DOT/FAA/ND-02/1

Office of Communication,
Navigation, and Surveillance
Washington, DC 20591

Checklist – An Integrated Program Plan Template

Robert D. Smith, James Baird
Federal Aviation Administration
Washington, DC 20591

Worth Kirkman, Dan Stapleton
MITRE
McLean VA, DC 22102

September 2001

Final Report

U. S. Department of Transportation

Federal Aviation Administration

Technical Report Documentation Page

1. Report No. DOT/FAA/ND-02/1	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Checklist – An Integrated Program Plan Template Version 1.0		5. Report Date September 2001 6. Performing Organization No.
Author (s) Robert D. Smith & James Baird, Federal Aviation Administration Worth Kirkman & Dan Stapleton, MITRE		8. Performing Organization Report No.
9. Performing Organization Name and Address Federal Aviation Administration Safe Flight 21 Product Team, AND-510 800 Independence Avenue, S. W. Washington DC 20591		10. Work Unit No. (TRAIS) 11. Contract or Grant No.
12. Sponsoring Agency Name and Address Federal Aviation Administration Safe Flight 21 Product Team, AND-510 800 Independence Avenue, S. W. Washington DC 20591		13. Type Report and Period Covered Program Plan Template 14. Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

The National Airspace System (NAS) is a complex, sophisticated collection of hardware, software, and trained personnel. Over many decades, this system has matured to the point where it can handle, safely and reasonably efficiently, many millions of flights on an annual basis. Nonetheless, the FAA and Industry must find ways to improve NAS safety and efficiency while meeting the constantly increasing demand for capacity. The Safe Flight 21 program (a Government/Industry partnership dedicated to developing, demonstrating, and evaluating various "applications" that could provide operational enhancements to the NAS) represents a major component of this effort.

In order to minimize the inherent tension between the need to examine proposed NAS changes thoroughly and the need to implement NAS changes expeditiously, the Safe Flight 21 program has initiated the development of application "Checklists". The purpose of each Checklist is to identify all the "level 2" tasks required to develop and implement an application in the NAS, and to:

- Plan and track program activities, schedules, and responsibilities for the application
- Address stakeholder resource needs and build agreements between stakeholders/activities
- Educate all involved parties and manage expectations
- Achieve buy-in from stakeholders and participants (FAA, Industry, and other Federal agencies)

This document presents a generic Checklist to be used as a program plan template for developing various Checklists for specific Safe Flight 21 applications and applications sets.

17. Key Words	18. Distribution Statement
RTCA 13 Steps Safe Flight 21 Applications Automated dependent surveillance – broadcast (ADS-B) Checklist	This document is available to the public through the National Technical Information Service, 5258 Port Royal Road, Springfield, Virginia 22161.

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	245	

CONTENTS

FIGURES

APPENDIXES

EXECUTIVE SUMMARY

The National Airspace System (NAS) is a complex, sophisticated collection of hardware, software, and trained personnel. Over many decades, this system has matured to the point where it can handle, safely and reasonably efficiently, many millions of flights on an annual basis. Nonetheless, the FAA and Industry must find ways to improve NAS safety and efficiency while meeting the constantly increasing demand for capacity. The Safe Flight 21 program (a Government/Industry partnership dedicated to developing, demonstrating, and evaluating various "applications" that could provide operational enhancements to the NAS) represents a major component of this effort.

In order to minimize the inherent tension between the need to examine proposed NAS changes thoroughly and the need to implement NAS changes expeditiously, the Safe Flight 21 program has initiated the development of application "Checklists". The purpose of each Checklist is to identify all the "level 2" tasks required to develop and implement an application in the NAS, and to:

- Plan and track program activities, schedules, and responsibilities for the application
- Address stakeholder resource needs and build agreements between stakeholders/activities
- Educate all involved parties and manage expectations
- Achieve buy-in from stakeholders and participants (FAA, Industry, and other Federal agencies)

This document presents a generic Checklist to be used as a program plan template for developing various Checklists for specific Safe Flight 21 applications and applications sets. The first several Checklists to be developed are shown below.

Phase 1 Terminal Domain Applications Set (includes the following applications:)

3.1.1, Enhanced Visual Approaches (existing procedures using ADS-B only)
3.1.2, Enhanced Visual Approaches (new procedures using ADS-B only)
3.1.3, Enhanced Visual Approaches (new procedures using ADS-B and TIS-B)
4.1.1, Enhance Visual Acquisition See-and-Avoid (using ADS-B only)
4.1.2, Enhance Visual Acquisition See-and-Avoid (using ADS-B and TIS-B)

Phase 1 Surface Domain Applications Set (includes the following applications:)

6.1.1, Runway and Final Approach Occupancy Awareness (ADS-B only)
6.1.2, Runway and Final Approach Occupancy Awareness (ADS-B and TIS-B)
6.2, Airport Surface Situational Awareness
7.1,Enhance Existing Surface Surveillance with ADS-B
Surface Management System (SMS)

Phase 1 General Aviation Domain Applications Set (includes the following applications:)

1.1.1, Weather Alerts
1.1.2, Weather Products
2.1, Low-cost Terrain Situational Awareness

This generic Checklist (program plan template) provides background and introductory material to aid the reader in understanding the origins and scope of the Checklist, and describes both the components of the Checklist and how the application stakeholders (FAA, Industry, and other Federal agencies) will use it. This document is also intended to serve as the basis upon which the authors of this document and the

affected FAA LOBs and other stakeholders work together to refine the contents of specific Checklists. This will require that the FAA LOBs and other stakeholders review the Checklist, identify changes required, assist in developing changes and improving articulation of issues, identify issues that should be raised to higher levels for resolution, and help the authors work toward consensus among interfacing organizations.

The contents of this document were developed in harmony with the Safe Flight 21 Master Plan, Safe Flight 21 High-Level Concepts of Operations, and the RTCA Template for ADS-B Applications ("13-Step Process"). Additional inputs from application stakeholders, issues and resolution documents, test and evaluation plans, and the ADS-B Research Evaluation Plan (REP) were used to provide the basis for the detailed activity descriptions contained in the Checklist. As the contents of the Checklist are refined and consensus is obtained, the Master Plan and other documents will be revised (as appropriate) to reflect the results of this consensus.

The Safe Flight 21 (SF21) Program is a Government/Industry partnership dedicated to developing, demonstrating, and evaluating various "applications" that address nine potential operational enhancements of the NAS. The FAA and Industry are considering roughly two dozen "applications" as candidates to achieve these nine enhancements. Efforts are underway to evaluate these applications via simulation and flight testing in operational environments. The SF21 Program hopes to validate the anticipated increase in safety, efficiency, and capacity benefits and thereby expedite these applications and their associated emerging technologies.

1. INTRODUCTION

The National Airspace System (NAS) is a complex, sophisticated collection of hardware, software, and trained personnel. Over many decades, this system has matured to the point where it can handle, safely and reasonably efficiently, many millions of flights on an annual basis. None the less, the FAA and Industry must find ways to improve NAS safety and efficiency while meeting the constantly increasing demand for capacity. The Safe Flight 21 program (a Government/Industry partnership dedicated to developing, demonstrating, and evaluating various "applications" that could provide operational enhancements to the NAS) represents a major component of this effort.

Historically, the minimum time required to bring a capability involving new ground systems from the idea stage to implementation in the NAS was 12 – 15 years; if avionics equipage were required to realize this capability (such as those of the Safe Flight 21 applications), the additional time required to achieve avionics equipage in 60 percent of the US aircraft fleet could be as much as 15 – 20 years. Industry expectations of Safe Flight 21, on the other hand, were to have over 20 applications developed, evaluated, and ready for implementation within 3 years, with avionics equipage to occur soon after on a very compressed timetable. As it turns out, the Safe Flight 21 program has developed, evaluated, and made ready for implementation 2 applications over the past 3 years (Enhanced Visual Acquisition (ADS-B Only) and Radar-Like Services with ADS-B), with possibly 4 more applications becoming ready for implementation within the next 1 – 2 years. Although these accomplishments imply that Safe Flight 21 will achieve its objectives far more quickly than the historical timeframe of 15 – 35 years, it also implies that Safe Flight 21 will not meet Industry expectations.

Given these circumstances, the Safe Flight 21 program, and the FAA in general, face significant challenges, specifically in managing very high (and in some cases very low) expectations from certain key sectors of Industry, overcoming a perceived lack of FAA accomplishments to date, working efficiently with many stakeholders (with many issues) while still meeting FAA obligations, and helping all stakeholders gain a sufficient understanding of the entire process. Many stakeholders believe that, to meet these challenges, it is necessary to develop a Checklist that clearly identifies all the tasks and resources required to implement a given application.

1.1 Purpose of the Checklist

In order to minimize the inherent tension between the need to examine proposed NAS changes thoroughly and the need to implement NAS changes expeditiously, the Safe Flight 21 program initiated the development of application "Checklists". The purpose of each Checklist is to identify all the "level 2"tasks required to develop and implement an application in the NAS, and to:

- Plan and track program activities, schedules, and responsibilities for the application
- Address stakeholder resource needs and build agreements between stakeholders/activities
- Educate all involved parties and manage expectations
- Achieve buy-in from stakeholders and participants (FAA, Industry, and other Federal agencies)

1.2 Purpose of This Document

This document presents a generic Checklist to be used as a program plan template for developing various Checklists for specific Safe Flight 21 applications and applications sets. The first several Checklists to be developed are shown below.

Phase 1 Terminal Domain Applications Set (includes the following applications:)

3.1.1, Enhanced Visual Approaches (existing procedures using ADS-B only)
3.1.2, Enhanced Visual Approaches (new procedures using ADS-B only)
3.1.3, Enhanced Visual Approaches (new procedures using ADS-B and TIS-B)
4.1.1, Enhance Visual Acquisition See-and-Avoid (using ADS-B only)
4.1.2, Enhance Visual Acquisition See-and-Avoid (using ADS-B and TIS-B)

Phase 1 Surface Domain Applications Set (includes the following applications:)

6.1.1, Runway and Final Approach Occupancy Awareness (ADS-B only)
6.1.2, Runway and Final Approach Occupancy Awareness (ADS-B and TIS-B)
6.2, Airport Surface Situational Awareness
7.1,Enhance Existing Surface Surveillance with ADS-B
Surface Management System (SMS)

Phase 1 General Aviation Domain Applications Set (includes the following applications:)

1.1.1, Weather Alerts
1.1.2, Weather Products
2.1, Low-cost Terrain Situational Awareness

This generic Checklist (program plan template) provides background and introductory material to aid the reader in understanding the origins and scope of the Checklist, and describes both the components of the Checklist and how the application stakeholders (FAA, Industry, and other Federal agencies) will use it. This document is also intended to serve as the basis upon which the authors of this document and the affected FAA LOBs and other stakeholders work together to refine the contents of specific Checklists. This will require that the FAA LOBs and other stakeholders review the Checklist, identify changes required, assist in developing changes and improving articulation of issues, identify issues that should be raised to higher levels for resolution, and help the authors work toward consensus among interfacing organizations.

1.3 Relationship to Other Documents

The contents of this document were developed in harmony with the Safe Flight 21 Master Plan, Safe Flight 21 High-Level Concepts of Operations, and the RTCA Template for ADS-B Applications ("13-Step Process"). Additional inputs from application stakeholders, issues and resolution documents, test and evaluation plans, and the ADS-B Research Evaluation Plan (REP) were used to provide the basis for the detailed activity descriptions contained in the Checklist. As the contents of the Checklist are refined and consensus is obtained, the Master Plan and other documents will be revised (as appropriate) to reflect the results of this consensus.

1.4 Stakeholders and participants

Federal Aviation Administration
Air Traffic Planning and Procedures (ATP)
Aircraft Certification Service (AIR)
Airway Facilities Service (AAF)
Communications, Navigation, and Surveillance Directorate (ARN)
Flight Standards Service (AFS)
FAA Alaskan Region (AAL)
FAA Southern Region (ASO)

FAA Technical Center (FAATC)
NAS Transition and Integration (ANS)
Office of Communications, Navigation, and Surveillance (AND)
Office of NAS Operations (AOP)
Office of Systems Architecture and Investment Analysis (ASD)
Office of Systems Safety (ASY)
Operational Support (AOS)
Requirements Development Directorate (ARR)
Seattle Aircraft Certification Office

FAA Unions
National Association of Air Traffic Specialists (NAATS)
National Air Traffic Controllers Association (NATCA)
Professional Airway Systems Specialists (PASS)

Industry Associations and Unions
Air Line Pilots Association Intl. (ALPA)
Air transport Association (ATA)
Aircraft Owners and Pilots Association (AOPA)
Cargo Airlines Association (CAA)

Other Participants
Airborne Express
Allied Signal
BF Goodrich
Department of Defense (DOD)
Federal Express
Honeywell
Johns Hopkins Univ. Applied Physics Laboratory (JHUAPL)
L3 Communications
National Aeronautics and Space Administration (NASA)
MIT Lincoln Laboratory
MITRE Corporation
Ohio University
Rockwell-Collins
RTCA, Inc.
Safe Flight 21 Steering Committee
Sensis
Trios Associates, Inc.
United Parcel Service
United Parcel Service Aviation Technologies
Volpe National Transportation System Center (VNTSC)

2. BACKGROUND

The Safe Flight 21 (SF21) Program is a Government/Industry partnership dedicated to developing, demonstrating, and evaluating various "applications" that address nine potential operational enhancements of the NAS:

1. Weather and other information to the cockpit
2. Cost-effective controlled flight into terrain (CFIT) avoidance

3. Improved terminal operations in low visibility
4. Enhanced see and avoid
5. Enhanced en route air-to-air operations
6. Improved surface surveillance and navigation for the pilot
7. Enhanced surface surveillance for the controller
8. ADS-B surveillance for non-radar airspace
9. ADS-B surveillance in radar airspace

The FAA and Industry are considering roughly two dozen "applications" as candidates to achieve these nine enhancements. These applications currently include (as of 1/12/01):

1.1.1 Initial FIS-B
1.1.2 Additional FIS-B
2.1 Low-Cost Terrain Situational Awareness
2.2 Increased Access to Terrain-Constrained Airspace
3.1.1 Enhanced Visual Approaches (Existing Procedures, ADS-B Only)
3.1.2 Enhanced Visual Approaches (New Procedures, ADS-B Only)
3.1.3 Enhanced Visual Approaches (New Procedures, ADS-B & TIS-B)
3.2.1 Approach Spacing for Visual Approaches
3.2.2 Approach Spacing for Instrument Approaches
3.4 Departure Spacing/Clearance
4.1.1 Enhanced Visual Acquisition (ADS-B Only)
4.1.2 Enhanced Visual Acquisition (ADS-B & TIS-B)
4.2.1 Conflict Detection
4.2.2 Conflict Resolution
5.2.1 Pilot Situational Awareness (Beyond Visual Range)
6.1.1 Runway and Final Approach Occupancy Awareness (ADS-B Only)
6.1.2 Runway and Final Approach Occupancy Awareness (ADS-B & TIS-B)
6.2 (Pilot) Airport Surface Situational Awareness
7.1 Enhance Existing Surface Surveillance with ADS-B
7.2 Surveillance Coverage at Airports Without Existing Surface Surveillance
8.2 Radar-Like Services with ADS-B
8.3 Tower Situational Awareness Beyond Visual Range
9.1.1 Radar Augmentation with ADS-B - Terminal
9.2.1 Radar Augmentation with ADS-B - En Route

Efforts are underway to evaluate these applications via simulation and flight testing in operational environments. The SF21 Program hopes to validate the anticipated increase in safety, efficiency, and capacity benefits and thereby expedite these applications and their associated emerging technologies.

3. DETAILED CONCEPTS OF OPERATION (CONOPS)

RESERVED. [As subsequent Checklists are developed, this section will contain or reference the CONOPS for the specific application(s) involved.]

4. APPROACH

4.1 Checklist Concept

This document presents a generic Checklist. Subsequent Checklists will be developed for specific applications or applications sets. These subsequent Checklists will be structured like this document with

introductory material (Sections 1 and 2), detailed CONOPS (Section 3), high-level descriptions of Checklist development phases and categories of activities (this section), and detailed Checklist activity descriptions (Section 5). In total there are approximately 70 activities, 7 management tasks and 13 key decisions defined in the current Checklist. As individual Checklists are refined and customized for specific applications sets, the total number of required items in the Checklist may change accordingly.

The basic structure of the Checklist is based on RTCA document (DO-249) entitled "Development and Implementation Planning Guide for Automatic Independent Surveillance Broadcast (ADS-B) Applications." This document was intended to identify the range of activities that need to take place in order to guide an application from an initial concept to operational use. This document has come to be known as the "RTCA 13-Step Process," which partitions the required activities into categories, or "steps":

Category	Description
1	Application Concept
2	Benefits and Constraints
3	Buy-In/Maturity
4	Procedures
5	Human Factors
6	Performance and Technical Requirements
7	Interoperability
8	Safety
9	Avionics and Ground Systems
10	Operational Evaluation
11	Certification (Air and Ground)
12	Operational Approval
13	Implementation Transition

In the Checklist, activities within each category are represented by a two-level numbering scheme, where the first number represents the activity category, and the second number the specific activity within the category (e.g., the activity "Analyze Benefits," described in detail in Section 5, would be identified as Activity 2.3, since it is the third activity defined in the Checklist under category 2). Products of a specific activity are represented by a three-level number, where the first two numbers represent the activity (as before) and the third number the specific product produced by the activity (e.g., the product "Benefits Estimates," described in detail in Section 5, would be identified as 2.3.1, since it is the first product defined in the Checklist under activity 2.3).

In order to provide a more comprehensive view of the development process, Program Management activities (Category 0) were added.

The activities in the Checklist are also grouped into the following phases of development. These phases provide a method for describing the flow of development activities over time.

- Concept
- Development
- Limited Evaluation
- Full Evaluation
- Post-Evaluation
- Investment Analysis
- Step-Up
- Implementation

- Transition
- In-Service

The Checklist will be used to plan and track application development activities, address stakeholder resource needs, build agreements between stakeholders/activities, educate all involved parties and manage expectations, and achieve buy-in from stakeholders and participants. The Safe Flight 21 Product Team (the organization responsible for planning, developing, and executing the Safe Flight 21 program) will be responsible for working with stakeholder representatives in developing the Checklists. The Safe Flight 21 Strategic Support Group (SSG), an FAA decision-making body focused on the strategic evolution of Safe Flight 21 goals and initiatives in support of NAS modernization (particularly those relating to ADS-B), will serve as the forum for obtaining consensus and buy-in to the Checklists at the management level.

4.2 Category Summaries

The FAA relied heavily on the "RTCA 13-Step Process" in developing the Checklist. The structure of the Checklist retains all of the 13 steps (in the form of activity "categories"), and includes an additional category (Category 0) to address the various Program Management efforts required to support application development.

The following sections provide short descriptions of each Category of activities, the roles of the participants involved, issues, risks, and interactions with other Categories.

4.2.1 Category 0: Program Management

Description: This category includes a variety of management and administrative tasks.

Activities:
- 0.1 Develop and revise SF21 Master Plan
- 0.2 Develop and revise Checklist
- 0.3 Manage issues and risks
- 0.4 Administer SF21 program
- 0.5 Coordinate for decisions
- 0.6 Develop acquisition program plans
- 0.7 Prepare acquisition contract(s)

Participants and Roles: The development and revision of the Safe Flight 21 Master Plan is an FAA/Industry task done within the purview of the RTCA Safe Flight 21 Steering Group, with assistance from MITRE/CAASD. The development and revision of the Checklist is an FAA task involving the Safe Flight 21 Program Office, ASD-140, and several FAA support contractors with significant input from FAA Lines of Business (LOBs) and Industry. Issues/Risk Management, Safe Flight 21 Program Administration, and Decision Coordination are the responsibility of the SF21 Program Office. The development of acquisition program plans and preparation of acquisition contracts will be the responsibility of a yet to be selected IPT.

Issues and Risks: While major program risks are addressed under this category of activities, this document discusses specific risks below under the activity category of concern.

Interactions with Other Categories: Efforts under this category interact with the efforts of all other categories of activities.

4.2.2 Category 1: Application Concept

Description: This category addresses the definition of operations and systems concepts both at a high level and at the detailed level. High-level concepts provide an initial framework against which initial studies are planned and performed. A Research Evaluation Plan (REP) is also developed (collectively for all applications) to help guide development efforts from an Air Traffic Control (ATC) perspective. The high-level concepts and the REP are developed in the Concept phase and generally take several months to complete. Detailed concepts are derived from the high-level concepts and from research activities occurring in the concept phase. These identify required development activities for the application, the systems and functionality required to support the application, and proposed assignments of functionality to systems. These detailed concepts are developed in the Development phase and generally take several months to complete. A link assessment is also conducted at this point (collectively for all applications) to determine the most appropriate link(s) for the underlying systems.

Synergistic sets of applications are defined showing the relationships among applications being developed, and providing guidance for future evaluations of application sets. The detailed concepts and synergistic application sets are updated and refined as the application develops. The more significant efforts (about 1-2 months each) occur just after limited evaluations in the Limited Evaluation phase and just after full evaluations in the Post-Evaluation phase.

At some point in the development cycle, once the issues raised in the REP have been sufficiently addressed, a mission need is established to define the scope of the FAA program for the ATC/ground component of the architecture. Once approved, requirements documents are developed to help baseline and guide the subsequent acquisition.

Activities:
- 1.1 Define high-level concept
- 1.2 Develop detailed OPS concepts
- 1.3 Develop detailed systems concepts
- 1.4 Identify synergistic applications sets
- 1.5 Perform link assessment
- 1.6 Develop research evaluation plan
- 1.7 Establish mission need
- 1.8 Develop requirements document

Participants and Roles: The primary organization that produces the operations concepts is the RTCA Safe Flight 21 Steering Group Ops/Procedures Sub-Group, which has participation by FAA (Air Traffic, Flight Standards, SF21) and Industry (CAA, AOPA, MITRE). Various organizations produce specific systems concepts, but the OCG is the organization that coordinates these various concepts with application requirements. The OCG has both FAA (Air Traffic, Flight Standards, Certification, Cost/Benefit, SF21, Capstone) and Industry (CAA, AOPA, MITRE) participation. The RTCA Safe Flight 21 Steering Group approves the concepts for further development. The FAA is performing the link assessment with participation from Industry and from Eurocontrol. The FAA develops the REP, mission need and requirements documents.

Issues and Risks: None of particular concern at this time.

Interactions with Other Categories: This category generally requires inputs either from pre-existing documents (such as the roadmap, MASPS, etc. for initial concepts), or from development activities (such as simulations, limited evaluations, or full evaluations) where previous operations and systems concepts have been evaluated and require modifications. The products of this category generally serve as inputs to all other categories in the Checklist, for all phases of development.

4.2.3 Category 2: Benefits and Constraints

Description: This category addresses the assessment of expected benefits and anticipated costs associated with the application, as part of a combined effort to address benefits and costs for all applications collectively. These estimates are used to assist stakeholders in deciding whether development of an application should continue. Plans for operational analysis, metrics definition, data collection and analysis are developed in the Concept phase to guide the assessments of benefits and costs, and generally take several months to complete. Synergistic sets of applications are also used to aid in the assessments. Benefits are analyzed for these sets and for the individual application based on the application concepts and the results of development activities. Costs are estimated based on the application concepts and the synergistic application sets. Benefits and cost estimates are used as the baseline for Industry business case development.

The cost and benefits estimates are updated and refined as the application develops, with the more significant efforts (about 2-4 months each) occurring just after limited evaluations in the Limited Evaluation phase, and just after Full Evaluation in the Post-Evaluation phase.

Industry business cases and FAA investment analysis are based, in part, on the results of the previous cost and benefits analyses, and can dramatically influence the decision on implementation.

Activities:
- 2.1 Plan cost/benefit analyses
- 2.2 Analyze costs
- 2.3 Analyze benefits
- 2.4 Develop Industry business cases
- 2.5 Conduct investment analysis

Participants and Roles: The primary organization that produces the benefits and cost estimates is the RTCA Safe Flight 21 Steering Group Cost/Benefit Sub-Group, which has participation by FAA (Cost/Benefit, System Architecture, SF21) and Industry (CAA, MITRE). The RTCA Safe Flight 21 Steering Group approves the adequacy of the estimates. In Industry, each business organization develops its own business cases. The FAA conducts investment analysis.

Issues and Risks: An effective estimate of benefits and costs for an application (or set of applications) requires the availability of fairly detailed operations and systems concepts. For many applications, estimates of benefits and costs were developed without these detailed concepts, which may result in additional revisions to the estimates being required.

Interactions with Other Categories: This category generally requires inputs from the Application Concepts category to provide the framework and guidance for the estimates, and from those categories that provide simulation or evaluation results where benefits mechanisms were addressed. The products of this category generally serve as inputs to stakeholder decision-making processes (Buy-In/Maturity category) and to the Operational Evaluation category (providing data collection requirements).

4.2.4 Category 3: Buy-In / Maturity

Description: This category addresses the key decisions required to develop and implement an application. An initial FAA/Industry decision resulted in the selection of 9 potential NAS operational enhancements. The FAA and Industry then jointly selected and prioritized a set of SF21 applications that could provide these enhancements. For a given application or set of applications, a joint FAA/Industry decision is required to initiate a limited and/or a full evaluation. In parallel with these evaluations, the FAA makes a

decision on the link(s) that will be used by the systems supporting the application. After the evaluations have been performed, the FAA decides whether all significant issues for the application(s) have been resolved. If this decision is positive, Industry decides whether they wish to pursue implementation. The decisions that are required next are for the FAA to make its acquisition decisions, and for the FAA and the involved unions to reach agreement. Agreement with NATCA is required for changes that affect controllers. Agreement with PASS is required for changes that affect maintenance personnel. The final decision is for the FAA to decide to place ground infrastructure in service.

Activities:
- 3.1 Decision - Select enhancements
- 3.2 Decision - Select and prioritize applications
- 3.3 Decision - Go for limited evaluation
- 3.4 Decision – Select link(s)
- 3.5 Decision - Go for full evaluation
- 3.6 Decision – Mission need
- 3.7 Decision - Was OpEval adequate?
- 3.8 Decision – Initial investment
- 3.9 Decision - Industry commits to implementation
- 3.10 Decision – Select vendor and award contract
- 3.11 Decision – Final investment
- 3.12 Decision - Formal FAA/Union agreement
- 3.13 Decision – In-service

Participants and roles: Either Industry or the FAA make a few of these major decisions individually. However, the FAA and Industry make the majority of these decisions together.

Issues and risks: None of particular concern at this time.

Interactions with other categories: The initial decisions, selecting the 9 enhancements and selecting and prioritizing the SF21 applications to be evaluated, comprised the start of the Safe Flight 21 program. The link decision and the joint FAA/Industry decisions required to initiate the planning for a limited or full evaluation requires inputs from most categories, but primarily from Benefits and Constraints, Procedures, Human Factors, Performance and Technical Requirements, and Safety. These decisions also affect subsequent activities in all other categories, most prominently those in the Operational Evaluation category. The FAA decision, on whether the evaluations have resolved all significant issues regarding an application(s), and the Industry decision to commit to implementation, require inputs from most activity categories. These decisions also drive the majority of the Certification and Operational Approval activities, following the evaluations that are required to implement the application(s) in the NAS. The decisions for the FAA to acquire ground infrastructure rely primarily on activities in the Program Management, Application Concepts, and Benefits and Constraints categories. The decision for the FAA and the involved unions to reach agreement requires inputs from and affects subsequent activities in the Operational Approval category. The decision for the FAA to place ground infrastructure in service relies primarily on the results of activities in the Operational Approval category.

4.2.5 Category 4: Procedures

Description: Based on the operational concept, the current maturity of the application, and with input from pilots and controllers, a process for developing, testing, and demonstrating the procedures that are necessary to support the operational use of specific applications is defined. Simulations of procedures with pilots and controllers are conducted and needed modifications to procedures are identified. Training materials are developed and training of pilots and controllers who will participate in the evaluation is conducted. These procedures are modified as necessary based on simulations and flight evaluations. (In

this category, proposed procedures are developed and tested in joint FAA/Industry partnership. Formal approval and implementation by the FAA is part of the Air Traffic approval process in Category 12.)

Activities:
- 4.1 Plan procedures development
- 4.2 Specify procedures
- 4.3 Simulate with pilots
- 4.4 Simulate with controllers
- 4.5 Train for procedures

Participants and roles: The Operational Evaluation Coordination Group (OCG) is responsible for the development and evaluation of procedures. OCG membership includes virtually all FAA LOBs, Industry, various support contractors, and other Government agencies.

Issues and risks: None of particular concern at this time.

Interactions with other categories: The procedures are based on the Application Concept and on the results of Human Factors considerations. As they are developed and evaluated, procedures are a major consideration in Safety. They also have a significant interaction with Performance and Technical Requirements. Results from procedure development guide the creation and revision of detailed Ops Concepts. The proposed procedures, training materials, and evaluation results are input to the Air Traffic approval process.

4.2.6 Category 5: Human Factors

Description: This category addresses the assessment of human factors issues and requirements related to the application. The FAA develops a human factors plan outlining the human factors assessment activities to be conducted to support the development of the application. Initial cockpit and controller task analyses and simulations are conducted (about 6 months to complete) in the Concept and Development phases to develop initial human factors requirements to guide subsequent evaluations of the application. These requirements are updated and refined as the application develops, with the more significant efforts (about 2-4 months each) occurring during simulations and limited evaluations in the Limited Evaluation phase, and during simulations and full evaluations in the Full Evaluation phase.

Activities:
- 5.1 Plan human factors activities
- 5.2 Analyze cockpit tasks
- 5.3 Design cockpit interface
- 5.4 Define cockpit interface standards
- 5.5 Analyze controller tasks
- 5.6 Design controller interface

Participants and Roles: The OpEval Coordination Group (OCG) is the primary organization that conducts and approves the human factors analysis activities. (The OCG has participation from FAA, Industry, and other Federal agencies.) SAE is the organization that defines and approves cockpit interface standards. The FAA is responsible for the approval of controller interface standards.

Issues and Risks: An effective assessment of human factors requirements for an application (or set of applications) requires the availability of fairly detailed operations and systems concepts. For many applications, human factors requirements were developed without these detailed concepts, which may result in additional assessments being required.

Interactions with Other Categories: This category generally requires inputs from the Application Concept category to provide the operational and system conceptual framework for the human factors assessments. This category also generally requires joint efforts with activities in the Procedures category, since the development of procedures and the assessment of human factors by their very nature are closely intertwined activities, and with activities in the Operational Evaluation category, since this is where the majority of human factors operational data is collected. The products of this category generally serve as inputs to both the Application Concept and the Benefits and Constraints categories (providing assessment results for updating application concepts and benefits mechanisms), as well as to stakeholder decision-making processes (Buy-In/Maturity category).

4.2.7 Category 6: Performance and Technical Requirements

Description: This category addresses the assessment of expected and required system performance to support the application. An initial estimate of performance requirements is developed (about 4 months to complete) during the Concept phase based on initial operational and systems concepts for the application, and is used as a guide in the initial development of the application. Estimates of expected performance and required performance are updated and refined as the application develops, with the more significant efforts (about 2-4 months each) occurring just after initial application development in the Development phase, just after limited evaluation activities in the Limited Evaluation phase, and just after full evaluation in the Post-Evaluation phase. Once the estimates of required system performance have been refined and validated, performance standards are developed to support the manufacture and certification of required systems to support the application. These standards are developed in the Post-Evaluation phase, and can take up to 2 years to complete. These estimates of required system performance are also used to develop ground system requirements and specifications, which in turn support subsequent system acquisition activities.

Activities:
- 6.1 Estimate performance
- 6.2 Define performance standards
- 6.3 Develop ground system specifications

Participants and Roles: The OpEval Coordination Group (OCG) is the primary organization that conducts and approves the estimation of performance expectations and requirements. (The OCG has participation from FAA, Industry, and other Federal agencies.) RTCA SC-186 is the primary organization that conducts and approves the development of performance standards. The FAA is responsible for developing and approving ground system specifications.

Issues and Risks: Effective estimates of required performance requires the availability of fairly detailed operations and systems concepts. For many applications, estimated performance requirements were developed without these detailed concepts, which may result in additional revisions to the estimates being required.

Interactions with Other Categories: This category generally requires inputs from the Application Concept category to provide the operational and system conceptual framework for the development of performance requirements, as well as inputs from the Interoperability and Safety categories, which provide additional potential requirements. This category also generally requires inputs from the Operational Evaluation category, which provides data to validate the performance estimates. The products of this category generally serve as inputs to the Avionics and Ground Systems, Operational Evaluation, and Certification categories (providing guidance in the development of avionics, technical parameters for simulation and evaluation, and guidance for certification of avionics, respectively).

4.2.8 Category 7: Interoperability

Description: This category addresses the assessment of interoperability requirements of proposed systems supporting the application. An initial estimate of interoperability requirements (among both airborne and ground systems, including ground-ground interfaces) is established during the Concept phase (about 6 months to complete) based on initial operational and systems concepts for the application, and are used as a guide in the initial development of the application. Validations of interoperability performance are conducted (about 2 months each) based on the outcomes of activities in the Limited Evaluation and Full Evaluation phases, the results of which are fed into performance standards development activities.

Activities:
- 7.1 Analyze interoperability
- 7.2 Define ground system interoperability
- 7.3 Validate interoperability

Participants and Roles: RTCA SC-186 is the primary organization that conducts and approves the estimation of interoperability requirements. The FAA is responsible specifically for defining ground-ground system interface requirements. The OpEval Coordination Group (OCG) is the primary organization that conducts and approves the assessment of overall interoperability performance. (The OCG has participation from FAA, Industry, and other Federal agencies.)

Issues and Risks: An effective assessment of interoperability performance requires the availability of well-defined performance estimates, which in turn requires the availability of fairly detailed systems concepts. For many applications, interoperability performance was assessed without these performance estimates, which may result in additional assessments being required.

Interactions with Other Categories: This category generally requires inputs from the Application Concept category to provide the operational and system conceptual framework for initial estimates of interoperability requirements, and from both the Performance and Technical Requirements and Operational Evaluation categories to support the assessment of interoperability performance. The products of this category generally serve as inputs to the Performance and Technical Requirements category to support the development of system performance standards and specifications.

4.2.9 Category 8: Safety

Description: Safety activities guide the development of applications, validate their safety to guide decision-making, and plan for evolution to facilitate subsequent regulatory approvals. In the Concept phase, safety activities are structured to efficiently guide the definition of the application. Safety works closely with design to evaluate potential elements of systems and procedures. Some interacting elements will be highlighted if they create hazards or make hazards more difficult to mitigate; others will be highlighted because they provide an assumed mitigation and should be maintained as designs evolve. Immediate consideration of mitigations in early-phase safety analysis allows efforts to be focused on elements that are most important in developing an application that can be safe. Subsequent activities are structured to validate application safety and to guide decisions about implementation - possibly as a collection of applications. In this subsequent process, mitigations are considered only after hazard severities, probabilities, and interactions have been evaluated. The levels of safety for current operations and proposed new operations are compared. Standard FAA safety analyses are conducted in the Implementation phase from a ground system perspective, once the system acquisition process is initiated.

In addition to application-by-application activities for development and decision-making, an over-all safety plan is used to facilitate regulatory approval and make it more predictable for evolutionary extensions of capability that span multiple applications. This plan is developed from applications

concepts and may be revised as more is learned. It lays out groupings and levels of capability that should be certified or approved together, and boundaries between levels of capability that reflect the need for different (or additional) safety analyses and/or certification and/or approval. In addition to these activities, test-safety strategies and reviews are developed with each iteration of flight-testing, and safety issues and resolutions are represented as part of over-all SF21 program management.

An evolution safety plan across all applications will require 6 months from the availability of high-level concepts for the relevant applications, with later updates requiring 2 months per year. Coordinated safety analysis plans for individual applications will require 1 month each, plus revisions later for unexpected issues or results. Safety analyses for concept/development will extend the duration of these phases - about 6 months. Revisions during the limited evaluation and full evaluation phases will also extend about 6 months, but with reduced or intermittent effort. Comparative/validation analyses occur near or before the start of full evaluation, and analysis of the current-operations baseline makes this a significant effort over a 6-month interval. Revisions after operational evaluation require approximately 1 month. FAA acquisition safety analyses are conducted as part of the system acquisition process, and will require approximately 6 months to complete (in parallel with other acquisition activities).

Activities:
- 8.1 Plan coordinated safety activities
- 8.2 Summarize operational services and environment
- 8.3 Perform safety analyses
- 8.4 Allocate safety objectives and requirements
- 8.5 Track safety issues during development
- 8.6 Ensure safety of testing
- 8.7 Assess comparative safety
- 8.8 Formalize scopes of operations
- 8.9 Plan safety for implementation
- 8.10 Analyze hazards of individual systems
- 8.11 Analyze hazards over-all
- 8.12 Analyze hazards of operations and support
- 8.13 Assess health hazards

Organizations and Roles: Safety planning for each application will be performed by (or for) the SF21 program office. The SF21 Steering Group will develop and coordinate the evolution plan (for multiple applications) as part of the periodic revisions of the SF21 Master Plan. The Safety Sub-Group of the OCG is responsible for test safety and safety analyses to guide development, with participation of FAA/ASD, ASY, AFS and AIR, and by the RTCA/SC-189 ASA MASPS working group. The FAA/System Safety Working Group will perform comparative/validation analyses to guide implementation decisions. They will also be responsible for tracking and coordinating safety issues and resolutions with the SSG, the SF21 Steering Group, and RTCA SC-189. The FAA IPT assigned to the system acquisition is responsible for ensuring that the acquisition safety analyses are performed.

Issues and Risks: These safety processes are based on the FAA "Safety Handbook", which references the coordinated safety analysis process developed for data-link by ICAO and RTCA/SC-189 and published as RTCA DO-264. Integration of developmental and validational safety analyses and strategic/evolution safety planning has never been undertaken, and process specifics and buy-in are needed.

Interactions with Other Categories: Safety takes primary inputs from Program Management, Application Concepts, Procedures, Human Factors, Performance and Technical Requirements, and Interoperability. It interacts with these and with Operational Evaluation, and provides output to Application Concepts, Performance and Technical Requirements, Certification, and Operational Approval, and to decisions and commitments to proceed with each application (Buy-In/Maturity category). Safety activities are also

performed in conjunction with activities in the Avionics and Ground Systems category during the Implementation phase.

4.2.10 Category 9: Avionics and Ground Systems

Description: In order to evaluate the safety, service, and procedure improvements that Safe Flight 21 (SF21) applications may provide, it is necessary to demonstrate and evaluate these applications and their associated avionics, ground systems, and procedures. In the Limited Evaluation or Full Evaluation phases, this may involve the use of experimental equipment. Demonstration ground systems may be operated in a "shadow" mode while air traffic controllers use existing ground systems for the actual control of traffic. Demonstration avionics may be certified with extensive limitations (e.g., geographic limitations, date of use limitations, and aircraft serial number limitations). If flown on an aircraft in experimental status, avionics certification may not be required.

Industry or Government develops avionics for various phases of the demonstration and evaluation process. Avionics used during a limited evaluation may be of limited maturity and sophistication. Avionics used in a full operational evaluation should be of a maturity and sophistication that allows a complete evaluation of all significant issues. In addition, the avionics cockpit interfaces ought to conform with that for which applicants intend to apply for certification; in some cases limited or full certification may be obtained prior to operational evaluation. In the Step-Up phase, the applicant develops avionics that will be submitted for certification (if not completed previously).

The FAA is responsible for the development of ground systems that will be implemented in the NAS in support of the applications. This involves the manufacture, delivery, and integration of ground systems into the NAS during the Implementation and Transition phases.

Activities:
- 9.1 Develop avionics
- 9.2 Develop ground systems for evaluation
- 9.3 Manufacturer ground systems for implementation
- 9.4 Deliver and integrate ground systems

Participants and roles: Industry develops avionics and applies to the FAA for certification. AIR provides policy guidance on certification. The actual certification is approved at the regional level. The lead region is dependent on the type of aircraft (The Northwest Mountain Region is the lead for air transport aircraft; the Central Region is the lead for general aviation aircraft; the Southwest Region is the lead for helicopters and tilt-rotor aircraft.) Prototype or experimental avionics may be developed and used by either Industry or Government researchers on experimental aircraft. These may include flyable versions of prototypes developed for simulations.

Industry develops aviation ground systems to support the evaluations. Generally, this development takes place under contract to the FAA since the agency purchases and maintains the majority of the ground systems that make up the NAS. FAA certification of certain non-federal ground systems is required. However, this is not expected to apply to non-federal SF21 ground systems.

Issues and risks: While a portion of Industry expresses great eagerness to make use of SF21 applications, discussions with the avionics manufacturers indicate that they are not yet convinced that there is a significant market for their goods in the near future. Consequently, there are limitations on the level of resources the avionics manufacturers are prepared to invest in this effort at this time.

Interactions with other categories: The Applications Concept and Procedures categories identify what the avionics are intended to support. The Human Factors, Performance and Technical Requirements, and

Safety categories identify detailed avionics design requirements. Consideration of the avionics and ground systems is a key factor during the planning for limited or full evaluation. Unless the avionics are installed on an aircraft that will be operated in experimental status, certification is required for flight evaluation. Operational approval to use the avionics for specific procedures is required for flight evaluation. The development of implementation ground system requires inputs primarily from Program Management, Performance and Technical Requirements, and Safety categories, and delivers products required for activities in the Operational Approval category.

4.2.11 Category 10: Operational Evaluation

Description: In order to fully evaluate the safety, service, and procedure improvements that Safe Flight 21 (SF21) applications might provide; it will be necessary to operationally demonstrate and evaluate these applications along with their associated avionics, ground systems, and procedures. This category of activities addresses the planning and the execution of both simulation and flight evaluation.

Activities:
10.1 Plan joint evaluations
10.2 Simulate mission
10.3 Conduct joint evaluations

Participants and roles: The Operational Evaluation Coordination group (OCG) is responsible for planning and performing joint evaluation activities. The OCG is a large group with membership from virtually all FAA lines of business, from Industry, Labor, other Government agencies, and research organizations. Prior to a joint evaluation, this group meets over a period of several months to discuss and reach a consensus on all aspects of the evaluations.

Issues and risks: Joint evaluations are generally large, expensive events requiring the commitment of resources from many different organizations. Current practice has been to set an evaluation time frame and then plan for it. There is a risk that all activities required to support an evaluation may not necessarily be accomplished by this time frame. If this occurs, the FAA and Industry must decide whether to delay the evaluation in order to make it more productive or to conduct it as scheduled with less than maximum benefit. Since this is often a very political decision, either the FAA or Industry may be unwilling to delay the planned event. When this occurs, the evaluation then becomes more of a publicity event and less of an event to address unresolved issues regarding specific applications.

Interactions with other categories: The Procedures category identifies what the evaluation is intended to support. The Human Factors, Performance and Technical Requirements, and Safety categories identify detailed design and testing requirements. The Avionics and Ground Systems category provides the equipment that will be used in the evaluation. Operational approval to use the ground systems and avionics for specific procedures is required for the evaluation. The results of the evaluation influence subsequent activities in all categories.

