

US-India Aviation Cooperation Program

FAA GBAS Program Update

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Federal Aviation
Administration



**Major milestone completed in the
history of the FAA GBAS program**

**FAA completed System Design
Approval of Honeywell SLS 4000
in September 2009**

LAAS and the FAA Next Generation Air Transportation System (NextGen)

- The FAA has identified GBAS as an “enabler” for the Next Generation Air Transportation System for the US National Airspace, as the all-weather landing aid for a satellite based navigation system for all phases of flight, and as an alternative technology to ILS
- The NextGen Integrated Work Plan (IWP) includes GBAS as part of the PNT Services enabler roadmap



NextGen Implementation Plan

- LAAS CAT II/III is a contributor to NextGen – **Flexibility in Terminal Environment**
- The Operational Evolution Partnership (OEP) identified GBAS as one of the enabling technologies in the OEP plan that directly supports the transformation of the National Airspace.

Plan for New Aircraft Capability Guidance

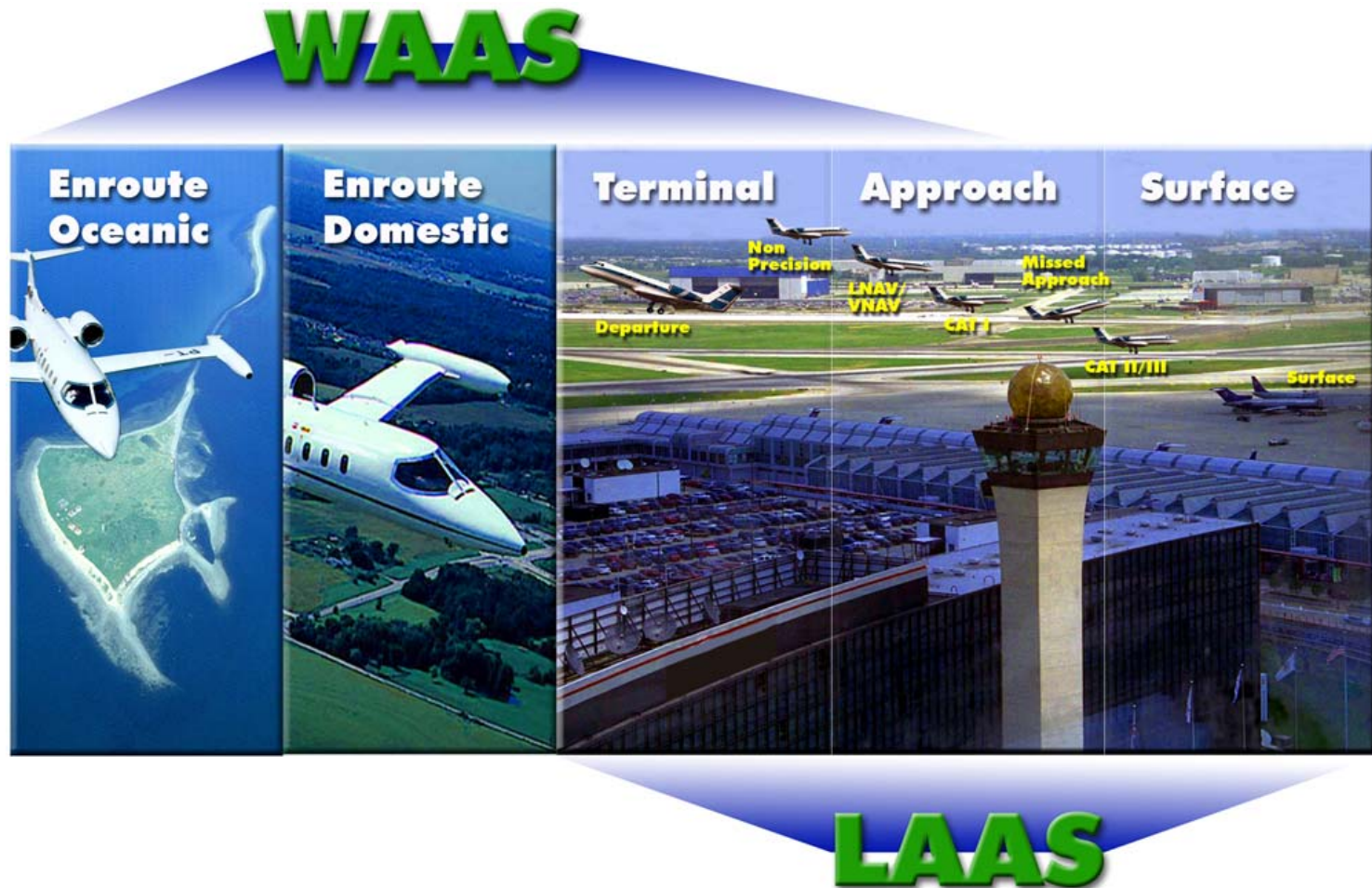
Avionics Enablers	Aircraft and Operator Guidance		Aircraft Implications	Flight Crew Implications
	Guidance	Schedule		
Data Communications: ATN Baseline 2	AC20-140B, AC120-70C	2014	Based on RTCA SC-214	AC 120-70C
CDTI (ADS-B IN)	AC, TSO	2010	Receive capability in 1090ES or UAT, display of traffic, and ability to select traffic to follow	
CDTI with alerting (ADS-B IN)	AC, TSO	2011	CDTI, plus display of target speed to maintain desired spacing (distance or time) and alerting if minimum requirement is exceeded	
ADS-B Guidance Display (ADS-B IN)	AC, TSO	2012	Along-track guidance (achieve spacing in time/distance).	
Paired approach guidance	TBD	2015	Builds on ADS-B guidance display to address wake vortex and collision risk	
GLS (CAT II/III)	Project specific policy	2012	GBAS Landing System (CAT II/III) (detailed requirements being developed)	Common exp procedures u

