Federal Aviation Administration
Alaskan Region

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Capstone Test and Evaluation Master Plan

for

Area Navigation (RNAV) Operations in Southeast Alaska

DRAFT

30 September 2003

ALASKAN REGION

Capstone

Investment in Safety

Preface

The Capstone Program is sponsored by the Federal Aviation Administration's (FAA's) Alaskan Region and is conducted in cooperation with the FAA Safe Flight 21 Program. Capstone is a technology focused safety program in Alaska that seeks near-term safety and efficiency gains in aviation by accelerating implementation and use of modern technology. It links multiple programs and initiatives under a common umbrella for planning, coordination, focus, and direction. Capstone develops capabilities and requirements jointly with FAA, the Alaska community and aviation industry in a manner consistent with future National Airspace System (NAS) plans and concepts, and implements in a manner leading to self-equipage.

Capstone is taking a phased implementation approach as industry directs and technologies mature. Starting in 1999 under Phase I, Capstone installed Global Positioning System (GPS) and Universal Access Transceiver (UAT) Automatic Dependent Surveillance-Broadcast (ADS-B) avionics suites in over 150 commercial aircraft, and provided a corresponding ground infrastructure serving the Yukon-Kuskokwim (Y-K) River Delta in and around Bethel, Alaska. During Phase II, which began in 2001 and is focused in Southeast (SE) Alaska, Capstone will incorporate technologies matured in the Y-K Delta, explore the use of other safety technologies, and build on lessons learned to further reduce accidents and fatalities. A main goal for Phase II is to provide a "more useable" Instrument Flight Rules (IFR) infrastructure in SE Alaska consistent with the National Transportation Safety Board (NTSB) safety study recommendation A-95-121.

This Capstone Test and Evaluation Master Plan (TEMP) for Area Navigation (RNAV) Operations in Southeast Alaska outlines the activities within Phase II for use of Capstone RNAV services in SE Alaska, initially centered in and around Juneau. These activities are based on a transition from the use of conventional ground-based navigation aids to the use of GPS and the Wide Area Augmentation System (WAAS). Use of GPS/WAAS opens usable airspace for IFR navigation below conventional minimum enroute altitudes (MEAs) on existing routes and enables new instrument approach and departure procedures. Capstone's objectives are to use GPS/WAAS navigation, RNAV procedures, appropriate operational training and approvals, and advanced certified avionics to provide a usable IFR system (e.g., below hazardous weather) and to improve access to remote airports. Operational feedback during the initial period will lead to system refinements, requirement validation, and NAS implementation risk mitigation for services implemented in other parts of the NAS.

The Capstone Program Office is producing this document in coordination with participating organizations. It presents program background; system descriptions; and test management, organization, planning, and documentation activities. The Capstone TEMP for RNAV Operations is not intended as a public relations document; these type inquiries should be directed to the appropriate offices of the participating organizations.

Acknowledgments

Aircraft Owners and Pilots Association (AOPA)
Alaska Air Carrier Association
Alaska Airman's Association, Inc.
Alaska Aviation Safety Foundation
FAA Alaskan Region (AAL)
FAA Office of Rulemaking (ARM)
FAA Office of the Chief Counsel (AGC)
FAA Aviation System Standards (AVN)
FAA Flight Standards Service (AFS)
FAA Aircraft Certification Service (AIR)
FAA Air Traffic Service (AAT)
MITRE Corporation Center for Advanced Aviation System Development (CAASD)
NAS Implementation Support Contract (NISC)
University of Alaska Anchorage

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1. Program Overview

1.1 Capstone Background

Capstone is a technology focused safety program in Alaska that seeks near-term safety and efficiency gains in aviation by accelerating implementation and use of modern technology. It links multiple programs and initiatives under a common umbrella for planning, coordination, focus, and direction. Capstone develops capabilities and requirements jointly with FAA, the Alaska community and aviation industry in a manner consistent with future National Airspace System (NAS) plans and concepts, and implements them in a manner leading to self-equipage. The program is implemented in cooperation with the Alaska aviation industry and responds to a National Transportation Safety Board (NTSB) Safety Study, "Aviation Safety in Alaska," Safety Study NTSB/SS-95/03, dated November 1955. The study's foremost recommendation to the FAA states:

> "Implement, by December 31, 1997, a model program in the Arctic and southeast regions of Alaska to demonstrate a low altitude instrument flight rules (IFR) system that better fulfill the needs of Alaska's air transportation system. The model should include the following components:
>
> (1) The use of the global positioning system (GPS) as a sole source of navigational information for en route navigation and for non-precision instrument approaches at a representative number of airports where instrument approaches do not currently exist. (Operators participating in the program will have to be allowed to conduct these operations without the integrity monitoring functions of the wide area augmentation system (WAAS) until WAAS is fully implemented in the demonstration region.)
>
> (2) The use of satellite-based voice communications and satellite based, Mode S, or VHF data link (for aircraft position and altitude) between aircraft in flight and air traffic controllers.
>
> (3) The operation of commercial, passenger-carrying flight under IFR in turbine powered single-engine airplanes equipped with redundant sources of electrical power and gyroscopic instrument vacuum/pressure.
>
> (4) The use of currently uncontrolled airspace for IFR departures, en route flight, and instrument approaches in the demonstration program region. (Class II, Priority Action) (A-95-121)."

Phase II of the Capstone Program responds to these recommendations and RNAV Services are directed toward recommendations (1) and (4). Capstone is also responsive to requests by the Alaska Aviation Coordination Council and the U.S. Congress as expressed in Appendix A1. Appendices A2 and A3 affirm FAA management support for initiatives to achieve the Capstone safety improvements.

Capstone implements new technologies enabling pilots to cope with terrain, traffic conflict and weather hazards. These technologies also allow dispatchers/operators better means to monitor their aircraft, and give air traffic controllers expanded surveillance coverage to provide Air Traffic Control (ATC) services. Capstone provides answers to technical, operational, and cost/benefit questions that enable the FAA and industry decision-makers to make future CNS technology implementation choices. Some of these questions were raised in an RTCA document on Free Flight operational enhancements.[1] Capstone addresses many of these areas and the overall Safe Flight 21 Program addresses the remainder through additional work with the aviation industry. Capstone provides an improved aviation system and an infrastructure from which to gather data necessary to make better decisions on implementing the future NAS architecture. Capstone participation with the Alaskan aviation industry is vital to the successful outcome of the program. Industry "buy-in" connects everyone to the goals and objectives of Capstone and ensures support. This involvement helped establish the avionics and ground system equipment requirements and drives the need to demonstrate early tangible progress in improving aviation safety and efficiency.

1.2 Capstone RNAV Services

The primary operational goal of Capstone RNAV services is to expand the usable low-altitude airspace for IFR operations and increase the access to airports in poor and marginal weather conditions. This should also improve the safety of all aircraft operations in the region by providing a better aviation infrastructure.

1.2.1 Objective

The first objective supporting this goal is to allow the use of GPS/WAAS technology for the en route portion of flights on routes in Alaska outside the operational service volume of ground based navigation aids. This requires changes to Federal Aviation Regulations, and the results are threefold. First, it permits satellite navigation as the only means of navigation needed onboard the aircraft. A comparison of navigation availability in Figure 1-1 was a prime motivation for using GPS; the criteria being "as good as or better than" the existing navigation system. Secondly, it allows the use of lower Minimum Enroute Altitudes (MEAs) than those currently based on ground-based navigation aids. In this process, Capstone used current Terminal Instrument Procedures (TERPS) criteria for enroute airways; however Capstone applied it to the use of the GPS/WAAS navigation signal. Low enroute RNAV GPS MEAs will eventually cover the entire region and become available publicly. Thirdly, it promotes safety by creating and promoting a usable IFR environment that allows an IFR option for pilots that had to fly predominantly in the visual flight rules (VFR) environment that exists today.

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[1] Joint Government/Industry Roadmap for Free Flight Operational Enhancements, August 1998.

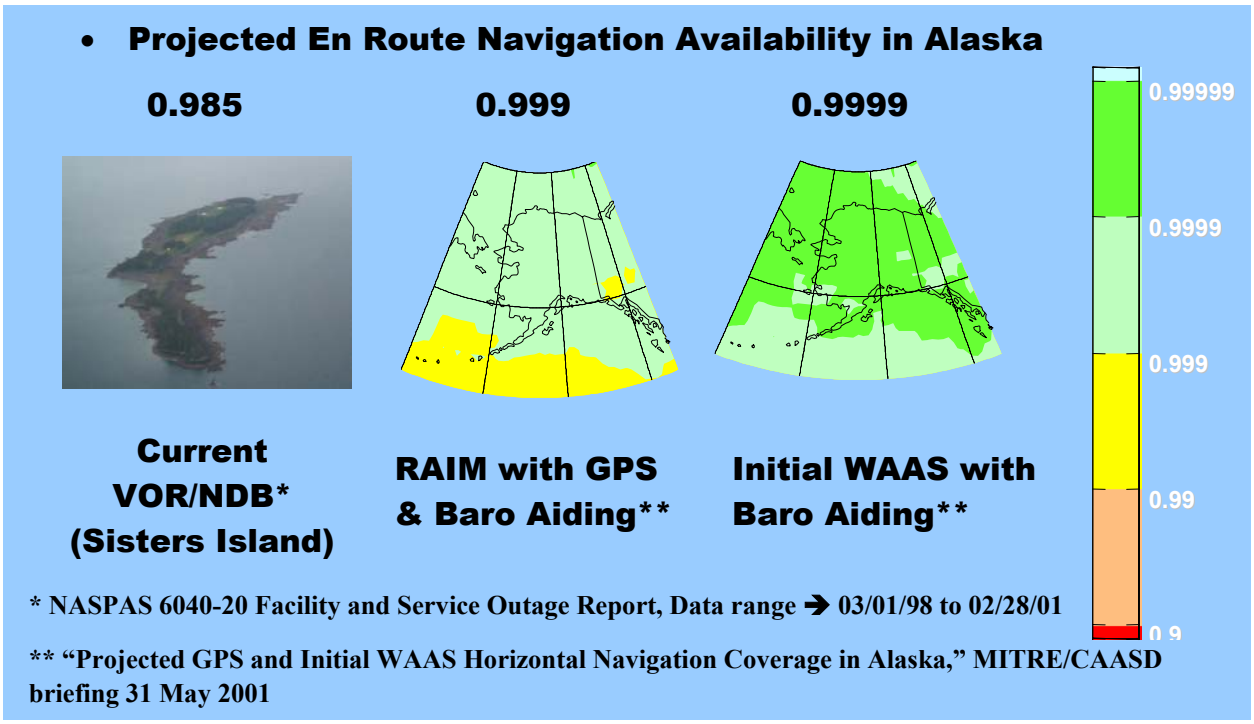


Figure 1-1. IFR Navigation Availability

The second objective is to establish new departure and approach procedures, initially between Juneau, Haines, Hoonah and Gustavus airports and, with operator acceptance, expand to other parts of SE Alaska. This allows safer airport-to-airport access. These procedures will be developed as "specials" and achieve the lowest possible minimums for RNAV/GPS non-precision approaches by applying waivers with special training requirements to current TERPS criteria.

Activities supporting these objectives include certifying and installing state-of-the-art GPS/WAAS avionics, amending air routes to achieve lower MEAs, developing special approach and departure procedures, filling communication gaps and ensuring all supporting training and operational approval guidance for operators as well as FAA oversight personnel is accomplished.

Lower MEAs were requested by the Capstone Office in Appendix B1. Feasibility studies for development of departure and approach procedures in Southeast Alaska were requested in Appendix B2. Appendix B3 requested publication of the lower MEAs.

1.2.2 Description of Operational Use

RNAV services make use of GPS/WAAS as the only means of navigation from departure, throughout en route operations, to approach at the destination airport. These are supplemented by a terrain avoidance warning system (TAWS) which provides a 3-dimensional forward view as well as a plan view of terrain and surface features. This application makes use of current TERPS standards with waivers for instrument procedure

development. An example of this application is the development of a departure-approach pair from Juneau to Hoonah. Aircraft would depart Juneau and follow optimized low altitude routes to clear terrain while avoiding unnecessary climbs to stay within the service volumes of traditional navigation aids. These procedures have the added advantage of allowing aircraft to fly below adverse weather (e.g., icing) and to avoid weather obscurations as well. RNAV will then allow the use of a new instrument approach at Hoonah.

This initiative creates an end-to-end IFR system, meeting our RNAV services goal. By using GPS/WAAS avionics requirements for integrity monitoring, these departure/arrival routes can be optimized for lowest altitudes (typically 3000 feet) to connect city pairs. In addition, airports with GPS approaches will be used as alternate airports if flown with GPS/WAAS equipment. Additional remote communications air-ground (RCAG) facilities and automated weather observations system (AWOS) sites will be installed in support of the RNAV infrastructure.

1.2.3 Potential Benefits

Numerous benefits are anticipated with RNAV services. Some will accrue through the application of lower MEAs and creation of new RNAV routes, allowing many flights to remain below adverse weather conditions or obscurations. This is also important because many flights in SE Alaska are in small aircraft and often cover short distances and climbs to higher altitudes are impractical. With the use of new RNAV instrument approaches, access to area airports will increase. Safety will be enhanced during these operations with the use of a multifunction color display featuring a terrain avoidance database and a navigation moving map. These new capabilities can provide an IFR alternative for Part 135 scheduled VFR passenger service. Scheduled VFR service places special demands on the operator. These flights often involve low level flight segments under patterns of regional weather obscurations that might seem prohibitively low elsewhere.

Additional RCAG sites are being installed to expand communications with Air Traffic control (ATC). These will enable further reductions in GPS MEAs, improve safety and utility for large transport aircraft and support the increased use of IFR by small aircraft.

Weather observation sites are essential in providing air carrier access to airports with instrument approaches and new sites are being installed to support Capstone RNAV services. They will improve safety for all operators and contribute to a more comprehensive, overall weather picture. More weather sensors are also important in this region where visibilities and ceilings can vary significantly between nearby areas that are separated by dramatic geographical features.

1.3 Other Capstone Phase II Services

Although not required for RNAV services, Capstone is also providing additional services in SE Alaska to improve overall safety. This initiative is to promote better situational awareness of weather and other traffic by expanding the ADS-B ground infrastructure to SE Alaska and adding data link avionics. This will provide a data link to include Automatic Dependent Surveillance-Broadcast (ADS-B) and Flight Information Services-Broadcast (FIS-B).

The objective is to use multiple means to alert pilots of possible traffic conflicts and other hazards. Adding a universal access transceiver (UAT) to the avionics will enable display of other ADS-B aircraft (cockpit display of traffic information or CDTI). Installing an ADS-B ground system in SE Alaska will provide track information to controllers and Automated Flight Service Station (AFSS) specialists. The UAT data link will also be used to relay weather information to the cockpit. Eventually, multilateration and Traffic Information Services – Broadcast (TIS-B) will be added to complete the surveillance picture.

1.4 Purpose of TEMP

This Capstone RNAV TEMP documents the tasks and activities required to achieve operational status using the Capstone system for RNAV operations in airspace in and around Southeast Alaska. The Capstone Program Office in coordination with the participating organizations is producing this TEMP for RNAV Services in Southeast Alaska. Progress on these various activities will be reflected through updates to the appendices. The TEMP presents program background, system descriptions, test management, organization, planning, and documentation activities. Operational feedback during this initial period will lead to system refinements, requirement validation, and risk mitigation.

There are 6 parts to this TEMP. Part 1 provides a program overview, including operational concept, schedule, and system descriptions. Part 2 defines the Capstone documentation and deliverables for RNAV services. Parts 3 and 4 describe the developmental and operational evaluation activities for the ground, aircraft, and airspace systems. Part 5 summarizes Capstone System Safety activities and Part 6 summarizes resources. Appendices follow the body of the document.

1.5 Implementation and Operational Evaluation Activities

Capstone integrates the planning of resources required to implement Capstone technologies and procedures. Operational and technical performance data will be collected and analyzed during developmental and operational tests and evaluations to support transition to full RNAV services. The following tasks for establishing RNAV services were derived from a Juneau Capstone Planning meeting (7-9 August 2001).

- Obtain certification for aircraft equipment,
- Develop and provide low altitude en route charts showing new GPS altitudes on existing airways,
- Develop and provide approach and departure procedures for airports requested by industry,
- Improve communications in Southeast Alaska by filling identified coverage gaps,
- Develop and publish applicable notices and advisory information such as NOTAMs, Aeronautical Information Manual changes, etc.,
- Approve operational standards, guidance materials and associated operations specifications permitting use of RNAV operations, and

- Perform an operational safety review.

1.6 Schedule

Listed below are key activities and milestones for the TEMP. See Appendix C for details of schedule and activities.

- Publish new, lower altitude route structures, using GPS/WAAS March 2003
- Train pilots, air traffic controllers, and operators March 2003
- Install initial Phase II avionics, beginning March 2003
- Begin operational use of new avionics, routes March 2003
- Approve new special IFR approaches/departures November 2003
- Begin operational use of end-to-end RNAV system in SE Alaska November 2003

1.7 System Description

The system supporting Capstone RNAV operations is being established from a full communications, navigation, and surveillance/air traffic management (CNS/ATM) perspective. New avionics are being certified and installed to enable instrument approaches/departures and GPS/WAAS navigation along airways at lower altitudes. It also requires the publishing of new navigation charts and instrument departure and approach procedures for use by pilots and controllers. Supporting this limited system are the new communications transceiver sites required to prevent gaps when MEAs are lowered below line-of-sight with existing communication sites. Finally, new weather observation facilities are included at airports to permit commercial IFR operations.

The overall, full Capstone Phase II infrastructure is shown in Figure 1-2. Capstone RNAV services are enabled by the airborne configuration within Segment C (primary flight display-PFD, multifunction display-MFD). In Segment D, AWOS, RCAG facilities and Remote Communications Outlets (RCOs) complement and support the airborne component. The remaining Phase II components include

Segment A - display equipment in the Juneau Air Traffic Control Tower (ATCT) and Juneau AFSS ,

Segment B - existing air traffic automation and display facilities at Anchorage ARTCC (Air Route Traffic Control Center) and interconnecting telecommunications (e.g., ANICS), and

Segment C - remote ground broadcast transceiver (GBT) sites.

Segments B and C will add surveillance capabilities to SE Alaska as well as provide better situational awareness information to pilots. Capstone Phase II will integrate these new and existing systems and equipment to complement the RNAV services and provide a lower, usable IFR infrastructure. Together, these systems and equipment will be used to enhance the operational use and safety of the airspace system in SE Alaska.

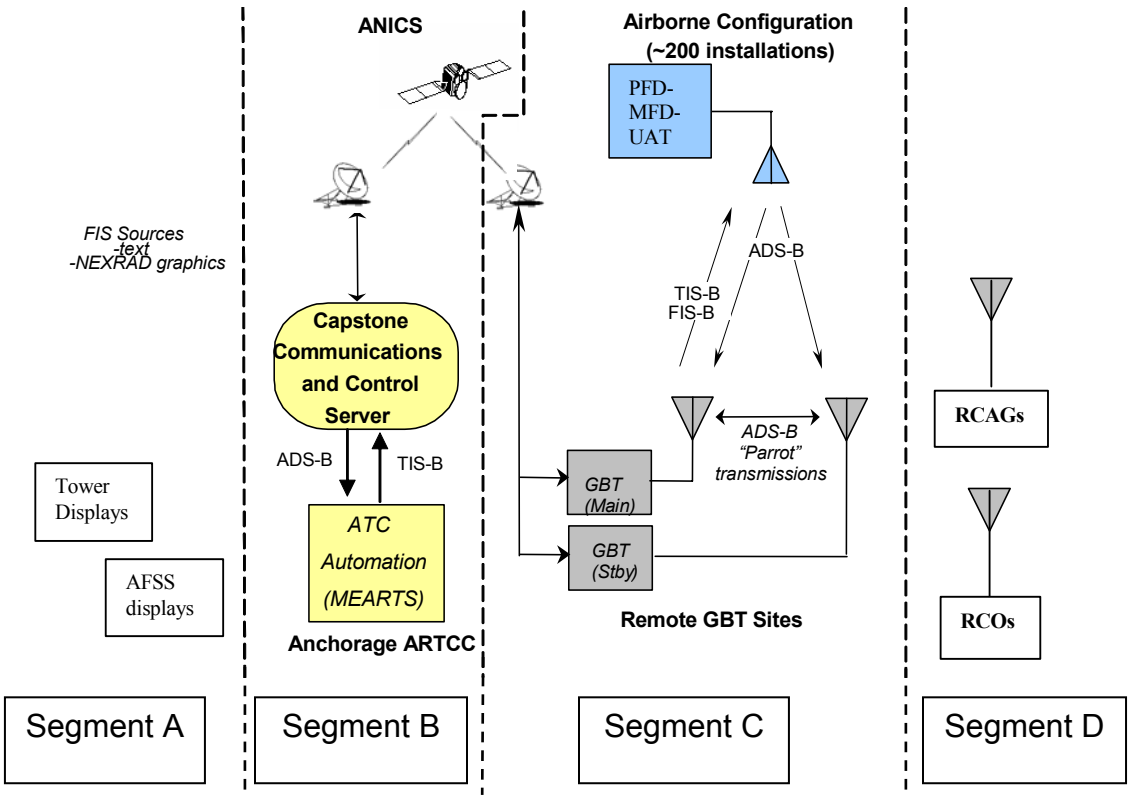


Figure 1-2. Phase II Capstone System Block Diagram

1.7.1 Ground System

The ground system will expand the Capstone Phase I data link infrastructure into SE Alaska. It consists of the ATC automation within Anchorage ARTCC and new remote GBT sites. It will expand ATC surveillance service, provide weather information to the cockpit and the tracking data will enable flight following tools for commercial operators and FAA AFSS specialists. Communication sites and weather reporting sites are discussed in following sections. A multilateration surveillance system may be installed later in Juneau, supplementing ADS-B in the terminal area.

1.7.1.1 Voice Communications

Communications enhancements include new RCAGs to fill ATC communication gaps, enable new RNAV operations, and lower many minimum enroute altitudes. Initial communications improvements to support Capstone Phase II are shown in Figure 1-3 and will include a new RCAG facility at the south end of Stephens Passage for direct pilot-controller voice contact and at Mt. Robert Barron for improvements along Lynn Canal and over Icy Bay. Flight Service support will also be improved with the installation of an RCO radio in the same vicinity. Further communications improvements are expected as needs are documented.

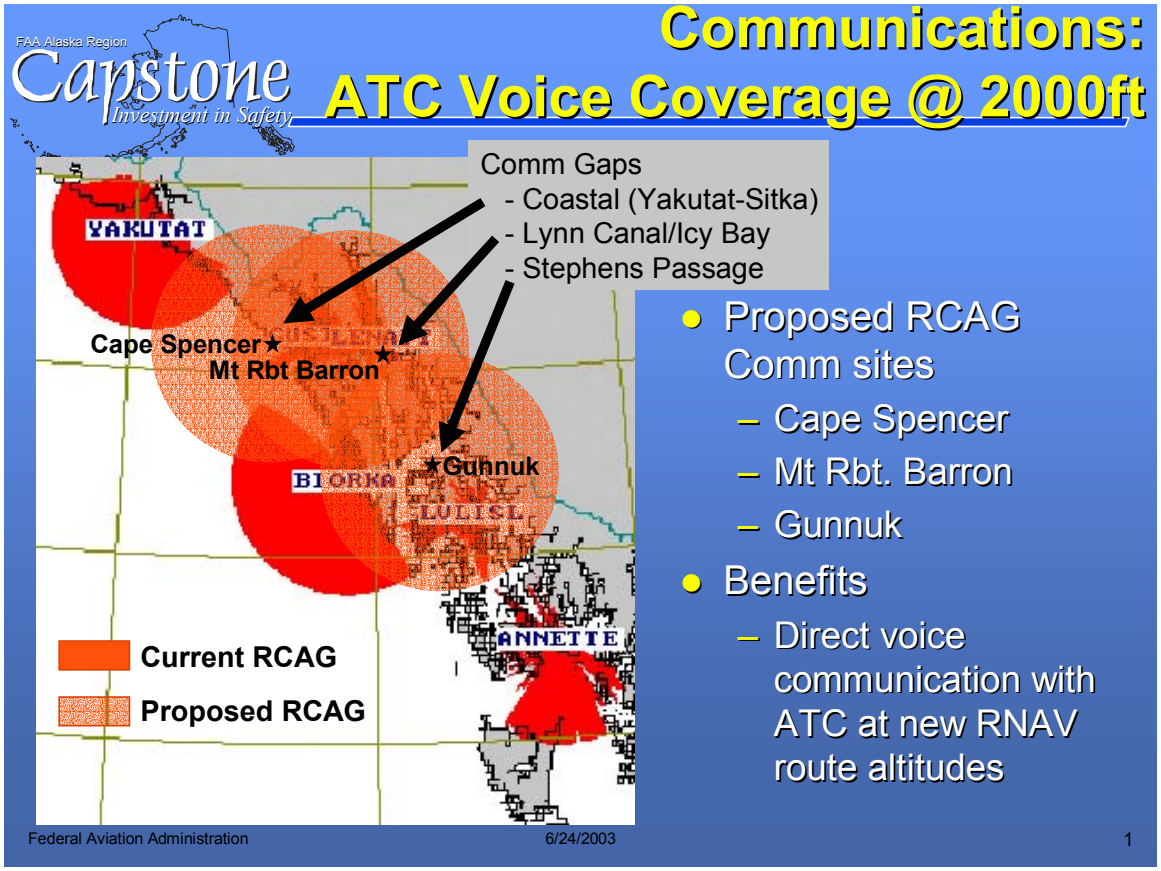


Figure 1-3. Communications Coverage Improvements in Phase II

1.7.1.2 MicroEARTS and Next Generation Ground Based Transceivers

New GBT sites are being chosen to provide surveillance coverage (Figure 1-4) at, around, and between the key airports with new GPS approaches. Other sites are being chosen as well to create and expand a low altitude RNAV route structure in SE Alaska. Initially, 14 sites have been identified. Surveillance data will be linked back to the MicroEARTS automation system at Anchorage ARTCC. The data will be used for ATC and distributed to other users including air carrier operations centers (AOCs) and AFSS for flight following. FIS-B (and eventually, TIS-B) will also be provided through use of the Capstone Communications Control Server (CCCS) and the GBTs. Weather and other NAS data will be uplinked in SE Alaska, just as it is the Bethel, Y-K Delta area. Although the surveillance and FIS services supported by these initiatives are important, they are not the subject of this TEMP.

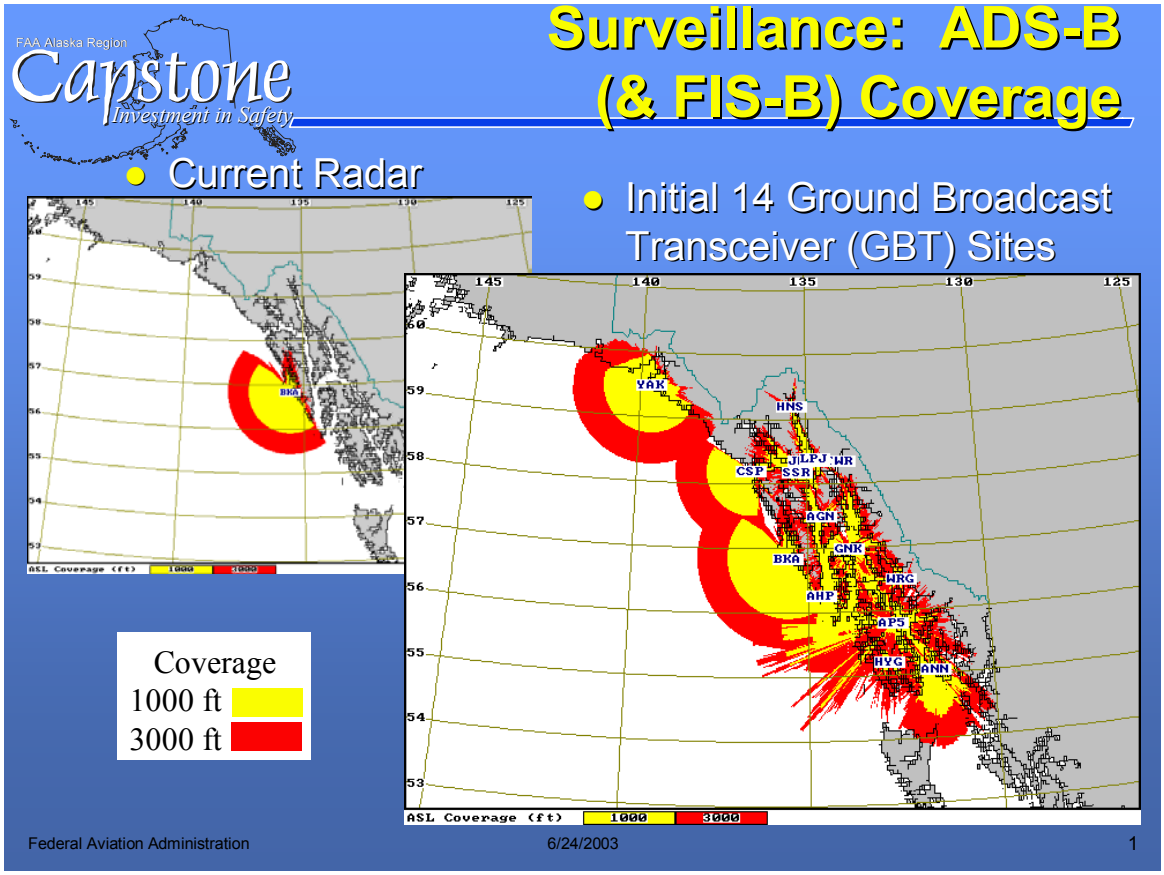


Figure 1-4. Surveillance Improvements with GBTs

1.7.1.3 Automated Weather Observation Sites

Weather observations are required for destination airports before a commercial air carrier can perform an instrument approach. They are also useful inputs to the overall weather picture because additional sites improve the accuracy and detail of weather forecasts in the region. New AWSS (Automated Weather Sensor System) will be installed and report weather conditions including temperature, dew point, wind, altimeter setting, visibility, sky condition, and precipitation. The weather reports from these sites will be available by phone, over radio on aviation frequencies and, once in the weather system, can be extracted from other weather data at AFSS, over the internet or via FIS-B.

1.7.1.4 Other Infrastructure Changes Supporting Capstone Phase II

Situational awareness displays are planned for the Juneau ATCT and the AFSS. Surveillance data derived from the ground system will be used to feed new "BRITE-like" displays in the Juneau ATCT cab. Two displays are planned; one for surface and one for the airport terminal area. Other situational displays are planned for the Juneau AFSS. The Flight Service specialists will use the displays to issue advisories when the tower is closed and to

assist in monitoring VFR flight plans. The AFSS will also receive a flight following or flight plan monitoring capability.

When suitable for integration with ADS-B, a multilateration installation is planned for Juneau to increase the number of "participating aircraft" for surveillance in the area and provide another data feed for TIS-B. Multilateration will identify/locate targets in the terminal area and on the ground at Juneau airport.

1.7.2 Aircraft System

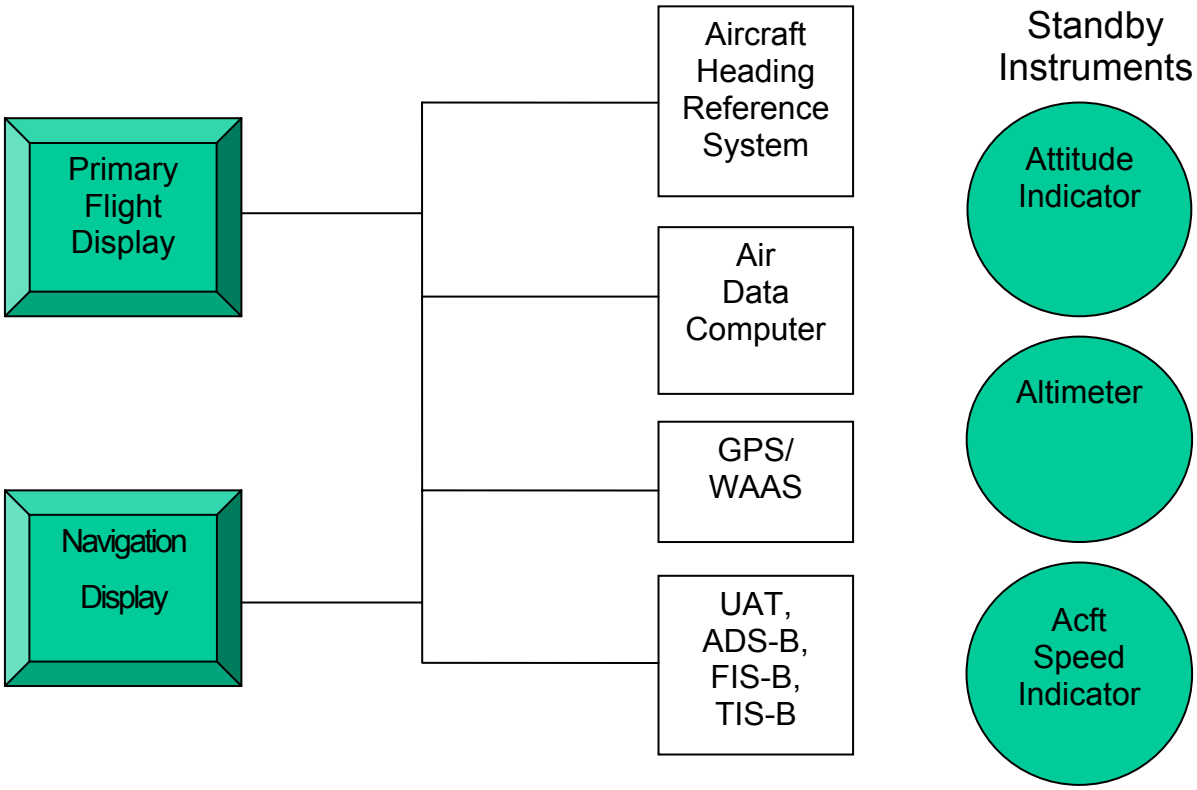
During CY2003, installation of government-provided avionics began for up to 200 commercially operated aircraft (estimated 150 fixed-wing and 50 rotor-wing) in and around SE Alaska. The intent of the Phase II avionics is to increase pilot situational awareness and increase navigational performance during IFR and VFR operations. A description of the avionics is provided below with a block diagram depicted in Figure 1-5. The avionics package will include the following functions, in stages:

Stage 1 (initial avionics – Primary Flight and Navigation Displays)

- Primary flight display functions, including heading, pitch and roll attitude, airspeed, vertical speed, etc., as well as flight path.
- Display 3-dimensional views of terrain. The system will include terrain alerting and warning system (TAWS) that meets TSO-151a, Class B.
- Navigation display functions using GPS/WAAS including position, course, waypoints and fixes, groundspeed, etc.

