SUBJ: Flight Inspection/ Validation of Ground-Based Augmentation System (GBAS) Precision Approach and Flight Procedures

1. Purpose of This Notice. This Notice details the flight inspection/ validation procedures, requirements, and analysis for the evaluation of Ground-Based Augmentation System (GBAS) precision instrument approach and flight procedures. The FAA version of a GBAS is Local Area Augmentation System (LAAS). This Notice is applicable to the evaluation of approach procedures with Decision Altitudes (DA(s)) of not less than 200 feet above ground level (AGL), terminal area path (TAP) procedures, and airport surface procedures that provide enhanced situational awareness, which may be supported by a LAAS. As LAAS equipment certified for supporting Category II/ III operation becomes available and as additional operational experience is gained, this Notice will be reviewed and revised as appropriate.

2. Audience. The audience for this notice is the Air Traffic Technical Operations Eastern, Central, and Western Service Areas; Aviation System Standards Flight Inspection Operations Group offices and crewmembers, Air Force Flight Standards Agency (AFFSA), and the 1st Air Force Reserves Unit.

3. Where Can I Find This Notice? Go to the Directives Management System (DMS) website: https://employees.faa.gov/tools_resources/orders_notices/ or the Aviations System Standards website: http://www.avn.faa.gov/index.asp?xml=fioo/notices

4. Background. The GPS is a world-wide position, velocity, and time determination system operated by the Department of Defense that includes a satellite constellation and a ground control segment. The GPS has been accepted by the International Civil Aviation Organization (ICAO) as an integral part of the Global Navigation Satellite System (GNSS). Civil use of GPS for oceanic, en route, terminal, and approach flight has been authorized in the National Airspace System (NAS). GBAS/ LAAS is a safety-critical ground based augmentation system, consisting of the hardware and software that augments the GPS Standard Positioning Service (SPS) to provide for precision approach and landing capability. The SPS provided by GPS is insufficient to meet the integrity, continuity, accuracy, and availability demands of precision approach and landing navigation. The LAAS Ground Facility (LGF) augments the GPS SPS in order to meet these requirements. These augmentations are based on differential GPS concepts.

5. Related Material:

a. Specification FAA-E-2937, April 17, 2002, "Performance Type One Local Area Augmentation System Ground Facility".

b. RTCA DO-245A, December 9, 2004, "Minimum Aviation System Performance Standards for the Local Area Augmentation System".

c. RTCA DO-246C, April 7, 2005, "GNSS Based Precision Approach Local Area Augmentation System (LAAS) –Signal-In-Space Interface Control Document (ICD)".

d. RTCA DO-253A, November 28, 2001, "Minimum Operational Performance Standards for GPS Local Area Augmentation System Airborne Equipment".

e. RTCA DO-247, January 7, 1999, "The Role of the Global Navigation Satellite System (GNSS) in Supporting Airport Surface Operations".

f. ICAO AN-WP/7556, Addendum No. 1, "Draft Standards and Recommended Practices for Global Navigation Satellite Systems," October 27, 2000.

g. FAA Order 8200.1C, October 2005, "United States Standard Flight Inspection Manual (USSFIM)".

h. Technical Memorandum OU/AEC 00-09TM00078/2-4, May 2000, "Development of Provisional Flight Inspection concepts for Local Area Augmentation System (LAAS) Approach Procedures", Avionics Engineering Center, Ohio University.

i. Technical Memorandum OU/AEC 07-01TM15689/2-1, October 2008, "Review of Local Area Augmentation System (LAAS) Flight Inspection Requirements, Methodologies, and Procedures for Precision Approach, Terminal Area Path, and Airport Surface Guidance Operations", Avionics Engineering Center, Ohio University.

6. Flight Inspection/ Validation Procedures, Analysis, and Tolerances:

- Appendix A contains background material concerning the LAAS.
- Appendix B contains the flight inspection procedures, requirements, and analysis for LAAS approaches.
- Appendix C contains the records and reports required for LAAS flight inspection.
- Appendix D contains Acronyms and Definitions.

7. The above guidance will be incorporated into Change 3 of FAA Order 8200.1C, United States Standard Flight Inspection Manual

For additional information, please contact Dan Burdette, Flight Inspection Policy, 405-954-6164.

/s/

Thomas C. Accardi
Director of Aviation System Standards

Appendix A. Background Material for LAAS

This appendix provides a high-level discussion of the major GPS components and how LAAS is used to augment GPS performance to meet requirements for navigation and landing operations. The key LAAS subsystems are introduced with discussions then focusing on the ground subsystem.

GPS is an integrated system comprised of the following three components:

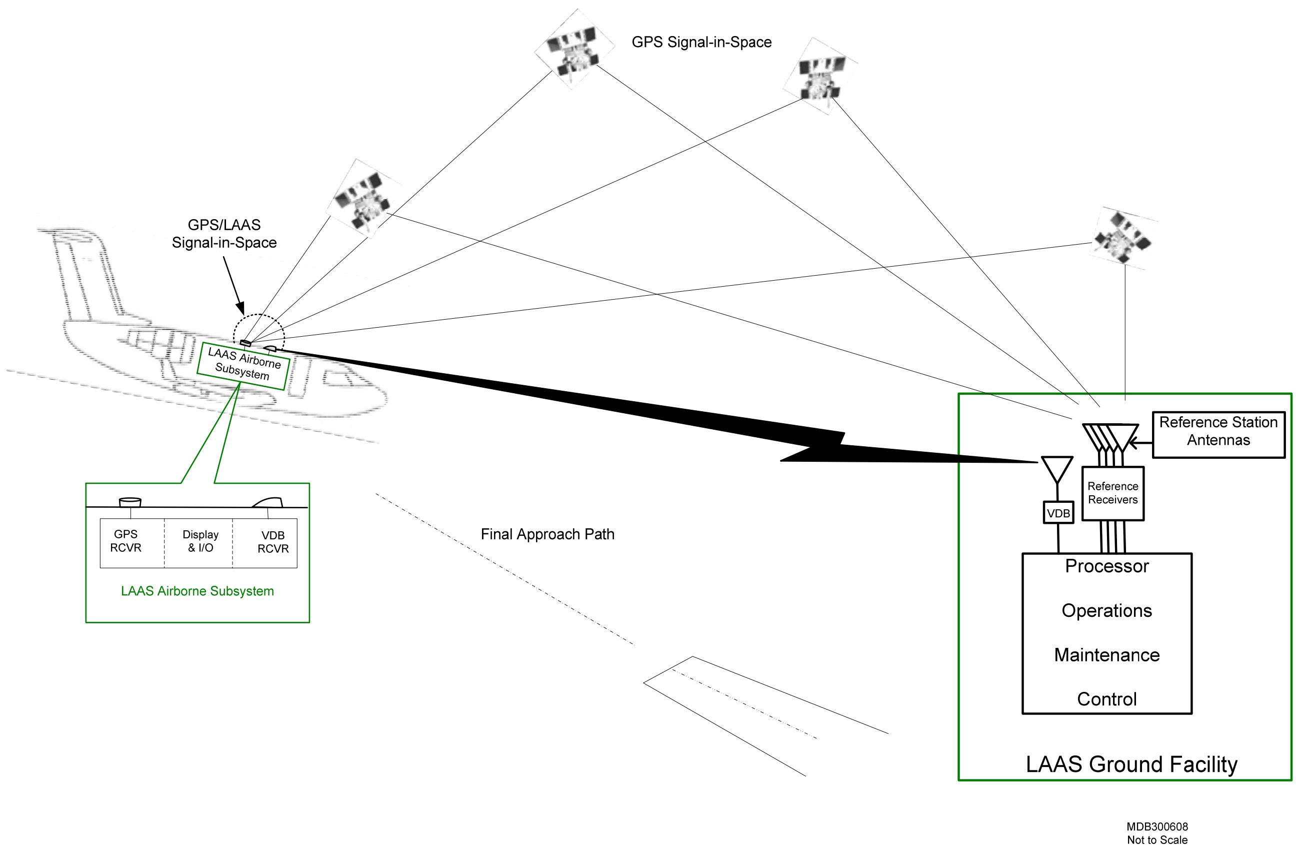
- The satellite constellation or space segment
- The ground control and monitoring network also known as the operational control segment
- The user segment commonly referred to as the GPS receiver.