This table shows when the standards for various avionics equipment will be published.

Descent and Approach	
Key Ground Infrastructure	Avionics
<ul style="list-style-type: none"> • 4-Dimensional Weather Cube • ADS-B ground stations • ASDE-X • Common Automated Radar Terminal System/Standard Terminal Automation Replacement System enhancements • Data Communications • Enhanced/Integrated Traffic Management Advisor • Ground-Based Augmentation System • Terminal Flight Data Management System • Traffic Flow Management System 	<ul style="list-style-type: none"> • ADS-B In and Out • Data Communications • FANS • Ground Based Augmentation System (GBAS) avionics • RNAV/RNP • VNAV

32 NextGen Implementation Plan

FAA Satellite Navigation Vision

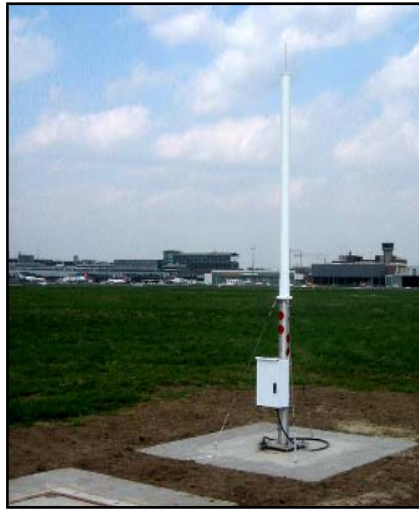




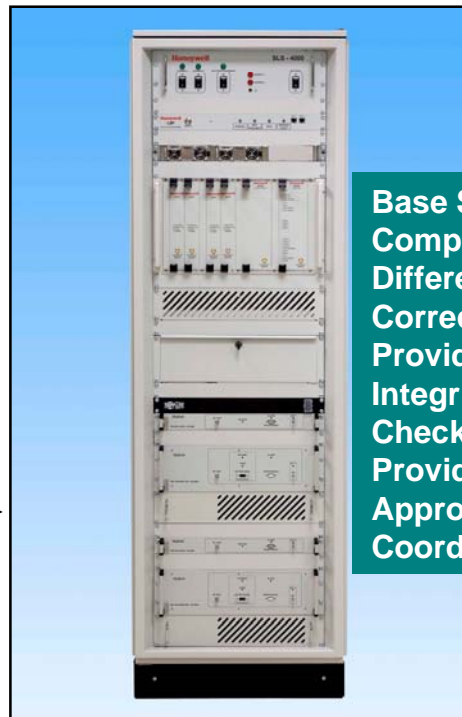
DATALINK

Broadcast Information

Differential Corrections,
Integrity Status and
Approach Coordinates



Reference
Receiver



Base Station
Computes
Differential
Corrections,
Provides
Integrity
Check &
Provides
Approach
Coordinates