Stage 2 (full avionics to operate air-to-air and with ground system – Universal Access Transceiver)

- ADS-B air-to-air traffic targets along with TIS-B targets (when TIS-B becomes available) on a multi-function navigation display and primary flight display when appropriate. Traffic warnings will also be provided.
- Display FIS-B information (text and graphics).



Legend – New terms

ADS-B – Automatic Dependent Surveillance-Broadcast

FIS-B – Flight Information Services-Broadcast

TIS-B – Traffic Information Services-Broadcast

UAT – Universal Access Transceiver

Figure 1-5. Capstone Phase II Avionics Block Diagram

Chelton Flight Systems (formerly Sierra Flight systems) was selected to provide its EFIS-2000 Primary Flight Display (PFD) (Figure 1-6) and its Navigation Display (Figure 1-7). UPS-AT Corporation has been selected to provide an operational demonstration of the stand-alone UAT ADS-B system, which may lead to a production contract. The Capstone program will oversee integration of these systems and the ground system and provide avionics units to individual aircraft operators. Installation of these avionics is covered under a multiple make, model, and series FAA Supplemental Type Certificate (STC) as shown in Appendix D.

Figure 1-6. Primary Flight Display

Figure 1-7. Navigation Display

1.7.3 Airspace

To provide RNAV services, Capstone is developing an end-to-end (airport-to-airport) RNAV airspace structure. This dictates changes in both the enroute and the approach/departure airspace structures. The enroute initiative is providing RNAV/GPS MEAs (lower than conventional MEAs, but not lower then the Minimum Obstruction Clearance Altitude (MOCA) on existing Victor and Color airways in Southeast Alaska. The initial approach/departure procedure changes being pursued are between Juneau and the airports of Hoonah, Gustavus, and Haines. Based on user/operator input and acceptance, this will expand to other city-pairs, for instance, from Ketchikan. Appendix E provided Flight Standards guidance for development of new MEAs. Appendix F addresses the flight checking of these MEAs. Appendix G contains concurrence from the labor union National Air Traffic Controllers Association (NATCA). Figure 1-8 depicts an IFR Enroute Low Altitude chart, showing new GPS MEAs.

Figure 1-8. Proposed IFR Enroute Low Altitude Chart Showing New GPS Altitudes

Hoonah, Haines, Juneau, Gustavus departure and approach RNAV procedures (including holding procedures and fixes) are being modified or created to provide a low altitude IFR structure in SE Alaska (see Figure 1-9). Appendix B2 requested a feasibility study of the procedures and Appendix H designates Hoonah and Haines as IFR airports. Appendix I provides FAA/AFS guidance and Appendix J contains drafts of the new procedures. When

completed, these procedures will be published as Special (or Public, as appropriate) procedures.

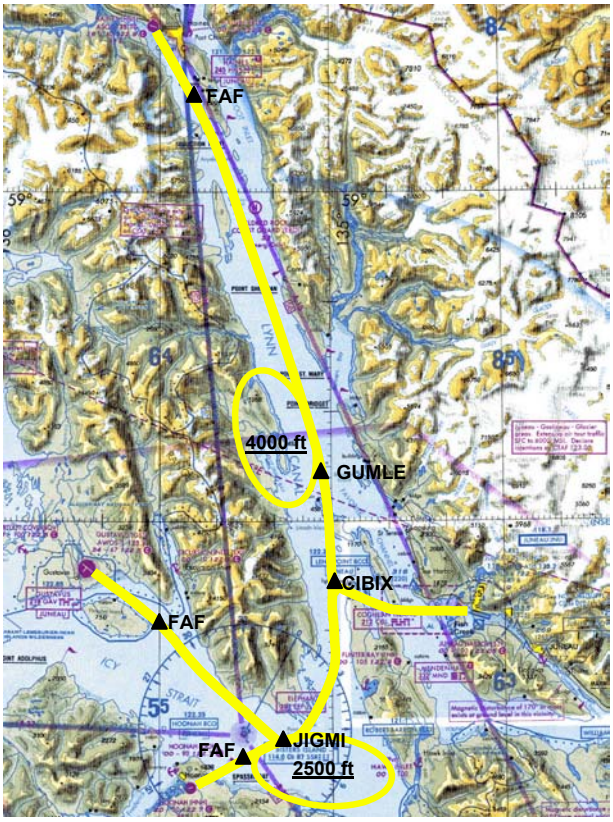


Figure 1-9. Depiction of Proposed Initial Departure and Approach RNAV Structure

2. Capstone Deliverables

2.1 Operational Certifications and Approvals

Important Capstone products include operational certifications and approvals gained through Capstone activities that other organizations (e.g., RTCA, FAA Office of System Architecture and Investment Analysis (ASD), FAA Air Traffic System Requirements (ARS), Boeing Air Traffic Management) and decision-makers can use in a variety of on-going regulatory and industry activities. Table 2-1 summarizes the activity areas, data, and potential organizations that may benefit from this data. Input to NAS Architecture, cost/benefit analyses, and industry standards development is also expected.

Table 2-1. Example of Capstone Data Sources Categorized and Keyed to RTCA Planning Guide Activities[2]

Activity Area	Capstone Data Sources	Potential Users of the Data
Operational Concept	Pilot and controller training material, pilot and controller questionnaires and operational feedback	FAA Air Traffic System Requirements (ARS), Aviation Flight Standards (AFS), Aircraft Certification (AIR), SF21 Ops/Procedures SG, RTCA and other standards committees
Benefits and Constraints	Capstone Safety Studies, actual equipment costs	SF21 Cost/Benefit WG, FAA System Architecture and Investment Analysis (ASD)
Maturity of Concept and Technology	Certification and operational approvals of equipment and procedures	FAA Air Traffic System Requirements (ARS), Flight Standards Systems, SF21 Ops/Procedures SG

[2] RTCA, Development and Implementation Planning Guide for ADS-B Applications, RTCA/DO-249, October 1999.

Activity Area	Capstone Data Sources	Potential Users of the Data
Operational Procedures	Pilot and controller training material. OpSpecs, SFAR, AIM, inspector guidance	FAA Air Traffic System Requirements (ARS), Aviation Flight Standards (AFS), Aircraft Certification (AIR), SF21 Ops/Procedures SG, RTCA and other standards committees
Human Factors Issues	Controller operational feedback, UAA Pilot Training and Safety Study	RTCA and other standards committees, Air Traffic, Flight Standards, Aircraft Certification, SF21 Ops/Procedures SG
End-to-End Performance and Technical Requirements	Certification test data - terrain database - flight procedures - PFD/ND requirements - ADS-B requirements	FAA Air Traffic System Requirements (ARS), FAA System Architecture and Investment Analysis (ASD), SF21 Tech/Cert SG
Interoperability Requirements for Air and Ground Systems	Certification test data, interface requirements document (IRD) and ground system architecture documentation	RTCA, FAA Air Traffic System Requirements (ARS), SF21 Ops/Procedures SG
Operational Safety Assessment	Safety Engineering Report, certification test data	System Safety (ASY), Air Traffic, Flight Standards, Aircraft Certification
Equipment Development, Test, and Evaluation (Aircraft and Ground)	Controller operational feedback, UAA Training and Safety Study	RTCA and other standards committees, Air Traffic, Flight Standards, Aircraft Certification, SF21 Tech/Cert SG
Operational Test and Evaluation	Controller operational feedback, UAA Pilot Training and Safety Study	RTCA and other standards committees, Air Traffic, Flight Standards, Aircraft Certification, SF21 Ops/Procedures SG, SF21 Cost/Benefit, SF21 Tech/Cert

2.2 Safety Engineering Report

An end-to-end system-level operational safety review for Capstone RNAV services is being performed by the Capstone Program Office and the Alaskan Region in coordination with the

FAA Office of System Safety (ASY-300). A Capstone system safety working group has been formed that includes FAA headquarters Safety Specialists and Alaskan operations specialists. This analysis will include hazard identification, risk assessment, severity and probability determination, and controls and mitigation documentation specific to Capstone avionics, ground systems and procedures.

2.3 Safety Benefit Study

The University of Alaska – Anchorage (UAA) is under contract to perform a study addressing the safety and benefits that result from the Capstone Program and associated new flight procedures in the Juneau/Southeast Alaska area. The safety study includes:

- Causes and severity of accidents among Capstone area aircraft
- Expected prevention
- Changes in accidents from the baseline population
- User assessments
- Interim assessments.

3. Developmental Test and Evaluation

Developmental Tests and Evaluations (DT&E) are used to identify and resolve critical technical and operational issues leading toward certifications and approvals of the ground and aircraft systems. New avionics being delivered must be evaluated to exploit new technologies and apply human factors knowledge. New airspace routes, instrument approaches and procedures are being produced to meet requirements and user needs. Certification, operations approval, and flight check verification are conducted to ensure the new designs and procedures are flyable and meet the requirements.

3.1 Ground System

3.1.1 Ground Infrastructure

No ground infrastructure changes or improvements are required for the initial RNAV services; only new GPS/WAAS avionics, new procedures, aeronautical charts and publications. However, changes are planned under Phase II that will support and enhance these RNAV services. These changes include new GBT sites for ADS-B/FIS-B, new communications outlets and additional weather observation systems. The Capstone Phase II architecture will support multiple services with emphasis on products (e.g., ADS-B, FIS-B, TIS-B) that meet the needs of the aviation community. Phase II will also provide surveillance information to allow ATC surveillance of the new route structure and application of radar-like services.

All ground equipment will go through standard development testing (e.g., FAA Technical Center) as appropriate, as well as Joint Acceptance Inspection (JAI) and commissioning process.

Site adaptation of the automation system is required for the new RNAV structure and will be performed by FAA/AOS. This will ensure proper MSAW (Minimum Safe Altitude Warning) alerting and charting.

3.1.2 Air Traffic Services Procedures and Training

No new procedures are required. Standard clearance for enroute altitudes and approach/departures apply. See Appendix G for concurrence from NATCA.

Training will be developed for ARTCC, ATCT and AFSS as well as for maintenance technicians, as appropriate.

3.2 Aircraft System

3.2.1 Equipment

Chelton Flight Systems is delivering the navigation and primary flight displays with GPS/WAAS and has received an STC from the Alaskan aircraft certification office. Certification is part of the avionics contracts. Aircraft certification evaluates human factors data such as functionality, integration, and operational interface ease of use. Flight Standards evaluates similar items and approves air carrier training, manuals/procedures, and operational use in the NAS. These efforts complete the initial avionics stage necessary to provide the RNAV services addressed by this TEMP. The displays are installed in single (VFR) and dual display (IFR) configurations. Standard certification test and evaluation processes will be used and coordinated with the Small Airplane and Rotorcraft Directorate and the FAA headquarters aircraft certification service.

For the next avionics stage in Capstone Phase II, UPS-AT was chosen to demonstrate a minimum operational performance specification (MOPS)-compliant UAT (data link). Additional integration and testing of the UAT must be accomplished in order to verify end-to-end interoperability with the ground system which is being produced by a third vendor. Avionics are being procured under government contract from different vendors and will be integrated under FAA supervision.

3.2.2 Procedures and Training

To implement these RNAV services, a number of approvals and procedures needed to be implemented and new navigation charts produced.

- AVN-132 completed a feasibility study of the RNAV routes between Juneau, Haines, Hoonah and Gustavus. As a result, waivers had to be processed by AFS-420. New GPS MEAs were requested by Appendix B1.
- It was determined that WAAS GPS/FDE is sufficient for IFR navigation as the primary navigation source. This is documented by SFAR 97 (Appendix K).
- Failure or degradation modes (Figure 3-1) for GPS/WAAS (e.g., WAAS to GPS/FDE, to GPS/RAIM to Dead Reckoning) were identified and procedures developed for dealing with each.
- Current AFS-400 policy was reviewed and amended for operation below traditional MEAs. This is a concurrence process between air traffic, airways facilities, aircraft certification, and flight standards. See Appendices E, I and N for examples regarding standards and a recommendation to authorize.
- AVN-100 used the new policy to develop applicable approach procedures. AFS-420 approved new minima and flight checks were flown by AVN-200.

- VHF communications flight checks were conducted along specific routes to determine what new MEAs could be approved.
- Charts with new symbology and depictions were procured. Aeronautical Information Manual (AIM) guidance was prepared as shown in Appendix L. A NOTAM, issued to announce the new procedures, is shown in Appendix M.
- FAA Flight Standards Principal Inspectors (operations, maintenance, avionics) for the participating operators approved the training and procedures for the new instrument approaches and airway MEAs. Appropriate oversight will continue as the new avionics are used and new functions developed.

The University of Alaska at Anchorage (UAA) was contracted by the Capstone Program Office to develop and administer FAR Part 135 approved initial and recurrent pilot training on the Capstone avionics. Beta-testing of the training was conducted in February 2003. Training was made available for operators and others in Juneau and in Sitka. The training program was updated from Phase I (Bethel), as appropriate, to include new RNAV procedures, new approach procedures, new functionality in the avionics and to reflect pilot operational feedback.

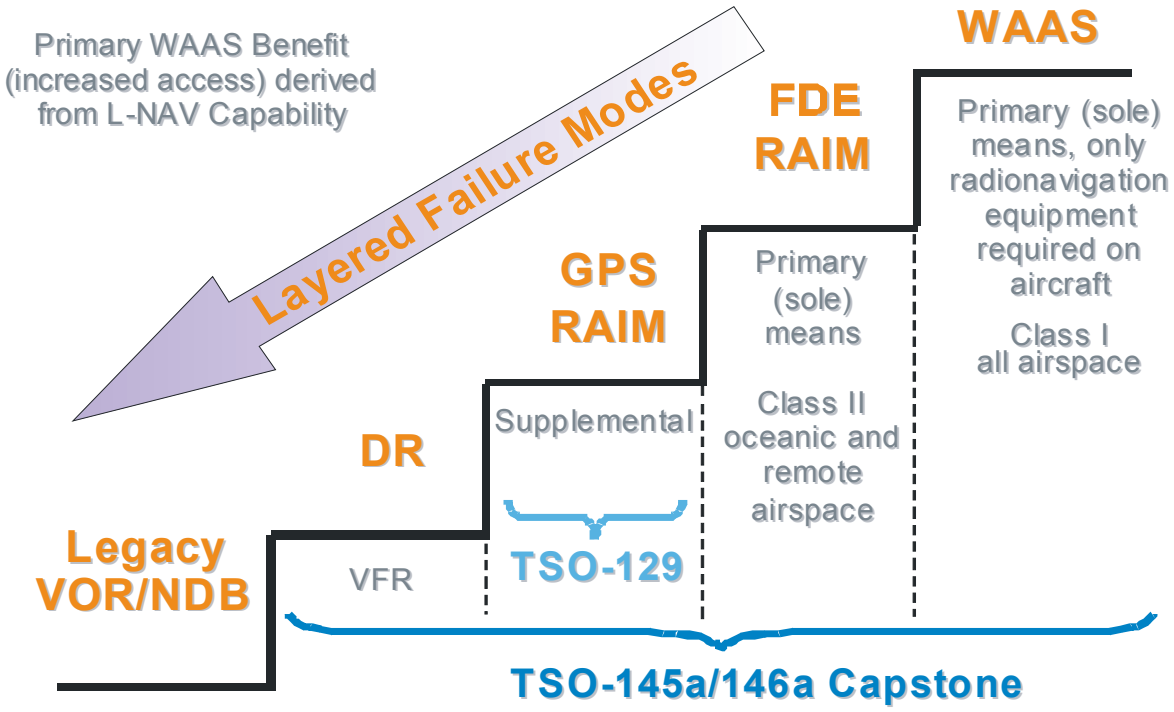


Figure 3-1. Degradation Modes for TSO-C145a/C146a GPS/WAAS Avionics

3.3 Airspace

User needs and requirements (improved low altitude route structures and new RNAV instrument approaches) were translated and developed into specific airway modifications (e.g., lower MEAs) and new RNAV departure/arrival routes. Flight Standards guidance for development of new MEAs is contained in Appendix E. New charting and procedural issues were resolved regarding new MEAs for GPS (special symbology on existing routes rather than new routes). Use of GPS/WAAS as the only means of navigation was resolved regarding the establishment of new RNAV routes that are anchored by GPS waypoints rather than traditional navigation aids. Airspace designation (Class E with a 700' floor vs. a 1200' floor) was evaluated for the new IFR airports.

4. Operational Evaluation

Once the system components (avionics, airways and routes, approach procedures, etc.) are tested and approved for use and operations begin, the system will be evaluated operationally for the overall and individual contributions to safety, utility and efficiency. Deficiencies and opportunities for improvement will be noted and elements selected and adapted for use elsewhere in Alaska and the NAS. Implementation and operational evaluation during normal revenue service flying will be conducted to monitor Capstone systems performance and to collect operational feedback from the pilots and controllers. Changes in use resulting from these enhancements will be studied, e.g. whether increased IFR use would justify an extensive investment in the expansion of surveillance or where such expansion would be worthwhile.

4.1 Aircraft System

Evaluation will be conducted largely by UAA, using pilot surveys, questionnaires and interviews. Difficulties in operation, confusing or inadequate displays and other discrepancies will be noted and recommendations for changes, improvements, new features and new capabilities will be obtained. Operational feedback is required to identify equipment and system anomalies and potential refinements.

4.1.1 Data Collection Methodology and Performance Measures

The UAA has been contracted to provide a training and safety study that will baseline the current operations as well as monitor pilot acceptance, usability, and usefulness of avionics, and collect feedback on training and Capstone avionics use. In addition, other data collection mechanisms are in place, such as the FAA Flight Standards Program Tracking and Reporting Subsystem (PTRS). Data collection and analysis will help validate pilot's ease of use, application for RNAV/IFR navigation and terrain avoidance, increased situational awareness and improved flight safety.

The Capstone program office, Aircraft Certification, and Flight Standards have requirements to review operations of the Capstone avionics for any unanticipated design anomalies as well as to improve the next generation designs.

4.2 Airspace

The objective of this effort is to verify whether the new RNAV/GPS MEAs and RNAV routes meet user needs and if further refinements are necessary to enhance utility or safety.

4.2.1 Data Collection Methodology and Performance Measures

Flight checks will be used and procedures reviewed periodically. As the initial RNAV route structure is flown, feedback from the operators and controllers will be used to refine and expand the structure.

4.3 UAA Safety Effects and Benefits

To quantify the safety effects and benefits of Capstone, the UAA has been contracted to provide a Training and Safety Study that will baseline the current operations and periodically update that baseline to measure Capstone's effect on operations. It must be noted that uncontrolled changes (e.g., increase/decrease in IFR traffic, increase/decrease in pilot experience) within the affected area will also affect operations – so these must be considered in the analysis. This training and safety study will be used to track the effect of RNAV services.

4.3.1 Data Collection Methodology and Performance Measures

The UAA has been contracted to provide a safety study and will evaluate user reaction to new procedures and routes. Route structures and procedures will be evaluated for use elsewhere in Alaska or the NAS.

The performance measures for the aircraft system operational evaluation is defined largely by baseline survey results. Follow-on surveys will be compared to the baseline results to see how Capstone, in this case, has affected operations in the SE Alaska region. Items such as equipment malfunctions will be fed back to the manufacturer for their analysis and consideration for product improvement.

5. Capstone System Safety

Development of an RNAV infrastructure and operations in SE Alaska has followed defined system safety practices in order to facilitate a safe and risk-managed implementation. This is a similar system of safety practices used during the development of Capstone ADS-B radar-like services.

System Safety is a specialty within systems engineering that supports program risk management. It is the application of engineering and management principles, criteria, and techniques to optimize safety. The tasks and activities of system safety management and engineering being used by Capstone are defined in the Capstone System Safety Program Plan (CSSPP). The specific elements include Scope and Objectives, System Safety Organization, Program Milestones, System Safety Requirements, Hazard Analysis, System Safety Data, Safety Verification, Audit Program, Training, Incident Reporting, and System Safety Interfaces.

6. Resources Summary

See the most current version of the Capstone Program Plan for a summary of Capstone resources. That and other documents can be found on the Capstone website at http://www.alaska.faa.gov/capstone/doc

Appendix A

A.1 U.S. Senator Ted Stevens WAAS Letter

A20020318033 1

United States Senate

COMMITTEE ON APPROPRIATIONS
WASHINGTON, DC 20510-6025

February 28, 2002

The Honorable Jane F. Garvey
Administrator
Federal Aviation Administration
800 Independence Avenue, S.W.
Room 1010
Washington, D.C. 20591

Dear Jane:

I appreciate your continued cooperation in seeing the timely and successful implementation of Capstone in Alaska. I would appreciate any feedback you might provide on the issue of access to the GPS WAAS signal.

In December of 2002, I received a letter from the Alaska Aviation Coordination Council (AACC) on this matter. AACC suggested the possibility that approval of WAAS might be sped up, or that the L-NAV portion of WAAS might at least be made available for the Capstone Phase II test by August of this year. I would appreciate anything you can do to make this happen.

With best wishes,

Cordially,

Ted Stevens

TED STEVENS

Appendix A

A.2 AVR1 Letter to Industry

U.S. Department
of Transportation
Federal Aviation
Administration

800 Independence Ave., SW.
Washington, DC 20591

APR 16 2002

Mr. Felix Maguire
Chair, Alaska Aviation Coordination Council
P.O. Box 241185
Anchorage, AK 99524-1185

Dear Mr. Maguire:

Administrator Garvey has asked me to respond to your letter dated November 2, 2001, asking for our support to have the schedule for approval of the wide area augmentation system (WAAS) speeded up or, at the least, the lateral navigation (LNAV) portion made available for the Capstone Phase II test by August 2002. Our apologies for the late response, but as I'm sure you are aware, our mail has been severely delayed as a result of the Anthrax threat here in the Washington, D.C., area.

We agree that implementation of an instrument flight rules (IFR) area navigation (RNAV) infrastructure in Alaska, especially where no infrastructure exists today, should be a high priority. The Federal Aviation Administration (FAA) Capstone Program Office has initiated activities for development of requirements and procedures for an IFR RNAV infrastructure using satellite-based navigation systems for primary means of navigation in Southeast Alaska. FAA Air Traffic Procedures, Flight Standards, Airways Facilities, and Aviation Systems Standards personnel are currently providing support to the Capstone Program Office for the development and implementation of global positioning system RNAV routes in Alaska.

The WAAS signal in space is available now for applications other than IFR aviation uses and, barring any unforeseen circumstances, should be available and commissioned for IFR applications for all aviation users when we have completed the final end-to-end operational test and evaluation of the system. Contractor delivery of WAAS LNAV and vertical navigation (VNAV) to the FAA could be as early as March 2003, with possible FAA commissioning of WAAS not later than December 2003, and potentially as early as July 2003.

The LNAV capability that you request in your letter is available now for those operators who equip their aircraft with TSO-C146 stand-alone airborne navigation equipment. Since the TSO-C146 avionics equipment is certified for IFR LNAV operations even when the WAAS signal in space is not available, air carrier and general aviation operators will be authorized to conduct IFR LNAV operations using this equipment. Once the WAAS signal in space is made available to IFR aviation users, operators equipped with TSO-C146 avionics systems will automatically start receiving the WAAS signal in space and have the additional capability of VNAV using WAAS.

In summary, we wholeheartedly support the earliest implementation of a usable IFR infrastructure in those areas of Alaska where that infrastructure does not exist today. We will continue to provide the resources needed to support timely equipment certification and operational approvals that lead to the use of satellite-based navigation systems while providing the highest level of safety to the flying public.

If you have additional questions, concerns, or recommendations, please contact Mr. Don Streeter, Flight Standards Service, Flight Technologies and Procedures Division, Free Flight Program Manager, at (202) 267-9093.

Sincerely,

Nicholas A. Sabatini
Associate Administrator for Regulation
and Certification

Appendix A

A.3 ATS-1 RNAV Support Memo

Subject: **ACTION**: Air Traffic Services (ATS) Support of Area Navigation (RNAV) Infrastructure in Alaska

Date: May 20 2002

From: Acting Associate Administrator for Air Traffic Services

Reply to Attn. of:

To: ATS Management Team

As you know, safety in the NAS is of paramount concern to the Administrator and to the ATS organization. The Capstone Program's efforts to improve aviation safety in Alaska through the accelerated introduction of emerging technologies are critical, in light of Alaska's dependency on aviation as its primary mode of transportation and the need to reduce its aviation accident rate.

On April 16, 2002, the Associate Administrator for Regulation and Certification, AVR-1, announced efforts to enable the use of satellite-based instrument flight rules (IFR) lateral navigation (LNAV) in Alaska, for operators whose aircraft are equipped with the appropriate avionics. This will represent a significant advancement in our efforts to improve safety in Alaska, because it will enable the early implementation of a usable IFR area navigation (RNAV) infrastructure, including in areas where no infrastructure exists today.

The safety improvements represented by this new navigational capability cannot be realized without the full and direct support of ATS. It is imperative that ATS organizations align their efforts and work in partnership with AVR to complete the timely development of flight procedures and other activities that will lead to the use of satellite-based navigation systems, while providing the highest level of safety to the flying public. I am asking each of you to ensure that your personnel are provided with the necessary support to accomplish this important task.

ORIGINAL SIGNED BY.
STEVEN J. BROWN

Steven J. Brown

cc:

AVR-1, ARC-1, AAL-1

Appendix B

B.1 AAL Request to Lower MEAs to MOCAs

ALASKAN REGION

Capstone

Investment in Safety

November 30, 2001

To: Merle D. Perrine, Anchorage Flight Procedures Office, AVN-132.

From: Gary E. Childers, National Free Flight Field Coordinator, AAL-1SC.

Subject: Request to lower Minimum Enroute Altitudes (MEA) on existing routes in Southeast Alaska.

The Capstone office, in response to industry wishes, requests the MEAs for the following Victor and Colored air routes be lowered to there appropriate Minimum Obstruction Clearance Altitude (MOCA) for aircraft equipped and approved to navigate using Global Positioning System information.

- All low altitude airways inside of Alaskan airspace, East and Southeast of Johnstone Point, Middleton Island, Magum, and Whitehorse, and Northwest of Sandspit, Nilla/Banne, Wacal and Prince Rupert. (See attachment 1)

We request the Alaskan Regional Airspace and Procedures Team prioritize this effort and forward the lowest possible minimums for each route involved, without regard to existing ground based navigation aid reception, to the appropriate national level authority for inclusion as a future change.

Capstone Phase II is a collateral community/FAA commitment to provide a usable IFR infrastructure in Southeast Alaska beginning with this initiative. Some Capstone equipped aircraft will be ready to use these routes as early as September 30, 2002.

Sincerely

Gary E. Childers

Attachment 1

Southeast Alaska Airways under consideration for lower MEA's

V307 between ANN and YZP
V309 between ANN and AGPAL
V311 between BKA and ANN
V317 between HAPIT and ZAYAS
V318 between LVD and ANN
V319 between JOH and YAK
V362 between ANN and TUMEZ
V428 between YXY and BKA
V431 between SSR and BKA
V440 between MDO and MOCHA
V473 between BKA and LVD
A1 between HBK and HALAM
A15 between A15 and BANNE
B28 between SIT and PR
B37 between SPARL and SQM
B38 between XY and EEF
B40 between PJ and HNS
B79 between ICK and ZP
R51 between SIT and SQM

Appendix B

B.2 AAL Departure-Approach Feasibility Request

ALASKAN REGION

Capstone

Investment in Safety

August 10, 2001

To: Merle D. Perrine, Anchorage Flight Procedures Office, AVN-132.

From: Gary E. Childers, Capstone Program Office, AAL-1SC.

Subject: Request Feasibility Studies For Departure and Approach Procedures in Southeast Alaska.

The Capstone office requests a feasibility study be conducted and the results forwarded to our office for the following procedures:

- Departure procedures from the Juneau, Alaska airport to initial approach fixes serving the Hoonah, Gustavus, and Haines, Alaska airports.
- Departure Procedures from the Hoonah, Gustavus and Haines Alaska airports to an initial approach fix serving the Juneau, Alaska Airport.
- Approach procedures serving Hoonah, Gustavus, Haines and Juneau Alaska airports.

Verifying the feasibility of these procedures is the first step toward delivering an IFR infrastructure that satisfies industry and FAA requirements. Users plan to fly the resulting procedures with RNAV equipped air carrier aircraft operating primarily from the Juneau, Alaska airport.

We request your staff find and use the lowest possible minimums for each procedure, using either public or special criteria, and waivers if necessary to achieve the best possible results. Due to the close proximity and geological nature of these airports the members of the requirements team request that each departure procedure be connected directly to the respective initial approach segment. If your staff discovers any other special requirements that would enable even lower minimums, please include them in a list for our consideration.

Please forward your report to us by September 15, 2001 so that we can validate the results with industry and FAA users in Juneau.

Sincerely - Gary E. Childers

Appendix B

B.3 AAL-500 Request for Publishing MEAs

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

Memorandum

Subject: **ACTION:** Establishment of GPS MEAs on Southeast Alaska Airways

Date: January 6, 2003

From: Air Traffic Division Manager, Alaskan Region, AAL-500

Reply to Attn. of:

To: Manager, Aeronautical Information Division, ATA-100

We have received and reviewed flight check documentation for establishment of Global Positioning System (GPS) Minimum Enroute Altitudes (MEA) in Southeast Alaska. Please see Attachment 1 for the GPS MEAs that we request your office publish on the IFR Enroute Low Altitude-Alaska L-1 and L-2 (L-3 and L-4 also, where overlap occurs with L-1 and L-2).

The GPS MEAs are part of the Capstone Program for Southeast Alaska and the target date for publication is March 20, 2003. This date has been discussed on Capstone national TELECONs and we believe that coordination with the appropriate Flight Standards and Air Traffic offices that have approving authority has been completed.

If you have questions concerning this matter, please call Derril Bergt at 907 271-2796.

Anthony M. Wylie

cc:
Capstone Program Manager
ATP-104
ATA-400
Attachments
1. GPS MEA Airway Segment Altitudes
2. Flight Check Report

GPS MEAs FOR SOUTHEAST ALASKA - CAPSTONE PROJECT Attachment 1

Airway	Segment	Conventional MEA	GPS MEA (New)
A1	Hinchinbrook NDB (HBK) to Campbell Lake NDB (CMQ)	9,000 ft.	**8,000 ft.**
V431	LYRIC DME Fix to Sisters Island (SSR) VORTAC	8,000 ft.	**5,800 ft.**
V311	TOKEE DME Fix to FLIPS DME Fix	9,000 ft.	**6,000 ft.**
B28	Nichols NDB (ICK) to Sitka NDB (SIT)	6,900 ft.	**6,000 ft.**
V473**	Level Island (LVD) VOR/DME to FLIPS DME Fix	7,000 ft.	**6,000 ft.**
V440	SALLS DME Fix to HAPIT Int.	9,000 ft.	**8,000 ft.**
V440	HAPIT Int. to CENTA DME Fix	9,000 ft.	**8,000 ft.**
V440	CENTA DME Fix to Yakutat (YAK) VORTAC	3,000 ft.	**2,000 ft.**
V440	OCULT DME Fix to Middleton Island (MDO) VOR/DME	8,000 ft.	**7,000 ft.**
V440	Middleton Island (MDO) VOR/DME to HOPER Int.	10,000 ft.	**8,500 ft.**
V440	HOPER Int. to Anchorage (ANC) VOR/DME	7,000 ft.	**6,000 ft.**
V317**	GESTI DME Fix to Level Island (LVD) VOR/DME	7,000 ft.	**5,000 ft.**
V317**	Sisters Island (SSR) VORTAC to CSPR DME Fix	7,000 ft.	**5,000 ft.**
V317	CSPR DME Fix to HAPIT DME Fix	15,000 ft.	**8,000 ft.**

Airway	Segment	Conventional MEA	GPS MEA (New)
V428	Biorka Island (BKA) VORTAC to Sisters Island (SSR) VORTAC	7,000 ft.	**6,000 ft.**
V428*	ODBOE DME Fix to Haines (HNS) NDB	10,000 ft.	**8,500 ft.**
V428	Haines (HNS) NDB to U.S. Canada Border	10,000 ft.	**9,500 ft.**
V319	MALAS DME Fix to KATAT Int.	10,000 ft.	**9,000 ft.**
V319	KATAT Int. to CASEL Int.	7,000 ft.	**5,000 ft.**
V319**	WILER DME Fix to Anchorage (ANC) VOR/DME	10,000 ft.	**7,000 ft.**

* - Intersection ODBOE currently not published on L1/L2.