4.2.12 Category 11: Equipment Certification (Air & Ground)

Description: An aircraft, and equipment permanently installed in aircraft, must be certified for safety, reliability and airworthiness before it can be flown. This category deals with the process of obtaining FAA approval of equipment, particularly avionics, for installation and use in aircraft. It describes the process and the activities from initiation through final approval.

Two kinds of approvals are considered here: Technical Standard Orders (TSOs) and Type Certificates (TCs) or more specifically, Supplemental Type Certificates (STCs). A TSO is a broad approval, providing a minimum performance standard for parts, materials or manufacturing/assembly processes and

is not related to a specific aircraft or aircraft class, make or model. Installation of TSO items in specific aircraft requires separate approval. The installation may constitute an aircraft design change and therefore would require an engineering design approval. The approval would be in the form of a TC if it were a major change. When the change is not so extensive as to require a new TC, an STC can be used. A third form of installation approval is a field approval, using FAA Form 337.

The certification process can begin as early as the Development phase, where the manufacturer initiates discussions with the FAA to describe the new equipment and define the scope of certification. Radio spectrum may be of concern where a frequency or frequencies would be necessary for the equipment to perform its mission. A formal request for specific frequencies may be necessary and should be initiated as soon as possible.

When the equipment design has reached at least an initial level of maturity, a formal application should be made to the FAA for certification. The request would contain a certification plan, at least an initial design, the regulatory basis for the certification and method of compliance. The certification basis can be federal regulations or other guidance, such as airworthiness standards. Once the FAA has reviewed the certification plan and concurs, all supporting data is submitted, such as a final design, test plans and test data. The submission may contain an aircraft flight manual supplement and, if necessary, a flight test plan. Unless the aircraft is classified as experimental, some form of approval is required before flight. Early flight tests or demonstrations may be restricted in duration, geographic area or limited to a particular aircraft. The FAA may or may not participate in or observe the testing, depending on the significance of the certification. The final step is the issuance of the STC or TSO, with the objective to receive certification on as broad a basis as possible.

Activities:
- 11.1 Obtain spectrum
- 11.2 Plan and apply for avionics certification
- 11.3 Establish avionics certification project
- 11.4 Submit updated or supplemental information
- 11.5 Test and evaluate for certification
- 11.6 Issue TSO or STC

Participants and roles: The manufacturer generally initiates the certification process as soon as a new product begins to emerge. The FAA Aircraft Certification Office (ACO) has the role of reviewer and approval agent and the two parties interact until certification is accomplished. Some new equipment and systems involve revolutionary and controversial procedures and approvals and require involvement from other parties, such as the Aircraft Certification Service (AIR), until the process is completed. In these cases, issues need to be raised across FAA LOBs and resolved. The Flight Standards Service (AFS) may need to be involved early if new pilot roles and procedures are created. Interaction with Air Traffic Services, and even unions, may be necessary if the new procedures include changes in air traffic control. Certification plays such a critical role that it affects nearly all of the activities.

Issues and risks: Although ADS-B is well within the state of the art, the use of this technology is not and it may suggest a change to the traditional partition between pilot and controller roles and responsibilities. Since the uses are new and evolutionary, certification authorities are careful and want to limit what they certify. They are wary of allowing opportunities to extend the use beyond the original purpose as it may foster unsafe situations.

Interactions with other categories: While the Certification category precedes and feeds directly into the Operational Approval category, it is often somewhat self-contained, with limited interactions with other categories. There is some involvement with Human Factors, Performance and Technical Requirements, and Safety categories for equipment that permits radically new and more controversial procedures. These

identify detailed avionics design requirements. Unless the avionics are installed on an aircraft that will be operated in experimental status, avionics certification is required for flight evaluation (Operational Evaluation category).

4.2.13 Category 12: Operational Approval

Description: This category deals with the process for obtaining FAA approval of new procedures. This includes FAA Flight Standards approval of new pilot procedures and FAA Air Traffic approval of new air traffic procedures.

Flight operations are governed by Federal Aviation Regulations and are supplemented by Operations Specifications (OpSpecs) that are tailored for and assigned to a particular operator. These OpSpecs may impose additional restrictions, such as prohibiting the carriage of passengers with a single pilot, while they may relax other regulatory requirements. Before the operator can use new procedures, they must be formally proposed, examined and approved by FAA Flight Standards.

The operator usually starts the operational approval process by initiating a dialog with the FAA. Examples of the operator's purpose for requesting operational approval could be to employ a new type of instrument approach, to initiate flights to destinations outside the continental United States, or to have the flight crew assume new roles usually reserved for air traffic control. The procedures may involve the use of new avionics.

Following an informal dialog or perhaps a statement of intent, the operator makes a formal application to the operator's Flight Standards District Office (FSDO) for operational approval. The formal submission must contain sufficient information for the FSDO to evaluate the new procedures and to determine if the new procedures can be conducted safely. Therefore, the application must contain information and approvals for any new equipment to be used, and a complete description of the new procedures, including training plans and materials for the flight crew.

Following a FSDO review of the proposal, one or more operational demonstrations may be required and perhaps a validation of actual training sessions as well. Once the safety of the new procedure is substantiated, the FAA would issue amended OpSpecs that authorize the new procedures.

Air traffic procedures are governed by FAA Orders (such as 7110.65, Air Traffic Control; 7210.3, Facility Operations and Administration; and 7610.2, Special Military Operations). Users are informed of these procedures by the orders themselves, by the Aeronautical Information Manual (AIM), and, for particular operations at selected locations, by letters of agreement (LOAs). Before controllers can use new procedures, FAA Air Traffic must approve them. Usually, this requires drafting a revised version of one or more of the governing ATC documents, coordinating the draft via a formal review process, and negotiating a formal agreement with the National Air Traffic Controller Association (NATCA). If the proposed change involves the maintenance of FAA equipment, it may also require negotiating a formal agreement with the Professional Airway Systems Specialists (PASS). If ground systems are to be integrated into the NAS, maintenance training will be required, along with field testing and commissioning of these systems.

Activities:
- 12.1 State intent to conduct new flight OPS (phase 1)
- 12.2 Request operational approval (phase 2)
- 12.3 Review application package (phase 3)
- 12.4 Demonstrate operation (phase 4)
- 12.5 Grant operational approval (phase 5)
- 12.6 Revise ATC orders & LOAs

12.7 Revise the AIM
12.8 Develop/perform controller training
12.9 Coordinate with FAA LOBs
12.10 Inform Unions
12.11 Develop maintenance procedures
12.12 Develop/perform maintenance training
12.13 Field test ground systems
12.14 Commission ground systems

Participants and roles: The air carrier operator (such as an airline, air charter operator or cargo airline) usually initiates the process for operational approval of new pilot procedures, and is responsible for submitting all documentation and sponsoring the training and changes necessary to implement the new or revised operation. The Flight Standards District Office receives the application, processes and approves the new procedure or involves other entities to resolve issues. The Flight Standards Service (AFS) becomes involved when new procedures raise contentious issues and may coordinate with other FAA lines of business.

Based on the results of prior development and evaluation, the Operational Evaluation Coordination Group (OCG) would formally propose new air traffic procedures. FAA Air Traffic would develop a revised version of one or more of the governing ATC documents, coordinate the draft document(s), and negotiate formal agreements with FAA unions. FAA Airway Facilities would be responsible for maintenance training, procedures, field testing, and commissioning of any ground systems to be incorporated into the NAS to support the applications.

Issues and risks: While operational approval is within the purview of the Flight Standards Service, the newly proposed procedures may require a transfer of roles and responsibilities from one job specialty to another and require extensive coordination with other entities inside and outside the FAA. These proposals can raise wide-ranging issues with unknown outcome from safety to job security.

Interactions with other categories: The operational approval of new pilot procedures is a fairly self-contained effort, with few interactions with other activity categories; that is, most interaction is between the applicant and Flight Standards. Where controversial and radically new procedures are involved, there can be interactions with other activities such as Certification. The operational approval of new air traffic procedures and testing/commissioning of ground systems is also a fairly self-contained effort, with few interactions with other categories; that is, most interaction is between FAA offices or between FAA management and FAA unions.

4.2.14 Category 13: Implementation Transition

Description: This category addresses those activities that actually involve the end-user operational use of avionics and ground systems in the In-Service phase. This includes pilot/airline use of avionics, as well as FAA controller/maintainer use of ground systems.

Activities: 13.1 Operate and maintain avionics
13.2 Operate and maintain ground systems

Participants and roles: Pilots, airlines, AOCs, and possibly third parties are considered to be the end-user of avionics systems. Manufacturers and/or end-users are responsible for the maintenance of the avionics. FAA controllers and maintainers are the primary end-users of the ground systems, except where these systems are required to support airborne applications. The FAA is responsible for the maintenance of the ground systems in the NAS.

Issues and risks: None at this time.

Interactions with other categories: The activities in this category require inputs primarily from the Avionics and Ground Systems and Operational Approval categories. This category represents the end of the checklist process, and so there are no significant interactions with other categories, nor are there any products supplied to other categories, except perhaps in the form of lessons learned and/or operational experience that can be transferred to the activities of follow-on application development processes.

4.3 Phase Summaries

The flow of activities in the Checklist can be described in terms of a series of development "phases" as shown in Fig. 4-1. The scope of each of these phases is described in the following sections.

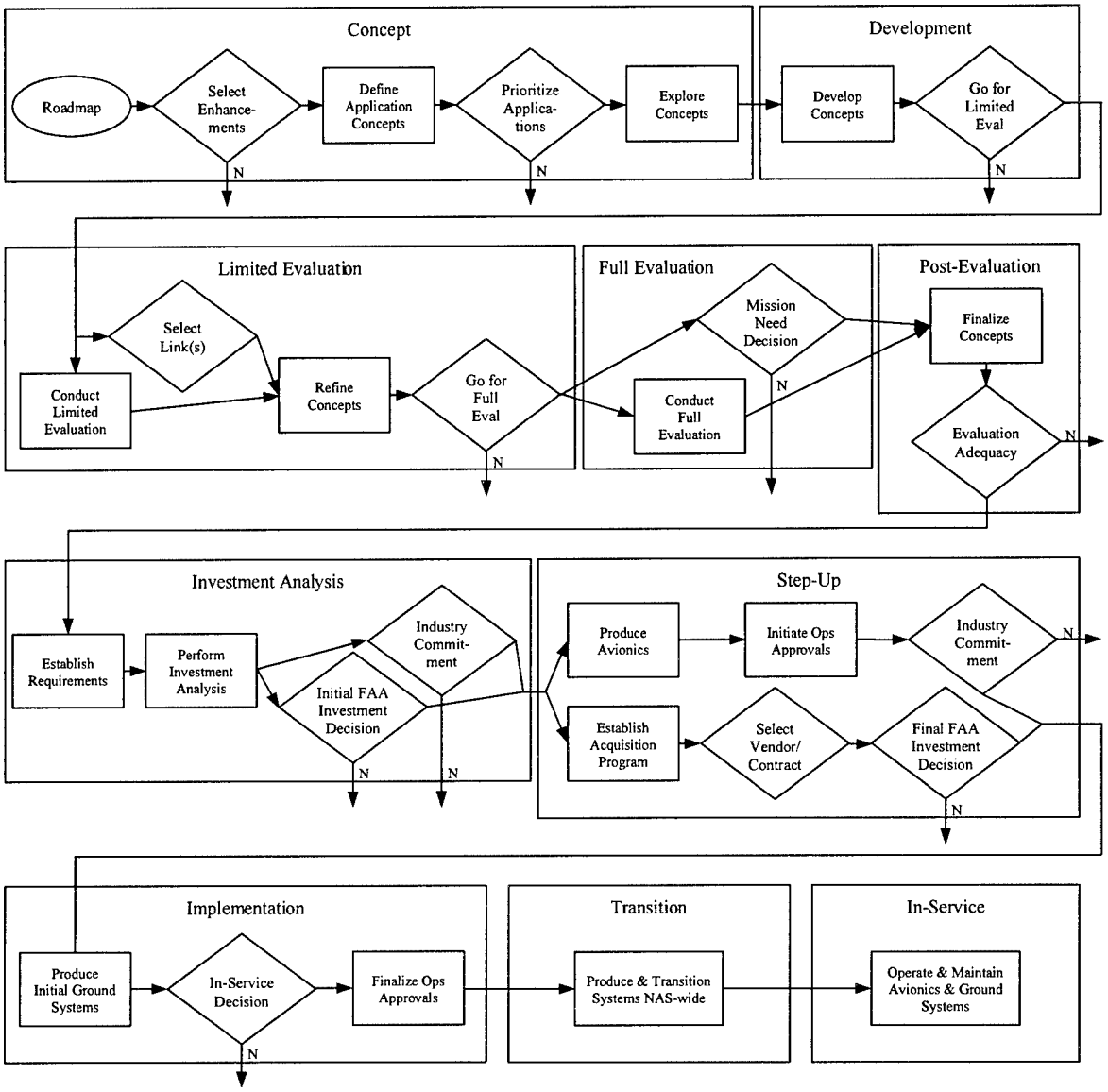


Figure 4-1: High-Level Phase Flow

4.3.1 Concept

This first phase addresses the development of high-level operational concepts that support the application. The roadmap outlining the nine Free Flight Operational Enhancements that provide the greatest potential benefits is used as a starting point for this phase (as well as the SF21 program as a whole). High-level concepts are defined for specific applications identified or implied by the roadmap. FAA and Industry then prioritize these specific applications to identify those that have sufficient priority to warrant further action, and provide guidance toward their future development within the framework of the roadmap. FAA application development and implementation plans ("Checklists") are based on the outcome of these activities.

4.3.2 Development

Once an application has been identified and prioritized, the second phase addresses the development of detailed CONOPS and detailed systems concepts that support the application and its refinement through initial procedures development, human factors assessments, safety analyses, system and interoperability assessments, and cost/benefits assessments. These activities culminate in the development of draft procedures, system performance requirements, cost/benefits estimates, and detailed systems and Ops concepts.

At this point, the FAA and Industry determine if development has progressed to the point where selected (limited) aspects of the application can be operationally evaluated, and if resources can and should be expended to conduct such an evaluation. A "Yes" decision allows the application to progress to the next phase, Limited Evaluation. A "No" decision either returns the application to some point in the Development phase (for further development) or eliminates the application from further development.

4.3.3 Limited Evaluation

This phase addresses the evaluation of selected (limited) aspects of the application in both simulated and live operational environments, considering benefits, procedures, human factors, system performance, safety, certification, and operational issues in the evaluation. Limited evaluation is performed when application concepts have not yet fully matured, but whose development requires certain simulated and live operational assessments to be conducted. In some cases, a limited evaluation of an application may not be necessary, in which case the application may progress directly to the Full Evaluation phase.

Once a determination is made that an application requires a Limited Evaluation, the FAA and Industry make preparations for selected simulated and operational assessments (usually in conjunction with similar assessments for other applications). This includes coordination among the various FAA and Industry organizations that have responsibility for specific activities such as procedures, human factors, safety, cost/benefits, system performance, avionics and ground systems (for test), certification, and operational approvals, as required. Once preparations are complete, simulations and assessments are conducted on selected aspects of the application. These assessments culminate in the refinement of draft procedures, system performance requirements, cost/benefits estimates, and detailed systems and Ops concepts.

At this point, the FAA and Industry determine if development has progressed to the point where all aspects of the application are ready to be (fully) operationally evaluated, and if resources can and should be expended to conduct such an evaluation. A "Yes" decision allows the application to progress to the next phase, Full Evaluation. A "No" decision either returns the application to an earlier phase of development (Limited Evaluation or Development), or eliminates the application from further development. It should be noted that many applications may require more than one pass through a Limited Evaluation phase before they are ready to progress to the Full Evaluation phase.

4.3.4 Full Evaluation

This phase addresses the evaluation of all aspects of the application in both simulated and live operational environments, considering benefits, procedures, human factors, system performance, safety, certification, and operational issues in the evaluation. Full Evaluation is performed when an application has fully matured and requires the validation of application concepts before stakeholder commitments could be obtained.

Once a determination is made that an application is ready for Full Evaluation, preparations for full simulated and live operational assessments are made (usually in conjunction with similar assessments for other applications). This includes coordination among the various FAA and Industry organizations that have responsibility for specific activities such as procedures, human factors, safety, cost/benefits, system performance, avionics and ground systems (for test), certification, and operational approvals, as required. Once preparations are complete, full simulations and live assessments are conducted on the application. The goal is to collect sufficient data to support Post-Evaluation analyses.

4.3.5 Post-Evaluation

Based on the results of Full Evaluation and application development to date, Post-Evaluation final assessments and validations are performed in preparation for stakeholder decisionmaking. These assessments culminate in the final revision of draft procedures, system performance requirements, cost/benefits estimates, and detailed systems and Ops concepts. At this point, the FAA and Industry determine if the evaluations have been adequate such that all significant issues have been addressed. A "No" decision either returns the application to an earlier phase of development (Full Evaluation, Limited Evaluation, or Development), or eliminates the application from further development.

If "Yes", the FAA then determines if it will commit to implementing the application, should there be sufficient user commitment to pursue operational approval of the application. Likewise, the users develop business cases to determine if they will commit to pursuing operational approval of the application, given an FAA commitment to do the same. A "No" decision for either case either returns the application to an earlier phase of development, or eliminates the application from implementation. A "Yes" decision for both cases allows the application to progress to the next phase.

4.3.6 Investment Analysis

Should the application require ground infrastructure, the FAA must perform an investment analysis prior to determining its commitment to implement the application (most likely bundled along with other applications that would also require ground infrastructure). In this case, the FAA's commitment, should it be forthcoming, would be represented by an Investment Decision as defined in the acquisition management system (AMS). This Investment Decision would only be made with the understanding that users would also commit to pursuing operational approval of the application(s).

4.3.7 Step-Up

In this phase, once the FAA and the users both commit to the application, users "step-up" by applying for operational approval for the application, while the FAA "steps-up" by drafting ATC procedures (if necessary). The FAA also works with the users to certify avionics and move the application through the formal operational approval process in a timely fashion.

Based on final system performance requirements (preferrably in the form of standards), avionics vendors develop their certification packages and submit them to the FAA for review and approval. Likewise, based also on final draft procedures, cost/benefits estimates, and detailed systems and Ops concepts, users develop their operational approval packages and submit them to the FAA for review. The FAA initiates the process for modifying or adding ATC procedures required to support the application. Should the application require ground infrastructure, the FAA would establish program baselines, develop and award contracts, and develop production systems in accordance with the AMS.

The FAA and the labor unions affected by the application then develop the formal agreements necessary to implement the application, based on union involvement throughout the development process. A "No" decision either returns the application to an earlier phase of development or pre-approval, or eliminates the application from possible approval altogether. A "Yes" decision allows the application to progress to the next phase, Implementation.

4.3.8 Implementation

In this phase, the FAA finalizes the proper procedures and regulatory documentation, and integrates the required ground systems at the first site into the NAS. This process starts with the manufacture of ground systems, followed by field testing and an FAA In-Service decision. Once a positive In-Service decision is made, the FAA can then commission the ground systems for operational use, and approve (Air Traffic, Flight Standards) the application for operational use at the first site by the user(s).

4.3.9 Transition

This phase consists primarily of waterfall ground system installations, commissionings, and operational approvals (both air and ground) beyond the first site implementation. These approvals could conceivably be limited to specific pockets of implementation, or may be fleet-wide or nation-wide.

4.3.10 In-Service

The final phase of development and implementation represents the actual operational use of the application in the NAS, the maintenance of the equipment required to support the application (e.g., avionics and ground systems), and any recurring training required (operator, maintainer, controller). Operational experience and data accumulated during this phase can/may feed into the development and implementation cycle of other applications, or future variations of the current application.

4.4 Checklist Flow Chart

Figure 4-2 shows the primary relationships between the 70 activities, 7 management tasks, and 13 key decisions required to develop and implement the applications described in Section 3. Each activity, task and decision is described in detail in Section 5.

Activity categories in the chart appear horizontally, while development phases appear vertically. Each box in the chart represents a single activity, with a numeric identification (ID) representing the detailed description of that activity (much like a work breakdown structure). Lines connecting boxes represent major dependencies between different activities. Vertical dotted (blue) lines represent key decisions, and red arrows represent dependencies from activities to these decisions.

Activity IDs are annotated with the phase in which the activity is performed. For example, IDs for activities in the Concept phase are annotated as "con." IDs for activities in the Development phase are annotated as "dev." IDs for activities in the Limited Evaluation phase are annotated as "lim". IDs for

activities in the Full Evaluation are annotated as "full". IDs for activities in the Post-Evaluation phase are annotated as "post." IDs for activities in the Investment Analysis phase are annotated as "IA." IDs for activities in the Step-Up phase are annotated as "step." IDs for activities in the Implementation phase are annotated as "imp." IDs for activities in the Transition phase are annotated as "tra." IDs for activities in the In-Service phase are annotated as "ins". IDs for ongoing activities that span multiple phases are not annotated.

When an activity is repeated in several phases, it is understood that the work performed in later phases will use the products of earlier phases as inputs. For example, if Activity 6.1in the Concept (con) phase is repeated in the Development (dev) phase, the work performed in the "dev" phase (6.1 dev) will have available to it the output product of the "con" phase (6.1 con). Likewise, it is also understood that if the output of "6.1 lim" is provided as an input to Activity 4.5 in the Full Evaluation phase (4.5 full), then "4.5 full" will have available to it as inputs the products of not only "6.1 lim" but also "6.1 con" and "6.1 dev." Thus, for the simplicity of presentation, only direct dependencies between different activities are explicitly shown in the flowchart and in the detailed activity descriptions. Dependencies between different phases of the same activity and second-order dependencies between activities are not explicitly identified.

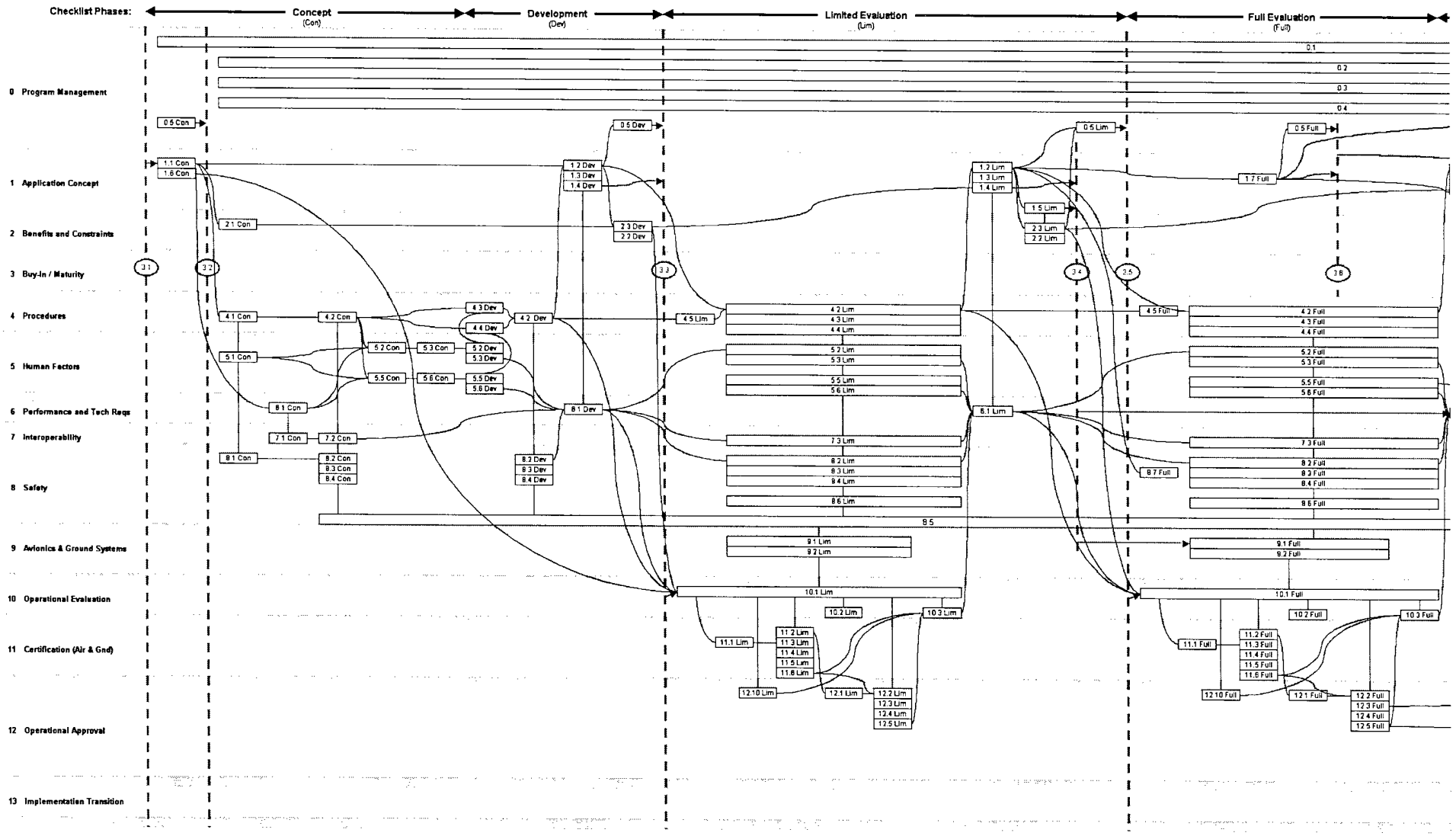


Figure 4-2: Checklist Activity Flowchart

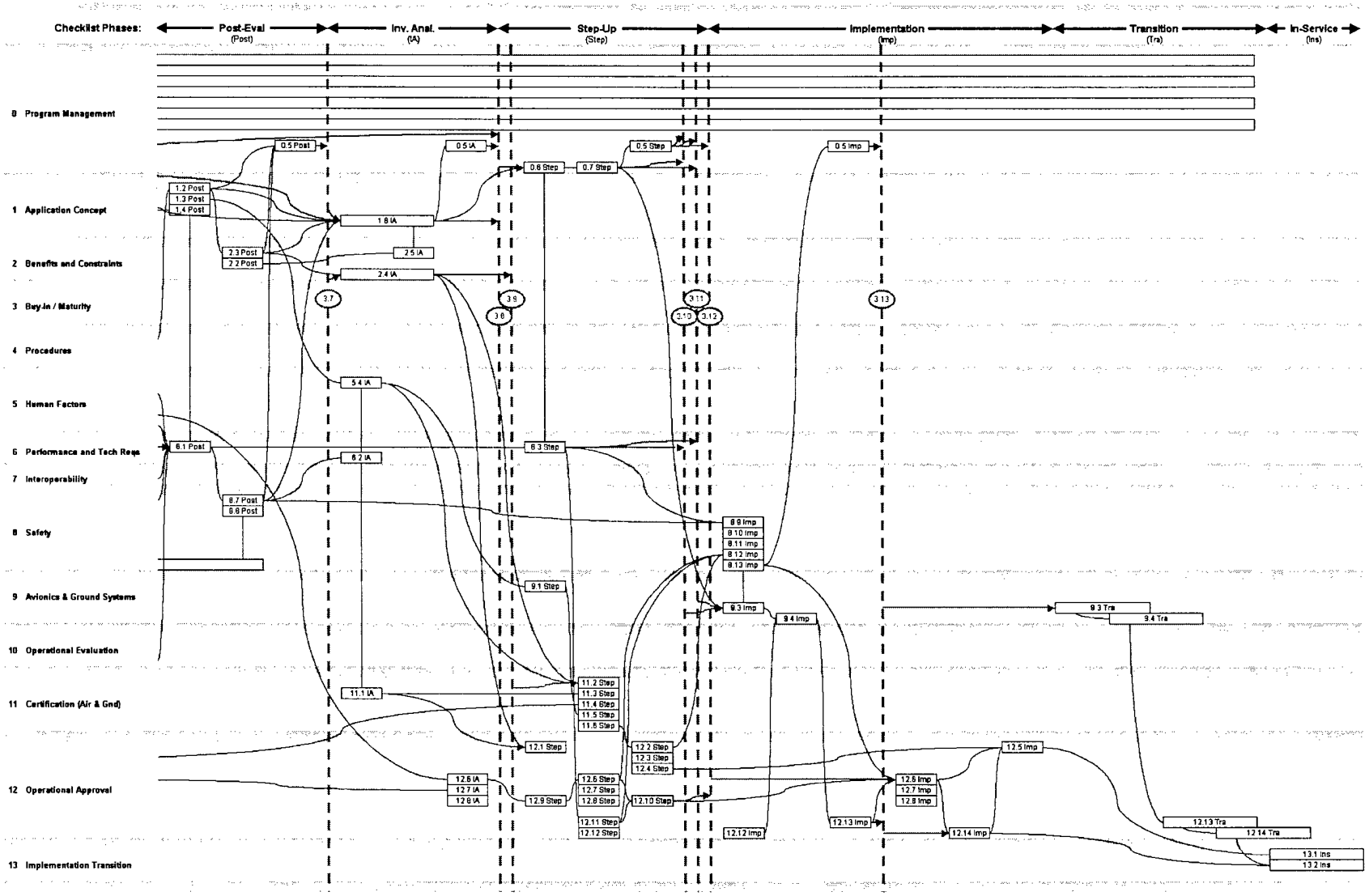


Figure 4-2: Checklist Activity Flowchart (continued)

5. DETAILED ACTIVITY DESCRIPTIONS

5.1 Outline

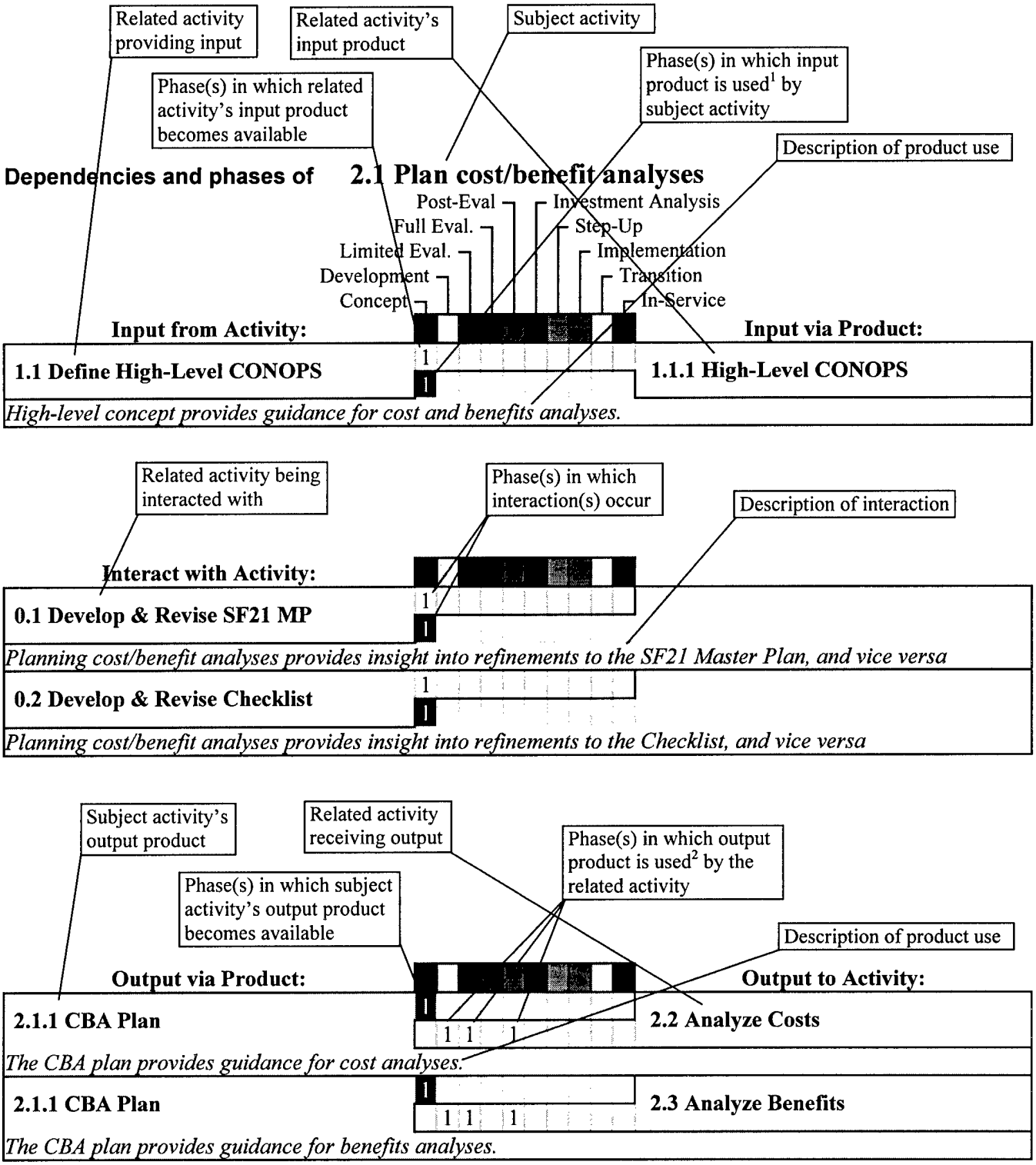
Section 5.2 contains a detailed description of each of the activities, tasks, and key decisions represented in Figure 4-2. Each description contains the following:

- Description of the activity
- Organization(s) responsible for planning or performing the activity
- Organization(s) responsible for approving or accepting the results of the activity, or for making the decision
- Products generated by the activity
- Issues to be addressed
- Schedule: Estimated start date, duration, and level of effort
- Inputs needed from other activities to accomplish this activity
- Interactions with other activities being done at the same time
- Outputs from this activity that will be used as inputs to other activities

Input, interaction, and output dependencies for each activity are presented in tabular format, with references to the phases in which the required inputs become available, interactions occur, or outputs are generated. Figure 5-1 provides a graphical explanation on how to interpret the Input, Interaction, and Output dependency tables in the detailed activity descriptions.

5.2 Detailed Activity Descriptions

Detailed activity descriptions and the associated interaction tables are shown on the pages following Figure 5-1.



[1]numeric reference identifies which phase of the input product will be used by the subject activity
[2]numeric reference identifies which phase of the output product will be used by the related (output) activity

Figure 5-1: Sample Dependency Tables for a Detailed Activity Description

Overview of Activity **0.1: Develop and Revise SF21 MP**

Description: Develop, coordinate, and reach consensus on the Safe Flight 21 Master Plan. [Note: OpEval planning documents will be developed in conjunction with Activity 10.1].

The Safe Flight 21 (SF21) Master Plan will characterize the status of all Checklist activities as appropriate. In particular, the SF21 Master Plan will characterize the various key decisions (3.1 thorough 3.7) and the other management tasks (0.2 through 0.5).

This task is performed collectively for all applications.

Plan and Perform: SF21 Program Office POC = SF21 Progam Lead

Approve or Accept: SF21 Steering Group POC = SF21 StG Co-chairs

Products:

0.1.1: Safe Flight 21 Master Plan: This product includes the periodic revision of the Master Plan (MP).

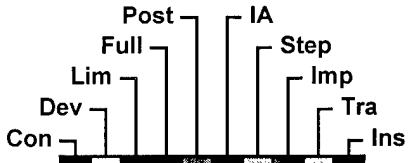
Issues:

- With industry pushing for a very aggressive schedule, there is a risk that the published schedule may be unrealistic
- Sequencing and flow of applications (collectively) through development, evaluation, and transition

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	12	12	12	12	12	12	12	12	8	4
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
3.1: Decision - Select Enhancements **3.2: Decision - Select & Prioritize Apps**	1 1	**3.1.1: Roadmap for Free Flight Operational Enhancements** **3.2.1: Application Target Schedule**
Roadmap identifies things to be addressed in the original SF 21 Master Plan. Decision(s) will impact the contents of the document(s).		
3.3: Decision - Go for Limited Evaluation **3.4: Decision - Select Link(s)**	3 3	**3.3.1: Decision to Undertake Limited Evaluation** **3.4.1: Link Decision**
Decision(s) will impact the contents of the document(s).		
3.5: Decision - Go for Full Evaluation **3.6: Decision - Mission Need**	4 4	**3.5.1: Decision to Plan for Full Evaluation** **3.6.1: Mission Need Decision**
Decision(s) will impact the contents of the document(s).		
3.7: Decision - Was OpEval Adequate?	6 6	**3.7.1: OpEval Adequacy Decision**
Decision(s) will impact the contents of the document(s).		
3.8: Decision - Initial Investment **3.9: Decision - Industry Commits to Impl.** **3.10: Decision - Sel. Vendor & Award Contract** **3.11: Decision - Final Investment**	7 7	**3.8.1: Initial Investment Decision** **3.9.1: Formal Notice from Applicants** **3.10.1: Contract Award** **3.11.1: Final Investment Decision**
Decision(s) will impact the contents of the document(s).		
3.12: Decision - Formal FAA/Union Agreement **3.13: Decision - In-Service** **12.5: Grant Operational Approval (Ph. 5)**	8 8	**3.12.1: FAA/Union Agreement** **3.13.1: In-Service Decision** **12.5.1: Operational Approval**
Decision(s) will impact the contents of the document(s).		

Interact with Activity:	
0.2: Develop and Revise Checklist **0.3: Manage Issues and Risks** **0.4: Administer SF21 Program**	1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
May identify changes needed (and vice versa).	
1.1: Define High-Level Concept **1.6: Develop Research Evaluation Plan** **2.1: Plan Cost/Benefit Analyses** **4.1: Plan Procedure Development** **5.1: Plan Human Factors Activities** **8.1: Plan Coord. Safety Activities**	1 1
Provides insight into refinement of interacting activity products and vice versa.	

1.2: Develop Detailed Ops Concepts		2	3		5				
1.3: Develop Detailed Systems Concepts		2	**3**		5				
1.4: Identify Synergistic Applications Sets									
Provides insight into refinement of interacting activity products and vice versa.									
10.1: Plan Joint Evaluations			3	4					
			3	4					
Provides insight into refinement of interacting activity products and vice versa.									

Output via Product:	1	2	3	4	5	6	7	8	**Output to Activity:**
0.1.1: Safe Flight 21 Master Plan	**1**	2	**3**	4	5	6	7	**8**	**0.5: Coordinate for Decisions**
	1	2	3	4	5	6	7	8	
Provides partial basis for decisions.									

Overview of Activity **0.2: Develop and Revise Checklist**

Description: Develop and revise a checklist for an application or group of related applications. The Checklist is to describe all Level 2 activities that are required before the FAA and Industry could make a decision to implement for operational use of particular application(s). The development and revision of the Checklist activities will consider as appropriate all of the Checklist activities. In particular, the Checklist will consider the various key decisions (3.1 thorough 3.7) and the other management tasks (0.1 and 0.3 through 0.5).

Plan and Perform: Checklist Team POC = Checklist Team

Approve or Accept: FAA Lines of Business POC = Various

Products:

0.2.1: Checklist: A detailed listing of all the Level 2 activities that must be accomplished before the aviation community can decide whether an Application should be implemented for operational use. This product will be revised as needed.

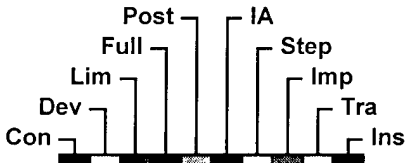
Issues:

- The complexity of Checklist may put people off
- Selection of applications for special attention

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	24	16	16	16	16	16	16	16	12	8
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
3.1: Decision - Select Enhancements **3.2: Decision - Select & Prioritize Apps**	1	**3.1.1: Roadmap for Free Flight Operational Enhancements** **3.2.1: Application Target Schedule**
Decision(s) will impact the contents of the document(s).		
3.3: Decision - Go for Limited Evaluation **3.4: Decision - Select Link(s)**	3	**3.3.1: Decision to Undertake Limited Evaluation** **3.4.1: Link Decision**
Decision(s) will impact the contents of the document(s).		
3.5: Decision - Go for Full Evaluation **3.6: Decision - Mission Need**	4	**3.5.1: Decision to Plan for Full Evaluation** **3.6.1: Mission Need Decision**
Decision(s) will impact the contents of the document(s).		
3.7: Decision - Was OpEval Adequate?	6	**3.7.1: OpEval Adequacy Decision**
Decision(s) will impact the contents of the document(s).		
3.8: Decision - Initial Investment **3.9: Decision - Industry Commits to Impl.** **3.10: Decision - Sel. Vendor & Award Contract** **3.11: Decision - Final Investment**	7	**3.8.1: Initial Investment Decision** **3.9.1: Formal Notice from Applicants** **3.10.1: Contract Award** **3.11.1: Final Investment Decision**
Decision(s) will impact the contents of the document(s).		
3.12: Decision - Formal FAA/Union Agreement **3.13: Decision - In-Service** **12.5: Grant Operational Approval (Ph. 5)**	8	**3.12.1: FAA/Union Agreement** **3.13.1: In-Service Decision** **12.5.1: Operational Approval**
Decision(s) will impact the contents of the document(s).		

Interact with Activity:	
0.1: Develop and Revise SF21 MP **0.3: Manage Issues and Risks** **0.4: Administer SF21 Program**	1 2 3 4 5 6 7 8 9 0
May identify changes needed (and vice versa).	
1.1: Define High-Level Concept **1.6: Develop Research Evaluation Plan** **2.1: Plan Cost/Benefit Analyses** **4.1: Plan Procedure Development** **5.1: Plan Human Factors Activities** **8.1: Plan Coord. Safety Activities**	1
Provides insight into refinement of interacting activity products and vice versa.	

1.2: Develop Detailed Ops Concepts **1.3: Develop Detailed Systems Concepts** **1.4: Identify Synergistic Applications Sets**	2 3 5 2 3 5
Provides insight into refinement of interacting activity products and vice versa.	
10.1: Plan Joint Evaluations	3 4 3 4
Provides insight into refinement of interacting activity products and vice versa.	

Output via Product:		**Output to Activity:**
0.2.1: Checklist	1 2 3 4 5 6 7 8 1 2 3 4 5 6 7 8	**0.5: Coordinate for Decisions**
Provides partial basis for decisions.		

Overview of Activity **0.3: Manage Issues and Risks**

Description: Manage the issues and risks of all Safe Flight 21 activities and implement risk management controls to insure success of the program. The Management of Issues and Risks Task will interact with all of the Checklist activities as appropriate.

Plan and Perform: SF21 Program Office POC = SF21 Progam Lead

Approve or Accept: FAA Lines of Business POC = Various

Products:

0.3.1: Risk Management Plan: A plan that outlines the risk management processes that will identify and assess risk areas, develop and execute risk mitigation or elimination strategies, track and evaluate mitigation efforts, and continue mitigation activity until risk is eliminated or its consequences reduced to acceptable levels.

