (ITAR).

Along with policy to protect the information being shared, Phase 2 ASIAS will employ privacy and security protections as well. Mechanisms to secure the shared information include the use of firewalls, intrusion detection, user authentication, encryption and virus protection. Privacy enhancements include elevated authentication, need-to-know access controls and audit trails. As ASIAS evolves, security and privacy enhancement requirements will be continuously improved.

3.2 Sharing Safety Information

Many kinds of information needed to support SRM and SA could be shared among the stakeholders and safety communities in Phase 2 ASIAS. The specific types of data and information to be included will be determined by the Phase 2 AEB, but is expected to include the following:

- Accident and incident reports such as those found in the NTSB Accident Data Management System, the military departments' aviation mishap and hazard reporting systems, and the Aviation Safety Communiqué (SAFECOM) system at the Department of the Interior
- Air traffic-related reports, including loss of separation, near misses, and runway incursions
- Narrative information self-reported by pilots, controllers, dispatchers, and mechanics to systems such as the Aviation Safety Action Programs or the Aviation Safety Reporting System, which often contain human factors information
- Maintenance and repair records such as those found in the Service Difficulty Reporting System or the Government-Industry Data Exchange Program managed by the U.S. Navy
- Operational data such as Flight Operations Quality Assurance and Military Flight Operations Quality Assurance data, or derived flight track data such as that from the Enhanced Traffic Management System
- System state information such as weather, facility outages, airspace density, bird migratory patterns, and the status of Special Use Airspace.

One of the major benefits of pooling data from different operators is the ability to identify trends or patterns in that larger set of data that may not be visible within one operator or regulator’s data set. Also, through appropriate service oriented architecture, perhaps with encryption, data sets could be integrated without revealing proprietary information needed to perform the integration. For example, a FOQA flight data set could be matched with relevant weather or radar data while never revealing (and possibly automatically removing) any identifying data in the combined dataset. For example, neither FAA nor DoD, nor an individual airline, might see an issue at a joint use airport, but having more observations available in a pooled data set permits identification of the issue. In other words, sharing permits "connecting the dots." While discrete events may appear idiosyncratic, combining data sets can enable identification of similar event clusters.

In addition to sharing existing information, Phase 2 ASIAS participants will work together to identify types of information not currently being collected that should be collected for safety analysis. The ASIAS participants will need to think to the future to help support NextGen information needs.

Phase 2 ASIAS is expected to transition to a net-centric infrastructure, providing participants with mechanisms to control their own data and information using very secure protocols. To facilitate the transition, the JPDO Net Centric Working Group is developing a National Aviation Information Sharing Strategy (NAISS)[10]. Elements of the strategy include NextGen cyber security, data management and exchange as well as standards. Using NAISS protocols, Phase 2 ASIAS will employ a data and quality management plan to assure reliability, completeness, validity, and accuracy of the information being shared. Additionally, the ASIAS community will develop a common taxonomy to which participating organizations can map their legacy information systems. It is expected all JPDO partner agencies will begin aligning resources to meet the NAISS goals in FY 2010.

3.3 Sharing the Development and Use of Advanced Methods and Tools for Safety Analysis

One of the aims of Phase 2 ASIAS is to increase the efficiency and effectiveness of safety analysis by arranging for organizations in government and industry to work together to develop and use advanced methods and tools for safety analysis. While many excellent safety analysis methods and tools exist today, some are very expensive or require well-trained personnel to operate. One exception is the current focus in the NASA Aviation Safety Program to develop methods for advanced data mining of aviation safety data, including tools that are open-source and publicly released; however, the industry's full data mining needs may exceed their resources. In leveraging existing analytical capabilities such as NASA's data mining methods and tools, ASIAS could be the conduit for community consensus on the most pressing needs in data-mining methods and tools and required resources and development timeline, to enable development of analytical capabilities for future application.

The types of analysis methods and tools that might be provided for and incorporated into Phase 2 ASIAS (or developed by ASIAS) include methods and tools to perform:

- Statistics and Trend Analysis
- Flight Data Monitoring Analysis and Visualization
- Analysis of human error in accident and incidents
- Safety Risk Modeling and Analysis
- Root Cause Analysis
- Text Mining or Data Mining and Data Visualization
- Multi-dimensional modeling of large data sets to identify statistical anomalies
- Comparison of phenomenon across disparate datasets
- Integration of different data sources
- Methods and tools for de-identification of data while maintaining statistical relevance
- Prognostic analysis to predict future trends and issues.