** - Published MOCA's on L1/L2 are higher than MOCAs listed on FAA Form 8260-16. The GPS MEAs requested for these segments would be lower than the published MOCAs unless MOCAs are corrected to match FAA Form 8260-16.

Appendix C

C.1 RNAV EnRoute Structure

RNAV En Route Structure

Project Start Date: Wed 11/6/02
Project Finish Date: Tue 5/27/03

Task_Data

ID	Task_Name	Duration	Start_Date	Finish_Date	Predecessors	Resource_Names
0	**RNAV En Route Structure**	627 days	Mon 1/1/01	Tue 5/27/03		
1	**Industry Coordination and Buy-In**	78 days	Mon 1/1/01	Wed 4/18/01		
2	User Meetings Ongoing	0 days	Mon 1/1/01	Mon 1/1/01		
3	Concept of Operations Document (with industry help)	78 days	Mon 1/1/01	Wed 4/18/01		
4	**AVR and ATS Buy-in and Policy Guidance**	25 days	Tue 4/16/02	Mon 5/20/02		
5	AVR-1 memo	1 day	Tue 4/16/02	Tue 4/16/02		
6	ATS-1 memo	1 day	Mon 5/20/02	Mon 5/20/02		
7	**Develop Lower Altitude RNAV EnRoute Structure**	426 days	Wed 8/1/01	Thu 3/20/03		
8	Identify Route segments for lower altitudes	132 days	Wed 8/1/01	Thu 1/31/02		
9	RAPT/NAPT Submission	12 days	Mon 1/28/02	Tue 2/12/02		
10	AVN-500 develop pilot charting specifications	44 days	Mon 1/28/02	Thu 3/28/02		
11	AVN receives AFS development criteria letter	1 day	Wed 5/1/02	Wed 5/1/02	40	
12	AVN-100 develop RNAV/GPS MEAs for routes	90 days	Thu 5/2/02	Wed 9/4/02	11	
13	AK Regional Review	14 days	Thu 9/5/02	Tue 9/24/02	12	
14	AAL-500 Airspace Review	30 days	Tue 10/22/02	Mon 12/2/02	13	
15	AAL-500 Environmental Impact Study	30 days	Wed 9/25/02	Tue 11/5/02	13	
16	ATP-100/ATX NATCA National Impact and Implemenation brief	35 days	Wed 9/18/02	Tue 11/5/02	11	
17	AVN-200/AAL-ZAN/500 Flight Inspection Plan	10 days	Wed 9/25/02	Tue 10/8/02	13	
18	AVN-200 Perform Flight Inspections	30 days	Wed 10/9/02	Tue 11/19/02	17	
19	Review Flight Inspection Results - AAL-500/ZAN/AWO	20 days	Wed 11/20/02	Tue 12/17/02	18	
20	AAL-ZAN/AOS automation site adaptation complete	0 days	Thu 3/20/03	Thu 3/20/03	19	
21	AAL-500/ZAN NATCA local Imapct and Implementation brief	0 days	Thu 3/20/03	Thu 3/20/03	16,20	
22	ATC Training Complete	0 days	Thu 3/20/03	Thu 3/20/03	19	
23	**Publish Jeppesen "Special" Charts**	42 days	Fri 1/31/03	Mon 3/31/03		
24	ATA Coordination Complete	0 days	Fri 1/31/03	Fri 1/31/03		
25	Request for Charting	0 days	Fri 1/31/03	Fri 1/31/03	24	
26	Receive Draft Chart	0 days	Fri 2/28/03	Fri 2/28/03		
27	Jeppesen Prepare Charts	42 days	Fri 1/31/03	Mon 3/31/03	25	
28	Jeppesen Publish Charts	0 days	Mon 3/31/03	Mon 3/31/03	27	
29	**Publish Public charts (May 15 Chart Date)**	64 days	Fri 2/14/03	Thu 5/15/03		
30	Complete Chart Legend	0 days	Fri 2/14/03	Fri 2/14/03		
31	Chart Change Notice developed(ATA-100)	0 days	Fri 2/14/03	Fri 2/14/03		
32	Meet Chart Date Deadline	0 days	Thu 3/13/03	Thu 3/13/03	18,19,50	
33	ATA-100 FAR-95 entry and coordination (incl NACO)	45 days	Thu 3/13/03	Wed 5/14/03	32	
34	Chart Date Effective	0 days	Thu 5/15/03	Thu 5/15/03		
35	Develop FAA Internet Prediction Tool	29 wks	Wed 11/6/02	Tue 5/27/03		
36	Develop Dispatch Function Training Material (to include RAIM prediction)	1 wk	Wed 5/28/03	Tue 6/3/03	35	
37	**Develop En Route Operational Approval Material**	472 days	Thu 5/31/01	Fri 3/21/03		
38	AFS determine requirements	300 days	Mon 1/28/02	Fri 3/21/03		

39	Request AVR guidance on TSO-145/146 primary means navigation	225 days	Thu 5/31/01	Wed 4/10/02		
40	AFS develop policy guidance and criteria for RNAV/GPS MEAs	67 days	Mon 1/28/02	Tue 4/30/02		
41	**Produce SFAR for enroute GPS primary-means (using TSO-145/146)**	226 days	Wed 5/1/02	Thu 3/13/03		
42	Coord with AFS-200, 300, 400, 800	200 days	Wed 5/1/02	Tue 2/4/03		
43	Coord with ATP-100 and AGC	200 days	Wed 5/1/02	Tue 2/4/03		
44	FAA formal coord - signatures	58 days	Wed 11/6/02	Fri 1/24/03		
45	SFAR Published	0 days	Fri 1/24/03	Fri 1/24/03	44	
46	SFAR Public Comment Period	30 edays	Fri 1/24/03	Sun 2/23/03	45	
47	Adjudicate Public comments	5 edays	Sun 2/23/03	Fri 2/28/03	46	
48	HDQ Capstone Overview Committee Meeting	0 days	Fri 2/28/03	Fri 2/28/03		
49	Obtain Signatures for final SFAR	5 days	Mon 3/3/03	Fri 3/7/03	47,48	
50	Publish SFAR	3 days	Mon 3/10/03	Wed 3/12/03	49	
51	Chart Date Deadline	0 days	Thu 3/13/03	Thu 3/13/03		
52	**Develop new OpSpecs**	245 days	Mon 4/1/02	Fri 3/7/03		
53	Prepare Draft OpSpec	25 days	Mon 4/1/02	Fri 5/3/02		
54	Coord with AFS-200, 300, 400, 800	200 days	Mon 5/6/02	Fri 2/7/03	53	
55	Coord with ATP-100 and AGC	200 days	Mon 5/6/02	Fri 2/7/03	53	
56	Receive Input from AAL-230, AAL-03, AAL-05	0 days	Fri 2/28/03	Fri 2/28/03	53	
57	Coord with industry	1 wk	Mon 2/3/03	Fri 2/7/03		
58	Final OpSpec	6 days	Fri 2/28/03	Fri 3/7/03	53,54,55,56,57	
59	FSDO Can Begin Operational Approval Use of RNAV for En Route	1 wk	Mon 3/24/03	Fri 3/28/03	58FS-1 day,64	
60	**Develop Air Carrier Training for En Route Operations**	11 days	Fri 2/28/03	Fri 3/14/03		
61	Develop RNAV En Route Training Module for En Route Operations	8 edays	Fri 2/28/03	Sat 3/8/03	26	
62	FSDO Review of Generic Training Module for En Route Operations	1 wk	Mon 3/10/03	Fri 3/14/03	61	
63	Begin Carrier Submital of Training Programs (Avionics & RNAV En Route) to POI	0 days	Mon 3/17/03	Mon 3/17/03	62	
64	**Develop Operator Manual/Procedure Material for En Route Operations**	30 days	Mon 2/3/03	Fri 3/14/03		
65	Develop Material	4 wks	Mon 2/3/03	Fri 2/28/03		
66	FSDO Review of Generic Material	2 wks	Mon 3/3/03	Fri 3/14/03	65	
67	**Develop and Issue Pilot Guidance Material (for Public use)**	51 days	Thu 2/20/03	Thu 5/1/03		
68	New AIM language Effective	0 days	Thu 2/20/03	Thu 2/20/03		
69	AIP Update Effective	0 days	Thu 2/20/03	Thu 2/20/03		
70	NTAP Deadline	0 days	Wed 4/23/03	Wed 4/23/03		
71	Informational Letter to AK Airmen	30 days	Fri 3/21/03	Thu 5/1/03		
72	RNAV En Route Structure Available for Public Use	0 days	Thu 5/15/03	Thu 5/15/03	37,7,67,23,29	
73	RNAV En Route Available for Special Use	0 days	Mon 3/31/03	Mon 3/31/03	37,7,23	

Appendix C

C.2 RNAV Approach-Departure Procedures

RNAV Approach/Departure Procedures

Project Start Date: Wed 11/6/02
Project Finish Date: Thu 7/10/03

Task_Data

ID	Task_Name	Duration	Start_Date	Finish_Date	Predecessors	Resource_Names
0	**RNAV Approach/Departure Procedures**	659 days	Mon 1/1/01	Thu 7/10/03		
1	**Industry Coordination and Buy-In**	78 days	Mon 1/1/01	Wed 4/18/01		
2	User Meetings Ongoing	0 days	Mon 1/1/01	Mon 1/1/01		
3	Concept of Operations Document (with industry help)	78 days	Mon 1/1/01	Wed 4/18/01		
4	**AVR and ATS buy-in and policy guidance**	25 days	Tue 4/16/02	Mon 5/20/02		
5	AVR-1 memo	1 day	Tue 4/16/02	Tue 4/16/02		
6	ATS-1 memo	1 day	Mon 5/20/02	Mon 5/20/02		
7	**Airports/Comm Coordination and Requirements**	417 days	Wed 8/1/01	Thu 3/6/03		
8	**Airport Preparations**	90 days	Mon 1/28/02	Fri 5/31/02		
9	State of Alaska - Designate airports as IFR	90 days	Mon 1/28/02	Fri 5/31/02		
10	Provide runway lighting and markings	90 days	Mon 1/28/02	Fri 5/31/02		
11	**Runway and Airport Surveys**	95 days	Mon 1/28/02	Fri 6/7/02		
12	Contract SOW for runway and airport surveys	90 days	Mon 1/28/02	Fri 5/31/02		
13	Provide Results to AVN-100 and AK DOT	5 days	Mon 6/3/02	Fri 6/7/02	12	
14	**Provide Weather Observations**	417 days	Wed 8/1/01	Thu 3/6/03		
15	ANI-700/AAL-400 AWOS/AWSS at Hoonah	90 days	Wed 8/1/01	Tue 12/4/01		
16	TAFs for Alternate Airport Use	90 days	Fri 11/1/02	Thu 3/6/03		
17	**Develop Special RNAV/RNP Departure, Approach Procedures**	507 days	Wed 8/1/01	Thu 7/10/03		
18	Identify Initial Airports	132 days	Wed 8/1/01	Thu 1/31/02		
19	AVN-170G Perform Feasibility Study	60 days	Wed 8/1/01	Tue 10/23/01		
20	RAPT/NAPT Submission	12 days	Mon 1/28/02	Tue 2/12/02		
21	AVN-100 develop DRAFT approach/departure procedures	60 days	Mon 6/10/02	Fri 8/30/02	13	
22	AK Regional Review	14 days	Mon 9/2/02	Thu 9/19/02	21	
23	AAL-500 Airspace Review	30 days	Tue 10/22/02	Mon 12/2/02	22	
24	AAL-500 Environmental Impact Study	30 days	Fri 9/20/02	Thu 10/31/02	22	
25	AVN receives AFS development criteria waiver letter	1 day	Wed 12/11/02	Wed 12/11/02	53	
26	AVN-100 develop final DRAFT approach/departure procedures	45 days	Thu 12/12/02	Wed 2/12/03	25	
27	AK Regional Review	7 days	Thu 2/13/03	Fri 2/21/03	26	
28	Jeppesen submit TEST database to Chelton	28 days	Thu 2/13/03	Mon 3/24/03	27	
29	Chelton distribute TEST database	6 wks	Tue 3/25/03	Mon 5/5/03	28	
30	Capstone review TEST database with Simulator	1 wk	Tue 5/6/03	Mon 5/12/03	29	
31	AVN-100 develop FINAL approach/departure procedures	10 wks	Mon 2/24/03	Fri 5/2/03	27	
32	National Procedure Review Board (PRB) coordination	10 days	Mon 5/5/03	Fri 5/16/03	31	
33	AVN-200 Perform Flight Inspections	10 days	Mon 5/5/03	Fri 5/16/03	31	
34	Receive Flight Inspection Results (Provide copies to ZAN, Jeppesen, etc)	0 days	Fri 5/16/03	Fri 5/16/03	33	
35	Jeppesen Prepare Draft Chart	10 days	Mon 5/19/03	Fri 5/30/03	34	
36	Jeppesen complete avionics database and provide to Chelton	30 days	Mon 5/19/03	Fri 6/27/03	34,30	
37	Chelton distributes final database	9 days	Mon 6/30/03	Thu 7/10/03	36	
38	AAL-ZAN/AOS automation site adaptation for new waypoints (e.g., video maps)	39 days	Mon 5/19/03	Thu 7/10/03	34	

39	AAL-500/ZAN NATCA local Imapct and Implementation brief?	29 days	Mon 5/19/03	Thu 6/26/03	34	
40	ATC Training	2 wks	Fri 6/27/03	Thu 7/10/03	39	
41	ATA-100 database entry for waypoints and coordination (incl NACO)	30 days	Mon 5/19/03	Fri 6/27/03	34	
42	AFS-400 approval of procedures	1 wk	Mon 5/19/03	Fri 5/23/03	34	
43	Send approved procedures to Jeppesen	0 days	Fri 5/23/03	Fri 5/23/03	42	
44	Jeppesen "special" charts complete	30 days	Mon 5/26/03	Fri 7/4/03	43	
45	Approach/Departure Procedures Effective Date	0 days	Thu 7/10/03	Thu 7/10/03	40,41,44,37	
46	Operational Approval of RNAV IFR Approach-Departure Operations	1 day?	Mon 6/23/03	Mon 6/23/03	47	
47	**Develop App/Dep Operational Approval Material**	537 days	Thu 5/31/01	Fri 6/20/03		
48	AFS determine requirements	300 days	Mon 1/28/02	Fri 3/21/03		
49	Request AVR guidance on TSO-145/146 primary means navigation	225 days	Thu 5/31/01	Wed 4/10/02		
50	**AFS Policy Guidance and Criteria Waivers for Special App/Depart Procedures**	228 days	Mon 1/28/02	Wed 12/11/02		
51	Form Tiger Team to ensure cohesive workplan between AFS and AVN	20 days	Mon 1/28/02	Fri 2/22/02		
52	AAL-AWO/AVN-100, 200/AFS-410,420, 430 review and coordination meetings	200 days	Mon 2/25/02	Fri 11/29/02	51	
53	Development Criteria Memo	20 days	Thu 11/14/02	Wed 12/11/02		
54	**Develop Air Carrier Training for App/Depart Special Procedures**	15 days	Mon 6/2/03	Fri 6/20/03		
55	Develop RNAV App-Dep Training Module for "Special"	2 wks	Mon 6/2/03	Fri 6/13/03	35	
56	FSDO Acceptance of Generic Training Module for App/Dep Procedures	1 wk	Mon 6/16/03	Fri 6/20/03	55	
57	Begin Carrier Submital of Training Programs (App/Dep) to POI	0 days	Fri 6/20/03	Fri 6/20/03	56	
58	**Develop Operator Manual/Procedure Material for App/Depart Operations**	30 days	Mon 2/3/03	Fri 3/14/03		
59	Develop Material	4 wks	Mon 2/3/03	Fri 2/28/03		
60	FSDO Acceptance of Generic Material	2 wks	Mon 3/3/03	Fri 3/14/03	59	
61	RNAV Approach-Departure Procedures Available for Use	0 days	Thu 7/10/03	Thu 7/10/03	17,47	

Appendix C

C.3 Capstone RNAV Telcon Record and Matrix

Capstone RNAV Procedures Planning Matrices

Revised 9/02/03

The following matrix was created at the Capstone RNAV Procedures Meeting hosted by AFS-420 in OKC on January 24, 2002. This was agreed upon by the attendees and will be updated via monthly telecons. Revisions will be shown as ***Bold Italics***.

Scope	**Action/Task**	**OPR**	**Date**	**Status**
Haines/Hoonah/Juneau approach and departure* (note: Gustavus already in process for public approach, may need special departure)	1) Proponent and/or operator	Capstone	Complete	Complete
See files: - CapstoneAVNfeaseApp_Depart.doc	2) Feasibility study	AVN-170G	Complete – feasible with mixed criteria, waivers (not sure of extent) and crew training, but would be	Complete

Scope	Action/Task	OPR	Date	Status
			special/non-public	
	3) Capstone request and provide resources/funding to support development, flt inspection, publications of Haines special (RAPT website – www.mmac.jccbi.gov/avn/iap/)	Capstone	Jan 28, 2002	Complete
	4) Present to RAPT to be kicked up to NAPT with proposal (AVN feasibility study complete, AFS prelim looks doable, Capstone supplying resources, form tiger team in OKC, …) for approval to go ahead?	AVN-170G (Merle Perrine) to AVN-100 (John Lawrence)	Present to NAPT on Tuesday Jan 29, 2002 (Merle to check with Dale Anderson	Procedures were presented to NAPT. During NAPT AFS-400 (Kathy Abbott) took action item to prioritize and provide guidance on Capstone procedures. NAPT buy-in and prioritization still needed - given CAST priority is in writing, Capstone is worked as time permits. Telecon held in June between Capstone and Tom Accardi, his advice was if progress is being made, no need to complicate coordination process with the NAPT at this time. Complete.

Scope	Action/Task	OPR	Date	Status
	5) Get on NAPT agenda Feb 12	Merle Perrine – Dale Anderson (AVN-170)	Prior to Feb 12, 2002	Complete
	6) Resource determination and allocation	AVN and AFS determines Capstone pays	ASAP	AVN-100 estimated 120hrs per procedure for total of 720 hours = $67,000 ***AVN-200 estimated 50 flight check hrs = $73,600*** No additional AFS resources required at this time AVN needs to formally request funding from Capstone. Capstone contract contact coordinating with AVN contract contact Caline Spikes (405-954-0048) As of July 22, 2003 Capstone agreed to pay AVN $158,922.96 for 2003 procedure development, even though there were discrepancies with some of the procedures being charged - given they were not specifically requested by Capstone. (Note: Capstone paid $128,000 for 2002 procedure development.) A written agreement will be worked between AVN-1 and Capstone Program Office to clearly define what is and is not a "Capstone Priority" procedure – for future work and payment these will be requested in writing from the Capstone Program Office through the Alaskan region RAPT. Chart dates represent effective dates for published (public or special) procedures ready for use by aviation users with appropriate AVN and AFS signatures on FAA

Scope	Action/Task	OPR	Date	Status
				8260 forms (including waivers).
	7) Form Capstone tiger team (now called Capstone Procedures WG) in OKC – needs AVN-100, AFS-410, AFS-420, AVN-230 - Don Streeter (AFS-410) - Carl Moore (AFS-420) - John Pannell (AVN-100) - Tom Page (AVN-230) - Tim McHenry (AVN-160)	Coordinator - AVN-100 Terry DePlois	Kick-off by mid-Feb 02	Pre-Capstone Procedures WG management mtg held 3/27/02. First Capstone Procedures WG meeting held May 2nd 2002. Meetings will be held as necessary and coordination will be ongoing as needed.
	8) Surveys – Haines and Hoonah	Mike Post check if needed. Capstone contract per Rick Girard contact	Mar 1, 2002	Gary Childers created SOW to contract surveyor in coordination with AVN. Contract issued and surveys complete.

Scope	Action/Task	OPR	Date	Status
		(may need to be NGS – Childers will coord)		
	9) Lighting and runway markings (Hoonah)	Capstone coord – will find status from AK DOT (Paul Bowers)	Prior to use	AK State DOT installing/installed appropriate lighting and runway markings for Hoonah and Haines per IFR designation below. Complete. Hoonah and Haines have PAPI, MIRL, and REILS. Complete
	10) Designate airport IFR	Capstone coord	Prior to use	AK State DOT sent copies of FAA Forms 7480-1 designating Hoonah and Haines as IFR airports. Complete.
	11) Required weather reporting	Capstone coord	Prior to use	WX reporting available at JNU, HNH, GUS and HNS. Complete.
	12) AT Airspace Rulemaking	Bob Durand (AAL-500)	Prior to use	The possible need for airspace rulemaking was discussed. Bob Durand will check. Since there may be some public and special procedures (e.g., JNU) the airspace will be evaluated - once the draft procedures are delivered by AVN. AT Region determined that no airspace rulemaking is required. Complete
	13) Develop procedures	Caren Sych (AVN-140) (originally John Pannell)	(Jun 2002) ***(Sept 2002)*** ***(Feb 2003)***	Preliminary work complete. As of June 25th 2002, JNU public and special approaches are in quality assurance (AVN-160). Hoonah and Haines will be complete in a couple weeks. Want to complete all packages so they can be reviewed at the same time. All departure routes

Scope	Action/Task	OPR	Date	Status
			(Mar 2003) Apr 2003	connect to an initial approach fix – so there is no need for arrival routes. As of July 23rd 2002, JNU procedures were pulled back from quality assurance (AVN-160) for some minor changes from AT. Hoonah and Haines are being worked and should be complete by end of next week. The departures are being developed and will be connected by one or two central waypoints, therefore are being developed as a package. Waivers being worked with AFS-420. Capstone and AFS received copies of procedures in OKC on 9/12/02. Alaskan Capstone procedures reps (AAL-230, ANC FPO, AAL-510, AAL-530, ZAN-510, ZAN-530, ZAN-NATCA, AAL-470, AAL-1SC) held coordination meeting on 9/19/02 to review draft procedures, the comments were faxed to AVN-100 and a meeting summary e-mail followed. As of 10/22/02 AVN procedures development complete and over to AFS for review, changes can be requested as amendments after published. Hoonah was still not acceptable and Capstone office said to pull that procedure back, but push forward with others. Hoonah would be handled off-line, possibly through the AFS PRB. After AFS PRB/AK AWO review of specials and after a meeting wk of Nov 11th 2002 in OKC between AFS-410/420/AK AWO and AVN-140/160 it was agreed that the procedures needed to be reworked - based on criteria and waivers documented in a letter from AFS-400 to AVN-100. AVN-100 received letter and is continuing to

Scope	Action/Task	OPR	Date	Status
				rework the special procedures. Procedure development should be complete by Feb 1st 2003. They will then go to AVN-160 for QC, followed by AFS-420 for waiver review. The FAA has put a moratorium on all RNAV arrival/departure procedures – it is unclear if it applies to Capstone Specials – Capstone will work offline. Capstone specials received dispensation from the RNAV arrival/departure moratorium. The procedures for Juneau, Haines, and Gustavus were complete and in QC as of 1/28/03. There was still an issue with the MDA for Hoonah, which will be worked on a post-telecon. Using a fly VFR segment to achieve a Hoonah MDA of 800 ft was agreed to on a 1/28/03 post-telecon with AFS-410. Draft procedures were sent to AK FPO and then distributed to AWO and AT Reg/ZAN. AWO and AT requirements from Nov 02 still had not been incorporated (e.g., reporting fixes clear of JNU LDA) and additional requirements for crossing altitudes to ensure avionics display procedure correctly need to be added. As of Feb 25 2003, AVN-100 has the comments and is re-working the procedures. Most procedures submitted to AVN-200 for flight check and AFS-420 for waiver review 4/03. As of May 24 2003, Caren would send list and status of each Capstone procedure to AK FPO. As of June 24, 2003 list received showing Haines special app & depart, Hoonah special 1300ft app & depart, Juneau special app all satisfactory flight checked week of May 5, 2003 and delivered to AFS-420 between May 13 and May 19, 2003. In addition the Juneau special depart and Gustavus special

Scope	Action/Task	OPR	Date	Status
				app were delivered to flight check on May 21, 2003. The Gustavus special app was still in quality assurance as of May 15, 2003. There was much confusion on the actual location of these packages. As of July 22, 2003 it was reported that the Gustavus special RNAV Z app was delivered to flight check on 7/18/03. On the same telecon there was again much discussion on the Hoonah special app. It was agreed to go forward with the 1300/5 procedure to get it through the FAA system – however it was explicitly stated that Capstone did not think any operator would ever request it given they can fly VFR at lower minimums. It was also agreed that AVN and AFS would continue working the Hoonah approach with usable 800/3 minimums using the June 6, 2003 memo from AFS-400 to AVN-1 concerning Capstone procedure development. Tom Accardi said AVN had issues with the AFS memo and he took the action to continue working it. ***As of 9/2/03*** ***Haines app complete*** ***Haines depart complete*** ***Juneau app complete*** ***Juneau depart complete*** ***Gustavus app complete*** ***Gustavus depart complete*** ***Hoonah depart complete***

Scope	Action/Task	OPR	Date	Status
				Hoonah app being re-developed
	13.5) Waiver Review by AFS	Carl Moore (AFS-420)	Post procedure development. (Feb 2003) Apr 2003	AVN-100/AFS-420 mutually agreed that standard 8260-1 process would be used. AFS-420 review of waiver action. AFS-400 approval required. On Oct 24 2002 AFS held PRB on special waivers and concluded they could be more usable based on additional criteria/waivers and therefore should be reworked (see above). Another PRB to include AFS-420/410 and AK AWO will be held, once procedures are reworked. On Feb 25 2003 it was agreed that the procedures will go through an AFS PRB prior to flight check. As of 4/22/03 procedures had not made there way to AFS-420 yet, Carl Moore will check on status. On June 24, 2003 Mike Werner (AFS-420) took the action to work with Les Smith (AFS-410) to track down procedure packages that were sent back to AVN for flight check pilot signature. Neither Mike Werner Les Smith, nor Carl Moore were on the July 22, 2003 telecon from AFS-420, so update was limited. On July 17, 2003 AFS had a PRB that included Haines SIAP, DP and Juneau SIAP. These had already been PRBd prior to Flight Check. The 8260.10s for Haines app and DP were in AFS-410 and the Juneau app was at AFS-400 for signature. The Hoonah special DP was not reviewed on that PRB. ***As of 9/2/03*** ***Haines app signed***

Scope	Action/Task	OPR	Date	Status
				Haines depart signed ***Juneau app signed*** ***Juneau depart not reviewed*** ***Gustavus app not reviewed*** ***Gustavus depart not reviewed*** ***Hoonah depart not reviewed*** ***Hoonah app being re-developed between AFS-420 and AVN-140. AFS-420 requested Hoonah PAPI, survey, and tree height information – Alaskan AWO and FPO responding.***
	14) Flight inspection	Tom Page (AVN-200)	(Jul 2002) ***(Oct 2002)*** ***(Feb/Mar 2003)*** (Apr 2003) May 2003	AT and flight check comm and nav requirements for these routes will be met. Tom Page (AVN-200) will coordinate with Lari Belisle (ZAN) on flight checks. Can be accomplished after QC and waiver review – need to schedule. Approaches can be flight checked with Alaskan flight check KingAir. Due to length of airways and aircraft speed may want to use both Alaskan and lower 48 flight check aircraft for enroute portion. AVN-200 ready to schedule flight check, awaiting finalized procedures and waiver review from AFS. ZAN and AAL-500 said that no special flight check requirements are anticipated. Standard comm procedures using RCAGs for in flight clearances, and RCOs to file/cancel at the airport is adequate. Awaiting final packages after AVN-160 QC and AFS PRB. Flight check

Scope	Action/Task	OPR	Date	Status
				aircraft scheduled for early May. As of May 24 2003, most procedures flight checked. On Hoonah approach could not see runway environment at 800ft, but could at 1300ft. On June 24, 2003it was reported that - Haines special app & depart, Hoonah special 1300ft app & depart, Juneau special app all satisfactory flight checked week of May 5, 2003 and delivered to AFS-420 between May 13 and May 19, 2003. In addition the Juneau special depart and Gustavus special app were delivered to flight check on May 21, 2003. As of July 22, 2003 there was no status on when the Juneau ALSEK Special DP, Gustavus GUSTY Special DP, or RNAV Z special approach are scheduled for flight check – however, AVN has a chart date of 10/30/03 for them. ***As of 9/2/03*** ***Haines app FC complete*** ***Haines depart FC complete*** ***Juneau app FC complete*** ***Juneau depart FC complete*** ***Gustavus app FC complete*** ***Gustavus depart FC complete*** ***Hoonah depart FC complete***

Scope	Action/Task	OPR	Date	Status
				Hoonah app awaiting re-develop
	15) AFS write, coord, review – 8260-10, Ops Spec, inspector guidance, etc	Don Streeter (AFS-410)	(Sept 1, 2002) ***(Dec 2002)*** ***Mar 2003***	Draft opspecs and policy/ inspector handbook guidance is developed to approve TSO-145a/146a avionics for primary navigation w/ no other navigation equipment required on aircraft. Dual TSO-145a/146a equipage required for Part 121/135 operators. AVR-1 letter provides guidance on use of TSO-145a/146a avionics for IFR with or without the WAAS signal. Don Streeter hosted meeting on May 6th for national AFS and AGC review of draft opspecs/inspector guidance. OpSpecs, inspector guidance, training, NOTAMs, etc will be finalized referencing the SFAR (see below task 11). Ops approval material was reviewed with the JNU FSDO and operators the week of Feb 3rd 2003 coordinated with pilot beta-training. Material was coordinated with AFS HQ wk of Mar 3rd 2003 in particular with AFS-200 to include SFAR, OpSpecs, handbook changes, inspector training. Rick Girard is AAL-200 AFS regional rep. AFS-200 agreed that the standard process and "C"OpSpec for "special procedures" can be used for these procedures. ***No change***.
	16) Pilot training	POIs	Prior to use	Univ of Alaska, Anchorage (UAA) will develop and provide approved training. Capstone Phase II avionics simulator is available. A Beta training class in Juneau will be held when final aircraft and simulator software, plus a completed Pilot Operating Handbook have been available for 30-days to allow time for final training module development. The Beta-training class took place

Scope	Action/Task	OPR	Date	Status
				the first wk of Feb in JNU. Some refinements were made by UAA, and it was reviewed by the JNU FSDO and AK Region AFS for finalization. Pilots from LAB Flying Service received initial avionics training on Mar 25-26, 2003 and Harris Flying Service on Apr 21-22, 2003. Special training for these app/depart procedures will be developed and then trained when procedures are finalized. ***No change.***
	17) AT crew briefing	AAL-500/ZAN	2 weeks prior to use – (Sept 16, 2002) ***(Jan 9, 2003)*** ***(Mar 2003)*** (May 2003) June 2003	ZAN will need to schedule training in relation to a major training effort scheduled to begin in Jan (i.e., 3rd specialty). ZAN would like DRAFT procedures ASAP to begin developing training. AAL-500/ZAN reiterated their need for DRAFT procedures to review and finalized procedures to begin training. ***No change.***
	17.5) Jeppesen "Special" nav database and charts	Rick Girard (AK AWO) / James Call (Capstone coord)	28+ days after final procedures	Jeppesen coded a TEST database (NOT for NAV) with DRAFT procedures (prior to flight check) to test within Capstone Phase II avionics / simulator and ensure procedures are properly displayed and flown. Once procedures are final (post flight check) Jeppesen will code "Special" nav database and produce charts that will then be approved and issued by AFS. Jeppesen worked with Chelton and coded the Feb 03 2003 DRAFT procedures into TEST database for review in avionics simulator. Some coding and coordination issues were worked. Jeppesen requires final signed procedure packages about

Scope	Action/Task	OPR	Date	Status
				30 days prior to effective date e.g., 1st wk of June of July 10th 2003 effective date. There are reported errors in the existing Nav Database, as well as coding issues with VNAV on existing procedures – this is a bigger issue than Capstone. Capstone is tracking and issues should be addressed for the new Special procedures. ***No change.***
	18) AFS approval of special/Publication date	***JNU FSDO***	(October 1, 2002) ***(Jan 23, 2003)*** (May 2003) July 10, 2003	Dates are firming up for avionics certification, delivery, and installs beginning in Jan 2003. Twenty-four aircraft from 11 operators have been identified for initial installs (13 VFR-Beavers, Cherokees, Astar 350s; 11 IFR – Chieftans, Islanders, Seneca, Twin Otters, Caravans). Certification and delivery of first 15 Capstone Phase II avionics is scheduled for Jan 31st, 2003. Installs on first aircraft to begin shortly thereafter. As of 1/28 certification and delivery has slipped 2-weeks. Two operators, LAB (Seneca) and Harris (Navajo) have volunteered to be the first to equip. STC issued for Chelton Avionics March 03. LAB's Seneca (Mar 03) and Harris's Navajo (Apr 03) have been installed by Northern lights Avionics in Anchorage. ***No change.***

*Note – May be requirements for additional Alaska approach/departure procedures, but these are the identified first step. Future consideration should be given to point-in-space seaplane approaches. Capstone will continue coordination with Users. Jim Cieplak received a call (5/02) from the chief pilot for LAB Flying Service who requested Capstone to start looking into IFR routes from JNU to Kake to Petersburg – LAB currently flies scheduled VFR service between these points. Angoon (Seaplane Base) also has scheduled VFR service from JNU via Wings of Alaska. These may be the next airports and routes to look into.