The space segment nominally consists of a 24-satellite constellation with each satellite providing ranging signals and data to the GPS receiver. The operational control segment maintains the satellites in terms of orbital location and functionality, as well as monitoring the health and status of each satellite. Although the satellites are monitored by the control segment, the requisite user alarm or warning functionality typical of navigation, approach, and landing systems is not provided. Further, enhancement of the GPS SPS is normally required to meet the accuracy, integrity, availability, and continuity performance requirements for instrument operations.

Enhancement of the GPS SPS can be accomplished by using airborne-based augmentation systems (ABAS), satellite based augmentation systems (SBAS), and/or ground-based augmentation systems (GBAS). As referred to herein, LAAS is the specific realization of the GBAS architecture adopted by the United States of America. LAAS is intended to be an all-weather navigation service meeting ICAO Standards and Recommended Practices (SARPS) in terms of performance and interoperability. As illustrated in Figure A-1, it consists of the following three primary subsystems:

- the satellite subsystem
- the ground subsystem
- the airborne subsystem

Figure A-1. Illustration of LAAS Subsystems



For LAAS, the satellite subsystem is GPS, which was discussed previously. It provides ranging signals to both the airborne subsystem and the ground subsystem.

The ground subsystem for LAAS is referred to as the LAAS Ground Facility (LGF). The LGF produces ground-monitored differential corrections for each satellite in view, integrity-related information, and definition of the final approach segment, missed approach, or Terminal Area Path (TAP) based on path point data stored within its local navigation database. These data are transmitted throughout the entire service volume by the VHF Data Broadcast (VDB) transmitter to the aircraft avionics comprising the airborne subsystem. Thus, LAAS is capable of providing service simultaneously to all aircraft in the service volume. Also, the LGF provides for both local and remote status, control, and maintenance interfaces.

The airborne subsystem applies the LGF-generated differential corrections to the GPS ranging signals to obtain a differentially-corrected position solution with the required accuracy, integrity, continuity, and availability. In addition to the integrity information broadcast by the VDB, the airborne subsystem also employs Receiver Autonomous Integrity Monitoring (RAIM) as a means of GPS ranging signal fault detection on the airborne side. The more-precise position solution and the path point data transmitted by the VDB are used to calculate lateral and vertical guidance with respect to the final approach path (precision approach), TAP or other supported instrument procedures.

Proportional guidance deviation outputs, in "ILS look-alike" fashion, are provided to aircraft displays and navigation systems. The airborne subsystem also provides appropriate annunciations of system performance to the user, e.g., alerts and flags. In addition to deviation outputs, a position-velocity-time (PVT) output with integrity is provided to support enhanced navigation and surveillance operations.

In general, LAAS provides a flexible positioning service capable of supporting precision approach, TAP, departure procedures, airport surface operations, and enhanced area navigation (RNAV). It enables "precision RNAV" in the terminal area that provides the level of navigation service required for supporting curved arrival, approach, and departure procedures. The position accuracy is well suited for supporting airport surface operations by enabling both enhanced situational awareness and electronic guidance. The PVT output can be used to support surveillance applications within local and terminal areas; it can be used as a source of position information for Automatic Dependent Surveillance-Broadcast (ADS-B) equipment.

The objective of a commissioning LAAS flight inspection/ validation is the evaluation of a particular LGF and all of the instrument flight procedures to be supported by that facility. The rationale for this objective is discussed further in Appendix B. Since the inspection activity is "LGF-based", the LGF and related matters will be discussed in more detail at this point.

LAAS is intended to provide radio navigation vertical and lateral guidance for instrument precision approach and landing from 20 nm from the runway threshold through touchdown and rollout. It will nominally require only one LGF at an airport to provide service to all runways and aircraft in the service volume. The ground subsystem will be modular and will have appropriate redundancy to support all runway ends, and it is capable of being installed entirely on the airport. An LGF generally consists of the following four main equipment groups:

- Reference receiver
- VDB equipment
- Processor
- Operations and maintenance

The reference receiver group usually consists of four reference receiver stations, each station containing:

- A GPS reference receiver
- A reference receiver antenna
- Associated cables
- Equipment racks
- Antenna mounts

The reference receivers may be located in an environmentally controlled shelter or individual equipment enclosures located in proximity to the reference receiver antenna. Although there are limitations on the location of the reference receiver antennas relative to the runways being serviced, they are not constrained to be in close proximity (i.e., 1,000 feet) to those runways. The reference receiver antennas should be sited in protected, low-multipath (GPS signal reflection) locations with an unobstructed view of the sky.

The VDB equipment group consists of:

- The VDB transmitter
- Antenna
- Monitor
- Associated cables
- Equipment racks
- Antenna mounts

Although it may be preferable from a logistic viewpoint to site the reference receiver antennas and VDB antenna in the same location, the VDB antenna may be independently sited to provide adequate signal coverage. If required, two or more VDB equipment groups can be used to satisfy coverage requirements at complex airports or airports having coverage-related siting issues. The use of multiple VDB groups is one method for satisfying both airborne and airport surface coverage requirements, since antenna installation requirements differ in the case of airborne versus surface coverage.

The processor group consists of:

- Dedicated micro-processors
- Operationally pertinent data
- Software that performs the differential correction computations and integrity processes
- VDB message generation functions
- Human interfaces (display)
- Associated communication cables
- Equipment racks.

Operationally, pertinent data includes the navigation database containing all the procedure data that is broadcast to users within the LAAS service volume. This group is housed in the primary LGF equipment shelter, which may also contain the reference receivers.

The operations and maintenance group includes equipment to perform those control and status functions normally required for a landing aid. This group includes items such as:

- A local status and control panel
- Maintenance data terminal/ terminal interface
- Remote status panel/ interface
- An air traffic control unit/ interface

It is important to realize that LAAS uses an earth-centered, earth-fixed (ECEF) reference system based on the WGS-84 datum instead of being source-referenced like conventional radio navigation systems. Because of this, reference receiver antenna locations, runway threshold coordinates, obstacle locations, and all path point data must be accurately surveyed relative to each other. Further, if the coordinates for these items are surveyed separately by different entities and/or accomplished over an extended period of time, then accuracy of the absolute coordinates becomes important.

Appendix B. Flight Inspection/ Validation of LAAS Instrument Approach Procedures

1. Introduction. The FAA term for a GBAS is Local Area Augmentation System (LAAS). This appendix provides flight inspection/ validation requirements for LAAS precision approaches and flight procedures. This policy is preliminary and will be revised as more experience with system performance is acquired.

2. Preflight Requirements. The Flight Inspector must prepare for the flight inspection/ validation in accordance with FAA Order 8200.1, United States Standard Flight Inspection Manual (USSFIM). For each LGF to be evaluated, the inspector must determine the type and number of approach procedures to be supported, if approach procedures to parallel runway groups will be provided, if TAP procedures will be provided, and if airport surface operations are to be supported. For each TAP procedure, determine if augmented VDB coverage assessments are required.

a. Inspection System Calibration. Since the VDB antenna may radiate both horizontally and vertically polarized signals, the flight inspection system will be calibrated for both horizontal and vertical polarized signals. This will include data for the airborne antenna pattern and cable loss.

b. D_{max} Determination. Determine LGF maximum use distance (D_{max}) for service volume coverage evaluation. An LGF may or may not utilize a D_{max} function.

c. LAAS FAS Data Block Validation. The LAAS FAS data block consists of data elements that prescribe the precision three-dimensional geometric path in space that an aircraft is supposed to fly on final approach. Errors in this data can quickly lead to an unacceptable or dangerous flight path. Data errors have several sources. Survey data is a common source. Terrain and obstacle data may be incomplete. LAAS uses an ECEF reference system based on WGS-84. Conversions between geodetic datums can induce errors. Vertical datum differences between NAD-83 and WGS-84 can result in positioning errors, causing the actual TCH for LAAS procedures to be higher or lower than designed. Input errors, especially to the FAS data block, can result in significant changes to the flight path in relation to the runway. Additionally, data temporality can induce errors if the procedure design data and the airport environment are not matched to an effective date (e.g., when future changes to the airport, such as a runway extension, will be realized at a future time when the procedure is actually published, then pending data is required). Particular attention should be paid to data accuracy in the precision FAS data block for LAAS flight procedures. Corruption of ellipsoid height data can have disastrous effects on the location of a glide path by displacing the glide path forward or aft along track of the intended design.