0.3.2: Issues and Resolutions Document:

0.3.3: Risk Analysis Reports:

0.3.4: Risk Mitigation:

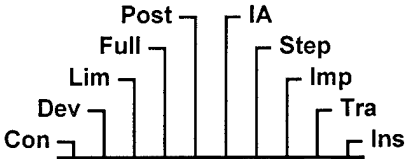
Issues:

- The complexity and interactions between various applications will make it difficult to identify and control all of the risks

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	999	999	999	999	999	999	999	999	999	999
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
3.1: Decision - Select Enhancements **3.2: Decision - Select & Prioritize Apps**	1	**3.1.1: Roadmap for Free Flight Operational Enhancements** **3.2.1: Application Target Schedule**
Decision(s) will impact the contents of the document(s).		
3.3: Decision - Go for Limited Evaluation **3.4: Decision - Select Link(s)**	3	**3.3.1: Decision to Undertake Limited Evaluation** **3.4.1: Link Decision**
Decision(s) will impact the contents of the document(s).		
3.5: Decision - Go for Full Evaluation **3.6: Decision - Mission Need**	4	**3.5.1: Decision to Plan for Full Evaluation** **3.6.1: Mission Need Decision**
Decision(s) will impact the contents of the document(s).		
3.7: Decision - Was OpEval Adequate?	6	**3.7.1: OpEval Adequacy Decision**
Decision(s) will impact the contents of the document(s).		
3.8: Decision - Initial Investment **3.9: Decision - Industry Commits to Impl.** **3.10: Decision - Sel. Vendor & Award Contract** **3.11: Decision - Final Investment**	7	**3.8.1: Initial Investment Decision** **3.9.1: Formal Notice from Applicants** **3.10.1: Contract Award** **3.11.1: Final Investment Decision**
Decision(s) will impact the contents of the document(s).		
3.12: Decision - Formal FAA/Union Agreement **3.13: Decision - In-Service** **12.5: Grant Operational Approval (Ph. 5)**	8	**3.12.1: FAA/Union Agreement** **3.13.1: In-Service Decision** **12.5.1: Operational Approval**
Decision(s) will impact the contents of the document(s).		

Interact with Activity:	1 2 3 4 5 6 7 8 9 0
0.1: Develop and Revise SF21 MP **0.2: Develop and Revise Checklist** **0.4: Administer SF21 Program**	1 2 3 4 5 6 7 8 9 0
May identify changes needed (and vice versa).	
0.6: Develop Acquisition Program Plans **12.9: Coord w/ FAA LoBs**	7
May identify changes needed (and vice versa).	
1.1: Define High-Level Concept **1.6: Develop Research Evaluation Plan** **2.1: Plan Cost/Benefit Analyses** **4.1: Plan Procedure Development** **5.1: Plan Human Factors Activities** **8.1: Plan Coord. Safety Activities**	1
Provides insight into refinement of interacting activity products and vice versa.	

8.5: Track Safety Issues During Dev't	1 2 3 4
May identify changes needed (and vice versa).	
8.6: Ensure Safety of Testing **10.1: Plan Joint Evaluations**	3 4
Incorporates safety and other issues into safety strategy for testing. May identify changes needed (and vice versa).	
11.3: Estab. Avionics Cert. Project **12.3: Review Application Package (Ph. 3)**	3 4 7
May identify changes needed (and vice versa).	
12.13: Field Test Ground Systems	8 9
May identify changes needed (and vice versa).	

Output via Product:		Output to Activity:
0.3.1: Risk Management Plan **0.3.2: Issues and Resolutions Document** **0.3.3: Risk Analysis Reports** **0.3.4: Risk Mitigation**	2 3 4 5 6 7 8	**0.5: Coordinate for Decisions**
Provides partial basis for decisions.		

Overview of Activity **0.4: Administer SF21 Program**

Description: Administer all aspects of the Safe Flight 21 program. Develop, award, and manage the contracts needed to support the program office and the operational evaluations. Manage all budgetary matters and resource allocation.

The Administration of SF21 Program Task will interact with or serve as an input to all of the Checklist activities as appropriate. In particular, the Administration of SF21 Program Task will serve as an input to the various key decisions (3.1 thorough 3.7) and the other management tasks (0.1, 0.2, 0.3, and 0.5). For simplicity of presentation, the key decisions and the other management tasks are NOT shown in the following interaction tables.

Plan and Perform: SF21 Program Office POC = Various

Approve or Accept: SF21 Program Office POC = SF21 Progam Lead

Products:

0.4.1: Annual Budgetary Documents:

0.4.2: Contracts to Support Evaluations:

0.4.3: Contracts to Support SF21 Program Office:

0.4.4: Resource Allocation Decisions:

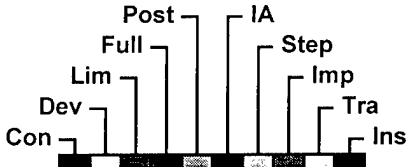
Issues:

- With the many different players involved in this program with all of their various agendas, the program needs to be flexible and responsive; there is a risk that resource limitations and contractual constraints may limit our ability to modify the program quickly when the need arises

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	999	999	999	999	999	999	999	999	999	999
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
3.1: Decision - Select Enhancements 3.2: Decision - Select & Prioritize Apps	1 1	3.1.1: Roadmap for Free Flight Operational Enhancements 3.2.1: Application Target Schedule
Decision(s) will impact the contents of the document(s).		
3.3: Decision - Go for Limited Evaluation 3.4: Decision - Select Link(s)	3 3	3.3.1: Decision to Undertake Limited Evaluation 3.4.1: Link Decision
Decision(s) will impact the contents of the document(s).		
3.5: Decision - Go for Full Evaluation 3.6: Decision - Mission Need	4 4	3.5.1: Decision to Plan for Full Evaluation 3.6.1: Mission Need Decision
Decision(s) will impact the contents of the document(s).		
3.7: Decision - Was OpEval Adequate?	6 6	3.7.1: OpEval Adequacy Decision
Decision(s) will impact the contents of the document(s).		
3.8: Decision - Initial Investment 3.9: Decision - Industry Commits to Impl. 3.10: Decision - Sel. Vendor & Award Contract 3.11: Decision - Final Investment	7 7	3.8.1: Initial Investment Decision 3.9.1: Formal Notice from Applicants 3.10.1: Contract Award 3.11.1: Final Investment Decision
Decision(s) will impact the contents of the document(s).		
3.12: Decision - Formal FAA/Union Agreement 3.13: Decision - In-Service 12.5: Grant Operational Approval (Ph. 5)	8 8	3.12.1: FAA/Union Agreement 3.13.1: In-Service Decision 12.5.1: Operational Approval
Decision(s) will impact the contents of the document(s).		

Interact with Activity:	
0.1: Develop and Revise SF21 MP 0.2: Develop and Revise Checklist 0.3: Manage Issues and Risks	1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
May identify changes needed (and vice versa).	
0.6: Develop Acquisition Program Plans	7 7
SF21 program management will affect development of baselines and vice versa.	
1.1: Define High-Level Concept 1.6: Develop Research Evaluation Plan 2.1: Plan Cost/Benefit Analyses 4.1: Plan Procedure Development 5.1: Plan Human Factors Activities 8.1: Plan Coord. Safety Activities	1 1
Provides insight into refinement of interacting activity products and vice versa.	

10.1: Plan Joint Evaluations			3	4						
			3	4						
May identify changes needed (and vice versa).										

Output via Product:	1	2	3	4	5	6	7	8			Output to Activity:
0.4.1: Annual Budgetary Documents	1	2	3	4	5	6	7	8			
0.4.3: Contracts to Support SF21 Program Office	1	2	3	4	5	6	7	8			**0.5: Coordinate for Decisions**
0.4.4: Resource Allocation Decisions											
Provides partial basis for decisions.											
0.4.2: Contracts to Support Evaluations		2	3								**0.5: Coordinate for Decisions**
		2	3								
Contracts required to support evaluations.											

Overview of Activity **0.5: Coordinate for Decisions**

Description: Coordination and documentation of FAA position as an input to key program decisions.

The Coordinate for Decisions Task will consider all of the Checklist activities as appropriate. In particular, the Administration of SF21 Program Task will consider the other management tasks (0.1, through 0.4) as appropriate. For simplicity of presentation, the other management tasks are NOT shown in the following interaction tables.

Plan and Perform: SF21 Program Office POC = SF21 Progam Lead

Approve or Accept: FAA Lines of Business POC = Various

Products:

0.5.1: FAA Coord. for Decision 3.2: Internal FAA coordination on the selection and periodic prioritization of SF21 Applications.

0.5.2: FAA Coord. for Decision 3.3: Internal FAA coordination on the Decision on whether Application maturity is sufficient to justify limited evaluation.

0.5.3: FAA Coord. for Decision 3.5: Internal FAA coordination on whether an Application is sufficiently mature to justify full evaluation.

0.5.4: FAA Coord. for Decision 3.6: Internal FAA coordination for Mission Need Decision, a.k.a. JRC 1.

0.5.5: FAA Coord. for Decision 3.7: Internal FAA coordination: Have all significant issues been resolved?

0.5.6: FAA Coord. for Decision 3.8: Internal FAA coordination for Initial Investment Decision, a.k.a. JRC2a.

0.5.7: FAA Coord. for Decision 3.10:

0.5.8: FAA Coord. for Decision 3.11:

0.5.9: FAA Coord. for Decision 3.12:

0.5.10: FAA Coord. for Decision 3.13:

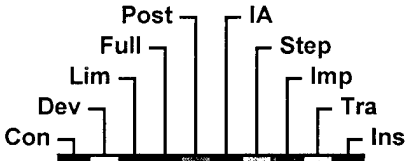
Issues:

- With the many FAA offices involved in this program with distinctly different responsibilities and concerns, there is a risk of conflict between FAA viewpoints on a given issue; thus, developing an FAA position on a key program decision may require a decision at the associate administrator level

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	3	3	3	3	3	3	3	3		
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
0.1: Develop and Revise SF21 MP **0.2: Develop and Revise Checklist** **0.4: Administer SF21 Program**	**0.1.1: Safe Flight 21 Master Plan** **0.2.1: Checklist** **0.4.1: Annual Budgetary Documents** **0.4.3: Contracts to Support SF21 Program Office** **0.4.4: Resource Allocation Decisions**
Provides partial basis for decisions.	
0.3: Manage Issues and Risks	**0.3.1: Risk Management Plan** **0.3.2: Issues and Resolutions Document** **0.3.3: Risk Analysis Reports** **0.3.4: Risk Mitigation**
Provides partial basis for decisions.	
0.4: Administer SF21 Program	**0.4.2: Contracts to Support Evaluations**
Contracts required to support evaluations.	
0.6: Develop Acquisition Program Plans **0.7: Prepare Acquisition Contract**	**0.6.1: Acquisition Strategy Paper** **0.6.2: Program WBS** **0.6.3: Integrated Program Plan** **0.7.1: Contract Package** **0.7.2: SIR/RFO**
Provides inputs to FAA decision making.	
1.2: Develop Detailed Ops Concepts **1.3: Develop Detailed Systems Concepts** **6.1: Estimate Performance** **8.5: Track Safety Issues During Dev't**	**1.2.1: Detailed OPS Concepts** **1.3.1: Detailed Systems Concepts** **6.1.1: Performance Expectations** **8.5.1: Safety Issues and Resolutions**
Provides inputs to FAA decision making.	
1.7: Establish Mission Need	**1.7.1: Mission Need Statement**
Development of the MNS will impact coordination for certain FAA decisions.	
1.8: Develop Requirements Document **2.5: Conduct Investment Analysis**	**1.8.2: Final Requirements Document** **2.5.1: Investment Analysis Report** **2.5.2: Acquisition Program Baseline (APB)**
Provides inputs to FAA decision making.	
2.2: Analyze Costs **2.3: Analyze Benefits**	**2.2.1: Cost Estimates** **2.3.1: Benefits Estimates**
Provides inputs to FAA decision making.	
8.6: Ensure Safety of Testing **10.3: Conduct Joint Evaluation**	**8.6.2: Test Safety Review** **10.3.2: Joint Evaluation Report**
Provides inputs to FAA decision making.	
8.7: Assess Comparative Safety	**8.7.1: Comparative Safety Analysis**
Provide guidance to FAA lines of business (including regulatory authorities) on relative safety, and on residual issues that should be monitored to ensure safety benefits.	

8.11: Analyze Hazards Over-All **8.12: Analyze Hazards of Ops & Support** **8.13: Assess Health Hazards** **12.13: Field Test Ground Systems**	8 8	**8.11.1: System Hazard Analysis (SHA)** **8.12.1: Operating & Support Hazard Analysis (O&SHA)** **8.13.1: Health Hazard Analysis (HHA)** **12.13.1: Test Reports**
Provides inputs to FAA decision making.		

No interact dependencies defined

Output via Product:		Output to Activity:
0.5.1: FAA Coord. for Decision 3.2	1 1	**3.2: Decision - Select & Prioritize Apps**
Coordination provided on the selection and periodic prioritization of SF21 Applications.		
0.5.2: FAA Coord. for Decision 3.3	2 2	**3.3: Decision - Go for Limited Evaluation**
Coordination provided on whether the Application is sufficiently mature to justify limited evaluation.		
0.5.3: FAA Coord. for Decision 3.5	3 3	**3.5: Decision - Go for Full Evaluation**
Coordination provided on whether the Application is sufficiently mature to justify full evaluation.		
0.5.4: FAA Coord. for Decision 3.6	4 4	**3.6: Decision - Mission Need**
0.5.5: FAA Coord. for Decision 3.7	5 5	**3.7: Decision - Was OpEval Adequate?**
Coordination of issues with FAA LOBs used as an input to SSG decision making.		
0.5.6: FAA Coord. for Decision 3.8	6 6	**3.8: Decision - Initial Investment**
0.5.7: FAA Coord. for Decision 3.10	7 7	**3.10: Decision - Sel. Vendor & Award Contract**
0.5.8: FAA Coord. for Decision 3.11	7 7	**3.11: Decision - Final Investment**
0.5.9: FAA Coord. for Decision 3.12	7 7	**3.12: Decision - Formal FAA/Union Agreement**
0.5.10: FAA Coord. for Decision 3.13	8 8	**3.13: Decision - In-Service**

Overview of Activity **0.6: Develop Acquisition Program Plans**

Description: Based on the outcome of the investment analysis and the initial investment decision, develop the plans necessary to acquire and implement the ground systems that support the application(s). This can range from the development of new systems to modifications of existing system hardware and/or software.

Plan and Perform: Product Team POC = PT Lead

Approve or Accept: IMT POC = IMT Lead

Products:

0.6.1: Acquisition Strategy Paper: The Acquisition Strategy Paper defines the business and technical approach the Integrated Product Team will use to implement the acquisition program within constraints of the Acquisition Program Baseline.

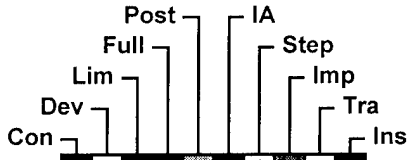
0.6.2: Program WBS: The Program Work Breakdown Structure displays and defines the product to be developed and every related element of work that must be accomplished. In addition to the critical building blocks of the system, the program WBS includes such top-level work categories as program management, training and training equipment, support and support infrastructure, facilities, physical infrastructure, test and evaluation, data and data management, systems engineering, and deployment. The purpose of the program WBS is to identify all work that will have to be completed for the program to be successful.

0.6.3: Integrated Program Plan: The Integrated Program Plan is the single document within the Acquisition Management System for planning the detailed actions and activities the Integrated Product Team will accomplish to execute the program within the cost schedule, benefits, and performance baselines in the approved Acquisition Program Baseline.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)							6			
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.8: Develop Requirements Document 2.5: Conduct Investment Analysis	6 6	1.8.2: Final Requirements Document 2.5.1: Investment Analysis Report 2.5.2: Acquisition Program Baseline (APB)
The FRD is used to establish baseline requirements. IA Reports are used as input to the development of program plans.		
3.8: Decision - Initial Investment	7 7	3.8.1: Initial Investment Decision
The Initial Investment Decision initiates the development of program plans.		

Interact with Activity:	
0.3: Manage Issues and Risks 0.4: Administer SF21 Program 6.3: Develop Ground System Specs	7 7
May identify changes needed (and vice versa). SF21 program management will affect development of baselines and vice versa. Development of ground system spec and interface documents may impact acquisition plans, and vice versa.	

Output via Product:		Output to Activity:
0.6.1: Acquisition Strategy Paper 0.6.2: Program WBS 0.6.3: Integrated Program Plan	7 7	0.5: Coordinate for Decisions 0.7: Prepare Acquisition Contract 3.10: Decision - Sel. Vendor & Award Contract 3.11: Decision - Final Investment
Provides inputs to FAA decision making. Required for development of contract. Forms part of criteria for vendor selection. Progam planning documents used as guidance in making final investment decision.		

Overview of Activity **0.7: Prepare Acquisition Contract**

Description: Prepare the contract package and screening request/request for offer that will be used to select a vendor and award a contract. The contract package typically include a Statement of Work (SOW), Contract Data Requirements List (CDRL), Data Item Descriptions (DIDs), instructions, conditions and notices to Offerors, and evaluation criteria. The Product Team will develop a Screening Information Request (SIR) or a Request for Offer (RFO), including the contract package as the means to solicit offers from prospective vendors and identify the vendor with the best value.

Plan and Perform: Product Team POC = PT Lead

Approve or Accept: Product Team POC = CO

Products:

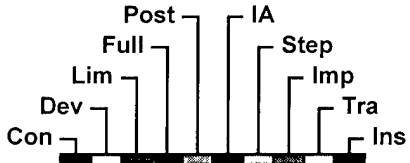
0.7.1: Contract Package: The contract package contains a Statement of Work (SOW), Contract Data Requirements List (CDRL), Data Item Descriptions (DIDs), and instructions, conditions and notices to offerors, and evaluation criteria. The SOW contains specific contractor tasking related to procurement of software and hardware. The CDRL is the primary vehicle for acquiring documentation from the contractor. It lists all deliverable data items, provides a delivery schedule, and refers to applicable DIDs. DIDs provide preparation instructions and formats for data items. Instructions, conditions, and notices to offerors typically contain provisions and information that guide offerors in preparing proposals or quotations. The items in the contract package should be tailored to the requirements of the specific acquisition.

0.7.2: SIR/RFO: A Screening Information Request is a request for documentation, information, presentations, proposals, or binding offers by which the Product Team identifies the offeror that provides best value. A Request for Offer should be used when the selection decision will be made after one SIR. The RFO requests offerors to commit formally to provide products or services under stated terms and conditions.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)							6			
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
0.6: Develop Acquisition Program Plans	0.6.1: Acquisition Strategy Paper (7)
6.3: Develop Ground System Specs	0.6.2: Program WBS (7)
	0.6.3: Integrated Program Plan
	6.3.1: Ground System Design Specification
	6.3.2: Interface Documents

Required for development of contract.

No interact dependencies defined

Output via Product:	Output to Activity:
0.7.1: Contract Package	0.5: Coordinate for Decisions (7)
0.7.2: SIR/RFO	3.10: Decision - Sel. Vendor & Award Contract (7)
	3.11: Decision - Final Investment

Provides inputs to FAA decision making. Forms part of criteria for vendor selection. Progam planning documents used as guidance in making final investment decision.

0.7.1: Contract Package	9.3: Manufacture Gnd Systems for Impl. (7)
0.7.2: SIR/RFO	9.4: Deliver and Integrate Gnd Systems (7 7)

Overview of Activity

1.1: Define High-Level Concept

Description: Define a high-level concept that will provide the framework for more detailed operational and system concepts and future development of the application. This high-level concept also provides the initial baseline against which initial studies for the application are planned and performed.

This activity is conducted in the Concept phase with products updated as needed in later phases.

Plan and Perform: SF21 StG - Ops/Proc SubGroup — POC = SF21 StG/OPsG Co-chairs

Approve or Accept: SF21 Steering Group — POC = SF21 StG Co-chairs

Products:

1.1.1: High-Level Concept: This document provides a brief conceptual overview (about 2-3 pages) of the application, and summarizes high-level operational and system implications. The document serves as the framework upon which more detailed operational and system concepts and future development of the application are based, and against which initial studies for the application are planned and performed.

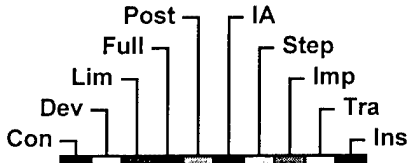
Issues:

- None (task completed)

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	8									
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
3.1: Decision - Select Enhancements	1 / 1	3.1.1: Roadmap for Free Flight Operational Enhancements

Decision(s) will impact the contents of the document(s).

Interact with Activity:	
0.1: Develop and Revise SF21 MP	1
0.2: Develop and Revise Checklist	1
0.3: Manage Issues and Risks	
0.4: Administer SF21 Program	
1.6: Develop Research Evaluation Plan	

Provides insight into refinement of interacting activity products and vice versa.

Output via Product:		Output to Activity:
1.1.1: High-Level Concept	1	1.2: Develop Detailed Ops Concepts
	1	1.3: Develop Detailed Systems Concepts
		1.4: Identify Synergistic Applications Sets

High-level concept provides basis for development and revisions of detailed concepts. High-level concepts provide basis for initial definition of synergistic sets.

1.1.1: High-Level Concept	1	1.7: Establish Mission Need
	1	

High-level concepts provide basis for development of mission need.

1.1.1: High-Level Concept	1	2.1: Plan Cost/Benefit Analyses
	1	4.1: Plan Procedure Development
		4.2: Specify Procedures
		5.1: Plan Human Factors Activities
		5.2: Analyze Cockpit Tasks
		5.5: Analyze Controller Tasks
		6.1: Estimate Performance
		7.1: Analyze Interoperability
		7.2: Define Ground System Interop.
		8.1: Plan Coord. Safety Activities
		8.2: Summarize Op. Services and Env't
		8.3: Perform Safety Analyses
		8.4: Allocate Safety Objs & Reqs

High-level concept provides guidance for conducting activity.

Overview of Activity **1.2: Develop Detailed Ops Concepts**

Description: Expand the high-level concepts based on development and evaluation results in the OCG to provide detailed operational concepts for the application. The concepts should provide sufficient detail to identify needed activities and involvement of LOBs, identify and characterize the systems and functionality required to support the application, and propose an initial functional decomposition that assigns functions to systems.

Plan and Perform: SF21 StG - Ops/Proc SubGroup POC = SF21 StG/OPsG Co-chairs

Approve or Accept: SF21 Steering Group POC = SF21 StG Co-chairs

Products:

1.2.1: Detailed OPS Concepts: This document provides a detailed description of the application operational concept (about 10 pages), and is based on the high-level concept. The document serves as the basis for subsequent cost/benefit, human factors, and other analyses, and for joint evaluations of the application.

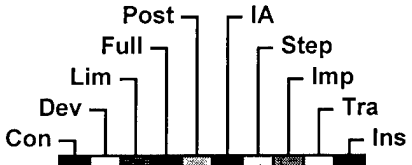
Issues:

- Failure to obtain consensus with pilot or controller union representatives in the OPSG, and subsequent concurrence by their respective parent national union organizations
- Failure to complete the document in a timely fashion to support subsequent assessment activities (cost/benefit, safety, joint evaluations)
- Determine the need for equipage indication on ATC displays
- Determine the method to be used to maintain spacing (range rings, other methods)
- Clarify (potential) changes in roles or responsibilities

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)		12	16		8					
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.1: Define High-Level Concept	1 / 1	**1.1.1: High-Level Concept**
High-level concept provides basis for development and revisions of detailed concepts.		
4.2: Specify Procedures **5.2: Analyze Cockpit Tasks** **5.5: Analyze Controller Tasks** **8.2: Summarize Op. Services and Env't** **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs**	2 3 4 / 2 3 4	**4.2.1: Procedures Specification** **5.2.1: Cockpit Task Analysis Report** **5.5.1: Controller Task Analysis Report** **8.2.1: Operational Services and Env't Definition** **8.3.1: Operational Hazard Assessment** **8.3.2: Hazard Analysis (PHA or SSHA/SHA)** **8.4.1: ASOR**
Procedures provide input to the definition and revisions of detailed concepts. Task analyses provide input to the definition and revisions of detailed concepts. Safety considerations and the need for safety-relevant specifics will influence the specification of the applications concept, both for systems and operations.		
10.3: Conduct Joint Evaluation	3 4 / 3 4	**10.3.1: Joint Evaluation Data** **10.3.2: Joint Evaluation Report**
Results from evaluation are captured in updates to concept documents.		

Interact with Activity:	
0.1: Develop and Revise SF21 MP **0.2: Develop and Revise Checklist** **1.3: Develop Detailed Systems Concepts** **1.4: Identify Synergistic Applications Sets** **6.1: Estimate Performance**	2 3 5 / 2 3 5
Provides insight into refinement of interacting activity products and vice versa. Revisions to detailed concepts provides insight into refinements of performance estimates, and vice versa.	

Output via Product:		Output to Activity:
1.2.1: Detailed OPS Concepts	2 3 5 / 2 3 5	**0.5: Coordinate for Decisions** **2.3: Analyze Benefits**
Provides inputs to FAA decision making. Ops concept provides inputs to benefits analyses.		
1.2.1: Detailed OPS Concepts	3 / 3	**1.5: Perform Link Assessment**
Initial concepts help define what requirements the data link must support.		
1.2.1: Detailed OPS Concepts	3 / 3	**1.7: Establish Mission Need**
Detailed concepts provide inputs to development of mission need.		
1.2.1: Detailed OPS Concepts	5 / 5	**1.8: Develop Requirements Document** **2.5: Conduct Investment Analysis**
Detailed concepts provide framework for development of requirements documents. Detailed concepts provide framework for investment analyses.		

1.2.1: Detailed OPS Concepts	2 **3** 2 3	**4.2: Specify Procedures** **5.2: Analyze Cockpit Tasks** **5.5: Analyze Controller Tasks** **8.2: Summarize Op. Services and Env't** **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs** **10.1: Plan Joint Evaluations**
Provides guidance for conduct of activity.		
1.2.1: Detailed OPS Concepts	**3** **5** 3 5	**8.7: Assess Comparative Safety**
Detailed concepts are required for comparative safety analyses.		
1.2.1: Detailed OPS Concepts	**5** 5	**8.8: Formalize Scopes of Operations**
Revised ops concepts support formalization of scopes of operation.		
1.2.1: Detailed OPS Concepts	2 **3** **5** 2 3 5	**12.1: State Intent to Conduct New Flight Ops (Ph. 1)** **12.2: Request Operational Approval (Ph. 2)**
Provides guidance in planning ops approvals for joint evaluations and implementation - defines scope of ops.		

Overview of Activity **1.3: Develop Detailed Systems Concepts**

Description: Expand the high-level concepts based on development and evaluation results in the OCG and other forums to provide detailed systems concepts for the application. The concepts should provide sufficient detail to identify needed activities and involvement of LOBs, identify and characterize the systems and functionality required to support the application, and propose an initial functional decomposition that assigns functions to systems.

Plan and Perform: SC-186 POC = SC-186 Co-chairs

Approve or Accept: SF21 Steering Group POC = SF21 StG Co-chairs

Products:

1.3.1: Detailed Systems Concepts: This document provides a detailed description of the application operational concept (about 10 pages), and is based on the high-level concept. The document serves as the basis for subsequent cost/benefit, human factors, and other analyses, for joint evaluations of the application, and for subsequent standards development and certification guidance.

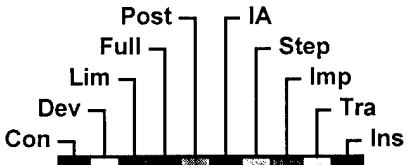
Issues:

- Failure to complete the activity in a timely fashion to support subsequent assessment activities (cost/benefit, safety, joint evaluations)
- Clarify (potential) new or modified air and ground systems functionality
- Propose allocations of functions to systems
- Determine anticipated system certification levels required for the application

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)		12	12		8					
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.1: Define High-Level Concept	1 / 1	**1.1.1: High-Level Concept**
High-level concept provides basis for development and revisions of detailed concepts.		
5.3: Design Cockpit Interface **5.6: Design Controller Interface** **8.2: Summarize Op. Services and Env't** **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs**	2 3 4 / 2 3 4	**5.3.1: Cockpit Interface Design** **5.6.1: Controller Interface Design** **8.2.1: Operational Services and Env't Definition** **8.3.1: Operational Hazard Assessment** **8.3.2: Hazard Analysis (PHA or SSHA/SHA)** **8.4.1: ASOR**
Cockpit interface requirements provide input to the definition and revisions of detailed concepts. Results of controller interface design used as input to detailed systems concepts. Safety considerations and the need for safety-relevant specifics will influence the specification of the applications concept, both for systems and operations.		
7.3: Validate Interoperability **10.3: Conduct Joint Evaluation**	3 4 / 3 4	**7.3.1: Interoperability Validation Report** **10.3.1: Joint Evaluation Data** **10.3.2: Joint Evaluation Report**
Assessments of interoperability provide input to the revisions of detailed systems concepts. Results from evaluation are captured in updates to concept documents.		

Interact with Activity:	
0.1: Develop and Revise SF21 MP **0.2: Develop and Revise Checklist** **1.2: Develop Detailed Ops Concepts** **1.4: Identify Synergistic Applications Sets** **6.1: Estimate Performance**	2 3 5 / 2 3 5
Provides insight into refinement of interacting activity products and vice versa. Development of detailed concepts provides insight into refinements of follow-on products.	

Output via Product:		Output to Activity:
1.3.1: Detailed Systems Concepts	2 3 5 / 2 3 5	**0.5: Coordinate for Decisions** **2.2: Analyze Costs**
Provides inputs to FAA decision making. Detailed concepts provide inputs to cost/benefit analyses.		
1.3.1: Detailed Systems Concepts	3 / 3	**1.5: Perform Link Assessment**
Initial concepts help define what requirements the data link must support.		
1.3.1: Detailed Systems Concepts	3 / 3	**1.7: Establish Mission Need**
Detailed concepts provide inputs to development of mission need.		

1.3.1: Detailed Systems Concepts	5	**1.8: Develop Requirements Document**
	5	**2.5: Conduct Investment Analysis**
		5.4: Define Cockpit Interface Stds
		6.2: Define Performance Standards
Detailed concepts provide framework for development of requirements documents. Detailed concepts provide framework for investment analyses. Systems concepts support standards development.		
1.3.1: Detailed Systems Concepts	2 3	**4.2: Specify Procedures**
	2 3	**5.3: Design Cockpit Interface**
		5.6: Design Controller Interface
		8.2: Summarize Op. Services and Env't
		8.3: Perform Safety Analyses
		8.4: Allocate Safety Objs & Reqs
		9.2: Develop Ground Systems for Eval.
		10.1: Plan Joint Evaluations
Provides guidance for conduct of activity. Validates and provides a reference for informal information sharing in previous phase. Detailed concepts help identify what ground systems are intended to do.		
1.3.1: Detailed Systems Concepts	3 5	**8.7: Assess Comparative Safety**
	3 5	
System performance details provide background in addition to (and potentially revisions made after) the OSED.		
1.3.1: Detailed Systems Concepts	5	**8.8: Formalize Scopes of Operations**
	5	
Systems concept used to support safety analyses.		
1.3.1: Detailed Systems Concepts	2 3 5	**9.1: Develop Avionics**
	2 3 5	**11.2: Plan and Apply for Avionics Cert.**
Detailed concepts help identify what avionics are intended to do. Systems concepts are an input to the certification plan.		

Overview of Activity

1.4: Identify Synergistic Applications Sets

Description: The introduction of ADS-B is unlikely to take place one application at a time. Rather, both the FAA and Industry expect that initial implementation for operational use will involve a synergistic set of ADS-B applications. Subsequent implementations may also be in synergistic sets. Identify those applications, in conjunction with the development of detailed ops and systems concepts, that can be grouped into synergistic sets so that more realistic cost/benefit and safety assessments may be performed, and so that more efficient joint evaluations may be planned and conducted.

The Synergistic Application Sets (product 1.4.1) will interact with or serve as a major or minor input to a number of other Checklist activities. In particular, the Synergistic Application Sets will be an input to the various key decisions (3.1 thorough 3.7) and the various management tasks (0.1 through 0.5). For simplicity of presentation, the key decisions and the other management tasks are NOT shown in the following interaction tables.

This activity is performed collectively for all applications.

Plan and Perform: SF21 StG - Ops/Proc SubGroup POC = SF21 StG/OPsG Co-chairs

Approve or Accept: SF21 Steering Group POC = SF21 StG Co-chairs

Products:

1.4.1: Synergistic Application Sets: This product provides a detailed description of the SF21 applications that would be more attractive when implemented as a set. This product will be used as guidance for the conduct of subsequent cost/benefit assessments, safety assessments, and joint evaluations. (This product will be developed collectively for multiple applications.)

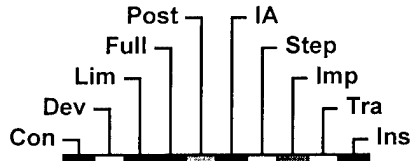
Issues:

- Political considerations may favor the implementation of a set of applications that is less attractive than a more synergistic set
- Identify the sets of applications that will most likely be used concurrently (e.g., approach spacing and final runway occupancy awareness, approach spacing and enhanced visual approaches, etc.) to aid in the assessment of collective benefits and safety

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)		8	6		4					
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.1: Define High-Level Concept	1 / 1	**1.1.1: High-Level Concept**
High-level concepts provide basis for initial definition of synergistic sets.		
2.2: Analyze Costs **2.3: Analyze Benefits**	2 3 / 2 3	**2.2.1: Cost Estimates** **2.3.1: Benefits Estimates**
Cost estimates provide inputs to revisions to application sets. Benefits estimates provide inputs to revisions to application sets.		

Interact with Activity:	
0.1: Develop and Revise SF21 MP **0.2: Develop and Revise Checklist** **1.2: Develop Detailed Ops Concepts** **1.3: Develop Detailed Systems Concepts**	2 3 5 2 3 5
Provides insight into refinement of interacting activity products and vice versa.	

Output via Product:		Output to Activity:
1.4.1: Synergistic Application Sets	2 3 5 2 3 5	**2.2: Analyze Costs** **2.3: Analyze Benefits**
Synergistic Applications Sets provide input to cost/benefit analyses.		
1.4.1: Synergistic Application Sets	5 5	**2.4: Develop Industry Business Cases**
Synergistic Applications Sets provide input to the development of Industry business cases.		
1.4.1: Synergistic Application Sets	2 3 5 2 3 5	**9.1: Develop Avionics**
Synergistic Applications Sets provide guidance to industry for finalizing avionics design at various phases of the development and evaluation process.		
1.4.1: Synergistic Application Sets	2 3 2 3	**9.2: Develop Ground Systems for Eval.** **10.1: Plan Joint Evaluations**
Synergistic Application Sets provide guidance for finalizing system designs at various phases of the development and evaluation process. Synergistic Applications Sets provide guidance for planning and conducting joint evaluations.		

Overview of Activity

1.5: Perform Link Assessment

Description: ADS-B applications require the transmission of data. In the design of ADS-B equipment, the choice of radio frequency/spectrum is a significant issue, both nationally and internationally. This choice will be based on technical, financial, and political considerations. Ideally, it is desirable that the same choice be made worldwide. With this in mind, a Technical Data Link Assessment Team (TLAT) that includes membership from the FAA and Eurocontrol is conducting the technical analysis.

The Data Link Decision will interact with or serve as a major or minor input to a number of other Checklist activities. In particular, the Data Link Decision will be an input to the various management tasks (0.1 through 0.5). For simplicity of presentation, interactions with .management tasks are NOT shown in the following interaction tables.

Plan and Perform: ASD-100, With SF21 StG - TLAT, Eurocontrol POC = ASD-100 Rep

Approve or Accept: AOA-1 POC = FAA Administrator

Products:

1.5.1: Phase 1 Link Assessment Report: This product, completed in Nov. 1999, documented the results of the first phase of the link analysis. It provided preliminary conclusions and made recommendations on what additional work was still required. (This product was developed collectively for multiple applications.)

1.5.2: Phase 2 Technical Link Assessment Report: This product will document the results of the work done by the Technical Data Link Assessment Team (TLAT). (This product is being developed collectively for multiple applications.)

Issues:

- Within the USA, political and financial considerations may not point to a single data link for both general aviation and air transport operations
- Throughout the world, various regulatory authorities may choose different data links

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			40							
LoE (sm)										

Dependencies and Phases:

Input from Activity:	Input via Product:
1.2: Develop Detailed Ops Concepts	1.2.1: Detailed OPS Concepts
1.3: Develop Detailed Systems Concepts	1.3.1: Detailed Systems Concepts
6.1: Estimate Performance	6.1.1: Performance Expectations
	6.1.2: Estimated Performance Requirements

Initial concepts help define what requirements the data link must support. Performance estimates guide the design and development of data link equipment.

Interact with Activity:
2.2: Analyze Costs
2.3: Analyze Benefits

Development of cost/benefit analyses provides insight into link assessments and vice versa.

Output via Product:	Output to Activity:
1.5.1: Phase 1 Link Assessment Report	3.4: Decision - Select Link(s)
1.5.2: Phase 2 Technical Link Assessment Report	

Inputs to the Administrator's Link Decision.

Overview of Activity **1.6: Develop Research Evaluation Plan**

Description: Develop a plan that identifies what the ADS-B Integrated Requirements Team (IRT) considers to be issues requiring resolution prior to development of a Requirements Document (RD).

Plan and Perform: ARR POC = ARR Rep

Approve or Accept: ARR POC = ARR Lead

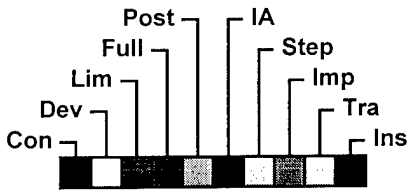
Products:

1.6.1: Research Evaluation Plan:

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	24									
LoE (sm)										

Dependencies and Phases:



No input dependencies defined

Interact with Activity:	
0.1: Develop and Revise SF21 MP	1
0.2: Develop and Revise Checklist	1
0.3: Manage Issues and Risks	
0.4: Administer SF21 Program	
1.1: Define High-Level Concept	

Provides insight into refinement of interacting activity products and vice versa.

Output via Product:		Output to Activity:
1.6.1: Research Evaluation Plan	1	**1.8: Develop Requirements Document**
	1	

The REP provides the framework for identifying requirements.

1.6.1: Research Evaluation Plan	1	**2.1: Plan Cost/Benefit Analyses**
	1	**4.1: Plan Procedure Development**
		5.1: Plan Human Factors Activities
		8.1: Plan Coord. Safety Activities
		8.2: Summarize Op. Services and Env't
		8.3: Perform Safety Analyses

The REP identifies issues that need to be addressed.

1.6.1: Research Evaluation Plan	1	**10.1: Plan Joint Evaluations**
	1 1	

The REP identifies data required to address issues raised.

Overview of Activity

1.7: Establish Mission Need

Description: Develop a Mission Need Statement (MNS) that documents the results of mission analysis, serves as the decision document for the mission need decision and, after approval by the JRC, serves as the basis for investment analysis. A MNS provides a clear, unambiguous, and quantitative description of the mission area, current capability, capability shortfall or technological opportunity, required operational capability, impact of disapproval, benefits, timeframe, criticality, and LRRAP resource estimate.

Plan and Perform: ARX POC = TBD

Approve or Accept: ATS POC = TBD

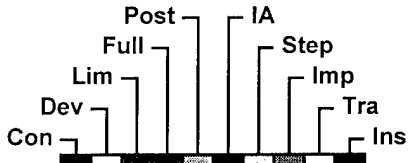
Products:

1.7.1: Mission Need Statement: The Mission Need Statement is the approval document at the mission need decision. It summarizes the decision factors relevant to a capability shortfall the agency should address or technological opportunity for satisfying mission responsibility more efficiently or effectively. Approval by the JRC authorizes entry into investment analysis to determine the best overall solution to mission need.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)				48						
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.1: Define High-Level Concept	1 / 1	**1.1.1: High-Level Concept**
High-level concepts provide basis for development of mission need.		
1.2: Develop Detailed Ops Concepts	3	**1.2.1: Detailed OPS Concepts**
1.3: Develop Detailed Systems Concepts	3	**1.3.1: Detailed Systems Concepts**
Detailed concepts provide inputs to development of mission need.		

No interact dependencies defined

Output via Product:		Output to Activity:
1.7.1: Mission Need Statement	4 / 4	**0.5: Coordinate for Decisions** / **3.6: Decision - Mission Need**
Development of the MNS will impact coordination for certain FAA decisions. The MNS is approved at the Mission Need Decision.		
1.7.1: Mission Need Statement	4 / 4	**1.8: Develop Requirements Document** / **2.5: Conduct Investment Analysis**
The definition of Mission Need initiates investment analysis processes.		
1.7.1: Mission Need Statement	4 / 4	**3.8: Decision - Initial Investment**
The MNS is revised, if necessary, at the Initial Investment Decision.		

Overview of Activity **1.8: Develop Requirements Document**

Description: Translate the mission need identified in the Mission Need Statement into initial top-level operational, functional, performance, and supportability requirements. These initial requirements establish the basis for identifying potential solutions to mission need, conducting market analyses, analyzing alternatives, and assessing affordability. Initial requirements accommodate applicable Congressional mandates, Executive Orders, or Federal regulations. They include Critical Operational Issues that must be resolved by any potential solution. Initial requirements are evaluated against such factors as cost, benefit, schedule, and performance throughout the investment analysis. They evolve to final requirements after completion of the analysis.

Plan and Perform: ARR POC = ARR Rep

Approve or Accept: ATS POC = TBD

Products:

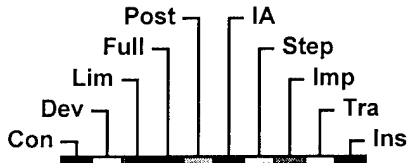
1.8.1: Initial Requirements Document: The initial Requirements Document is developed early in Investment Analysis by the sponsoring line of business. It translates the "need" in the Mission Need Statement into initial top-level requirements.

1.8.2: Final Requirements Document: The Final Requirements Document defines exactly the operational concept and requirements the approved acquisition program is intended to achieve. It is the basis for evaluating the readiness of resultant products and services to become operational.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)						8				
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.2: Develop Detailed Ops Concepts 1.3: Develop Detailed Systems Concepts 2.3: Analyze Benefits 6.1: Estimate Performance 8.5: Track Safety Issues During Dev't 8.7: Assess Comparative Safety 8.8: Formalize Scopes of Operations	5 5	1.2.1: Detailed OPS Concepts 1.3.1: Detailed Systems Concepts 2.3.1: Benefits Estimates 6.1.2: Estimated Performance Requirements 8.5.1: Safety Issues and Resolutions 8.7.1: Comparative Safety Analysis 8.8.1: AC on ADS-B/CDTI Capability Levels and Lims

Detailed concepts provide framework for development of requirements documents. Benefits estimates provide guidance in the development of the iRD. Estimated performance requirements are used as input to the development of requirements. Results of activities aid in the development of requirements documents. CSA results are used as inputs to the development of requirements documents. AC provides input to development of requirements and standards.

