11 REGULATION AND CERTIFICATION ACTIVITIES AFFECTED BY NEW NAS ARCHITECTURE CAPABILITIES

The FAA's regulation and certification mission is carried out primarily by the Regulation and Certification (AVR) organization. AVR is responsible for aircraft and aircraft component certification, continued airworthiness monitoring and inspection, and new or revised flight regulations that change operating procedures. The other FAA organizations that perform regulation and certification activities related to their primary mission are Air Traffic Services (ATS) and Research and Acquisitions (ARA).

ATS is responsible for ground-based equipment acceptance and certification. It also revises controller operational procedures and orders as necessary to achieve the full benefits of the modernization effort. Most ground-based systems described in the NAS architecture will have an ATS acceptance and certification requirement.

ARA develops initial functional and performance specifications for products with the sponsoring organization during the Integrated Product Team process. If the system produces electromagnetic signals, the Office of Spectrum Policy and Management (ASR) develops additional performance specifications, such as what portion of the radio frequency spectrum the system will use and parameters for radio frequency interference protection. Prior to system implementation, ARA conducts initial evaluations to ensure products meet requirements.

For NAS architecture purposes, the FAA's regulation and certification activities can be divided into three broad categories: ground-based components, airborne components, and procedures/rulemaking. However, certification processes may vary on a case-by-case basis. That is, each product has a unique set of variables that affect the length of the certification process. Following is a high-level discussion of the complex, cross-organizational certification mechanisms required by the FAA.

11.1 Ground-Based Components

Most of Part III, NAS Architecture Description, addresses ground-based air traffic control systems that the FAA will acquire as part of NAS modernization. The organizations responsible for ground-based equipment acceptance and certification are determined by the equipment's function and intended use. Some systems may require acceptance and certification from both the Airway Facilities Service (AAF) and Air Traffic Service (AAT);[1] others may require action by only one. For example, the Host/Oceanic Computer System Replacement (HOCSR) described in Sections 21, En Route, and 22, Oceanic and Offshore, will require AAF acceptance and certification for initial operating capability (IOC) based on specific parameters developed for this equipment. Typically, one formal parameter to declare IOC involves having technicians properly trained in system maintenance. Transition from IOC to operational readiness demonstration (ORD) is the responsibility of AAT.

The transition to ORD typically involves a period of dual operation of the old and new systems so that personnel can gain confidence and operational experience with the new equipment. Although the HOCSR, for example, probably will not require any specific controller training, training for other infrastructure systems is an important requirement that must be satisfied before the transition to ORD can begin. ATS will also be responsible for any changes to procedures enabled or required by the new system (see paragraph 11.3, Procedures/Rulemaking, for further discussion).

11.2 Aircraft Components

Many of the new capabilities and modernization efforts described in the NAS Architecture Version 4.0 depend on equipping aircraft with certified avionics. AVR is responsible for all airborne certification and procedural regulatory activities. Within AVR, the Aircraft Certification Service staff is responsible for certification related to de-

1. The Airway Facilities Service (AAF) and Air Traffic Service (AAT) are sub-organizations within the Air Traffic Services (ATS) organization.

sign, production, and installation approvals for aircraft, aircraft modifications, and aircraft appliances as well as for monitoring manufacturers after approvals are issued. Specialists in aircraft certification offices (ACOs) located throughout the United States perform certification approval and manufacturer monitoring. The applicants are ultimately responsible for demonstrating to the FAA ACO representatives that their designs comply with all applicable federal regulations. In general, certification processes lead to the same three required approvals: design approval, production approval, and installation approval.

Several methods are used to certify aircraft equipment such as avionics, but these methods only apply to aircraft that have Type Certificates. Avionics can be certified through an Amended Type Certificate, Parts Manufacturer Approval, Technical Standard Order Authorization, Supplemental Type Certificate, Form 337 Field Approval, or approval under an Operating Certificate (the airline equivalent of a Form 337 Field Approval).

Certificated aircraft have a Type Certificate and Production Certificate based on the approved type design drawings and specifications that define the configuration and design features of the product, including avionics equipment. For new avionics, the Type Certificate holder may elect to follow a process that amends the Type Certificate and Production Certificate to gain the design, production, and installation approvals for that aircraft model. The extent of the change determines how simple or complex the amendment process needs to be.

The Parts Manufacturer Approval and Technical Standard Order Authorization processes give manufacturers design and production approvals for their products, but do not provide an installation approval. The installation approval is subsequently granted through a Supplemental Type Certificate, Form 337 Field Approval, or under an Airline Operating Certificate.