A flight inspection system analysis is required to validate that FAS data elements for course alignment, TCH, and glide path angle are providing navigation guidance, as designed, to the physical runway threshold or the fictitious threshold point.

d. LGF Supporting Parallel Runways. When the LGF to be evaluated supports approach procedures to parallel runways, approach sectors are defined. An approach sector bounds the area of airspace common to all the approach procedures having the same approach and landing direction. Thus, a set of parallel runways will have two approach sectors associated with them, one for each landing direction. The methodology for evaluation of the approach sector, as opposed to assessing each runway end individually, permits sufficient assessment of each approach procedure while improving the efficiency of the inspection by eliminating redundant VDB coverage assessments. Some parallel runway sites may not be appropriate for application of this procedure due to excessive distance between the parallels, environmental issues between the parallels, etc. (e.g., KDFW RWY 13L/ RWY 31R and RWY 13R/ 31L)

(1) Determine fictitious approach sector alignment point (FASAP) and fictitious approach sector landing threshold point (FASLTP). Determine the coordinates of the FASAP and FASLTP for each approach sector. The approach sector centerline runs parallel to the runway centerlines and is located midway between the centerlines of the outer-most runways (see Figure B-1). The FASAP and FASLTP are located abeam the furthest most runway stop end and threshold, respectively, and on the approach sector centerline as illustrated in Figure B-1.

(2) Determine Left/ Right Sector Limits. Determine the four coordinates for the left and right limit boundary of the approach sectors for each set of parallel runways. The right limit boundary is defined by a radial rotated 10˚counterclockwise from the controlling runway centerline. The left limit boundary is defined by a radial rotated 10˚clockwise from the controlling runway centerline. Determine right boundary alignment point #1 (RBAP1), right boundary alignment point #2 (RBAP2), left boundary alignment point #1 (LBAP1), and left boundary alignment point #2 (LBAP2) as indicated by Figure B-2.

e. LGF Supporting TAP Procedures. The TAP procedure data is developed and coded into binary files by the procedure developer. The TAP procedure data files are saved into a network file for flight inspection access. Download the data files required for the scheduled itinerary onto removable disk media.

If augmented VDB coverage assessments are to be performed, determine the segment(s) of each procedure that requires an augmented assessment (criteria to be determined). For each segment, the waypoint/ navigation data needed to fly the required profiles is developed and coded into data files. The required profiles are:

- Full deflection below path, full deflection towards obstacle;
- On path, full deflection towards obstacle;
- Full deflection above path, full deflection towards obstacle.

The augmented coverage profile data files are saved into a network file for flight inspection/ validation access. Download the data files required for the scheduled itinerary onto removable disk media.

Prior to mission departure, confirm AFIS access to the procedural binary files. Access each individual binary procedure data file and confirm the CRC remainder matches the FAA Form 8260-10 data, or equivalent. This ensures no errors occurred during data transfer (data file integrity). Any corruption must be resolved prior to conducting the inspection. AFIS uses the TAP to calculate course alignment, path vertical angle/ decent profile or altitude, and the augmented VDB coverage flight profiles, if required.

f. LGF Supporting Airport Surface Operations. The airport map data (data specified on FAA Form 8260-10 or equivalent) is developed and coded into binary files by the map developer. The map data files are saved into a network file for flight inspection access. Download the map data files required for the scheduled itinerary onto removable disk media.

Prior to mission departure, confirm AFIS access to the procedural binary files. Access each individual airport map data file and confirm the CRC remainder matches the FAA Form 8260-10 data, or equivalent. This ensures no errors occurred during data transfer (data file integrity). Any corruption must be resolved prior to conducting the inspection. AFIS uses the airport map data to display the location of runways, taxiways, and other pertinent airport features.

Figure B-1. Determining Approach Sector Centerline, FASAP, and FASLTP

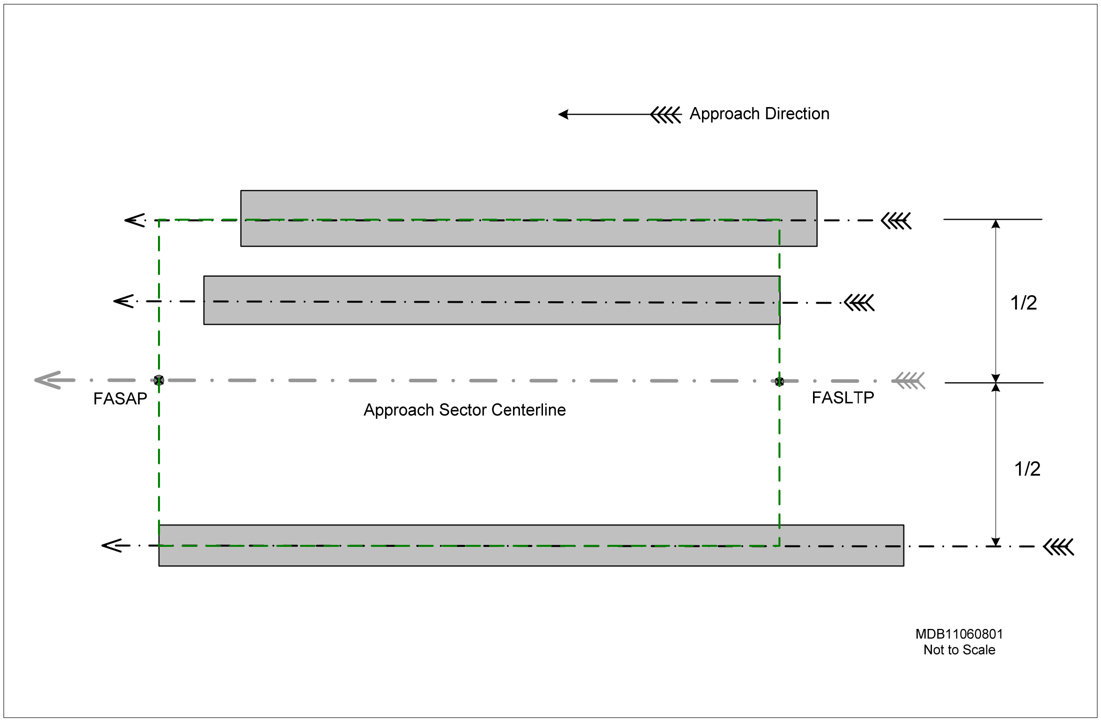
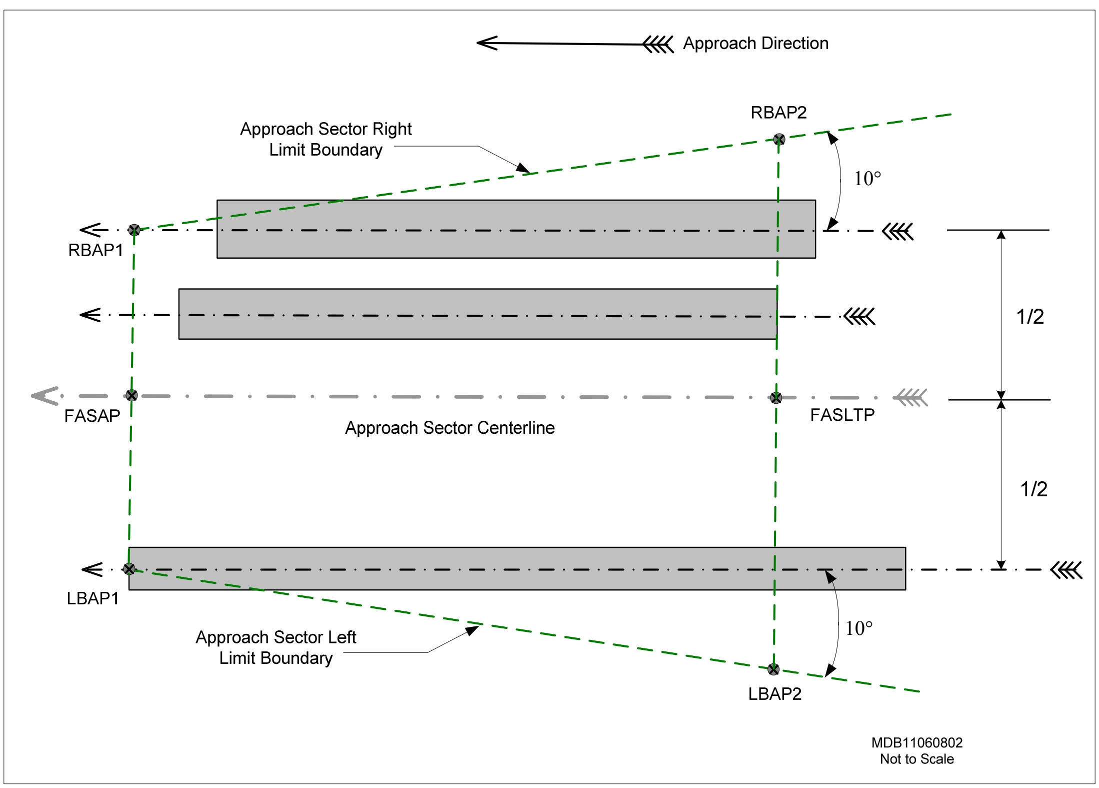