1.6: Develop Research Evaluation Plan	1 1	1.6.1: Research Evaluation Plan

The REP provides the framework for identifying requirements.

1.7: Establish Mission Need 3.6: Decision - Mission Need 4.2: Specify Procedures 5.5: Analyze Controller Tasks 5.6: Design Controller Interface 8.2: Summarize Op. Services and Env't 8.3: Perform Safety Analyses 8.4: Allocate Safety Objs & Reqs 10.3: Conduct Joint Evaluation	4 4	1.7.1: Mission Need Statement 3.6.1: Mission Need Decision 4.2.1: Procedures Specification 5.5.1: Controller Task Analysis Report 5.6.1: Controller Interface Design 8.2.1: Operational Services and Env't Definition 8.3.1: Operational Hazard Assessment 8.3.2: Hazard Analysis (PHA or SSHA/SHA) 8.4.1: ASOR 10.3.2: Joint Evaluation Report

The definition of Mission Need initiates investment analysis processes. Results of activities aid in the development of requirements documents. Results of controller interface design used as input to defining requirements.

3.7: Decision - Was OpEval Adequate?	6 6	3.7.1: OpEval Adequacy Decision

The OpEval adequacy decision formalizes the readiness to proceed to investment analysis.

Interact with Activity:	
2.5: Conduct Investment Analysis	6 6

The requirements in the iRD are refined as the investment analyses continue.

Output via Product:		Output to Activity:
1.8.1: Initial Requirements Document	6 6	2.5: Conduct Investment Analysis

The iRD establishes the initial requirements that guide the initial investment analyses.

1.8.2: Final Requirements Document	6 6 6	**0.5: Coordinate for Decisions**
Provides inputs to FAA decision making.		
1.8.2: Final Requirements Document	6 6	**0.6: Develop Acquisition Program Plans** **3.8: Decision - Initial Investment** **6.3: Develop Ground System Specs**
The FRD is used to establish baseline requirements. The FRD is used as input to the Initial Investment Decision.		

Overview of Activity

2.1: Plan Cost/Benefit Analyses

Description: Develop plans for operational analysis, metrics definition, and data collection, and identify the tools and models necessary to analyze the application as part of a broader initial analysis of synergistic application sets. Coordinate the plans with application stakeholders.

The plan will be updated as needed as work progresses. This activity is performed collectively for all applications.

Plan and Perform: SF21 StG - Cost/Benefit SubGroup — POC = SF21 StG/CBsG Co-chairs

Approve or Accept: SF21 Steering Group — POC = SF21 StG Co-chairs

Products:

2.1.1: CBA Plan: The Cost/Benefit Analysis (CBA) Plan outlines the basic steps and activities that need to be carried out to analyze and assess the costs and benefits for a set of applications. The plan identifies the scope of the analyses to be conducted, and provides a high-level schedule for completion. The plan also includes the metrics by which benefits will be measured and analyzed. The activities outlined in the plan are not part of the FAA Investment Analysis process, but may produce results that can be used as inputs to that process for those applications in the set that may require it.

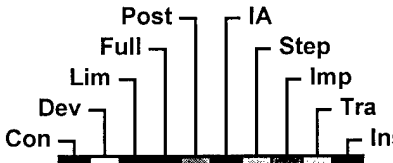
Issues:

- None (activity completed)

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	12									
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.1: Define High-Level Concept	1	1.1.1: High-Level Concept
1.6: Develop Research Evaluation Plan	1	1.6.1: Research Evaluation Plan

High-level concept provides guidance for conducting activity. The REP identifies issues that need to be addressed.

Interact with Activity:	
0.1: Develop and Revise SF21 MP	1
0.2: Develop and Revise Checklist	1
0.3: Manage Issues and Risks	
0.4: Administer SF21 Program	

Provides insight into refinement of interacting activity products and vice versa.

Output via Product:		Output to Activity:
2.1.1: CBA Plan	1	2.2: Analyze Costs
	1 1 1	2.3: Analyze Benefits

The CBA plan provides guidance for cost/benefit analyses.

Overview of Activity

2.2: Analyze Costs

Description: Develop estimates of costs for the application as part of a broader refined analysis of synergistic application sets. Identify the system constraints and parameters affecting the analysis and how these constraints and parameters should be characterized. Coordinate the analysis with application stakeholders.

The cost estimates for the applications will be used to support industry business cases, and to evaluate cases for implementing synergistic application sets as part of a subsequent FAA investment analysis. The constraints and parameters that need to be characterized will be used in planning application development and operational evaluation activities. Results on critical parameter trade-offs may be used to plan subsequent refinement of the application. [This activity is performed collectively for all applications.]

Plan and Perform: SF21 StG - Cost/Benefit SubGroup POC = SF21 StG/CBsG Co-chairs

Approve or Accept: SF21 Steering Group POC = SF21 StG Co-chairs

Products:

2.2.1: Cost Estimates: In accordance with the CBA Plan, cost estimates provide an estimate of the costs of the system architecture and its implementation that would be required to support the set of applications. Estimates are developed based on detailed system concepts and updated as application development progresses. All cost estimates are developed in concert with benefits estimates for the same set of applications. Cost estimates are used to support the decision to proceed with joint evaluations and to support industry business cases. These estimates are not developed as part of the FAA Investment Analysis process, but may be used as inputs into that process for those applications in the set that may require it.

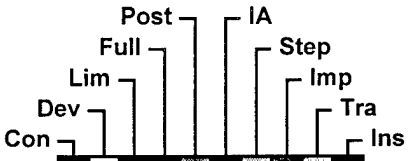
Issues:

- The maturity of cost estimates may not meet stakeholders' expectations for decision making in the earlier phases of application development (error ranges on early estimates need to be strongly emphasized)
- Methods for accounting for quantities of scale need to be identified and implemented as part of the cost estimate process
- Assumptions for the analysis need to be identified and industry consensus obtained

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)		16	16		8					
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.3: Develop Detailed Systems Concepts **1.4: Identify Synergistic Applications Sets**	2 3 5 2 3 5	**1.3.1: Detailed Systems Concepts** **1.4.1: Synergistic Application Sets**
Detailed concepts provide inputs to cost/benefit analyses. Synergistic Applications Sets provide input to cost/benefit analyses.		
2.1: Plan Cost/Benefit Analyses	1 1 1	**2.1.1: CBA Plan**
The CBA plan provides guidance for cost/benefit analyses.		

Interact with Activity:	
1.5: Perform Link Assessment	3 3
Development of cost/benefit analyses provides insight into link assessments and vice versa.	
2.3: Analyze Benefits	2 3 5 2 3 5
Cost analyses provide insight into benefits analyses, and vice versa.	

Output via Product:		Output to Activity:
2.2.1: Cost Estimates	3 5 3 5	**0.5: Coordinate for Decisions**
Provides inputs to FAA decision making.		
2.2.1: Cost Estimates	2 3 2 3	**1.4: Identify Synergistic Applications Sets**
Cost estimates provide inputs to revisions to application sets.		
2.2.1: Cost Estimates	5 5	**2.4: Develop Industry Business Cases** **2.5: Conduct Investment Analysis**
Cost/benefit estimates support development of industry business cases. Cost/benefit estimates are used as the starting point for investment analyses.		

Overview of Activity

2.3: Analyze Benefits

Description: Develop estimates of benefits for the application as part of a broader refined analysis of synergistic application sets. Identify the constraints and parameters affecting the analysis and how these constraints and parameters should be characterized (through additional measurement and analysis) to more accurately estimate benefits as the application is further developed and evaluated. Validate and/or refine benefits models and metrics based on analysis of available evaluation data. Coordinate the analysis with application stakeholders.

The benefits estimates for the applications will be used to support industry business cases, and to evaluate cases for implementing synergistic application sets as part of a subsequent FAA investment analysis. The constraints and parameters that need to be characterized will be used in planning application development and operational evaluation activities. Results on critical parameter trade-offs may be used to plan subsequent refinement of the application.

Plan and Perform: SF21 StG - Cost/Benefit SubGroup POC = SF21 StG/CBsG Co-chairs

Approve or Accept: SF21 Steering Group POC = SF21 StG Co-chairs

Products:

2.3.1: Benefits Estimates: In accordance with the CBA Plan, benefits estimates provide an estimate of the benefits that would be obtained by the implementation of the set of applications. Estimates are developed based on detailed operational concepts and updated as application development progresses. All benefits estimates are developed in concert with cost estimates for the same set of applications. Benefits estimates are used to support the decision to proceed with joint evaluations and to support industry business cases. These estimates are not developed as part of the FAA Investment Analysis process, but may be used as inputs into that process for those applications in the set that may require it.

2.3.2: Benefits Data Collection Requirements: Data collection requirements are defined for joint evaluation activities, so that benefits data can be obtained to validate the models used to arrive at the estimates.

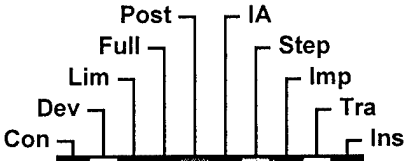
Issues:

- The structured environment in which joint evaluations are conducted may not lend itself to sufficiently validating assumed benefits mechanisms
- The maturity of benefits estimates may not meet stakeholders' expectations for decision making in the earlier phases of application development (error ranges on early estimates need to be strongly emphasized)
- Assumptions for the analysis need to be identified and industry consensus obtained

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)		16	16		12					
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.2: Develop Detailed Ops Concepts **1.4: Identify Synergistic Applications Sets**	2 3 5 2 3 5	**1.2.1: Detailed OPS Concepts** **1.4.1: Synergistic Application Sets**
Ops concept provides inputs to benefits analyses. Synergistic Applications Sets provide input to cost/benefit analyses.		
2.1: Plan Cost/Benefit Analyses	1 1 1 5	**2.1.1: CBA Plan**
The CBA plan provides guidance for cost/benefit analyses.		
10.3: Conduct Joint Evaluation	3 4 3 4	**10.3.1: Joint Evaluation Data** **10.3.2: Joint Evaluation Report**
Evaluation results enable validation of benefits models and assumptions.		

Interact with Activity:	
1.5: Perform Link Assessment	3 3
Development of cost/benefit analyses provides insight into link assessments and vice versa.	
2.2: Analyze Costs	2 3 5 2 3 5
Cost analyses provide insight into benefits analyses, and vice versa.	

Output via Product:		Output to Activity:
2.3.1: Benefits Estimates	3 5 3 5	**0.5: Coordinate for Decisions**
Provides inputs to FAA decision making.		
2.3.1: Benefits Estimates	2 3 2 3	**1.4: Identify Synergistic Applications Sets**
Benefits estimates provide inputs to revisions to application sets.		
2.3.1: Benefits Estimates	5 5	**1.8: Develop Requirements Document** **2.4: Develop Industry Business Cases** **2.5: Conduct Investment Analysis**
Benefits estimates provide guidance in the development of the iRD. Cost/benefit estimates support development of industry business cases. Cost/benefit estimates are used as the starting point for investment analyses.		
2.3.2: Benefits Data Collection Requirements	2 3 2 3	**10.1: Plan Joint Evaluations**
Identifies benefits data to be collected during evaluations.		

Overview of Activity **2.4: Develop Industry Business Cases**

Description: This step is assumed to be required in order for industry to make the leap from refined cost and benefits estimates to making an investment decision to manufacture/equip with avionics. This step is assumed to be the industry equivalent to the FAA's Investment Analysis activity.

This activity is performed collectively for application sets of interest to industry stakeholders.

Plan and Perform: Industry Stakeholders POC = Various

Approve or Accept: Industry Stakeholders POC = Various

Products:

2.4.1: Industry Business Cases: The business cases provide the justification for industry stakeholders to equip with avionics (airline) or manufacture avionics (vendor). The business cases are based primarily on costs and benefits analyses, and joint evaluation results. The business cases are also used as input to applicants' development of certification and operational approval plans.

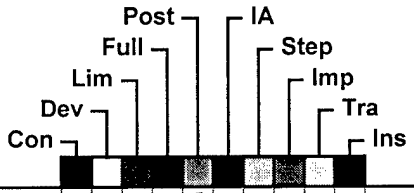
Issues:

- The methods and criteria that industry uses to develop business cases are unclear, which makes subsequent industry buy-in uncertain (even after successful post-eval activities) and places implementation at risk

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)						12				
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
1.4: Identify Synergistic Applications Sets **2.2: Analyze Costs** **2.3: Analyze Benefits**	**1.4.1: Synergistic Application Sets** **2.2.1: Cost Estimates** **2.3.1: Benefits Estimates**
Synergistic Applications Sets provide input to the development of Industry business cases. Cost/benefit estimates support development of industry business cases.	
3.7: Decision - Was OpEval Adequate?	**3.7.1: OpEval Adequacy Decision**
The OpEval adequacy decision formalizes the readiness to proceed to investment analysis.	

No interact dependencies defined

Output via Product:	Output to Activity:
2.4.1: Industry Business Cases	**3.9: Decision - Industry Commits to Impl.** **11.2: Plan and Apply for Avionics Cert.** **12.1: State Intent to Conduct New Flight Ops (Ph. 1)**
Industry business cases support stakeholder buy-in to equip/manufacture. Industry business cases provide basis for applicants' certification plan. Industry business cases provide basis for ops approval application.	

Overview of Activity

2.5: Conduct Investment Analysis

Description: Investment analysis generates the information needed by the Joint Resources Council (JRC) at the investment decision to determine whether the agency should invest resources to satisfy the mission need, and if so, to identify which candidate solution to select for implementation and to determine whether that solution is affordable. Investment analysis is triggered by JRC approval of a new Mission Need Statement, an anticipated breach to the cost baseline of an approved acquisition program, or the need for an investment decision on whether to substantially upgrade an existing capability. An investment analysis thoroughly analyzes and assesses the affordability of candidate solutions for obtaining the needed capability and quantifies the cost, schedule, performance, and benefit baselines for those solutions. At the same time, the mission analysis group of the sponsoring line of business revalidates mission need and determines its current priority among all agency needs. An Investment Analysis Team is established consisting of representatives from the sponsoring organization, acquiring organization(s), the investment analysis staff, and other organizations as needed. Investment analysis activities culminate in an Investment Analysis Report submitted to the JRC by the Director, Investment Analysis staff, and an Acquisition Program Baseline for each candidate solution.

Plan and Perform: ASD POC = TBD

Approve or Accept: ASD POC = TBD

Products:

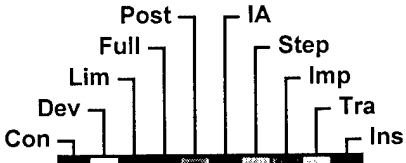
2.5.1: Investment Analysis Report: The Investment Analysis Report is the primary decision document at the investment decision. The intent of the report is to quantify and display the relative strengths and weakness, advantages and disadvantages of each candidate solution so the JRC can make an informed selection.

2.5.2: Acquisition Program Baseline (APB): The Acquisition Program Baseline defines the cost, schedule, benefits, and performance baselines for the acquisition program. It is the mutual agreement between the JRC, the provider organization, and the user organization concerning the capability and benefits the program will provide and the cost and schedule authorized for the program. The APB also establishes performance metrics for assessing program success and advancing it through the acquisition lifecycle.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)						12				
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.2: Develop Detailed Ops Concepts	5	1.2.1: Detailed OPS Concepts
1.3: Develop Detailed Systems Concepts	5	1.3.1: Detailed Systems Concepts
2.2: Analyze Costs		2.2.1: Cost Estimates
2.3: Analyze Benefits		2.3.1: Benefits Estimates
Detailed concepts provide framework for investment analyses. Cost/benefit estimates are used as the starting point for investment analyses.		
1.7: Establish Mission Need	4	1.7.1: Mission Need Statement
3.6: Decision - Mission Need	4	3.6.1: Mission Need Decision
The definition of Mission Need initiates investment analysis processes.		
1.8: Develop Requirements Document	6	1.8.1: Initial Requirements Document
3.7: Decision - Was OpEval Adequate?	6	3.7.1: OpEval Adequacy Decision
The iRD establishes the initial requirements that guide the initial investment analyses. The OpEval adequacy decision formalizes the readiness to proceed to investment analysis.		

Interact with Activity:	
1.8: Develop Requirements Document	6
	6
The requirements in the iRD are refined as the investment analyses continue.	

Output via Product:		Output to Activity:
2.5.1: Investment Analysis Report	6	
2.5.2: Acquisition Program Baseline (APB)	6 6	0.5: Coordinate for Decisions
Provides inputs to FAA decision making.		
2.5.1: Investment Analysis Report	6	0.6: Develop Acquisition Program Plans
2.5.2: Acquisition Program Baseline (APB)	6	3.8: Decision - Initial Investment
		3.11: Decision - Final Investment
IA Reports are used as input to the development of program plans. IA Reports are used as input to the Investment Decisions.		

Overview of Activity **3.1: Decision - Select Enhancements**

Description: Develop an FAA/Industry consensus on what National Airspace System (NAS) operational enhancements should be pursued by a joint FAA/Industry program. [Conceivably this decision could be revisited to add or subtract enhancements to the ones originally selected. However, this is not presently anticipated.] Activities enabled by this decision are shown as outputs in the tables that follow.

The Select Enhancements Decision will serve as a major or minor input to all of the Checklist activities. For simplicity of presentation, only the most important interactions are shown in the following tables.

Plan and Perform: N/A POC = N/A

Approve or Accept: FAA and Industry Stakeholders POC = Various

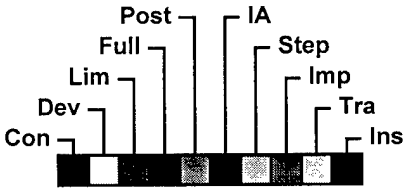
Products:

3.1.1: Roadmap for Free Flight Operational Enhancements: This August 1998 document defines the 9 enhancements that are to be achieved with the implementation of the various SF21 applications.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	0									
LoE (sm)										

Dependencies and Phases:



- *No input dependencies defined*

- *No interact dependencies defined*

Output via Product:		Output to Activity:
3.1.1: Roadmap for Free Flight Operational Enhancements	1 1	**0.1: Develop and Revise SF21 MP** **0.2: Develop and Revise Checklist** **0.3: Manage Issues and Risks** **0.4: Administer SF21 Program** **1.1: Define High-Level Concept**
Roadmap identifies things to be addressed in the original SF 21 Master Plan. Decision(s) will impact the contents of the document(s).		

Overview of Activity **3.2: Decision - Select & Prioritize Apps**

Description: Select SF21 applications that will enable us to achieve the enhancements selected in Decision 3.1. [FAA and Industry Stakeholders may revisit the list of selected applications and propose additions or subtractions from this list.] Establish priorities among the various applications and among the work efforts required to pursue the implementation of these applications. [This is done on a periodic basis (approximately annually).] Activities enabled by this decision are shown as outputs in the tables that follow.

The Select and Prioritize SF21 Applications Decision will serve as a major or minor input to virtually all of the Checklist activities. For simplicity of presentation, only the most important interactions are shown in the following tables.

Plan and Perform: N/A POC = N/A

Approve or Accept: FAA and Industry Stakeholders POC = Various

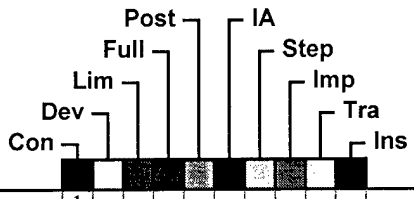
Products:

3.2.1: Application Target Schedule: The results of this selection and prioritization are included in the periodic revisions of the SF21 Master Plan.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	0									
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
0.5: Coordinate for Decisions	1 / 1	**0.5.1: FAA Coord. for Decision 3.2**
Coordination provided on the selection and periodic prioritization of SF21 Applications.		

No interact dependencies defined

Output via Product:		Output to Activity:
3.2.1: Application Target Schedule	1 / 1	**0.1: Develop and Revise SF21 MP** **0.2: Develop and Revise Checklist** **0.3: Manage Issues and Risks** **0.4: Administer SF21 Program**
Decision(s) will impact the contents of the document(s).		

Overview of Activity **3.3: Decision - Go for Limited Evaluation**

Description: Is this application sufficiently mature to justify its limited evaluation in the next OpEval? [This decision should consider informal inputs from pilot unions, controller unions, FAA management, and Industry management.] Does this Application show sufficient promise (costs versus benefits) to justify simulation and flight test evaluation? Have the procedures to be tested been developed to a maturity that justifies evaluation? Have the avionics to be tested been developed to a maturity that justifies evaluation? [This decision should consider informal inputs from pilot unions, controller unions, FAA management, and Industry management.] Activities enabled by this decision are shown as outputs in the tables that follow.

The Go for Limited Evaluation Decision will serve as a major or minor input to many subsequent Checklist activities. For simplicity of presentation, only the most important interactions are shown in the following tables.

Plan and Perform: N/A POC = N/A

Approve or Accept: OCG POC = OCG Co-chairs

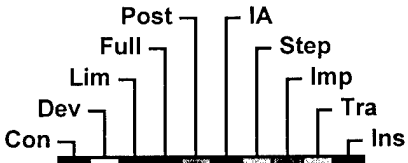
Products:

3.3.1: Decision to Undertake Limited Evaluation: Many different organizations and individuals have an interest in influencing this decision. The OCG provides a forum where these opinions can be voiced and considered.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			0							
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
0.5: Coordinate for Decisions	2 / 2	**0.5.2: FAA Coord. for Decision 3.3**
Coordination provided on whether the Application is sufficiently mature to justify limited evaluation.		

No interact dependencies defined

Output via Product:		Output to Activity:
3.3.1; Decision to Undertake Limited Evaluation	3 / 3	**0.1: Develop and Revise SF21 MP** **0.2: Develop and Revise Checklist** **0.3: Manage Issues and Risks** **0.4: Administer SF21 Program** **10.1: Plan Joint Evaluations**
Decision(s) will impact the contents of the document(s). Decision justifies limited evaluation.		

Overview of Activity

3.4: Decision - Select Link(s)

Description: Based on political, economic, and technical considerations; the FAA Administrator decides which data link(s) the FAA will support for the transmission of ADS-B data.

Plan and Perform: N/A POC = N/A

Approve or Accept: AOA-1 POC = FAA Administrator

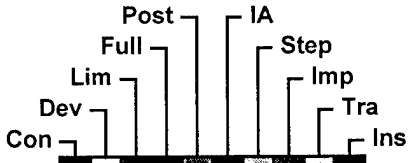
Products:

3.4.1: Link Decision: (This decision will be made collectively for multiple applications.)

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			0							
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.5: Perform Link Assessment	3	**1.5.1: Phase 1 Link Assessment Report**
	3	**1.5.2: Phase 2 Technical Link Assessment Report**
Inputs to the Administrator's Link Decision.		

No interact dependencies defined

Output via Product:		Output to Activity:
3.4.1: Link Decision	3	**0.1: Develop and Revise SF21 MP**
	3	**0.2: Develop and Revise Checklist**
		0.3: Manage Issues and Risks
		0.4: Administer SF21 Program
Decision(s) will impact the contents of the document(s).		
3.4.1: Link Decision	3	**6.1: Estimate Performance**
	3	
The Link Decision is required to refine performance estimates.		
3.4.1: Link Decision	3	**9.1: Develop Avionics**
	3 3	
The Link Decision is required so that Industry can finalize avionics design without the risk that the FAA will later choose not to support the avionics' data link.		

Overview of Activity **3.5: Decision - Go for Full Evaluation**

Description: Is this Application ready to be fully evaluated during an upcoming OpEval? [This decision should consider informal inputs from pilot unions, controller unions, FAA management, and Industry management.] Does this Application show sufficient promise (costs versus benefits) to justify simulation and flight test evaluation? Have the procedures to be tested been developed to a maturity that justifies evaluation? Are the cockpit and controller task analyses and the resulting interface designs sufficiently mature to justify evaluation? Have the avionics to be tested been developed to a maturity that justifies evaluation? Will this evaluation be a Limited evaluation or a full OpEval? Activities enabled by this decision are shown as outputs in the tables that follow.

The Go for Full Evaluation Decision will serve as a major or minor input to many subsequent Checklist activities. For simplicity of presentation, only the most important interactions are shown in the following tables.

Plan and Perform: N/A POC = N/A

Approve or Accept: OCG POC = OCG Co-chairs

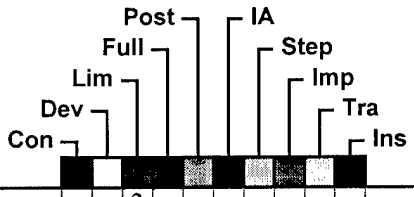
Products:

3.5.1: Decision to Plan for Full Evaluation: (This decision may be made collectively for multiple applications.)

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)				0						
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
0.5: Coordinate for Decisions	**0.5.3: FAA Coord. for Decision 3.5**
Coordination provided on whether the Application is sufficiently mature to justify full evaluation.	

No interact dependencies defined

Output via Product:	Output to Activity:
3.5.1: Decision to Plan for Full Evaluation	**0.1: Develop and Revise SF21 MP** **0.2: Develop and Revise Checklist** **0.3: Manage Issues and Risks** **0.4: Administer SF21 Program** **10.1: Plan Joint Evaluations**
Decision(s) will impact the contents of the document(s). Decision justifies full evaluation.	

Overview of Activity **3.6: Decision - Mission Need**

Description: The sponsoring line of business submits the Mission Need Statement, briefing package, and any critical supporting material to members of the JRC before the decision date, as specified in JRC guidance provided by the Program Evaluation Division. The sponsoring line of business presents and defends the proposed mission need to the Joint Resources Council. Approval of the MNS at the Mission Need Decision by the JRC establishes the mission need as valid and authorizes the exploration and investment analysis of alternative solutions for satisfying the need. If a MNS is not determined to be valid, it is returned to the sponsoring line of business for disposition. This may result in a decision by the sponsoring line of business to conduct further mission analysis, defer, or terminate analysis of the need.

Plan and Perform: N/A POC = N/A

Approve or Accept: JRC POC = JRC Lead

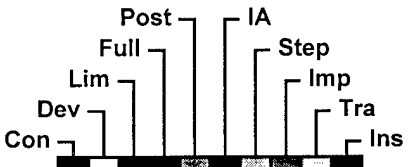
Products:

3.6.1: Mission Need Decision: (This decision may be made collectively for multiple applications.)

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)				0						
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
0.5: Coordinate for Decisions	4	0.5.4: FAA Coord. for Decision 3.6
1.7: Establish Mission Need	4	1.7.1: Mission Need Statement
The MNS is approved at the Mission Need Decision.		

No interact dependencies defined

Output via Product:		Output to Activity:
3.6.1: Mission Need Decision	4	0.1: Develop and Revise SF21 MP
	4	0.2: Develop and Revise Checklist
		0.3: Manage Issues and Risks
		0.4: Administer SF21 Program
Decision(s) will impact the contents of the document(s).		
3.6.1: Mission Need Decision	4	1.8: Develop Requirements Document
	4	2.5: Conduct Investment Analysis
The definition of Mission Need initiates investment analysis processes.		

Overview of Activity **3.7: Decision - Was OpEval Adequate?**

Description: Was the OpEval adequate (i.e., Did it address all of the significant issues? Did it collect the data required to resolve all of these issues? Is the analysis of the OpEval complete and have all significant issues been resolved? Is any additional evaluation required?)? Are the FAA lines of business ready to commit to implement the application in a timely fashion if suitable requests (for certification and operational approval) are received? Activities enabled by this decision are shown as outputs in the tables that follow. (If the application were to require FAA investment this would be preceded by investment analysis per AMS.

The Decision on OpEval Adequacy will serve as a major or minor input to many subsequent Checklist activities. For simplicity of presentation, only the most important interactions are shown in the following tables.

Plan and Perform: N/A POC = N/A

Approve or Accept: SF21 SSG POC = AND-500 Lead

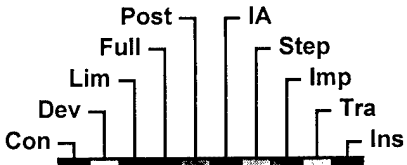
Products:

3.7.1: OpEval Adequacy Decision: (This decision may be made collectively for multiple applications.)

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)						0				
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
0.5: Coordinate for Decisions	5 5	**0.5.5: FAA Coord. for Decision 3.7**

Coordination of issues with FAA LOBs used as an input to SSG decision making.

No interact dependencies defined

Output via Product:		Output to Activity:
3.7.1: OpEval Adequacy Decision	6 6	**0.1: Develop and Revise SF21 MP** **0.2: Develop and Revise Checklist** **0.3: Manage Issues and Risks** **0.4: Administer SF21 Program** **1.8: Develop Requirements Document** **2.4: Develop Industry Business Cases** **2.5: Conduct Investment Analysis**

Decision(s) will impact the contents of the document(s). The OpEval adequacy decision formalizes the readiness to proceed to investment analysis.

Overview of Activity **3.8: Decision - Initial Investment**

Description: The JRC designates the alternative solution to be implemented, approves an initial Acquisition Program Baseline for the recommended alternative (no variance tracking), and approves an action plan that defines the cost, schedule, activities (such as vendor contract award for first production system/first site), and documentation required to mitigate risk and better define requirements in preparation for a final investment decision.

Plan and Perform: N/A POC = N/A

Approve or Accept: JRC POC = JRC Lead

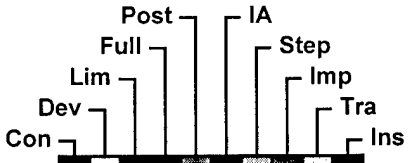
Products:

3.8.1: Initial Investment Decision: (This decision may be made collectively for multiple applications.)

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)							0			
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
0.5: Coordinate for Decisions 1.8: Develop Requirements Document 2.5: Conduct Investment Analysis	6 6	0.5.6: FAA Coord. for Decision 3.8 1.8.2: Final Requirements Document 2.5.1: Investment Analysis Report 2.5.2: Acquisition Program Baseline (APB)
The FRD is used as input to the Initial Investment Decision. IA Reports are used as input to the Investment Decisions.		
1.7: Establish Mission Need	4 4	1.7.1: Mission Need Statement
The MNS is revised, if necessary, at the Initial Investment Decision.		

No interact dependencies defined

Output via Product:		Output to Activity:
3.8.1: Initial Investment Decision	7 7	0.1: Develop and Revise SF21 MP 0.2: Develop and Revise Checklist 0.3: Manage Issues and Risks 0.4: Administer SF21 Program 0.6: Develop Acquisition Program Plans 6.3: Develop Ground System Specs
Decision(s) will impact the contents of the document(s). The Initial Investment Decision initiates the development of program plans.		

Overview of Activity **3.9: Decision - Industry Commits to Impl.**

Description: The applicant formally notifies the FAA of their commitment to pursue approval and implementation of this application, either at specific location(s) or NAS-wide. [This request may involve multiple applications or it may be for this application alone.] The applicants decision will be based on OpEval results, cost/benefit analysis, their company business case, and other considerations. (in coordination with the OCG) activity is phases. Activities enabled by this decision are shown as outputs in the tables that follow.

The Industry Decision to Commit to Implementation will serve as a major or minor input to many subsequent Checklist activities. For simplicity of presentation, only the most important interactions are shown in the following tables.

Plan and Perform: N/A POC = N/A

Approve or Accept: Industry Stakeholders POC = Various

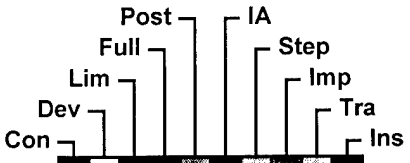
Products:

3.9.1: Formal Notice from Applicants: (This letter may apply to multiple applications.)

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)							0			
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
2.4: Develop Industry Business Cases	**2.4.1: Industry Business Cases**

Industry business cases support stakeholder buy-in to equip/manufacture.

No interact dependencies defined

Output via Product:	Output to Activity:
3.9.1: Formal Notice from Applicants	**0.1: Develop and Revise SF21 MP** **0.2: Develop and Revise Checklist** **0.3: Manage Issues and Risks** **0.4: Administer SF21 Program** **11.2: Plan and Apply for Avionics Cert.** **12.1: State Intent to Conduct New Flight Ops (Ph. 1)**

Decision(s) will impact the contents of the document(s). Applicant commitment is required to validate industry commitment.

Overview of Activity 3.10: Decision - Sel. Vendor & Award Contract

Description: The selection decision is based on the stated evaluation criteria including cost or price considerations to identify the best value. The Source Selection Official (SSO), usually the PT Lead, applies sound business judgment to the evaluation of the vendor's proposed solution against the stated evaluation criteria. The SSO provides a rational basis for the screening or selection decision.

Plan and Perform: N/A POC = N/A

Approve or Accept: Product Team POC = PT Lead

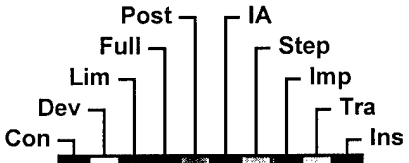
Products:

3.10.1: Contract Award: (This decision may be made collectively for multiple applications.)

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)							0			
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
0.5: Coordinate for Decisions 0.6: Develop Acquisition Program Plans 0.7: Prepare Acquisition Contract 6.3: Develop Ground System Specs	7 7	0.5.7: FAA Coord. for Decision 3.10 0.6.1: Acquisition Strategy Paper 0.6.2: Program WBS 0.6.3: Integrated Program Plan 0.7.1: Contract Package 0.7.2: SIR/RFO 6.3.1: Ground System Design Specification 6.3.2: Interface Documents
Forms part of criteria for vendor selection.		

No interact dependencies defined

Output via Product:		Output to Activity:
3.10.1: Contract Award	7 7	0.1: Develop and Revise SF21 MP 0.2: Develop and Revise Checklist 0.3: Manage Issues and Risks 0.4: Administer SF21 Program 3.11: Decision - Final Investment
Decision(s) will impact the contents of the document(s). Vendor selection is used as input to the Final Investment Decision.		
3.10.1: Contract Award	7 7 7	9.3: Manufacture Gnd Systems for Impl. 9.4: Deliver and Integrate Gnd Systems
Contract award initiates the development of the first production ground system. The contract outlines requirements for delivery and integration of ground systems.		

Overview of Activity **3.11: Decision - Final Investment**

Description: The JRC approves the program for implementation and assigns it to the appropriate IPT, approves the Final APB for program execution and variance tracking, ratifies and baselines the Requirements Document, commits the agency to full lifecycle funding for the program, and identifies future corporate decisions and level of delegation.

Plan and Perform: N/A POC = N/A

Approve or Accept: JRC POC = JRC Lead

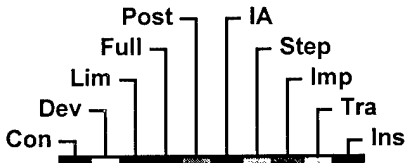
Products:

3.11.1: Final Investment Decision: (This decision may be made collectively for multiple applications.)

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)							0			
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
0.5: Coordinate for Decisions 0.6: Develop Acquisition Program Plans 0.7: Prepare Acquisition Contract 3.10: Decision - Sel. Vendor & Award Contract 6.3: Develop Ground System Specs	7 7	0.5.8: FAA Coord. for Decision 3.11 0.6.1: Acquisition Strategy Paper 0.6.2: Program WBS 0.6.3: Integrated Program Plan 0.7.1: Contract Package 0.7.2: SIR/RFO 3.10.1: Contract Award 6.3.1: Ground System Design Specification 6.3.2: Interface Documents
Progam planning documents used as guidance in making final investment decision. Vendor selection is used as input to the Final Investment Decision.		
2.5: Conduct Investment Analysis	6 6	2.5.1: Investment Analysis Report 2.5.2: Acquisition Program Baseline (APB)
IA Reports are used as input to the Investment Decisions.		

No interact dependencies defined

Output via Product:		Output to Activity:
3.11.1: Final Investment Decision	7 7	0.1: Develop and Revise SF21 MP 0.2: Develop and Revise Checklist 0.3: Manage Issues and Risks 0.4: Administer SF21 Program
Decision(s) will impact the contents of the document(s).		
3.11.1: Final Investment Decision	7 7	9.3: Manufacture Gnd Systems for Impl.
The Final Investment Decision allows the program to proceed with a full production run.		

Overview of Activity 3.12: Decision - Formal FAA/Union Agreement

Description: Complete formal negotiation with the FAA unions. Coordination with NATCA is required for changes that affect controllers. [Coordination with PASS is required for changes that affect maintenance personnel.] Obtain concurrence with the changes required to support the operational use of this application. Activities enabled by this decision are shown as outputs in the tables that follow.

Plan and Perform: N/A POC = N/A

Approve or Accept: Unions, With FAA Stakeholders POC = Various

Products:

3.12.1: FAA/Union Agreement: (This decision may be made collectively for multiple applications.)

3.12.2: NATCA Concurrence on 7110.65: Air Traffic Control. (This order may be revised to address procedural changes for multiple applications.)

3.12.3: NATCA Concurrence on 7210.3: Facility Operation and Administration

3.12.4: NATCA Concurrence on 7610.4: Special Military Operations. (This order may be revised to address procedural changes for multiple applications.)

3.12.5: NATCA Concurrence on LOAs: (These LOAs may be revised to address procedural changes for multiple applications.)

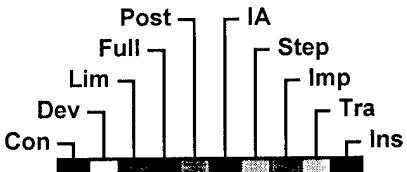
3.12.6: NATCA Concur: AIM: (The AIM and relevant supplements may be revised to address procedural changes for multiple applications.)

3.12.7: NATCA Concur: Training Materials: (This material may be developed to address procedural changes for multiple applications.)

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)								0		
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
0.5: Coordinate for Decisions 12.10: Inform Unions	7 7	0.5.9: FAA Coord. for Decision 3.12 12.10.2: NATCA Response to 7110.65 12.10.3: NATCA Response to 7210.3 12.10.4: NATCA Response to 7610.4 12.10.5: NATCA Response to LOAs 12.10.6: NATCA Response to AIM Revision 12.10.7: NATCA Response to Controller Training Mat'l
Union feedback on the draft should lead toward consensus.		

No interact dependencies defined

Output via Product:		Output to Activity:
3.12.1: FAA/Union Agreement	8 8	0.1: Develop and Revise SF21 MP 0.2: Develop and Revise Checklist 0.3: Manage Issues and Risks 0.4: Administer SF21 Program
Decision(s) will impact the contents of the document(s).		
3.12.2: NATCA Concurrence on 7110.65 3.12.3: NATCA Concurrence on 7210.3 3.12.4: NATCA Concurrence on 7610.4 3.12.5: NATCA Concurrence on LOAs	8 8	12.6: Revise ATC Orders & LOAs
NATCA concurrence with proposed changes required to implement the application.		
3.12.6: NATCA Concur: AIM	8 8	12.7: Revise the AIM
NATCA concurrence with proposed changes required to implement the application.		
3.12.7: NATCA Concur: Training Materials	8 8	12.8: Develop/Perform Controller Training
NATCA concurrence with proposed changes required to implement the application.		

Overview of Activity

3.13: Decision - In-Service

Description: A decision authority (usually the sponsoring LOB) determines if the procurement was developed in such a that users welcome it, i.e., the new system meets requirements, is supportable logistically, functions easily with the rest of the NAS, and all aspects of the transition to operational use are addressed and resolved. The decision authority is determined by the Associate Administrator of the sponsoring line of business working in conjunction with the Acquisition Executive and the appropriate IPT.

Plan and Perform: N/A POC = N/A

Approve or Accept: IPT POC = IPT Lead

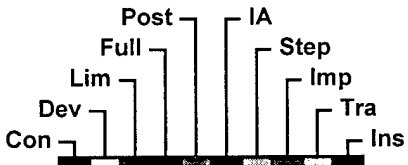
Products:

3.13.1: In-Service Decision: (This decision may be made collectively for multiple applications.)

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)								0		
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
0.5: Coordinate for Decisions	8	0.5.10: FAA Coord. for Decision 3.13
12.13: Field Test Ground Systems	8	12.13.1: Test Reports
Reports used as input to the In-Service Decision.		

No interact dependencies defined

Output via Product:		Output to Activity:
3.13.1: In-Service Decision	8	0.1: Develop and Revise SF21 MP
	8	0.2: Develop and Revise Checklist
		0.3: Manage Issues and Risks
		0.4: Administer SF21 Program
		12.6: Revise ATC Orders & LOAs
		12.7: Revise the AIM
		12.8: Develop/Perform Controller Training
		12.14: Commission Ground Systems
Decision(s) will impact the contents of the document(s). The In-Service Decision approves the commissioning and operational use of ground systems.		
3.13.1: In-Service Decision	8	9.3: Manufacture Gnd Systems for Impl.
	8	
The In-Service Decision initiates the deployment of ground systems to all sites.		

Overview of Activity **4.1: Plan Procedure Development**

Description: Based on the operational concept and the current maturity of the application, define a process for developing, testing, and demonstrating the procedures that are necessary to support the operational use of this application. (This plan will be revised as needed as development and evaluation progress.)

Plan and Perform: OCG - TOSG, With SF21 StG - Ops/Proc SubGroup POC = OCG/TOSG Rep

Approve or Accept: SF21 StG - Ops/Proc SubGroup POC = SF21 StG/OPsG Co-chairs

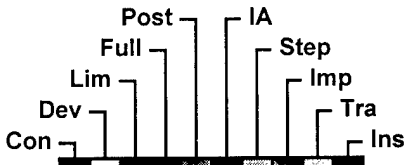
Products:

4.1.1: Procedures Development Plan: Working documentation within test-ops for refining procedures through simulation and HF analysis. This product is published as part of the Test and Evaluation Master Plan (TEMP). This plan will be periodically revised on an as-needed basis.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	4									
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.1: Define High-Level Concept	1	1.1.1: High-Level Concept
1.6: Develop Research Evaluation Plan	1	1.6.1: Research Evaluation Plan

High-level concept provides guidance for conducting activity. The REP identifies issues that need to be addressed.

Interact with Activity:	
0.1: Develop and Revise SF21 MP	1
0.2: Develop and Revise Checklist	1
0.3: Manage Issues and Risks	
0.4: Administer SF21 Program	
5.1: Plan Human Factors Activities	
8.1: Plan Coord. Safety Activities	

Provides insight into refinement of interacting activity products and vice versa. May identify changes needed (and vice versa).

Output via Product:		Output to Activity:
4.1.1: Procedures Development Plan	1 1 1 1 1	4.2: Specify Procedures
Provides guidance for conduct of activity.		
4.1.1: Procedures Development Plan	1 1 1 1	4.3: Simulate with Pilots 4.4: Simulate with Controllers
Provides guidance for conduct of activity.		
4.1.1: Procedures Development Plan	1 1 1	4.5: Train for Procedures
Provides guidance for conduct of activity.		

Overview of Activity

4.2: Specify Procedures

Description: Based on the operational concept and with input from pilots and controllers, define procedures that are necessary to support the operational use of this application. Modify these procedures as necessary based on simulations and evaluations.

