DOT/FAA/ES-85/01
ATC-85-1070

National Airspace System Interface Management Plan

System Engineering Service
Federal Aviation Administration
Washington, D.C. 20591

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January 1986

U.S. Department
of Transportation
**Federal Aviation
Administration**

U.S. Department of Transportation
Federal Aviation Administration

Memorandum

Subject: ACTION: NAS Interface Management Plan Date:

From: Director, Systems Engineering Service, AES-1 Reply to Attn. of: Morelli:426-7132

To: Acting Associate Administrator for Development & Logistics, ADL-1

The attached "NAS Interface Management Plan" has been developed to implement a systematic process for documenting and managing intersubsystem interfaces in the NAS. The Plan has been briefed to APM-1, AAP-1, and their respective cluster managers. The services have provided comments to this Plan which have been incorporated, and have agreed to adhere to the provisions of this Plan as signified by their concurrence herein.

Your concurrence with the "NAS Interface Management Plan" is requested. Interface Management is an important element in NAS Transition Design and requires early implementation for maximum benefit.

Leland F. Page

Attachment

CONCUR APM-1

CONCUR AAP-1

CONCUR ADL-1 1/10/88

FOREWORD

This document is intended to implement Interface Management for interfacing subsystems of the National Airspace System (NAS) and for external NAS interfaces by establishing a process which assures that:

- Interface requirements are agreed to by interfacing managers and complied with as the development of interfacing subsystems progresses.

- Interface requirements and designs are formally documented and controlled.

- No change which affects interfacing compatibility will be initiated in a design without coordination and agreement between affected subsystems.

These goals are accomplished by continuous systematic surveillance of design development for both hardware and software, NAS system level requirements, subsystem specifications, interface control documentation, and design drawings.

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1.0 INTRODUCTION

1.1 SCOPE

This interface management plan addresses the technical interfaces of the NAS, that is, those hardware and software interfaces among NAS subsystems, between NAS subsystems and cooperating external systems, between NAS subsystems and the facilities into which they are to be installed, and among hardware and software equipment items of NAS subsystems.

This interface management plan also discusses those interfaces of the NAS that are controlled by existing specifications and standards and are not considered within the scope of this plan. These interfaces include personnel to subsystem interfaces, intrasubsystem interfaces, existing subsystem-to-existing subsystem interfaces and those software development and design interfaces documented by existing standards. Further clarification is presented throughout the body of this plan.

1.2 PURPOSE

This interface management plan defines the administrative and technical process for NAS interface identification and definition, interface documentation, and interface control. It identifies the participants in the process and defines their respective roles and responsibilities, and it provides schedules for the development of the necessary requirements and design documentation for controlling the interfaces.

1.3 OVERVIEW

Interface management provides the necessary activity for specifying interface requirements, design, and documentation traceability from interface design performance requirements through test procedures and test reports. Also, it provides a means for presenting, identifying and resolving incompatibilities and determining the interface impacts of design changes. A formalized interface management process (see Figure 1.3-1) is viewed to be essential to the successful accomplishment of interface management activities.

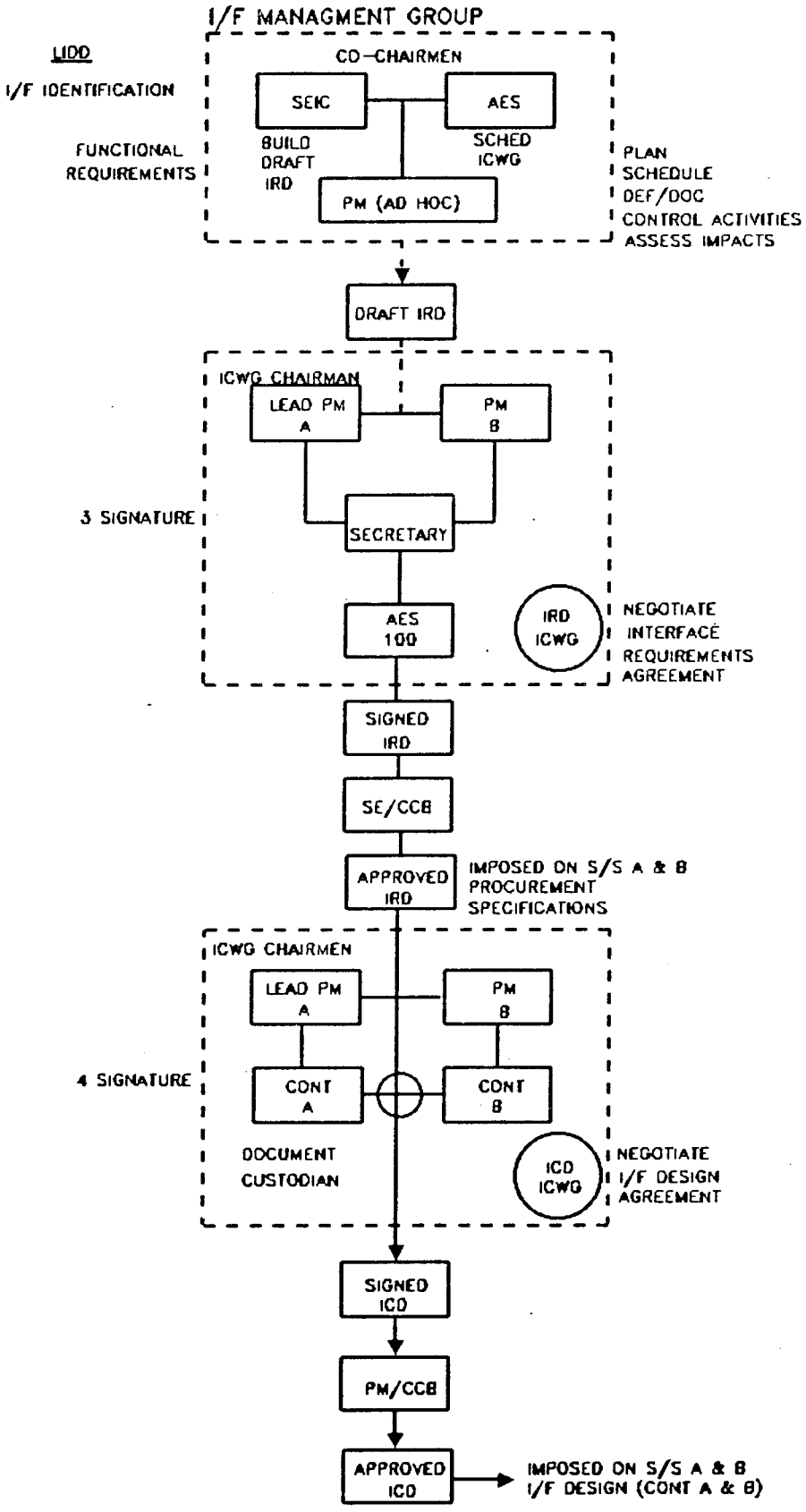


FIGURE 1.3-1 INTERFACE MANAGEMENT PROCESS STRUCTURE

Interface requirements which result from application of the NASSRS, the Level I Design Document, the NAS System Specification and the Interim Requirements Document (TBD) to subsystem procurements are reviewed by the Interface Management Group. This (IMG) group oversees interfaces during development of the NAS Specification and recommends changes to the NASSRS, Level I Design Document, NAS System Specification, NAS Interim Requirements Specification, and subsystem specifications based on evaluation of predicted NAS performance and feasibility of interface designs. This group is a working group with permanent co-chairmen, NAS system designers, and ad hoc project management membership based on agenda items. Minutes and action recommendations of this group are reviewed at scheduled design reviews of the NAS design including SARs and CDR.

Implementation of the requirements for interfaces is accomplished by project representatives through Interface Control Working Groups (ICWG). The ICWG reviews (IMG) prepared Interface Requirement Document (IRD) drafts and ICWG agendas as provided by AES-100 in accordance with the master program schedule and recommendations of project managers.