Capstone RNAV Follow-On Procedures Planning Matrix

Revised ***9/02/03***

The following matrix summarizes tasks, office of primary responsibility, date, and status to meet an IFR procedures effective date no later than March 31, 2004. This matrix covers GPS RNAV arrival, departure, and approach procedures for Juneau (Gastineau departure), Angoon, Kake, Petersburg, Sitka, Ketchikan, Klawock, and Wrangell Alaska as described in memorandum: *"Request for FAR 97 compliant GPS/WAAS RNAV based arrival, departure, and approach procedures at airport in Southeast Alaska"* from Capstone Program Office (AAL-1S) to Dennis W. Stoner, Anchorage Flight Procedures Office (ANC FPO, AVN-170G) dated March 20, 2003.

Task	**OPR**	**Date**	***Status***
1) Proponent and/or operator submission to AK RAPT and AVN website	Capstone	March 20, 2003	**Complete**
2) Resource determination and LOA	Capstone coord with AVN and AFS	***July-Sept 2003***	In progress
3) Feasibility study	AVN-170G (ANC FPO)	***April-August 2003***	On 7/22/03 Denny Stoner reported that the Alaskan FPO completed feasibility for the routes connecting app/dept procedures and said guidance was needed from AFS-420 on using the 1-2-2-1/RNP 1.0 criteria. ***Sent to AVN-100 wk of 8/25/03. Complete***

Task	**OPR**	**Date**	***Status***
4) AFS-400 Guidance to AVN on Fixed Wing Point in Space Approach/Depart (FWPnS)	AFS-400, 410, 420, 430	(May 31, 2003) June 6, 2003 (FWPnS)	Coordination meeting at AFS-400 on 5/6/03. As of 5/24/03 Les Smith took action to check on status of memo from AFS-400 to AVN-1. The memo was signed by AFS-400 on 6/6/03. As of 7/22/03 AVN had outstanding issues with guidance in the memo and Tom Accardi took action to continue working it. ***As of 9/2/03 AVN and AFS were in agreement on the FWPnS guidance at least applied to Hoonah.*** ***Also on the 9/2/03 telecon there was discussion on the possible need for guidance on 1-2-2-1/RNP 1.0 criteria for routes.***
5) Develop procedures	AVN-140, AVN-160	Jun 2003-Sept 2003	In 5/03, AK Region requested an AVN-140 specialist to work in Alaska during procedure development, this was denied by AVN. As of 7/22/03 AVN-100 delivered a proposed Capstone Priority List (dated 7/21/2003) that showed Angoon, Kake, Petersburg, and Sitka app and dep procedures chart dates as 5/31/04. Juneau Gastineau DP and Klawock, Wrangell, Ketchikan app and dep procedures chart dates of 8/31/04 ***As of 9/2/03 AVN-140 had received the feasibility study.***
6) AFS Waiver Review PRB	AK AWO and AFS-420	Oct 2003	After procedures developed
7) Flight Inspection	AVN-200	Nov-Dec 2003	After procedures developed

Task	**OPR**	**Date**	***Status***
8) AFS Approval of Special Procedures	AFS-400	***Jan 2004***	After flight check and AFS PRB
9) Airport Infrastructure			
- Airport surveys	Capstone will contract coordinated with AWO	June-July 2003	Angoon required, others have IFR approaches already but will be evaluated if additional work required.
- Airport lighting and runway markings	Capstone coord with AK DOT	Prior to use Prior to use	Angoon required, others have IFR approaches already but will be evaluated if additional work required
- Designate airport IFR	Capstone coord with AK DOT	Prior to use	Angoon required, others have IFR approaches already but will be evaluated if additional work required
- Required weather reporting	Capstone coord	Prior to use	Angoon required, others have IFR approaches already but will be evaluated if additional work required
10) AT Airspace Rulemaking	AAL-500	Prior to use	On 6/24/03 telecon, there was discussion on the need for communication and surveillance on these routes. AT region is looking at the need for airspace downto 1200ft. ***On 9/2/03 AT Region said they have started the airspace rulemaking process.***
11) Pilot Training	Operator with approval from POIs	Feb 2004	
12) AT Crew Briefing	AAL-500/ZAN	Feb 2004	

Task	**OPR**	**Date**	***Status***
13) Jeppesen produce "Special" nav database and charts	Capstone, AK AWO, Operator	Feb 2004 (requires 28+ days after final procedures)	
14) AFS issue OpSpec for special procedure	***FSDO, Opeator***	Mar 2004	

Next steps:

monthly telecons – 10am Alaska time (1pm central, 2pm eastern) 4th Tuesday each month – Capstone will set-up – Next Telecon – ***Sept 23*** call-in: 907-271-4755 passcode 1015. **This will be the permanent telecon number and passcode**.

Appendix D

D.1 Avionics STC SA02203 AK

United States Of America
Department of Transportation - Federal Aviation Administration

Supplemental Type Certificate

Number SA02203AK

This Certificate issued to

Chelton Flight Systems, Inc.
1109 Main St., Suite 560
Boise, ID 83702

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part * of the * Regulations.

Original Product Type Certificate Number: *

Make: *

Model: *

* See attached FAA Approved Model List (AML) No. SA02203AK, dated March 27, 2003, for a list of approved airplane models and applicable airworthiness regulations.

Description of Type Design Change: Installation of FlightLogic Synthetic Vision Electronic Flight Information System (EFIS-SV), in accordance with Chelton Flight Systems, Inc., Installation Guide, Document Number 150-045264, Revision D, dated March 27, 2003, or later FAA approved revision.

Limitations and Conditions:

1. Compatibility of the design change with previously approved modifications must be determined by the installer.

2. FAA approved Airplane Flight Manual Supplement or Supplemental Airplane Flight Manual, Document Number 150-045262, Revision A, dated March 27, 2003, or later FAA approved revision is a required part of this installation.

3. For Instructions for Continued Airworthiness, refer to Document Number 150-045261, Revision E, dated March 27, 2003, or later FAA approved revision.

4. If the holder agrees to permit another person to use this certificate to alter the product, the holder shall give the other person written evidence of that permission.

Date of application: January 11, 2002

Date of issuance: March 26, 2003

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

FEDERAL AVIATION ADMINISTRATION

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

This certificate may be transferred in accordance with FAR 21.47.

Appendix D

D.2 Approved Model List for STC SA 02203 AK

FAA APPROVED MODEL LIST (AML) SA02203AK
FOR
CHELTON FLIGHT SYSTEMS

STC Issue date: March 27,2003

Model Certification Basis	Type Certificate Number
Revo Models COLONIAL C-1, COLONIAL C-2 LAKE LA-4, LAKE LA-4A, LAKE LA-4P, LAKE LA-4-200, LAKE MODEL 250 Certification Basis: CAR 3, FAR Part 23	1A13, Rev. 25, 11/8/99
Piper Models PA-24, PA-24-250, PA-24-260, PA-24-400 Certification Basis: CAR 3	1A15, Rev. 33, 10/1/97
Piper Models PA-18, PA-18S, PA-18 "105" (Special), PA-18S "105" (Special), PA-18A, PA-18 "125" (Army L-21A) PA-18S "125", PA-18AS "125", PA-18 "135" (Army L-21B) PA-18A "135", PA-18S "135", PA-18AS "135", PA-18 "150" PA-18A "150", PA-18S "150", PA-18AS "150", PA-19 (Army L-18C) PA-19S Certification Basis: CAR 3	1A2, Rev. 37, 9/4/96
Helio Courier Models H-250, (USAF U-10D) H-295, HT-295, (USAF YL-24) H-391, H-391B, (USAF L-28A or U-10B) H-395, H-395A, H-700, H-800 Certification Basis: CAR 3	1A8, Rev. 33, 9/18/97
Piper Models PA-28-140, PA-28-150, PA-28-151, PA-28-160, PA-28-161, PA-28-180, PA-28-181, PA-28-201T, PA-28-235, PA-28-236, PA-28R-180, PA-28R-200, PA-28R-201, PA-28R-201T, PA-28S-160, PA-28S-180, PA-28RT-201, PA-28RT-201T Certification Basis: CAR 3	2A13, Rev. 45, 12/12/01

FAA APPROVED MODEL LIST (AML) SA02203AK
FOR
CHELTON FLIGHT SYSTEMS

STC Issue date: March 27,2003

Model Certification Basis	Type Certificate Number
Mooney Models M20, M20A, M20B, M20C, M20D, M20E, M20F, M20G, M20J, M20K, M20L, M20M, M20R, M20S Certification Basis: CAR 3	2A3, Rev. 46, 8/10/99
Cessna Models 172, 172A, 172B, 172C, 172D, 172E, 172F, 172H, 172I, 172K, 172L, 172M, 172N, 172P, 172Q, 172R, 172S Certification Basis: CAR 3, FAR Part 23	3A12, Rev. 68, 10/11/01
Cessna Models 182, 182A, 182B, 182C, 182D, 182E, 182F, 182G, 182H, 182J, 182K, 182L, 182M 182N, 182P, 182Q, 182R, 182S, 182T, R182, T182, TR182, T182T Certification Basis: CAR 3, FAR Part 23	3A13, Rev. 59, 12/12/01
Beechcraft Models 35-33, A33, B33, C33, C33, 36, A36, A36TC, B36TC, E33, E33A, E33C, F33, F33A, F33C, G33, H35, J35, K35, M35, N35, P35, S35, V35, V35A, V35B Certification Basis: CAR 3	3A15, Rev. 88, 1/15/00
Cessna Models 172RG, 175, 175A, 175B, 175C, P172D, R172E, R172F, R172G, R172H, R172J, R172K Certification Basis: CAR 3	3A17, Rev. 44, 11/15/97

FAA APPROVED MODEL LIST (AML) SA02203AK
FOR
CHELTON FLIGHT SYSTEMS

STC Issue date: March 27,2003

Model Certification Basis	Type Certificate Number
Cessna Models 210-5 (205), 210 -5A (205A), 210, 210A 210B, 210C, 210D, 210E, 210F, 210G, 210H, 210J, 210K, 210L, 210M, 210N, 210R, P210N, P210R, T210F, T210G, T210H, T210J, T210K, T210L, T210M, T210N, T210R Certification Basis: CAR 3	3A21, Rev. 45, 8/15/96
Maule Models Bee Dee M-4, M-5-180C, MXT-7-160, M-4, M-5-200, MX-7-180A, M-4C, M-5-210C, MXT-7-180A, M-4S, M-5-210TC, MX-7-180B, M-4T, M-5-220C, MXT-7-420, M-4-180C, M-5-235C, M-7-235B, M-4-180S, M-6-180, M-7-235A, M-4-180T, M-6-235, M-7-235C, M-4-210, M-7-235, MX-7-180C, M-4-210C, MX-7-235, M-7-260, M-4-210S MX-7-180 MT-7-260, M-4-210T, MX-7-420, M-7-260C, M-4-220, MXT-7-180, M-7-420AC, M-4-220C, MT-7-235, MX-7-160C, M-4-220S, M-8-235, MX-7-180AC, M-4-220T, MX-7-160 Certification Basis: CAR 3	3A23, Rev. 28, 4/6
Cessna Models 185, 185A, 185B, 185C, 185D, 185E, A185E, A185F Certification Basis: CAR 3	3A24, Rev. 36, 11/15/99
Helio Courier Models 15A, 20 Certification Basis: CAR 4a	3A3, Rev. 7, 3/1/91
Cessna Models 180, 180A, 180B, 180C, 180D, 180E, 180F, 180G, 180H, 180J, 180K Certification Basis: CAR 3	5A6, Rev. 64, 10/11/01

FAA APPROVED MODEL LIST (AML) SA02203AK
FOR
CHELTON FLIGHT SYSTEMS

STC Issue date: March 27,2003

Model Certification Basis	Type Certificate Number
Lancair Model LC40-550FG Certification Basis: FAR Part 23	A00003SE, Rev. 8, 2/26/02
Cirrus Models SR20, SR22 Certification Basis: FAR Part 23	A00009CH, Rev. 3, 9/28/01
Ruschmeyer Luftfahrttechnik GmbH Model R90-230RG Certification Basis: FAR Part 23	A77EU, Rev. 0, 6/24/94
Commander Models 112, 112B, 112TC, 112TCA 114, 114A, 114B, 114TC Certification Basis: CAR 3	A12SO, Rev. 21, 8/4/95
Cessna Models 177, 177A, 177B Certification Basis: FAR Part 23	A13CE, Rev. 23, 10/15/94
Cessna 207, 207A, T207, T207A Certification Basis: FAR Part 23	A16CE, Rev. 20, 10/15/94
Cessna Model 177RG Certification Basis: FAR Part 23	A20CE, Rev. 18, 10/15/94
American Champion Models 8GCBC, 8KCAB Certification Basis: FAR Part 23	A21CE, Rev. 11, 8/25/97
Aviat Models A-1, A-1A, A-1B Certification Basis: FAR Part 23	A22NM, Rev. 12, 6/15/00
Piper Models PA-46-310P, PA-46-350P Certification Basis: FAR Part 23	A25SO, Rev. 10, 1/2/02

FAA APPROVED MODEL LIST (AML) SA02203AK
FOR
CHELTON FLIGHT SYSTEMS

STC Issue date: March 27,2003

Model Certification Basis	Type Certificate Number
Piper Models PA-32-260, PA-32-300, PA-32-301, PA-32-301T, PA-32R-300, PA-32R-301, PA-32R-301T, PA-32RT-300, PA-32-300T, PA-32S-300 Certification Basis: CAR 3	A3SO, Rev. 26, 7/23/97
Extra Model EA-400 Certification Basis: FAR Part 23	A43CE, Rev. 5, 3/5/02
Diamond Model DA-40 Certification Basis: FAR Part 23	A47CE, Rev. 2, 4/8/02
Cessna Models 206, 206H, P206, P206A, P206B, P206C, P206D, P206E, P206H, TP206A, TP206B, TP206C, TP206D, TP206E, TU206A, TU206B, TU206C, TU206D, TU206E, TU206F, TU206G, U206, U206A, U206B, U206C, U206D, U206, U206E, U206F, U206G Certification Basis: CAR 3, FAR Part 23	A4CE, Rev. 40, 6/19/02
Socata Models TB 9, TB 10, TB 21, TB 20, TB 200 Certification Basis: CAR 3, FAR Part 23	A51EU, Rev.14, 4/6/01
Grob Models G115EG, G115, G115A, G115B, G115C, G115C2, G115D, G115D2 Certification Basis: FAR Part 23	A57EU, Rev. 10, 2/6/
Slingsby Models T67M260, T67M260-T3A Certification Basis: FAR Part 23	A73EU, Rev. 4, 7/27/00

FAA APPROVED MODEL LIST (AML) SA02203AK
FOR
CHELTON FLIGHT SYSTEMS

STC Issue date: March 27,2003

Model Certification Basis	Type Certificate Number
Beechcraft Models 35, 35R, A35, B35, C35, D35, E35, F35, G35 Certification Basis: CAR 3	A-777, Rev. 57, 4/15/96
Piper Models PA-12, PA-12S Certification Basis: CAR 3	A-780, Rev. 13, 3/30/01
Cessna Models 170, 170A, 170B Certification Basis: CAR 3	A-799, Rev. 51, 7/15/98
Piper Models PA-46-310P, PA-46-350P, PA-46-500TP Certification Basis: FAR Part 23	A25SO, Rev. 10, 1/2/02
Britten-Norman Models BN-2, BN-2A Certification Basis: FAR Part 23	A17EU, Rev. 15, 1/3/96
Beechcraft Models 58PA, 58TCA Certification Basis: FAR Part 23	A23CE, Rev. 14, 4/15/96
Pilatus Model PC-7 Certification Basis: FAR Part 23	A50EU, Rev. 2, 7/1/96
Pilatus Models PC-6, PC-6/350, PC-6/A, PC-6-H1, PC-6/350-H1, PC-6/A-H1, PC-6-H2, PC-6/350-H2, PC-6/A-H2 Certification Basis: CAR 3, CAR 10	7A15, Rev. 11, 8/9/99

FAA APPROVED MODEL LIST (AML) SA02203AK
FOR
CHELTON FLIGHT SYSTEMS

STC Issue date: March 27,2003

Model Certification Basis	Type Certificate Number
de Havilland Models DHC-2 Mk. I, DHC-2 Mk. II, DHC-2 Mk. III Certification Basis: CAR 3	A-806, Rev. 21, 1/21/94
Cessna Models 310, 310A (USAF U-3A), 310B, 310C, 310D, 310E(USAF U-3B), 310F, 310G, 310H, E310H, 310I, 310J, 310J-1, E310J, 310K, 310L, 310N, 310P, T310P, 310Q, T310Q, 310R, T310R Certification Basis: CAR 3	3A10, Rev. 61, 11/15/
Beechcraft Models 56TC, 58, 58A, 95, 95-55, 95-A55, 95-B55, 95-B55A, 95-B55B, 95-C55, 95-C55A, A56TC, B95, B95A, D55, D55A, D95A, E55, E55A, E95 Certification Basis: CAR 3, FAR Part 23	3A16, Rev. 80, 1/15/00
Cessna Models 320, 320-1, 320A, 320B, 320C, 320D 320E, 320F, 335, 340, 340A Certification Basis: CAR 3	3A25, Rev. 25, 8/15/94
Aerostar Models 360, 400 Certification Basis: FAR Part 23	A11WE, Rev. 4, 10/22/92
Piper Models PA-44-180, PA-44-180T Certification Basis: FAR Part 23	A19SO, Rev. 8, 11/14/01
Piper Models PA-30, PA-39, PA-40 Certification Basis: CAR 3	A1EA, Rev. 15, 10/1/97
Beechcraft Model 76 Certification Basis: FAR Part 23	A29CE, Rev. 5, 4/15/96

FAA APPROVED MODEL LIST (AML) SA02203AK
FOR
CHELTON FLIGHT SYSTEMS

STC Issue date: March 27,2003

Model Certification Basis	Type Certificate Number
Partenavia Models P 68, P 68B, P 68 C, P 68C-TC, P 68 OBSERVER, AP68TP300 SPARTACUS, P68TC OBSERVER, AP68TP 600 VIATOR, P68 OBSERVER 2 Certification Basis: FAR Part 23	A31EU, Rev. 14, 5/30/00
Cessna Model 336 Certification Basis: CAR 3	A2CE, Rev. 6, 6/15/99
Cessna Model T303 Certification Basis: FAR Part 23	A34CE, Rev. 5, 10/15/94
Cessna Models 337, 337A, 337B, 337C, 337D, 337E, 337F, 337G, 337H, M337B, P337H, T337B, T337C, T337D, T337E, T337F, T337G, T337H, T337H-SP Certification Basis: CAR 3, FAR Part 23	A6CE, Rev. 38, 10/11/01
Piper Models PA-34-200, PA-34-200T, PA-34-220T Certification Basis: CAR 3	A7SO, Rev. 14, 6/1/01
Commander Models 560-F, 680, 680E, 680F, 680FL, 680FL(P), 680T, 680V, 680W, 681, 685, 690, 690A, 690B, 690C, 690D, 695, 695A, 695B, 720 Certification Basis: CAR 3, FAR Part 23	2A4, Rev. 46 04/03/2000

FAA APPROVED MODEL LIST (AML) SA02203AK
FOR
CHELTON FLIGHT SYSTEMS

STC Issue date: March 27,2003

Model Certification Basis	Type Certificate Number
Beechcraft Models 65, 65-A90-1, A65, 65-A90-2 A65-8200, 65-A90-3, 65-80 65-A90-4, 65-A80, 65-A80-8800, 65-B80, 65-88, 65-90, 65-A90, 70, B90, C90, C90A, E90, H90 Certification Basis: CAR 3	3A20, Rev. 60, 9/10/01
Beechcraft Models 50 (L-23A), B50 (L-23B), C50, D50 (L-23E), D50A, D50B, D50C, D50E, D50E-5990, E50 (L-23D, RL-23D), F50, G50, H50, J50 Certification Basis: CAR 3	5A4, Rev. 60, 4/15/96
Commander Models 500, 500-A, 500-B, 500-U, 520, 560 560-A, 560-E, 500-S Certification Basis: CAR 3	6A1, Rev. 45, 1/1/90
Pilatus Models PC-6/B-H2, PC-6/B1-H2, PC-6/B2-H2 PC-6/B2-H4, PC-6/C-H2, PC-6/C1-H2 Certification Basis: CAR 3, CAR 10	7A15, Rev. 11, 8/9/99
Beechcraft Model 3000 Certification Basis: FAR Part 23	A00009WI, Rev. 8, 11/29/01
Piper Models PA-31, PA-31-300, PA-31-325, PA31-350 Certification Basis: CAR 3	A20SO, Rev.9, 3/19/01
Piper Models PA-31P, PA-31T, PA-31T1, PA-31T2 PA-31T3, PA-31P-350 Certification Basis: CAR 3	A8EA, Rev. 21, 4/8/98

FAA APPROVED MODEL LIST (AML) SA02203AK
FOR
CHELTON FLIGHT SYSTEMS

STC Issue date: March 27,2003

Model Certification Basis	Type Certificate Number
Mitsubishi Models MU-2B-25, MU-2B-35, MU-2B-26, MU-2B-36, MU-2B-26A, MU-2B-36A, MU-2B-40 MU-2B-60 Certification Basis: CAR 3	A10SW, Rev. 13, 4/2/98
Beechcraft Models 60, A60, B60 Certification Basis: FAR Part 23	A12CE, Rev. 23, 4/15/96
Commander Model 700 Certification Basis: CAR 3, FAR Part 23	A12SW, Rev. 10, 1/1/90
Beechcraft Models 99, 99A, 99A (FACH), C99, 100, A99, A100 (U-21F), A99A, A100A, A100C, B99, B100 Certification Basis: FAR Part 23	A14CE, Rev. 35, 5/18
Shorts Models SC-7 Series 2, SC-7 Series 3 Certification Basis: FAR Part 23	A15EU, Rev. 9, 8/1/90
Britten-Norman Models BN-2, BN-2A, BN-2A-3, BN-2A-2, BN-2A-6, BN-2A-8, BN-2A-9, BN-2A-20, BN-2A-21, BN-2A-26, BN-2A-27, BN-2B-20, BN-2B-21, BN-2B-26, BN-2B-27, BN-2T, BN-2T-4R Certification Basis: FAR Part 23	A17EU, Rev. 15, 1/3/96
Aerostar Models PA-60-600, PA-60-601, PA-60-601P, PA-60-602P, PA-60-700P Certification Basis: FAR Part 23	A17WE, Rev. 22, 11/2/95

FAA APPROVED MODEL LIST (AML) SA02203AK
FOR
CHELTON FLIGHT SYSTEMS

STC Issue date: March 27,2003

Model Certification Basis	Type Certificate Number
Beechcraft Models 58P, 58TC Certification Basis: FAR Part 23	A23CE, Rev. 14, 4/15/96
Piper Models PA-42, PA-42-1000, PA-42-720 Certification Basis: FAR Part 23	A23SO, Rev. 14, 11/16/01
Beechcraft Models 200, 200C, 200CT, 200T, B200, B200C, B200CT, B200T, 300, 300LW, A100-1 (U-21J), A200 (C-12A), A200 (C-12C), A200C (UC-12B), A200CT (C-12D), A200CT (FWC-12D), A200CT (RC-12D), A200CT (C-12F), A200CT (RC-12G), A200CT (RC-12H), A200CT (RC-12K), A200CT (RC-12P), A200CT (RC-12Q), B200C (C-12F), B200C (UC-12F), B200C (C-12R), B200C (UC-12M) Certification Basis: FAR Part 23	A24CE, Rev. 82, 4/23/02
Cessna Models 404, 406 Certification Basis: FAR Part 23	A25CE, Rev. 11, 6/15/95
Cessna Model 441 Certification Basis: FAR Part 23	A28CE, Rev. 11, 8/15/99
Britten-Norman Models BN2A MK. III, BN2A MK. III-2, BN2A MK. III-3 Certification Basis: FAR Part 23	A29EU, Rev. 3, 6/21/78
Mitsubishi Models MU-2B, MU-2B-10, MU-2B-15, MU-2B-20, MU-2B-25, MU-2B-26, MU-2B-30, MU-2B-35, MU-2B-36 Certification Basis: CAR 3, CAR 10	A2PC, Rev. 16, 6/30/75

FAA APPROVED MODEL LIST (AML) SA02203AK
FOR
CHELTON FLIGHT SYSTEMS

STC Issue date: March 27,2003

Model Certification Basis	Type Certificate Number
Beechcraft Model F90 Certification Basis: FAR Part 23	A31CE, Rev. 7, 4/15/96
Cessna Models 208, 208A, 208B Certification Basis: FAR Part 23	A37CE, Rev. 12, 6/15/99
Beechcraft Model 2000 Certification Basis: FAR Part 23	A38CE, Rev. 10, 8/23/01
Piaggio Model P-180 Certification Basis: FAR Part 23	A59EU, Rev. 9, 10/25/00
Socata Model TBM-700 Certification Basis: FAR Part 23	A60EU, Rev. 8, 11/6/01
Beechcraft Models 18D, A18A, A18D, S18D, SA18A, SA18D Certification Basis: Aero Bulletin 7A	A-684, Rev. 2, 4/15/96
Beechcraft Models 3N, E18S-9700, 3NM, G18S 3TM, H18, JRB-6, C-45G, TC-45G, D18C, C-45H, TC-45H D18S, TC-45J or UC-45J (SNB-5), E18S, RC-45J (SNB-5P) Certification Basis: CAR 3	A-765, Rev. 74, 4/15/96
Beechcraft Model 3000 Certification: FAR Part 23	A00009W, Rev. 8, 11/29/01
Pilatus Models PC-12, PC-12/45 Certification Basis: FAR Part 23	A78EU, Rev. 9, 3/30/01

FAA APPROVED MODEL LIST (AML) SA02203AK
FOR
CHELTON FLIGHT SYSTEMS

STC Issue date: March 27,2003

Model Certification Basis	Type Certificate Number
Cessna Models 401, 401A, 401B, 402, 402A, 402B, 402C 411, 411A, 414, 414A, 421, 421A, 421B, 421C, 425 Certification Basis: CAR 3	A7CE, Rev. 44, 5/15/99
de Havilland Model DHC-3 Certification Basis: CAR 3	A-815, Rev. 4, 6/26/98
de Havilland Models DHC-6-1, DHC-6-100, DHC-6-200, DHC-6-300 Certification Basis: CAR 3	A9EA, Rev. 11, 6/20/00

FAA APPROVED:_____
Manager, Anchorage Aircraft Certification Office
Federal Aviation Administration
Anchorage, Alaska

Date: March 27, 2003

Appendix E

AFS-1 RNAV GPS MEA Guidance Memo

U.S. Department
of Transportation
Federal Aviation Administration

Memorandum

APR 30 2002

Subject: INFORMATION: GPS Minimum En Route Altitudes (MEAs) on Existing Airways

Date:

From: Director, Flight Standards Service, AFS-1

Reply to Attn. of:

To: Director, Airway Facilities Service, AAF-1

MEAs on conventional airways, both VOR and LF/MF, ensure navigation facility coverage over the entire length of the airway. This requirement can result in high MEAs necessary to ensure navaid reception. The widespread availability and acceptability of the Global Positioning System (GPS) provides a system alternative for navigating along existing airways that is not dependent on ground-based navaid signal reception. The Capstone Program Office has proposed using MEAs based on GPS in its SE Alaska Phase II project. GPS MEAs can provide lower IFR en route altitudes and permit IFR flight below icing levels. This memo provides Flight Standards guidance for procedure specialists to develop and document MEAs based on GPS for existing VOR or LF/MF airways but does not constitute approval to conduct operations at GPS MEAs.

1. Determine GPS MEAs using non-VOR/DME en route criteria found in Chapter 15 of FAA Order 8260.3B, TERPs.
2. GPS MEAs must provide communication capability as discussed in TERPs, paragraph 1718, and as provided by conventional MEAs.
3. A GPS MEA will not be published unless it is at least 500′ lower than the conventional MEA and provides use of a cardinal altitude.
4. A GPS MEA on a route or route segment will in no case be lower than the Minimum Obstruction Clearance Altitude of that route or route segment.
5. GPS MEA will be incorporated into the obstruction evaluation program.

6. Document a GPS MEA in the remark section of the Form 8260-16 for the applicable route. Include the controlling terrain/obstacles and coordinates. Example: "GPS MEA-4500. Terrain 3500, 630900/1561500"

If you have any questions, contact Don Pate, AFS-420, at 405-954-5829.

for James J. Ballough

Appendix F

F.1 GPS MEA Flight Check Request

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

Memorandum

Subject: **ACTION:** Flight Check in Support of the Proposed Development of the Proposed Low Altitude Random Navigation (RNAV) Routes for Southeast Alaska

Date: OCT 28 2002

From: Air Traffic Manager, Anchorage ARTCC, ZAN-1

Reply to Attn. of:

To: Manager, Operations Branch, AAL-530

In support of the development of the proposed low altitude random navigation (RNAV) routes for Southeast Alaska, Anchorage ARTCC is requesting that the routes as defined in the attached FAA Forms 8260.16 be flight checked for communications requirements. The flight check should begin at the lowest cardinal altitude allowed by the forms and climb 1,000 feet until communications can be established. These altitude changes should occur until 1,000 feet below the currently published MEA.

Anchorage ARTCC requirements are to provide a safe and efficient service to all users operating in Southeast Alaska; therefore, the flight check must demonstrate clear and continuous direct pilot/controller communications with our controllers. Communications through any other FAA facility is not acceptable as this would cause a degradation of services rather than enhance services.

Upon completion of the flight check, Anchorage ARTCC requests that the results be provided to our staff for review prior to being published. It is important to us to be able to properly coordinate this change to our en route structure with other programs scheduled for implementation in early 2003.

If you have any questions regarding this information, please contact Lari Belisle, Airspace and Procedures Specialist, ZAN-530.LB at 269-1124, or Jim Hill, Anchorage Center Capstone Liaison, ZAN-530.JC at 269-2573.