Plan and Perform: OCG - TOSG, With SF21 StG - Ops/Proc SubGroup, SC-186 WG1 POC = OCG/TOSG Rep

Approve or Accept: SF21 StG - Ops/Proc SubGroup POC = SF21 StG/OPsG Co-chairs

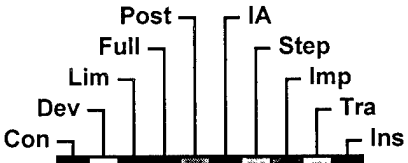
Products:

4.2.1: Procedures Specification: Working documentation within test-ops for refining procedures through simulation and HF analysis, for informal input other groups analyses and planning, and to revising the (more formal) detailed concepts.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	20	20	20	20						
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.1: Define High-Level Concept	1	**1.1.1: High-Level Concept**
High-level concept provides guidance for conducting activity.		
1.2: Develop Detailed Ops Concepts	2 3	**1.2.1: Detailed OPS Concepts**
1.3: Develop Detailed Systems Concepts	2 3	**1.3.1: Detailed Systems Concepts**
6.1: Estimate Performance		**6.1.1: Performance Expectations**
Provides guidance for conduct of activity. Performance estimates provide inputs to development of procedures.		
4.1: Plan Procedure Development	1 1 1 1	**4.1.1: Procedures Development Plan**
Provides guidance for conduct of activity.		
4.3: Simulate with Pilots	2	**4.3.1: Pilot Simulation Report**
4.4: Simulate with Controllers	2	**4.4.1: Controller Simulation Report**
5.2: Analyze Cockpit Tasks		**5.2.1: Cockpit Task Analysis Report**
5.5: Analyze Controller Tasks		**5.5.1: Controller Task Analysis Report**
Reports identify potential changes needed to procedures.		
4.5: Train for Procedures	3 4	**4.5.1: Pilot Training Materials**
	3 4	**4.5.2: Controller Training Materials**
Defines and formalizes training requirements.		

Interact with Activity:	
4.3: Simulate with Pilots	3 4
4.4: Simulate with Controllers	3 4
5.2: Analyze Cockpit Tasks	
5.3: Design Cockpit Interface	
5.5: Analyze Controller Tasks	
5.6: Design Controller Interface	
10.1: Plan Joint Evaluations	
10.2: Simulate Mission	
10.3: Conduct Joint Evaluation	
Existing definitions of procedures are the starting point for interactions with pilots in each simulation - modifications to procedures (during simulation) and evaluation of the procedures as simulated effect development of procedures. Task analyses provides insight into procedure development and vice versa. Evaluations help determine limits to parameters that affect the performance and acceptability of procedures.	
7.2: Define Ground System Interop.	1
Development of draft procedures may impact ground system interoperability requirements, and vice versa.	
8.2: Summarize Op. Services and Env't	1 2 3 4
8.3: Perform Safety Analyses	1 2 3 4
8.4: Allocate Safety Objs & Reqs	
Safety considerations influence the specification and development of procedures and vice versa.	

Output via Product:		Output to Activity:
4.2.1: Procedures Specification	2 3 4	**1.2: Develop Detailed Ops Concepts**
	2 3 4	
Procedures provide input to the definition and revisions of detailed concepts.		

4.2.1: Procedures Specification	4 4	**1.8: Develop Requirements Document** **12.6: Revise ATC Orders & LOAs**
Results of activities aid in the development of requirements documents. Procedures flown at OpEval provide partial basis for approval.		
4.2.1: Procedures Specification	1 1	**4.3: Simulate with Pilots** **4.4: Simulate with Controllers**
Initial procedures needed for refining procedures through simulation and HF analysis.		
4.2.1: Procedures Specification	2 3 2 3	**4.5: Train for Procedures** **8.6: Ensure Safety of Testing** **10.1: Plan Joint Evaluations** **12.10: Inform Unions**
Initial procedures for evaluations are basis for training development. Provides information on expectations, requirements, operational sensitivities & mitigations. Specification defines procedures to be flown and data to be collected during evaluations. Provides procedures flown during evaluations for review.		
4.2.1: Procedures Specification	1 1	**5.2: Analyze Cockpit Tasks** **5.5: Analyze Controller Tasks**
Initial procedures are basis for initial task analyses.		
4.2.1: Procedures Specification	2 3 4 2 3 4	**11.2: Plan and Apply for Avionics Cert.** **12.1: State Intent to Conduct New Flight Ops (Ph. 1)** **12.2: Request Operational Approval (Ph. 2)**
Procedures flown at OpEval provide partial basis for approval. Provides partial basis for statement of intent.		

Overview of Activity

4.3: Simulate with Pilots

Description: Beginning from initial definitions of procedures, conduct and evaluate a simulations of procedures with pilots and identify needed modifications.

Plan and Perform: OCG - TOSG, With SF21 StG - Ops/Proc SubGroup, SC-186 WG1 POC = OCG/TOSG Rep

Approve or Accept: OCG POC = OCG Co-chairs

Products:

4.3.1: Pilot Simulation Report: Report that sumarrizes the results of pilot simulations.

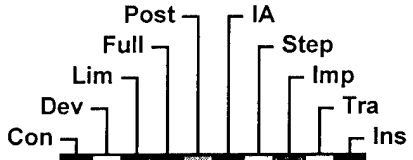
Issues:

- Adequate simulation and evaluation of worst-case scenarios may not be achievable
- Identify where changes may be needed in procedures and propose alternatives

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)		1	1	1						
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
4.1: Plan Procedure Development	**4.1.1: Procedures Development Plan**
Provides guidance for conduct of activity.	
4.2: Specify Procedures	**4.2.1: Procedures Specification**
Initial procedures needed for refining procedures through simulation and HF analysis.	
4.5: Train for Procedures	**4.5.1: Pilot Training Materials**
Training materials required to conduct simulation.	

Interact with Activity:
4.2: Specify Procedures **4.4: Simulate with Controllers** **10.2: Simulate Mission**
Existing definitions of procedures are the starting point for interactions with pilots in each simulation - modifications to procedures (during simulation) and evaluation of the procedures as simulated effect development of procedures. Interleaved (or simultaneous) controller-in-the-loop and pilot-in-the-loop simulations exchange potential procedure adjustments without waiting for updated specifications - pilots and controllers may interact in debriefing and evaluating simulations. Cockpit simulations are conducted during joint evaluation periods.
5.2: Analyze Cockpit Tasks **5.3: Design Cockpit Interface**
Cockpit task analysis provides insight into pilot procedure simulations and vice versa. Cockpit simulation provides insight into cockpit interface issues/design and vice versa.

Output via Product:	Output to Activity:
4.3.1: Pilot Simulation Report	**4.2: Specify Procedures**
Reports identify potential changes needed to procedures.	

Overview of Activity **4.4: Simulate with Controllers**

Description: Beginning from initial definitions of procedures, conduct and evaluate simulations of procedures with controllers and identify needed modifications.

Plan and Perform: OCG - TOSG, With SF21 StG - Ops/Proc SubGroup, SC-186 WG1 POC = OCG/TOSG Rep

Approve or Accept: OCG POC = OCG Co-chairs

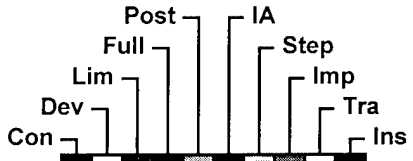
Products:

4.4.1: Controller Simulation Report: Report that summarizes the results of controller simulations.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)		1	1	1						
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
4.1: Plan Procedure Development	**4.1.1: Procedures Development Plan**
Provides guidance for conduct of activity.	
4.2: Specify Procedures	**4.2.1: Procedures Specification**
Initial procedures needed for refining procedures through simulation and HF analysis.	
4.5: Train for Procedures	**4.5.2: Controller Training Materials**
Training materials required to conduct simulation.	

Interact with Activity:
4.2: Specify Procedures **4.3: Simulate with Pilots** **10.2: Simulate Mission**
Existing definitions of procedures are the starting point for interactions with pilots in each simulation - modifications to procedures (during simulation) and evaluation of the procedures as simulated effect development of procedures. Interleaved (or simultaneous) controller-in-the-loop and pilot-in-the-loop simulations exchange potential procedure adjustments without waiting for updated specifications - pilots and controllers may interact in debriefing and evaluating simulations. Cockpit simulations are conducted during joint evaluation periods.
5.5: Analyze Controller Tasks **5.6: Design Controller Interface**
Controller task analysis provides insight into controller procedure simulations, and vice versa.

Output via Product:	Output to Activity:
4.4.1: Controller Simulation Report	**4.2: Specify Procedures**
Reports identify potential changes needed to procedures.	

Overview of Activity

4.5: Train for Procedures

Description: Develop training materials and conduct training of pilots and controllers who will participate in simulations, evaluations, and operational tests

Plan and Perform: OCG POC = OCG/TOSG Rep

Approve or Accept: ATP, With AFS POC = TBD

Products:

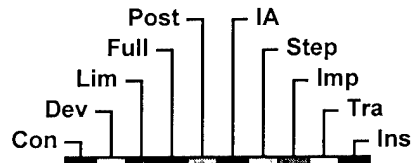
4.5.1: Pilot Training Materials: Materials used to train pilots on the procedures to be used for evaluations.

4.5.2: Controller Training Materials: Materials used to train controllers on the procedures to be used for evaluations.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			2	2						
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
4.1: Plan Procedure Development	1 / 1 1	**4.1.1: Procedures Development Plan**
Provides guidance for conduct of activity.		
4.2: Specify Procedures	2 3 / 2 3	**4.2.1: Procedures Specification**
Initial procedures for evaluations are basis for training development.		

Interact with Activity:	
8.6: Ensure Safety of Testing	3 4
10.1: Plan Joint Evaluations	3 4
Safety strategies identified at the time that training materials are developed will be included in the materials (further safety strategies will be incorporated into participants training and preparation as they are defined.) Aspects of the application to be evaluated and the methods of evaluation should be reflected in the training materials, and resources must be budgeted for training.	

Output via Product:		Output to Activity:
4.5.1: Pilot Training Materials	3 4	**4.2: Specify Procedures**
4.5.2: Controller Training Materials	3 4	
Defines and formalizes training requirements.		
4.5.1: Pilot Training Materials	3 4 / 3 4	**4.3: Simulate with Pilots**
Training materials required to conduct simulation.		
4.5.1: Pilot Training Materials	3 4 / 3 4 4	**12.2: Request Operational Approval (Ph. 2)**
Pilot training materials may provide basis for approved training.		
4.5.2: Controller Training Materials	3 4 / 3 4	**4.4: Simulate with Controllers**
Training materials required to conduct simulation.		
4.5.2: Controller Training Materials	4 / 4	**12.8: Develop/Perform Controller Training**
May provide basis for approved training.		

Overview of Activity **5.1: Plan Human Factors Activities**

Description: Develop a Human Factors Plan that outlines all required human factors analyses and other related activities that will need to be conducted to support the development of the application.

Plan and Perform: OCG - HFSG POC = TBD

Approve or Accept: OCG POC = OCG Co-chairs

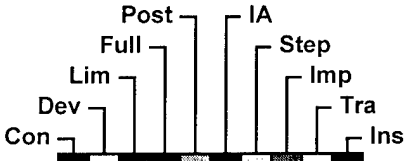
Products:

5.1.1: Human Factors Plan: This HF plan provides a description and planned schedule of all required human factors analyses and other related activities that will need to be conducted to support the development of the application.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	8									
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins	Input via Product:
1.1: Define High-Level Concept	1										1.1.1: High-Level Concept
1.6: Develop Research Evaluation Plan	1										1.6.1: Research Evaluation Plan

High-level concept provides guidance for conducting activity. The REP identifies issues that need to be addressed.

Interact with Activity:	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
0.1: Develop and Revise SF21 MP	1									
0.2: Develop and Revise Checklist	1									
0.3: Manage Issues and Risks										
0.4: Administer SF21 Program										
4.1: Plan Procedure Development										
8.1: Plan Coord. Safety Activities										

Provides insight into refinement of interacting activity products and vice versa. May identify changes needed (and vice versa). Improved understanding of HF issues will clarify the areas to focus on in safety analyses - previewing safety issues in drafting the HF plan will influence the strategy for analysis and development.

Output via Product:	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins	Output to Activity:
5.1.1: Human Factors Plan	1										5.2: Analyze Cockpit Tasks
	1	1	1	1							5.3: Design Cockpit Interface
											5.5: Analyze Controller Tasks
											5.6: Design Controller Interface

Provides guidelines for subsequent human factors analyses.

5.1.1: Human Factors Plan	1										5.4: Define Cockpit Interface Stds
					1						

Provides guidelines for subsequent human factors analyses.

Overview of Activity

5.2: Analyze Cockpit Tasks

Description: Conduct a cockpit human factors task analysis. During limited evaluation and OpEval activities, this analysis is conducted jointly with a corresponding controller human factors analysis.

Plan and Perform: OCG - HFSG POC = TBD

Approve or Accept: OCG POC = OCG Co-chairs

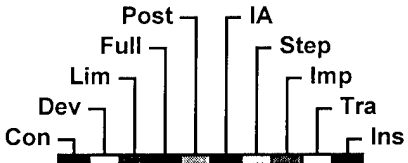
Products:

5.2.1: Cockpit Task Analysis Report: This document presents summary results of the initial analysis, including task identifications, issues and risks, and recommended computer-human interface (CHI) design requirements if appropriate. The analysis is based on initial application concepts and procedures, and is used to support the subsequent analysis of cockpit human factors.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	24	24	16	8						
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
1.1: Define High-Level Concept	**1.1.1: High-Level Concept**
4.2: Specify Procedures	**4.2.1: Procedures Specification**
High-level concept provides guidance for conducting activity. Initial procedures are basis for initial task analyses.	
1.2: Develop Detailed Ops Concepts	**1.2.1: Detailed OPS Concepts**
Provides guidance for conduct of activity.	
5.1: Plan Human Factors Activities	**5.1.1: Human Factors Plan**
Provides guidelines for subsequent human factors analyses.	
5.3: Design Cockpit Interface	**5.3.1: Cockpit Interface Design**
Initial cockpit interface design required for initial cockpit task analysis.	
6.1: Estimate Performance	**6.1.1: Performance Expectations** **6.1.2: Estimated Performance Requirements**
Performance estimates provide inputs to development of human factors criteria and subsequent task analyses.	

Interact with Activity:
4.2: Specify Procedures
9.1: Develop Avionics
10.1: Plan Joint Evaluations
10.2: Simulate Mission
10.3: Conduct Joint Evaluation
Task analyses provides insight into procedure development and vice versa. Avionics development identifies what the pilot needs to do with avionics. Cockpit task analysis evaluation requirements will effect planning for tests and evaluations, and vice versa. Cockpit task analyses are performed in conjunction with joint evaluations.
4.3: Simulate with Pilots
5.3: Design Cockpit Interface
Cockpit task analysis provides insight into pilot procedure simulations and vice versa. Cockpit task analysis provides insight into cockpit interface design, and vice versa.
8.2: Summarize Op. Services and Env't
8.3: Perform Safety Analyses
8.4: Allocate Safety Objs & Reqs
Safety considerations influence task analyses and vice versa.

Output via Product:	Output to Activity:
5.2.1: Cockpit Task Analysis Report	**1.2: Develop Detailed Ops Concepts**
Task analyses provide input to the definition and revisions of detailed concepts.	
5.2.1: Cockpit Task Analysis Report	**4.2: Specify Procedures**
Reports identify potential changes needed to procedures.	

5.2.1: Cockpit Task Analysis Report	1 1	**5.3: Design Cockpit Interface**
Characterizes basis for development of initial cockpit interface design.		
5.2.1: Cockpit Task Analysis Report	2 3 2 3	**8.6: Ensure Safety of Testing**
Provides information on expectations, requirements, operational sensitivities & mitigations.		
5.2.1: Cockpit Task Analysis Report	2 3 4 2 3 4	**12.2: Request Operational Approval (Ph. 2)**
Important ingredient to Ops Approval consideration.		

Overview of Activity **5.3: Design Cockpit Interface**

Description: Develop and refine the cockpit interface design based on the cockpit task analysis. This provides the input to the interface standards development activity once the interface design has been matured and validated.

Plan and Perform: OCG - TOSG POC = OCG/TOSG Rep

Approve or Accept: OCG POC = OCG Co-chairs

Products:

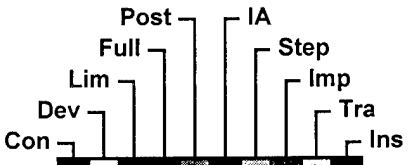
5.3.1: Cockpit Interface Design: Working documentation specifying the functions, sumbology, organization, and interactions of cockpit crew interfaces that enable the application.

5.3.2: Mock-Ups or Simulation Avionics: For refining interfaces and simulation and HF evaluation with pilots.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	24	24	12	8						
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.3: Develop Detailed Systems Concepts	2 3 / 2 3	**1.3.1: Detailed Systems Concepts**
Provides guidance for conduct of activity.		
5.1: Plan Human Factors Activities	1 / 1 1 1	**5.1.1: Human Factors Plan**
Provides guidelines for subsequent human factors analyses.		
5.2: Analyze Cockpit Tasks	1 / 1	**5.2.1: Cockpit Task Analysis Report**
Characterizes basis for development of initial cockpit interface design.		
6.1: Estimate Performance	1 2 3 / 1 2 3	**6.1.1: Performance Expectations** **6.1.2: Estimated Performance Requirements**
Performance estimates provide inputs to development of interfaces.		

Interact with Activity:	
4.2: Specify Procedures **7.3: Validate Interoperability** **9.1: Develop Avionics** **10.2: Simulate Mission** **10.3: Conduct Joint Evaluation**	3 4 / 3 4
Task analyses provides insight into procedure development and vice versa. Interoperability validations during joint evaluations provide insight into interface design evaluations, and vice versa. Evaluation of cockpit interface provides insight for avionics development and vice versa. Cockpit task analyses are performed in conjunction with joint evaluations.	
4.3: Simulate with Pilots **5.2: Analyze Cockpit Tasks**	2 3 4 / 2 3 4
Cockpit simulation provides insight into cockpit interface issues/design and vice versa. Cockpit task analysis provides insight into cockpit interface design, and vice versa.	
8.2: Summarize Op. Services and Env't **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs**	1 2 3 4 / 1 2 3 4
Safety considerations influence task analyses and vice versa.	

Output via Product:		Output to Activity:
5.3.1: Cockpit Interface Design	2 3 4 / 2 3 4	**1.3: Develop Detailed Systems Concepts** **6.1: Estimate Performance**
Cockpit interface requirements provide input to the definition and revisions of detailed concepts. Revisions to cockpit interface may change estimated requirements or capabilities.		
5.3.1: Cockpit Interface Design	1 / 1	**5.2: Analyze Cockpit Tasks**
Initial cockpit interface design required for initial cockpit task analysis.		
5.3.1: Cockpit Interface Design	4 / 4	**5.4: Define Cockpit Interface Stds**
Provides basis for defining avionics interface standards.		

5.3.1: Cockpit Interface Design	2 **3** **4** 2 3 4	**9.1: Develop Avionics** **11.2: Plan and Apply for Avionics Cert.** **11.4: Submit Updated/Supp. Information**
Interface designs are used to support avionics development. Preliminary designs provide an input to certification plan if standards are not ready.		
5.3.1: Cockpit Interface Design **5.3.2: Mock-Ups or Simulation Avionics**	2 **3** 2 3	**10.1: Plan Joint Evaluations**
Human factors analyses are required to plan the mission simulation.		

Overview of Activity **5.4: Define Cockpit Interface Stds**

Description: This activity defines the standards to be used when developing and manufacturing avionics to support the application.

Plan and Perform: SAE POC = TBD

Approve or Accept: SAE POC = TBD

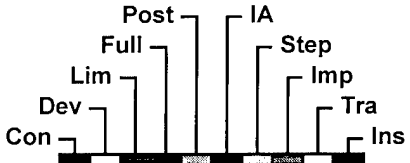
Products:

5.4.1: Cockpit Interface Standard: This document provides standards upon which subsequent avionics interface implementation and applications for certification and approval are based.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)						12				
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.3: Develop Detailed Systems Concepts **8.7: Assess Comparative Safety** **8.8: Formalize Scopes of Operations**	5 5	**1.3.1: Detailed Systems Concepts** **8.7.1: Comparative Safety Analysis** **8.8.1: AC on ADS-B/CDTI Capability Levels and Lims**
Systems concepts support standards development. CSA provides guidance in development of standards. AC provides input to development of requirements and standards.		
5.1: Plan Human Factors Activities	1 1	**5.1.1: Human Factors Plan**
Provides guidelines for subsequent human factors analyses.		
5.3: Design Cockpit Interface	4 4	**5.3.1: Cockpit Interface Design**
Provides basis for defining avionics interface standards.		

Interact with Activity:	
6.2: Define Performance Standards	6 6
Cockpit interface standards definition provide insight into the definition of avionics performance standards, and vice versa.	

Output via Product:		Output to Activity:
5.4.1: Cockpit Interface Standard	6 6	**9.1: Develop Avionics** **11.2: Plan and Apply for Avionics Cert.** **11.4: Submit Updated/Supp. Information**
Standards provide baseline upon which final avionics designs are developed - use if available, otherwise use preliminary designs. Completion of interface standards (with performance standards) facilitates certification by TSO. Data input for certification.		

Overview of Activity

5.5: Analyze Controller Tasks

Description: Conduct a controller human factors task analysis. During limited data collection and OpEval activities, this analysis is conducted jointly with a corresponding cockpit human factors analysis.

Plan and Perform: OCG - HFSG POC = TBD

Approve or Accept: OCG POC = OCG Co-chairs

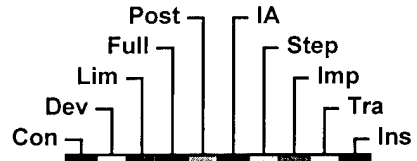
Products:

5.5.1: Controller Task Analysis Report: This document presents summary results of the analysis, including task identifications, issues and risks. The analysis is based on analyses and evaluations previously conducted (if applicable), as well as revised procedures, and is performed as part of current evaluation activities. The results of the analysis are used to support subsequent planning efforts and stakeholder commitments.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	24	24	16	8						
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
1.1: Define High-Level Concept **4.2: Specify Procedures**	**1.1.1: High-Level Concept** **4.2.1: Procedures Specification**
High-level concept provides guidance for conducting activity. Initial procedures are basis for initial task analyses.	
1.2: Develop Detailed Ops Concepts	**1.2.1: Detailed OPS Concepts**
Provides guidance for conduct of activity.	
5.1: Plan Human Factors Activities	**5.1.1: Human Factors Plan**
Provides guidelines for subsequent human factors analyses.	
5.6: Design Controller Interface	**5.6.1: Controller Interface Design**
Initial controller interface design required for initial controller task analysis.	
6.1: Estimate Performance	**6.1.1: Performance Expectations** **6.1.2: Estimated Performance Requirements**
Performance estimates provide inputs to development of human factors criteria and subsequent task analyses.	

Interact with Activity:
4.2: Specify Procedures **10.1: Plan Joint Evaluations** **10.2: Simulate Mission** **10.3: Conduct Joint Evaluation**
Task analyses provides insight into procedure development and vice versa. Controller task analyses may be revised in conjunction with procedure adjustments in mission simulation and evaluation. Controller task analyses are performed in conjunction with joint evaluations.
4.4: Simulate with Controllers **5.6: Design Controller Interface**
Controller task analysis provides insight into controller procedure simulations, and vice versa. Controller task analysis provides insight into controller interface design, and vice versa.
8.2: Summarize Op. Services and Env't **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs**
Safety considerations influence task analyses and vice versa.

Output via Product:	Output to Activity:
5.5.1: Controller Task Analysis Report	**1.2: Develop Detailed Ops Concepts**
Task analyses provide input to the definition and revisions of detailed concepts.	
5.5.1: Controller Task Analysis Report	**1.8: Develop Requirements Document** **12.6: Revise ATC Orders & LOAs**
Results of activities aid in the development of requirements documents. Analysis helps define what needs to be revised in ATC Orders and LOAs.	

5.5.1: Controller Task Analysis Report	2 2	**4.2: Specify Procedures**
Reports identify potential changes needed to procedures.		
5.5.1: Controller Task Analysis Report	1 1	**5.6: Design Controller Interface**
Results of controller task analyses provide the framework for controller interface design.		
5.5.1: Controller Task Analysis Report	2 3 2 3	**8.6: Ensure Safety of Testing**
Provides information on expectations, requirements, operational sensitivities & mitigations.		

Overview of Activity **5.6: Design Controller Interface**

Description: Develop and refine the ATC interface design based on the controller task analysis. This provides the input to the interface specification development activity once the interface design has been matured and validated.

Plan and Perform: SF21 Program Office, With ATP, AUA, OCG POC = SF21 Progam Lead

Approve or Accept: SF21 Program Office, With ATS, SF21 Program Office POC = SF21 Progam Lead

Products:

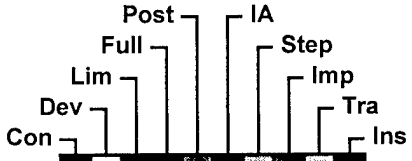
5.6.1: Controller Interface Design: Interim design requirements for controller (automation) interfaces to support the development of the application.

5.6.2: Mock-Ups or Simulation Gnd Eqpt: For refining interfaces and simulation and HF evaluation with controllers.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	12	12	12	8						
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.3: Develop Detailed Systems Concepts		**1.3.1: Detailed Systems Concepts**
Provides guidance for conduct of activity.		
5.1: Plan Human Factors Activities		**5.1.1: Human Factors Plan**
Provides guidelines for subsequent human factors analyses.		
5.5: Analyze Controller Tasks		**5.5.1: Controller Task Analysis Report**
Results of controller task analyses provide the framework for controller interface design.		
6.1: Estimate Performance		**6.1.1: Performance Expectations** **6.1.2: Estimated Performance Requirements**
Performance estimates provide inputs to development of interfaces.		

Interact with Activity:
4.2: Specify Procedures **7.3: Validate Interoperability** **9.2: Develop Ground Systems for Eval.** **10.2: Simulate Mission** **10.3: Conduct Joint Evaluation**
Task analyses provides insight into procedure development and vice versa. Interoperability validations during joint evaluations provide insight into interface design evaluations, and vice versa. Controller interface design will impact development of ground systems and vice versa. Controller task analyses are performed in conjunction with joint evaluations.
4.4: Simulate with Controllers **5.5: Analyze Controller Tasks**
Controller task analysis provides insight into controller procedure simulations, and vice versa. Controller task analysis provides insight into controller interface design, and vice versa.
8.2: Summarize Op. Services and Env't **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs**
Safety considerations influence task analyses and vice versa.

Output via Product:	Output to Activity:
5.6.1: Controller Interface Design	**1.3: Develop Detailed Systems Concepts** **6.1: Estimate Performance**
Results of controller interface design used as input to detailed systems concepts. Controller interface design used as input to performance estimates.	
5.6.1: Controller Interface Design	**1.8: Develop Requirements Document**
Results of controller interface design used as input to defining requirements.	
5.6.1: Controller Interface Design	**5.5: Analyze Controller Tasks**
Initial controller interface design required for initial controller task analysis.	

5.6.1: Controller Interface Design **5.6.2: Mock-Ups or Simulation Gnd Eqpt**	2 **3** 2 3	**9.2: Develop Ground Systems for Eval.** **10.1: Plan Joint Evaluations**
Interface designs are used to support ground systems development. Human factors analyses are required to plan the mission simulation.		

Overview of Activity

6.1: Estimate Performance

Description: Develop estimates for required performance to support the development and evaluation of the application. Data is collected throughout simulations and OpEvals, and is used to validate and/or revise initial estimates. The output of this activity will eventually drive the establishment and/or revision of performance and technical standards.

Plan and Perform: OCG — POC = OCG Co-chairs

Approve or Accept: OCG — POC = OCG Co-chairs

Products:

6.1.1: Performance Expectations: These expectations are developed with initial or revised Ops and system concepts based on the knowledge and experience available at that time. These expectations guide the planning and conduct of simulations and evaluations. They also guide procedures development and data collection requirements for later evaluation activities. At several points during the process, this product is modified as needed.

6.1.2: Estimated Performance Requirements: These estimates are developed with initial Ops and system concepts based on the knowledge and experience available at that point in time. In the Concept Phase, estimated performance requirements provide guidance in assessing the trade-offs between alternative systems to support application refinement. Estimated performance requirements provide a basis of comparison between systems that will support subsequent simulations/evaluations and the performance required to support the application.

6.1.3: Performance Data Collection Requirements: These requirements provide inputs into the planning and conduct of simulation and evaluation activities, to better characterize performance capabilities and requirements.

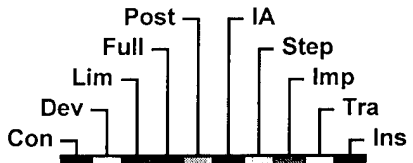
Issues:

- Need to determine how estimates of UAT and VDL Mode 4 performance will be made in the absence of pre-existing (draft) standards

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	16	16	8		2					
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.1: Define High-Level Concept	1	**1.1.1: High-Level Concept**
High-level concept provides guidance for conducting activity.		
3.4: Decision - Select Link(s)	3	**3.4.1: Link Decision**
The Link Decision is required to refine performance estimates.		
5.3: Design Cockpit Interface **5.6: Design Controller Interface** **8.2: Summarize Op. Services and Env't** **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs**	2 3 4	**5.3.1: Cockpit Interface Design** **5.6.1: Controller Interface Design** **8.2.1: Operational Services and Env't Definition** **8.3.1: Operational Hazard Assessment** **8.3.2: Hazard Analysis (PHA or SSHA/SHA)** **8.4.1: ASOR**
Revisions to cockpit interface may change estimated requirements or capabilities. Controller interface design used as input to performance estimates. Safety considerations and the need for safety-relevant specifics will influence the specification of the applications concept, both for systems and operations.		
7.2: Define Ground System Interop.	1	**7.2.1: Estimated Interface Reqs**
Interoperability assessments provide inputs to refinement of performance estimates.		
7.3: Validate Interoperability **9.1: Develop Avionics** **9.2: Develop Ground Systems for Eval.** **10.3: Conduct Joint Evaluation**	3 4	**7.3.1: Interoperability Validation Report** **9.1.1: Avionics** **9.2.1: Ground Systems for Evaluation** **10.3.1: Joint Evaluation Data**
Interoperability assessments provide inputs to refinement of performance estimates. Results of system development used as input to estimating performance. Evaluation results enable validation of performance models and assumptions.		

Interact with Activity:	
1.2: Develop Detailed Ops Concepts **1.3: Develop Detailed Systems Concepts**	2 3 5
Revisions to detailed concepts provides insight into refinements of performance estimates, and vice versa. Development of detailed concepts provides insight into refinements of follow-on products.	
7.1: Analyze Interoperability	1
Revisions to performance estimates provide insight into analysis of interoperability, and vice versa.	

Output via Product:		Output to Activity:
6.1.1: Performance Expectations	2 3 5	**0.5: Coordinate for Decisions**
Provides inputs to FAA decision making.		
6.1.1: Performance Expectations **6.1.2: Estimated Performance Requirements**	3	**1.5: Perform Link Assessment**
Performance estimates guide the design and development of data link equipment.		

6.1.1: Performance Expectations	2 **3** 2 3	**4.2: Specify Procedures** **10.2: Simulate Mission** **10.3: Conduct Joint Evaluation** **11.1: Obtain Spectrum**
Performance estimates provide inputs to development of procedures. Provides inputs to development of joint evaluation parameters. Provides guidance for allocating/assigning spectrum for joint evaluations.		
6.1.1: Performance Expectations **6.1.2: Estimated Performance Requirements**	**1 2 3** 1 2 3	**5.2: Analyze Cockpit Tasks** **5.3: Design Cockpit Interface** **5.5: Analyze Controller Tasks** **5.6: Design Controller Interface** **8.2: Summarize Op. Services and Env't** **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs**
Performance estimates provide inputs to development of human factors criteria and subsequent task analyses. Performance estimates provide inputs to development of interfaces. Provide inputs to safety analyses.		
6.1.1: Performance Expectations **6.1.2: Estimated Performance Requirements**	**5** 5	**6.2: Define Performance Standards**
Provides estimates of required performance to support validation and/or revision of standards.		
6.1.1: Performance Expectations **6.1.2: Estimated Performance Requirements**	**1** 1	**7.2: Define Ground System Interop.**
Performance estimates used as guidance in assessment of ground system interoperability.		
6.1.1: Performance Expectations **6.1.2: Estimated Performance Requirements**	2 **3** 2 3	**7.3: Validate Interoperability**
Provides inputs to support validation of interoperability performance.		
6.1.1: Performance Expectations **6.1.2: Estimated Performance Requirements**	**3** **5** 3 5	**8.7: Assess Comparative Safety**
System performance details provide background in addition to (and potentially revisions made after) the OSED.		
6.1.1: Performance Expectations **6.1.2: Estimated Performance Requirements**	**5** 5	**8.8: Formalize Scopes of Operations**
Performance estimates provide input to scoping of operations.		
6.1.1: Performance Expectations **6.1.2: Estimated Performance Requirements** **6.1.3: Performance Data Collection Requirements**	2 **3** 2 3	**10.1: Plan Joint Evaluations**
Provides guidance for conduct of activity. Data collection requirements for simulation and flight evaluation.		
6.1.2: Estimated Performance Requirements	**5** 5	**1.8: Develop Requirements Document**
Estimated performance requirements are used as input to the development of requirements.		
6.1.2: Estimated Performance Requirements	**5** 5	**6.3: Develop Ground System Specs**
Estimated performance requirements used as guidance in development of ground system specs.		

6.1.2: Estimated Performance Requirements	2 **3** 5	**9.1: Develop Avionics**
	2 3 5	**11.2: Plan and Apply for Avionics Cert.**
Performance estimates provide basis for development of avionics for joint evaluation if formal avionics standards are not available. Performance estimates provide (a portion of) the basis for avionics certification, if formal avionics standards are not available.		
6.1.2: Estimated Performance Requirements	2 **3**	**9.2: Develop Ground Systems for Eval.**
	2 3	
Estimated performance requirements used as guidance in development of ground system specs.		

Overview of Activity **6.2: Define Performance Standards**

Description: Define and validate performance standards. In coordination with RTCA, this provides the standards needed for certification. Data should be collected throughout simulations and OpEvals and used to validate standards. MASPS, which address overall end-to-end system standards, and MOPS, which address avionics standards, will be developed and/or potentially revised based on the validation of these standards.

Plan and Perform: SC-186 POC = SC-186 Co-chairs

Approve or Accept: SC-186 POC = SC-186 Co-chairs

Products:

6.2.1: Revised ADS-B MASPS: MASPS provide the minimum aviation system performance standards upon which subsequent end-to-end system designs and operational applications are based. ADS-B MASPS provides a view of the system-wide operational use of ADS-B, but does not describe a specific technical implementation or design architecture to support the applications. The revised MASPS is developed based on initial MASPS developed prior to the application development process, and on the collective results of (multiple) application simulations and OpEvals in the form of performance estimates. The revised MASPS also provides the guiding material for the (concurrent) generation of related MOPS.

6.2.2: Avionics MOPS: MOPS provide the minimum operational performance standards upon which operational avionics and certification requirements are based. MOPS are developed based on MASPS and other available data in the form of (in this case) performance estimates. MOPS that will be impacted by the development and evaluation of this application (in concert with all other applications) include 1090 MHz ADS-B, VDL Mode 4 ADS-B, UAT ADS-B, CDTI, and ASSAP (TIS-B MOPS will not be impacted by this application, but will be by many of the other applications).

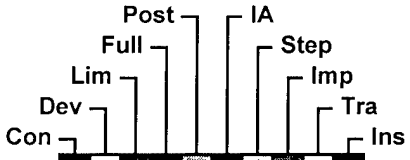
Issues:

- Methods for adopting and/or using SARPS and (externally developed) avionics standards to support the establishment of (RTCA-approved) standards needs to be identified

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)					50	50				
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.3: Develop Detailed Systems Concepts	5	**1.3.1: Detailed Systems Concepts**
6.1: Estimate Performance	**5**	**6.1.1: Performance Expectations**
8.7: Assess Comparative Safety		**8.7.1: Comparative Safety Analysis**
8.8: Formalize Scopes of Operations		**8.8.1: AC on ADS-B/CDTI Capability Levels and Lims**

Systems concepts support standards development. Provides estimates of required performance to support validation and/or revision of standards. CSA provides guidance in development of standards. AC provides input to development of requirements and standards.

6.1: Estimate Performance	5	**6.1.2: Estimated Performance Requirements**
	5	

Provides estimates of required performance to support validation and/or revision of standards.

Interact with Activity:		
5.4: Define Cockpit Interface Stds	6	
11.1: Obtain Spectrum	**6**	

Cockpit interface standards definition provide insight into the definition of avionics performance standards, and vice versa. Definition of avionics performance standards and the allocation/assignment of spectrum for implementation are performed jointly.

Output via Product:		Output to Activity:
6.2.1: Revised ADS-B MASPS	**6**	**9.1: Develop Avionics**
6.2.2: Avionics MOPS	6	**11.2: Plan and Apply for Avionics Cert.**

Standards provide baseline upon which final avionics designs are developed - use if available, otherwise use preliminary designs. Standards provide (portion of) basis for avionics certification.

Overview of Activity **6.3: Develop Ground System Specs**

Description: Translate requirements in the Requirements Document into a System Specification and Interface Documents that govern development by the prime system / software contractor.

Plan and Perform: Product Team POC = PT Lead

Approve or Accept: CCB, With Spec Review Board POC = TBD

Products:

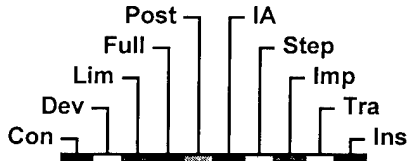
6.3.1: Ground System Design Specification: This document translates requirements in the Requirements Document into a specification that governs ground system development by the prime system/software contractor.

6.3.2: Interface Documents: Interface Requirements Documents (IRDs) and Interface Control Documents (ICDs) define each interface of the system or equipment with other NAS systems, equipment, or facilities.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)							12			
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.8: Develop Requirements Document	6 / 6	**1.8.2: Final Requirements Document**
The FRD is used to establish baseline requirements.		
3.8: Decision - Initial Investment	7 / 7	**3.8.1: Initial Investment Decision**
The Initial Investment Decision initiates the development of program plans.		
6.1: Estimate Performance	5 / 5	**6.1.2: Estimated Performance Requirements**
Estimated performance requirements used as guidance in development of ground system specs.		

Interact with Activity:	
0.6: Develop Acquisition Program Plans	7 / 7
Development of ground system spec and interface documents may impact acquisition plans, and vice versa.	

Output via Product:		Output to Activity:
6.3.1: Ground System Design Specification **6.3.2: Interface Documents**	7 / 7	**0.7: Prepare Acquisition Contract** **3.10: Decision - Sel. Vendor & Award Contract** **3.11: Decision - Final Investment** **12.11: Develop Maintenance Procedures** **12.12: Develop/Perform Maint. Training**
Required for development of contract. Forms part of criteria for vendor selection. Progam planning documents used as guidance in making final investment decision. Ground system spec provides technical baseline upon which maintenance procedures are based. Ground system specs provide input to development of maintenance training.		
6.3.1: Ground System Design Specification **6.3.2: Interface Documents**	7 / 7	**8.9: Plan Safety for Implementation** **8.10: Analyze Hazards of Sub-Systems** **8.11: Analyze Hazards Over-All** **8.12: Analyze Hazards of Ops & Support** **8.13: Assess Health Hazards**
Ground system spec forms (part of) technical baseline for implementation safety activities.		
6.3.1: Ground System Design Specification **6.3.2: Interface Documents**	7 / 7 7	**9.3: Manufacture Gnd Systems for Impl.**
Ground system specs provide technical requirements for vendor.		

Overview of Activity

7.1: Analyze Interoperability

Description: Assess interoperability based on high-level concepts and anticipated capabilities of proposed systems, and develop estimated baseline interoperability requirements for evaluation.

Plan and Perform: Various POC = TBD

Approve or Accept: Various POC = TBD

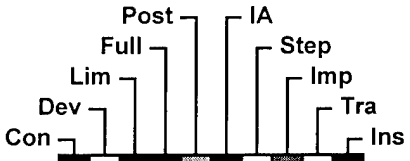
Products:

7.1.1: Interoperability Assessment: This report provides a preliminary assessment of interoperability based on high-level concepts and the anticipated capabilities of proposed systems, and baselines estimated interoperability requirements for subsequent evaluations.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	16									
LoE (sm)										

Dependencies and Phases:



Input from Activity: | **Input via Product:**

1.1: Define High-Level Concept	**1.1.1: High-Level Concept**

High-level concept provides guidance for conducting activity.

Interact with Activity:

6.1: Estimate Performance

Revisions to performance estimates provide insight into analysis of interoperability, and vice versa.

Output via Product: | **Output to Activity:**

7.1.1: Interoperability Assessment	**7.2: Define Ground System Interop.** **8.2: Summarize Op. Services and Env't** **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs**

Provides inputs to support definition of ground system interoperability. Provides identification and anticipated functionality and performance of system-system interfaces.

7.1.1: Interoperability Assessment	**7.3: Validate Interoperability** **9.1: Develop Avionics** **9.2: Develop Ground Systems for Eval.** **10.1: Plan Joint Evaluations**

Provides inputs to support validation of interoperability performance. Provides guidance in the development of systems for joint evaluations. Helps identify data collection needs.

Overview of Activity **7.2: Define Ground System Interop.**

Description: Identify required system-system interfaces to support the anticipated ground infrastructure required for the application. These interfaces will be evaluated and validated in later phases of application development.

Plan and Perform: OCG POC = OCG Co-chairs

Approve or Accept: OCG POC = OCG Co-chairs

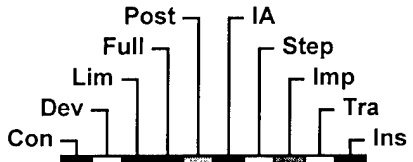
Products:

7.2.1: Estimated Interface Reqs: Provides estimated interface requirements to support the application in support of evaluations.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	8									
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
1.1: Define High-Level Concept	1.1.1: High-Level Concept
6.1: Estimate Performance	6.1.1: Performance Expectations
7.1: Analyze Interoperability	6.1.2: Estimated Performance Requirements
	7.1.1: Interoperability Assessment

High-level concept provides guidance for conducting activity. Performance estimates used as guidance in assessment of ground system interoperability. Provides inputs to support definition of ground system interoperability.

Interact with Activity:
4.2: Specify Procedures
8.2: Summarize Op. Services and Env't
8.3: Perform Safety Analyses
8.4: Allocate Safety Objs & Reqs

Development of draft procedures may impact ground system interoperability requirements, and vice versa. Safety analyses will impact definition of ground system interoperability and vice versa.

Output via Product:	Output to Activity:
7.2.1: Estimated Interface Reqs	6.1: Estimate Performance

Interoperability assessments provide inputs to refinement of performance estimates.