The interface requirement document (IRD) and the interface control document (ICD) are the primary documents used in the interface control process. The IRD is a formal agreement among interfacing subsystems project managers and AES-100 which documents the functional, performance, and verification requirements for the NAS technical interfaces. The ICD is a formal agreement between interfacing subsystem Project Managers and the subsystem development contractors, which documents how the interface requirements are implemented in the design of the respective subsystem/equipment item.

Interfaces are identified and the development and control process formulated as part of the contractors' statements of work (SOW). The SOW and contract data requirements list (CDRL) for contractors and memoranda of agreement for participating FAA organizations specify the responsibilities for development and control of each interface.

2.0 APPLICABLE DOCUMENTS

2.1 COMPLIANCE

The following documents contain requirements and constraints which will be imposed on the NAS interface management activities and documentation, and are included in this plan. The latest revision of these documents will apply.

STANDARDS:

FAA

FAA-STD-005	Preparation of Specification Documents
FAA-STD-021	Configuration Management (Contractor Requirements)
FAA-STD-025	Preparation of Interface Control Documents
FAA-STD-029	Selection and Implementation of Telecommunications Standards

Military

MIL-STD-1521	Technical Reviews and Audits for Systems, Equipments, and Computer Software
DOD-STD-2167	Defense System Software Development

International Standards Organization (ISO)

ISO 7498	Information Processing System - Open Systems Interconnection - Basic Reference Model

OTHER PUBLICATIONS:

FAA

FAA order 1800.8	NAS Configuration Management

NAS Program

ATC-85-006	NAS Master Transition Plan
NAS-DD-1000	NAS Level I Design Document
NAS-SR-1000	NAS System Requirements Specification
NAS-SS-100000	NAS System Specification
NAS-MD-790	Remote Maintenance Monitoring System (ICD)
(TBD)	NAS Interim Requirements Specification

2.2 REFERENCE

The following documents are related to the NAS interface management activities defined in this plan and will be referenced for interface management activities. The latest revision of these documents will apply.

STANDARDS:

Military

MIL-STD-1472	Human Factors Engineering

3.0 APPROACH

3.1 INTERFACE IDENTIFICATION AND DEFINITION

3.1.1 Technical Interface

A technical interface is a common functional and/or physical boundary where hardware, software, and/or personnel interact. Physical Interfaces are interfaces associated with material contact. They are described in terms of mechanical, electrical/electronic, envelope, and environmental characteristics. Functional interfaces are interfaces which intereact across non-material boundaries, and are described in terms of information transfer characteristics per the International Standards Organization/Open System Interconnection (ISO/OSI) seven layer model as discussed herein and in ISO 7498. In the NAS, there are functional and physical interfaces within subsystems which are (intrasubsystem) interfaces between NAS subsystems or between subsystems and external systems which are (intersubsystem) interfaces between subsystems and their host facilities that are (facility interfaces), and interfaces between subsystems and NAS operations and maintenance personnel that are personnel interfaces.

3.1.2 Intersubsystem Interfaces

Intersubsystem interfaces are hardware/software interfaces among subsystems of the NAS, and between external systems and NAS subsystems. Included are those interfaces between components of the same subsystem when a connection is via another subsystem i.e., a path between two elements of subsystem A connected by subsystem B to form an A:B, B:A path. (In these cases the communications path consists of two or more subsystems, where the Interface Requirements Documents and Interface Control documents are required). Intersubsystem interfaces may include one or more of the communication service IRD's (referenced in section 4.0). These interfaces are further defined in the NAS Subsystem Specification, the NAS Master Transition Plan, and the appropriate subsystem procurement specifications. Requirements for the above identified interfaces will be further specified in the IRD's developed for the interfaces, and the resultant interface designs will be documented and

controlled in Interface Control Documents. Several types of intersubsystem interfaces are considered in this plan (see Figure 3.1.2-1, NAS Interface Types).

3.1.2.1 Subsystem A - Comm - Subsystem B (A-C-B)

The interface between two interacting subsystems (A & B), which require an intervening communications service (C), is perhaps the most common type of interface in a distributed or deployed system like the NAS. The Functional interface is between A and B for the necessary interaction, and between A & B, and the communications service, C, for the communications requirements (e.g. signal levels, protocols, switching requirements). The physical interfaces are between A and C, and between C and B.

The functional, performance, and verification requirements for the A-C-B type interface are documented in an IRD signed by the interfacing Project Managers and AES-100. The IRD will reference a communications standard interface IRD for the communications portion of the information transfer portion of the document. (See section 3.1.2.3)

The physical design of the interface is documented in a communications standard ICD for the communication service used to implement the A-B interface. (See Section 3.1.2.5)

The A-C-B IRD and the included Communications Standard IRD's are controlled in accordance with FAA order 1800.8 by the NAS/Systems Engineering Configuration Control Board (SE/CCB).

The communications standard ICD is controlled in accordance with FAA Order 1800.8 by the NAS/Project Management CCB.

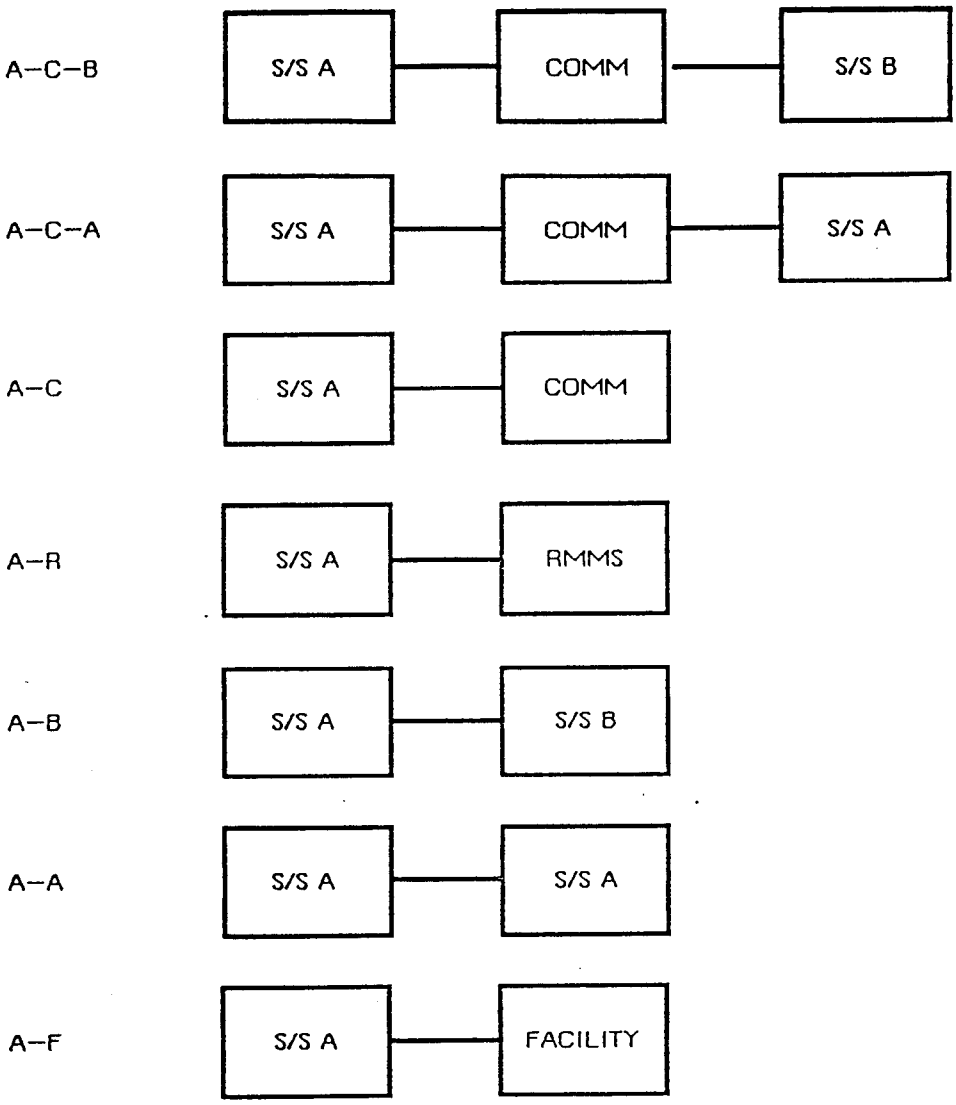


Figure 3.1.2-1 NAS INTERFACE TYPES

3.1.2.2 Subsystem A - COMM - Subsystem A (A-C-A)

In distributed or deployed systems such as the NAS, subsystem equipment are often installed at geographically separate facilities (e.g. sensors remoted from their processors), and connected via a communications service. The subsystem equipment to equipment functional interface via the communications service is an intrasubsystem interface under the cognizance of the subsystem project manager.