The difference between a Parts Manufacturer Approval and Technical Standard Order Authorization is the certification basis. A Parts Manufacturer Approval is granted based on test reports and computations conducted under an FAA-approved and -supervised test plan; identicality with a previously certified article; or a licensing agreement from a Type Certificate or Supplemental Type Certificate holder. For a Technical Standard Order Authorization, the FAA establishes minimum performance standards for the general equipment item (i.e., radios, the Global Positioning System (GPS), transponders, etc.), and the applicant submits material for FAA review demonstrating that their product meets the standards.

The Supplemental Type Certificate process is used to grant any one or all three required certification approvals (design, production, installation) for changes to a Type Certificated product. A Supplemental Type Certificate (STC) is only valid for a specific aircraft (one-time STC) or a specific aircraft make and model (multiple STC). To receive an STC, applicants must provide data proving the Type Certificated product still complies with its applicable certification basis. The complexity of the STC process depends on the extent of the change being requested.

The Form 337 Field Approval process typically involves a Flight Standards Service representative[2] certifying that the alteration complies with regulations and conforms with accepted industry practices. The three elements of this process are approval of data, conformity of installation, and approval to return the aircraft to service. Approval can be accomplished through an engineering review, by physical inspection and testing, or by demonstration. Field Approvals usually apply to one specific aircraft and require relatively less design data for substantiation than the other certification processes. The extent of the alteration determines if the Field Approval process can be used or if one of the other certification processes is needed.

11.3 Procedures/Rulemaking

NAS operations are governed by a complex set of procedures and rules that determine controller and pilot actions. The new equipment and concepts described in this document will have little or no effect on the NAS until both controllers and pilots have approved procedures that enable a change in operations. In some cases, the NAS architecture

2. The Flight Standards personnel may receive support from Aircraft Certification Service engineers or manufacturing inspectors if needed.

will also require airspace structure revisions before the projected benefits can be realized.

11.3.1 Controllers

ATS develops controller procedures for ground-based air traffic control (ATC) components of NAS modernization. FAA Order 7110.65, Air Traffic Control, describes services provided by controllers, safety standards that must be maintained, and standardized methods to accomplish controller tasks. However, many of the new concepts, such as Free Flight, fall outside the current boundaries of 7110.65. If no changes are made to procedures, controllers will be limited to using the new equipment for traffic separation in much the same way they used the equipment that was replaced. This could severely limit the benefits from modernization efforts and prevent final implementation of new concepts such as Free Flight.

ATS is also responsible for airspace redesign. Today, changes to airspace design are usually done at the local level by the air traffic facilities that require a change. Typically, only refinements that do not drastically alter the airspace configuration around the facility are made to the existing structure. However, new capabilities for air traffic control proposed in the architecture may require strategic, systemwide changes to the airspace structure.

Without new controller procedures and changes to the current airspace structure, new NAS capabilities will not be fully exploited, and the intended benefits will not be realized. Future versions of the architecture will need to address in greater detail how, when, and what changes to controller procedures and airspace design are needed for the future NAS as part of a fully integrated modernization plan.

11.3.2 Pilots

The Flight Standards Service develops basic operating procedures for pilots established in selected parts of 14 Code of Federal Regulations (CFR). Airlines may supplement these regulations with FAA-approved company operating procedures. Many new capabilities will require new avionics in aircraft before benefits are realized. Accordingly, regulations will need to be revised or new regulations created so that pilots can use new avionics fully.

Table 11-1 is a preliminary summary of current regulations in 14 CFR, Parts 1 through 1273, that are affected by the baseline architecture capabilities. The preliminary assessment has identified 11 regulations that will require modification. Full descriptions of the capabilities listed in Table 11-1 appear in Section 5, Evolution of NAS Capabilities, and Appendix D, NAS Capabilities and Matrix.

For systems implemented in the near term, affected regulations will generally require only modest wording changes. However, in many instances, the existing regulations do not address the new capabilities described in the architecture, such as direct routing or cockpit display of traffic information for air-to-air surveillance. Therefore, new regulations will be required before longer-term concepts and systems can be implemented. In particular, the existing regulations will have to be expanded, or new regulations written, to establish minimum avionics equipage requirements relative to airspace class[3] and type of operation.[4] Additionally, procedures will have to be established for both controllers and pilots that detail how aircraft with varying equipage levels will be accommodated when operating in the same airspace.