Figure B-2. Determining right/ left boundary and boundary alignment points



3. Flight Inspection Procedures:

a. Checklist

Type Inspection	Paragraph Reference
Initial Evaluation/ Commissioning	3a(2)(a)
VHF Data Broadcast (VDB)	4
Terminal Area Path (TAP)	5a
Initial and Intermediate Approach Segment	5b
Final Approach Segment	5c
Missed Approach Segment	5d
Instrument Approach Procedure	5e
Airport Surface	5f
VDB Equipment or Frequency Change	
VHF Data Broadcast (VDB)	4
Final Approach Segment	4b(2)(b)
Periodic Evaluation	6
Facility-based Coverage	6a
Approach Procedures	6b
Terminal Area Path (TAP)	6c
Airport Surface	6d
Special Evaluations	7
Approach Procedures	7a
Terminal Area Path (TAP)	7b
Airport Surface	7c

(1) Maintenance Procedures That Require a Confirming Flight Evaluation. A confirming flight inspection evaluation/ validation is required whenever the data link transmit antenna location or type is changed, or the system database has been changed or corrupted. The extent of the evaluation will depend on the changes made.

(2) Flight Inspection and Validation:

(a) Commissioning. The LAAS instrument approach procedures and VHF Data Broadcast (VDB) coverage must be evaluated during initial flight inspection/ validation. If provided, each TAP procedure must be evaluated during initial inspection. If airport surface operations are supported, the applicable electronic map and VDB signal coverage must be evaluated during initial inspections.

(b) Periodic. LGF is to be configured in normal mode. VDB coverage along the lower orbit will be evaluated based on loss of signal and data continuity alerts. The altitude established for the lower orbit during commissioning must be used. The LGF broadcast FAS data block CRC will be checked for each Standard Instrument Approach Procedure (SIAP) and TAP. Approach obstacle verification scheduling must be completed in accordance with FAA Order 8200.1, Chapter 4.

VDB signal coverage on the airport surface may be required depending on the level of service provided, and the airport map data CRC will be checked to ensure there has been no change or corruption.

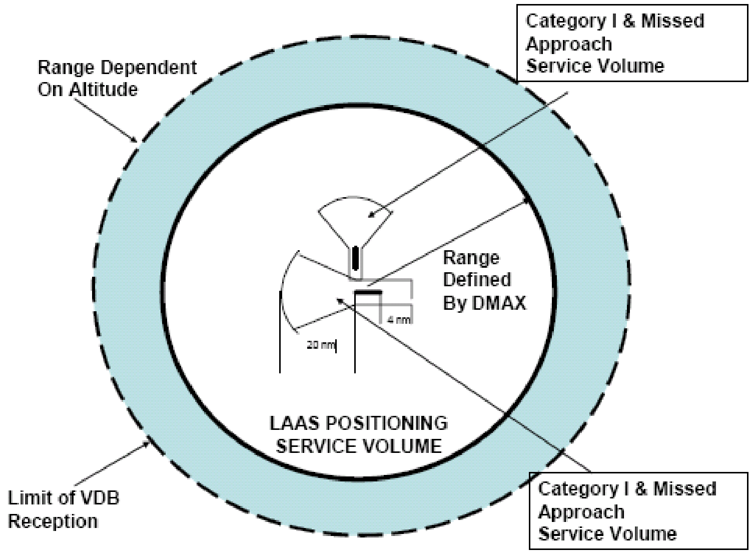
(c) Special. A special flight inspection evaluation is required subsequent to select maintenance actions, for a change in VDB antenna, antenna type or antenna phase center location, whenever physical changes occur at the site having the potential to effect GPS signal reception and VDB coverage, such as new obstructions or construction or in response to multiple user complaints. Evaluation/ validation must be required when an existing approach or TAP procedure is modified or when a new approach or TAP procedure added to an operational facility.

4. LAAS VHF Data Broadcast Coverage. The service volume for LAAS is constrained by both the RF signal coverage provided by the ground-based VDB antenna(s) and maximum range (D_{max}) from the LGF for which the broadcast differential corrections are applicable (See Figure B-3). RF signal coverage refers to those regions where the signal strength is sufficient to ensure reliable, continuous reception by the aircraft of the data broadcast. RF signal coverage can extend 100 to 200 nm, dependent on the output power of the VDB transmitter, VDB antenna type, aircraft altitude, and the horizon (line-of-sight) profile about the VDB antenna site.

The applicability, or accuracy, of the differential corrections degrade with increased distance from the LGF, specifically, the reference receiver antenna locations. In general, the vertical/ horizontal protection levels (VPL/ HPL) must not exceed the vertical/ horizontal alert limits (VAL/ HAL) for the differential corrections and satellite status information to be applicable. The values for VAL/ HAL are dependent on the flight operation being conducted. For LAAS, the maximum use distance, D_{max}, is site dependent and it is usually broadcast by the LGF. In order to use the LAAS differentially corrected position/ velocity/ time (PVT) information, the aircraft must be within the range defined by D_{max}. That is, the LAAS positioning service is available when within the RF coverage service volume out to the D_{max} range. Outside of D_{max}, the uncorrected PVT or SBAS corrected PVT information provides performance equivalent to GPS or the associated SBAS performance requirement, respectively.

The service volume required is dependent on the operations to be supported, and D_{max} is set accordingly. D_{max} may or may not be used, dependent upon operational requirements. The value for D_{max} will typically be 23 nm when the LGF is used to support terminal and approach procedures.

Figure B-3. LAAS Coverage/ Service Volume (courtesy RTCA DO-245)



a. VDB Signal Polarization. The VDB transmits either a horizontal or vertically polarized signal. This allows the data broadcast to be tailored to the operational requirements of the local user community. The majority of aircraft will be equipped with a horizontally polarized VDB receive antenna, which can receive the VDB from either a horizontally or vertically polarized transmitter. Aircraft equipped with a vertically polarized antenna are limited to the reception of vertically polarized transmissions only.

b. VDB Coverage Evaluation. The service volume of the VDB must encompass the area of intended terminal and approach operations. Since the outer limit of the service volume is defined by D_{max}, D_{max} must be set appropriately for each facility. The suitability of the value used for D_{max} will be evaluated for each LGF (facility-based coverage assessment). In addition, RF signal (minimum power) coverage within the service volume defined by D_{max} will be evaluated for procedurally significant airspace (procedure-based coverage assessment).

VDB coverage will be evaluated based on loss of signal and data continuity alerts. The LAAS sensor annunciation of operation in GBAS integrity will confirm adequate coverage. VDB signal coverage validation must be made for both horizontally and vertically polarized signals. No data continuity alerts are allowed. The LGF must be configured for normal data transmission, except the power output must be at the RF power alarm point and the D_{max} data field populated for test mode. The initial coverage checks will either confirm or establish the RF power alarm point.