The functional and physical interface requirements between the separated subsystem and the communications service will be handled by Communications Standard IRD and ICD. The interface design will be documented in an ICD between the separated subsystem Project Manager and his development contractor, and the appropriate communications subsystem Project Manager and his development contractor. The functional interface between the separated subsystem equipments may be handled by IRD and ICD at the discretion of the subsystem Project Manager. He would be the approval authority for the IRD, and his development contractors would each sign the ICD.

The Communications Standard IRD's are controlled by the SE/CCB. The ICD between the separated subsystem and the communications subsystem are controlled by the PM/CCB. Intrasubsystem interface between separated equipments are controlled by the subsystem Project Manager.

3.1.2.3 Subsystem A - COMM Standard Interface (A-C)

In order to accommodate the many subsystem in the NAS that interact through the NAS Interfacility Communications System (NICS), Communications Standard Interfaces are being defined for the major services. The functional and physical interfaces are referred to as type A-C, where A is using subsystem, and C is the communications service subsystem.

Communication standard interface requirements are documented in standard IRD's that are imposed on all using subsystems. These documents control the functional requirements for user subsystems, as well as any physical design constraints imposed by the communications service subsystem design. Details of the physical interface designs are documented in ICD's between using subsystem Project Managers, and interfacing communications service subsystem Project managers, and their development contractors.

Communications standard IRD's are controlled by the SE/CCB, and ICD's are controlled by the PM/CCB.

3.1.2.4 Subsystem A - RMMS Standard Interface (A-R)

RMMS standard interfaces are similar to the Communications standard interfaces. A set of interface requirements which apply to all subsystems which are monitored/controlled by the RMMS define the standard interface, referred to as type A-R interface. The functional and physical interfaces are between the monitored subsystem and the RMS/RMSC, MDT, or MPS subsystems of the RMMS.

RMMS standard interface requirements are documented in standard IRD's, as in communications standard interfaces. Interface designs for physical interfaces to RMMS are documented in ICD's between the monitored subsystems and RMMS Project managers, and their contractors.

RMMS standard IRD's are controlled by the SE/CCB. ICD's are controlled by the PM/CCB.

3.1.2.5 Subsystem A - Subsystem B (A-B)

When two interacting subsystem interface directly without an intervening communications service, the interface is referred to as A-B. The functional and physical interfaces are between the two interacting subsystems.

Directly interfacing subsystems interface requirements are documented in IRD's between the two interfacing subsystem Project Managers. Physical, functional interface designs are documented in ICD's between the interfacing subsystem Project Managers and their development contractors.

Interface requirements for directly interfacing subsystems are controlled in IRD's by the SE/CCB. ICD's documenting the interfacing designs are controlled by the PM/CCB's chaired by AAP, and APM, as appropriate.

3.1.3 Intrasubsystem Interfaces

Intrasubsystem interfaces are hardware/software interfaces other than intersubsystem interfaces within a single NAS subsystem, and are identified and defined in the subsystem procurement specifications for the appropriate subsystems. Intrasubsystem interfaces, referred to in Figure 3.1.2-1, as A-A, are direct interfaces among subsystem equipments without intervening intersubsystem communications services. The functional and physical interfaces are between equipments of the same subsystem.

Intrasubsystem interface documentation is at the discretion of the cognizant subsystem Project Manager. It is recommended that for equipment-equipment interfaces within a single subsystem where the equipments are under development by different contractors, the IRD & ICD documents be used as for intersubsystem interface documentation.

Control of intrasubsytem interfaces is accomplished within the cognizance of a single subsystem Project Manager, and need not involve the NAS CCB at any level, unless the interface has impact on another subsystem, or NAS facility.

3.1.4 Facility Interfaces

Facility interfaces are hardware interfaces resulting from subsystem designs requiring floor space, specific environmental control, external power source, external monitoring and control, and other support as may be required by a host facility for NAS subsystems. Facility interfaces to NAS subsystems will be as defined in NAS-DD-1000, ATC-85-006, and NAS-SS-100000. Further

definition will be included in NAS standard facility designs, and in installation drawings for the subsystems installed at a designated facility.

Facility interface requirements referred to in (Figure 3.1.2-1), as A-F are developed for host facility types into which NAS subsystems will be installed (e.g., ACF, AFSS, RCF). The functional and physical interfaces are between the facility and the hosted subsystems.

Facility interfaces will be documented in Facility IRD's that govern the requirements for all subsystems hosted in a particular facility type. ICD's and installation drawings detailing the interface design will be developed for each subsystem, and tailored to the specific sites.

Standard facility IRD's will be controlled by the SE CCB. Site specific installation drawings will be controlled by the PM CCB's (APM & AAP).

3.1.5 Personnel Interfaces

NAS Personnel interfaces are the points of interaction between NAS subsystems and NAS operations and maintenance personnel. NAS Personnel interfaces are identified in the NAS-DD-1000, NAS-SS-100000, and further defined in the appropriate subsystem procurement specifications. Personnel interfaces are not within the scope of this plan.

3.1.6 Interim Interfaces

Interim interfaces are interfaces required for NAS transition that do not exist in the 1985 NAS and are not required by the 1995 NAS. The interim NAS technical interfaces of interfacing subsystems and to the external systems are as identified in the ATC-85-006.

3.1.7 External Interfaces

External technical, functional or physical interfaces between subsystems of the NAS and cooperating systems under cognizance of other agencies will be identified, defined, and controlled in the same manner as intersubsystem

interfaces. Exceptions are those procedural or documentation differences required by the interfacing external subsystem development/operating organization, and are agreed to by the FAA approval authority. External interfaces include, but are not limited to the following:

Military ATC
MBO
Air Force Global Weather Central
NORAD
NWS
Airline Dispatch Office
Foreign ATC
GOES (East/West)
Satellite Field Service Station
ARINC
Airports, Lights
FBO
International Users, (ICAO Members), AFTN
NOAA
OAG
Avionics

3.2 INTERFACE DOCUMENTATION

3.2.1 NAS System Requirements Specification

3.2.1.1 Definition and Content

The NAS System Requirements Specification (NASSRS), NAS-SR-1000, is the top NAS System Requirements document for the 1995 NAS, and was baselined March 21, 1985. The contents are a compilation of required operational capabilities for the National Airspace System as envisioned to exist when the NAS Plan for Facilities, Equipment and Associated Development is implemented. In that context, NAS-SR-1000 includes the existing and transitional system capabilities that will exist in the 1995 NAS. The primary intention of NAS-SR-1000 is for FAA internal use as a management tool in support of the NAS design, engineering, acquisition activities, and to manage and control change to the NAS operational requirements.

3.2.1.2 Document Relationship

NAS-SR-1000 is the compliance document for NAS-DD-1000 and the ATC-85-006 that reflects the operational capabilities of the existing and the 1995 NAS.

3.2.1.3 Change Control Authority

NAS-SR-1000 is under the control of the NAS Configuration Control Board (CCB), which approves all changes to the document in accordance with FAA order 1800.8. The custodian of the NASSRS AES-200

3.2.2 Level I Design Document

3.2.2.1 Definition and Contents

The Level I Design Document, NAS-DD-1000 is the top functional requirements document for the 1995 NAS. NAS-DD-1000 has been baselined as the interim NAS System Specification (October 5, 1984), and will remain the design control authority for the NAS until such time as the NAS System Specification (NAS-SS-100000) has been approved.

The 1995 NAS functional interfaces among subsystems, and to external systems are identified in the NAS-DD-1000.

3.2.2.2 Document Relationship

NAS-DD-1000 is the compliance document for the NAS system specification which further defines the functional requirements of the 1995 NAS.