7.2.1: Estimated Interface Reqs	7.3: Validate Interoperability
	9.2: Develop Ground Systems for Eval.
	10.1: Plan Joint Evaluations

Estimated interface requirements used as input to validation of interoperability. Estimated interface requirements used as guidance in development of ground systems for evaluation. Estimated interface requirements provide inputs into joint evaluation planning.

Overview of Activity

7.3: Validate Interoperability

Description: Based on the previous assessment of interoperability and the results of other simulations and performance estimates, validate the interoperability performance of systems supporting the application.

Plan and Perform: OCG POC = OCG Co-chairs

Approve or Accept: OCG POC = OCG Co-chairs

Products:

7.3.1: Interoperability Validation Report: This report provides the results of the interoperability validation activity, and identifies modifications to estimated system requirements, if necessary, to support future implementation.

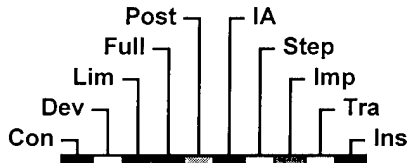
Issues:

- Methods for adopting and/or using SARPS and (externally developed) avionics standards to support the establishment of (RTCA-approved) standards need to be identified

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			12	12						
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
6.1: Estimate Performance	2 3 2 3	**6.1.1: Performance Expectations** **6.1.2: Estimated Performance Requirements**
Provides inputs to support validation of interoperability performance.		
7.1: Analyze Interoperability **7.2: Define Ground System Interop.**	1 1 1	**7.1.1: Interoperability Assessment** **7.2.1: Estimated Interface Reqs**
Provides inputs to support validation of interoperability performance. Estimated interface requirements used as input to validation of interoperability.		

Interact with Activity:	
5.3: Design Cockpit Interface **5.6: Design Controller Interface** **10.1: Plan Joint Evaluations** **10.2: Simulate Mission** **10.3: Conduct Joint Evaluation**	3 4 3 4
Interoperability validations during joint evaluations provide insight into interface design evaluations, and vice versa. Interoperability validation activities occur in conjunction with evaluations.	

Output via Product:		Output to Activity:
7.3.1: Interoperability Validation Report	3 4 3 4	**1.3: Develop Detailed Systems Concepts** **6.1: Estimate Performance**
Assessments of interoperability provide input to the revisions of detailed systems concepts. Interoperability assessments provide inputs to refinement of performance estimates.		
7.3.1: Interoperability Validation Report	3 3	**8.2: Summarize Op. Services and Env't** **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs** **9.2: Develop Ground Systems for Eval.** **10.1: Plan Joint Evaluations**
Provides input to safety assessment activities. Provides guidance in systems development for evaluation. Helps identify data collection needs.		
7.3.1: Interoperability Validation Report	3 4 3 4	**9.1: Develop Avionics**
Provides guidance in avionics development for evaluation & for Implementation.		

Overview of Activity **8.1: Plan Coord. Safety Activities**

Description: In coordination with FAA regulatory authorities and other FAA and non-FAA stakeholders, plan safety analyses to guide application development , and to guide implementation decisions for near-term capability. Detail the mechanisms and responsibilities for tracking safety hazards, and plan for safety representation in program risk-management activities. Anticipate and document what further safety analyses, approvals, and certifications will be required to authorize subsequent steps in the evolution of the capability. (Conducted in the concept phase with subsequent updates as needed.)

Plan and Perform: TBD POC = TBD

Approve or Accept: TBD POC = TBD

Products:

8.1.1: Coordinated Safety Analysis Plan: Plan the safety analyses needed for near-term capability. (This should be coordinated with the FAA/SEC, and for capabilities requiring FAA acquisition, must be approved by the SEC for FAA decision-making.)

8.1.2: Demarcations in Safety Analyses, Cert., and Approval: As operational capability evolves, successive increments of capability will change in operational scope (including weather condition, distances, geometries, airspace, or ATC surveillance) and are likely to require changes to procedures and training and to the functionality, performance, human interface, and certification-level of avionics and ground systems. This product describes the range of operational scopes supported by each near-term activity, and proposes demarcations between anticipated future levels of operational capability that will require separate (or additional) analysis or validation. (This product is developed collectively for multiple applications, and addresses boundaries both within and between them.)

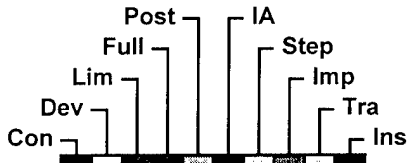
Issues:

- Validate or revise the safety activities from this checklist and specialize them to create a detailed plan for the safety analyses of near-term application capabilities; specify details of what is to be done, by whom, when, why, and how
- Evaluate proposed evolutions of capability and identify additional analyses, approvals, and certification needed to support successive levels of capability; coordinate with stakeholders on specific safety requirements for alternative evolution strategies
- Evolution plans may not be sufficiently defined for timely assessment of safety constraints

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	8									
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.1: Define High-Level Concept	1	1.1.1: High-Level Concept
1.6: Develop Research Evaluation Plan	1	1.6.1: Research Evaluation Plan

High-level concept provides guidance for conducting activity. The REP identifies issues that need to be addressed.

Interact with Activity:	
0.1: Develop and Revise SF21 MP	1
0.2: Develop and Revise Checklist	1
0.3: Manage Issues and Risks	
0.4: Administer SF21 Program	
4.1: Plan Procedure Development	
5.1: Plan Human Factors Activities	

Provides insight into refinement of interacting activity products and vice versa. May identify changes needed (and vice versa). Improved understanding of HF issues will clarify the areas to focus on in safety analyses - previewing safety issues in drafting the HF plan will influence the strategy for analysis and development.

Output via Product:		Output to Activity:
8.1.1: Coordinated Safety Analysis Plan	1 1 1 1 1	8.2: Summarize Op. Services and Env't 8.3: Perform Safety Analyses 8.4: Allocate Safety Objs & Reqs

Coordinated Safety Activities Plan will guide safety analyses.

8.1.1: Coordinated Safety Analysis Plan	1 1 1 1 1 1	8.5: Track Safety Issues During Dev't

Plans the process for safety activities, including coordination on issues.

8.1.1: Coordinated Safety Analysis Plan	1 1 1	8.6: Ensure Safety of Testing

Coordinated Safety Activities Plan will guide safety analyses.

8.1.1: Coordinated Safety Analysis Plan	1 1 1	8.7: Assess Comparative Safety

Coordinated Safety Activities Plan will guide safety analyses.

8.1.1: Coordinated Safety Analysis Plan 8.1.2: Demarcations in Safety Analyses, Cert., and Approval	1 1	8.8: Formalize Scopes of Operations

Coordinated Safety Activities Plan will guide safety analyses. The demarcations between applications for safety analysis, certification, and approval will be validated and published as an AC by AFS in consultation with AIR.

8.1.1: Coordinated Safety Analysis Plan	1 1	8.9: Plan Safety for Implementation

Coordinated Safety Activities Plan will guide safety analyses.

Overview of Activity **8.2: Summarize Op. Services and Env't**

Description: Insure that systems, operations, and environment for near-term applications capability are adequately defined. Draw on or reference ops-concepts, draft procedures, system definitions, and performance information to summarize anticipated application parameters that are relevant to safety so they can be used in analyses to guide further development of the application. This activity is iterative, using available documentation while working with on-going efforts defining operations, procedures, systems, interfaces, and performance expectations.

(See RTCA DO-264 and the FAA System Safety Management Plan and System Safety Handbook).

This activity is conducted in the Concept phase with revisions in the Development, Limited, and OpEval phases.

Plan and Perform: TBD POC = TBD

Approve or Accept: TBD POC = TBD

Products:

8.2.1: Operational Services and Env't Definition: This should include type of airspace, equipage levels, weather limitations, distances and geometries, user-interface functionality, workload considerations, user training, secondary systems, procedural confirmations, fallback procedures, and system characteristics.

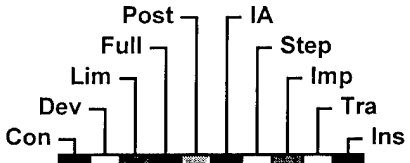
Issues:

- Summarize airspace users operational objectives, ATS providers intentions, and intended operational capabilities
- Summarize the air traffic services provided by the CNS/ATM system
- Summarize system functional characteristics, performance expectations, and technologies
- Identify dependencies on aircraft equipage or ATS provider technical system automation, including ATS, procedural requirements, operational scenarios, and human factors requirements
- The operational environment for which the services are intended include separation minima, route configuration and complexity, type of ATM services, airspace class, traffic characteristics, traffic rates, and aircraft mix
- (Updates) The OSED is updated with information resulting from development, evaluation, and safety analyses (it is not used after formal standards and requirements are defined)

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	4	4	4	4						
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
1.1: Define High-Level Concept **1.6: Develop Research Evaluation Plan** **7.1: Analyze Interoperability**	**1.1.1: High-Level Concept** **1.6.1: Research Evaluation Plan** **7.1.1: Interoperability Assessment**
High-level concept provides guidance for conducting activity. The REP identifies issues that need to be addressed. Provides identification and anticipated functionality and performance of system-system interfaces.	
1.2: Develop Detailed Ops Concepts **1.3: Develop Detailed Systems Concepts**	**1.2.1: Detailed OPS Concepts** **1.3.1: Detailed Systems Concepts**
Provides guidance for conduct of activity. Validates and provides a reference for informal information sharing in previous phase.	
6.1: Estimate Performance	**6.1.1: Performance Expectations** **6.1.2: Estimated Performance Requirements**
Provide inputs to safety analyses.	
7.3: Validate Interoperability	**7.3.1: Interoperability Validation Report**
Provides input to safety assessment activities.	
8.1: Plan Coord. Safety Activities	**8.1.1: Coordinated Safety Analysis Plan**
Coordinated Safety Activities Plan will guide safety analyses.	

Interact with Activity:
4.2: Specify Procedures **5.2: Analyze Cockpit Tasks** **5.3: Design Cockpit Interface** **5.5: Analyze Controller Tasks** **5.6: Design Controller Interface** **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs** **8.5: Track Safety Issues During Dev't**
Safety considerations influence the specification and development of procedures and vice versa. Safety considerations influence task analyses and vice versa. Initially and as they are updated, the OSED provides information to safety analysis and ASOR, analyses of hazards identifies gaps in the OSED and guides ASOR, and ASOR specifies and allocates needs identified in safety analysis to elements of the capability described in the OSED. Issues arising from or resolved by analysis are communicated with other development and evaluation activities.
7.2: Define Ground System Interop.
Safety analyses will impact definition of ground system interoperability and vice versa.
8.6: Ensure Safety of Testing **10.1: Plan Joint Evaluations**
Safety considerations influence testing and vice versa. Safety analyses will impact planning for evaluations.

Output via Product:		Output to Activity:
8.2.1: Operational Services and Env't Definition	2 **3** **4** 2 3 4	**1.2: Develop Detailed Ops Concepts** **1.3: Develop Detailed Systems Concepts** **6.1: Estimate Performance**
Safety considerations and the need for safety-relevant specifics will influence the specification of the applications concept, both for systems and operations.		
8.2.1: Operational Services and Env't Definition	**4** 4	**1.8: Develop Requirements Document**
Results of activities aid in the development of requirements documents.		
8.2.1: Operational Services and Env't Definition	**3** **4** 3 4	**8.7: Assess Comparative Safety**
The OSED defines the (new) alternative and its context for comparison to current operations and systems.		
8.2.1: Operational Services and Env't Definition	**4** 4	**8.8: Formalize Scopes of Operations**
Results of activities aid in the development of operational scopes.		
8.2.1: Operational Services and Env't Definition	**4** 4	**8.9: Plan Safety for Implementation** **8.10: Analyze Hazards of Sub-Systems** **8.11: Analyze Hazards Over-All** **8.12: Analyze Hazards of Ops & Support** **8.13: Assess Health Hazards**
Reports used as input to implementation safety activities.		
8.2.1: Operational Services and Env't Definition	2 **3** **4** 2 3 4	**11.2: Plan and Apply for Avionics Cert.** **11.3: Estab. Avionics Cert. Project** **12.2: Request Operational Approval (Ph. 2)** **12.3: Review Application Package (Ph. 3)**
Safety analyses provide a starting point for the certification process (and provides background for the cert. project). Safety analyses provide inputs to the approval process.		

Overview of Activity **8.3: Perform Safety Analyses**

Description: Based on the evolving OSED, iteratively analyze safety implications of the capability. Provide qualitative and quantitative guidance that will enable safety objectives and requirements to be defined, refined, and allocated. With each iteration, use the increased specificity in the OSED to conduct more detailed and quantitative analysis. The initial iteration will be an Operational Hazard Assessment (OHA) in the concept/development phase. Begin with functional analysis of the application to derive a preliminary hazard list. Next, identify contributing hazards, initiators, and other causes. Baseline any controls for these that are in the current OSED, and list potential outcomes, harms, and hazard effects. Determine the worst credible severity of consequences for each hazard in consideration of the baselined controls, and from this, propose target levels of safety for important hazards. If needed, propose new restrictions on the environment of operation.

Iterations in the limited- and full-evaluation phases will be Preliminary Hazard Analyses (PHA), or if sufficient information exists, Subsystem and System Hazard Analyses (SSHA and SHA) that extend the OHA. Update the hazard list and analyze hazard severity using new specifics and controls. Analyze the probability of severe consequence including the new control baseline, and code and rank the resulting risks for use in hazard tracking and program risk management.

(See FAA Safety Handbook chapters 8&9, and FAA SSMP sections 5.3.4, 6, &7.)

Plan and Perform: TBD POC = TBD

Approve or Accept: TBD POC = TBD

Products:

8.3.1: Operational Hazard Assessment:

8.3.2: Hazard Analysis (PHA or SSHA/SHA):

Issues:

- Perform or update (or if available, validate) functional analysis of the capability as described the OSED
- List or update Operational Hazards; identify or update contributory hazards, initiators, and other causes; establish or update a hazard control baseline based on the OSED
- Identify or update relationships between system failures, procedural errors, and combinations of these that contribute to hazards; identify or update the effect of controls on these relationships
- Assess or analyze and update the severity of potential outcomes, effects, or harm considering baselined controls (prior to full evaluation and CHA: if a control is believed likely to be reconsidered (in ASOR or in subsequent development or evaluation), determine severities with and without the control in order to guide potential trade-offs)
- In limited or full evaluation phases, analyze the probability of severe hazards and assign risk codes
- Rank hazards (by risk if known); propose target levels of safety for identified hazards, and if needed, recommend additional limits on the environment of operation
- Provide to ASOR and risk management: controls baseline, hazard ranking (risk ranking with risk codes if available), recommended target levels of safety, and recommended additional limits on environment

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	4	4	4	4						
LoE (sm)										

Dependencies and Phases:

Input from Activity:		Input via Product:
1.1: Define High-Level Concept **1.6: Develop Research Evaluation Plan** **7.1: Analyze Interoperability**	1 1	**1.1.1: High-Level Concept** **1.6.1: Research Evaluation Plan** **7.1.1: Interoperability Assessment**
High-level concept provides guidance for conducting activity. The REP identifies issues that need to be addressed. Provides identification and anticipated functionality and performance of system-system interfaces.		
1.2: Develop Detailed Ops Concepts **1.3: Develop Detailed Systems Concepts**	2 3 2 3	**1.2.1: Detailed OPS Concepts** **1.3.1: Detailed Systems Concepts**
Provides guidance for conduct of activity.		
6.1: Estimate Performance	1 2 3 1 2 3	**6.1.1: Performance Expectations** **6.1.2: Estimated Performance Requirements**
Provide inputs to safety analyses.		
7.3: Validate Interoperability	3 3	**7.3.1: Interoperability Validation Report**
Provides input to safety assessment activities.		
8.1: Plan Coord. Safety Activities	1 1 1 1 1	**8.1.1: Coordinated Safety Analysis Plan**
Coordinated Safety Activities Plan will guide safety analyses.		

Interact with Activity:	
4.2: Specify Procedures **5.2: Analyze Cockpit Tasks** **5.3: Design Cockpit Interface** **5.5: Analyze Controller Tasks** **5.6: Design Controller Interface** **8.2: Summarize Op. Services and Env't** **8.4: Allocate Safety Objs & Reqs** **8.5: Track Safety Issues During Dev't**	1 2 3 4 1 2 3 4
Safety considerations influence the specification and development of procedures and vice versa. Safety considerations influence task analyses and vice versa. Initially and as they are updated, the OSED provides information to safety analysis and ASOR, analyses of hazards identifies gaps in the OSED and guides ASOR, and ASOR specifies and allocates needs identified in safety analysis to elements of the capability described in the OSED. Issues arising from or resolved by analysis are communicated with other development and evaluation activities.	
7.2: Define Ground System Interop.	1 1
Safety analyses will impact definition of ground system interoperability and vice versa.	
8.6: Ensure Safety of Testing **10.1: Plan Joint Evaluations**	3 4 3 4
Safety considerations influence testing and vice versa. Safety analyses will impact planning for evaluations.	

Output via Product:	Output to Activity:
8.3.1: Operational Hazard Assessment **8.3.2: Hazard Analysis (PHA or SSHA/SHA)**	**1.2: Develop Detailed Ops Concepts** **1.3: Develop Detailed Systems Concepts** **6.1: Estimate Performance**
Safety considerations and the need for safety-relevant specifics will influence the specification of the applications concept, both for systems and operations.	
8.3.1: Operational Hazard Assessment **8.3.2: Hazard Analysis (PHA or SSHA/SHA)**	**1.8: Develop Requirements Document**
Results of activities aid in the development of requirements documents.	
8.3.1: Operational Hazard Assessment **8.3.2: Hazard Analysis (PHA or SSHA/SHA)**	**8.7: Assess Comparative Safety**
The OSED, safety analyses, and ASOR from the R&D phases provide data and analysis on the new capability to start comparative safety analyses that support commitment decisions.	
8.3.1: Operational Hazard Assessment **8.3.2: Hazard Analysis (PHA or SSHA/SHA)**	**8.8: Formalize Scopes of Operations**
Results of activities aid in the development of operational scopes.	
8.3.1: Operational Hazard Assessment **8.3.2: Hazard Analysis (PHA or SSHA/SHA)**	**8.9: Plan Safety for Implementation** **8.10: Analyze Hazards of Sub-Systems** **8.11: Analyze Hazards Over-All** **8.12: Analyze Hazards of Ops & Support** **8.13: Assess Health Hazards**
Reports used as input to implementation safety activities.	
8.3.1: Operational Hazard Assessment **8.3.2: Hazard Analysis (PHA or SSHA/SHA)**	**11.2: Plan and Apply for Avionics Cert.** **11.3: Estab. Avionics Cert. Project** **12.2: Request Operational Approval (Ph. 2)** **12.3: Review Application Package (Ph. 3)**
Safety analyses provide a starting point for the certification process (and provides background for the cert. project). Safety analyses provide inputs to the approval process.	

Overview of Activity

8.4: Allocate Safety Objs & Reqs

Description: Based on target levels of safety and system/procedure failure relationships, Allocate Safety Objectiives and Requirements (ASOR) to elements of the capability as they are called out in the OSED or derived by functional analysis. Allocation must be negotiated/coordinated with stakeholders and their technical representatives. (See RTCA D)-264.)

Changes to baselined hazard controls will require modification of the OSED and updates to safety analyses, which may feed back via revised target levels of safety or new limits on environments for operation. ASOR is performed in the context of techical performance, interoperability, and cost/benefit-based requirements, which must be considered simultaneously, but may be documented or revised in other or subsequent activities.

Plan and Perform: TBD POC = TBD

Approve or Accept: TBD POC = TBD

Products:

8.4.1: ASOR:

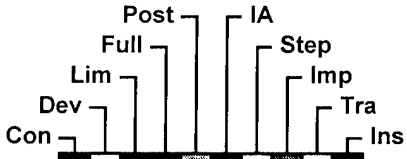
Issues:

- Evaluate target levels of safety and system procedure failure relationships to understand trade-offs in ASOR
- Negotiate and coordinate alternative allocations of requirements with stakeholders
- Coordinate any shared safety objectives and requirements across organizational boundaries
- Identify any unresolved requirements for program risk management
- Provide working specifications and requirements for R&D use until formal standards and specifications are available
- Identify any changes (or potential changes) to the hazard control baseline for incorporation into the OSED and safety analyses

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	4	4	4	4						
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.1: Define High-Level Concept **7.1: Analyze Interoperability**	1 1	**1.1.1: High-Level Concept** **7.1.1: Interoperability Assessment**
High-level concept provides guidance for conducting activity. Provides identification and anticipated functionality and performance of system-system interfaces.		
1.2: Develop Detailed Ops Concepts **1.3: Develop Detailed Systems Concepts**	2 3 2 3	**1.2.1: Detailed OPS Concepts** **1.3.1: Detailed Systems Concepts**
Provides guidance for conduct of activity.		
6.1: Estimate Performance	1 2 3 1 2 3	**6.1.1: Performance Expectations** **6.1.2: Estimated Performance Requirements**
Provide inputs to safety analyses.		
7.3: Validate Interoperability	3 3	**7.3.1: Interoperability Validation Report**
Provides input to safety assessment activities.		
8.1: Plan Coord. Safety Activities	1 1 1 1 1	**8.1.1: Coordinated Safety Analysis Plan**
Coordinated Safety Activities Plan will guide safety analyses.		

Interact with Activity:	
4.2: Specify Procedures **5.2: Analyze Cockpit Tasks** **5.3: Design Cockpit Interface** **5.5: Analyze Controller Tasks** **5.6: Design Controller Interface** **8.2: Summarize Op. Services and Env't** **8.3: Perform Safety Analyses** **8.5: Track Safety Issues During Dev't**	1 2 3 4 1 2 3 4
Safety considerations influence the specification and development of procedures and vice versa. Safety considerations influence task analyses and vice versa. Initially and as they are updated, the OSED provides information to safety analysis and ASOR, analyses of hazards identifies gaps in the OSED and guides ASOR, and ASOR specifies and allocates needs identified in safety analysis to elements of the capability described in the OSED. Issues arising from or resolved by analysis are communicated with other development and evaluation activities.	
7.2: Define Ground System Interop.	1 1
Safety analyses will impact definition of ground system interoperability and vice versa.	
8.6: Ensure Safety of Testing **10.1: Plan Joint Evaluations**	3 4 3 4
Safety considerations influence testing and vice versa. Safety analyses will impact planning for evaluations.	

Output via Product:		Output to Activity:
8.4.1: ASOR	2 3 4 2 3 4	**1.2: Develop Detailed Ops Concepts** **1.3: Develop Detailed Systems Concepts** **6.1: Estimate Performance**
Safety considerations and the need for safety-relevant specifics will influence the specification of the applications concept, both for systems and operations.		
8.4.1: ASOR	4 4	**1.8: Develop Requirements Document**
Results of activities aid in the development of requirements documents.		
8.4.1: ASOR	3 4 3 4	**8.7: Assess Comparative Safety**
Fault-trees will be incorporated into severity analysis for comparisons - allocations will be assumed for comparative analysis.		
8.4.1: ASOR	4 4	**8.8: Formalize Scopes of Operations**
Results of activities aid in the development of operational scopes.		
8.4.1: ASOR	4 4	**8.9: Plan Safety for Implementation** **8.10: Analyze Hazards of Sub-Systems** **8.11: Analyze Hazards Over-All** **8.12: Analyze Hazards of Ops & Support** **8.13: Assess Health Hazards**
Reports used as input to implementation safety activities.		
8.4.1: ASOR	2 3 4 2 3 4	**11.2: Plan and Apply for Avionics Cert.** **11.3: Estab. Avionics Cert. Project** **12.2: Request Operational Approval (Ph. 2)** **12.3: Review Application Package (Ph. 3)**
Safety analyses provide a starting point for the certification process (and provides background for the cert. project). Safety analyses provide inputs to the approval process.		

Overview of Activity **8.5: Track Safety Issues During Dev't**

Description: Participate in program-level risk management activities to insure that safety-relevant concerns are communicated between safety analysts, application developers, program planners, managers, and stakeholders. Insure that safety-relevant issues and resolutions are tracked and documented. Insure that valid safety information is available during coordination for decision-making.

This activity is conducted in All phases.

Plan and Perform: TBD POC = TBD

Approve or Accept: TBD POC = TBD

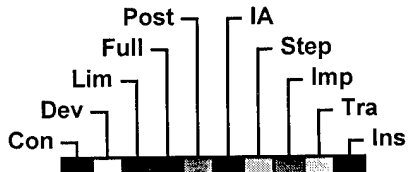
Products:

8.5.1: Safety Issues and Resolutions:

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)	999	999	999	999	24					
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
8.1: Plan Coord. Safety Activities	**8.1.1: Coordinated Safety Analysis Plan**
Plans the process for safety activities, including coordination on issues.	

Interact with Activity:	
0.3: Manage Issues and Risks **8.2: Summarize Op. Services and Env't** **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs**	
May identify changes needed (and vice versa). Issues arising from or resolved by analysis are communicated with other development and evaluation activities.	
8.6: Ensure Safety of Testing **10.1: Plan Joint Evaluations** **11.3: Estab. Avionics Cert. Project** **12.3: Review Application Package (Ph. 3)**	
Issues are coordinated with program management and other activities.	
8.7: Assess Comparative Safety	
Issues arising from or resolved by analyses are communicated with evaluation activities and program management.	
8.8: Formalize Scopes of Operations	
Issues arising from or resolved by analyses are communicated with evaluation activities and program management.	

Output via Product:	Output to Activity:
8.5.1: Safety Issues and Resolutions	**0.5: Coordinate for Decisions**
Provides inputs to FAA decision making.	
8.5.1: Safety Issues and Resolutions	**1.8: Develop Requirements Document**
Results of activities aid in the development of requirements documents.	
8.5.1: Safety Issues and Resolutions	**8.9: Plan Safety for Implementation**
Safety issues used as input to planning safety for implementation.	
8.5.1: Safety Issues and Resolutions	**11.3: Estab. Avionics Cert. Project** **12.3: Review Application Package (Ph. 3)**
Safety issues provide partial basis for certification issues and resolutions document.	

Overview of Activity

8.6: Ensure Safety of Testing

Description: Perform analyses and assessments as appropriate to identify potential safety issues in conducting operational tests. Develop strategies to insure test safety. Coordinate within field-evaluation planning-teams to facilitate resolution of issues and confirm safe practices. Provide status assessments on test safety to evaluation managers and program managers and regulatory authorities as appropriate. Insure that appropriate documentation of safety strategies is available for incorporation in Test and Evaluation Master Plans. Insure that appropriate documentation of safety preparations and of the safe conduct of testing are available for OpEval Final Reports.

This activity is conducted in the Limited and Full Evaluation Phases

Plan and Perform: TBD POC = TBD

Approve or Accept: TBD POC = TBD

Products:

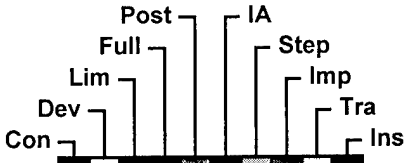
8.6.1: Test Safety Strategy:

8.6.2: Test Safety Review:

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			4	4						
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
4.2: Specify Procedures	2 3	4.2.1: Procedures Specification
5.2: Analyze Cockpit Tasks	2 3	5.2.1: Cockpit Task Analysis Report
5.5: Analyze Controller Tasks		5.5.1: Controller Task Analysis Report
Provides information on expectations, requirements, operational sensitivities & mitigations.		
8.1: Plan Coord. Safety Activities	1 1 1	8.1.1: Coordinated Safety Analysis Plan
Coordinated Safety Activities Plan will guide safety analyses.		

Interact with Activity:	
0.3: Manage Issues and Risks	3 4
4.5: Train for Procedures	3 4
8.2: Summarize Op. Services and Env't	
8.3: Perform Safety Analyses	
8.4: Allocate Safety Objs & Reqs	
8.5: Track Safety Issues During Dev't	
9.2: Develop Ground Systems for Eval.	
10.1: Plan Joint Evaluations	
Incorporates safety and other issues into safety strategy for testing. Safety strategies identified at the time that training materials are developed will be included in the materials (further safety strategies will be incorporated into participants training and preparation as they are defined.) Safety considerations influence testing and vice versa. Issues are coordinated with program management and other activities. Test safety will impact development of ground systems for evaluation and vice versa. Safety analyses will impact planning for evaluations.	

Output via Product:		Output to Activity:
8.6.1: Test Safety Strategy	3 4 3 4	10.3: Conduct Joint Evaluation
Test safety strategy used as guidance in conduct of joint evaluations.		
8.6.2: Test Safety Review	3 4 3 4	0.5: Coordinate for Decisions
Provides inputs to FAA decision making.		

Overview of Activity **8.7: Assess Comparative Safety**

Description: A Comparative Safety Assessment (CSA) assesses the severity and likelihood of application hazards relative to the severity and likelihood of hazards in baseline systems and operations. Whereas the OSA is structured to guide application development toward target levels of safety, the CSA is structured to validate the relative safety of the application and guide decisions on whether it should be implemented.

(See FAA System Safety Handbook, Chapter 4, Section 4.2 dated 8/2/00).

This activity occurs in the Full Evaluation Phase.

Plan and Perform: TBD POC = TBD

Approve or Accept: TBD POC = TBD

Products:

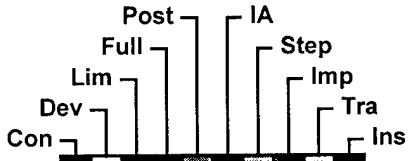
8.7.1: Comparative Safety Analysis: The CSA is a risk assessment that defines both severity and likelihood in terms of the current risk of the system alternatives. A risk assessment provides an estimation of the risk associated with the identified hazards.

8.7.2: Comparative Hazard Probs in Worst Cred. Conds:

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)				12	12					
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.2: Develop Detailed Ops Concepts 1.3: Develop Detailed Systems Concepts 6.1: Estimate Performance	3 5 3 5	1.2.1: Detailed OPS Concepts 1.3.1: Detailed Systems Concepts 6.1.1: Performance Expectations 6.1.2: Estimated Performance Requirements
Detailed concepts are required for comparative safety analyses. System performance details provide background in addition to (and potentially revisions made after) the OSED.		
8.1: Plan Coord. Safety Activities	1 1	8.1.1: Coordinated Safety Analysis Plan
Coordinated Safety Activities Plan will guide safety analyses.		
8.2: Summarize Op. Services and Env't 8.3: Perform Safety Analyses 8.4: Allocate Safety Objs & Reqs	3 4 3 4	8.2.1: Operational Services and Env't Definition 8.3.1: Operational Hazard Assessment 8.3.2: Hazard Analysis (PHA or SSHA/SHA) 8.4.1: ASOR
The OSED defines the (new) alternative and its context for comparison to current operations and systems. The OSED, safety analyses, and ASOR from the R&D phases provide data and analysis on the new capability to start comparative safety analyses that support commitment decisions. Fault-trees will be incorporated into severity analysis for comparisons - allocations will be assumed for comparative analysis.		

Interact with Activity:	
8.5: Track Safety Issues During Dev't	4 5 4 5
Issues arising from or resolved by analyses are communicated with evaluation activities and program management.	

Output via Product:		Output to Activity:
8.7.1: Comparative Safety Analysis	5 5	0.5: Coordinate for Decisions
Provide guidance to FAA lines of business (including regulatory authorities) on relative safety, and on residual issues that should be monitored to ensure safety benefits.		
8.7.1: Comparative Safety Analysis	5 5	1.8: Develop Requirements Document 5.4: Define Cockpit Interface Stds 6.2: Define Performance Standards
CSA results are used as inputs to the development of requirements documents. CSA provides guidance in development of standards.		
8.7.1: Comparative Safety Analysis 8.7.2: Comparative Hazard Probs in Worst Cred. Conds	5 5	8.9: Plan Safety for Implementation 8.10: Analyze Hazards of Sub-Systems 8.11: Analyze Hazards Over-All 8.12: Analyze Hazards of Ops & Support 8.13: Assess Health Hazards
CSA results used as input to implementation safety activities.		

8.7.1: Comparative Safety Analysis **8.7.2: Comparative Hazard Probs in Worst Cred. Conds**	4 5 4 5	**11.2: Plan and Apply for Avionics Cert.** **11.3: Estab. Avionics Cert. Project** **12.2: Request Operational Approval (Ph. 2)** **12.3: Review Application Package (Ph. 3)**
CSA provides partial basis for certification until standards become available and provides background to justify and plan certification. An input to certification plan. Provides partial basis for operational approval and for evaluating applications for approval.		

Overview of Activity **8.8: Formalize Scopes of Operations**

Description: As operational capability evolves, successive increments of capability will include changes in the operational scope of applications (including weather condition, distances, geometries, airspace, or ATC surveillance) and are likely to require changes to procedures and training and to the functionality, performance, human interface, and certification-level of avionics and ground systems. This activity formalizes the agreed upon range of operational scopes supported near-term applications and the demarcations between these and future levels of operational capability that will require separate (or additional) analysis, validation, and regulatory approvals such as certification.

This activity is conducted in the Post Evaluation phase.

Plan and Perform: TBD POC = TBD

Approve or Accept: TBD POC = TBD

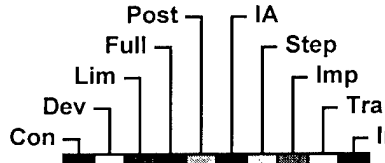
Products:

8.8.1: AC on ADS-B/CDTI Capability Levels and Lims: This advisory circular (AC) will define anticipated boundaries between applications (or between levels of capability within applications) beyond which additional safety analyses will be required, additional procedures and approvals will be required, or higher levels of certification will be required. (This product is developed collectively for multiple applications.)

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)					24					
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
1.2: Develop Detailed Ops Concepts 1.3: Develop Detailed Systems Concepts 6.1: Estimate Performance	1.2.1: Detailed OPS Concepts 1.3.1: Detailed Systems Concepts 6.1.1: Performance Expectations 6.1.2: Estimated Performance Requirements
Revised ops concepts support formalization of scopes of operation. Systems concept used to support safety analyses. Performance estimates provide input to scoping of operations.	
8.1: Plan Coord. Safety Activities	8.1.1: Coordinated Safety Analysis Plan 8.1.2: Demarcations in Safety Analyses, Cert., and Approval
Coordinated Safety Activities Plan will guide safety analyses. The demarcations between applications for safety analysis, certification, and approval will be validated and published as an AC by AFS in consultation with AIR.	
8.2: Summarize Op. Services and Env't 8.3: Perform Safety Analyses 8.4: Allocate Safety Objs & Reqs	8.2.1: Operational Services and Env't Definition 8.3.1: Operational Hazard Assessment 8.3.2: Hazard Analysis (PHA or SSHA/SHA) 8.4.1: ASOR
Results of activities aid in the development of operational scopes.	

Interact with Activity:	
8.5: Track Safety Issues During Dev't	
Issues arising from or resolved by analyses are communicated with evaluation activities and program management.	

Output via Product:	Output to Activity:
8.8.1: AC on ADS-B/CDTI Capability Levels and Lims	1.8: Develop Requirements Document 5.4: Define Cockpit Interface Stds 6.2: Define Performance Standards
AC provides input to development of requirements and standards.	
8.8.1: AC on ADS-B/CDTI Capability Levels and Lims	8.9: Plan Safety for Implementation
AC provides input to development of implementation safety program plans.	
8.8.1: AC on ADS-B/CDTI Capability Levels and Lims	11.2: Plan and Apply for Avionics Cert. 11.3: Estab. Avionics Cert. Project 12.2: Request Operational Approval (Ph. 2) 12.3: Review Application Package (Ph. 3)
AC provides useful input for the manufacturer's use in preparing the certification application. Guidance to applicants and ACOs/FSDOs on scopes and limitations expected to be associated with the same or additional regulatory approvals.	

Overview of Activity

8.9: Plan Safety for Implementation

Description: Develop a System Safety Program Plan (SSPP) to ensure that safety is designed into the systems, subsystems, equipment, facilities, and their interfaces and operation. A SSPP provides a contractually binding understanding between the FAA and a contractor on how the contractor intends to meet specified system safety requirements. When there are projects or systems that have multiple subcontractors, an Integrated System Safety Program plan (ISSPP) should be developed. These plans should describe in detail the contractor's safety organization, schedule, procedures, and plans for fulfilling the contractual system safety obligations. The SSPP is a management vehicle for both the FAA and the contractor. The FAA uses the SSPP approval cycle to ensure that proper management attention, sufficient technical assets, correct analysis and hazard control methodology, and tasks are planned in a correct and timely manner. Once approved, the FAA uses the SSPP to track contractor System Safety Program (SSP) progress. The SSPP is of value to the contractor as a planning and management tool that establishes "before the fact" an agreement with the FAA on how the SSP will be executed and in what depth.

Plan and Perform: Product Team POC = PT Lead

Approve or Accept: SEC POC = TBD

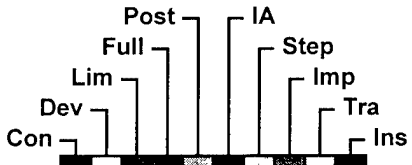
Products:

8.9.1: System Safety Program Plan (SSPP): An approved System Safety Program Plan (SSPP) is a contractually binding understanding between the FAA and a contractor on how the contractor intends to meet the specified system safety requirements. This plan should describe in detail the contractor's safety organization, schedule, procedures, and plans for fulfilling the contractual system safety obligations.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)								8		
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
6.3: Develop Ground System Specs	6.3.1: Ground System Design Specification 6.3.2: Interface Documents
Ground system spec forms (part of) technical baseline for implementation safety activities.	
8.1: Plan Coord. Safety Activities	8.1.1: Coordinated Safety Analysis Plan
Coordinated Safety Activities Plan will guide safety analyses.	
8.2: Summarize Op. Services and Env't 8.3: Perform Safety Analyses 8.4: Allocate Safety Objs & Reqs	8.2.1: Operational Services and Env't Definition 8.3.1: Operational Hazard Assessment 8.3.2: Hazard Analysis (PHA or SSHA/SHA) 8.4.1: ASOR
Reports used as input to implementation safety activities.	
8.5: Track Safety Issues During Dev't 8.7: Assess Comparative Safety 8.8: Formalize Scopes of Operations	8.5.1: Safety Issues and Resolutions 8.7.1: Comparative Safety Analysis 8.7.2: Comparative Hazard Probs in Worst Cred. Conds 8.8.1: AC on ADS-B/CDTI Capability Levels and Lims
Safety issues used as input to planning safety for implementation. CSA results used as input to implementation safety activities. AC provides input to development of implementation safety program plans.	

Interact with Activity:	
9.3: Manufacture Gnd Systems for Impl.	
Implementation safety activities will impact manufacturing of ground systems and vice versa.	

Output via Product:	Output to Activity:
8.9.1: System Safety Program Plan (SSPP)	8.10: Analyze Hazards of Sub-Systems 8.11: Analyze Hazards Over-All 8.12: Analyze Hazards of Ops & Support 8.13: Assess Health Hazards
SSPP provides framework for conduct of implementation safety activities.	

Overview of Activity **8.10: Analyze Hazards of Sub-Systems**

Description: Perform a Subsystem Hazard Analysis (SSHA). This analysis examines each subsystem or component and identifies hazards associated with normal or abnormal operations and is intended to determine how operation or failure of components or any other anomaly that adversely affects the overall safety of the system. This analysis should identify existing and recommended actions using the system safety precedence to determine how to eliminate or reduce the risk of identified hazards.

Plan and Perform: Vendor POC = Various

Approve or Accept: Product Team POC = PT Lead

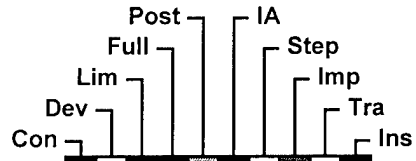
Products:

8.10.1: Subsystem Hazard Analysis (SSHA): This analysis examines each subsystem or component and identifies hazards associated with normal or abnormal operations and is intended to determine how operation or failure of components or any other anomaly that adversely affects the overall safety of the system. This analysis should identify existing and recommended actions using the system safety precedence to determine how to eliminate or reduce the risk of identified hazards.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)								6		
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
6.3: Develop Ground System Specs	7 7	6.3.1: Ground System Design Specification 6.3.2: Interface Documents
Ground system spec forms (part of) technical baseline for implementation safety activities.		
8.2: Summarize Op. Services and Env't 8.3: Perform Safety Analyses 8.4: Allocate Safety Objs & Reqs	4 4	8.2.1: Operational Services and Env't Definition 8.3.1: Operational Hazard Assessment 8.3.2: Hazard Analysis (PHA or SSHA/SHA) 8.4.1: ASOR
Reports used as input to implementation safety activities.		
8.7: Assess Comparative Safety	5 5	8.7.1: Comparative Safety Analysis 8.7.2: Comparative Hazard Probs in Worst Cred. Conds
CSA results used as input to implementation safety activities.		
8.9: Plan Safety for Implementation	8 8	8.9.1: System Safety Program Plan (SSPP)
SSPP provides framework for conduct of implementation safety activities.		

Interact with Activity:	
9.3: Manufacture Gnd Systems for Impl.	8 8
Implementation safety activities will impact manufacturing of ground systems and vice versa.	

Output via Product:		Output to Activity:
8.10.1: Subsystem Hazard Analysis (SSHA)	8 8	8.11: Analyze Hazards Over-All
SSHA used as input to the SHA.		

Overview of Activity **8.11: Analyze Hazards Over-All**

Description: Perform a System Hazard Analysis (SHA). The SHA determines how system operation and hazards can affect the safety of the system and its subsystems. The SSHA serves as input to the SHA. The SHA should begin as the system design matures, at the preliminary design review or the facilities concept design review milestone, and should be updated until the design is complete. Design changes will be evaluated to determine their effects on the safety of the system and its subsystems. This analysis provides recommended actions, applying the system safety precedence, to eliminate or reduce the risk of identified hazards. The techniques used to perform this analysis must be carefully selected to minimize problems in integrating the SHA with other hazard analyses.

Plan and Perform: Vendor POC = Various

Approve or Accept: Product Team POC = PT Lead

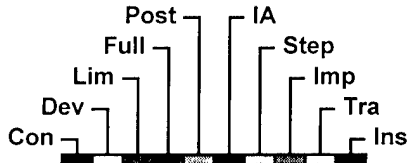
Products:

8.11.1: System Hazard Analysis (SHA): The SHA determines how system operation and hazards can affect the safety of the system and its subsystems. The SSHA, when available, serves as input to the SHA.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)								6		
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
6.3: Develop Ground System Specs	7	6.3.1: Ground System Design Specification 6.3.2: Interface Documents
Ground system spec forms (part of) technical baseline for implementation safety activities.		
8.2: Summarize Op. Services and Env't 8.3: Perform Safety Analyses 8.4: Allocate Safety Objs & Reqs	4	8.2.1: Operational Services and Env't Definition 8.3.1: Operational Hazard Assessment 8.3.2: Hazard Analysis (PHA or SSHA/SHA) 8.4.1: ASOR
Reports used as input to implementation safety activities.		
8.7: Assess Comparative Safety	5	8.7.1: Comparative Safety Analysis 8.7.2: Comparative Hazard Probs in Worst Cred. Conds
CSA results used as input to implementation safety activities.		
8.9: Plan Safety for Implementation 8.10: Analyze Hazards of Sub-Systems	8	8.9.1: System Safety Program Plan (SSPP) 8.10.1: Subsystem Hazard Analysis (SSHA)
SSPP provides framework for conduct of implementation safety activities. SSHA used as input to the SHA.		