(1) Facility-based Coverage Assessment. Orbits are required at the extremes of the VDB coverage service volume. The orbit maneuver is used primarily to check the lateral VDB coverage volume of the LGF. LGF coverage will be verified by flying an orbit at the maximum distance required to support the terminal and approach procedures to be supported by the LGF. This distance will typically be 23 nm, that is, D_{max} is expected to be 23 nm. Two orbits are required during the initial coverage evaluation:

- At a height above the antenna elevation as computed using Equation 1;

  Equation 1: Orbit Altitude (ft) = $[(D_{max} - 3) \times 100] + [(D_{max} - 3)^2 \times 0.883]$, D_{max} in nautical miles and,

  (Orbit height is 2,300' [2,353.2' rounded down to nearest 100'] above site level for D_{max} equal to 23 nm)

- At 10,000 ft above the antenna elevation.

Clear line-of-sight (LOS) from the VDB transmit antenna to the lower extreme coverage limit may not exist for the entire 360º of azimuth. Such situations may cause unavoidable outages of the VDB signal during inspection of the lower coverage limit. In this case, an additional orbit (partial or whole, as required) should be performed at the lowest altitude where clear LOS from the VDB transmit antenna to the lower extreme coverage limit exists for the entire 360º of azimuth.

Note 1: Enable "Test Override" during coverage orbit to override test message/ D_{max} limit.

Note 2: Facility-based coverage assessments are performed with the power output at the RF power alarm point.

(a) Facilities Broadcasting D_{max}: The LAAS sensor and AFIS will display integrity status "GBAS" when VDB integrity/ correction/ signal strength is satisfactory in side D_{max}. Verify D_{max} is properly set by flying across the D_{max} distance specified. "GBAS" integrity/ correction and course guidance will only be available inside the D_{max} limit.

(b) Facilities Not Broadcasting D_{max}: LGF(s) not having a value set for D_{max} should provide differential integrity/ corrections beyond the terminal area (greater than ≈23 nm). D_{max} check in Paragraph 4b(1)(a) above not required for these facilities.

(c) Spectrum Analyzer Monitor the LGF frequency in a surveillance mode during all inspections. Monitor the LGF, GPS, or other appropriate frequencies anytime interference or anomalies are suspected and **document** all findings for analysis.

Other validation checks may be requested by facilities maintenance. All restrictions should be defined and noted on the commissioning inspection report. (Example of restricted VDB facility: "NOTAM, KACY VDB unusable 030 cw 090, beyond 18 nm below 4,000 ft").

(2) Procedure-based Coverage Assessment:

(a) Terminal Area Path (TAP) and Initial/ Intermediate Segment Coverage. The VDB transmitter power is set at the RF power alarm point. The TAP and/or Initial/ Intermediate segments must be flown from the initial waypoint to the final waypoint, flying on course and on path. Augmented coverage profiles are flown for the indicated segments, as required.

GPS signal reception is confirmed and VDB coverage is evaluated. The LAAS sensor annunciation of GBAS integrity will confirm adequate coverage while inside D_{max} (if D_{max} is used).

(b) Approach Coverage. Table 1 provides the requirements for assessing VDB coverage for each approach procedure and is based primarily on RTCA D0-245 recommendations. The maneuvers listed in Table 1 are intended to provide assessment of the coverage requirements illustrated in Figure B-4. For LGF(s) servicing multiple runways, each approach procedure must be evaluated in accordance with Table 1, except for the case of parallel runways.

When the LGF to be evaluated supports approach procedures to parallel runways, approach sectors are defined, one for each landing direction. Table 2 provides modified requirements for assessing parallel runway configurations, and the measured values are the same as those specified in Table 1.

Note: Initial approach coverage assessments are performed with the power output at the RF power alarm point.

(c) Airport Surface Coverage. The VDB transmitter power is set at the lower limit of the VDB monitor. The flight inspection aircraft or inspection vehicle must taxi along all runway centerlines and major taxiway centerlines within the airport surface area to be serviced. GPS signal reception will be confirmed and VDB coverage is evaluated. LAAS sensor annunciation of GBAS mode will confirm adequate coverage when within the area intended to be serviced. (Example of VDB airport surface coverage restriction: “KACY VDB unusable on Runway 31 from Taxiway A north to Taxiway B”.)

Table B-1

VDB Approach Coverage Assessment (See Note 3)

Requirement	Evaluation Area	Method	Evaluation Criteria
Normal Approach	From 20 nm to LTP	Fly on Path, on course	(1) LAAS Receiver maintains "GBAS" Integrity (2) No CDI Flags
Lower Limit of Approach	From 20 nm to LTP	From 21 nm and 5,000' above LGF, fly on course, intercept and fly glide path within 1 dot of full scale below path	(1) Same as above (2) Note 1 (3) Note 2
Upper Limit of Approach	From 20 nm to LTP	From 21 nm and 8,000' above LGF, fly on course, intercept and fly glide path within 1 dot of full scale above path.	(1) Same as above (2) Note 1 (3) Note 2
Left Limit of Approach Note 4	From 20 nm to LTP	From 21 nm, fly on path and offset course to within 1 dot of full scale of "fly right".	(1) LAAS Receiver maintains "GBAS" Integrity. (2) No CDI Flags (3) Note 2
Right Limit of Approach Note 4	From 20 nm to LTP	From 21nm, fly on path and offset course to within 1 dot of full scale of "Fly left".	(1) LAAS Receiver maintains "GBAS" Integrity. (2) No CDI Flags (3) Note 2
Coverage from MVA Note 4	From 20 nm to 7º glide path	From 21 nm on course and the MVA or 2,300 feet above LTP, whichever is higher, fly at level altitude until 7º path.	(1) LAAS Receiver maintains "GBAS" Integrity. (2) No CDI Flags (3) Note 2
Coverage from Upper Service Volume Note 4	From 20 nm to 7º glide path (13.4 nm to Glide Path Intercept Point (GPIP))	From 21 nm on course and 10,000' above LTP, fly at level altitude until 7ºpath.	(1) LAAS Receiver maintains "GBAS" Integrity. (2) No CDI Flags (3) Note 2
Missed Approach	From Decision Altitude to 4nm from departure end of runway	Fly runway course, climb at 200' per nm	(1) LAAS Receiver maintains "GBAS" Integrity. (2) No CDI Flags
Roll Out	From Runway End to Runway End	Taxi Along Runway	(1) LAAS Receiver maintains "GBAS" Integrity. (2) No Lateral CDI Flags

Note 1: Determine that guidance is available and the CDI is active at the upper and lower vertical procedure extremities.

Note 2: Determine that guidance is available and the CDI is active at the lateral procedure extremities.