3.2.2.3 Change Control Authority

NAS-DD-1000 is under the control of the NAS CCB which approves all changes to the document in accordance with FAA Order 1800.8. The custodian of the Level I Design Document is AES-200.

3.2.3 NAS Master Transition Plan

3.2.3.1 Definition and Contents

The NAS Master Transition Plan (ATC-85-006) was developed as part of the NAS Transition Design and shows the overall plan for the National Airspace System implementation as it evolves from 1985 to the NAS Plan end-state. ATC-85-006 represents the overall transition strategy and provides guidance and direction to Program Managers and others as they develop detailed project implementation plans.

3.2.3.2 Document Relationship

ATC-85-006 is the compliance document for the NAS Interim Requirements specification which further defines the functional performance interface requirments for all interim transition subsystems.

3.2.3.3 Change Control Authority

ATC-85-006 will be approved and controlled by the SE/CCB. The custodian of the document is AES-100. When the document is under configuration control, change authority will be the NAS Change Proposal (NCP) process in accordance with FAA Order 1800.8.

3.2.4 NAS System Specification

3.2.4.1 Definition and Contents

The NAS System Specification, NAS-SS-100000 will specify the functional, performance, interface, support and verification requirements of the 1995 NAS. When approved NAS-SS-100000 will be the design control authority for the NAS, replacing the NAS-DD-1000.

The 1995 NAS intersubsystem and external interfaces are specified in the NAS-SS-100000 by functional and performance requirements for each interface.

3.2.4.2 Document Relationship

NAS-SS-100000 is compliant with the NAS-SR-1000, and the NAS-DD-1000 Documents. NAS-SS-100000 will be the source document for all end-state IRD's and ICD's. These documents will comply with and further define the requirements contained in the NAS System Specification for the subject interfaces.

3.2.4.3 Change Control Authority

NAS-SS-100000 will be approved and controlled by the SE/CCB. Change Control Authority is through the NCP process in accordance with FAA-Order 1800.8. The document custodian for the NAS-SS-100000 is AES-200.

3.2.5 NAS Interim Requirements Specification

3.2.5.1 Definition and Contents

The NAS Interim Requirements Specification will contain requirements for interim configurations of the NAS thru 1995. It will contain the system level interface requirements for the NAS as the 1995 end-state transition is accomplished.

3.2.5.2 Document Relationship

The NAS Interim Requirements Specification is compliant with the NAS Plan, NASSRS, NAS System Specification and the NAS Master Transition Plan.

3.2.5.3 Change Control Authority

The NAS Interim Requirements Specification will be approved and controlled by the SE/CCB . The custodian of the NAS Interim Requirements Specification is AES-100.

3.2.6 Interface Requirement Document (IRD)

3.2.6.1 Definition and Contents

The purpose of an IRD is to formalize, document and impose interface design requirements. The Interface Requirement Document is the requirements specification for an interface. It contains the functional, performance, and verification requirements for the interface which have been derived from the NAS-DD-1000, NAS-SS-100000, NAS Interim Requirements Specification and the existing subsystem interface documentation.

The IRD is a formal agreement which will establish design requirements for interfaces between subsystems, external systems, or a subsystem and its supporting facility.

3.2.6.2 Document Relationship

The IRD will be compliant with NAS-DD-1000, NAS-SS-100000, and ATC-85-006. The IRD in turn, is a compliance document for the interfacing subsystem specifications and the ICD's developed for the same interfacing subsystems.

3.2.6.3 Development Criteria

IRD's are required for all technical interfaces among NAS subsystems, between NAS subsystems and external systems, and between NAS subsystems and the facilities in which they are to be installed, except in those instances where the interfacing project managers and System Engineering (AES-100) agree that the requirements are described sufficiently in the procurement specification or ICD have been incorporated in the completed design.

3.2.6.4 Development Responsibility

AES-100 will develop draft IRD's for NAS intersubsystem and external interfaces. One IRD will document each planned NAS intersubsystem interface and each external interface except as noted in section 4.0, Standard Interfaces. There will be one IRD for each facility that will include the interface requirements for all of the subsystems that it contains.

3.2.6.5 Approval Authority

IRD's will be jointly approved by the interfacing subsystem project managers, and AES-100. Approved IRD's will be provided to subsystem contractors as part of the subsystem procurement package. The draft IRD will be reviewed at the Request for Proposal (RFP) preparation for the earlier subsystem design and the signed IRD will be reviewed at the System Requirements Review (SRR) in accordance with MIL-STD-1521.

3.2.6.6 Change Control Authority

Change Control Authority is through the NCP process in accordance with FAA Order 1800.8. Changes are authorized by the SE CCB, which is responsible for the NAS intersubsystems and external interface requirements. The SE CCB will resolve all conflicts between IRD's and baselined system level documents.

3.2.7 Interface Control Document (ICD)

3.2.7.1 Definition and Contents

The ICD specifies the technical design for an interface. It defines the functional and physical characteristics of the design of the interface between subsystem equipment and software items, or between subsystem equipment or software items and facilities. The ICD documents how interface design requirements have been fulfilled. The ICD identifies, qualifies and controls the characteristics of interfaces between subsystem/equipment or software items or between subsystem/equipments or software items and its supporting facility. The purpose of the ICD is to assure interface compatibility by documenting form, fit, and function required to satisfy installations, checkout and operations. The ICD serves as a record of interface design agreements and as a basis for developing coordinated design changes.

3.2.7.2 Document Relationship

The ICD must be compliant with the related IRD's and interfacing subsystem specifications.

3.2.7.3 Development Criteria

ICD's are required for all technical interface designs that are or would normally be controlled by IRD's. This includes interfaces among the NAS subsystems, between NAS subsystems and external subsystems, and between NAS

subsystems and facilities in which they are to be installed. Where documentation is available to specify existing interface designs, that documentation will be referenced. ICD's will document all applicable interfaces of the NAS in the absence of the required IRD's.

3.2.7.4 Development Responsibility

The designated subsystem contractor (normally, the development contractor for the more mature subsystem) will be responsible for development of the ICD. The designated project manager (normally the project manager for the more mature subsystem) will be responsible for the coordination of interfacing subsystem development contractor for their NAS subsystems ICD's and subsystem interfaces. One ICD will be written for each NAS intersubsystem interface, each external interface, and each subsystem to facility interface. The designated lead contractor will write the document with the support/coordination of the interfacing contractor and the project managers.

3.2.7.5 Approval Authority

ICD's will be jointly approved by the subsystem project managers and subsystem contractors. The draft ICD will be reviewed at the Preliminary Design Review (PDR) of the earlier subsystem design and the signed ICD will be reviewed at the Critical Design Review (CDR) in accordance with MIL-STD-1521.

3.2.7.6 Change Control Authority

Change Control will be accomplished by the NCP process in accordance with FAA Order 1800.8. Changes are authorized by the lowest level of NAS configuration control board which has cognizance over both interfacing subsystems. This will be Program Engineering and Maintenance Service (APM) or Advanced Automation Program (AAP) Project Management (PM) Configuration Control Boards (CCB). The SE CCB will resolve all conflicts between ICD's and IRD's.

3.2.8 Subsystem Procurement Specifications

3.2.8.1 Definition and Content

The subsystem procurement specification will define the design requirements for a subsystem. It will contain the functional, performance, interface, support, and verification requirements for the subsystem.

3.2.8.2 Document Relationship

The subsystems procurement specification will be compliant with NAS-SR-1000, NAS-DD-1000, NAS Interim Requirements Specification, the NAS System Specification, and IRDs as applicable. The subsystem procurement specification in turn, is a compliance document for ICDs. (See Figure 3.2.8.2-1 Interface Documentation Structure.)

3.2.8.3 Change Control Authority

Changes to the subsystem procurement specification will be authorized by the lowest level of NAS configuration control board which has cognizance over the subsystem. This will be APM or AAP PM/CCB. The NAS and SE/CCB will resolve conflicts between the procurement specification and the NAS system level documents. Change Control will be accomplished by the NCP process in accordance with FAA-Order-1800.8.