[10] National Aviation Information Sharing Strategy, JPDO Net Centric Working Group Work Plan, Fiscal Year 2008

The stakeholders will be able to use the methods and tools within their organizations to analyze issues, and the IAT will also perform analysis of system-wide issues. The IAT will monitor safety data and perform vulnerability discovery. The IAT will develop a set of metrics for monitoring the performance of various aspects of the aviation system (and sub-elements of that system), and any exceedances of those metrics will trigger an "alert" for further evaluation by the IAT. The IAT, via the WGs they charter, will also scan safety information for safety issues that are not being monitored with existing metrics, in order to identify any emerging vulnerabilities.

3.4 Providing Information and Methods and Tools to Identify and Prioritize Risk and Design Corrective Actions

It is the function of ASIAS to integrate aviation safety information, perform issue analysis and discover statistically significant system safety issues. As significant issues are identified, the AEB notifies the appropriate stakeholder or safety community for further action. It is the responsibility of the respective stakeholder or safety community to evaluate the issue, assess the risk and, if appropriate, develop a corrective action. Phase 2 ASIAS will not change or transfer responsibilities among certificate holders and regulatory authorities for safety management and safety assurance; rather, it will enhance the capabilities of those organizations to fulfill their responsibilities.

To assist with SRM activities, the Phase 2 ASIAS AEB will make de-identified safety information (information with identifying elements removed such as pilot names, specific flights numbers, and other information as needed) and analytical methods and tools available to approved participants. After a corrective action is selected and implemented, the ASIAS IAT will monitor the treatment to determine if it addresses the risk appropriately. Additionally, the ASIAS IAT and AEB will monitor the implemented corrective action to ensure no unintentional consequences arise.

In addition to system safety activities, Phase 2 will make methods and tools and de-identified safety information available for ASIAS participants to compare their individual safety performance with that of their peers.

4. Transition Approach

Transitioning from Phase 1 to Phase 2 ASIAS will require leadership and commitment to evolve the trusted environment and culture that will increase participation and enable necessary processes and technologies (electronic networks, data standards or translations, analysis methods and tools, etc.). Resources will need to be applied to support research and development (R&D) as well as operations and support (O&S) of the Phase 2 ASIAS. Phase 2 successes will depend on long-term commitment by JPDO partner departments and agencies to champion development and operation of the ASIAS environment and its principles.

As ASIAS transitions from Phase 1 to Phase 2, additional organizations that choose to participate will have their interests represented on the AEB in manner to be worked out among all participating organizations. The scope of ASIAS will expand to include JPDO partner departments and agencies in the issue identification process, with IAT membership expanded to encompass all stakeholders. Where appropriate, agencies will make it a priority to share and analyze information as well as provide resources to support the expanded ASIAS environment. ASIAS will provide incentives and demonstrate benefits for agency participation through

performance metrics. A cost model for future phases of ASIAS will need to be developed and continuously evaluated to ensure stakeholders are fully realizing ASIAS benefits.

In an effort to create clear roles, responsibilities and authority, the Safety WG proposes the SPC select a single lead department or agency to oversee the implementation, operation and continuous improvement of Phase 2 ASIAS. In coordination with the AEB, the lead agency will refine Phase 2 concept requirements, seek funding to support the core Phase 2 program through the Federal Budget Process and develop a Phase 2 Implementation Plan. As requirements for Phase 2 ASIAS are identified, the lead agency, in coordination with the AEB, will identify and manage research needs. All stakeholders will be invited to fulfill the research.

Participating agencies will use the Implementation Plan as guidance for resource and budget alignment of agency ASIAS support functions. Support functions may include:

- Identification of agency subject matter experts to support ASIAS working groups or special studies
- Tagging agency aviation safety information assets that might be shared within ASIAS via a net centric architecture
- Research and development of methods and tools, processes, and methods and tools to support aviation safety information analysis.

It will be the responsibility of the lead agency and each supporting agency to execute the tasks described in the implementation plan in a timely manner. The lead department or agency will provide periodic implementation status updates to the SPC and the AEB.

Regarding costs, the Safety Working group has identified 4 cost centers associated with ASIAS:

1. Safety Management System Implementation and Operation – costs associated with implementing and operating an SMS within a department or agency, that are needed to generate the quality safety data required by ASIAS. Each department or agency will be responsible for costs associated with implementing SMS within their respective organization. The lead agency SMS program office will provide advisory implementation support only. SMS requirements may be found in the Safety Working Group's SMS Standard version 1.4.
2. ASIAS Research and Development – costs associated with defining research requirements and identifying feasible, alternative solutions. As requirements for Phase 2 ASIAS are identified, the lead agency, in coordination with the AEB, will identify and manage research needs. All stakeholders will be invited to fulfill the research. The Safety Working Group's National Aviation Safety Strategic Plan (NASSP) [11]provides additional details regarding possible Phase 2 ASIAS research requirements.
3. ASIAS Implementation, Operation and Improvement – costs associated with the implementation, operation and continuous improvement of the capability. The lead implementing department or agency will be responsible for expenses associated with this cost center. In some cases, supporting departments or agencies will have costs associated with tagging their safety information assets for the ASIAS architecture. Additionally,

[11] National Aviation Safety Strategic Plan, Version 8.0, September 8, 2008, JPDO Safety Working Group

supporting agencies may be responsible for costs associated with training. ASIAS-related policy and rulemaking is part of this cost center.