Creating or changing regulations is a complex, time-consuming process. By law, there are sequential steps and mandatory comment periods that must be observed before a rule becomes final. Simple changes or rules that do not generate a great deal of comments can be processed in 12 to 18 months. However, it can take 3 to 4 years for a final rule to be issued if it entails major changes that generate many comments from the aviation community. It is reasonable to assume that any rulemaking actions resulting in significant operational changes or minimum equipage requirements will generate intense interest from the aviation community.

3. Refers to class A,B,C,D,E, and G airspace.
4. Visual flight rules, instrument flight rules, 14 CFR Part 91, 121, 135, etc.

11.4 Summary

The full range of benefits projected by the NAS architecture will not occur without new or revised aircraft operating regulations with complementary controller procedural changes and airspace redesign. These are complex issues that will be addressed in the architecture through a cooperative effort of the FAA and the aviation community.

Table 11-1. Preliminary Analysis of Regulations Affected by the Baseline Architecture (Sheet 1 of 2)

Capability Title	Federal Aviation Regulation (FAR) Part										
	1.1	1.2	61.63	71.75	71.901	91.205	121.349	129.17	147 Appendix C	170.3	171 new Subpart K
Initial WAAS Precision Approach Existing Airports	X	X	X	X	X	X	X	X	X	X	X
WAAS Precision Approach New Qualifiers	X	X	X	X	X	X	X	X	X	X	X
GPS Oceanic	X	X		X	X	X	X	X	X	X	
Terrain Avoidance	X	X				X			X		
Initial WAAS Cruise	X	X	X			X	X	X	X	X	X
LAAS Cat I	X	X	X	X	X	X	X	X	X	X	X
LAAS/Cat II/III	X	X	X	X	X	X	X	X	X	X	X
ITWS Stand Alone	X	X				X			X		
Initial TWIP	X	X				X			X		
Expanded TWIP	X	X				X			X		
MDCRS	X	X				X	X	X	X	X	
Enhanced MDCRS	X	X				X	X	X	X	X	
Initial FIS	X	X				X			X		
Automatic Simultaneous Weather Notification	X	X				X			X		
Improved Terminal Surveillance (ASTERISK/SI)	X	X				X			X		
Runway Incursion Reduction	X	X				X		X	X		
Integrated Terminal Surveillance with ADS-B	X	X				X	X	X	X	X	
Integrated En-Route Surveillance with ADS-B	X	X				X	X	X	X	X	
Improved En-Route Surveillance (ASTERISK/SI)	X	X				X	X	X	X	X	
Integrated Tower Area Surveillance	X	X				X	X	X	X	X	X
Air-Air ADS-B	X	X				X	X	X	X	X	X
TIS via Mode-S	X	X				X			X		
ADS-B Gap Filler	X	X				X			X		
Ocean Surveillance via ADS-A	X	X				X	X	X	X	X	X
TDLS	X	X				X			X		
CPDLC Build 1	X	X				X			X		

Table 11-1. Preliminary Analysis of Regulations Affected by the Baseline Architecture (Sheet 2 of 2)

Capability Title	Federal Aviation Regulation (FAR) Part										
	1.1	1.2	61.63	71.75	71.901	91.205	121.349	129.17	147 Appendix C	170.3	171 new Subpart K
CPDLC Build 1A	X	X				X			X		
Oceanic Data Link	X	X				X	X	X	X		
Multi-Sector Oceanic Data Link	X	X				X	X	X	X		
Expanded TDLS	X	X				X			X		
CPDLC Build 2 via VDL Mode-2	X	X				X		X	X	X	
CPDLC Build 2 via VDL Mode-3	X	X				X		X	X	X	
CPDLC Build 3 via VDL Mode-3	X	X				X		X	X	X	
NAS-Wide Data Link	X	X				X		X	X	X	
Interactive Airborne Refile	X	X				X		X	X	X	
aFAST with Wake Vortex	X	X				X		X	X		
RVSM/50 Lateral	X	X				X	X	X	X	X	
50/50	X	X				X	X	X	X	X	
SMS	X	X				X		X	X		
Low-Altitude Direct Routes—Using WAAS	X	X	X	X	X	X	X	X	X	X	X
Low-Altitude Direct Routes—Expanded Radar Coverage	X	X	X	X	X	X	X	X	X	X	X
Low-Altitude Direct Routes—Expanded Surveillance Coverage	X	X	X	X	X	X	X	X	X	X	X
NAS-Wide Information Sharing	X	X				X		X	X		
ELT for SAR and Flight Following	X	X				X		X	X		