3.2.9 Preparation of Interface Control Documents (FAA-STD-025)

3.2.9.1 Definition and Content

The Preparation of Interface Control Documents Standard (FAA-STD-025) will establish the format and content, and provide guidance for the preparation and revisions of IRD's and ICD's.

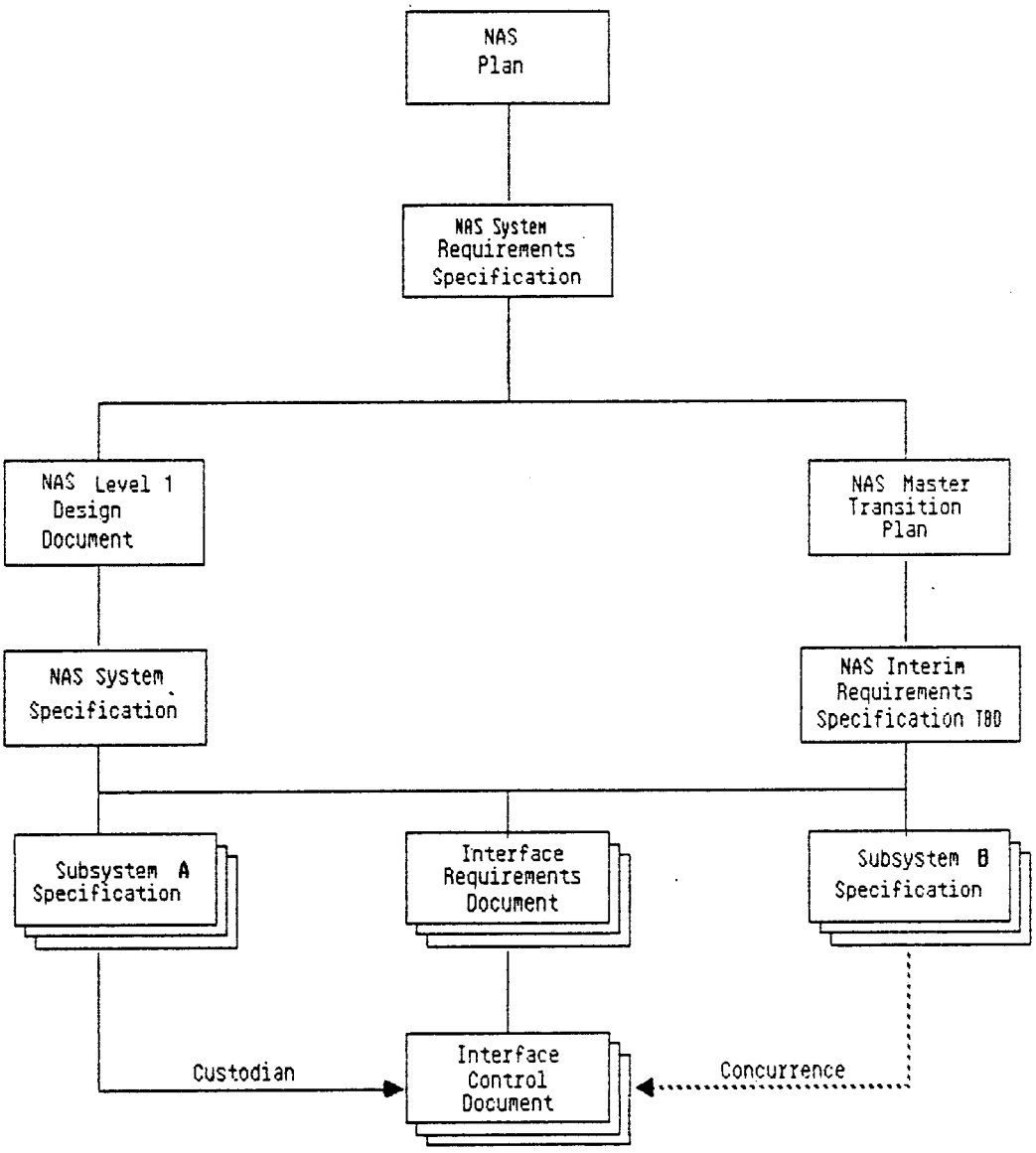


Figure 3.2.8.2-1 NAS Interface Documentation Structure

3.2.9.2 Document Relationship

FAA-STD-025 is in compliance with FAA-STD-005 for format and style requirements used for NAS specifications. FAA-STD-025 is a compliance document for all NAS IRD's and ICD's.

3.2.10 International Standard Organization/Open Systems Interconnection (OSI) Basic Reference Model (ISO-7498)

3.2.10.1 Definition and Content

The International Standards Organization Open Systems Interconnection (ISO/OSI) Base Reference model ISO-7498 has been developed to organize the requirements for information transfer from one subsystem to another. The model and protocols are grouped into seven layers, with each layer built on a series of successive layers that provide specific services for the preceding layer. The two lowest layers, the physical and data-link, deal with the electronic signals and message recognition, related to communications transmission systems. The additional five layers, network, transport, session, presentation, and application are responsible for internetwork connection management, quality of service, dialogue management and control, and the transfer of information from one subsystem to another. (See figure 3.2.10.1-1 ISO/OSI Architecture).

3.2.10.2 Documentation Relationship

The Open System Interconnection model (ISO 7498) is described in FAA-STD-029 and referenced in FAA-STD-025. The Open System Interconnection model will be used to organize the information transfer data for communications and processor-to-processor protocols in the development of NAS IRD's and ICD's.