4. ASIAS Subject Matter Expertise – costs associated with providing aviation safety subject matter resources to support AEB, IAT and WG activities. Departments and agencies will be responsible for costs associated with their respective ASIAS SMEs.

When developing the Phase 2 ASIAS Implementation Plan, the lead agency will identify the rough order magnitude (ROM) costs estimates associated with each of the cost centers listed above.

Given the complexity and size of the proposed Phase 2 ASIAS, an incremental and phased implementation approach offers the most practical and cost efficient strategy to achieve the fully realized ASIAS vision. Participating organizations should consider a "Unity of Effort" approach, which involves building and maintaining a common, agreeable development and operational space where gains made by the environment as a whole encompass individual benefit and effort. This type of approach enables continuous assessment and integration of programs, evolution of an ASIAS architecture, and timely performance monitoring, as well as resource management to achieve the long term ASIAS vision and goals. Figure 4 provides a proposed implementation timeline.

Initial efforts in Phase 2 ASIAS will focus on integration of all JPDO partner departments and agencies into the Phase 1 ASIAS capability. Over time, ASIAS will increase incrementally with the participation of additional organizations based upon the needs of participants and areas of interest from potential partners. Great value could also be gained by expanding to include foreign partners such as EASA and EUROCONTROL. However, since data protection issues will likely become more complicated as ASIAS moves outside the United States, this expansion will likely be delayed until future phases.

In addition, the ASIAS vision includes the eventual incorporation of the many sectors of aviation, including commercial and GA flight operations, maintenance, training, airport and air traffic control operations, weather/environmental forecasting and aircraft, airport and airspace design. Initial efforts in Phase 2 ASIAS will build upon the successes of Phase 1 ASIAS in areas such as flight operations and air traffic control, and gradually expand to other sectors of aviation based on the needs of participants.