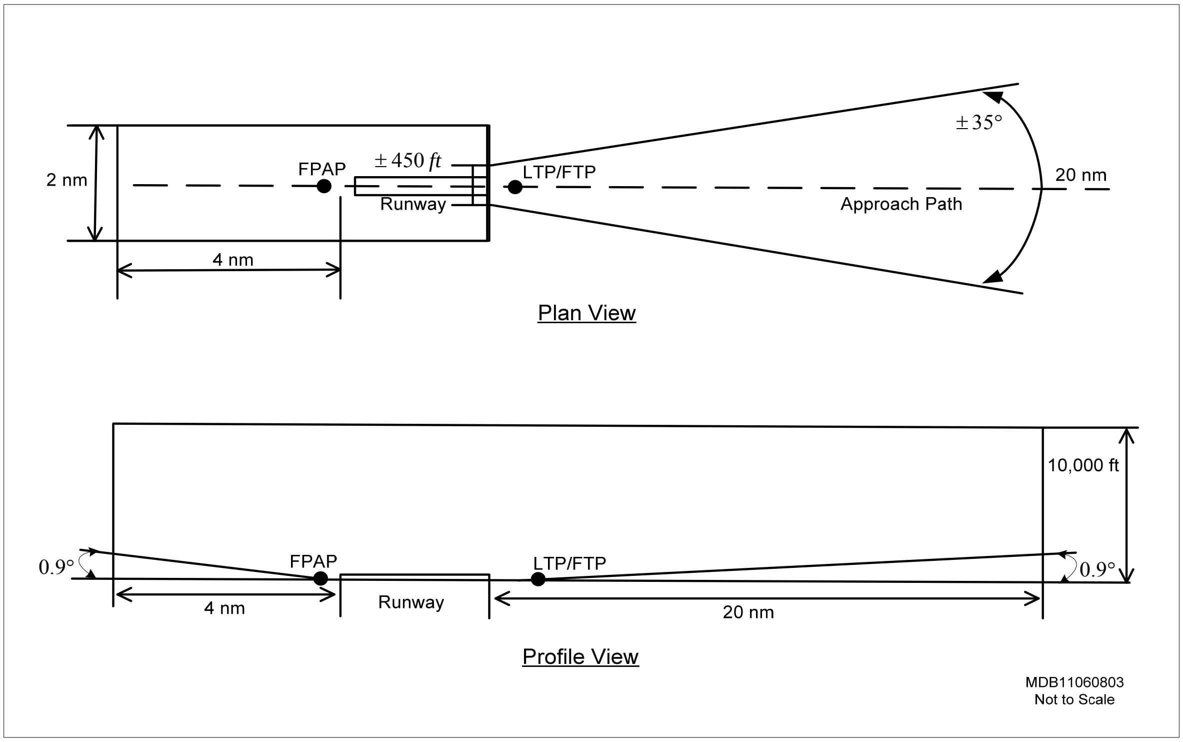
Note 3: VDB transmitter power set at the lower limit of the VDB monitor.

Note 4: See Table 2 for requirement when evaluating parallel runway configurations.

Table B-2
VDB Approach Coverage Assessment – Parallel Runways

Requirement	Evaluation Area	Modified Method	Performed For
Normal Approach	From 20 nm to LTP	No change	Each approach procedure
Lower-Limit of Approach	From 20 nm to LTP	No change	Each approach procedure
Upper-Limit of Approach	From 20 nm to LTP	No change	Each approach procedure
Left-Limit of Approach	From 20 nm to abeam FASTLP	From 21 nm, fly on path and on sector left boundary to within 1 dot of full scale of "fly right".	For left limit of each approach sector
Right-Limit of Approach	From 20 nm to abeam FASLTP	From 21 nm, fly on path and on sector right boundary within 1 dot of full scale of "fly left".	For right limit of each approach sector
Coverage from MVA	From 20 nm to 7° glide path	From 21 nm, on approach sector centerline and the MVA or 2,300' above FASLTP, whichever is higher, fly at level altitude until 7º path relative to FASLTP.	For each approach sector centerline
Coverage from Upper Service Volume	From 20 nm to 7° glide path (13.4 nm to GPIP)	From 21 nm, on course and 10,000' above FASLTP fly at level altitude until 7º path relative to FASLTP.	For each approach sector centerline
Missed Approach	From Runway Stop End to 4 nm	No change	For each approach procedure
Roll Out	From Runway End to Runway End	No change	Once for each runway

Figure B-4
Approach Coverage Requirements



5. Aircraft Positioning. The instrument approach procedure must be validated to ensure flyability and safety. This evaluation and analysis must be performed in accordance with FAA Order 8200.1. Use of an RNAV-coded procedure to overlay the TAP, Initial, and Intermediate segments will assist in analysis of those segments.

Note: All vertical guidance from the LAAS is GPS altitude.

a. Terminal Area Path (TAP). The TAP procedure should be flown from the initial waypoint to the final waypoint, flying on course and on path. Evaluations must include procedure design, segment alignments, obstacle clearance, supporting navigation systems, GPS signal reception, and VDB signal reception within the coverage volume. Augmented coverage profiles are flown for the indicated segments, as required.

b. Initial and Intermediate Approach Segments. Fly the procedure from the Initial Approach Fix (IAF) to the Final Approach Fix (FAF). Maintain procedural altitudes. The evaluation must include obstructions, procedure design, supporting navigation systems, and VDB coverage where required.

c. Final Approach Segment. Fly the final segment at procedural altitudes until intercepting the glide path, and descend on the glide path to the LTP/ FTP. The evaluation must include obstructions, procedural design, horizontal alignment, glide path alignment, TCH, CRC, and VDB coverage. Procedures that support azimuth only approaches must be evaluated to the MAP.

d. Missed Approach Segment. Fly the missed approach procedure from the MAP using the procedural waypoints or associated navigation systems. The evaluation must include obstructions, procedural design, transition to the missed approach, and VDB coverage.

e. Standard Instrument Approach Procedure. The instrument approach procedure must be validated to ensure flyability and safety. This evaluation and analysis must be performed in accordance with FAA Order 8200.1.

f. Airport Surface. The flight inspection aircraft or inspection vehicle must taxi along all runway centerlines and major taxiway centerlines within the airport surface area to be serviced. Evaluations must include assessing alignment/ agreement of the electronic airport map with runway and major taxiway surfaces, GPS signal reception, and VDB signal reception within the coverage volume intended to be serviced.

6. Periodic Evaluation. The purpose of a periodic evaluation is to ensure there has not been any degradation of the VDB coverage due to environmental changes or equipment repair/ replacement and there are no new sources of RF interference. Commissioned facilities must be inspected initially on a 360-day interval. After two 360-day periodic cycles with no LGF out-of-tolerance condition, the periodic interval may be increased to 540 days. During a 540-day periodic interval, any facility anomaly is cause to reset the LGF back to the initial periodic interval requirement of 360 days until there are two anomaly free cycles.

a. Facility-Based Coverage. VDB coverage along the lower orbit will be evaluated based on loss of signal and data continuity alerts. The altitude established for the lower orbit during commissioning must be used. LGF should be configured in normal mode.

b. Approach Procedures. The LGF broadcast FAS data block CRC will be checked for each SIAP to ensure there has been no change or corruption. The evaluation must be performed during the orbit specified in Paragraph 6a. Additionally, VDB coverage and the LGF broadcast FAS data block CRC should be checked when runway-based obstacle clearance evaluations are performed for runways that provide LAAS approach service.

c. Terminal Area Path (TAP). The TAP procedure data block CRC will be checked for each procedure to ensure there has been no change or corruption. The evaluation should be performed during the orbit specified in Paragraph 6a.

d. Airport Surface. For operations limited to visibility conditions where the pilot or vehicle driver has sufficient visibility to steer and avoid other aircraft/ obstacles based on visual observations, no periodic inspection is required. Otherwise, the flight inspection aircraft or inspection vehicle must taxi along all runway centerlines and taxiway centerlines within the airport surface area to be serviced. Evaluations must include GPS signal reception, VDB signal reception within the coverage volume intended to be serviced, and the airport map data block. Procedural CRC(s) will be verified to ensure there has been no change or corruption.

7. Special Evaluation. A special flight inspection evaluation is required subsequent to select maintenance actions (as detailed below):

a. Approach Procedures. Special inspection/ validation must be performed when:

- There has been a modification of the instrument approach procedure
- A new procedure has been added to a commissioned facility
- Changes to the LGF configuration are made such as hardware/ software changes having the potential to affect the internal navigation database or coding/ construction of the VDB messages
- There is a change in VDB antenna, antenna type, or antenna location
- Physical changes occur at the site having the potential to effect GPS signal reception and VDB coverage or in response to multiple user complaints.

As predicated by the reason for the special, VDB coverage is evaluated at the altitude established for the lower orbit during commissioning, and in operationally utilized areas where coverage is predicted or known to be affected. The VDB coverage evaluation is based on loss of signal and data continuity alerts. For each modified or new SIAP, the LGF broadcast FAS data block CRC should be checked to ensure there has been no change or corruption. A normal approach should be flown for modified instrument approach procedures (see Table 1). A normal approach, as well as upper, lower, left, and right limit profiles should be flown for new procedures (see Table 1). The evaluations performed should include procedure design, segment alignments, obstacle clearance, GPS signal reception, and VDB signal reception within the coverage volume.

b. Terminal Area Path (TAP). Special inspections must be performed when:

- There has been a modification of the TAP procedure
- A new procedure has been added to a commissioned facility
- Subsequent to maintenance actions having the potential to affect TAP data
- There is a change in VDB antenna type or antenna location
- Physical changes occur at the site having the potential to effect GPS signal reception and VDB coverage; or in response to multiple user complaints

As predicated by the reason for the special, VDB coverage is evaluated in operationally utilized areas where coverage is predicted or known to be affected. Each modified or new TAP procedure should be flown from the initial waypoint to the final waypoint, flying on course and on path, and the evaluations performed should include:

- Obstacle clearance
- GPS signal reception
- VDB signal reception within the service volume.