Interact with Activity:	
9.3: Manufacture Gnd Systems for Impl.	8
Implementation safety activities will impact manufacturing of ground systems and vice versa.	

Output via Product:		Output to Activity:
8.11.1: System Hazard Analysis (SHA)	8	0.5: Coordinate for Decisions 8.12: Analyze Hazards of Ops & Support 8.13: Assess Health Hazards
Provides inputs to FAA decision making. Reports used as input to implementation safety activities.		

Overview of Activity **8.12: Analyze Hazards of Ops & Support**

Description: Perform an Operating and Support Hazard Analysis (O&SHA) to identify and evaluate the hazards associated with the environment, personnel, procedures, operation, support, and equipment involved throughout the total life cycle of a system/element. The O&SHA will be performed on such activities as testing, installation, modification, maintenance, support, transportation, ground servicing, storage, operations, emergency escape, egress, rescue, post-accident responses, and training.

Plan and Perform: Vendor POC = Various

Approve or Accept: Product Team POC = PT Lead

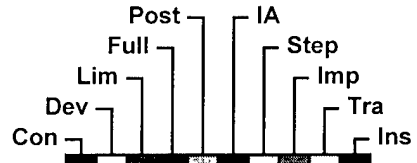
Products:

8.12.1: Operating & Support Hazard Analysis (O&SHA): The O&SHA is performed primarily to identify and evaluate the hazards associated with the environment, personnel, procedures, operation, support, and equipment involved throughout the total life cycle of a system/element.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)								6		
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
6.3: Develop Ground System Specs 12.2: Request Operational Approval (Ph. 2) 12.6: Revise ATC Orders & LOAs 12.11: Develop Maintenance Procedures	6.3.1: Ground System Design Specification 6.3.2: Interface Documents 12.2.1: Formal Request/Application Package 12.6.1: Revised Order 7110.65 12.6.2: Revised Order 7210.3 12.6.3: Revised Order 7610.4 12.6.4: Revised LOAs 12.11.1: Maintenance Procedures
Ground system spec forms (part of) technical baseline for implementation safety activities. Request forms (portion of) basis of safety analysis. Revised ATC documents support safety analyses. Maintenance procedures required to perform safety analysis.	
8.2: Summarize Op. Services and Env't 8.3: Perform Safety Analyses 8.4: Allocate Safety Objs & Reqs	8.2.1: Operational Services and Env't Definition 8.3.1: Operational Hazard Assessment 8.3.2: Hazard Analysis (PHA or SSHA/SHA) 8.4.1: ASOR
Reports used as input to implementation safety activities.	
8.7: Assess Comparative Safety	8.7.1: Comparative Safety Analysis 8.7.2: Comparative Hazard Probs in Worst Cred. Conds
CSA results used as input to implementation safety activities.	
8.9: Plan Safety for Implementation 8.11: Analyze Hazards Over-All	8.9.1: System Safety Program Plan (SSPP) 8.11.1: System Hazard Analysis (SHA)
SSPP provides framework for conduct of implementation safety activities. Reports used as input to implementation safety activities.	

Interact with Activity:
9.3: Manufacture Gnd Systems for Impl.
Implementation safety activities will impact manufacturing of ground systems and vice versa.

Output via Product:	Output to Activity:
8.12.1: Operating & Support Hazard Analysis (O&SHA)	0.5: Coordinate for Decisions 8.13: Assess Health Hazards 12.5: Grant Operational Approval (Ph. 5) 12.6: Revise ATC Orders & LOAs 12.14: Commission Ground Systems
Provides inputs to FAA decision making. Reports used as input to implementation safety activities. O&SHA used as guidance in granting operational approval. O&SHA used as guidance in revising ATC orders & LOAs. Safety analyses used as guidance in commissioning ground systems.	

Overview of Activity

8.13: Assess Health Hazards

Description: Perform a Health Hazard Analysis (HHA) to identify health hazards, evaluate proposed hazardous materials, and propose protective measures to reduce the associated risk to an acceptable level.

Plan and Perform: Vendor POC = Various

Approve or Accept: Product Team POC = PT Lead

Products:

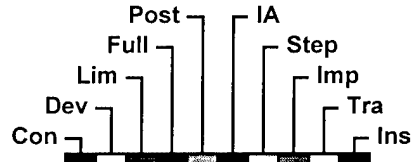
8.13.1: Health Hazard Analysis (HHA): An HHA identifies health hazards, evaluates proposed hazardous materials, and proposes protective measures to reduce the

associated risk to an acceptable level.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)								4		
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
6.3: Develop Ground System Specs 12.6: Revise ATC Orders & LOAs 12.11: Develop Maintenance Procedures	6.3.1: Ground System Design Specification 6.3.2: Interface Documents 12.6.1: Revised Order 7110.65 12.6.2: Revised Order 7210.3 12.6.3: Revised Order 7610.4 12.6.4: Revised LOAs 12.11.1: Maintenance Procedures
Ground system spec forms (part of) technical baseline for implementation safety activities. Revised ATC documents support safety analyses. Maintenance procedures required to perform safety analysis.	
8.2: Summarize Op. Services and Env't 8.3: Perform Safety Analyses 8.4: Allocate Safety Objs & Reqs	8.2.1: Operational Services and Env't Definition 8.3.1: Operational Hazard Assessment 8.3.2: Hazard Analysis (PHA or SSHA/SHA) 8.4.1: ASOR
Reports used as input to implementation safety activities.	
8.7: Assess Comparative Safety	8.7.1: Comparative Safety Analysis 8.7.2: Comparative Hazard Probs in Worst Cred. Conds
CSA results used as input to implementation safety activities.	
8.9: Plan Safety for Implementation 8.11: Analyze Hazards Over-All 8.12: Analyze Hazards of Ops & Support	8.9.1: System Safety Program Plan (SSPP) 8.11.1: System Hazard Analysis (SHA) 8.12.1: Operating & Support Hazard Analysis (O&SHA)
SSPP provides framework for conduct of implementation safety activities. Reports used as input to implementation safety activities.	

Interact with Activity:
9.3: Manufacture Gnd Systems for Impl.
Implementation safety activities will impact manufacturing of ground systems and vice versa.

Output via Product:	Output to Activity:
8.13.1: Health Hazard Analysis (HHA)	0.5: Coordinate for Decisions 12.6: Revise ATC Orders & LOAs 12.14: Commission Ground Systems
Provides inputs to FAA decision making. HHA used as guidance in revising ATC orders & LOAs. Safety analyses used as guidance in commissioning ground systems.	

Overview of Activity

9.1: Develop Avionics

Description: Develop avionics of suitable maturity to support the evaluation of this application (perhaps in concert with other applications) during evaluations (limited and full evaluations as needed). Develop avionics for certification and operational use.

Plan and Perform: Avionics Manufacturers — POC = Various

Approve or Accept: OCG, With ACO — POC = OCG Co-chairs

Products:

9.1.1: Avionics: Includes systems and/or software for limited evaluation (in the limited phase), full operational evaluation (in the OpEval phase), for preparitory simulations (in both phases) and later, systems for operational use (in the transition and in service phases).

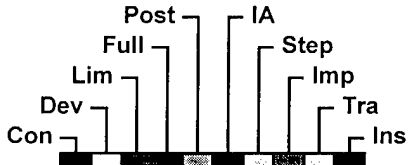
Issues:

- In the interest of achieving a wide spread ADS-B capability in the near future, some are arguing that industry needs to start installing avionics very soon; this could certainly be done if one was willing to accept that currently available avionics may only support the operational use of a few VMC SF21 applications and that later SF 21 applications, particularly IMC applications, may require avionics replacement; how should we proceed to capture the near term benefits of ADS-B while minimizing the need for costly avionics replacement programs?

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			24	24			48			
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.3: Develop Detailed Systems Concepts **1.4: Identify Synergistic Applications Sets** **6.1: Estimate Performance**	2 3 5 2 3 5	**1.3.1: Detailed Systems Concepts** **1.4.1: Synergistic Application Sets** **6.1.2: Estimated Performance Requirements**
Detailed concepts help identify what avionics are intended to do. Synergistic Applications Sets provide guidance to industry for finalizing avionics design at various phases of the development and evaluation process. Performance estimates provide basis for development of avionics for joint evaluation if formal avionics standards are not available.		
3.4: Decision - Select Link(s)	3 3 3	**3.4.1: Link Decision**
The Link Decision is required so that Industry can finalize avionics design without the risk that the FAA will later choose not to support the avionics' data link.		
5.3: Design Cockpit Interface	2 3 4 2 3 4	**5.3.1: Cockpit Interface Design**
Interface designs are used to support avionics development.		
5.4: Define Cockpit Interface Stds **6.2: Define Performance Standards**	6 6	**5.4.1: Cockpit Interface Standard** **6.2.1: Revised ADS-B MASPS** **6.2.2: Avionics MOPS**
Standards provide baseline upon which final avionics designs are developed - use if available, otherwise use preliminary designs.		
7.1: Analyze Interoperability	1 1 1	**7.1.1: Interoperability Assessment**
Provides guidance in the development of systems for joint evaluations.		
7.3: Validate Interoperability	3 4 3 4	**7.3.1: Interoperability Validation Report**
Provides guidance in avionics development for evaluation & for Implementation.		

Interact with Activity:	
5.2: Analyze Cockpit Tasks **5.3: Design Cockpit Interface** **9.2: Develop Ground Systems for Eval.** **10.1: Plan Joint Evaluations** **10.2: Simulate Mission**	3 4 3 4
Avionics development identifies what the pilot needs to do with avionics. Evaluation of cockpit interface provides insight for avionics development and vice versa. Development of avionics will impact development of ground systems and vice versa. Evaluations should be consistent with planned use of systems.	
11.2: Plan and Apply for Avionics Cert. **11.3: Estab. Avionics Cert. Project** **11.4: Submit Updated/Supp. Information** **12.2: Request Operational Approval (Ph. 2)** **12.3: Review Application Package (Ph. 3)**	3 4 7 3 4 7
Cert. plan should be based on avionics design. Additional information may be requested by the FAA Certification Office during avionics development. Approval plan should be (in part) based on avionics design.	

Output via Product:		Output to Activity:
9.1.1: Avionics	3 4 3 4	**6.1: Estimate Performance**
Results of system development used as input to estimating performance.		
9.1.1: Avionics	3 4 3 4	**10.3: Conduct Joint Evaluation**
Avionics required for use in joint evaluations.		
9.1.1: Avionics	3 4 7 3 4 7	**11.5: Test and Evaluate For Cert.** **11.6: Issue TSO or STC** **12.4: Demonstrate Operation (Ph. 4)**
Avionics required for certification. Avionics required for operational approval.		
9.1.1: Avionics	3 4 7 3 4 7	**12.5: Grant Operational Approval (Ph. 5)**
Avionics required for operational approval.		
9.1.1: Avionics	7 7	**13.1: Operate & Maintain Avionics**
Avionics to be used in normal operations.		

Overview of Activity **9.2: Develop Ground Systems for Eval.**

Description: Develop ground systems of suitable maturity to support the evaluation of this application (perhaps in concert with other applications) as needed.

Plan and Perform: Vendor POC = Various

Approve or Accept: AND-500 POC = AND-500 Lead

Products:

9.2.1: Ground Systems for Evaluation: Ground systems and interfaces required to support the evaluations of the application.

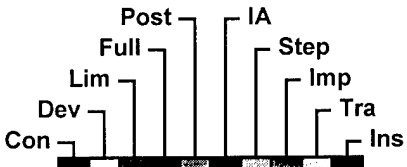
Issues:

- If new ground systems or software modification to existing ground systems are required, it adds a significant amount of time to the schedule of what is required to implement a particular SF21 application

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			24	24						
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.3: Develop Detailed Systems Concepts **1.4: Identify Synergistic Applications Sets** **5.6: Design Controller Interface** **6.1: Estimate Performance**	2 3 2 3	**1.3.1: Detailed Systems Concepts** **1.4.1: Synergistic Application Sets** **5.6.1: Controller Interface Design** **5.6.2: Mock-Ups or Simulation Gnd Eqpt** **6.1.2: Estimated Performance Requirements**
Detailed concepts help identify what ground systems are intended to do. Synergistic Application Sets provide guidance for finalizing system designs at various phases of the development and evaluation process. Interface designs are used to support ground systems development. Estimated performance requirements used as guidance in development of ground system specs.		
7.1: Analyze Interoperability **7.2: Define Ground System Interop.**	1 1 1	**7.1.1: Interoperability Assessment** **7.2.1: Estimated Interface Reqs**
Provides guidance in the development of systems for joint evaluations. Estimated interface requirements used as guidance in development of ground systems for evaluation.		
7.3: Validate Interoperability	3 3	**7.3.1: Interoperability Validation Report**
Provides guidance in systems development for evaluation.		

Interact with Activity:	
5.6: Design Controller Interface **8.6: Ensure Safety of Testing** **9.1: Develop Avionics** **10.1: Plan Joint Evaluations** **10.2: Simulate Mission** **12.10: Inform Unions**	3 4 3 4
Controller interface design will impact development of ground systems and vice versa. Test safety will impact development of ground systems for evaluation and vice versa. Development of avionics will impact development of ground systems and vice versa. Evaluations should be consistent with planned use of systems. Coordination with unions should be (in part) based on ground systems design.	

Output via Product:		Output to Activity:
9.2.1: Ground Systems for Evaluation	3 4 3 4	**6.1: Estimate Performance**
Results of system development used as input to estimating performance.		
9.2.1: Ground Systems for Evaluation	3 4 3 4	**10.3: Conduct Joint Evaluation**
Ground systems required for use in joint evaluations.		

Overview of Activity **9.3: Manufacture Gnd Systems for Impl.**

Description: Manufacture ground systems in accordance with the specifications and contract package requirements. This activity includes system requirements review, system design review, preliminary design review, critical design review, software development, hardware fabrication, system integration and testing, design qualification testing, and production acceptance testing.

Plan and Perform: Vendor POC = Various

Approve or Accept: Product Team POC = PT Lead

Products:

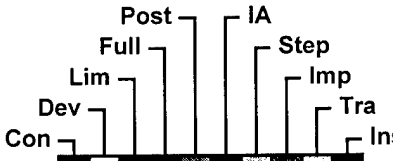
9.3.1: Production System:

9.3.2: System Documentation: Includes system diagrams/schematics, manuals, material lists, and other documentation used to maintain and configure control the system in the field.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)								75	75	
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
0.7: Prepare Acquisition Contract **3.10: Decision - Sel. Vendor & Award Contract** **6.3: Develop Ground System Specs**	7 7 7	**0.7.1: Contract Package** **0.7.2: SIR/RFO** **3.10.1: Contract Award** **6.3.1: Ground System Design Specification** **6.3.2: Interface Documents**
Contract award initiates the development of the first production ground system. Ground system specs provide technical requirements for vendor.		
3.11: Decision - Final Investment	7 7	**3.11.1: Final Investment Decision**
The Final Investment Decision allows the program to proceed with a full production run.		
3.13: Decision - In-Service	8 8	**3.13.1: In-Service Decision**
The In-Service Decision initiates the deployment of ground systems to all sites.		

Interact with Activity:	
8.9: Plan Safety for Implementation **8.10: Analyze Hazards of Sub-Systems** **8.11: Analyze Hazards Over-All** **8.12: Analyze Hazards of Ops & Support** **8.13: Assess Health Hazards** **12.12: Develop/Perform Maint. Training**	8 8
Implementation safety activities will impact manufacturing of ground systems and vice versa. Manufacturing of ground systems will impact development of maintenance training and vice versa.	

Output via Product:		Output to Activity:
9.3.1: Production System **9.3.2: System Documentation**	8 9 8 9	**9.4: Deliver and Integrate Gnd Systems**
Production system for delivery and installation. System documentation to support system installation and integration.		

Overview of Activity **9.4: Deliver and Integrate Gnd Systems**

Description: This activity encompasses site preparation, delivery, unpacking, inspection, installation, and testing in a stand-alone mode to demonstrate conformance with equipment specifications and standards, followed by integration and testing of internal and external interfaces with other FAA systems and equipment. The system contractor will perform stand-alone testing, although it may be independently contracted by the Regional office. A Contractor Acceptance / Inspection (CAI) team will confirm that the system is working properly and ready for field testing. The FAA accepts the transfer of system ownership upon successful completion of the CAI efforts. Subsequent successful completion of operational (first system) and site acceptance (all systems) testing verifies proper integration and operation of FAA interfaces. These activities are performed first for the system delivered to the key site, prior to the In-Service Decision, and again for the follow-on production systems at the remaining sites after the In-Service Decision.

Plan and Perform: Vendor, With AF, ACT POC = Various

Approve or Accept: Product Team POC = PT Lead

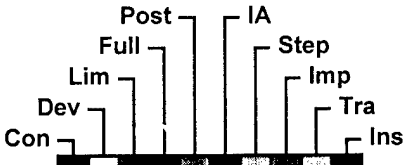
Products:

9.4.1: Installed Production System: This represents the not-yet-field-tested system installed at the site.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)								12	12	
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
0.7: Prepare Acquisition Contract **3.10: Decision - Sel. Vendor & Award Contract**	7 7 7	**0.7.1: Contract Package** **0.7.2: SIR/RFO** **3.10.1: Contract Award**
The contract outlines requirements for delivery and integration of ground systems.		
9.3: Manufacture Gnd Systems for Impl.	8 9 8 9	**9.3.1: Production System** **9.3.2: System Documentation**
Production system for delivery and installation. System documentation to support system installation and integration.		
12.12: Develop/Perform Maint. Training	8 8 8	**12.12.2: Trained Maintenance Personnel**
Trained maintenance personnel required to integrate system at site.		

No interact dependencies defined

Output via Product:		Output to Activity:
9.4.1: Installed Production System	8 9 8 9	**12.13: Field Test Ground Systems**
Integrated system ready for field test.		

Overview of Activity **10.1: Plan Joint Evaluations**

Description: Conduct an analysis, coordinate with all interested parties, and develop detailed plans for evaluation of the application, either during a Limited Evaluation or during a full OpEval. Define all the issues that need to be resolved; identify the data needed to resolve these issues; define the tests, procedures, and questionnaires needed to capture the required date, and assemble a team to accomplish this task. This planning addresses both the simulation test and evaluation and the flight test and evaluation.

Plan and Perform: OCG POC = OCG Co-chairs

Approve or Accept: OCG POC = OCG Co-chairs

Products:

10.1.1: Plan for Joint Evaluation: Two successive versions of this plan will define the details of the operations to be conducted and the data to be collected during the limited evaluation (in the limited phase) and at OpEval (in the OpEval phase).

10.1.2: Request for Spectrum: Request for (interim) spectrum required to support the evaluations of the application.

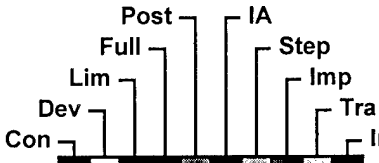
Issues:

- For many years, there has been a clear distinction between the roles and responsibilities of pilots and controllers; many SF21 applications propose to blur this distinction in the interest of increased capacity and efficiency; would such a change increase safety or make things worse, & how should we test to determine this?
- New procedures need to be safe even under worst-case scenarios (marginal weather, pilots and controllers tired near end of day, equipment failures, etc.); how can we test worst-case scenarios?
- To what degree must the controller be in the loop?
- Determine if alerting is needed
- Address requirements from other activities

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			20	20						
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.2: Develop Detailed Ops Concepts **1.3: Develop Detailed Systems Concepts** **1.4: Identify Synergistic Applications Sets** **2.3: Analyze Benefits** **4.2: Specify Procedures** **5.3: Design Cockpit Interface** **5.6: Design Controller Interface** **6.1: Estimate Performance**	2 3 2 3	**1.2.1: Detailed OPS Concepts** **1.3.1: Detailed Systems Concepts** **1.4.1: Synergistic Application Sets** **2.3.2: Benefits Data Collection Requirements** **4.2.1: Procedures Specification** **5.3.1: Cockpit Interface Design** **5.3.2: Mock-Ups or Simulation Avionics** **5.6.1: Controller Interface Design** **5.6.2: Mock-Ups or Simulation Gnd Eqpt** **6.1.1: Performance Expectations** **6.1.2: Estimated Performance Requirements** **6.1.3: Performance Data Collection Requirements**
Provides guidance for conduct of activity. Synergistic Applications Sets provide guidance for planning and conducting joint evaluations. Identifies benefits data to be collected during evaluations. Specification defines procedures to be flown and data to be collected during evaluations. Human factors analyses are required to plan the mission simulation. Data collection requirements for simulation and flight evaluation.		
1.6: Develop Research Evaluation Plan **7.1: Analyze Interoperability** **7.2: Define Ground System Interop.**	1 1 1	**1.6.1: Research Evaluation Plan** **7.1.1: Interoperability Assessment** **7.2.1: Estimated Interface Reqs**
The REP identifies data required to address issues raised. Helps identify data collection needs. Estimated interface requirements provide inputs into joint evaluation planning.		
3.3: Decision - Go for Limited Evaluation	3 3	**3.3.1: Decision to Undertake Limited Evaluation**
Decision justifies limited evaluation.		
3.5: Decision - Go for Full Evaluation	4 4	**3.5.1: Decision to Plan for Full Evaluation**
Decision justifies full evaluation.		
7.3: Validate Interoperability	3 3	**7.3.1: Interoperability Validation Report**
Helps identify data collection needs.		
10.2: Simulate Mission	3 4 3 4	**10.2.1: Mission Simulation Report**
Simulation results applicable to flight evaluation planning.		

Interact with Activity:	
0.1: Develop and Revise SF21 MP	3 4
0.2: Develop and Revise Checklist	3 4
0.3: Manage Issues and Risks	
0.4: Administer SF21 Program	
4.2: Specify Procedures	
4.5: Train for Procedures	
5.2: Analyze Cockpit Tasks	
5.5: Analyze Controller Tasks	
7.3: Validate Interoperability	
8.2: Summarize Op. Services and Env't	
8.3: Perform Safety Analyses	
8.4: Allocate Safety Objs & Reqs	
8.5: Track Safety Issues During Dev't	
8.6: Ensure Safety of Testing	
9.1: Develop Avionics	
9.2: Develop Ground Systems for Eval.	
10.2: Simulate Mission	
11.2: Plan and Apply for Avionics Cert.	
11.3: Estab. Avionics Cert. Project	
12.2: Request Operational Approval (Ph. 2)	
12.3: Review Application Package (Ph. 3)	
12.10: Inform Unions	

Provides insight into refinement of interacting activity products and vice versa. May identify changes needed (and vice versa). Evaluations help determine limits to parameters that affect the performance and acceptability of procedures. Aspects of the application to be evaluated and the methods of evaluation should be reflected in the training materials, and resources must be budgeted for training. Cockpit task analysis evaluation requirements will effect planning for tests and evaluations, and vice versa. Controller task analyses may be revised in conjunction with procedure adjustments in mission simulation and evaluation. Interoperability validation activities occur in conjunction with evaluations. Safety analyses will impact planning for evaluations. Issues are coordinated with program management and other activities. Evaluations should be consistent with planned use of systems. Results of simulation will impact evaluation planning. Evaluation planning will impact certification projects and vice versa. Ops approvals are developed during and affected by evaluation planning. Union approval will impact evaluation planning.

Output via Product:		Output to Activity:
10.1.1: Plan for Joint Evaluation	3 4 3 4	10.2: Simulate Mission 10.3: Conduct Joint Evaluation 11.2: Plan and Apply for Avionics Cert. 12.2: Request Operational Approval (Ph. 2)

Defines the details of the operations and the data to be collected. Plans provide details of joint evaluations. Evaluation plans are inputs to certification plan. Evaluation plans are inputs to operational approval plans.

10.1.2: Request for Spectrum	3 4 3 4	11.1: Obtain Spectrum

Plans affect spectrum assigned.

Overview of Activity

10.2: Simulate Mission

Description: This is an itterative activity in two phases. Conduct a mission simulation prior to limited evaluation (in the limited phase) and prior to full operational evaluation (in the OpEval phase). Validate Ops concepts, procedures, HF assumptions, system interfaces, and modify as needed.

Plan and Perform: OCG — POC = OCG Co-chairs

Approve or Accept: SF21 Steering Group — POC = SF21 StG Co-chairs

Products:

10.2.1: Mission Simulation Report: Two successive versions of this report will answer some questions on the application, and better enable conduct of the limited evaluation (in the limited phase) a more complete evaluation at OpEval (in the OpEval phase).

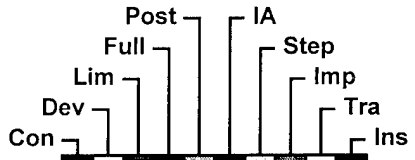
Issues:

- New procedures need to be safe even under worst-case scenarios (marginal weather, pilots and controllers tired near end of day, equipment failures, etc.); simulators allow us to test emergency situations and boundary conditions without the risks associated with actual flight operations; but the high fidelity simulators that enable us to do such evaluation are very expensive; to control program costs, there is a risk that we may not do enough simulation to address the full range of issues and operational scenarios
- To what degree must the controller be in the loop?
- Determine if alerting is needed

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			2	2						
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
6.1: Estimate Performance	2 3 / 2 3	**6.1.1: Performance Expectations**
Provides inputs to development of joint evaluation parameters.		
10.1: Plan Joint Evaluations	3 4 / 3 4	**10.1.1: Plan for Joint Evaluation**
Defines the details of the operations and the data to be collected.		

Interact with Activity:	
4.2: Specify Procedures	3 4 / 3 4
4.3: Simulate with Pilots	
4.4: Simulate with Controllers	
5.2: Analyze Cockpit Tasks	
5.3: Design Cockpit Interface	
5.5: Analyze Controller Tasks	
5.6: Design Controller Interface	
7.3: Validate Interoperability	
9.1: Develop Avionics	
9.2: Develop Ground Systems for Eval.	
10.1: Plan Joint Evaluations	
Evaluations help determine limits to parameters that affect the performance and acceptability of procedures. Cockpit simulations are conducted during joint evaluation periods. Cockpit task analyses are performed in conjunction with joint evaluations. Controller task analyses are performed in conjunction with joint evaluations. Interoperability validation activities occur in conjunction with evaluations. Evaluations should be consistent with planned use of systems. Results of simulation will impact evaluation planning.	

Output via Product:		Output to Activity:
10.2.1: Mission Simulation Report	3 4 / 3 4	**10.1: Plan Joint Evaluations**
Simulation results applicable to flight evaluation planning.		

Overview of Activity **10.3: Conduct Joint Evaluation**

Description: This is an iterative activity: collect and analysise data on the application to address some limited aspects (in the limited phase) or all significant aspects (in the OpEval phase).

Plan and Perform: OCG POC = OCG Co-chairs

Approve or Accept: SF21 Steering Group POC = SF21 StG Co-chairs

Products:

10.3.1: Joint Evaluation Data: In the limited phase, this is data from the limited evaluation. In the OpEval phase, this is data from the full operational evalution. (Currently, due to the expected volume, these data are not expected to be assembled into a single document. Data will be retained by the organization that collected it.)

10.3.2: Joint Evaluation Report: Two successive version that document the conclusions and recommendations from the limited evaluation (in the limited phase) and from full operational evaluation (in the OpEval phase).

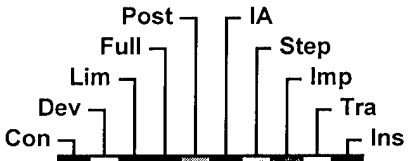
Issues:

- To what degree must the controller be in the loop?
- Determine if alerting is needed

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			2	2						
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
6.1: Estimate Performance	**6.1.1: Performance Expectations**
Provides inputs to development of joint evaluation parameters.	
8.6: Ensure Safety of Testing	**8.6.1: Test Safety Strategy**
9.1: Develop Avionics	**9.1.1: Avionics**
9.2: Develop Ground Systems for Eval.	**9.2.1: Ground Systems for Evaluation**
10.1: Plan Joint Evaluations	**10.1.1: Plan for Joint Evaluation**
11.1: Obtain Spectrum	**11.1.2: Assignment of Spectrum**
11.6: Issue TSO or STC	**11.6.1: TSO or STC**
12.5: Grant Operational Approval (Ph. 5)	**12.5.1: Operational Approval**
12.10: Inform Unions	**12.10.1: Informal Agreement to Participate in Eval.**
Test safety strategy used as guidance in conduct of joint evaluations. Avionics required for use in joint evaluations. Ground systems required for use in joint evaluations. Plans provide details of joint evaluations. Spectrum assignments must be in place for evaluations. Regulatory authorizations must be in place for evaluations. Union agreements are required to conduct evaluations.	

Interact with Activity:
4.2: Specify Procedures
5.2: Analyze Cockpit Tasks
5.3: Design Cockpit Interface
5.5: Analyze Controller Tasks
5.6: Design Controller Interface
7.3: Validate Interoperability
Evaluations help determine limits to parameters that affect the performance and acceptability of procedures. Cockpit task analyses are performed in conjunction with joint evaluations. Controller task analyses are performed in conjunction with joint evaluations. Interoperability validation activities occur in conjunction with evaluations.

Output via Product:	Output to Activity:
10.3.1: Joint Evaluation Data **10.3.2: Joint Evaluation Report**	**1.2: Develop Detailed Ops Concepts** **1.3: Develop Detailed Systems Concepts** **2.3: Analyze Benefits**
Results from evaluation are captured in updates to concept documents. Evaluation results enable validation of benefits models and assumptions.	
10.3.1: Joint Evaluation Data	**6.1: Estimate Performance**
Evaluation results enable validation of performance models and assumptions.	
10.3.2: Joint Evaluation Report	**0.5: Coordinate for Decisions**
Provides inputs to FAA decision making.	
10.3.2: Joint Evaluation Report	**1.8: Develop Requirements Document**
Results of activities aid in the development of requirements documents.	

Overview of Activity

11.1: Obtain Spectrum

Description: Manufacturer makes application to obtain FAA/FCC approval for the use of frequency(ies) for ADS-B (Not necessarily part of the avionics certification process, but is an input both to avionics certification and operational approval). Includes descriptions of ADS-B use in this application, such as from the Operations Concept and Systems Concept, a description of the user community, geographic area(s) of use and duration of use (one time/OpEval, short term or permanent).

This activity is conducted in the Limited phase with revisions in the OpEval Phase and Post OpEval phases.

Plan and Perform: Avionics Manufacturers POC = Various

Approve or Accept: ASR POC = TBD

Products:

11.1.1: Request for Spectrum/Freq. Assignment:

11.1.2: Assignment of Spectrum:

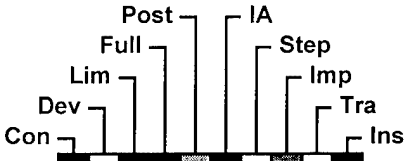
Issues:

- Approval and assignment of frequency may take longer than planned and jeopardize the associated phase of this activity
- Will use of the hardware for this application force the crossing of new thresholds?

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			12	12		75				
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
6.1: Estimate Performance	2 3 / **2 3**	**6.1.1: Performance Expectations**
Provides guidance for allocating/assigning spectrum for joint evaluations.		
10.1: Plan Joint Evaluations	3 4 / **3 4**	**10.1.2: Request for Spectrum**
Plans affect spectrum assigned.		

Interact with Activity:	
6.2: Define Performance Standards	6 / **6**
Definition of avionics performance standards and the allocation/assignment of spectrum for implementation are performed jointly.	

Output via Product:		Output to Activity:
11.1.1: Request for Spectrum/Freq. Assignment	**3 4 6** / 3 4 6	**11.3: Estab. Avionics Cert. Project**
Identifies and resolves issues of spectrum for certification.		
11.1.2: Assignment of Spectrum	**3 4** / 3 4	**10.3: Conduct Joint Evaluation**
Spectrum assignments must be in place for evaluations.		
11.1.2: Assignment of Spectrum	**3 4 6** / 3 4 6	**11.6: Issue TSO or STC** **12.1: State Intent to Conduct New Flight Ops (Ph. 1)**
Spectrum assignment affects certification. Approvals are dependent on spectrum assignment.		

Overview of Activity **11.2: Plan and Apply for Avionics Cert.**

Description: Manufacturer develops, and submits to the ACO, a plan for the certification of the ADS-B, CDTI and associated avionics. Plan contains system description, basis of certification and method of compliance, Functional Hazard Assessment, operational considerations (Min. Equip. List, crew operating manual, etc.), examples of operational scenarios, certification documentation, project schedule and use of designees (DER/DAR).

Plan and Perform: Avionics Manufacturers POC = Various

Approve or Accept: Avionics Manufacturers POC = Various

Products:

11.2.1: Avionics Cert. Application & Plan:

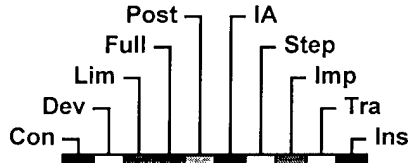
Issues:

- The plan may contain an unrealistic schedule or allow insufficient time for all certification steps
- Will this application force the crossing of new thresholds?
- Does the schedule address all of the activities and iterations required?
- Will this generation of avionics be different and introduce new complexities for the flight crew?

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			4	4			4			
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.3: Develop Detailed Systems Concepts **6.1: Estimate Performance**	2 3 5 2 3 5	**1.3.1: Detailed Systems Concepts** **6.1.2: Estimated Performance Requirements**
Systems concepts are an input to the certification plan. Performance estimates provide (a portion of) the basis for avionics certification, if formal avionics standards are not available.		
2.4: Develop Industry Business Cases **5.4: Define Cockpit Interface Stds** **6.2: Define Performance Standards**	6 6	**2.4.1: Industry Business Cases** **5.4.1: Cockpit Interface Standard** **6.2.1: Revised ADS-B MASPS** **6.2.2: Avionics MOPS**
Industry business cases provide basis for applicants' certification plan. Completion of interface standards (with performance standards) facilitates certification by TSO. Standards provide (portion of) basis for avionics certification.		
3.9: Decision - Industry Commits to Impl.	7 7	**3.9.1: Formal Notice from Applicants**
Applicant commitment is required to validate industry commitment.		
4.2: Specify Procedures **5.3: Design Cockpit Interface** **8.2: Summarize Op. Services and Env't** **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs**	2 3 4 2 3 4	**4.2.1: Procedures Specification** **5.3.1: Cockpit Interface Design** **8.2.1: Operational Services and Env't Definition** **8.3.1: Operational Hazard Assessment** **8.3.2: Hazard Analysis (PHA or SSHA/SHA)** **8.4.1: ASOR**
Procedures flown at OpEval provide partial basis for approval. Preliminary designs provide an input to certification plan if standards are not ready. Safety analyses provide a starting point for the certification process (and provides background for the cert. project).		
8.7: Assess Comparative Safety	4 5 4 5	**8.7.1: Comparative Safety Analysis** **8.7.2: Comparative Hazard Probs in Worst Cred. Conds**
CSA provides partial basis for certification until standards become available and provides background to justify and plan certification. An input to certification plan.		
8.8: Formalize Scopes of Operations	5 5	**8.8.1: AC on ADS-B/CDTI Capability Levels and Lims**
AC provides useful input for the manufacturer's use in preparing the certification application.		
10.1: Plan Joint Evaluations	3 4 3 4	**10.1.1: Plan for Joint Evaluation**
Evaluation plans are inputs to certification plan.		

Interact with Activity:	
9.1: Develop Avionics	3 4 7 3 4 7
Cert. plan should be based on avionics design.	
10.1: Plan Joint Evaluations	3 4 3 4
Evaluation planning will impact certification projects and vice versa.	

Output via Product:		Output to Activity:
11.2.1: Avionics Cert. Application & Plan	3 4 7 3 4 7	**11.3: Estab. Avionics Cert. Project** **11.5: Test and Evaluate For Cert.** **12.1: State Intent to Conduct New Flight Ops (Ph. 1)**
Receipt of the application and plan kicks off the cert. project. Required for cert. testing. Provides evidence cert. effort has begun.		

Overview of Activity **11.3: Estab. Avionics Cert. Project**

Description: Review the manufacturer's plan for obtaining certification of the ADS-B, CDTI and associated avionics. Establish a certification project, points of contact and team; provide ongoing liaison and support throughout the life of the certification project.

Plan and Perform: ACO POC = TBD

Approve or Accept: ACO POC = TBD

Products:

11.3.1: Certification Project Number: Project number established by the aircraft certification office (ACO) for the certification project.

11.3.2: Cert. Plan Initiation Meeting & Report:

11.3.3: Request for Conformity: FAA Form 8120 asks the manufacturer to submit FAA 8100-1, Conformity Inspection Record.

11.3.4: Cert. Issues Identification & Resolution:

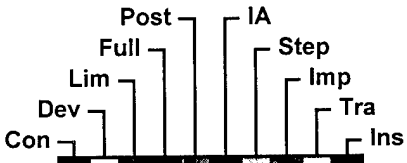
Issues:

- Is the target level of safety this adequate for the intended use?
- Will this generation of avionics be different and introduce new complexities?

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			4	4			4			
LoE (sm)										

Dependencies and Phases:



Input from Activity:

Input via Product:

8.2: Summarize Op. Services and Env't **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs**	**8.2.1: Operational Services and Env't Definition** **8.3.1: Operational Hazard Assessment** **8.3.2: Hazard Analysis (PHA or SSHA/SHA)** **8.4.1: ASOR**
Safety analyses provide a starting point for the certification process (and provides background for the cert. project).	
8.5: Track Safety Issues During Dev't **8.8: Formalize Scopes of Operations**	**8.5.1: Safety Issues and Resolutions** **8.8.1: AC on ADS-B/CDTI Capability Levels and Lims**
Safety issues provide partial basis for certification issues and resolutions document. Guidance to applicants and ACOs/FSDOs on scopes and limitations expected to be associated with the same or additional regulatory approvals.	
8.7: Assess Comparative Safety	**8.7.1: Comparative Safety Analysis** **8.7.2: Comparative Hazard Probs in Worst Cred. Conds**
CSA provides partial basis for certification until standards become available and provides background to justify and plan certification.	
11.1: Obtain Spectrum	**11.1.1: Request for Spectrum/Freq. Assignment**
Identifies and resolves issues of spectrum for certification.	
11.2: Plan and Apply for Avionics Cert.	**11.2.1: Avionics Cert. Application & Plan**
Receipt of the application and plan kicks off the cert. project.	

Interact with Activity:

0.3: Manage Issues and Risks **9.1: Develop Avionics**
May identify changes needed (and vice versa). Cert. plan should be based on avionics design.
8.5: Track Safety Issues During Dev't **10.1: Plan Joint Evaluations**
Issues are coordinated with program management and other activities. Evaluation planning will impact certification projects and vice versa.

Output via Product:

Output to Activity:

11.3.1: Certification Project Number **11.3.2: Cert. Plan Initiation Meeting & Report** **11.3.3: Request for Conformity** **11.3.4: Cert. Issues Identification & Resolution**	**11.5: Test and Evaluate For Cert.**
Required for cert. testing.	

11.3.2: Cert. Plan Initiation Meeting & Report **11.3.3: Request for Conformity** *Prompts manufacturer for additional data.*	3 4 7 3 4 7	**11.4: Submit Updated/Supp. Information**
11.3.4: Cert. Issues Identification & Resolution *Cert. issues affect certification.*	3 4 7 3 4 7	**11.6: Issue TSO or STC**

Overview of Activity **11.4: Submit Updated/Supp. Information**

Description: Submit additional certification data, including updates and revisions, design changes, plan for software aspects of Certification (PSAC), System Safety Assessment, environmental test results, Functional Hazard Assessment and Certification Test Plan. Provide data to resolve certification issues as they arise.

Plan and Perform: Avionics Manufacturers POC = Various

Approve or Accept: ACO POC = TBD

Products:

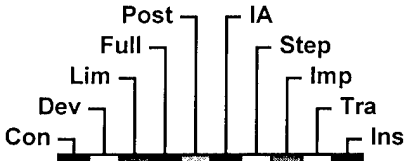
11.4.1: Descriptive Data:

11.4.2: Technical Information:

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			4	4			4			
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
5.3: Design Cockpit Interface	2 3 4 **2 3** 4	**5.3.1: Cockpit Interface Design**
Preliminary designs provide an input to certification plan if standards are not ready.		
5.4: Define Cockpit Interface Stds	6 6	**5.4.1: Cockpit Interface Standard**
Data input for certification.		
11.3: Estab. Avionics Cert. Project	3 4 7 **3 4** 7	**11.3.2: Cert. Plan Initiation Meeting & Report** **11.3.3: Request for Conformity**
Prompts manufacturer for additional data.		
12.3: Review Application Package (Ph. 3)	4 4	**12.3.1: Operational Issues and Resolution Paper**
Input for certification.		

Interact with Activity:	
9.1: Develop Avionics	3 4 7 **3 4** 7
Additional information may be requested by the FAA Certification Office during avionics development.	

Output via Product:		Output to Activity:
11.4.1: Descriptive Data	3 4 7	**11.5: Test and Evaluate For Cert.**
11.4.2: Technical Information	3 4 7	**11.6: Issue TSO or STC**
Required for cert. testing. Required for cert. decision.		

Overview of Activity **11.5: Test and Evaluate For Cert.**

Description: FAA reviews applicant data, proposes conformity inspections; applicant submits statement of conformity and requests conformity inspections and FAA witnessing of certification tests. If flight tests are required, applicant submits Flight Manual Supplement and flight test proposal; conducts flight tests and submits report to ACO.

Plan and Perform: Avionics Manufacturers POC = Various

Approve or Accept: ACO POC = TBD

Products:

11.5.1: Certification Test Report: Test report and the substantiating data.

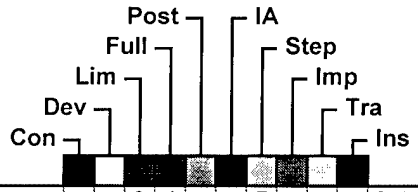
Issues:

- Simulations may be inadequate to resolve certification issues
- Will this application force the crossing of new thresholds?

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			8	8			8			
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
9.1: Develop Avionics 11.2: Plan and Apply for Avionics Cert. 11.3: Estab. Avionics Cert. Project 11.4: Submit Updated/Supp. Information	9.1.1: Avionics 11.2.1: Avionics Cert. Application & Plan 11.3.1: Certification Project Number 11.3.2: Cert. Plan Initiation Meeting & Report 11.3.3: Request for Conformity 11.3.4: Cert. Issues Identification & Resolution 11.4.1: Descriptive Data 11.4.2: Technical Information
Avionics required for certification. Required for cert. testing.	