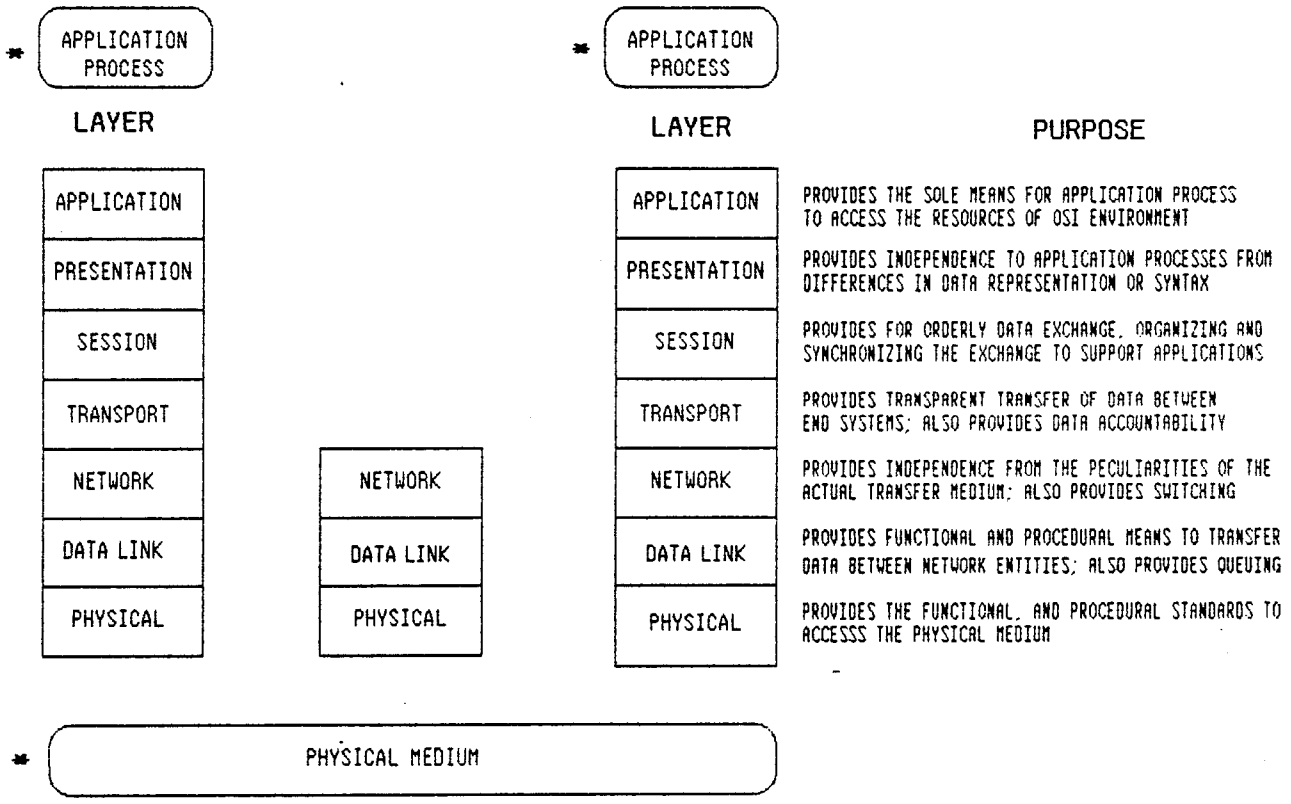


FIGURE 3.2.10.1-1 ISO/OSI Architecture

3.3 INTERFACE CONTROL

3.3.1 Interface Control Process

The interface control process is reliant on several organizations. Technical interface requirements data are developed by AES-100 in the form of an ICWG package consisting of interface plans, schedules, interface identification, and a draft IRD. This data along with a summary of IRD issues to be resolved are then provided to the appropriate Project Managers who will support the completion of the IRD through participation in an ICWG. The IRD will be authorized and approved at the project level and forwarded to AES-100 for their approval signature prior to submission to the SE CCB. Design coordination support in development of technical interface requirement data is provided by AES-200 for the NAS 1995 configuration and AES-100 for interim configurations. Technical subsystem issues will be resolved in the ICWG headed by the project manager of the earlier project. The ICD's will be developed by the designated subsystem contractor and will be reviewed in draft form at the interfacing subsystem PDR's and is final form at the CDR's. The ICD will be approved by the subsystem project managers, AES-100 and contractor when both subsystems are on contract, and by the interfacing subsystem project manager and AES-100 when one side of the interface exists in the field.

3.3.1.1 Interface Requirements Control

Control of functional, performance, and verification requirements for technical interfaces of the NAS is accomplished in the ICWG's resulting in formal agreements (IRD's) between interfacing project managers and AES-100. These IRD's are controlled on the FAA Configuration Management process in accordance with FAA Order 1800.8. The technical interface requirements flow, is from the top down through baseline documents that maintain the requirements traceability path from system to subsystem. The functional, performance and verification requirements for technical interfaces reside in the Engineering Data Base (EDB).

3.3.1.2 Interface Design Control

Technical interface designs will be guided by the interface requirements and controlled by formal agreements of the interfacing project managers and the subsystems contractors. These ICD's are controlled by the FAA Configuration Management process in accordance with FAA Order 1800.8.

3.3.1.3 Application of Control Process

NAS subsystems at this point, are in various states of development from inception to operations. To this end the application control process was developed to meet the NAS technical interface control needs.

Figure 3.3.1.3-1 application control process for IRD's/ICD's supports the identification of technical interface needs across the NAS that are at various states of maturity. The matrix in figure 3.3.1.3-1 is provided in order to assist in the selection of interface documentation needs between two interfacing subsystems of the NAS.

3.3.1.3.1 New Subsystem to New Subsystem

When a new subsystem is in development and the designated interfacing subsystem development is concurrent, (i.e., both subsystems are NAS Plan procurements and neither is operationally fielded) the subsystem reaching maturity first, (i.e. has earlier procurement) will generally be responsible for acquiring agreements of the interfacing project manager or the representative who can authorize interface designs of the designated interfacing subsystem. The above process is equally to the end-state and interim interfaces in the same manner. Requirements will be documented in IRD/ICD as described in 3.2.6.5 and 3.2.7.5 respectively. Situations where the more mature subsystem has already completed SRR will be treated as described in 3.3.1.3.2.

SUBSYSTEM 2

SUBSYSTEM 1	PRE RFP	PRE SRR	PRE PDR	PRE CDR	POST CDR	POST ORD-2 BY 1JULY85
PRE RFP	A	*	*	*	*	*
PRE SRR	B_1	C_1	*	*	*	*
PRE PDR	B_2	C_2	C_5	*	*	*
PRE CDR	B_3	C_3	C_6	C_8	*	*
POST CDR	B_4	C_4	C_7	C_9	C_{10}	*
POST ORD-1 BY 1JULY85	D_1	D_2	D_3	D_4	D_5	D_6

TYPE	CASE	IRD	ICD
NEW TO NEW	A B1 C1	NEGOTIATED IRD PER FAA-STD-025, LIDD, NASSRS, NAS SYSTEM SPECIFICATION COSIGNED BY SUBSYSTEM PMs AND AES-100. IMPOSED ON SUBSYSTEM CONTRACTORS	NEGOTIATED ICD PER IRD AND FAA-STD-025. COSIGNED BY SUBSYSTEM PMs AND CONTRACTORS. IMPOSED ON BOTH CONTRACTORS
	B2 C2	SUBSYSTEM 1 IRD IMPOSED ON SUBSYSTEM 2	NEGOTIATED ICD PER IRD AND FAA-STD-025. IMPOSED ON BOTH CONTRACTORS
	C5 C10	NOT REQUIRED	NEGOTIATED ICD PER LIDD, NASSRS, NAS SYSTEM SPECIFICATION AND FAA-STD-025
	B3 B4 C3 C4 C6 C7 C8 C9	NOT REQUIRED	SUBSYSTEM 1 ICD IMPOSED ON SUBSYSTEM 2
EXISTING TO NEW	D1 D2 D3 D4 D5	NOT REQUIRED	SUBSYSTEM 1 DESIGN IMPOSED ON SUBSYSTEM 2 VIA ICD OR PROCUREMENT SPECIFICATION
EXISTING TO EXISTING	D6	NOT REQUIDED	NOT REQUIRED

Figure 3.3.1.3-1 Application Control Process For IRD's/ICD's

3.3.1.3.2 New Subsystem to Existing Subsystem

When a new subsystem is in development and the designated interfacing subsystem exists in the field, IRD's will be not applicable except under the provision of 3.2.7.3 of this plan, and ICDs will be developed and provided by the designated new subsystem contractor. The above process applies equally to interim interfaces.

3.3.1.3.3 Existing Subsystem to Existing Subsystem

Existing operational subsystem interfaces not identified or scheduled for transition within the NAS, are not within the scope of the Interface Management plan.

3.3.1.4 Intersubsystem Interface Control

Intersubsystem and subsystem/facility interface designs will be controlled by agreements specified in IRDs/ICDs developed between subsystem managers who have project cognizance of separate and distinct projects.

3.3.1.5 Intrasubsystem Interface Control

The method of interface control for intrasubsystem interface design is under the cognizance of a single NAS project manager. Although the documentation methodology will be the same, the interface control provisions are not governed by this plan.

3.3.1.6 Facility Interface Control

Facility interfaces will be controlled by the development of IRD's/ICD's specifying design constraints imposed on subsystems interfacing with specific facilities and design constraints imposed on facilities by subsystems. These requirements will support the development of installation and facility designs.

3.3.1.7 Personnel Interface Control

Control of personnel interfaces identified in NAS-DD-1000 and NAS-SS-100000 are within the scope of MIL-STD-1472. They are not within the scope of this interface management plan.

3.3.1.8 External Interface Control

Control of NAS interfaces to cooperating systems outside the cognizance of the FAA will be accomplished in the same manner as for intersubsystem interfaces. Deviations to the NAS interface control process may be granted where procedural or documentation differences are required and the interfacing project managers and AES-100 are in agreement. Such deviations will be subject to the approval of the FAA approval authority (i.e. the NAS PM and SE CCB as appropriate).

3.3.1.9 Interface Verification Control

Interface Verification occurs at different stages of NAS subsystem development. Each IRD will contain a section 4, Quality Assurance Provisions, that defines which contractor organization is responsible for the verification of each interface requirement specified in the IRD. The procurement specification, section 4 and subsystem test plans define the verification requirements for those interfaces allocated to that subsystem. Those interface requirements needing system level verification will be covered in the NAS Master IRD, the NAS System Specification, verification plan and appropriate subsystem integration test plans.

The ICWG will assure that the appropriate verification activities are identified and assigned.