Judith G. Heckl

Appendix F

F.2 GPS MEA 8260-16 Forms

TRANSMITTAL OF AIRWAYS / ROUTE DATA

AIRWAY NO. OR ROUTE	FROM / TO	ROUTINE OR DOCKET NO.	CONTROLLING @ TERRAIN/OBSTRUCTION AND COORDINATES	MRA / MOCA	MAA / MEA	CHANGE OVER POINT	FIX MRA/MCA	REMARKS	FLIGHT INSPECTION DATES
A1	HINCHINBROOK, AK NDB / CAMPBELL LAKE, AK NDB*		TERRAIN 6050 604100/1485000	9000 / 8000	17500 / 9000		*MCA 6700E	GPS MEA 8000 100' REDUCTION	

DATE	OFFICE	TITLE	SIGNATURE
07/09/2002	AVN-140	MANAGER	CAREN L. SYCH for

FAA FORM 8260 - 16 / February 1995 (computer generated)

TRANSMITTAL OF AIRWAYS / ROUTE DATA

AIRWAY NO. OR ROUTE	FROM / TO	ROUTINE OR DOCKET NO.	CONTROLLING @ TERRAIN/OBSTRUCTION AND COORDINATES	MRA / MOCA	MAA / MEA	CHANGE OVER POINT	FIX MRA/MCA	REMARKS	FLIGHT INSPECTION DATES
B28	NICHOLS, AK NDB / SITKA, AK NDB		TERRAIN 4054 563430/1345200	6900 / 6100	17500 / 6900			GPS MEA-6000 1900 ROC USED TERRAIN 4054 563430/1345200	

DATE	OFFICE	TITLE	SIGNATURE
07/09/2002	AVN-140	MANAGER	CAREN L. SYCH

FAA FORM 8260 - 16 / February 1995 (computer generated)

TRANSMITTAL OF AIRWAYS / ROUTE DATA

AIRWAY NO. OR ROUTE	FROM / TO	ROUTINE OR DOCKET NO.	CONTROLLING @ TERRAIN/OBSTRUCTION AND COORDINATES	MRA / MOCA	MAA / MEA	CHANGE OVER POINT	FIX MRA/MCA	REMARKS	FLIGHT INSPECTION DATES
V311	TOKEE, AK DME FIX / FLIPS, AK DME FIX		TERRAIN 4054 563400/1345200	9000 / 6000	17500 / 9000*	ANN 103		GPS MEA-6000 1900 ROC USED TERRAIN 4054 563400/1345200	
								*CONTINUOUS NAV SIGNAL DOES NOT EXIST BETWEEN BKA 61 & ANN 103 AT MEA	

DATE	OFFICE	TITLE	SIGNATURE
07/09/2002	AVN-140	MANAGER	CAREN L. SYCH for

FAA FORM 8260 - 16 / February 1995 (computer generated)

TRANSMITTAL OF AIRWAYS / ROUTE DATA

AIRWAY NO. OR ROUTE	FROM / TO	ROUTINE OR DOCKET NO.	CONTROLLING @ TERRAIN/OBSTRUCTION AND COORDINATES	MRA / MOCA	MAA / MEA	CHANGE OVER POINT	FIX MRA/MCA	REMARKS	FLIGHT INSPECTION DATES
V317	GESTI, AK DME FIX LEVEL ISLAND, AK VOR/DME		TERRAIN 3144 553500/1320800	7000 5000	17500 7000	64 ANN		GPS MEA-5000 100' REDUCTION USED TERRAIN 3144 553500/1320800	
V317	LEVEL ISLAND, AK VOR/DME HOODS, AK DME FIX		TERRAIN 3853 571900/1341500	9000 5900	17500 9000	74 LVD		TERRAIN 3853 571900/1341500 NEW CONTROLLING OBST	
V317	HOODS, AK DME FIX SISTERS ISLAND, AK VORTAC		TERRAIN 3050 575800/1350300	7000 5000	17500 7000			TERRAIN 3050 575800/1350300	
V317	SISTERS ISLAND, AK VORTAC CSPER, AK DME FIX		TERRAIN 3100 581000/1355000	7000 5000	17500 7000			GPS MEA-5000 100' REDUCTION USED TERRAIN 3100 581000/1355000	
V317	CSPER, AK DME FIX HAPIT, AK DME FIX *		TERRAIN 2362 581600/1353700	15000 4400	17500 15000		* MRA 15000	GPS MEA-8000 TERRAIN 2362 581600/1353700	

DATE	OFFICE	TITLE	SIGNATURE
07/09/2002	AVN-140	MANAGER	CAREN L. SYCH

FAA FORM 8260 - 16 / February 1995 (computer generated)

TRANSMITTAL OF AIRWAYS / ROUTE DATA

AIRWAY NO. OR ROUTE	FROM / TO	ROUTINE OR DOCKET NO.	CONTROLLING @ TERRAIN/OBSTRUCTION AND COORDINATES	MRA / MOCA	MAA / MEA	CHANGE OVER POINT	FIX MRA/MCA	REMARKS	FLIGHT INSPECTION DATES
V319	YAKUTAT, AK VORTAC MALAS, AK DME FIX		TREES 599 593000/1393200	2000 2600	17500 2600			MEA ADJUSTMENT: NEW CONTROLLING OBST	
V319	MALAS, AK DME FIX KATAT, AK INT		TERRAIN 3315 601700/1443500	14000 5000	17500 10000	98 JOH		GPS MEA-9000 300' REDUCTION TERRAIN 3315 601700/1443500	
V319	KATAT, AK INT CASEL, AK INT		TERRAIN 3315 601700/1443500	7000 5000	17500 7000			GPS MEA-5000 300' REDUCTION TERRAIN 3315 601700/1443500	
V319	CASEL, AK INT EYAKS, AK DME FIX		TREES 599 602400/1452500	5000 2600	17500 5000			TREES 599 602400/1452500 MOCA ADJUSTMENT: NEW CONTROLLING OBST	
V319	EYAKS, AK DME FIX JOHNSTONE POINT, AK VORTAC		TERRAIN 2910 602430/1463300	2000 4900	17500 5000				
V319	JOHNSTONE POINT, AK VORTAC PEPPI, AK DME FIX		TERRAIN 2910 602430/1463300	5000 4900	17500 5000				
V319	PEPPI, AK DME FIX WILER, AK DME FIX		TERRAIN 6050 604200/1485000	10000 8000	17500 10000W 8000E			1900 ROC USED TERRAIN 4660 604900/1484200	
V319	WILER, AK DME FIX ANCHORAGE, AK VOR/DME *		TERRAIN 5005 610200/1493400	10000 7000	17500 10000		* MCA 5000 E	GPS MEA-7000 100' REDUCTON TERRAIN 5005 610200/1493400	

DATE	OFFICE	TITLE	SIGNATURE
07/09/2002	AVN-140	MANAGER	CAREN L. SYCH

FAA FORM 8260 - 16 / February 1995 (computer generated)

TRANSMITTAL OF AIRWAYS / ROUTE DATA

AIRWAY NO. OR ROUTE	FROM / TO	ROUTINE OR DOCKET NO.	CONTROLLING @ TERRAIN/OBSTRUCTION AND COORDINATES	MRA / MOCA	MAA / MEA	CHANGE OVER POINT	FIX MRA/MCA	REMARKS	FLIGHT INSPECTION DATES
V428	BIORKA ISLAND, AK VORTAC SISTERS ISLAND, AK VORTAC		TERRAIN 4325 572000/1351900	7000 6000	17500 7000	55 BKA		GPS MEA-6000 300' REDUCTION USED TERRAIN 4325 572000/1351900	
V428	SISTERS ISLAND, AK VORTAC HAINES, AK NDB		TERRAIN 6605 590600/1353300	10000 8500	17500 10000	21 SSR		GPS MEA-8500 1900 ROC USED TERRAIN 6605 590600/1353300	
V428	HAINES, AK NDB U.S. - CANADA BORDER		TERRAIN 7550 595000/1352500	10000 9500	175000 10000**	66YXY		GPS MEA-9500 1900 ROC USED TERRAIN 7550 595000/1352500	
								* MEA GAP 30 HNS 22 SSR	
								** FOR THAT PORTION OVER U.S. AIRSPACE	

DATE	OFFICE	TITLE	SIGNATURE
07/09/2002	AVN-140	MANAGER	CAREN L. SYCH

FAA FORM 8260 - 16 / February 1995 (computer generated)

TRANSMITTAL OF AIRWAYS / ROUTE DATA

AIRWAY NO. OR ROUTE	FROM / TO	ROUTINE OR DOCKET NO.	CONTROLLING @ TERRAIN/OBSTRUCTION AND COORDINATES	MRA / MOCA	MAA / MEA	CHANGE OVER POINT	FIX MRA/MCA	REMARKS	FLIGHT INSPECTION DATES
V431	BIORKA ISLAND, AK VORTAC / LYRIC, AK DME FIX		TERRAIN 3051 574100/1353200	5000 / ~~5800~~	17500 / 5000	LYRIC DME FIX**		1900 ROC USED	
V431	LYRIC, AK DME FIX * / SISTERS ISLAND, AK VORTAC		TERRAIN 3768 575752/1352259	8000 / 5800	17500 / 8000		* MRA 8000	GPS MEA-5800 TERRAIN 3768 575752/1352259	
								** DL BKA R-327 & SSR R-175	

DATE	OFFICE	TITLE	SIGNATURE
07/09/2002	AVN-140	MANAGER	CAREN L. SYCH for

FAA FORM 8260 - 16 / February 1995 (computer generated)

TRANSMITTAL OF AIRWAYS / ROUTE DATA

AIRWAY NO. OR ROUTE	FROM / TO	ROUTINE OR DOCKET NO.	CONTROLLING @ TERRAIN/OBSTRUCTION AND COORDINATES	MRA / MOCA	MAA / MEA	CHANGE OVER POINT	FIX MRA/MCA	REMARKS	FLIGHT INSPECTION DATES
V440	SANDSPIT, CANADA VORTAC		TERRAIN 2550 532800/1321900	8000	17500			GPS MEA-4600 TERRAIN 1454 535230/1323200	
	MOCHA, AK INT			4600	8000				
V440	MOCHA, AK INT		TERRAIN 2001 551900/1333600	18000	17500	138 BKA		GPS MEA-8000 TERRAIN 1999 555100/1341800 NAV GAP BETWEEN 122 BKA & 99 YZP AT MEA	
	LATCH, AK DME FIX			4000	12000				

DATE	OFFICE	TITLE	SIGNATURE
07/09/2002	AVN-140	MANAGER	CAREN L. SYCH

FAA FORM 8260 - 16 / February 1995 (computer generated)

TRANSMITTAL OF AIRWAYS / ROUTE DATA

AIRWAY NO. OR ROUTE	FROM / TO	ROUTINE OR DOCKET NO.	CONTROLLING @ TERRAIN/OBSTRUCTION AND COORDINATES	MRA / MOCA	MAA / MEA	CHANGE OVER POINT	FIX MRA/MCA	REMARKS	FLIGHT INSPECTION DATES
V440	SALIS, AK DME FIX HAPIT, AK INT *		OVERWATER	11000 2000	17500 9000*	98 BKA	*MRA 15000	GPS MEA-8000 OVERWATER *NAV GAP BETWEEN 100 YAK & 80 BKA AT MEA	
V440	HAPIT, AK INT CENTA, AK DME FIX		OVERWATER	11000 2000	17500 9000			GPS MEA 8000 OVERWATER NAV GAP BETWEEN 100 YAK & 80 BKA AT MEA	
V440	CENTA, AK DME FIX YAKUTAT, AK VORTAC		TREE 201 593100/1394000	3000 2000	17500 3000			GPS MEA - 2000 1800 ROC USED TREE 232 593100/1393927	
V440	YAKUTAT, AK VORTAC OCULT, AK DME FIX		TREE 201 593100/1394000	2000	17500 2000			1800 ROC USED	
V440	OCULT, AK DME FIX MIDDLETON ISLAND, AK VOR/DME		TOWER 170 592540/1462017	8000 2000	17500 8000	95 YAK		GPS MEA - 7000 1800 ROC USED TOWER 170 592540/1462017	
V440	MIDDLETON ISLAND, AK VOR/DME HOPER, AK INT		TERRAIN 6532 603500/1485300	1000 8500	17500 10000	60 ANC		GPS MEA - 8500 TERRAIN 6532 603500/14895300	
V440	HOPER, AK INT ANCHORAGE, AK VOR/DME		TERRAIN 4000 610200/1494200	7000 6000	17500 7000			GPS MEA - 6000 TERRAIN 4000 610200/1494200	

DATE	OFFICE	TITLE	SIGNATURE
07/09/2002	AVN-140	MANAGER	CAREN L. SYCH

FAA FORM 8260 - 16 / February 1995 (computer generated)

TRANSMITTAL OF AIRWAYS / ROUTE DATA

AIRWAY NO. OR ROUTE	FROM / TO	ROUTINE OR DOCKET NO.	CONTROLLING @ TERRAIN/OBSTRUCTION AND COORDINATES	MRA / MOCA	MAA / MEA	CHANGE OVER POINT	FIX MRA/MCA	REMARKS	FLIGHT INSPECTION DATES
V473	LEVEL ISLAND, AK VORTAC / FLIPS, AK DME FIX		TERRAIN 4054 563400/1345200	7000 / 6000	17500 / 7000			GPS MEA-6000 1900 ROC USED TERRAIN 4054 563400/1345200	
V473	FLIPS, AK DME FIX / BIORKA ISLAND, AK VORTAC		TERRAIN 4054 563400/1345200	6000 / ~~6000~~	17500 / 6000			1900 ROC USED	

DATE	OFFICE	TITLE	SIGNATURE
07/09/2002	AVN-140	MANAGER	CAREN L. SYCH

FAA FORM 8260 - 16 / February 1995 (computer generated)

Appendix G

NATCA GPS MEA Concurrence Letter

November 5, 2002

VIA ELECTRONIC TRANSMISSION AND FIRST CLASS MAIL

John Glassley
ATX-500
Federal Aviation Administration
Room 439
800 Independence Ave., SW
Washington, DC 20591

RE: Minimum En Route Altitudes (MEA) for GPS Equipped Aircraft

Dear Mr. Glassley;

Thank you for the briefing you provided us on October 22 concerning the above referenced matter. We have carefully reviewed the subject and understand that the criteria for determining MEA as defined by FAA Order 8260.3B has not changed. We also understand that a GPS MEA will not be published unless it is at least five hundred feet lower than the conventional MEA, provides use of a cardinal altitude, and in no case will be lower than the MOCA for the affected route or segment. Accordingly we do not believe that bargaining over this proposal will be necessary. The Union does not, however, waive any of its rights, including the statutory right to bargain should some unforeseen impact to the bargaining unit later become evident.

Thank you for your attention to this matter.
Very truly yours,

David E. Sandbach
Labor Relations Staff Representative

DES: yu

cc: Robert Taylor, Director of Labor Relations
Mike Hull, ATX Liaison
Wade Stanfield, ATP Liaison
Dale Wright, ARS Liaison
NEB

Appendix H

Haines, Hoonah IFR Designation Forms 7480-1

Form approved OMB No. 2120-0036

U.S. Department of Transportation
Federal Aviation Administration

NOTICE OF LANDING AREA PROPOSAL

Name of Proponent, Individual, or Organization	Address of Proponent, Individual, or Organization (No., Street, City, State, Zip Code)
State of Alaska, Department of Transportation and Public Facilities ☐ Check if the property owner's name and address are different than above, and list property owner's name and address on the reverse.	6860 Glacier Hwy Juneau, AK 99801-7999

☐ Establishment or Activation ☐ Deactivation or Abandonment } OF ☒ Airport ☐ Ultraflight Flightpark ☐ Vertiport
☐ Alteration ☒ Change of Status ☐ Heliport ☐ Seaplane Base ☐ Other (Specify)

A. Location of Landing Area

1. Associated City/State	2. County/State (Physical Location of Airport)			3. Distance and Direction From Associated City or Town	
Haines, Alaska	Haines, Alaska				
4. Name of Landing Area	5. Latitude	6. Longitude	7. Elevation	Miles	Direction
Haines Airport	59° | 14' | 43"	135° | 31' | 20"	16	3	W

B. Purpose

Type Use	If Change of Status or Alteration, Describe Change	☐ Establishment or change to traffic pattern (Describe on reverse)	Construction Dates	
			To Begin/Began	Est. Completion
☒ Public ☐ Private ☐ Private Use of Public Land/Waters	VFR to ~~I~~FR			

C. Other Landing Areas — Ref. A5 above

Direction From Landing Area	Distance From Landing Area

D. Landing Area Data

	Existing (if any) Rwy #1	Rwy #2	Rwy #3	Proposed Rwy	Rwy	Rwy
1. Airport, Seaplane Base, or Flightpark						
Magnetic Bearing of Runway (s) or Sealane						
Length of Runway (s) or Sealane (s) In Feet						
Width of Runway (s) or Sealane (s) In Feet						
Type of Runway Surface (Concrete, Asphalt, Turf, Etc.)						
2. Heliport						
Dimensions of Final Approach and Take off Area (FATO) In Feet						
Dimensions of Touchdown and Lift-Off Area (TLOF) in Feet						
Magnetic Direction of Ingress/Egress Routes						
Type of Surface (Turf, concrete, rooftop, etc.)						

E. Obstructions

Type	Height Above Landing Area	Direction From Landing Area	Distance From Landing Area

3. All Landing Areas — Description of Lighting (if any) — Direction of Prevailing Wind

F. Operational Data

1. Estimated or Actual Number Based Aircraft

Airport, Flightpark, Seaplane base	Present (If est. indicate by letter "E")	Anticipated 5 Years Hence	Heliport	Present (If est. indicate by letter "E")	Anticipated 5 Years Hence
Multi-engine			Under 3500 lbs MGW		
Single-engine			Over 3500 lbs MGW		
Glider					

G. Other Considerations

Identification	Direction From Landing Area	Distance From Landing Area

2. Average Number Monthly Landings

	Present (If est. indicate by letter "E")	Anticipated 5 Years Hence		Present (If est. indicate by letter "E")	Anticipated 5 Years Hence
Jet			Helicopter		
Turboprop			Ultralight		
Prop			Glider		

3. Are IFR Procedures For The Airport Anticipated
☐ No ☐ Yes Within _____ Years Type Navaid:

H. Application for Airport Licensing
☐ Has Been Made ☐ Not Required ☐ County
☐ Will Be Made ☐ State ☐ Municipal Authority

I. CERTIFICATION: *I hereby certify that all of the above statements made by me are true and complete to the best of my knowledge.*

Name, title (and address if different than above) of person filing this notice -- type or print	Signature (in ink)	
Carl Siebe, Airports Engineer	Date of Signature: Feb 12, 2002	Telephone No. (Precede with area code): 907-269-0725

FAA Form 7480-1 (1-93) Supersedes Previous Edition — Central Region Electronic Revision per ACE-625 (1-97)

Form approved OMB No. 2120-0036

U.S. Department of Transportation
Federal Aviation Administration

NOTICE OF LANDING AREA PROPOSAL

00AAL-03INRI

Name of Proponent, Individual, or Organization	Address of Proponent, Individual, or Organization (No., Street, City, State, Zip Code)
Alaska Dept. of Transportation & Public Facilities, Southeast Region ☐ Check if the property owner's name and address are different than above, and list property owner's name and address on the reverse.	6860 Glacier Highway Juneau, AK 99801-7999

☐ Establishment or Activation ☐ Deactivation or Abandonment ☐ Alteration ☒ Change of Status } OF ☒ Airport ☐ Ultraflight Flightpark ☐ Vertiport ☐ Heliport ☐ Seaplane Base ☐ Other (Specify) ____

A. Location of Landing Area

1. Associated City/State	2. County/State (Physical Location of Airport)			3. Distance and Direction From Associated City or Town	
Hoonah, Alaska	Juneau, Alaska				
4. Name of Landing Area	5. Latitude	6. Longitude	7. Elevation	Miles	Direction
Hoonah Airport	58° | 05' | 46"	135° | 24' | 35"	20	01	SE

B. Purpose

Type Use	If Change of Status or Alteration, Describe Change	☐ Establishment or change to traffic pattern (Describe on reverse)	Construction Dates	
			To Begin/Began	Est. Completion
☒ Public ☐ Private ☐ Private Use of Public Land/Waters	Change to IFR			

C. Other Landing Areas

Ref. A5 above		D. Landing Area Data	Existing (if any)			Proposed		
Direction From Landing Area	Distance From Landing Area	1. Airport, Seaplane Base, or Flightpark	Rwy #1	Rwy #2	Rwy #3	Rwy	Rwy	Rwy
		Magnetic Bearing of Runway (s) or Sealane						
		Length of Runway (s) or Sealane (s) in Feet						
		Width of Runway (s) or Sealane (s) in Feet						
		Type of Runway Surface (Concrete, Asphalt, Turf, Etc.)						
		2. Heliport						
		Dimensions of Final Approach and Take off Area (FATO) In Feet						
		Dimensions of Touchdown and Lift-Off Area (TLOF) In Feet						
		Magnetic Direction of Ingress/Egress Routes						
		Type of Surface (Turf, concrete, rooftop, etc.)						

N/A

E. Obstructions

Type	Height Above Landing Area	Direction From Landing Area	Distance From Landing Area
See attached Part 77 Obst. Sheet			

3. All Landing Areas	Description of Lighting (If any)	Direction of Prevailing Wind

F. Operational Data

1. Estimated or Actual Number Based Aircraft

Airport, Flightpark, Seaplane base	Present (If est. indicate by letter "E")	Anticipated 5 Years Hence	Heliport	Present (If est. indicate by letter "E")	Anticipated 5 Years Hence
Multi-engine			Under 3500 lbs. MGW		
Single-engine			Over 3500 lbs. MGW		
Glider					

N/A

G. Other Considerations

2. Average Number Monthly Landings

Identification	Direction From Landing Area	Distance From Landing Area		Present (If est. indicate by letter "E")	Anticipated 5 Years Hence		Present (If est. indicate by letter "E")	Anticipated 5 Years Hence
			Jet			Helicopter		
			Turboprop			Ultralight		
			Prop			Glider		

3. Are IFR Procedures For The Airport Anticipated ☐ No ☐ Yes Within ___ Years Type Navaid:

H. Application for Airport License

☐ Has Been Made ☐ Will Be Made ☒ Not Required ☐ State ☐ County ☐ Municipal Authority

I. CERTIFICATION: *I hereby certify that all of the above statements made by me are true and complete to the best of my knowledge.*

Name, title (and address if different than above) of person filing this notice -- type or print	Signature (in ink)	Telephone No. (Precede with area code)
Andy Hughes, Chief of Planning	Andy Hughes Date of Signature 2-22-02	(907) 465-1776

FAA Form 7480-1 (1-93) Supersedes Previous Edition Central Region Electronic Revision per ACE-625 (1-97)

Appendix I

AFS-400 Approach-Departure Guidance Memo

Subject: ACTION: Capstone II Procedure Development in Southeast Alaska

Date: DEC 10 2002

From: Manager, Flight Technologies and Procedures Branch, AFS-400

Reply to Attn. of:

To: Manager, National Flight Procedures Office, AVN-100

One of the objectives of the Capstone II program is to develop a usable Instrument Flight Rules (IFR) infrastructure in Southeast Alaska. This will be accomplished, at least in part, using advanced avionics, including Technical Standard Order (TSO) C145/146 compliant Global Positioning System (GPS) and Wide Area Augmentation System (WAAS) receivers and special aircrew training. In addition, only aircraft approach Category A and B aircraft will be included in Capstone II.

In consideration of these factors, the following guidelines may be applied to development of special instrument approach and departure procedures at the following airports in Southeast Alaska, Juneau, Hoonah, Haines, and Gustavas.

Level 1 criteria from FAA Order 8260.44A, Civil Utilization of Area Navigation (RNAV) Departure Procedures, may be applied where necessary and appropriate for feeder routes, instrument approach initial and missed approach segments.

Holding patterns may be designed using 175 Knots Indicated Airspeed (KIAS) criteria found in FAA Order 7130.3A, Holding Pattern Criteria. Any such patterns must be depicted on the aeronautical chart using an appropriate cartographic icon.

Alternate minimums are authorized on special RNAV instrument approaches at any of the above airports, if the airport otherwise qualifies as an alternate in accordance with FAA Order 8260.19C, Flight Procedures and Airspace.

All special instrument approach and departure procedures developed in support of Capstone II shall be annotated, "Special Aircraft and Aircrew Authorization Required."

Separate waiver action is not required for procedures designed in accordance with guidance addressed in this memo. This memo shall be made part of the permanent development package for each procedure.

Please address any comments to Donald Pate, AFS-420, at (405) 954-4164.

Original Signed By:

John W. McGraw

cc: AFS-400/405/410/420/430

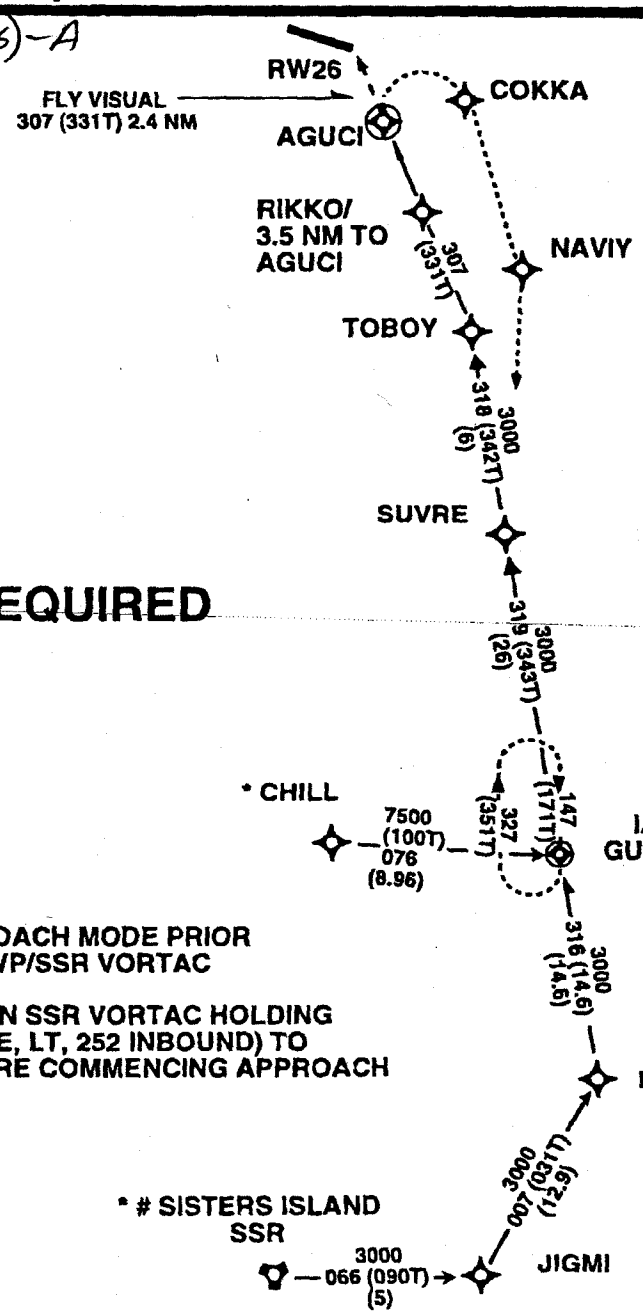
File: 1110-17
WP: S:\AFS420tm\420\Moore\Capstone II ProcedureDevelopment.doc
AFS-420:CMoore:lcc:405-954-5829:11/20/2002

Appendix J

Draft Capstone SE Approach-Departure Procedure Charts

RNAV (GPS)-A HAINES AK

PROTOTYPE – NOT FOR NAVIGATION

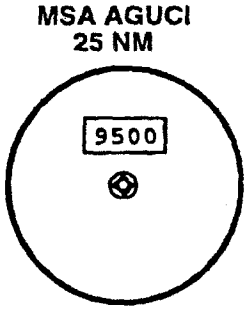


GPS REQUIRED

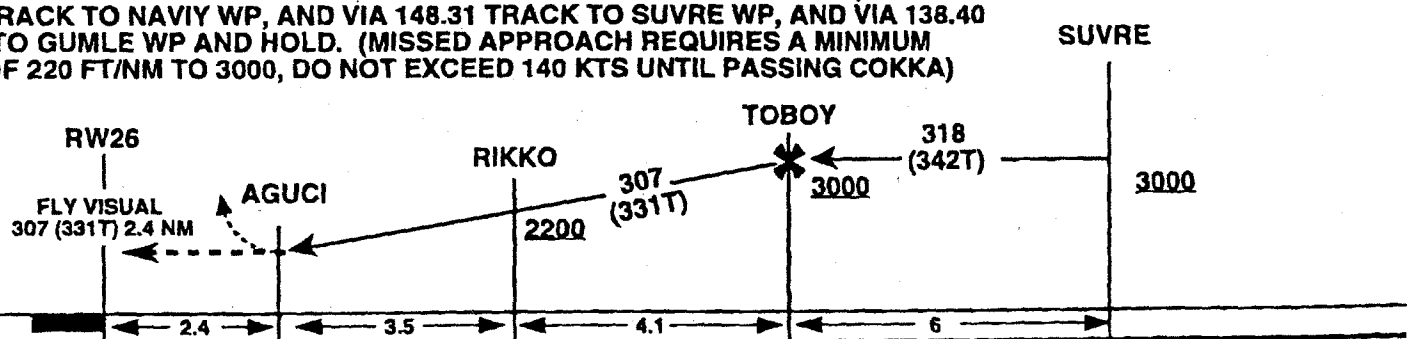
CHILL	5836.902N–13519.825W
SSR VTAC	5810.660N–13515.532W
BARLO	5821.627N–13453.533W
JIGMI	5810.689N–13506.089W
GUMLE	5835.312N–13502.974W
SUVRE	5900.053N–13518.000W
TOBOY	5905.757N–13521.518W
RIKKO	5909.323N–13525.291W
AGUCI	5912.389N–13528.545W
RW26	5914.517N–13530.811W
COKKA	5911.552N–13523.453W
NAVIY	5907.898N–13520.054W

* ARM APPROACH MODE PRIOR TO CHILL WP/SSR VORTAC

DESCEND IN SSR VORTAC HOLDING PATTERN (E, LT, 252 INBOUND) TO 5000 BEFORE COMMENCING APPROACH



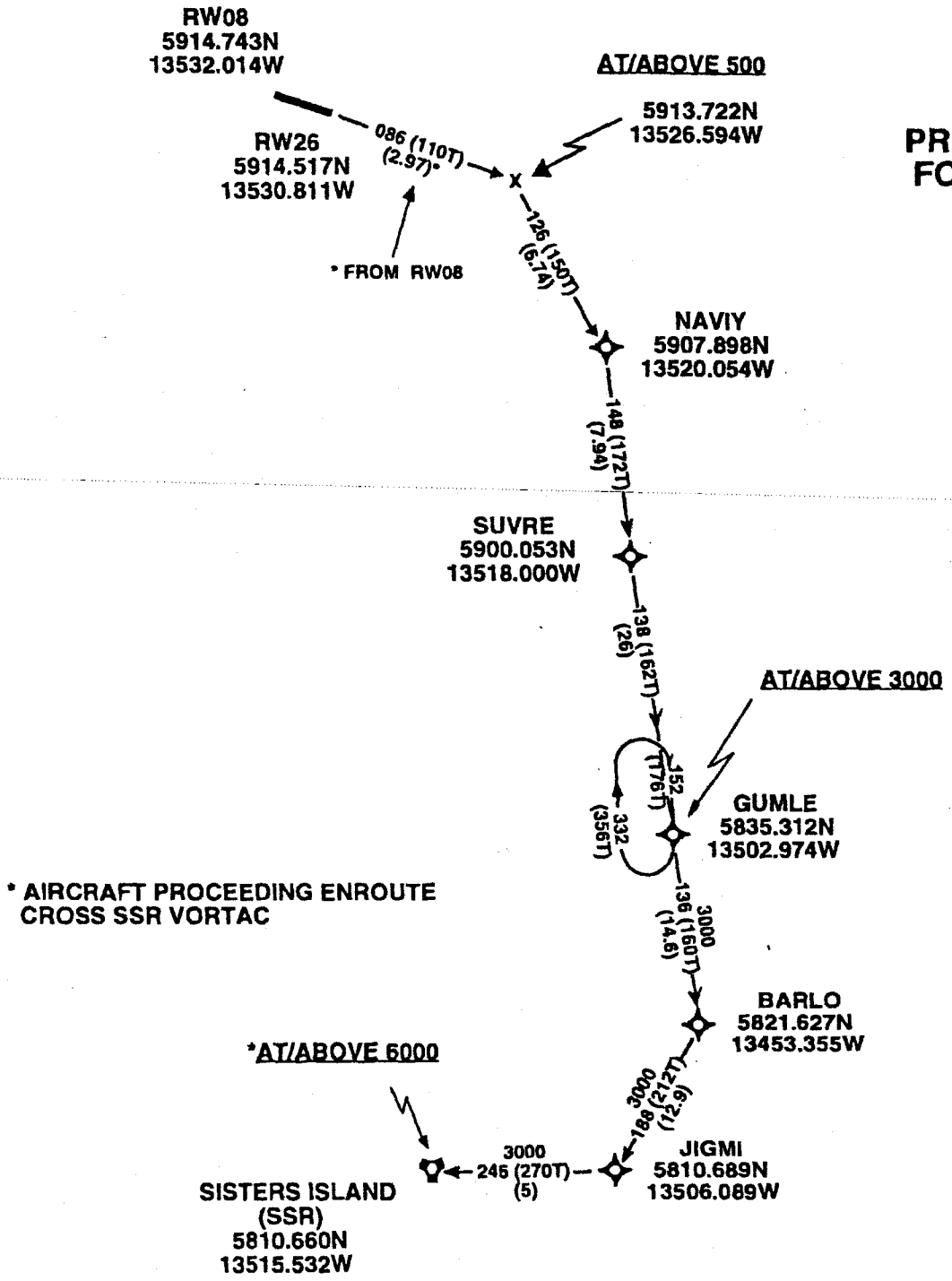
MISSED APPROACH: CLIMBING RIGHT TURN TO 5000 DIRECT COKKA WP, AND VIA 130.44 TRACK TO NAVIY WP, AND VIA 148.31 TRACK TO SUVRE WP, AND VIA 138.40 TRACK TO GUMLE WP AND HOLD. (MISSED APPROACH REQUIRES A MINIMUM CLIMB OF 220 FT/NM TO 3000, DO NOT EXCEED 140 KTS UNTIL PASSING COKKA)