Base Station

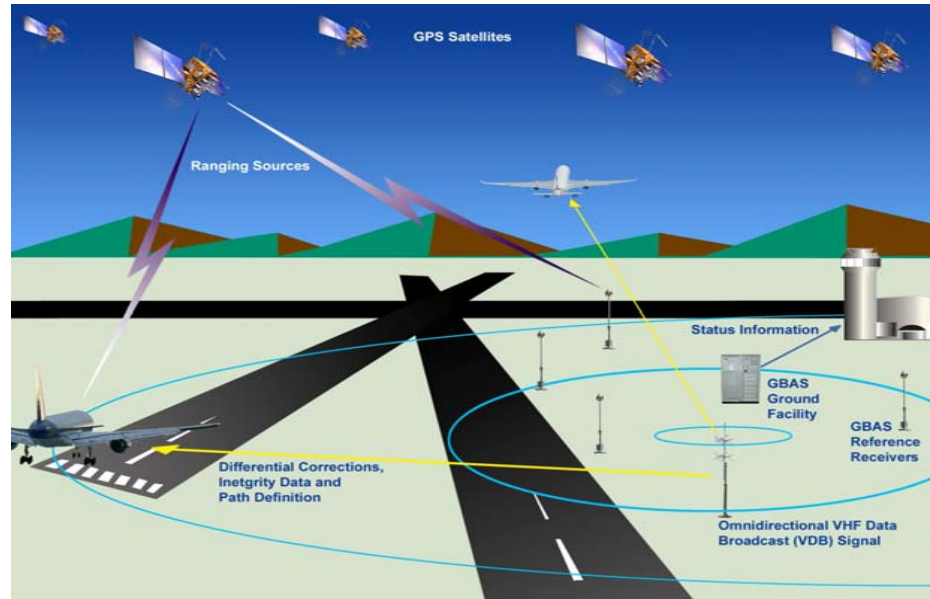


VDB



GBAS Capabilities

- One GBAS covers multiple runway ends
- GBAS eliminates ILS critical areas
- Supports offset landing thresholds and flexible glide-path to mitigate wake turbulence
- Contributing technology for high precision terminal area navigation services
 - Closely Spaced Parallel Approach
 - Simultaneous Independent Approach
- Precise positioning for terminal area navigation RNAV and RNP
- Benefits:
 - Replaces aging navigation systems that are expensive to maintain
 - Increases efficiency of arrival and departure operations and improves usage of runway capacity
 - Supports fuel efficiency and noise abatement initiatives
 - Improves access to airports during extremely low visibility operations



FAA GBAS Activities

- **Implementation**

- Continue CAT I implementation at Memphis and Newark
- Implementation may expand to other airports depending on NextGen funding
 - Minneapolis, Houston, Seattle, Guam, Philadelphia, John F Kennedy, Atlanta

- **Close NextGen coordination**

- Coordination of GBAS activities with
 - Closely spaced parallel runway operations – CSPO
 - Defining performance requirements
 - Wake turbulence avoidance -
 - Variable glidepath – offset threshold operations

- **Joint Precision Approach and Landing (JPALS) Cooperation**

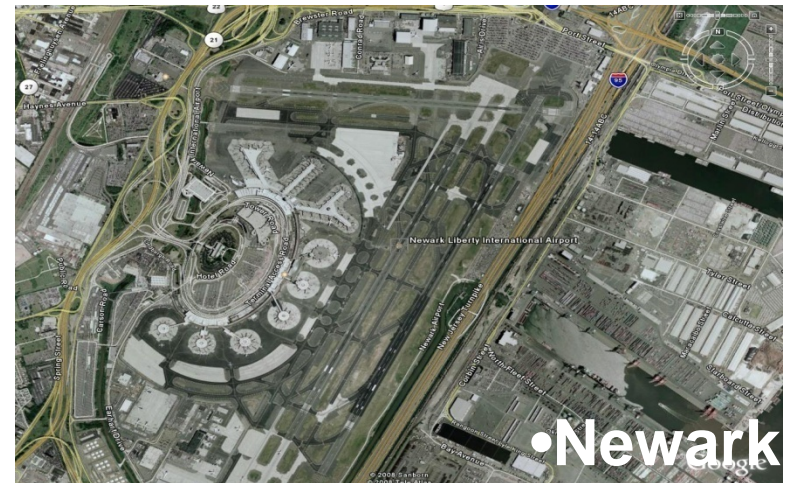
- FAA and DoD discussing option to leverage FAA GBAS experience for a joint GBAS/JPALS acquisition program

FAA GBAS/LAAS Implementation

- Facility/Service approval for integration into the NAS at Memphis and Newark early 2010



- Memphis Shelby County Airport Authority
- Federal Express
- Honeywell Corporation
- FAA



- Port Authority New York New Jersey
- Continental Airlines
- Honeywell Corporation
- FAA



FAA ATO-W Navigation Services Newark International Airport

Graphical Visualization of Runway 29 LAAS GLS



Federal Aviation
Administration

GBAS Avionics Integration

- **GBAS/LAAS CAT I avionics documents completed**
 - (MASPS / MOPS / TSO / SARPS)
- **LAAS Integration into Multi Mode Receiver (MMR) completed**
 - Rockwell Collins MMR
- **Boeing**
 - 737- 800 series GBAS capable,
 - B787 and B 747-800 GBAS as standard capability
- **Airbus**
 - A320/A380 certification completed
 - Planning for GBAS option in all new generation aircraft