3.3.2 Interface Management Group (IMG)

3.3.2.1 Charter

The NAS Interface Management Group will provide technical support in the SARs, PDR's, CDR's, and to the entire interface management process. This management group will continue to evaluate interface designs to assure that they meet the NAS system functional and performance requirements. Functional, physical and facility interfaces, including hardware, software, and operation maintenance personnel interfaces will be considered among NAS subsystems and to external systems. Emphasis will be placed on critical relationships which require interorganizational coordination and delegation of interface tasks to be performed by the ICWGs.

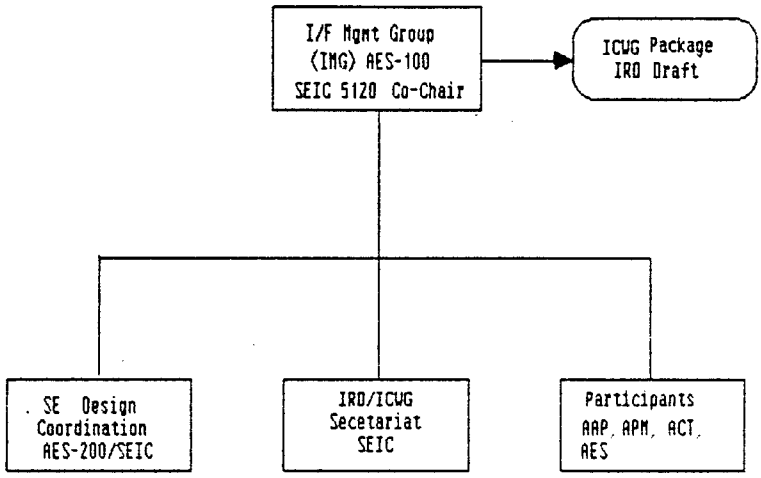
3.3.2.2 Participation

The Interface Management Group is co-chaired by AES-100 and SEIC Interface Management and will include representatives from AAP, the ACT, AES, and APM as appropriate for the agenda discussions. See Figure 3.3.2.2-1 Interface Management Organization.

3.3.3 Interface Control Working Groups (ICWG)

3.3.3.1 Charter

Two types of interface control working groups will be chartered to provide the forum for facilitating the coordination of interface control activities. The two types of working groups are, the ICWG's which will provide the forum for the coordination and endorsement of interface agreements for IRD's and the ICWG's which will provide the forum for interface designs as documented in the ICD's as further defined in the following paragraphs.



ICWG Package

- Interface Plans / schedules
- Interface Identification
- Interface Incompatibilities Identification
- Interface Requirements

Figure 3.3.2.2-1 Interface Management Organization Structure

3.3.3.2 Participants

Participants of the ICWG's will include, but are not limited to, the interfacing subsystems' project managers AAP, APM and/or their representatives, System Engineering representatives AES as required for the IRD/ICWG's, the secretariat, and subsystem contractors as appropriate. Participants for the ICD/ICWG's consist of basically the same representatives and the subsystems contractors with the exception of AES.

3.3.3.3 Interface Requirements Documents

The Interface Control Working Groups (ICWG) for IRD's will be responsible for the identification, definition, and resolution of incompatibilities of technical interface requirements. The ICWG for a given interface will consist of Project Managers of the interfacing subsystems, appropriate subsystem engineering personnel (e.g., Advanced Automation Project, Support Project Management, and Federal Aviation Administration Technical Center (FAATC), support personnel or development contractor). The ICWG will be chaired by the project manager of the more mature subsystem, and AES-100 will provide the ICWG secretariat. When an IRD is developed and provided to the interfacing project managers and no requirement deficiencies or incompatibilities exist, a formal ICWG meeting will not be required. The interfacing project managers and AES-100 will sign the IRD and forward it to the appropriate CCB. (See Figure 3.3.3.3-1 Interface Requirements Document ICWG Structure)

3.3.3.4 Interface Control Documents

The ICWG responsible for resolving incompatibilities during development of an ICD will consist of the interfacing subsystem Project Managers, appropriate subsystem engineering personnel and subsystem development contractors.

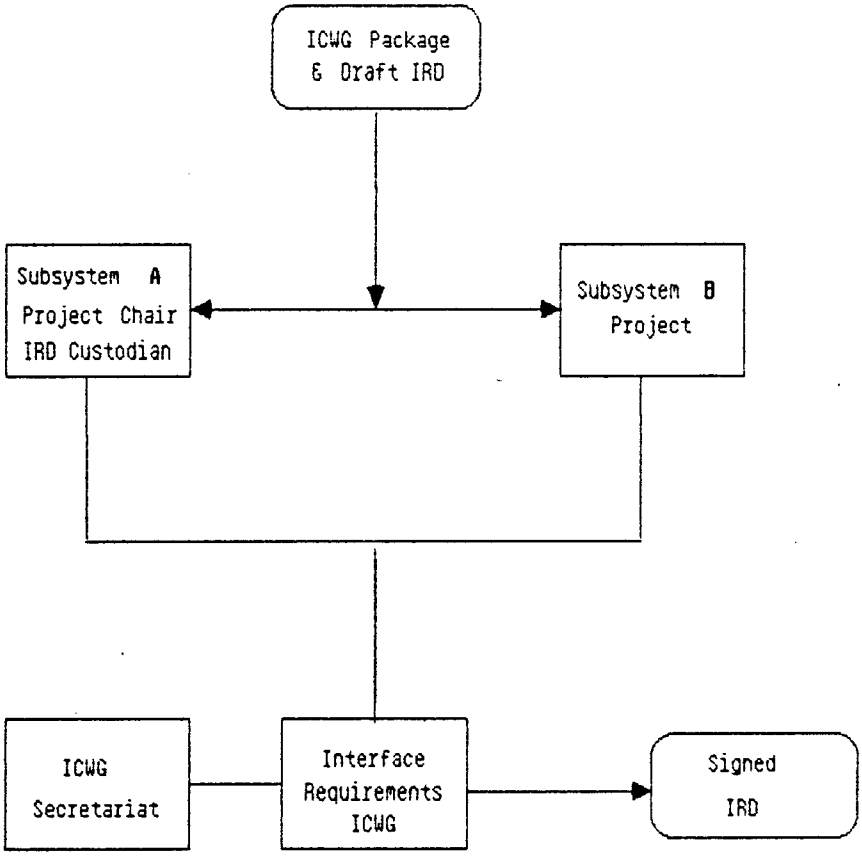


Figure 3.3.3.3-1 Interface Requirements Document ICWG Structure

The project manager of the more mature subsystem will chair the ICWG, and the development contractor, designated by the ICWG chairman to be the custodian of the ICD, will provide the ICWG secretariat. When an ICD is developed and all incompatibilities have been resolved, the interfacing project managers and subsystem contractors will sign the ICD and forward the ICD to the appropriate PM/CCB. When interfacing subsystem contractors are out of phase during subsystems development and design, the ICD signatories will be the FAA project managers and the subsystem contractor under contract. After CCB approval the ICD will be levied on the out-of-phase subsystem contractor with the Request for Proposal (RFP) for the interfacing subsystem design. (See Figure 3.3.3.4-1 Interface Control Document ICWG Structure).

3.3.3.5 Software Interface Documents

Interface Requirements Specifications IRS's and Interface Design Documents (IDDs), as described in DOD-STD-2167, are documents used for the development of software programs within a single subsystem and are not within the scope of this interface management plan. Software interfaces across a subsystem boundary will be documented by IRD's & ICD's.

3.3.4 NAS Configuration Management (FAA Order 1800.8)

3.3.4.1 Definition and Contents

FAA Order 1800.8, defines the requirements for establishing and sustaining the NAS Configuration Management Program. It contain the policy and responsibilities related to the three NAS configuration management life cycle phases: requirements determination, acquisition process, and operational support. It defines the NAS configuration management process, and the NAS CCB structure.