CATEGORY	A	B	C	D
CIRCLING	1620–2 1605	1620–2 1605	NA	NA

SPECIAL AIRCRAFT AND AIRCREW AUTHORIZATION REQUIRED
CIRCLING NA N OF RWY 8–26
ANY MISSED APPROACH COMMENCED AFTER PASSING AGUCI WP WILL NOT PROVIDE OBSTRUCTION CLEARANCE

GUMLE ONE RNAV DEPARTURE HAINES, AK



PROTOTYPE – NOT FOR NAVIGATION

TAKE-OFF RWY 26 – NA
TAKE-OFF RWY 8 – STANDARD WITH A MINIMUM CLIMB OF 470 FT/NM TO 2500

SPECIAL AIRCRAFT AND AIRCREW AUTHORIZATION REQUIRED

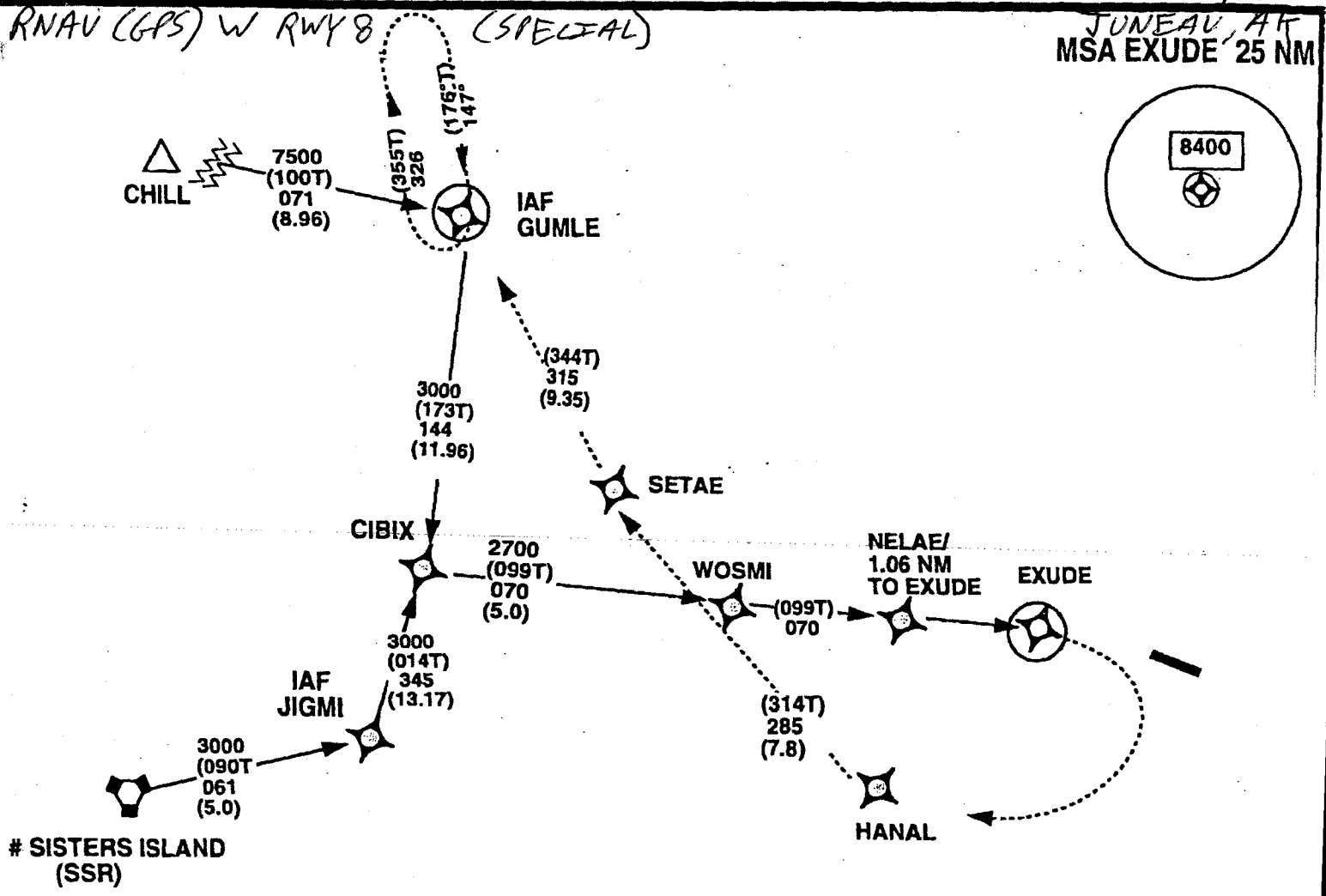
RNAV (GPS) W RWY 8 (SPECIAL)

JUNEAU, AK

RNAV (GPS) W RWY 8 (SPECIAL)

JUNEAU, AK

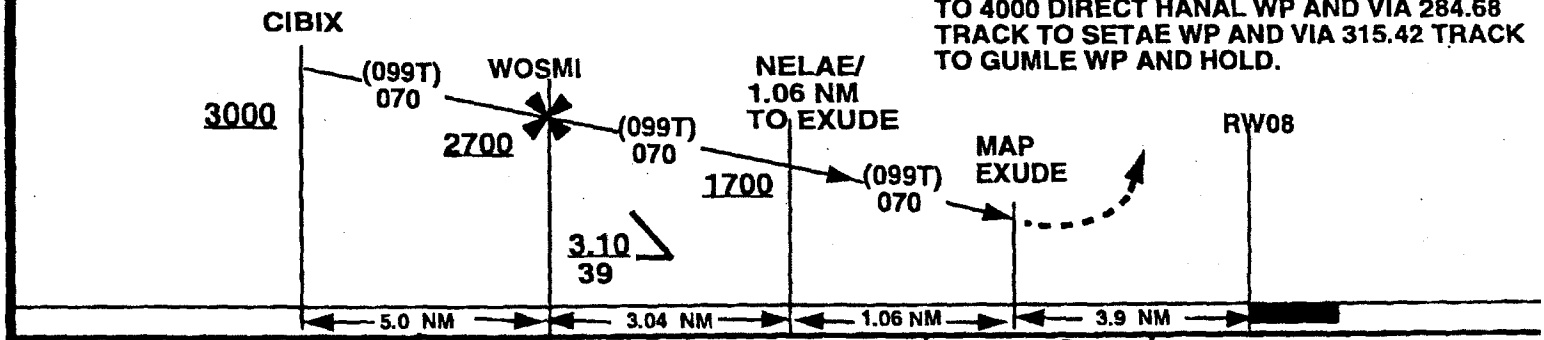
MSA EXUDE 25 NM



#DESCEND IN SSR VORTAC HOLDING PATTERN (HOLD E, LT, 252.00 INBOUND) TO 5000 BEFORE COMMENCING APPROACH

PROTOTYPE: NOT FOR NAVIGATION

MISSED APPROACH: CLIMBING RIGHT TURN TO 4000 DIRECT HANAL WP AND VIA 284.68 TRACK TO SETAE WP AND VIA 315.42 TRACK TO GUMLE WP AND HOLD.



CATEGORY	A	B	C	D
LNAV MDA	940 – 2 910		NA	
CIRCLING	940 – 2 910	1160 – 2 1130	NA	

SSR	5810.660N–13515.532V
CHILL	5836.902N–13519.825V
GUMLE	5835.312N–13502.974V
JIGMI	5810.689N–13506.089V
CIBIX	5823.466N–13500.249V
WOSMI	5822.710N–13450.860V
NELAE	5822.244N–13445.156'
EXUDE	5822.081N–13443.167'
HANAL	5820.956N–13447.437'
SETAE	5826.324N–13458.173'

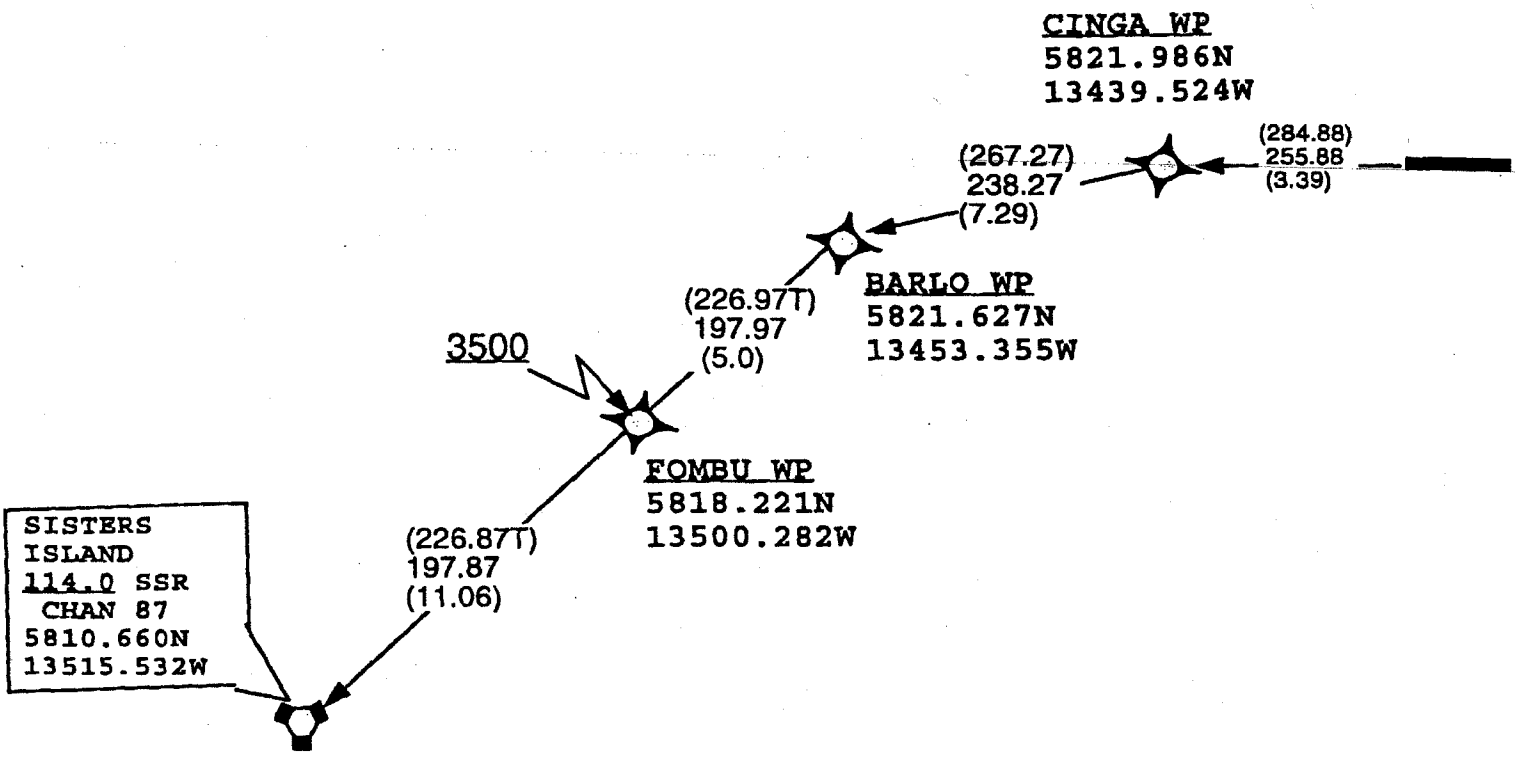
"SPECIAL AIRCRAFT AND AIRCREW AUTHORIZATION REQUIRED."
LEAD-IN LIGHTS NOT ALIGNED WITH FINAL APPROACH COURSE.
"FLY VISUAL TO AIRPORT, 070°–3.9 MILES."
CIRCLING NOT AUTHORIZED NORTH OF RWY 8/26.
CIRCLING NA AT NIGHT.
SPECIFICATION ONLY NOT FOR COCKPIT USE.

CINGA ONE RNAV DEPARTURE

NOTE: GPS REQUIRED.

NOTE: FOR USE BY /E, /F, /R (RNP 1.0) AND /G EQUIPPED AIRCRAFT. (1) /E AND /F AIRCRAFT ARE REQUIRED TO UPDATE NAVIGATION SYSTEM AT A KNOWN LOCATION WITHIN 30 MINUTES PRIOR TO TAKEOFF. (2) /G AIRCRAFT WITH SELECTABLE CDI MUST SET CDI TO 1 NM TERMINAL SENSITIVITY. AIRCRAFT WITHOUT SELECTABLE CDI MUST USE FLIGHT DIRECTOR.

CINGA ONE RNAV DEPARTURE JUNEAU, AK



¡ PROTOTYPE NOT FOR NAVIGATION

TAKE-OFF RWY 8: NA – TERRAIN
TAKE-OFF RWY 26: 600–2 WITH MINIMUM CLIMB OF 260 FEET PER NM TO 7000.
NOTE: RWY 26: ANT ON TWR 7589 FEET FROM DER 884 RIGHT OF CENTERLINE, 73 AGL/583 MS
NOTE: RWY26: NUMEROUS TREES/TERRAIN LEFT AND RIGHT SIDE OF RWY WITHIN 1.5 NM OF DER.

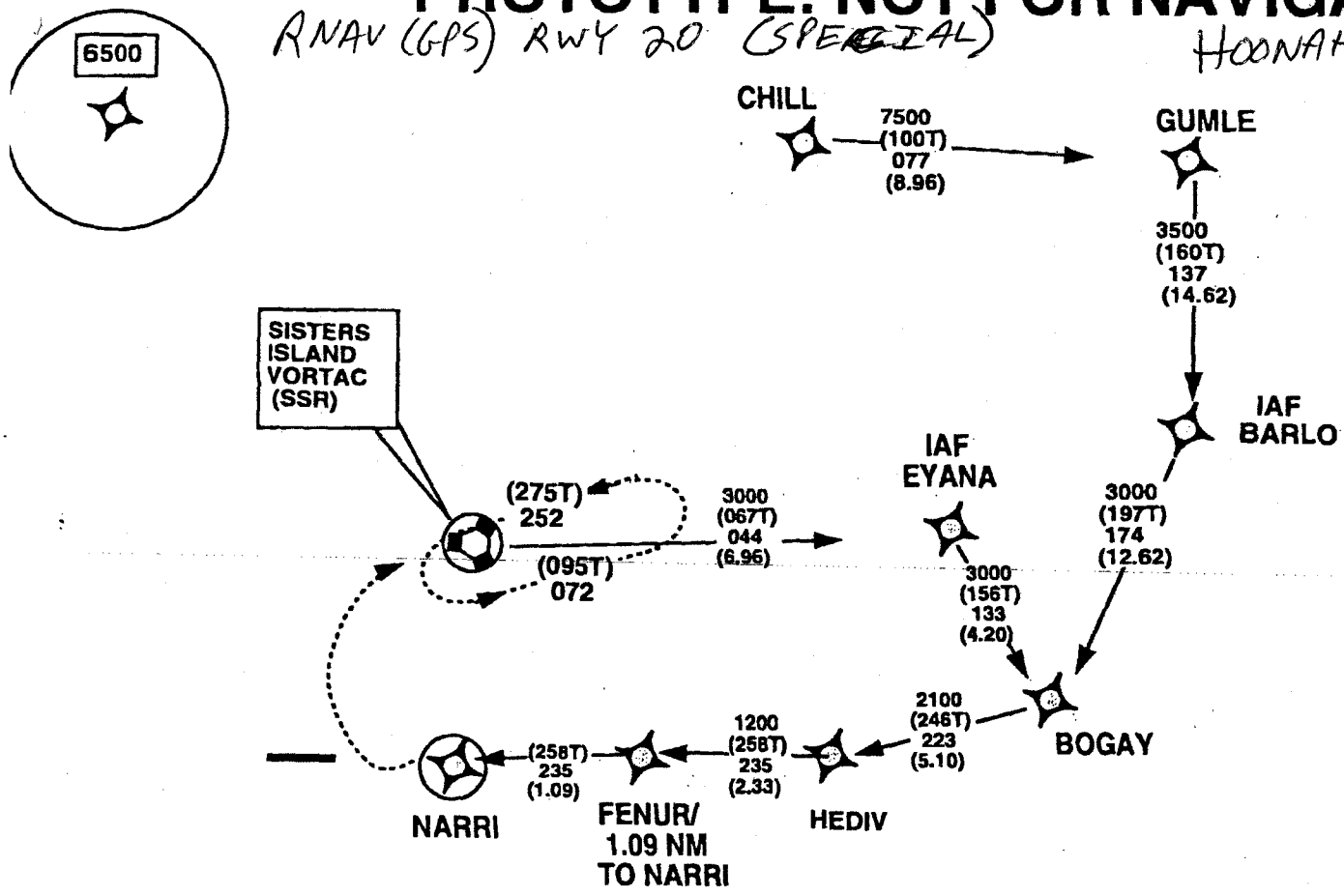
DEPARTURE PROCEDURE ROUTE:
TAKEOFF RWY 26: CLIMB VIA 255.88 COURSE TO CINGA WP, THEN VIA 238.27 COURSE TO BARLO WP, THEN VIA 197.97 TRACK TO CROSS FOMBU WP AT OR ABOVE 3500, THEN VIA DEPICTED ROUTE CROSS SSR VORTAC AT OR ABOVE MEA/MCA FOR DIRECTION OF FLIGHT THENCE...
...VIA FURTHER CLEARANCE

(CINGA1.CINGA)

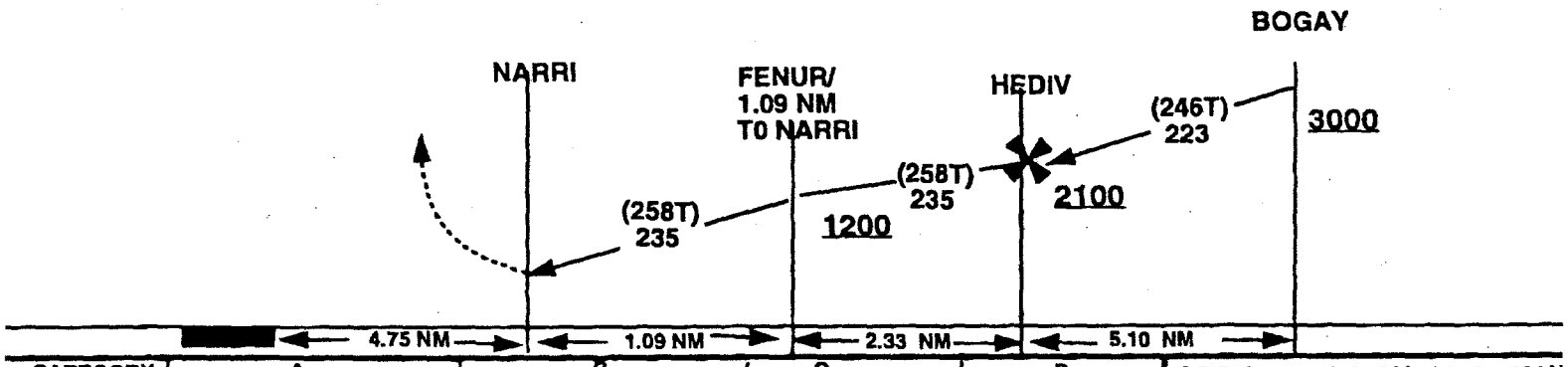
ISA NARRI 25NM

PROTOTYPE: NOT FOR NAVIGATION

RNAV (GPS) RWY 20 (SPECIAL) HOONAH, AK



CLIMBING RIGHT TURN TO 3000 DIRECT SSR VORTAC AND HOLD.



CATEGORY	A	B	C	D
LNAV MDA	800–5 1/2 780	800–5 1/2 780	NA	
CIRCLING	NA			

SSR;C	5810.660N–13515.532V
CHILL	5836.902N–13519.825W
GUMLE	5835.312N–13502.974V
BARLO	5821.627N–13453.355\
EYANA	5813.412N–13503.464\
BOGAY	5809.577N–13500.265'
HEDIV	5807.524N–13509.065'
FENUR	5807.040N–13513.366\
NARRI	5806.813N–13515.375\

PILOTS MUST PROCEED UNDER "VISUAL FLIGHT RULES" AFTER REACHING THE MISSED APPROACH POINT OR EXECUTE MISSED APPROACH.

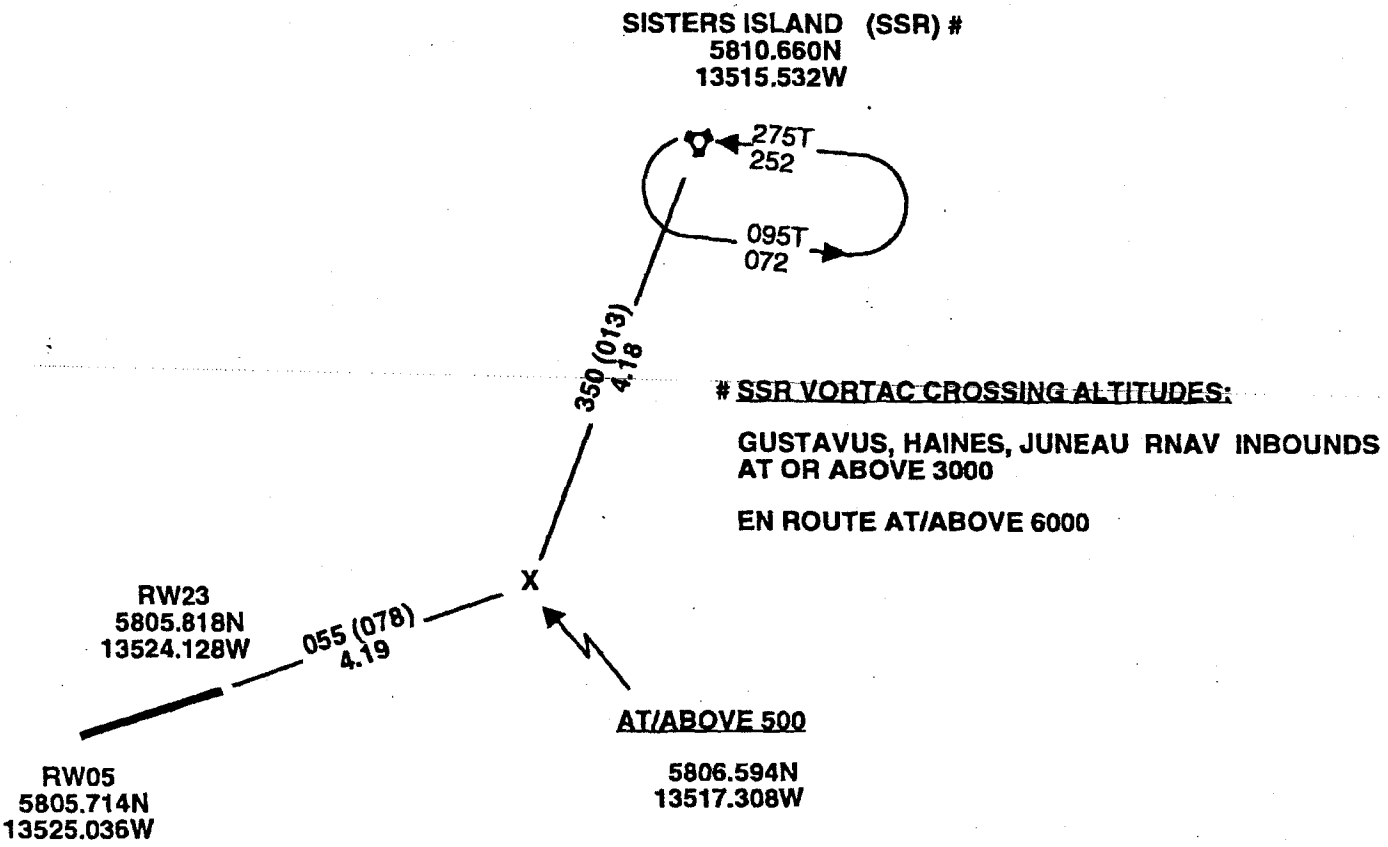
SPECIAL AIRCRAFT AND AIRCREW AUTHORIZATION REQUIRED

FOR SPECIFICATION ONLY NOT FOR COCKPIT USE

PROCEDURE NA AT NIGHT.

ISLAND ONE RNAV DEPARTURE

HOONAH, AK



PROTOTYPE – NOT FOR NAVIGATION

TAKE-OFF RWY 5: CLIMB VIA 054.81 HEADING TO AT OR ABOVE 500, THEN VIA 350.00 COURSE TO SSR VORTAC. CLIMB IN SSR VORTAC HOLDING PATTERN TO CROSS SSR VORTAC AT OR ABOVE THE FOLLOWING ALTITIUDES: GUSTAVUS, HAAINES, JUNEAU RNAV INBOUNDS 3000; EN ROUTE 6000.

TAKE-OFF RWY 23 – NA
TAKE-OFF RWY 5 – 1200-3 OR 400-2 WITH A MINIMUM CLIMB OF 590 FT/NM TO 1600 TO 1600

RWY 5: NUMEROUS TREES 2352 FEET FROM DER 795 FEET LEFT OF CENTERLINE, 113 FEET AGL/260 FEET MSL.
TREES 5622 FEET FROM DER 1045 FEET LEFT OF CENTERLINE, 165 FEET AGL/396 FEET MSL.
NUMEROUS TREES 576 FEET FROM DER 431 FEET RIGHT OF CENTERLINE, 23 FEET AGL/104 FEET MSL.
TREES 15004 FEET FROM DER 4276 FEET RIGHT OF CENTERLINE, 200 FEET AGL/1136 FEET MSL.

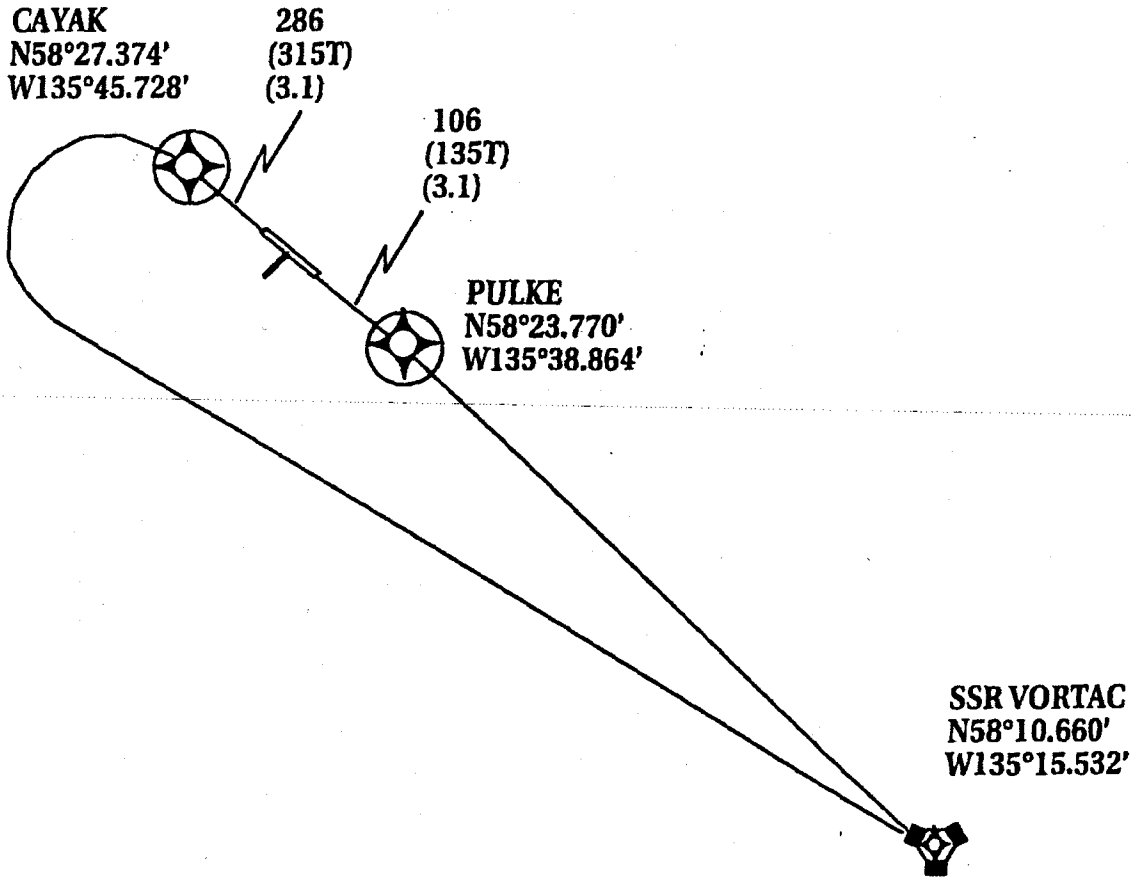
SPECIAL AIRCRAFT AND AIRCREW AUTHORIZATION REQUIRED

SISTERS ONE DEPARTURE (RNAV)

GUSTAVUS, AK

PROTOTYPE: NOT FOR NAVIGATION

SISTERS ONE DEPARTURE (RNAV) Gustavus, AK



NOTE: CHART NOT TO SCALE

DEPARTURE ROUTE DESCRIPTION

TAKEOFF RWY 29: CLIMB VIA 286.03 COURSE TO CAYAK WP, THEN CLIMBING LEFT TURN TO 6000 OR ASSIGNED ALTITUDE DIRECT SSR VORTAC...

TAKEOFF RWY 11: CLIMB VIA 106.01 COURSE TO PULKE WP, THEN CLIMBING RIGHT TURN TO 6000 OR ASSIGNED ALTITUDE DIRECT SSR VORTAC...

...CROSS SSR VORTAC AT OR ABOVE MEA/MCA FOR DIRECTION OF FLIGHT THENCE FURTHER CLEARANCE.

TAKEOFF MINIMUMS:

RWY 11 STANDARD WITH A MINIMUM CLIMB OF 270 FEET PER NM TO 5400.
RWY 29 STANDARD WITH A MINIMUM CLIMB OF 220 FEET PER NM TO 5400.
RWYS 2, 20 NA – RWY LIMITATIONS.
NOTE: FOR USE BY /E, /F, /R (RNP 1.0) AND /G EQUIPPED AIRCRAFT. (1) /E AND /F AIRCRAFT ARE REQUIRED TO UPDATE NAVIGATION SYSTEM AT A KNOWN LOCATION WITHIN 30 MINUTES PRIOR TO TAKEOFF. (2) /G AIRCRAFT WITH SELECTABLE CDI MUST SET CDI TO 1 NM TERMINAL SENSITIVITY. AIRCRAFT WITHOUT SELECTABLE CDI MUST USE FLIGHT DIRECTOR.
NOTE: GPS REQUIRED

GUSTAVUS, ALASKA

AL-1192 (FAA)

RNAV (GPS) RWY 29

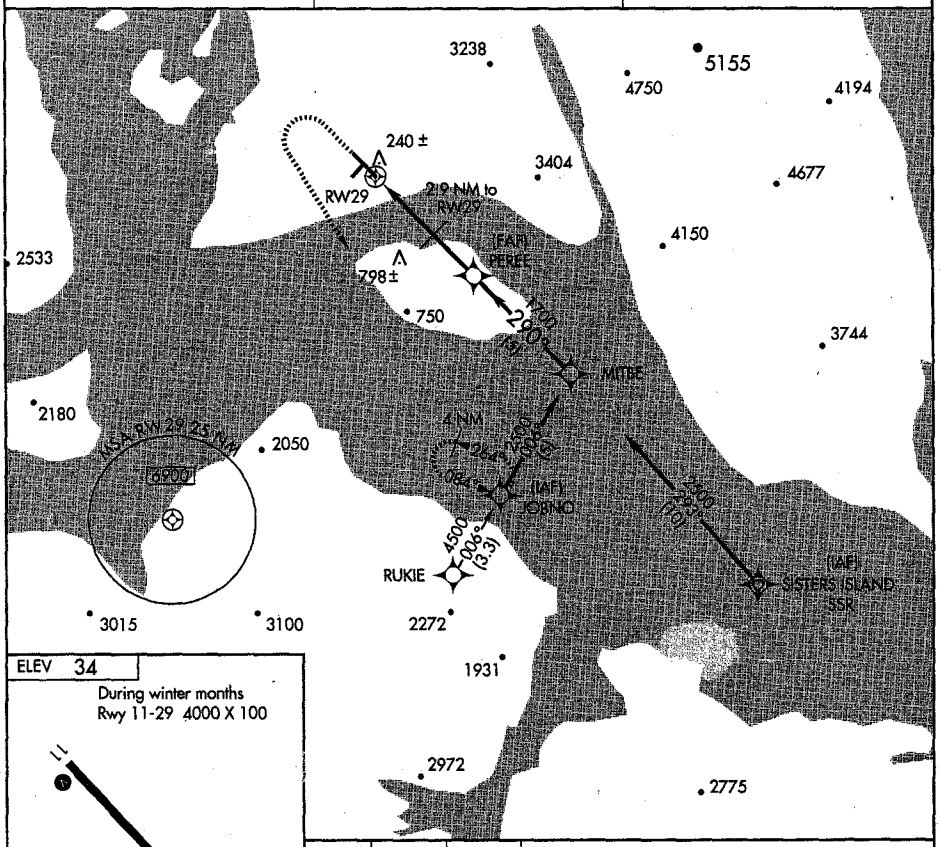
GUSTAVUS (GST)

APP CRS	Rwy ldg	6720
290°	TDZE	30
	Apt Elev	34

Procedure not authorized at night.
NA Circling not authorized NE of Rwy 11-29.
GPS or RNP -0.3 required. DME/DME RNP -0.3 NA.