No interact dependencies defined

Output via Product:	Output to Activity:
11.5.1: Certification Test Report	11.6: Issue TSO or STC
Report provides final basis for certification decision.	

Overview of Activity **11.6: Issue TSO or STC**

Description: FAA issues a TSO (Technical Standard Order) or STC (Supplemental Type Certificate).

Plan and Perform: ACO POC = TBD

Approve or Accept: ACO POC = TBD

Products:

11.6.1: TSO or STC:

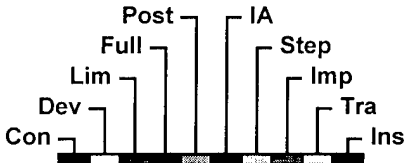
Issues:

- Will this application force the crossing of new thresholds?

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			4	4			4			
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
9.1: Develop Avionics **11.3: Estab. Avionics Cert. Project** **11.4: Submit Updated/Supp. Information** **11.5: Test and Evaluate For Cert.**	3 4 7 3 4 7	**9.1.1: Avionics** **11.3.4: Cert. Issues Identification & Resolution** **11.4.1: Descriptive Data** **11.4.2: Technical Information** **11.5.1: Certification Test Report**
Avionics required for certification. Cert. issues affect certification. Required for cert. decision. Report provides final basis for certification decision.		
11.1: Obtain Spectrum	3 4 6 3 4 6	**11.1.2: Assignment of Spectrum**
Spectrum assignment affects certification.		

No interact dependencies defined

Output via Product:		Output to Activity:
11.6.1: TSO or STC	3 4 3 4	**10.3: Conduct Joint Evaluation**
Regulatory authorizations must be in place for evaluations.		
11.6.1: TSO or STC	3 4 7 3 4 7	**12.2: Request Operational Approval (Ph. 2)**
Required input for operational approval.		
11.6.1: TSO or STC	7 7	**13.1: Operate & Maintain Avionics**
TSO or STC required to operate avionics.		

Overview of Activity12.1: State Intent to Conduct New Flight Ops (Ph. 1)

Description: Formal, written letter of intent to implement and use Application 6.1.1 through issuance of Operations Specifications (for FAR Parts 121 and 135) or Letter of Authorization (for Part 91). Meet with FAA to discuss issues and prepare for formal request for Operational Approval.

Plan and Perform: Industry Stakeholders — POC = Various

Approve or Accept: FSDO — POC = TBD

Products:

12.1.1: Request for Auth./Statement of Intent:

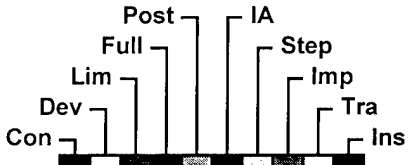
Issues:

- Will this application force the crossing of new thresholds?

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			4	4			4			
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
1.2: Develop Detailed Ops Concepts	**1.2.1: Detailed OPS Concepts**
Provides guidance in planning ops approvals for joint evaluations and implementation - defines scope of ops.	
2.4: Develop Industry Business Cases	**2.4.1: Industry Business Cases**
Industry business cases provide basis for ops approval application.	
3.9: Decision - Industry Commits to Impl.	**3.9.1: Formal Notice from Applicants**
Applicant commitment is required to validate industry commitment.	
4.2: Specify Procedures	**4.2.1: Procedures Specification**
Provides partial basis for statement of intent.	
11.1: Obtain Spectrum	**11.1.2: Assignment of Spectrum**
Approvals are dependent on spectrum assignment.	
11.2: Plan and Apply for Avionics Cert.	**11.2.1: Avionics Cert. Application & Plan**
Provides evidence cert. effort has begun.	

No interact dependencies defined

Output via Product:	Output to Activity:
12.1.1: Request for Auth./Statement of Intent	**12.2: Request Operational Approval (Ph. 2)**
Statement of intent is a prerequisite for formal request.	

Overview of Activity **12.2: Request Operational Approval (Ph. 2)**

Description: Make formal, written request for Operation Approval with all supporting documentation: operations and maintenance manuals, checklists, curriculum changes and training/lesson plans, Minimum Equipment List changes, human factors test results, certifications and certification basis, schedule of events.

Plan and Perform: Industry Stakeholders POC = Various

Approve or Accept: FSDO POC = TBD

Products:

12.2.1: Formal Request/Application Package:

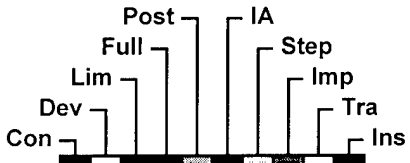
Issues:

- The schedule of events may be unrealistic and allow insufficient time to complete all activities

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			4	4			4			
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
1.2: Develop Detailed Ops Concepts	2 3 5 2 3 5	**1.2.1: Detailed OPS Concepts**
Provides guidance in planning ops approvals for joint evaluations and implementation - defines scope of ops.		
4.2: Specify Procedures **5.2: Analyze Cockpit Tasks** **8.2: Summarize Op. Services and Env't** **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs**	2 3 4 2 3 4	**4.2.1: Procedures Specification** **5.2.1: Cockpit Task Analysis Report** **8.2.1: Operational Services and Env't Definition** **8.3.1: Operational Hazard Assessment** **8.3.2: Hazard Analysis (PHA or SSHA/SHA)** **8.4.1: ASOR**
Procedures flown at OpEval provide partial basis for approval. Important ingredient to Ops Approval consideration. Safety analyses provide inputs to the approval process.		
4.5: Train for Procedures	3 4 3 4	**4.5.1: Pilot Training Materials**
Pilot training materials may provide basis for approved training.		
8.7: Assess Comparative Safety	4 5 4 5	**8.7.1: Comparative Safety Analysis** **8.7.2: Comparative Hazard Probs in Worst Cred. Conds**
Provides partial basis for operational approval and for evaluating applications for approval.		
8.8: Formalize Scopes of Operations	5 5	**8.8.1: AC on ADS-B/CDTI Capability Levels and Lims**
Guidance to applicants and ACOs/FSDOs on scopes and limitations expected to be associated with the same or additional regulatory approvals.		
10.1: Plan Joint Evaluations	3 4 3 4	**10.1.1: Plan for Joint Evaluation**
Evaluation plans are inputs to operational approval plans.		
11.6: Issue TSO or STC **12.1: State Intent to Conduct New Flight Ops (Ph. 1)**	3 4 7 3 4 7	**11.6.1: TSO or STC** **12.1.1: Request for Auth./Statement of Intent**
Required input for operational approval. Statement of intent is a prerequisite for formal request.		

Interact with Activity:	
9.1: Develop Avionics	3 4 7 3 4 7
Approval plan should be (in part) based on avionics design.	
10.1: Plan Joint Evaluations	3 4 3 4
Ops approvals are developed during and affected by evaluation planning.	

Output via Product:		Output to Activity:
12.2.1: Formal Request/Application Package	7 7	**8.12: Analyze Hazards of Ops & Support**
Request forms (portion of) basis of safety analysis.		

12.2.1: Formal Request/Application Package *Required for review.*	3 4 7 3 4 7	**12.3: Review Application Package (Ph. 3)**

Overview of Activity **12.3: Review Application Package (Ph. 3)**

Description: Review applicant's package for the specific application, evaluate manuals, curricula, training plans, checklists and all other documentation, observe and evaluate training, identify and resolve operational issues. Coordinate with FAA LOBs concerning any elements of the proposed operations that extend beyond the demarcations of systems and operations agreed to for this level of capability (for this application).

Plan and Perform: FSDO POC = TBD

Approve or Accept: FSDO, With AFS POC = TBD

Products:

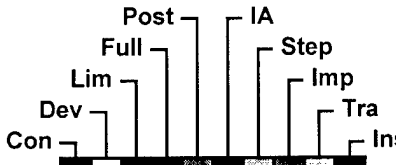
12.3.1: Operational Issues and Resolution Paper:

12.3.2: Application Package Evaluation Report:

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			8	8			4			
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
8.2: Summarize Op. Services and Env't **8.3: Perform Safety Analyses** **8.4: Allocate Safety Objs & Reqs**	2 3 4 2 3 4	**8.2.1: Operational Services and Env't Definition** **8.3.1: Operational Hazard Assessment** **8.3.2: Hazard Analysis (PHA or SSHA/SHA)** **8.4.1: ASOR**
Safety analyses provide inputs to the approval process.		
8.5: Track Safety Issues During Dev't **8.8: Formalize Scopes of Operations**	5 5	**8.5.1: Safety Issues and Resolutions** **8.8.1: AC on ADS-B/CDTI Capability Levels and Lims**
Safety issues provide partial basis for certification issues and resolutions document. Guidance to applicants and ACOs/FSDOs on scopes and limitations expected to be associated with the same or additional regulatory approvals.		
8.7: Assess Comparative Safety	4 5 4 5	**8.7.1: Comparative Safety Analysis** **8.7.2: Comparative Hazard Probs in Worst Cred. Conds**
Provides partial basis for operational approval and for evaluating applications for approval.		
12.2: Request Operational Approval (Ph. 2)	3 4 7 3 4 7	**12.2.1: Formal Request/Application Package**
Required for review.		

Interact with Activity:	
0.3: Manage Issues and Risks **9.1: Develop Avionics**	3 4 7 3 4 7
May identify changes needed (and vice versa). Approval plan should be (in part) based on avionics design.	
8.5: Track Safety Issues During Dev't **10.1: Plan Joint Evaluations**	3 4 3 4
Issues are coordinated with program management and other activities. Ops approvals are developed during and affected by evaluation planning.	

Output via Product:		Output to Activity:
12.3.1: Operational Issues and Resolution Paper	4 4	**11.4: Submit Updated/Supp. Information**
Input for certification.		
12.3.1: Operational Issues and Resolution Paper **12.3.2: Application Package Evaluation Report**	3 4 7 3 4 7	**12.4: Demonstrate Operation (Ph. 4)**
Issues and resolutions and evaluation of applicant materials are required for demonstration and approval.		
12.3.1: Operational Issues and Resolution Paper **12.3.2: Application Package Evaluation Report**	3 4 7 3 4 7	**12.5: Grant Operational Approval (Ph. 5)**
Issues and resolutions and evaluation of applicant materials are required for demonstration and approval.		

Overview of Activity **12.4: Demonstrate Operation (Ph. 4)**

Description: Conduct and evaluate a flight demonstration of the Application.

Plan and Perform: Industry Stakeholders POC = Various

Approve or Accept: FSDO POC = TBD

Products:

12.4.1: Report of Operational Demo:

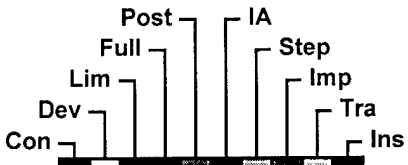
Issues:

- The applicant may be unable to demonstrate that the new procedure can be conducted safely
- The new procedure may require too much heads down time

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			4	4			4			
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
9.1: Develop Avionics **12.3: Review Application Package (Ph. 3)**	**9.1.1: Avionics** **12.3.1: Operational Issues and Resolution Paper** **12.3.2: Application Package Evaluation Report**

Avionics required for operational approval. Issues and resolutions and evaluation of applicant materials are required for demonstration and approval.

No interact dependencies defined

Output via Product:	Output to Activity:
12.4.1: Report of Operational Demo	**12.5: Grant Operational Approval (Ph. 5)**

Demonstration required for Ops approval.

Overview of Activity **12.5: Grant Operational Approval (Ph. 5)**

Description: Assess results of the application package review and the operational demonstration; resolve any remaining issues. Grant operational approval with the issuance of Operations Specifications or a Letter of Authorization.

Plan and Perform: FSDO, With AFS POC = TBD

Approve or Accept: FSDO, With AFS POC = TBD

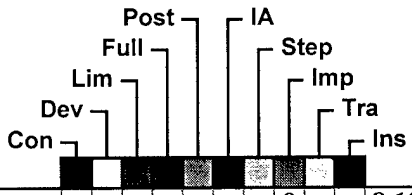
Products:

12.5.1: Operational Approval:

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			2	2				2		
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
8.12: Analyze Hazards of Ops & Support 12.6: Revise ATC Orders & LOAs 12.7: Revise the AIM 12.8: Develop/Perform Controller Training 12.14 Commission Ground Systems	8 8	8.12.1: Operating & Support Hazard Analysis (O&SHA) 12.6.1: Revised Order 7110.65 12.6.2: Revised Order 7210.3 12.6.3: Revised Order 7610.4 12.6.4: Revised LOAs 12.7.1: Revised AIM 12.8.1: Controller Training Materials 12.14.1: Commissioned System
O&SHA used as guidance in granting operational approval. Final ATC documents support operational approvals and commissioning. Commissioned systems required before air-ground operations can be approved.		
9.1: Develop Avionics 12.3: Review Application Package (Ph. 3) 12.4: Demonstrate Operation (Ph. 4)	3 4 7 3 4 7	9.1.1: Avionics 12.3.1: Operational Issues and Resolution Paper 12.3.2: Application Package Evaluation Report 12.4.1: Report of Operational Demo
Avionics required for operational approval. Issues and resolutions and evaluation of applicant materials are required for demonstration and approval. Demonstration required for Ops approval.		

No interact dependencies defined

Output via Product:		Output to Activity:
12.5.1: Operational Approval	8 8	0.1: Develop and Revise SF21 MP 0.2: Develop and Revise Checklist 0.3: Manage Issues and Risks 0.4: Administer SF21 Program
Decision(s) will impact the contents of the document(s).		
12.5.1: Operational Approval	3 4 3 4	10.3: Conduct Joint Evaluation
Regulatory authorizations must be in place for evaluations.		
12.5.1: Operational Approval	4 4	12.7: Revise the AIM
Ops approval provides input to revisions to AIM.		
12.5.1: Operational Approval	8 8	13.1: Operate & Maintain Avionics
Operational approval required to operate avionics.		

Overview of Activity **12.6: Revise ATC Orders & LOAs**

Description: Review and update FAA Order 7110.65 (Air Traffic Control), FAA Order 7210.3 (Facility Operation and Administration), FAA) Order 7610.4 (Special Military Operations), and selected letters of agreement (LOAs) based on an FAA/Industry decision to implement this application.

Plan and Perform: ATP POC = TBD

Approve or Accept: ATS POC = TBD

Products:

12.6.1: Revised Order 7110.65: Order 7110.65, Air Traffic Control

12.6.2: Revised Order 7210.3: Order 7210.3, Facility Operation and Administration

12.6.3: Revised Order 7610.4: Order 7610.4, Special Military Operations

12.6.4: Revised LOAs: This product addresses selected letters of agreement (LOAs).

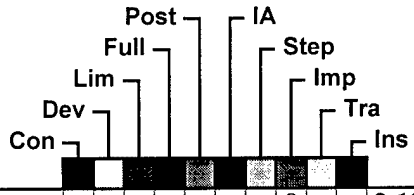
Issues:

- Union's acceptance
- Separation responsibility
- Roles of controllers
- Roles of pilots
- Equivalent Level of Safety

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)						12	12	16		
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
3.12: Decision - Formal FAA/Union Agreement 3.13: Decision - In-Service 8.12: Analyze Hazards of Ops & Support 8.13: Assess Health Hazards 12.13: Field Test Ground Systems	8 8	3.12.2: NATCA Concurrence on 7110.65 3.12.3: NATCA Concurrence on 7210.3 3.12.4: NATCA Concurrence on 7610.4 3.12.5: NATCA Concurrence on LOAs 3.13.1: In-Service Decision 8.12.1: Operating & Support Hazard Analysis (O&SHA) 8.13.1: Health Hazard Analysis (HHA) 12.13.1: Test Reports
NATCA concurrence with proposed changes required to implement the application. The In-Service Decision approves the commissioning and operational use of ground systems. O&SHA used as guidance in revising ATC orders & LOAs. HHA used as guidance in revising ATC orders & LOAs. Field test reports used as input to final revision of ATC documents.		
4.2: Specify Procedures 5.5: Analyze Controller Tasks	4 4	4.2.1: Procedures Specification 5.5.1: Controller Task Analysis Report
Procedures flown at OpEval provide partial basis for approval. Analysis helps define what needs to be revised in ATC Orders and LOAs.		
12.9: Coord w/ FAA LoBs	7 7	12.9.1: Response to Draft 7110.65 12.9.2: Response to Draft 7210.3 12.9.3: Response to Draft 7610.2 12.9.4: Response to Draft LOAs
FAA LOB comments on and concurrence with the draft document(s) are provided.		
12.10: Inform Unions	7 7	12.10.2: NATCA Response to 7110.65 12.10.3: NATCA Response to 7210.3 12.10.4: NATCA Response to 7610.4 12.10.5: NATCA Response to LOAs
NATCA comments on Final drafts are provided.		

Interact with Activity:	
12.7: Revise the AIM 12.8: Develop/Perform Controller Training	6 7 8 6 7 8
ATC Orders, AIM, and Controller Training are revised in parallel.	

Output via Product:		Output to Activity:
12.6.1: Revised Order 7110.65 12.6.2: Revised Order 7210.3 12.6.3: Revised Order 7610.4 12.6.4: Revised LOAs	7 7	8.12: Analyze Hazards of Ops & Support 8.13: Assess Health Hazards
Revised ATC documents support safety analyses.		
12.6.1: Revised Order 7110.65 12.6.2: Revised Order 7210.3 12.6.3: Revised Order 7610.4 12.6.4: Revised LOAs	8 8	12.5: Grant Operational Approval (Ph. 5) 12.14: Commission Ground Systems
Final ATC documents support operational approvals and commissioning.		

12.6.1: Revised Order 7110.65	6	**12.9: Coord w/ FAA LoBs**
12.6.2: Revised Order 7210.3	6	
12.6.3: Revised Order 7610.4		
12.6.4: Revised LOAs		
Formal coordination of revisions with FAA LOBs is required.		
12.6.1: Revised Order 7110.65	7	**12.10: Inform Unions**
12.6.2: Revised Order 7210.3	7	
12.6.3: Revised Order 7610.4		
12.6.4: Revised LOAs		
Formal coordination of revisions with unions is required.		

Overview of Activity

12.7: Revise the AIM

Description: Review and update the Aeronautical Information Manual (AIM) and relevant supplements as required to implement this application.

Plan and Perform: AT POC = TBD

Approve or Accept: AT POC = TBD

Products:

12.7.1: Revised AIM: This revision includes the relevant supplements.

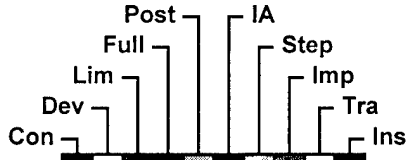
Issues:

- Equivalent Level of Safety
- Union's acceptance
- Separation responsibility
- Roles of controllers
- Roles of pilots

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)						16	12	12		
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
3.12: Decision - Formal FAA/Union Agreement **3.13: Decision - In-Service** **12.13: Field Test Ground Systems**	8 8	**3.12.6: NATCA Concur: AIM** **3.13.1: In-Service Decision** **12.13.1: Test Reports**
NATCA concurrence with proposed changes required to implement the application. The In-Service Decision approves the commissioning and operational use of ground systems. Field test reports used as input to final revision of ATC documents.		
12.5: Grant Operational Approval (Ph. 5)	4 4	**12.5.1: Operational Approval**
Ops approval provides input to revisions to AIM.		
12.9: Coord w/ FAA LoBs	7 7	**12.9.5: Response to Draft AIM**
FAA LOB comments on and concurrence with the draft AIM and relevant supplements are provided.		
12.10: Inform Unions	7 7	**12.10.6: NATCA Response to AIM Revision**
NATCA comments on the Final draft AIM and relevant supplements are provided.		

Interact with Activity:	
12.6: Revise ATC Orders & LOAs **12.8: Develop/Perform Controller Training**	6 7 8 6 7 8
ATC Orders, AIM, and Controller Training are revised in parallel.	

Output via Product:		Output to Activity:
12.7.1: Revised AIM	8 8	**12.5: Grant Operational Approval (Ph. 5)** **12.14: Commission Ground Systems**
Final ATC documents support operational approvals and commissioning.		
12.7.1: Revised AIM	6 6	**12.9: Coord w/ FAA LoBs**
Formal coordination of revisions with FAA LOBs is required.		
12.7.1: Revised AIM	7 7	**12.10: Inform Unions**
Formal coordination of revisions with unions is required.		

Overview of Activity **12.8: Develop/Perform Controller Training**

Description: Develop and publish controller training materials. Perform controller training.

Plan and Perform: AT POC = TBD

Approve or Accept: AT POC = TBD

Products:

12.8.1: Controller Training Materials: Materials used to train controllers on new/modified procedures to be used to support the application in the NAS.

12.8.2: Trained Controllers: This product in effect produces trained controllers, required to allow implementation of the application in the NAS.

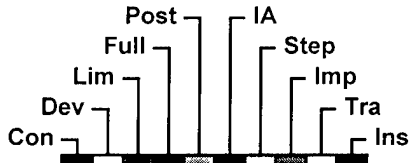
Issues:

- Equivalent Level of Safety
- Union's acceptance
- Geographic areas of implementation
- Which ATC facilities are involved

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)						12	12	12		
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
3.12: Decision - Formal FAA/Union Agreement	8	**3.12.7: NATCA Concur: Training Materials**
3.13: Decision - In-Service	8	**3.13.1: In-Service Decision**
12.13: Field Test Ground Systems		**12.13.1: Test Reports**
NATCA concurrence with proposed changes required to implement the application. The In-Service Decision approves the commissioning and operational use of ground systems. Field test reports used as input to final revision of ATC documents.		
4.5: Train for Procedures	4 / 4	**4.5.2: Controller Training Materials**
May provide basis for approved training.		
12.9: Coord w/ FAA LoBs	7 / 7	**12.9.6: Response to Draft Controller Training Mat'l**
FAA LOB comments on and concurrence with the draft controller training material are provided.		
12.10: Inform Unions	7 / 7	**12.10.7: NATCA Response to Controller Training Mat'l**
NATCA comments on Final drafts are provided.		

Interact with Activity:	
12.6: Revise ATC Orders & LOAs	6 7 8
12.7: Revise the AIM	6 7 8
ATC Orders, AIM, and Controller Training are revised in parallel.	

Output via Product:		Output to Activity:
12.8.1: Controller Training Materials	8 / 8	**12.5: Grant Operational Approval (Ph. 5)**
Final ATC documents support operational approvals and commissioning.		
12.8.1: Controller Training Materials	6 / 6	**12.9: Coord w/ FAA LoBs**
Formal coordination of training materials with FAA LOBs is required.		
12.8.1: Controller Training Materials	7 / 7	**12.10: Inform Unions**
Formal coordination of training materials with unions required.		
12.8.2: Trained Controllers	8 / 8 8	**12.14: Commission Ground Systems**
Controller training required before system can be commissioned.		
12.8.2: Trained Controllers	8 / 8	**13.2: Operate & Maintain Gnd Systems**
Required for new procedures.		

Overview of Activity

12.9: Coord w/ FAA LoBs

Description: Formally coordinate draft revisions to FAA ATC Orders, the AIM, and selected letters of agreement (LOAs) with FAA lines of business (LOBs).

Plan and Perform: ATP POC = TBD

Approve or Accept: ATS POC = TBD

Products:

12.9.1: Response to Draft 7110.65: Order 7110.65, Air Traffic Control

12.9.2: Response to Draft 7210.3: Order 7210.3, Facility Operation and Admin

12.9.3: Response to Draft 7610.2: Order 7610.2, Special Military Operations

12.9.4: Response to Draft LOAs: This product is limited to selected letters of agreement (LOAs).

12.9.5: Response to Draft AIM: This draft revision includes relevant supplements.

12.9.6: Response to Draft Controller Training Mat'l:

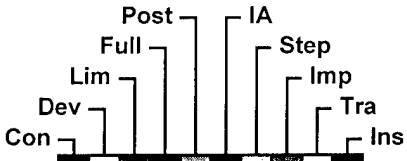
Issues:

- Equivalent Level of Safety

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)							16			
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
12.6: Revise ATC Orders & LOAs 12.7: Revise the AIM 12.8: Develop/Perform Controller Training	6 6	12.6.1: Revised Order 7110.65 12.6.2: Revised Order 7210.3 12.6.3: Revised Order 7610.4 12.6.4: Revised LOAs 12.7.1: Revised AIM 12.8.1: Controller Training Materials
Formal coordination of revisions with FAA LOBs is required. Formal coordination of training materials with FAA LOBs is required.		

Interact with Activity:	
0.3: Manage Issues and Risks	7 7
May identify changes needed (and vice versa).	

Output via Product:		Output to Activity:
12.9.1: Response to Draft 7110.65 12.9.2: Response to Draft 7210.3 12.9.3: Response to Draft 7610.2 12.9.4: Response to Draft LOAs	7 7	12.6: Revise ATC Orders & LOAs
FAA LOB comments on and concurrence with the draft document(s) are provided.		
12.9.5: Response to Draft AIM	7 7	12.7: Revise the AIM
FAA LOB comments on and concurrence with the draft AIM and relevant supplements are provided.		
12.9.6: Response to Draft Controller Training Mat'l	7 7	12.8: Develop/Perform Controller Training
FAA LOB comments on and concurrence with the draft controller training material are provided.		

Overview of Activity

12.10: Inform Unions

Description: Inform NATCA of what is proposed for controllers during Limited evaluation and during OpEval. Notify NATCA formally about proposed changes to support the operational implementation of this application. Negotiate with NATCA to reach an agreement on proposed changes. [With application involving ground system changes, it will be necessary to deal with PASS.]

Plan and Perform: ATS — POC = TBD

Approve or Accept: FAA Lines of Business, With AT — POC = Various

Products:

12.10.1: Informal Agreement to Participate in Eval.:

12.10.2: NATCA Response to 7110.65: Final draft revision of Order 7110.65, Air Traffic Control

12.10.3: NATCA Response to 7210.3: Final draft revision of Order 7210.3, Facility Operation and Administration

12.10.4: NATCA Response to 7610.4: Final draft revision of Order 7610.4, Special Military Operations

12.10.5: NATCA Response to LOAs: This product addresses selected letters of agreement (LOAs).

12.10.6: NATCA Response to AIM Revision: This product includes relevant supplements.

12.10.7: NATCA Response to Controller Training Mat'l:

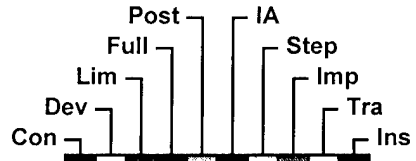
Issues:

- Equivalent Level of Safety
- Union's acceptance
- Separation responsibility
- Roles of controllers
- Roles of pilots

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)			8	8			8			
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
4.2: Specify Procedures	2 3 / 2 3	**4.2.1: Procedures Specification**
Provides procedures flown during evaluations for review.		
12.6: Revise ATC Orders & LOAs **12.7: Revise the AIM** **12.8: Develop/Perform Controller Training** **12.11: Develop Maintenance Procedures** **12.12: Develop/Perform Maint. Training**	7 / 7	**12.6.1: Revised Order 7110.65** **12.6.2: Revised Order 7210.3** **12.6.3: Revised Order 7610.4** **12.6.4: Revised LOAs** **12.7.1: Revised AIM** **12.8.1: Controller Training Materials** **12.11.1: Maintenance Procedures** **12.12.1: Maintenance Training Materials**
Formal coordination of revisions with unions is required. Formal coordination of training materials with unions required. Maintenance procedures required before PAAS will approve. Training materials required before PAAS will approve.		

Interact with Activity:	
9.2: Develop Ground Systems for Eval. **10.1: Plan Joint Evaluations**	3 4 / 3 4
Coordination with unions should be (in part) based on ground systems design. Union approval will impact evaluation planning.	

Output via Product:		Output to Activity:
12.10.1: Informal Agreement to Participate in Eval.	3 4 / 3 4	**10.3: Conduct Joint Evaluation**
Union agreements are required to conduct evaluations.		
12.10.2: NATCA Response to 7110.65 **12.10.3: NATCA Response to 7210.3** **12.10.4: NATCA Response to 7610.4** **12.10.5: NATCA Response to LOAs** **12.10.6: NATCA Response to AIM Revision** **12.10.7: NATCA Response to Controller Training Mat'l**	7 / 7	**3.12: Decision - Formal FAA/Union Agreement**
Union feedback on the draft should lead toward consensus.		
12.10.2: NATCA Response to 7110.65 **12.10.3: NATCA Response to 7210.3** **12.10.4: NATCA Response to 7610.4** **12.10.5: NATCA Response to LOAs**	7 / 7	**12.6: Revise ATC Orders & LOAs**
NATCA comments on Final drafts are provided.		
12.10.6: NATCA Response to AIM Revision	7 / 7	**12.7: Revise the AIM**
NATCA comments on the Final draft AIM and relevant supplements are provided.		

12.10.7: NATCA Response to Controller Training Mat'l							7			**12.8: Develop/Perform Controller Training**
							7			
NATCA comments on Final drafts are provided.										

Overview of Activity **12.11: Develop Maintenance Procedures**

Description: Develop the anticipated maintenance procedures required to support the ground systems in the field.

Plan and Perform: AF POC = TBD

Approve or Accept: AF POC = TBD

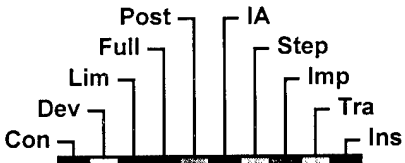
Products:

12.11.1: Maintenance Procedures: Procedures to be used by field maintenance personnel to maintain the systems.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)							16			
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
6.3: Develop Ground System Specs	**6.3.1: Ground System Design Specification** **6.3.2: Interface Documents**
Ground system spec provides technical baseline upon which maintenance procedures are based.	

Interact with Activity:
12.12: Develop/Perform Maint. Training
Initial maintenance procedures provide insight into training requirements and vice versa.

Output via Product:	Output to Activity:
12.11.1: Maintenance Procedures	**8.12: Analyze Hazards of Ops & Support** **8.13: Assess Health Hazards** **12.12: Develop/Perform Maint. Training**
Maintenance procedures required to perform safety analysis. Maintenance procedures required before training can be developed or performed.	
12.11.1: Maintenance Procedures	**12.10: Inform Unions**
Maintenance procedures required before PAAS will approve.	

Overview of Activity **12.12: Develop/Perform Maint. Training**

Description: Develop the appropriate maintenance training materials to support the training of maintenance personnel, and perform personnel training in preparation for site installations, tests, and commissionings.

Plan and Perform: AF POC = TBD

Approve or Accept: AF POC = TBD

Products:

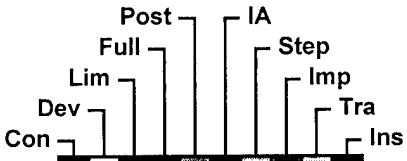
12.12.1: Maintenance Training Materials: Materials used to train system maintainers on the equipment to be used to support the application in the NAS.

12.12.2: Trained Maintenance Personnel: This product in effect represents trained maintenance personnel, required to allow the implementation of equipment required to support the application in the NAS.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)							16	16		
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
6.3: Develop Ground System Specs	7 7	6.3.1: Ground System Design Specification 6.3.2: Interface Documents
Ground system specs provide input to development of maintenance training.		
12.11: Develop Maintenance Procedures	7 7	12.11.1: Maintenance Procedures
Maintenance procedures required before training can be developed or performed.		

Interact with Activity:	
9.3: Manufacture Gnd Systems for Impl.	8 8
Manufacturing of ground systems will impact development of maintenance training and vice versa.	
12.11: Develop Maintenance Procedures	7 7
Initial maintenance procedures provide insight into training requirements and vice versa.	

Output via Product:		Output to Activity:
12.12.1: Maintenance Training Materials	7 7	12.10: Inform Unions
Training materials required before PAAS will approve.		
12.12.2: Trained Maintenance Personnel	8 8 8	9.4: Deliver and Integrate Gnd Systems 12.13: Field Test Ground Systems 12.14: Commission Ground Systems
Trained maintenance personnel required to integrate system at site. Trained maintenance personnel required to field test system. Trained maintenance personnel required to commission system.		
12.12.2: Trained Maintenance Personnel	8 8	13.2: Operate & Maintain Gnd Systems
Trained maintenance personnel required to maintain ground system throughout life cycle.		

Overview of Activity

12.13: Field Test Ground Systems

Description: For those systems designated for Independent Operational Test & Evaluation (IOT&E), independent operational test and evaluation is conducted at the first site to ensure that all critical operational issues are resolved before the In-Service Decision. IOT&E is initiated upon receipt of an IOT&E Readiness Declaration from ARA-1 certifying the system has successfully completed operational testing and is ready for IOT&E. The system is evaluated for operational suitability and effectiveness based on the resolution of Critical Operational Issues (COIs) in the Requirements Document. Test data from earlier test phases may be applicable to COI resolution, as may the results of field familiarization testing. Following IOT&E at the first site, or following site acceptance test at subsequent sites, AT and AF personnel familiarize themselves with the new equipment in a carefully controlled operational environment to verify satisfaction of all operational and support requirements, and to develop full proficiency in the operation and maintenance of the new equipment. The adequacy and availability of support materials such as manuals, handbooks, and other documentation is also verified. Successful completion of field familiarization testing results in a declaration of Initial Operational Capability (IOC). Site personnel then use the new system operationally during the Operational Readiness Demonstration (ORD), usually in dual operation with its predecessor. During this period, the system is operated under intense scrutiny to discover and fix any operational problems, and to enable site personnel to become fully qualified to operate and maintain it. The ORD ends when a Joint Acceptance / Inspection (JAI) team of designated AT / AF personnel declare the system ready for operational use.

Plan and Perform: AF, With AT POC = TBD

Approve or Accept: AF, With AT POC = TBD

Products:

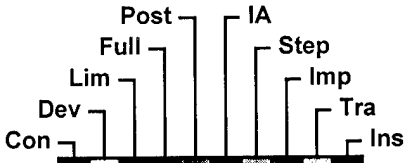
12.13.1: Test Reports: Reports of operational field tests that are used to validate/invalidate the system's ability to meet operational requirements. These tests include OT&E, IOT&E and field shakedown tests.

12.13.2: Tested System: This product represents the field-tested system ready for commissioning.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)								12	12	
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
9.4: Deliver and Integrate Gnd Systems	8 9 / 8 9	9.4.1: Installed Production System
Integrated system ready for field test.		
12.12: Develop/Perform Maint. Training	8 / 8 8	12.12.2: Trained Maintenance Personnel
Trained maintenance personnel required to field test system.		

Interact with Activity:	
0.3: Manage Issues and Risks	8 9 / 8 9
May identify changes needed (and vice versa).	

Output via Product:		Output to Activity:
12.13.1: Test Reports	8 / 8	0.5: Coordinate for Decisions 3.13: Decision - In-Service 12.6: Revise ATC Orders & LOAs 12.7: Revise the AIM 12.8: Develop/Perform Controller Training
Provides inputs to FAA decision making. Reports used as input to the In-Service Decision. Field test reports used as input to final revision of ATC documents.		
12.13.1: Test Reports 12.13.2: Tested System	8 9 / 8 9	12.14: Commission Ground Systems
Test report used as reference point when commissioning system. Tested system for commissioning.		

Overview of Activity **12.14: Commission Ground Systems**

Description: The local AF technician certifies and commissions each site into NAS service after dual operations demonstrate readiness for full operational service. An AT technician also approves commissioning when the product will be used for air traffic control.

Plan and Perform: AF, With AT POC = TBD

Approve or Accept: AF, With AT POC = TBD

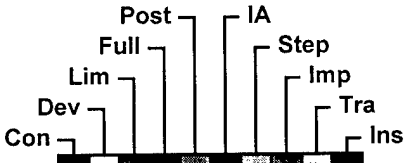
Products:

12.14.1: Commissioned System: This product represents the commissioned system, approved for operational use at the site.

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)								2	2	
LoE (sm)										

Dependencies and Phases:



Input from Activity:	Input via Product:
3.13: Decision - In-Service 8.12: Analyze Hazards of Ops & Support 8.13: Assess Health Hazards 12.6: Revise ATC Orders & LOAs 12.7: Revise the AIM	3.13.1: In-Service Decision 8.12.1: Operating & Support Hazard Analysis (O&SHA) 8.13.1: Health Hazard Analysis (HHA) 12.6.1: Revised Order 7110.65 12.6.2: Revised Order 7210.3 12.6.3: Revised Order 7610.4 12.6.4: Revised LOAs 12.7.1: Revised AIM
The In-Service Decision approves the commissioning and operational use of ground systems. Safety analyses used as guidance in commissioning ground systems. Final ATC documents support operational approvals and commissioning.	
12.8: Develop/Perform Controller Training 12.12: Develop/Perform Maint. Training	12.8.2: Trained Controllers 12.12.2: Trained Maintenance Personnel
Controller training required before system can be commissioned. Trained maintenance personnel required to commission system.	
12.13: Field Test Ground Systems	12.13.1: Test Reports 12.13.2: Tested System
Test report used as reference point when commissioning system. Tested system for commissioning.	

No interact dependencies defined

Output via Product:	Output to Activity:
12.14.1: Commissioned System	12.5: Grant Operational Approval (Ph. 5)
Commissioned systems required before air-ground operations can be approved.	
12.14.1: Commissioned System	13.2: Operate & Maintain Gnd Systems
Commissioned system for operational use.	

Overview of Activity **13.1: Operate & Maintain Avionics**

Description: Avionics are maintained and operated to provide the services defined by the application. Outages, deficiencies, etc. are identified and corrected as required to maintain the required services.

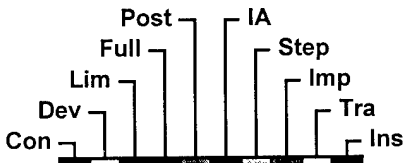
Plan and Perform: Industry Stakeholders POC = Various

Approve or Accept: N/A POC = N/A

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)										999
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
9.1: Develop Avionics	7	**9.1.1: Avionics**
11.6: Issue TSO or STC	7	**11.6.1: TSO or STC**
Avionics to be used in normal operations. TSO or STC required to operate avionics.		
12.5: Grant Operational Approval (Ph. 5)	8	**12.5.1: Operational Approval**
	8	
Operational approval required to operate avionics.		

Interact with Activity:	
13.2: Operate & Maintain Gnd Systems	0
	0
Operation and maintenance of avionics may impact ground system operation and maintenance.	

No output dependencies defined

Overview of Activity **13.2: Operate & Maintain Gnd Systems**

Description: Ground systems are maintained and operated to provide the services defined by the application. System outages, deficiencies, etc. are identified in System Trouble Reports and corrected as required to maintain the required services.

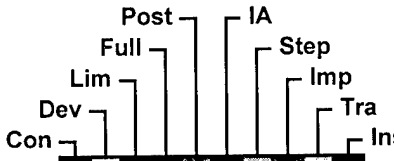
Plan and Perform: AT, With AF POC = TBD

Approve or Accept: AT, With AF POC = TBD

Schedule:

	Con	Dev	Lim	Full	Post	IA	Step	Imp	Tra	Ins
Start Date										
Dur (wk)										999
LoE (sm)										

Dependencies and Phases:



Input from Activity:		Input via Product:
12.8: Develop/Perform Controller Training **12.12: Develop/Perform Maint. Training**	8 8	**12.8.2: Trained Controllers** **12.12.2: Trained Maintenance Personnel**
Required for new procedures. Trained maintenance personnel required to maintain ground system throughout life cycle.		
12.14: Commission Ground Systems	8 8 8	**12.14.1: Commissioned System**
Commissioned system for operational use.		

Interact with Activity:	
13.1: Operate & Maintain Avionics	0 0
Operation and maintenance of avionics may impact ground system operation and maintenance.	

No output dependencies defined

APPENDIX A: ACRONYMS

AAL	FAA Alaskan Region
ACO	aircraft certification office
ADS-B	automatic dependent surveillance - broadcast
AFS	FAA Flight Standards Service
AIM	Aeronautical Information Manual
AIR	FAA Aircraft Certification Service
ALPA	Air Line Pilots Association Intl.
AMS	acquisition management system
AND	FAA Office of Communications, Navigation, and Surveillance Services
AOPA	Aircraft owners and Pilots Association
ASA	airborne separation assurance
ASD	FAA Office of System Architecture and Investment Analysis
ASOR	allocation of safety objectives and requirements
ASSAP	airborne surveillance and separation assurance processing
ASY	FAA Office of System Safety
ATA	Air Transport Association
ATC	air traffic control
ATM	air traffic management
ATP	FAA Air Traffic Planning and Procedures Program
ATS	air traffic services
ASY	FAA Office of System Safety
CAA	Cargo Airline Association
CAASD	Center for Advanced Aviation System Development
CBA	cost benefit analysis
CDTI	cockpit display of traffic information
CFIT	controlled flight into terrain
CHI	computer-human interface
CNS	communications, navigation, and surveillance
CSA	comparative safety assessment
CONOPS	concept of operations
CPDLC	controller/pilot data link communications
DAR	designated airworthiness representative
DER	designated engineering representative
DO-249	document 249 (RTCA)
DOD	Department of Defense
EUROCAE	European Organization for Civil Aviation Equipment
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEDEX	Federal Express
FIS	flight information service
FIS-B	flight information service, broadcast

FSDO	flight standards district office
GA	general aviation
GPS	global positioning satellite
HF	human factors
ICAO	International Civil Aviation Organization
ID	identification
IFR	instrument flight rules
IMC	instrument meteorological conditions
IPT	integrated product team
JRC	Joint Resources Council
LAAS	local area augmentation system
LOA	letter of agreement
LOB	FAA line of business
MASPS	minimum aviation system performance standards
MHz	megahertz
MITLL	Massachusetts Institute of Technology/Lincoln Laboratory
MITRE	MITRE Inc.
MP	Master Plan
MOPS	minimum operational performance standards
NAATS	National Association of Air Traffic Specialists
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NATCA	National Air Traffic Controllers Association
OCG	Operational Evaluation Coordination Group
OHA	operational hazards analysis
OpEval	operational evaluation
OpSpecs	operational specification
ORV	Ohio River Valley
OSA	operational safety analysis
OSED	operational service and environment description
PASS	Professional Airway Systems Specialists
POC	point of contact
PSAC	plan for software aspects of certification
ROM	rough order of magnitude
RTCA	RTCA Inc. (formerly Radio Technical Commission for Aeronautics)
SARPS	standards and recommended practices (ICAO)
SC	special committee (RTCA)
SC-186	special committee 186 (RTCA)
SF21	Safe Flight 21
SM	staff month(s)
SSG	Strategic Support Group
STC	supplemental type certificate
StG	steering group
TBD	to be determined
TC	type certificate
TEMP	test and evaluation master plan

TIS-B	traffic information services - broadcast
TSO	technical standard order
UAT	universal access transceiver
UPS	United Parcel Service
UPSAT	United Parcel Services Aviation Technologies
VDLM4	very high frequency data link mode 4
VFR	visual flight rules
VMC	visual meteorological conditions
VNTSC	Volpe National Transportation System Center
WAAS	wide area augmentation system
WG	working group
WK	week(s)