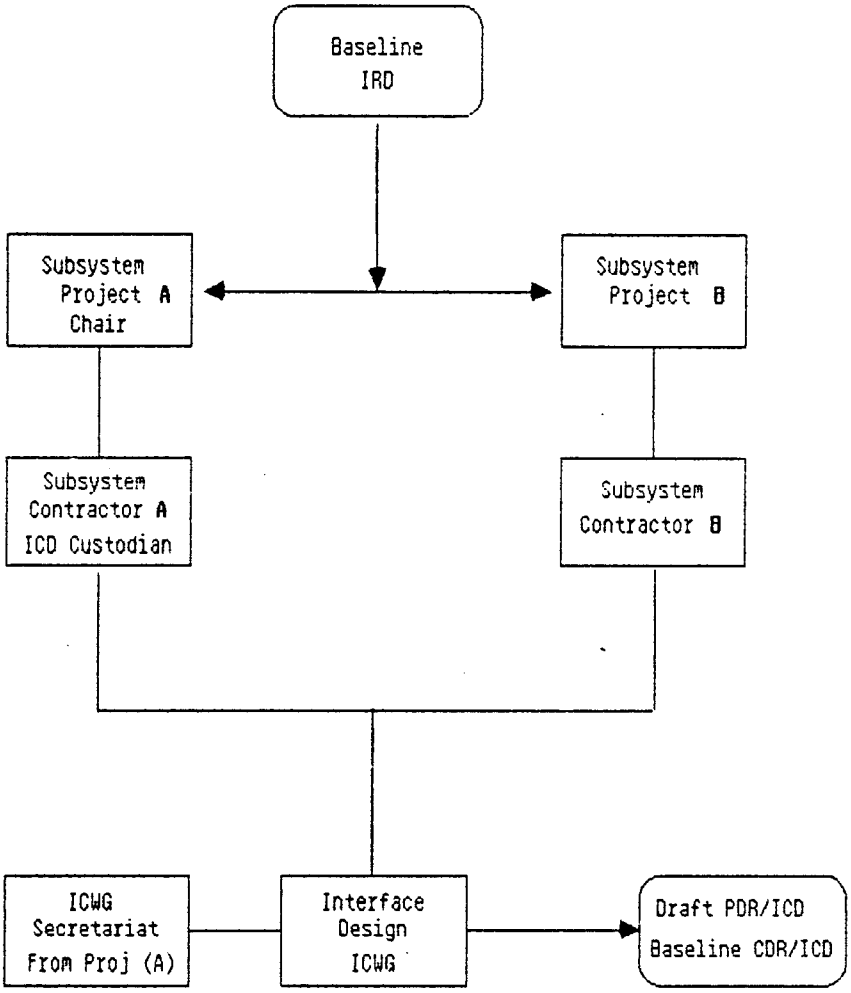


Figure 3.3.3.4-1 Interface Control Document ICWG Structure

3.3.4.2 Document Relationship

The emphasis on technical management of the NAS design mandates exercising Configuration Management over NAS technical documentation as systems evolve through the NAS life cycle phases. Procedure authority for proper coordination of IRD/ICD changes are documented in FAA Order 1800.8 for case file/NCP change process, for CCB baseline and change procedures. Authority for IRD/ICD preparation and revision is through the use of Interface Revisions (IR's) contained in FAA-STD-025. The Interface management plan contains the process for management of NAS technical interfaces, determination of interface issues, resolutions and maintenance of agreements. Configuration control of documents that control interface requirements and design (IRD's and ICD's) will be carried out in accordance FAA order 1800.8.

4.0 STANDARD INTERFACES

4.1 COMMUNICATIONS

The communications links, transmission equipment, and associated interfaces for the NAS are extensive. To expedite and insure standardization, the communications interfaces will be documented standard IRD's. These IRDs will be defined as "design-to" requirements for all subsystems that require the services provided by the Communications element. Examples of standardized "design-to" IRD's that will be developed include: NADIN PACKET MODE, NADIN ASYNCHRONOUS, NADIN PC/PAD SYNCHRONOUS, LEASED LINE, DATA MUX, Circuit Routing Unit (CRU) and Local Communications Network (LCN).

4.2 REMOTE MAINTENANCE MONITORING SYSTEM (RMMS)

Standard interfaces between subsystems and Remote Monitoring Subsystem Concentrator (RMSC) defined in NAS-MD-790. Maintenance Processor subsystem (MPS) to MPS, RMSC to Maintenance Data Terminal (MDT) and MPS to other NAS Subsystems are considered within the scope of the interface control process, as intersubsystem interfaces, and will be documented in standard IRD's wherever possible, and in individual intersubsystem IRD's where not possible.

4.3 FACILITIES

Technical interface requirements for standard facility types, between NAS developed subsystems when NAS subsystems and their host facilities will be documented by Standard IRD's. These documents will contain the interface requirements data for subsystems that will be installed in ACF, AFSS, ATCT, NAWP, ATCCC, and TMCC. This data will provide the necessary subsystem design requirements to support the installation design process.

5.0 INTERFACE MANAGEMENT IMPLEMENTATION

5.1 SUBSYSTEMS INTERFACE CONTROL DOCUMENTATION REQUIREMENTS

Appendix I is a list of subsystem interfaces requiring IRD's/ICD's for both the 1995 NAS configurations and the interim NAS configurations. Interfacing subsystems are identified with projected or established dates for their respective preliminary Design Reviews (PDR) and Critical Design Review (CDR).

5.2 FACILITIES INTERFACE CONTROL DOCUMENTATION REQUIREMENTS

Appendix II is a list of facility interfaces requiring IRD's/ICD's for both the 1995 NAS and the NAS transition Configurations. Interfacing subsystems are identified with projected or established dates for their respective PDR's and CDR's.

5.3 WORKING GROUP ROLES AND RESPONSIBILITIES

The Interface Control Working Group (ICWG) roles and responsibilities are summarized in Appendix III for IRD ICWG's for ICD ICWG's and for supporting Technical Interchange Meetings (TIM's).

6.0 GLOSSARY

AAP	Advanced Automation Program Office Organization
ACT	Technical Center Organizational Code
AES	System Engineering Service Organization
ACF	Area Control Facility
AFTN	Aeronautical Fixed Telecommunications Network
AFSS	Automated Flight Service Station
ARINC	Aeronautical Radio, Incorporated
APM	Program Engineering and Maintenance Service Organization
ASR-9	Airport Survillance Radar-Model9
ATC	Air Traffic Control
ATCCC	Air Traffic Control Command Center
ATCT	Airport Traffic Control Tower
CCB	Configuration Control Board
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CM	Configuration Management
CRU	Circuit Routing Unit
CD	Collision Detection
DoD	Department of Defense
EDB	Engineering Data Base
FAA	Federal Aviation Administration
FAATC	Federal Aviation Administration Technical Center
FBO	Fixed Base Operations
F&E	Facility and Equipment
GOES	Geostationary Operational Environmental Satellite
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
ICWG	Interface Control Working Group
IDD	Interface Design Document
IMG	Interface Management Group
IR	Interface Revision
IRD	Interface Requirements Document
IRS	Interface Requirements Specifications
ISO	International Standards Organization

LCN	Local Communications Network
MBO	Military Base Operations
MDT	Maintenance Data Terminal
MPS	Maintenance Processor Subsystem
NADIN	National Airspace Data Interchange Network
NAS	National Airspace System
NASSRS	NAS System Requirements Specification
NAWP	National Aviation Weather Processing
NICS	NAS Interfacility Communications System
NCP	NAS Change Proposal
NOAA	National Oceanographic and Atmospheric Administration
NORAD	North American Air Defense Command
NWS	National Weather Service
OAG	Official Airline Guide
OSI	Open Systems Interconnection
PDR	Preliminary Design Review
PM	Project Management
RCF	Remote Communications Facility
RCL	Radio Communications Link
RFP	Request for Proposal
RMS	Remote Monitoring Subsystem
RMMS	Remote Maintenance Monitoring System
RMSC	Remote Monitoring Subsystem Concentrator
SAR	System Analysis Review
SE	System Engineering
SEIC	System Engineering Integration Contractor
SOW	Statement of Work
SRR	System Requirements Review
STD	Standard
TBD	To Be Determined
TBS	To Be Supplied
TMCC	Traffic Management Computer Center
UHF	Ultra High Frequency
VHF	Very High Frequency