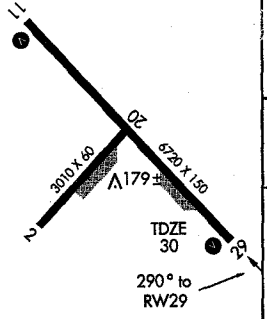
MISSED APPROACH: Climb to 900 then climbing left turn to 4000 direct JOBNO WP and hold.

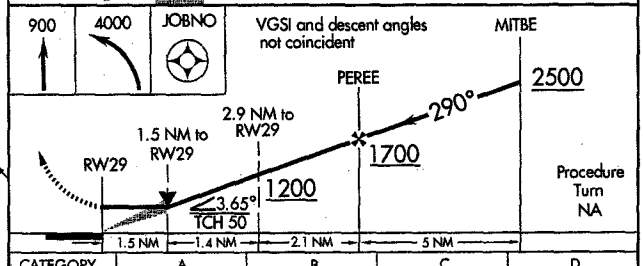
AWOS-3	ANCHORAGE CENTER	CTAF
125.9	133.2 360.65	122.5



ELEV 34

During winter months
Rwy 11-29 4000 X 100





CATEGORY	A	B	C	D
LNAV MDA	540-1	510 (600-1)	540-1½	510 (600-1½)
CIRCLING	560-1	526 (600-1)	560-1½ 526 (600-1½)	600-2 566 (600-2)

Appendix K
SFAR 97

Federal Register

Friday,
March 21, 2003

Part IV

Department of Transportation

Federal Aviation Administration

14 CFR Parts 71, 91, et al.

Special Operating Rules for the Conduct of Instrument Flight Rules (IFR) Area Navigation (RNAV) Operations Using Global Positioning Systems (GPS) in Alaska; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 71, 91, 95, 121, 125, 129, 135

[Docket No. FAA–2003–14305; Special Federal Aviation Regulation No. 97]

RIN 2120–AH93

Special Operating Rules for the Conduct of Instrument Flight Rules (IFR) Area Navigation (RNAV) Operations Using Global Positioning Systems (GPS) in Alaska

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: Under Special Federal Aviation Regulation (SFAR) No. 97, the FAA allows the use of Global Positioning System/Wide Area Augmentation Systems for the en route portion of flights on routes in Alaska outside the operational service volume of ground based navigation aids. The use of aircraft navigation equipment other than area navigation systems, that only permit navigation to or from ground-based navigation stations, often results in less than optimal routes or instrument procedures and an inefficient use of airspace. SFAR 97 optimizes routes and instrument procedures and provides for a more efficient use of airspace. Further, the FAA anticipates that it will result in an associated increase in flight safety.

DATES: This final rule is effective March 13, 2003.

FOR FURTHER INFORMATION CONTACT: Donald W. Streeter, Flight Technologies and Procedures Division (AFS–400), Federal Aviation Administration, 800 Independence Avenue SW., Washington, DC 20591; telephone: (202) 385–4567; e-mail: *donald.w.streeter@faa.gov.*

SUPPLEMENTARY INFORMATION:

Availability of Final Rules

You can get an electronic copy of this final rule through the Internet by:

(1) Searching the Department of Transportation's electronic Docket Management System (DMS) Web page (*http://dms.dot.gov/search*);

(2) Visiting the Office of Rulemaking's Web page at *http://www.faa.gov/avr/armhome.htm;* or

(3) Accessing the **Federal Register**'s Web page at *http://www.access.gpo.gov/su_docs/aces/aces140.html.*

You also can get a copy by submitting a request to the Federal Aviation Administration, Office of Rulemaking, ARM–1, 800 Independence Avenue SW., Washington, DC 20591, or by calling (202) 267–9680. Make sure to identify the docket number or amendment number of this rulemaking.

Background

Aviation is critical to Alaska for routine travel and commerce, and for nearly any kind of emergency. Only 10% of Alaska is accessible by road, and waterways are impassable most of each year. Alaska also is very large and crisscrossed by mountains that block radio and radar transmissions so that aviation services and infrastructure that are available in the 48 contiguous states are not available in many areas of Alaska. Aviation is essential to Alaska, but there also is a safety consequence of operating in this environment. The aviation accident rate for rural Alaska is 2.5 times the average for the rest of the United States. The Capstone Program is one initiative by the FAA to reduce this accident rate.

The Capstone Program is a joint initiative by the FAA Alaskan Region and the aviation industry to improve safety and efficiency in Alaska by using new technologies. Derived from the National Transportation Safety Board (NTSB) and industry recommendations, Capstone Phase I focuses on southwest Alaska (the Yukon and Kuskokwim River Delta—YK Delta), which is isolated, has limited infrastructure, and has the same high rate of aviation accidents experienced in the rest of the state. Under Capstone, installation of advanced avionics in the YK Delta aircraft began in November 1999 and expansion of ground infrastructure and data collection will continue through December 2004. Relying on lessons learned during Phase I, Capstone Phase II is beginning in southeast Alaska. A more robust set of avionics, that include Global Positioning Systems/Wide Area Augmentation Systems (GPS/WAAS), is being deployed that aims at further reduction of controlled flight into terrain and mid-air collision accidents. In addition, instrument flight rules (IFR) area navigation (RNAV) procedures are being introduced that enable participants to conduct IFR operations on published routes, improving overall safety and capacity.

The current operating rules under the Federal Aviation Regulations in title 14 of the Code of Federal Regulations (14 CFR) do not accommodate the use of GPS/WAAS technology for IFR RNAV outside the operational service volume of ground-based navigation aids. SFAR 97 allows the timely approval of approximately 200 aircraft that are being equipped under Capstone Phase II to conduct IFR RNAV operations using GPS/WAAS navigation systems. Additionally, SFAR 97 provides the opportunity for air carrier and general aviation operators, other than those participating in the Capstone Program, to voluntarily equip aircraft with advanced GPS/WAAS avionics that are manufactured, certified, and approved for IFR RNAV operations. This SFAR serves two purposes: (1) It allows persons to conduct IFR en route RNAV operations in the State of Alaska and its airspace on published air traffic routes using TSO C145a/C146a navigation systems as the only means of IFR navigation; and (2) it allows persons to conduct IFR en route RNAV operations in the State of Alaska and its airspace at Special MEA that are outside the operational service volume of ground-based navigation aids.

The FAA proposed SFAR 97 on January 24, 2003 (68 FR 3778). The comment period closed on February 24, 2003. The FAA received four comments on the proposed SFAR.

Discussion of Comments

Three comments received on the proposed SFAR supported the proposal. A pilot commented that this is a positive move toward improved safety and efficiency of operations in Alaska. The Alaska Airmen's Association commented that the SFAR provides more reliable navigation. The Association noted that by allowing safer minimum altitudes, the rule allows aircraft to fly below freezing/icing levels. It also noted greater operational capability. The Aircraft Owners and Pilots Association (AOPA) stated that SFAR 97 would also facilitate further development of the AOPA-supported Capstone Program, which uses current-day technology to increase capacity while improving safety. Allowing the use of Global Positioning System/Wide Area Augmentation Systems (GPS/WAAS) for the en route portion of flights on routes in Alaska will further reduce the chances for controlled flight into terrain and midair collisions while at the same time improving capacity.

The Boeing Commercial Airplane Group agreed with the intent and goal of proposed SFAR 97 but noted the following:

''1. The NPRMs provisions are inconsistent with movement towards a Performance based International Airspace System (INAS), and are inconsistent with applications of RNP (*e.g.,* it addresses only specific limited technologies; does not credit other more capable technologies, and has underlying angular criteria implications that are inappropriate in an inherently

linear future RNAV and RNP criteria world).''

FAA Response: SFAR 97 addresses specific safety issues existing in Alaska. Further, the SFAR only addresses the enroute lateral navigation capability of GPS and is not intended as a model for future rulemaking on RNP in the International Airspace System. Nothing in SFAR 97 precludes development of more capable technologies and systems.

''2. The NPRM sets precedents with regard to inappropriate definitions and concepts that are inconsistent with and adversely interfere with necessary ''Global'' navigation systems evolution (*e.g.,* Special MEA: 4000G).''

FAA Response: SFAR 97 addresses a specific safety need, is limited in geographic application, and is not proposed as a model for the future. As stated in Section 2 of SFAR 97, the definitions of this rule apply only to this SFAR. It is anticipated that this SFAR may be terminated when the national RNAV rule is in place. Therefore, FAA finds this SFAR does not ''adversely interfere with necessary 'Global' navigation systems evolution.''

''3. By its issuance, the NPRM could inappropriately set a precedent, inferring that this type SFAR is needed when it is not, and thus imply that other better and more capable (*e.g.*, RNP-based or GNSS based) systems may not be useable or eligible for MEA, route, or procedure credit, or that even some current operations (*e.g.,* Alaska Airlines RNP operations) may be addressed by such an SFAR which in fact is not necessary.''

FAA Response: As stated in the NPRM for SFAR 97, the current regulatory structure does not accommodate the use of GPS/WAAS technology for IFR RNAV outside the operational service volume of ground-based navigation aids. The FAA does not agree that the operations envisioned by SFAR 97 are appropriately conducted without this regulatory action. Nothing herein is intended to preclude or otherwise address certification, use, or operational approval of ''other better and more capable'' systems.

''4. The intended Capstone related capability can more easily and readily be achieved other ways (*e.g.*, by FAA approval or specific means via Op Spec, FSDO LOA, or various FAA Orders and associated AIM changes). Even if an SFAR was desired (and it should not be necessary), it could be done via a very simple SFAR issuance that essentially says that 'Other routes, procedures, navigation systems, or operations may be authorized in Alaskan airspace, as determined by the Administrator'.''

FAA Response: As noted, the current regulatory structure does not accommodate the use of GPS/WAAS technology for IFR RNAV outside the operational service volume of ground-based navigation aids. Operations envisioned under SFAR 97 include Parts 91, 121, 129, and 135. The FAA finds that due to the disparity in type of operations, no single administrative remedy could address all operators, and such an approach would be overly and unnecessarily burdensome for both the FAA and operators alike. The FAA finds that regulatory action is appropriate in resolving the existing regulatory deficiency for use of GPS systems in Alaska for IFR RNAV outside the operational service volume of ground-based navigational aids.

''5. The currently proposed SFAR appears to set criteria that may actually be harmful to expeditious and beneficial Alaska airspace management and evolution by implicitly invoking airspace standards that are overly restrictive and constraining (*e.g.*, not recognizing the credit of linear criteria capable systems, or better systems related to RNP and networks of LAAS, or limiting airspace planning to very narrowly defined specific systems such as for special GPS MEAs [4000G], when other combinations of navigation systems could provide equal or better airspace performance.''

FAA Response: SFAR 97 relaxes current existing regulatory requirements for surface based navigation capability only for aircraft equipped with appropriate TSO C145a/C146a GPS equipment. This rulemaking is not intended to address current or future capabilities attainable with appropriately installed and approved RNP capable systems. The FAA finds that permitting operations beyond service volume of ground based navigation aids adds previously unattainable and beneficial flexibility to management of and safe navigation through Alaskan airspace. The FAA anticipates that that experience gained through these Alaskan operations may provide a more precise and accurate basis for the formulation of future policies on airspace design that are now a work in progress.

''6. Language of the NPRM is technically flawed in that it make assertions like' * * * (GNSS) encompasses all satellite ranging technologies', when in fact the performance of some satellite-based systems may or may not alone meet specific RNP provisions (*e.g.*, some international systems), particularly in some regions of Alaska airspace.''

FAA Response: SFAR 97 makes no attempt to address or compare RNP performance to performance of existing satellite systems and only addresses operations with TSO C145a/C146a equipment in Alaska.

''7. The NPRM appears to exclusively attempt to credit systems meeting criteria only of TSO C145a/C146a. This is not appropriate technically because of certain characteristics of those systems which can be contrary to the general direction navigation needs to evolve in an RNP-based global system (*e.g.*, aspects of inappropriate angular criteria of C146 versus the more appropriate linear criteria of RNP; and system pilot interface issues). While these C145a/C146a systems may be beneficially purchased and operationally used, their inappropriate (*e.g.*, angular) characteristics should not be the basis (and certainly not exclusive basis) for future INAS procedure or airspace design, even in a limited region, in limited circumstances.''

FAA Response: As previously noted, the FAA intends SFAR 97 to address specific safety issues existing in Alaska, limits applicability to operations based on GPS within Alaska, addresses lateral navigation capabilities only, and is not proposed as a model for future rulemaking on RNP in the International Airspace System. The purpose of this SFAR is to address en route operations and is not intended to address approach procedures. FAA further finds nothing in SFAR 97 that precludes continued development of more capable technologies or eventual evolution of global RNP systems as eventually determined appropriate.

''8. Application of any of this SFAR to FAR 129 Operators is most inappropriate (*e.g.*, international operators flying in U.S. airspace). International Operations and international operators should be planning and equipping exclusively based on RNP-based criteria, ILS, LAAS, and GLS. Even if WAAS is used as a sensor in RNAV systems, international navigation criteria should be principally focused on RNP capability, not be defined as sensor specific.''

FAA Response: SFAR 97 neither precludes or requires international operators to equip with navigation systems other than as currently provided in existing regulations and operations specifications. Additionally, nothing in SFAR 97 addresses operations other than within Alaskan airspace. The rule gives part 129 operators the ability to operate in areas (including lower altitudes) that are outside the service volume of ground-based navigational rules.

''9. This NPRM is not currently consistent with some key FAA criteria (AC120–29A) and the direction key large aircraft manufacturers and operators are evolving future navigation systems or operational capability. If adopted without significant change, any final rule based significantly on this NPRM could unnecessarily restrict and inhibit beneficial and necessary evolution of RNP related systems and applications.''

FAA Response: While stating the NPRM is not consistent with some key FAA criteria per AC120–29A, the commenter does not provide sufficient information to identify the inconsistency. Advisory circulars provide advice on methods to comply with regulatory requirements; therefore, there is no requirement that an SFAR conform to an Advisory Circular. SFAR 97 provides the appropriate and intended regulatory structure for operations in Alaskan airspace that are outside the service volume of ground-based navigational aids. Additionally, as already noted, SFAR 97 does not preclude appropriate evolution and broad inclusion of other appropriately certificated and approved systems, including RNP systems, into the Global NAS.

''10. Numerous areas of analysis or comment in the NPRM preamble are also inappropriate, incorrect, or misleading. Significant revision of the preamble is also needed, before any final rule is issued (*e.g.*, incorrect suppositions about the applicability or flexibility of current rules).''

FAA Response: Insufficient specificity is provided to locate any such unintended anomalies. Specific comments addressing issues of applicability and/or flexibility of current rules have already been addressed above.

As a general comment, Boeing also recommended that this SFAR not be issued independently, but rather that the editing of this SFAR be delegated to the AWO and TAOARC groups. While no reason for such additional editing by specific named groups is offered, providing such an additional period would be unfair to those who commented during the prescribed period. The FAA does not agree with this recommendation and finds the rulemaking provisions of 14 CFR part 11 are applicable to this SFAR and have been followed.

In a separate comment, American Trans Air stated, ''The proposed rule uses language, terms and definitions found only in other OPEN proposed rulemaking actions (FAA–2002–14002 and FAA–2003–14449). Request this action be delayed/postponed until public comments regarding critical language contained in FAA–2002–14002 are resolved. This delay is necessary to allow the Proposed Rule to be reviewed in it's proper context and ensure common understanding and terminology with RNAV operations.''

FAA Response: FAA recognizes that language, terms, and definitions used in SFAR 97 also are found in other open rulemaking proposals. Definitions of language and terms used in SFAR 97 are applicable only to this SFAR, as stated in Section 2.

Based on its analysis of comments, the FAA adopts SFAR 97 as proposed.

Reference Material Relevant to SFAR 97

(1) Technical Standard Order (TSO) C145a, Airborne Navigation Sensors Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS); and (2) TSO C146a, Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS). Copies of these TSOs may be obtained from the FAA Internet Web site at *http://www.faa.gov/certification/aircraft/TSOA.htm.*

Related Activity

The FAA is conducting a thorough review of its rules to ensure consistency between the operating rules of 14 CFR and future RNAV operations for the NAS. This review may result in rulemaking that could enable the use of space-based navigation aid sensors for aircraft RNAV systems through all phases of flight (departure, en route, arrival, and approach) to enhance the safety and efficiency of the NAS. The changes anticipated could result in greater flexibility in air traffic routing, instrument approach procedure design, and airspace use than is now possible with a ground-based navigation aid system structure. The improved navigation accuracy and flexibility could enhance both system capacity and overall flight safety, and could promote the ''free flight'' concept in the NAS by enabling the NAS to move away from reliance on ground-based NAVAIDs. SFAR 97 supports this activity as an early implementation effort. The FAA anticipates that that experience gained through these Alaskan operations may provide a more precise and accurate basis for future policies on airspace design which are now a work in progress.

Contrary Provisions of the Current Regulations

People who conduct operations in Alaska in accordance with SFAR 97 are excepted from certain provisions of the FAA's regulations. For instance:

14 CFR 71.75. Extent of Federal airways. The extent of Federal airways is currently referenced as a center line that extends from one navigational aid or intersection to another navigational aid or intersection specified for that airway. SFAR 97 allows the Federal airway and other routes published by the FAA to be referenced and defined by one or more fixes that are contained in an RNAV system's electronic database that is derived from GPS satellites and used by the pilot to accurately fly the Federal airway or other published routes without reference to the ground based navigational aids that define those routes.

14 CFR 91.181. Course to be flown. Section 91.181 defines courses to be flown along Federal airways that are only referenced to station referenced navigational aids or fixes defining that route. SFAR 97 allows courses to be flown on Federal airways and other published routes that are defined by waypoints or fixes contained in a GPS WAAS navigation system that is certified for IFR navigation.

14 CFR 91.205(d)(2). Powered civil aircraft with standard category U.S. airworthiness certificates: Instrument and equipment requirements. Section 91.205(d)(2) states that navigational equipment appropriate to the ground facilities to be used is required for IFR operations and does not include RNAV equipment. Under SFAR 97, operations can be conducted using navigation equipment that is not dependent on navigating only to and from ground-based radio navigation stations.

14 CFR 91.711(c)(1)(ii) and 91.711(e). Special rules for foreign civil aircraft. Section 91.711(c)(1)(ii) requires foreign civil aircraft operating within the United States and conducting IFR operations to be equipped with radio navigational equipment appropriate to the navigational signals to be used and does not accommodate the use of RNAV systems for instrument flight rules operations. Section 91.711(e) states that no person may operate a foreign civil aircraft within the 50 states and the District of Columbia at or above flight level (FL) 240 unless the aircraft is equipped with distance measuring equipment (DME) capable of receiving and indicating distance information from the VORTAC facilities to be used. Although an IFR approved RNAV system provides distance information,

this section does not allow the use of an RNAV system in lieu of DME.

14 CFR 95.1. Applicability. Part 95 prescribes altitudes governing the operation of aircraft under IFR on Federal airways, jet routes, area navigation low or high routes, or other direct routes for which a minimum enroute altitude (MEA) is designated. In addition, it designates mountainous areas and changeover points. In general, the IFR altitudes prescribed in this section are determined by a route analysis based on the following factors: (1) An obstacle clearance assessment; (2) the lowest altitude at which the aircraft radio navigation receivers are able to receive the ground-based radio navigation fixes defining the airway, segment or route; and (3) the lowest altitude at which two-way voice communication between the aircraft and the air traffic control unit can be maintained. No accommodation is made for IFR altitudes determined by the above route analysis factors over routes that may be defined by fixes other than ground-based navigation aid fixes. Under SFAR 97, operators using IFR certified GPS/WAAS RNAV systems are permitted to conduct operations over routes in Alaska at the lowest minimum en route altitude based only on route obstacle assessments and ATC two-way voice communication capability. This MEA is defined as the ''special MEA'' for purposes of SFAR 97 to distinguish it from MEAs established under part 95.

14 CFR 121.349(a). Radio equipment for operations under VFR over routes not navigated by pilotage or for operations under IFR or over-the-top. Section 121.349(a) requires airplanes to be equipped with two independent radio navigation systems that are able to receive radio navigational signals from all primary en route and approach navigational facilities intended to be used. This section does not allow, nor does any other section of part 121, allow the use of RNAV GNSS for IFR navigation on Federal airways and other routes. SFAR 97 allows the use of IFR-certified RNAV GPS/WAAS systems for IFR navigation.

14 CFR 125.203(b) and (c). Radio and navigational equipment. These sections state that no person may operate an airplane over-the-top or under IFR unless it has two independent receivers for navigation that are able to receive radio signals from the ground facilities to be used and which are capable of transmitting to, and receiving from, at any place on the route to be flown, at least one ground facility. These sections do not allow the use of RNAV GNSS for IFR navigation for any airplanes conducting IFR operations under part 125 in the NAS. SFAR 97 allows for the use of IFR-certified RNAV GPS/WAAS systems for IFR navigation.

14 CFR 129.17(a) and (b). Radio Equipment. Sections 129.17(a) and (b) state that subject to the applicable laws and regulations governing ownership and operation of radio equipment, each foreign air carrier shall equip its aircraft with such radio equipment as is necessary to properly use the air navigation facilities. This section does not include or allow IFR RNAV GNSS to be used for air navigation on Federal airways or other published routes. SFAR 97 allows the use of IFR-certified RNAV GPS/WAAS systems for air navigation on Federal airways or other published routes.

14 CFR 135.165. Radio and navigational equipment: Extended overwater or IFR operations. Section 135.165 excludes turbojet airplanes with 10 or more passenger seats, multiengine airplanes in a commuter operations, as defined under 14 CFR part 119, and other aircraft from conducting IFR or extended overwater operations unless they have a minimum of two independent receivers for navigation appropriate to the facilities to be used that are capable of transmitting to, and receiving from, at any place on the route to be flown, at least one ground facility. Since IFR-certified RNAV GPS/WAAS systems do not receive navigation position information from ground facilities, they would not be acceptable for navigation based on this section. SFAR 97 allows the use of IFR-certified RNAV GPS/WAAS systems in lieu of aircraft navigation equipment that uses ground-based navigation facilities to navigate.

Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that the FAA consider the impact of paperwork and other information collection burdens imposed on the public. The FAA has determined that there are no new information collection requirements associated with this final rule.

International Compatibility

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to comply with International Civil Aviation Organization (ICAO) Standards and Recommended Practices to the maximum extent practicable. The FAA has determined that there are no ICAO Standards and Recommended Practices that correspond to SFAR 97.

Economic Evaluation

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs each Federal agency to propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act (19 U.S.C. 2531–2533) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. In developing U.S. standards, the Trade Agreements Act also requires agencies to consider international standards and, where appropriate, use them as the basis for U.S. standards. Fourth, the Unfunded Mandates Reform Act of 1995 (Public Law 104–4) requires agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local, or tribal governments, in the aggregate, or by the private sector, of $100 million or more annually (adjusted for inflation).

In conducting these analyses, FAA has determined that this rule: (1) Will generate benefits and not impose any costs, is not a ''significant regulatory action'' as defined in section 3(f) of Executive Order 12866, and is not ''significant'' as defined in DOT's Regulatory Policies and Procedures; (2) will not have a significant economic impact on a substantial number of small entities; (3) will not constitute a barrier to international trade; and does not impose an unfunded mandate on State, local, or tribal governments, or on the private sector.

The Department of Transportation Order DOT 2100.5 prescribes policies and procedures for simplification, analysis, and review of regulations. If it is determined that the expected impact is so minimal that the rule does not warrant a full evaluation, a statement to that effect and the basis for it is included in the regulation. No comments were received that conflicted with the economic assessment of minimal impact published in the notice of proposed rulemaking for this action. Given the reasons presented below, and the fact that no comments were received to the contrary, the FAA has determined that the expected impact of this rule is minimal and that the final rule does not warrant a full evaluation.

This rule establishes a minimum equipment and operational approval

requirement that operators have to comply with to operate at lower minimum en route altitudes (MEAs) that are outside the service volume of ground-based navigation aids. It is anticipated that most of the participants who volunteer to participate in Capstone Phase II will not incur any costs to equip their aircraft or conduct required training. Operators are not required to operate at these lower MEAs. Those who voluntarily decide to incur the costs to equip their aircraft and conduct the required training under this SFAR will have made their own business decisions that the costs associated with this SFAR's equipment and other requirements are worth the benefits of lower MEAs. For example, some operators will have concluded that flying at lower altitudes opens up markets that they could not previously have served because currently they do not have aircraft that can fly at certain altitudes on some routes and maintain reception with ground-based navigation aids. Other operators will conclude that having the ability to operate at lower MEAs will result in fewer flight cancellations or delays due to adverse weather (e.g., icing at higher altitudes).

Regarding benefits, this rule implements the National Transportation Board's recommendation ''to demonstrate a low altitude instrument flight rules (IFR) system that better fulfills the needs of Alaska's air transportation system.'' [1] An interim assessment of the safety impact of Capstone Phase 1 test program found that ''while the rates of accidents for specific causes have not changed in a way that is statistically significant yet, the over-all accident counts for the equipped and non-equipped groups were different: 12 accidents for non-equipped versus 7 for equipped even though each had nearly identical operations counts.'' [2] Operators having RNAV-equipped aircraft and flightcrews trained under this SFAR will realize safety benefits when such flights encounter adverse weather conditions en route at higher altitudes and they have the ability to seek clearance to the lower MEAs en route. In addition to the anticipated safety benefits, the rule might result in cost savings. The use of IFR RNAV equipment permits the use of more direct and therefore shorter routes and aircraft using RNAV equipment may require less fuel and time to reach their destinations. The FAA has established a number of test routes throughout the United States and some airlines have estimated annual cost savings in excess of $30 million dollars due to flying these advanced RNAV routes.[3] The FAA finds that the potential safety benefits and cost savings justify the adoption of this rule.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) establishes ''as a principle of regulatory issuance that agencies shall endeavor, consistent with the objective of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the business, organizations, and governmental jurisdictions subject to regulation.'' To achieve that principle, the RFA requires agencies to solicit and consider flexible regulatory proposals and to explain the rationale for their actions. The RFA covers a wide-range of small entities, including small businesses, not-for-profit organizations and small governmental jurisdictions.

Agencies must perform a review to determine whether a proposed or final rule will have a significant economic impact on a substantial number of small entities. If the agency determines that it will, the agency must prepare a regulatory flexibility analysis as described in the RFA.

However, if an agency determines that a proposed or final rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the RFA provides that the head of the agency may so certify and a regulatory flexibility analysis is not required. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

This rule establishes the minimum equipment and operational approval requirements that operators comply with to participate in the Alaska Capstone Phase II test and evaluation program. Most of the participants who volunteer to participate in this test program will not incur any costs to equip their aircraft or conduct required training since the Capstone Program was congressionally funded. No comments were received that differed with the assessment given in this section of the proposed rulemaking. The FAA therefore certifies that the rule will not have a significant economic impact on a substantial number of small operators.

Trade Impact Assessment

The Trade Agreement Act of 1979 prohibits Federal agencies from establishing any standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are not considered unnecessary obstacles. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards.

This rule imposes requirements on foreign air carriers operating in the SFAR area if they elect to participate in the test program. These requirements mirror the communication and navigation equipment requirements placed on domestic carriers that participate in the test program. No comments were received objecting to these provisions. The FAA has assessed the potential effect of this final rule and has determined that it will have a neutral impact on foreign trade and, therefore, create no obstacles to the foreign commerce of the United States.

Unfunded Mandates Assessment

The Unfunded Mandates Reform Act of 1995 (the Act) is intended, among other things, to curb the practice of imposing unfunded Federal mandates on State, local, and tribal governments. Title II of the Act requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in an expenditure of $100 million or more (adjusted annually for inflation) in any one year by State, local, and tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a ''significant regulatory action.''

This final rule does not contain such a mandate. The requirements of Title II do not apply.

Executive Order 13132, Federalism

The FAA has analyzed SFAR 97 under the principles and criteria of Executive Order 13132, Federalism. We determined that this action will not have a substantial direct effect on the States, on the relationship between the national Government and the States, or on the distribution of power and responsibilities among the various levels of government, and therefore would not have federalism implications.

Regulations Affecting Interstate Aviation in Alaska

Section 1205 of the FAA Reauthorization Act of 1996 (110 Stat. 3213) requires the Administrator, when modifying regulations under title 14 of

[1] Aviation Safety In Alaska (NTSB/SS–95/03) November 1995, page 77.

[2] The Safety Impact of Capstone Phase 1 (W. Worth Kirkman, Mitre) August 2002, page 15.

[3] 2001 ACE Plan, Building Capacity Today for the Skies of Tomorrow, FAA Office of System Capacity, prepared jointly by FAA and ARP Consulting, L.L.C., December 2001, pages 50–51.

the CFR that affect interstate aviation in Alaska, to consider the extent to which Alaska is not served by transportation modes other than aviation, and to establish such regulatory distinctions as he or she considers appropriate. The FAA considers that this rule will be beneficial to operations in Alaska.

Environmental Analysis

FAA Order 1050.1D defines FAA actions that may be categorically excluded from preparation of a National Environmental Policy Act (NEPA) environmental impact statement. In accordance with FAA Order 1050.1D, appendix 4, paragraph 4(j), SFAR 97 qualifies for a categorical exclusion.

Energy Impact

The energy impact of the notice has been assessed in accordance with the Energy Policy and Conservation Act (EPCA) Public Law 94–163, as amended (42 U.S.C. 6362) and FAA Order 1053.1. We have determined that SFAR 97 is not a major regulatory action under the provisions of the EPCA.

Justification for Immediate Adoption

Because this final rule is optional, that is, operators in Alaska may choose to meet the equipment and operational requirements of SFAR 97 or comply with the current regulations, the FAA finds that this SFAR may be adopted without meeting the required minimum 30-day notice period. The effective date for SFAR 97, March 13, 2003, is based, in part, on route charting dates for southeast Alaska and delay beyond that date would incur additional expense to the Government and be detrimental to operators.

List of Subjects

14 CFR Part 71

Airspace, Navigation (air).

14 CFR Part 91

Agriculture, Air traffic control, Aircraft, Airmen, Airports, Aviation safety, Canada, Freight, Mexico, Noise control, Political candidates, Reporting and recordkeeping requirements.

14 CFR Part 95

Air traffic control, Airspace, Alaska, Navigation (air), Puerto Rico.

14 CFR Part 121

Air carriers, Aircraft, Airmen, Aviation safety, Charter flights, Drug testing, Reporting and recordkeeping requirements, Safety, Transportation.

14 CFR Part 125

Aircraft, Airmen, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 129

Air carriers, Aircraft, Aviation safety, Reporting and recordkeeping requirements, Security, Smoking.

14 CFR Part 135

Air taxis, Aircraft, Airmen, Aviation safety, Reporting and recordkeeping requirements.

The Amendment

In consideration of the foregoing, the Federal Aviation Administration amends Chapter I of Title 14, Code of Federal Regulations, as follows:

PART 71—DESIGNATION OF CLASS A, CLASS B, CLASS C, CLASS D, AND CLASS E AIRSPACE AREAS; AIRWAYS; ROUTES; AND REPORTING POINTS

1. The authority citation for part 71 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40103, 40113, 40120, E.O. 10854, 24 FR 9565, 3 CFR, 1959–1963 Comp., p. 389.

PART 91—GENERAL OPERATING AND FLIGHT RULES

2. The authority citation for Part 91 Continues to read as follows:

Authority: 49 U.S.C. 106(g), 1155, 40103, 40113, 40120, 44101, 44111, 44701, 44709, 44711, 44712, 44715, 44716, 44717, 44722, 46306, 46315, 46316, 46504, 46506–46507, 47122, 47508, 47528–47531, articles 12 and 29 of the Convention on International Civil Aviation (61 stat. 1180).

3. Amend parts 71, 91, 95, 121, 125, 129, and 135 by adding SFAR No. 97. The full text will appear in part 91.

Special Federal Aviation Regulation No. 97—Special Operating Rules for the Conduct of Instrument Flight Rules (IFR) Area Navigation (RNAV) Operations using Global Positioning Systems (GPS) in Alaska

Those persons identified in Section 1 may conduct IFR en route RNAV operations in the State of Alaska and its airspace on published air traffic routes using TSO C145a/C146a navigation systems as the only means of IFR navigation. Despite contrary provisions of parts 71, 91, 95, 121, 125, and 135 of this chapter, a person may operate aircraft in accordance with this SFAR if the following requirements are met.