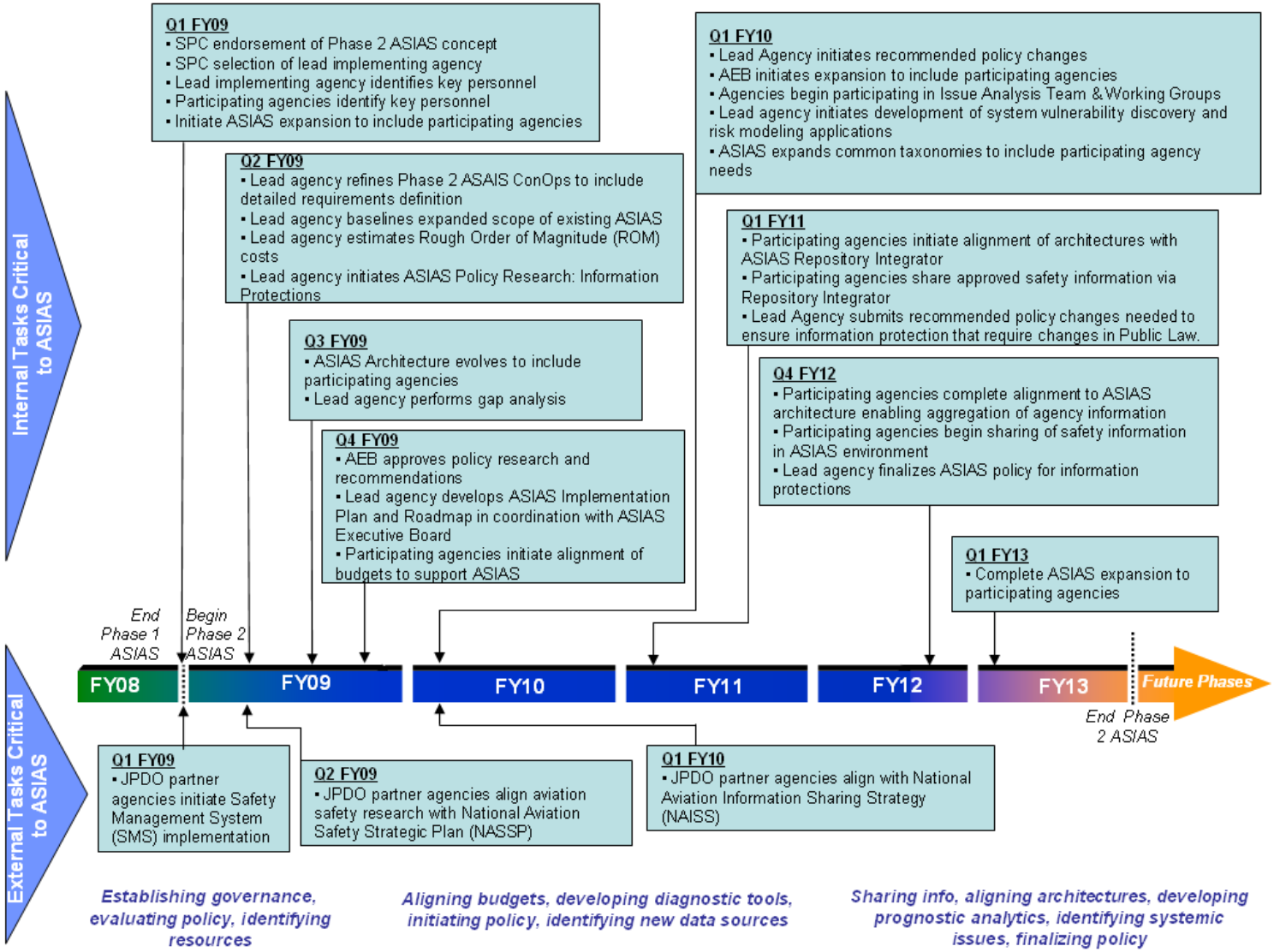

Figure 4 – Phase 2 Implementation Timeline

Note: Timeline shows plan as of Nov. 2008 when this document was conditionally approved by the JPDO Senior Policy Committee.

5. Request for SPC Endorsement

Today's sharing environment for aviation safety information is not adequate to support the envisioned comprehensive, proactive approach to safety management. With the extensive changes planned as part of NextGen, and the scope of involvement by individual operators (including the military services, FAA air traffic organization, and security agencies) and manufacturers, future safety assurance will require an overarching safety picture. By pooling relevant safety information, sharing resources for the development and use of advanced analysis methods and tools, performing analysis to proactively identify and measure risks, and sharing the resulting information, the aviation community will be able to collaboratively reduce the aviation accident rate below its current level.

Successful implementation of Phase 2 ASIAS relies on long-term commitments by JPDO partner departments and agencies to champion development and application of collective information sharing, risk management, and safety assurance. To begin implementation, the Safety WG requests that the SPC:

1. Endorse the Phase 2 ASIAS Concept described in this paper.
2. Identify a single lead department or agency to oversee the implementation, operation and continuous improvement of Phase 2 ASIAS and ensure that sufficient funding is provided to support this work; the FAA serves this role in Phase 1 and is prepared to continue serving in this capacity.
3. Ensure that JPDO member agencies currently conducting research relevant to aviation safety data sharing and analysis (such as automated knowledge-based aids, statistical analyses, information sciences, and other areas) coordinate on those projects.

Phase 2 Aviation Safety Information Analysis and Sharing Concept of Operations

Document Revision History

VERSION	DATE	DESCRIPTION
Draft Version 0.1	January 1, 2008	Draft written by ASIAS SC
Draft Version 0.5	January 10, 2008	Draft transmitted to Safety WG Review Team; draft revised based on comments received
Draft Version 1.0	February 19, 2008	Draft transmitted to Safety WG; draft revised based on comments received
Draft Version 1.5	May 3, 2008	Draft transmitted to JPDO Integration Council; draft revised based on comments received
Draft Version 1.5	May 14, 2008	Draft transmitted to JPDO WG Chairs; draft revised based on comments received
Draft Version 1.6	June 11, 2008	Draft transmitted to Subject Matter Experts from JPDO partner agencies and departments with close collaboration by industry stakeholders; draft revised based on comments received
Version 2.0	September 15, 2008	Transmitted to Safety WG
Version 2.0	October 1, 2008	Transmitted to JPDO Integration Council
Version 2.0	October 1, 2008	Transmitted to JPDO Director
Version 2.0	October 2, 2008	Transmitted to JPDO Board
Version 2.0	November 19, 2008	Transmitted to Senior Policy Committee
Version 2.0		Published on JPDO Website
Version 2.1	March 4, 2009	Updated per NASA's comments

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