The evaluation of procedure design and segment alignments should be performed when an existing procedure has been modified or a new procedure has been added. Augmented VDB coverage assessments should be performed when degradation of or a change in, the signal characteristics in a containment region is observed during the on-path evaluation.

c. Airport Surface. The criteria herein applies when operations are authorized in visibility conditions where the pilot or vehicle driver may have some level of reliance on LAAS to steer, avoid other aircraft/ obstacles, and detect upcoming runway and taxiway intersections. A Special inspection may also be conducted when LAAS guidance is used in an advisory only capacity, depending on the nature of the situation and availability of inspection resources. Special inspections must be conducted when:

- The airport map for a facility has been revised
- There is a change in VDB antenna, antenna type, or antenna phase center location
- Physical changes occur at the site having the potential to effect GPS signal reception and VDB coverage, such as new obstructions or construction
- In response to multiple user complaints.

As predicated by the reason for the special, VDB coverage should be evaluated in operationally utilized areas where coverage is predicted or known to be affected. The evaluations to be performed should include:

- Assessing alignment/ agreement of the electronic airport map with runway and major taxiway surfaces
- GPS signal reception
- VDB signal reception within the coverage volume intended to be serviced

8. Flight Inspection/ Validation Analysis. Paper recordings and electronic collection of data are required. Differential GPS is required for data analysis. Document LAAS data during all flight inspection/ validation runs.

a. VDB. Initial evaluation must require the VDB signal be validated throughout the defined service volume by ensuring there are no data continuity alerts. The LGF must be configured for normal data transmission, except the power output must be at the established RF power alarm point.

For periodic evaluation, VDB coverage along the lower orbit will be evaluated based on loss of signal and data continuity alerts. The LGF must be configured for normal data transmission and power level. The altitude established for the lower orbit during commissioning must be used. LAAS sensor annunciation of operation in GBAS integrity will confirm VDB signal strength is adequate for the LAAS sensor, and that valid GPS corrections are received. The LGF broadcast FAS data block CRC will be checked for each SIAP to ensure there has been no change or corruption. The LGF must be configured for normal data transmission.

b. Procedural Design and Database Integrity. A commissioning flight inspection requires that the approach path be evaluated to verify that the instrument approach procedure delivers the aircraft to the desired aiming point as designed by the procedure. The FAS data CRC remainder will be compared with the procedural design data to ensure no data changes or data corruptions have occurred. TAP, Initial, Intermediate, and Missed Approach segments must be evaluated to determine that they meet procedure design requirements.

The flight inspection system uses the LGF transmitted FAS data to calculate course alignment, TCH, and glide path angle to the actual landing threshold point or fictitious threshold point. The FAS data CRC transmitted by the LGF must be an exact match with the official source document.

Note: The official source document LGF FAS data files may be transferred directly into the flight inspection system via electronic media. This can provide a method for comparison that will serve as confirmation that the actual LGF transmitted FAS data is exactly the same as that on the official source documentation for the flight procedure. Prior to mission departure, confirm flight inspection system access to the procedural FAS data binary files. Access each individual FAS data file and confirm the cyclic redundancy check (CRC) remainder matches the FAA Form 8260-10 FAS data (or equivalent). This ensures no errors occurred during data transfer (data file integrity) to the flight inspection system. **Any corruption of data during transfer must be resolved prior to conducting the inspection.**

c. Horizontal Alignment and Glide Path Angle. Horizontal alignment and glide path angle must deliver the aircraft to the designed LTP/ FTP.

d. GPS Satellite Parameters. The following parameters must be documented at the time anomalies are found during any phase of the flight inspection:

Parameter	Expected Values
HPL_{GBAS}	≤ 17m (1)
VPL_{GBAS}	≤ 10m (1)
HDOP	≤ 4.0
VDOP	≤ 4.0
HIL	≤ 0.3nm
FOM	≤ 22meters
Satellites Tracked	5 Minimum
Signal-to-Noise Ratio (SNR)	30 dB/ Hz minimum

Note: There are no flight inspection tolerances applied to these parameters. However, they may provide useful information should GPS signal anomalies or interference be encountered.

(1) At the LTP/ FTP, on glide path. Values increase with distance from the LGF antenna.

e. Electromagnetic Spectrum. The RF spectrum from 1559 to 1595 MHz should be observed when GPS parameters indicate possible RF interference. Interference signals are not restrictive unless they affect receiver/ sensor performance. Loss of differential data is an indication of interference, multipath, or shadowing of the VHF transmission. The RF Spectrum ± 100 kHz either side of the VHF Data Link (VDL) frequency must be observed on the spectrum analyzer in the case of suspected interference. Report any spectrum anomalies or suspected anomalies encountered to the National Operational Control Center (NOCC).

8. Tolerances. Flight Inspection Reference System. AFIS with differential GPS (DGPS) corrected data will be used to provide FAS data analysis.

Parameter	Paragraph Reference	Tolerances
Terminal Area Path True Course to next WP Distance to next WP	5a	 ± 1° ± 0.1 nm
Airport Surface	5e	(Reserved)
Initial/ Intermediate Approach Segment	5b	FAA Order 8200.1
Final Approach Segment FAS data Bearing to LTP Glide Path Angle FAS Data CRC TCH	5c 5c 5c 5c 5c	 ± 0.1° true course ± 0.05° No Corruption ±2 m
Broadcast VDB messages Coverage VDB, minimum field strength, horizontal polarization Coverage VDB, minimum field strength, vertical polarization	4	Required message types >-99 dBW/m² or >215 µV /m >-103 dBW/m² or>136 µV /m
Co-channel / adjacent channels	4b(1)(c)	No misleading information
RF Interference	4b(1)(c)	No misleading information
Maximum Use Distance (D_{max})	4b(1)(a)	As defined by LGF Site.

9. Adjustments. (Reserved)

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Appendix C. Records and Reports

Represents Flight Inspection Report—LAAS Augmentation System

FLIGHT INSPECTION REPORT:
Local Area Augmentation System

1. FLIGHT INSPECTION REPORT HEADER

Ident	Owner	State	Country	Region	Inspection Dates

Location

2. CREW INFORMATION

PIC	SIC	MS	A/C NO

ACM	FIFO

3. NOTAMS

4. REMARKS

5. LGF COVERAGE

DMAX NM		LGF Frequency		Polarization	

Profile	Altitude	Radius Distance	Signal Strength	Facility Status

Runway	Normal Approach	Lower Limit	Upper Limit	Left Limit	Right Limit	Missed	Roll Out	CVG MVA	CVG USV

Represents Flight Inspection Report—LAAS Augmentation System
(continued)

6. FAS DATA

Runway	CRC	Channel #	Course Alignment	Glide Pat	TCH

Appendix D. Acronyms and Definitions

1. Acronyms

AFIS	Automated Flight Inspection System
AGL	Above Ground Level
APL	Airport Pseudolites
ATCU	Air Traffic Control Unit
CRC	Cyclic Redundancy Check
DA	Decision Altitude
DCH	Datum crossing height
D_{max}	Maximum use distance of GBAS Differential Corrections
ECEF	Earth Center Earth Fixed
FAF	Final Approach Fix
FAP	Final Approach Path
FASAP	Fictitious Approach Sector Alignment Point
FASLTP	Fictitious Approach Sector Landing Threshold Point
FTP	Fictitious Threshold Point
FAS	Final Approach Segment
FOM	Figure of Merit
FPAP	Flight Path Alignment Point
GBAS	Ground Based Augmentation System
GNSS	Global Navigation Satellite System
GPA	Glide Path Angle
GPIP	Glide Path Intercept Point
GPS	Global Positioning System
HAL	Horizontal Alert Limit
HDOP	Horizontal Dilution of Precision
HIL	Horizontal Integrity Limit
HPL	Horizontal Protection Level
IAF	Initial Approach Fix
ICAO	International Civil Aviation Organization
ICD	Interface Control Document