Section 1. *Purpose, use, and limitations*

a. This SFAR permits TSO C145a/C146a GPS (RNAV) systems to be used for IFR en route operations in the United States airspace over and near Alaska (as set forth in paragraph c of this section) at Special Minimum En Route Altitudes (MEA) that are outside the operational service volume of ground-based navigation aids, if the aircraft operation also meets the requirements of sections 3 and 4 of this SFAR.

b. Certificate holders and part 91 operators may operate aircraft under this SFAR provided that they comply with the requirements of this SFAR.

c. Operations conducted under this SFAR are limited to United States Airspace within and near the State of Alaska as defined in the following area description:

From 62°00′00.000″N, Long. 141°00′00.00″W.; to Lat. 59°47′54.11″N., Long. 135°28′38.34″W.; to Lat. 56°00′04.11″N., Long. 130°00′07.80″W.; to Lat. 54°43′00.00″N., Long. 130°37′00.00″W.; to Lat. 51°24′00.00″N., Long. 167°49′00.00″W.; to Lat. 50°08′00.00″N., Long. 176°34′00.00″W.; to Lat. 45°42′00.00″N., Long. −162°55′00.00″E.; to Lat. 50°05′00.00″N., Long. −159°00′00.00″E.; to Lat. 54°00′00.00″N., Long. −169°00′00.00″E.; to Lat. 60°00 00.00″N., Long. −180°00′ 00.00″E; to Lat. 65°00′00.00″N., Long. 168°58′23.00″W.; to Lat. 90°00′00.00″N., Long. 00°00′0.00″W.; to Lat. 62°00′00.000″N, Long. 141°00′00.00″W.

(d) No person may operate an aircraft under IFR during the en route portion of flight below the standard MEA or at the special MEA unless the operation is conducted in accordance with sections 3 and 4 of this SFAR.

Section 2. *Definitions and abbreviations*

For the purposes of this SFAR, the following definitions and abbreviations apply.

Area navigation (RNAV). RNAV is a method of navigation that permits aircraft operations on any desired flight path.

Area navigation (RNAV) route. RNAV route is a published route based on RNAV that can be used by suitably equipped aircraft.

Certificate holder. A certificate holder means a person holding a certificate issued under part 119 or part 125 of this chapter or holding operations specifications issued under part 129 of this chapter.

Global Navigation Satellite System (GNSS). GNSS is a world-wide position and time determination system that uses satellite ranging signals to determine user location. It encompasses all satellite ranging technologies, including

GPS and additional satellites. Components of the GNSS include GPS, the Global Orbiting Navigation Satellite System, and WAAS satellites.

Global Positioning System (GPS). GPS is a satellite-based radio navigational, positioning, and time transfer system. The system provides highly accurate position and velocity information and precise time on a continuous global basis to properly equipped users.

Minimum crossing altitude (MCA). The minimum crossing altitude (MCA) applies to the operation of an aircraft proceeding to a higher minimum en route altitude when crossing specified fixes.

Required navigation system. Required navigation system means navigation equipment that meets the performance requirements of TSO C145a/C146a navigation systems certified for IFR en route operations.

Route segment. Route segment is a portion of a route bounded on each end by a fix or NAVAID.

Special MEA. Special MEA refers to the minimum en route altitudes, using required navigation systems, on published routes outside the operational service volume of ground-based navigation aids and are depicted on the published Low Altitude and High Altitude En Route Charts using the color blue and with the suffix ''G.'' For example, a GPS MEA of 4000 feet MSL would be depicted using the color blue, as 4000G.

Standard MEA. Standard MEA refers to the minimum en route IFR altitude on published routes that uses ground-based navigation aids and are depicted on the published Low Altitude and High Altitude En Route Charts using the color black.

Station referenced. Station referenced refers to radio navigational aids or fixes that are referenced by ground based navigation facilities such as VOR facilities.

Wide Area Augmentation System (WAAS). WAAS is an augmentation to GPS that calculates GPS integrity and correction data on the ground and uses geo-stationary satellites to broadcast GPS integrity and correction data to GPS/WAAS users and to provide ranging signals. It is a safety critical system consisting of a ground network of reference and integrity monitor data processing sites to assess current GPS performance, as well as a space segment that broadcasts that assessment to GNSS users to support en route through precision approach navigation. Users of the system include all aircraft applying the WAAS data and ranging signal.

Section 3. *Operational Requirements*

To operate an aircraft under this SFAR, the following requirements must be met:

a. Training and qualification for operations and maintenance personnel on required navigation equipment used under this SFAR.

b. Use authorized procedures for normal, abnormal, and emergency situations unique to these operations, including degraded navigation capabilities, and satellite system outages.

c. For certificate holders, training of flight crewmembers and other personnel authorized to exercise operational control on the use of those procedures specified in paragraph b of this section.

d. Part 129 operators must have approval from the State of the operator to conduct operations in accordance with this SFAR.

e. In order to operate under this SFAR, a certificate holder must be authorized in operations specifications.

Section 4. *Equipment Requirements*

a. The certificate holder must have properly installed, certificated, and functional dual required navigation systems as defined in section 2 of this SFAR for the en route operations covered under this SFAR.

b. When the aircraft is being operated under part 91, the aircraft must be equipped with at least one properly installed, certificated, and functional required navigation system as defined in section 2 of this SFAR for the en route operations covered under this SFAR.

Section 5. *Expiration date*

This Special Federal Aviation Regulation will remain in effect until rescinded.

PART 95—IFR ALTITUDES

4. The authority citation for part 95 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40103, 40113, and 14 CFR 11.49 (b)(2).

PART 121—OPERATING REQUIREMENTS: DOMESTIC, FLAG, AND SUPPLEMENTAL OPERATIONS

5. The authority citation for part 121 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 40119, 44101, 44701–44702, 44705, 44709–44711, 44713, 44716–44717, 44722, 44901, 44903–44904, 44912, 46105.

PART 125—CERTIFICATION AND OPERATIONS: AIRPLANES HAVING A SEATING CAPACITY OF 20 OR MORE PASSENGERS OR A MAXIMUM PAYLOAD CAPACITY OF 6,000 POUNDS OR MORE; AND RULES GOVERNING PERSONS ON BOARD SUCH AIRCRAFT

6. The authority citation for part 125 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701–44702, 44705, 44710–44711, 44713, 44716–44717, 44722.

PART 129—OPERATIONS: FOREIGN AIR CARRIERS AND FOREIGN OPERATORS OF U.S.-REGISTERED AIRCRAFT ENGAGED IN COMMON CARRIAGE

7. The authority citation for part 129 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40104–40105, 40113, 40119, 41706, 44701–44702, 44712, 44716–44717, 44722, 44901–44904, 44906.

PART 135—OPERATING REQUIREMENTS: COMMUTER AND ON DEMAND OPERATIONS AND RULES GOVERNING PERSONS ON BOARD SUCH AIRCRAFT

8. The authority citation for part 135 continues to read as follows:

Authority: 49 U.S.C. 106(g) 41706, 44113, 44701–44702, 44705, 44709, 44711–44713, 44715–44717, 44722.

Issued in Washington, DC, on March 13, 2003.

Marion C. Blakey,

Administrator.

[FR Doc. 03–6749 Filed 3–20–03; 8:45 am]

BILLING CODE 4910–13–P

Appendix L

AIM Change Language

Aeronautical Information Manual
(change 2, effective date 2/20/03)

Chapter 1. Navigation Aids
1-1-21. Global Positioning System (GPS)

f. Use of GPS for IFR Oceanic, Domestic En Route, and Terminal Area Operations

1. GPS IFR operations in oceanic areas can be conducted as soon as the proper avionics systems are installed, provided all general requirements are met. A GPS installation with TSO C-129 authorization in class A1, A2, B1, B2, C1, or C2 may be used to replace one of the other approved means of long-range navigation, such as dual INS or dual Omega. (See TBL 1-1-7 and TBL 1-1-8.) A single GPS installation with these classes of equipment which provide RAIM for integrity monitoring may also be used on short oceanic routes which have only required one means of long-range navigation.

TBL 1-1-7
GPS IFR Equipment Classes/Categories
TSO-C129

TBL 1-1-8
GPS Approval Required/Authorized Use

2. GPS domestic en route and terminal IFR operations can be conducted as soon as proper avionics systems are installed, provided all general requirements are met. The avionics necessary to receive all of the ground-based facilities appropriate for the route to the destination airport and any required alternate airport must be installed and operational. Ground-based facilities necessary for these routes must also be operational.

(a) GPS en route IFR RNAV operations may be conducted in Alaska outside the operational service volume of ground-based navigation aids when a TSO-C145a or TSO-C146a GPS/WAAS system is installed and operating. Ground-based navigation equipment is not required to be installed and operating for en route IFR RNAV operations when using GPS WAAS navigation systems. All operators should ensure that an alternate means of navigation is available in the unlikely event the GPS WAAS navigation system becomes inoperative.

a. Two fixed route systems are established for air navigation purposes. They are the VOR and L/MF system, and the jet route system. To the extent possible, these route systems are aligned in an overlying manner to facilitate transition between each.

1. The VOR and L/MF Airway System consists of airways designated from 1,200 feet above the surface (or in some instances higher) up to but not including 18,000 feet MSL. These airways are depicted on Enroute Low Altitude Charts.

NOTE-
The altitude limits of a victor airway should not be exceeded except to effect transition within or between route structures.

(a) Except in Alaska and coastal North Carolina, the VOR airways are predicated solely on VOR or VORTAC navigation aids; are depicted in blue on aeronautical charts; and are identified by a "V" (Victor) followed by the airway number (e.g., V12).

NOTE-
Segments of VOR airways in Alaska and North Carolina (V56, V290) are based on L/MF navigation aids and charted in brown instead of blue on en route charts.

(1) A segment of an airway which is common to two or more routes carries the numbers of all the airways which coincide for that segment. When such is the case, pilots filing a flight plan need to indicate only that airway number for the route filed.

NOTE-
A pilot who intends to make an airway flight, using VOR facilities, will simply specify the appropriate "victor" airways(s) in the flight plan. For example, if a flight is to be made from Chicago to New Orleans at 8,000 feet, using omniranges only, the route may be indicated as "departing from Chicago-Midway, cruising 8,000 feet via Victor 9 to Moisant International." If flight is to be conducted in part by means of L/MF navigation aids and in part on omniranges, specifications of the appropriate airways in the flight plan will indicate which types of facilities will be used along the described routes, and, for IFR flight, permit ATC to issue a traffic clearance accordingly. A route may also be described by specifying the station over which the flight will pass, but in this case since many VOR's and L/MF aids have the same name, the pilot must be careful to indicate which aid will be used at a particular location. This will be indicated in the route of flight portion of the flight plan by specifying the type of facility to be used after the location name in the following manner: Newark L/MF,

Allentown VOR.

(2) With respect to position reporting, reporting points are designated for VOR Airway Systems. Flights using Victor Airways will report over these points unless advised otherwise by ATC.

(b) The L/MF airways (colored airways) are predicated solely on L/MF navigation aids and are depicted in brown on aeronautical charts and are identified by color name and number (e.g., Amber One). Green and Red airways are plotted east and west. Amber and Blue airways are plotted north and south.

NOTE-
Except for G13 in North Carolina, the colored airway system exists only in the state of Alaska. All other such airways formerly so designated in the conterminous U.S. have been rescinded.

(c) The use of TSO-C145a or TSO-C146a GPS/WAAS navigation systems is allowed in Alaska as the only means of navigation on published air traffic routes including those Victor and colored airway segments designated with a second minimum en route altitude (MEA) depicted in blue and followed by the letter G at those lower altitudes. The altitudes so depicted are below the minimum reception altitude (MRA) of the land-based navigation facility defining the route segment, and guarantee standard en route obstacle clearance and two-way communications. Air carrier operators requiring operations specifications are authorized to conduct operations on those routes in accordance with FAA operations specifications.

Appendix M

SE RNAV Draft NOTAM

REGION SPECIFIC – ALASKA 2-13-03

NOTAM

Implementation of Instrument Flight Rules (IFR) Area Navigation (RNAV) Operations Using Global Positioning Systems (GPS) in Alaska

When: May 15, 2003

Type: Permanent

Purpose.
To enable use of Global Positioning System/Wide Area Augmentation Systems (GPS/WAAS) for IFR RNAV outside the operational service volume in Alaska of ground-based navigation aids, including altitudes below current Minimum en route IFR altitude (MEAs). In general, IFR en route altitudes are determined by (1) Obstacle clearance; (2) the lowest altitude for receiving ground-based radio navigation signals; and (3) the lowest altitude for two-way voice communication with air traffic control. No accommodation is presently made for IFR altitudes determined by fixes using other than ground-based navigation aids. Under SFAR No. 97, operators using IFR certified TSO C145a and TSO 146a GPS WAAS RNAV systems will be permitted to conduct operations over routes in Alaska at the lowest minimum en route altitude based only on route obstacle assessments and ATC two-way voice communication capability.

Operations.

SFAR No. 97 allows the use of IFR-certified RNAV GPS/WAAS systems in lieu of ground facilities. This SFAR can be used for U.S. and foreign operations conducted under part 91 over Alaska, as well as operations conducted by part 119 or part 125 certificate holders and part 129 operations specifications holders, commercial, and certificated air carrier operators. The SFAR establishes training requirements for operators, including service degradation and equipment failure modes. It allows operators subject to this SFAR to operate over Air Traffic Service (ATS) routes where the MEA for a route or route segment is lower for GPS/WAAS IFR RNAV-equipped aircraft than the MEA for operators equipped only with ground-based navigation systems. This flexibility will allow those GPS/WAAS IFR RNAV-equipped operators to conduct operations at the lowest permissible altitude in an attempt to avoid in-flight icing or other adverse weather conditions.

Required equipment

TSO C145a and TSO C146a GPS WAAS navigation systems are authorized to be used as the only means of navigation on Federal airways and other published ATS routes outside the operational service volume of ground based navaids in Alaska. In the absence of a WAAS signal, these systems continue to provide navigation guidance using fault detection and exclusion (FDE) or receiver autonomous integrity monitoring (RAIM)

techniques. Commercial operators are required to have dual TSO 145a or TSO 146a GPS WAAS navigation equipment, while Part 91 operations require at least one.

New chart features
The MEA's for these routes will be depicted on the published Low Altitude En Route Charts as a "MEA-G."

Chart terminology
"Special MEA" refers to the minimum en route IFR altitude using GPS/WAAS systems on an ATS route, ATS route segment or other direct route outside the operational service volume of ground-based navigation aids. "Standard MEA" refers to the minimum en route IFR altitude on an ATS route, ATS route segment, or other direct route that uses very high frequency/ultra high frequency (VHF/UHF) ground-based navigation aids.

Chart symbology
GPS MEAs of 4000 feet MSL would be depicted using the color blue as "4000-G." Standard MEAs are depicted on the published Low Altitude and High Altitude En Route Charts using the color black.

Appendix N

HBAT (Flight Standards Handbook Bulletin (03-01))

ORDER: 8400.10

APPENDIX: 3

BULLETIN TYPE: Flight Standards Handbook Bulletin for Air Transportation (HBAT)

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1. PURPOSE. This bulletin provides guidance on approval and use of Global Positioning System (GPS)/Wide Area Augmentation System (WAAS), Area Navigation (RNAV) systems in Alaska, and authorized under Title 14 Code of Federal Regulations (14 CFR) Special Federal Aviation Regulation (SFAR) No.97.

2. BACKGROUND. Recent developments in GPS technology include the availability of WAAS capable GPS systems certified under TSO C145a and TSO C146a. The use of GPS/WAAS RNAV systems is in conjunction with the FAA Capstone project in the Alaska Region.

3. LOCATION. The attachments to this bulletin will be incorporated into Order 8400.10, volume 3, chapter 1, section 4, volume 4, chapter 1, section 1, and volume 4, chapter 1, section 2.

6. INQUIRIES. This guidance was developed by AFS-400 in conjunction with AFS-200. Please direct any question to Donald Streeter, AFS-430, at 202 385-4567.

/s/
Thomas M. Penland, for
Matthew Schack
Manager, Air Transportation Division
Attachment

8400.10 Ops. Inspector Handbook

Volume 3, Chapter 1, Section 4, Part B OpSpec B030

OPSPEC B030 – IFR Navigation Using GPS/WAAS RNAV Systems

A. OpSpec paragraph B030 is issued to those certificate holders identified in Section 1 of Special SFAR 97 for IFR en route RNAV operations in the State of Alaska and its airspace on published air traffic routes using TSO-C145a/C146a navigation systems as the only means of IFR navigation appropriate for the route to be flown.

B. The OpSpec also authorizes TSO-C145a/C146a WAAS equipment to be used for IFR en route operations at Special Minimum En Route Altitudes (MEA) that are outside the operational service volume of ground-based NAVAIDs if the aircraft operation meets the requirements of sections 3 and 4 of SFAR 97.

C. The recent availability of TSO-C145a/C146a WAAS equipment constitutes a significant improvement in GPS area navigation technology by the incorporation of Wide Area Augmentation Systems (WAAS), Fault Detection and Exclusion (FDE), along with Receiver Autonomous Integrity Monitoring (RAIM). For a complete discussion of this equipment see 8400.10, volume. 4, chapter 1, section 1, paragraph 25, GPS and WAAS Navigation, and volume 4, chapter 1, section 2, paragraph 52, FAA Approval of Wide Area Augmentation Navigation Systems (WAAS).

D. Principal inspectors can access OpSpec B030 in the automated Operations Specifications Subsystem (OPSS). Required information must be entered to specify the applicable aircraft make, model, and serial number, WAAS manufacturer and model, and the equipment type and class (See Figure 3.1.4.1).

FIGURE 3.1.4.1 WAAS EQUIPMENT CLASSES

TSO-C145a/C146a

EQUIPMENT CLASS	**Oceanic and Domestic En Route, Terminal Area Operations, Nonprecision Approach**			**LNAV/VNAV Approaches**	**LPV APPROACHES**
WAAS Sensor [TSO-C145a]					
Class 1	yes			no	no
Class 2	yes			yes	no

FIGURE 3.1.4.1 WAAS EQUIPMENT CLASSES					
TSO-C145a/C146a					
EQUIPMENT CLASS	**Oceanic and Domestic En Route, Terminal Area Operations, Nonprecision Approach**			**LNAV/VNAV Approaches**	**LPV APPROACHES**
Class 3	yes			yes	yes
WAAS Navigation Equipment [TSO-C146a] (note 1)					
Class 1	yes			no	no
Class 2	yes			yes	no
Class 3	yes			yes	yes
Class 4 (note 2)	no			no	yes

NOTE 1: WAAS sensor: While the TSO-C145a sensor supports the operations denoted, the integrated navigation system may not support all of these operations. Consult the Approved Flight Manual (AFM), AFM supplement, pilot's guide, etc., for more information.

NOTE 2: Class 4 equipment will typically also be authorized under TSO-C145a Class 3. In that configuration the WAAS equipment will support all phases of flight. The integrated navigation system may not support all of these operations (see NOTE 1).

E. WAAS equipment uses whatever GPS and WAAS satellites are in view and will provide the best available service. If the navigation service does not meet all of the requirements for the phase of flight, the equipment annunciates the "Loss of Integrity" or a RAIM indication. If all GPS guidance is lost, the equipment will revert to dead reckoning and the flightcrew should take appropriate action (e.g., revert to alternate means of navigation, climb into ground NAVAID coverage, request radar services, proceed visually). Special navigation limitations and provisions are included in this OpSpec to ensure that flightcrews have been properly trained, tested, and qualified. Procedures must also be established for flightcrews and dispatchers (when applicable) to govern operation during periods of degraded navigation capability and/or satellite outages. Additional special conditions included in this paragraph require the certificate holder to use an approved program to predict navigation outages that impact WAAS equipment.

F. Approval of this paragraph requires the aircraft to be equipped with two independent systems capable of supporting the operation. This may be met with:

(1) Dual TSO-C146a Class 1, 2 or 3 equipment, installed in accordance with AC 20-138A; or

(2) At least one flight management system (FMS) that complies with TSO-C115b (installed in accordance with AC 20-130A) and dual TSO-C145a Class 1, 2 or 3 receivers (installed in accordance with AC 20-138A).

G. The navigation system must be fully operational or operated in accordance with an approved MEL. The approved navigation system may only be used to navigate along routes defined by fixes residing in the aircraft navigation system database.

H. POIs are encouraged to use the University of Alaska Anchorage Aviation Technology's Capstone II Training Program for Part 121/135 Operations as a template for approving their certificate holders' GPS/WAAS ground and flight training. The University of Alaska's training program proved to be very successful during the Alaska Regions Capstone Phase I Program. It is recommended that POIs evaluate the carrier's specific system installation to determine if any program modifications are required.

Volume 4. Aircraft Equipment and Operational Authorizations

Chapter 1. Air Navigation and Communications

Section 1. General Navigation Concepts, Policies, and Guidance

25. GPS and WAAS Navigation

F. TSO-C145a /C146a WAAS equipment.

(1) Recent developments in navigation technology include the availability of Wide Area Augmentation System (WAAS) capable navigation systems approved under TSO-C145a/C146a. This equipment constitutes a significant improvement over the older GPS standards (TSO-C129()) by the incorporation of new technology to provide enhanced signal integrity using WAAS, Fault Detection and Exclusion (FDE), and Receiver Autonomous Integrity Monitoring (RAIM). The improved navigation accuracy and flexibility of WAAS equipment will ultimately produce an increase in both system capacity and overall flight safety.

(2) TSO-C145a provides the certification standards for airborne navigation WAAS sensors, while TSO-C146a refers to a WAAS stand-alone airborne navigation system. TSO-C145a/C146a equipment must be installed in accordance with Advisory Circular (AC) 20-138A, Airworthiness Approval of Global Navigation Satellite System (GNSS) Equipment. For TSO-C145a equipment, the flight management system must comply with TSO-C115b and be installed in accordance with AC 20-130A, Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors. When all provisions are met, including the installation of dual independent systems, these systems may be authorized for use as the only means of conducting Instrument Flight Rules (IFR) Area Navigation (RNAV) in the U.S. National Airspace System (NAS).

(3) WAAS has been developed to improve the accuracy, integrity, availability, and reliability of GPS signals. It is a safety critical system consisting of a ground network of reference and integrity monitor data processing sites which assess current GPS performance, as well as a space segment that broadcasts that assessment to GNSS users to support IFR navigation. WAAS equipment has been designed to automatically use the WAAS data and ranging signal. The operational availability of navigation for WAAS-equipped operators in any given area may be ascertained by accessing the FAA NOTAM system.

(4) FDE technology allows WAAS equipment to automatically detect a satellite failure that effects navigation and to exclude that satellite from the navigation solution.

(5) Receiver Autonomous Integrity Monitoring (RAIM) is a function that considers the availability of satisfactory signal integrity broadcasted from the particular GPS satellites used during a given flight. Onboard GPS/WAAS navigators accomplish this automatically as the aircraft proceeds along its route. When insufficient signal integrity is detected a 'loss of integrity' or RAIM alert is provided to the flight crew. To support pre-flight planning, operators can identify outages that impact WAAS equipment through NOTAMs or by accessing an FAA-approved prediction program.

(6) Under present regulations, operators certificated in accordance with 14 CFR part 119 proposing to use WAAS equipment as the only means of IFR navigation must have dual TSO-C145a/C146a approach capable navigation systems installed and operating in their aircraft. In the event of a complete failure of WAAS and GPS navigation capability operators must provide for reversion to another form of radio navigation or the navigation system must provide for an automatic dead reckoning capability to ensure the flight can be safely continued to its destination or a suitable alternate. TSO-C146a equipment will automatically revert to a dead reckoning mode if all other guidance is lost.

(7) OpSpec paragraph B030 is issued to those certificate holders identified in Section 1 of SFAR 97 for IFR en route RNAV operations in the State of Alaska and its airspace on published air traffic routes using TSO-C145a/C146a navigation systems as the only means of IFR navigation. The OpSpec also authorizes TSO-C145a/C146a navigational systems to be used for IFR en route operations at Special Minimum En Route Altitudes (MEA) that are outside the operational service volume of ground-based navigation aids, if the aircraft operation meets the requirements of sections 3 and 4 of SFAR 97.

(8) SFAR 97 is applicable to U.S. and foreign operations conducted in Alaska under 14 CFR parts 91, 121, 125, 129, and 135. The SFAR allows IFR operations using dual TSO-C145a/C146a GPS/WAAS systems as the only means of navigation on federal airways and other published Air Traffic Service (ATS) routes in domestic airspace, both within and outside the operational service volume of ground based navigation aids. The rule also authorizes the use of GPS designated minimum en route altitudes (MEA) for aircraft using TSO-C145a/C146a systems. These GPS MEAs along applicable routes are indicated on IFR charts in blue followed by the letter "G." The SFAR also establishes training requirements for operators of TSO-C145a/C146a equipped aircraft including training in service degradation and equipment failure modes.

Volume 4. Aircraft Equipment And Operational Authorizations

Chapter 1. Air Navigation And Communications

Section 2. Air Navigation Approval Requirements

51. FAA Approval Of Global Positioning System (GPS) Equipment.

Leave 51 A-D as it is.

52. FAA Approval of Wide Area Augmentation Navigation Systems (WAAS).

A. General.

(1) Recent developments in navigation technology include the availability of Wide Area Augmentation System (WAAS) capable navigation systems approved under TSO-C145a/C146a. This equipment constitutes a significant improvement over the older GPS standards (TSO-C129()) by the incorporation of new technology to provide enhanced signal integrity using WAAS, Fault Detection and Exclusion (FDE), and Receiver Autonomous Integrity Monitoring (RAIM). The improved navigation accuracy and flexibility of WAAS equipment will ultimately produce an increase in both system capacity and overall flight safety.

(2) TSO-C145a provides the certification standards for airborne navigation WAAS sensors, while TSO-C146a refers to a WAAS stand-alone airborne navigation system. TSO-C145a/C146a equipment must be installed in accordance with Advisory Circular (AC) 20-138A, Airworthiness Approval of Global Navigation Satellite System (GNSS) Equipment. For TSO-C145a equipment, the flight management system must comply with TSO-C115b and be installed in accordance with AC 20-130A, Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors. When all provisions are met, including the installation of dual independent systems, these systems may be authorized for use as the only means of conducting Class I IFR RNAV in the U.S. NAS.

> NOTE: Currently, the only operators authorized to use WAAS navigation systems as the only means of IFR RNAV are those operators in the State of Alaska approved in accordance with Special Federal Aviation Regulation (SFAR) No. 97.

B. WAAS Approval Classes. TSO C-145a WAAS equipment is categorized into three classes. TSO C-146a equipment is categorized into four classes. Principal Operations Inspectors should use Figure 4.1.2.2 WAAS Equipment Classes, to determine the phase of flight and operational use that WAAS navigation systems can be approved for.

FIGURE 4.1.2.2 WAAS EQUIPMENT CLASSES					
TSO-C145a/C146a					
EQUIPMENT CLASS	**Oceanic and Domestic En Route, Terminal Area Operations, Nonprecision Approach**			**LNAV/VNAV Approaches**	**LPV APPROACHES**
WAAS Sensor [TSO-C145a]					
Class 1	yes			no	no
Class 2	yes			yes	no
Class 3	yes			yes	yes
WAAS Navigation Equipment [TSO-C146a] (note 1)					
Class 1	yes			no	no
Class 2	yes			yes	no
Class 3	yes			yes	yes
Class 4 (note 2)	no			no	yes

NOTE 1: WAAS sensor: While the TSO-C145a sensor supports the operations denoted, the integrated navigation system may not support all of these operations. Consult the Approved Flight Manual (AFM), AFM supplement, pilot's guide, etc., for more information.

NOTE 2: Class 4 equipment will typically be authorized under TSO-C145a Class 3. In that configuration the WAAS equipment will support all phases of flight. The integrated navigation system may not support all of these operations (see NOTE 1).

C. Approval Criteria for WAAS Navigation Systems. Principal Operations Inspectors should refer to volume 3, chapter 1, section 4, paragraph 71, part B OpSpecs, B030-IFR Navigation Using GPS/WAAS RNAV Systems, for issuance of OpSpecs that authorize WAAS RNAV operations.

D. Initial Installations and Continued Airworthiness Criteria. The operator must ensure that the WAAS equipment is properly installed and maintained. Refer to Volume 4, Chapter 1, Section 1, Paragraph 25 of this Handbook for additional guidance on aircraft equipment and operational authorizations for WAAS navigation systems.

Sample OpSpec B030

B030. IFR Navigation Using GPS/WAAS RNAV Systems

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a. The certificate holder is authorized to conduct IFR en route area navigation (RNAV) operations in the State of Alaska and its airspace on published air traffic routes using TSO C145a/C146a GPS/WAAS RNAV systems as the only means of IFR navigation in accordance with the provisions of SFAR 97 and this operations specification.

b. The certificate holder is authorized to conduct IFR en route operations in the United States airspace over and near Alaska in accordance with the provisions of SFAR 97 Section 1, c and this operations specification, at Special Minimum En Route Altitudes (MEA) that are outside the operational service volume of ground-based navigation aids with TSO-C145a/C146a GPS/WAAS RNAV systems.

c. Authorized Aircraft Navigation Systems. The certificate holder is authorized to conduct these IFR navigation operations using the following aircraft and TSO-C145a/C146a area navigation systems.

Table 1

Aircraft M/M/S	RNAV Systems Manufacturer/Model	Equipment Functional/Operational Class
TABL01	TABL02	TABL03

d. Special Navigation Limitations and Provisions. The certificate holder shall conduct all operations authorized by this operations specification in accordance with the following navigation limitations and provisions:

(1) Except when navigation is performed under the supervision of a properly qualified check airman, the flightcrew must be qualified in accordance with the certificate holder's approved training program for the system being used or have satisfactorily completed a flight check using the system. The flightcrew shall have satisfactorily completed the ground school portion of that training program before performing under the supervision of a check airman.

(2) The approved navigation system may only be used to navigate along routes defined by fixes residing in the aircraft navigation system database.

(3) The operator must establish dispatcher (if applicable) and flightcrew procedures for degraded navigation capabilities, satellite system outages and Receiver Autonomous Integrity Monitoring procedures (RAIM). RAIM predictions must be performed prior to each IFR flight to ensure satisfactory signal coverage is available.

(4) Two independent TSO C145a/C146a navigation receivers that meet TSO-C145a equipment class 1, 2, or 3, and/orTSO-C146a equipment class 1, 2, 3, or 4 must be installed and operational for IFR operations.

(5) Before conducting any operations authorized by this operations specification, flight crewmembers must be qualified in accordance with the certificate holder's approved ground and flight training for the system and procedures being used. The University of Alaska Anchorage Aviation Technology's Capstone II Training Program (as amended) contains detailed curriculum guidance for the approval of air carrier training programs.

Appendix O

Acronyms

ADS-A	Automatic Dependence Surveillance-Addressed
ADS-B	Automatic Dependence Surveillance-Broadcast
AF	Airways Facilities
AIM	Aeronautical Information Manual
ANICS	Alaska NAS Interfacility Communications System
AOPA	Aircraft Owners and Pilots Association
ARINC	Aeronautical Radio Inc.
ARTCC	Air Route Traffic Control Center
AT	Air Traffic
ATC	Air Traffic Control
ATCT	Air Traffic Control Tower
AWOS	Automated Weather Observation System
CCCS	Capstone Communication Control Server
CNS	Communications, Navigation, and Surveillance
CSSPP	Capstone System Safety Program Plan
CSSWG	Capstone System Safety Working Group
DT&E	Developmental Test and Evaluation
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FDN	Functional Description Narrative
FIS-B	Flight Information Services-Broadcast
GBT	Ground Broadcast Transceiver
GPS	Global Positioning System
HBAT	Handbook Bulletin for Air Transportation
HBAW	Handbook Bulletin for Air Transportation and Continuous Airworthiness
ICD	Interface Control Document
IDS	Interim Design Specification
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
IOC	Initial Operational Capability
LMATM	Lockheed Martin Air Traffic Management
MASPS	Minimum Aviation System Performance Standards

MFD	Multi Function Display
Micro-EARTS	Micro Enroute Automated Radar Tracking System
MOPS	Minimum Operational Performance Standards
MOU	Memorandum of Understanding
MSAW	Minimum Safe Altitude Warning
NAS	National Airspace System
NATCA	National Air Traffic Controllers Association
NCP	NAS Change Proposal
NOTAM	Notice to Airmen
NTSB	National Transportation Safety Board
OT&E	Operational Test and Evaluation
PHA	Preliminary Hazard Assessment
PTRS	Problem Trouble Reporting System
SER	Safety Engineering Report
SF21	Safe Flight 21
STC	Supplemental Type Certificate
TEMP	Test and Evaluation Master Plan
TIS-B	Traffic Information Services-Broadcast
TSO	Technical Standard Order
UAA	University of Alaska-Anchorage
UAT	Universal Access Transceiver
UPS AT	United Parcel Service Aviation Technologies
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
WJHTC	William J. Hughes Technical Center
Y-K	Yukon-Kuskokwim
ZAN	Anchorage Air Route Traffic Control Center