LAAS	Local Area Augmentation System
LBAP1	Left Boundary Alignment Point 1
LBAP2	Left Boundary Alignment Point 2
LGF	LAAS Ground Facility
LSP	Local Status Panel
LTP	Landing Threshold Point
MDT	Maintenance Data Terminal
MVA	Minimum Vectoring Altitude
NAS	National Airspace System
PVT	Position Velocity Time
RBAP1	Right Boundary Alignment Point 1
RBAP2	Right Boundary Alignment Point 2
RDP	Runway Datum Point
RSP	Remote Status Panel
SBAS	Space Based Augmentation System
SIAP	Standard Instrument Approach Procedure
SPS	Standard Positioning Service
TAP	Terminal Area Path
TCH	Threshold Crossing Height
USSFIM	United States Standard Flight Inspection Manual
VAL	Vertical Alert Limit
VDB	VHF Data Broadcast
VDOP	Vertical Dilution of Precision
VHF	Very High Frequency
VPL	Vertical Protection Level
WAAS	Wide Area Augmentation System

2. Definitions

Alert: An indication provided to other aircraft systems or annunciation to the pilot to identify an operating parameter of a navigation system is out of tolerance.

Alert Limit: For a given parameter measurement, the error tolerance not to be exceeded without issuing an alert.

Availability: The ability of the navigation system to provide the required function and performance at the initiation of the intended operation. Short-term system availability is the probability that the aircraft can conduct the approach at the destination, given that the service at the destination was predicted to be available at dispatch. Long-term service availability is the probability that the signal in space from the service provider will be available for any aircraft intending to conduct the approach.

Continuity: The ability of the total system (comprising all elements necessary to maintain aircraft position within the defined airspace) to perform its function without interruption during the intended operation. More specifically, continuity is the probability that the specified system performance will be maintained for the duration of a phase of operation, presuming that the system was available at the beginning of that phase of operation.

Cyclic Redundancy Check (CRC): A very powerful form of parity check. The CRC algorithm associates a sequence of CRC code bits with a data block to preserve its integrity during storage and transmission operations.

Datum Crossing Height (DCH): The relative height at which the Final Approach Segment passes over the Runway Datum Point.

Datum Crossing Point (DCP): The point on the Final Approach Segment directly above the Runway Datum Point.

Fictitious Threshold Point (FTP): The FTP is a point functionally equivalent to a Landing Threshold Point, except that the FTP is not coincident with the designated runway threshold.

Final Approach Segment (FAS): The straight line segment that prescribes the three-dimensional geometric path in space that an aircraft is supposed to fly on final approach.

Final Approach Path (FAP): The prescribed straight three-dimensional path in space to be flown on final approach. For GPS/ LAAS, this path is defined in the FAS Path Data by the Runway Datum Point (RDP), the Datum Crossing Height (DCH), the Flight Path Alignment Point (FPAP), and the Glide Path Angle.

Flight Path Alignment Point (FPAP). A surveyed position used in conjunction with the Runway Datum Point to define the along track direction for the Final Approach Segment. The FPAP is specified in terms of (latitude, longitude), with height equal to the WGS-84 height of the RDP. The FPAP is used in conjunction with the LTP/ FTP and the geometric center of the WGS-84 ellipsoid to define the geodesic plane of a precision final approach, landing and flight path. The FPAP may be the LTP/ FTP for the reciprocal runway.

GBAS Integrity: A mode displayed by the Automated Flight Inspection System (AFIS) from the LAAS sensor. When displayed, GBAS Integrity indicates that the aircraft is within the D_{max} / service volume area of the LGF, VDB signal strength is adequate for the LAAS sensor, and that valid GPS corrections are received.

GBAS Service Level: The LAAS Approach Service performance is classified in terms of defined levels of service. A GBAS Service Level defines a specific level of required accuracy, integrity, and continuity. The Service Level is related to the operation which may be supported (e.g., Precision Approach to CAT I minima, Precision Approach to CAT II/ IIIa minima, etc).

Glide Path Angle (GPA): The glide path angle is an angle, defined at a calculated point located directly above the LTP/ FTP, that establishes the intended descent gradient for the final approach flight path of a precision approach procedure. It is measured from the plane containing the LTP/ FTP that is parallel to the surface of WGS-84 ellipsoid.

Glide Path Intercept Point (GPIP): The GPIP is the point at which the extension of the final approach segment intercepts the plane containing the LTP/ FTP that is parallel to the surface of WGS-84 ellipsoid.

Ground Based Augmentation System (GBAS): A safety-critical system that augments the GPS Standard Positioning Service and provides enhanced levels of service. GBAS provides two services: a precision approach service and a positioning service, which provides horizontal position information to support RNAV operations in the terminal area. GBAS refers to any system compliant with the existing ICAO standards.

LAAS Ground Facility (LGF): The LGF consists of four GPS reference receivers, equipment to process corrected GPS messages, and a VHF data broadcast transmitter.

Landing Threshold Point (LTP): The LTP is used in conjunction with the FPAP and the geometric center of the WGS-84 ellipsoid to define the geodesic plane of a precision final approach flight path to touchdown and rollout. It is a point at the designated center of the landing runway defined by latitude, longitude, ellipsoidal height, and orthometric height. The LTP is a surveyed reference point used to connect the approach flight path with the runway. The LTP may not be coincident with the designated runway threshold.

Local Area Augmentation System (LAAS): The FAA ground-based augmentation system (GBAS). LAAS refers to the system proposed for use and development by RTCA to meet the operational objectives for the United States National Airspace System. The LAAS focuses its service on the airport area to provide for departure, terminal, precision approach, and surface navigation operations. The coverage area is within approximately a 20 - 30 nm radius of the LGF. The LAAS broadcasts a GPS correction message via a very high frequency data link from a ground transmitter. LAAS will provide extremely high accuracy, availability, and integrity necessary for Category I, II, and III precision approaches. LAAS positioning service may also support Approach with Vertical Guidance (APV) and LAAS approach procedures to adjacent airports.

Maximum Use Distance (D_{max}): The range from the LGF within which the required integrity for the differentially-corrected position can be assured. D_{max} is the maximum distance lateral, and vertical guidance is provided from the LGF antenna (Service Volume). D_{max} is broadcast in Message Type 2. LGF D_{max} distance value is dependent on the specific operations intended and must be defined on a case-by-case basis. Depending on requirements, the LGF may or may not broadcast a Dmax.

Message Type 0: Message type broadcast from the LGF when the facility is in test mode. This message prevents an aircraft's avionics system from being able to use the LGF. AVN flight inspection aircraft have a unique capability to override "Message Type 0" in order to perform inspection and evaluation while the LGF is in test mode.

Misleading Information: Within this standard, misleading information is defined to be any data output to other equipment or displayed to the pilot that has an error larger than the current protection levels (HPL/ VPL) for the current operation. This includes all output data, such as position and deviations

Protection Level: The statistical error value which bounds the actual error (navigation sensor error in particular) with a specified confidence.

Pseudolite: A pseudolite (pseudo-satellite) is a ground-based GNSS augmentation which provides, at GNSS ranging source signal-in-space frequencies, an additional navigation ranging signal. The augmentation may include additionally differential GNSS corrections. (Adapted from the FANS GNSS Technical Subgroup).

Runway Datum Point (RDP): A surveyed position on the ground over which the Final Approach Segment passes at a relative height specified by the Datum Crossing Height.

Reference Receiver: A GNSS receiver incorporated into the LAAS ground subsystem, used to make pseudo-range measurements that support generation of pseudo-range corrections.

Standard Service Volume for LAAS: The service volume for a particular LGF is dependent on the specific operations intended and may be adjusted accordingly. Typical service volume is approximately 20-30 nm.

Terminal Area Path (TAP): A terminal procedure utilizing LAAS for lateral and vertical path definition, which is attached to a LAAS final approach segment. The path is defined by using ARINC 424 track-to-fix and radius-to-fix leg types.

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