GBAS CAT III

- **Technical**

- Finalize CAT II/III standards (standards for user equipment/avionics)
- Prototyping and Validation
 - Develop CAT II/III ground facility prototype to validate requirements and mitigate technical risk
 - Develop avionics prototype to validate user equipment requirements

- **CAT II/III Acquisition preparation**

- Drafting required documents according to FAA Acquisition Management System (AMS) for CAT II/III acquisition decision
 - Integrated program Plan
 - Business Case

- **Long-term GBAS: Single Frequency then Dual Frequency Approach**

- Upgrade to Dual Frequency dependent on dual frequency (L1,L5) constellation

International Support

- **International GBAS Working Group (IGWG)**
 - Last working group held in November 2009 in USA / Next WG will be hosted by Eurocontrol in June 2010 in Brussels
 - IGWG established by service providers and industry/ IGWG chaired by FAA and EUROCONTROL
 - Strong trend of more nations starting a transition from GBAS research to real implementation of GBAS
- **FAA Memorandum of Cooperation for GBAS development / implementation**
 - Australia, Brazil, Spain, Germany, Chile
- **GBAS in SESAR (Single European Sky ATM Research)**
 - SESAR budget includes approximately \$80M for GBAS R&D



Airline Commitments

- Aircraft with GBAS capability today: Continental, Qantas, Air Berlin, TuiFly, Sonair, Air Vanatu, Emirates, FedEx
- 60+ Airlines have ordered GBAS capable Boeing/Airbus aircraft

B 787 orders

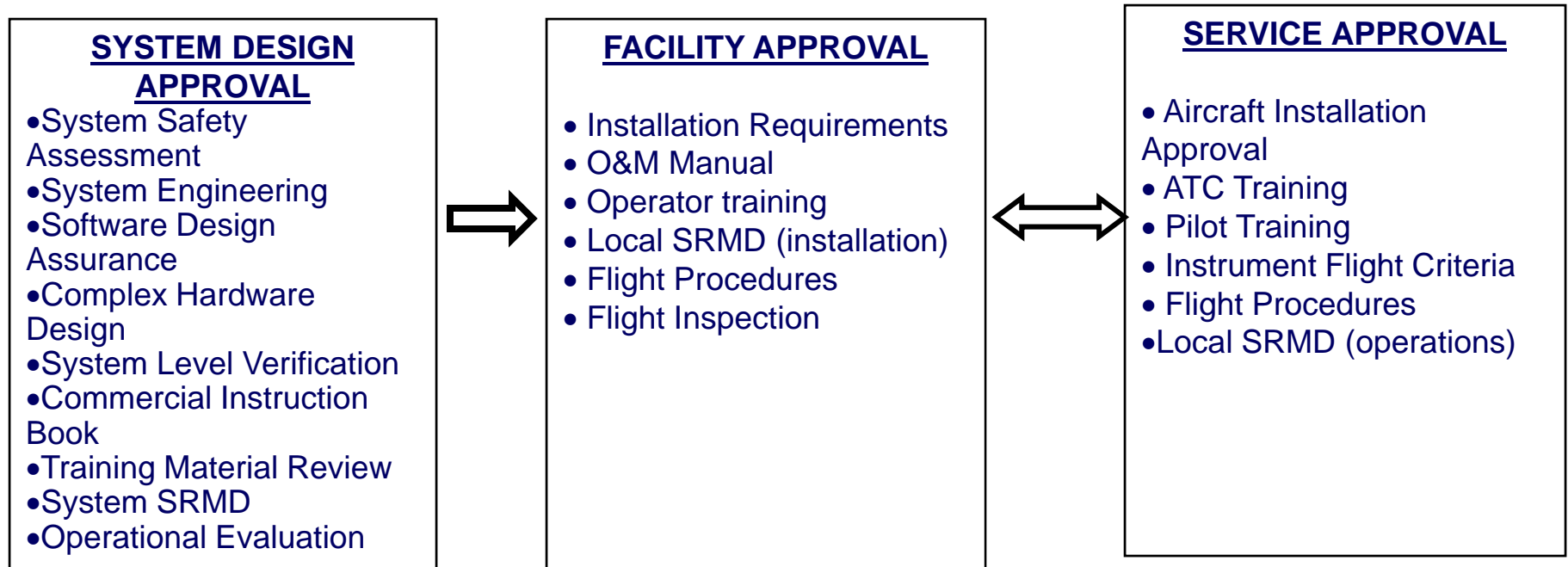


A 380 orders with GBAS option



GBAS CAT I Approval

- To be approved by FAA, system or equipment must be shown to meet ICAO, FAA and/or other (e.g. RTCA) recognized standard.
- The baseline for the FAA GBAS is the FAA GBAS Specification 2937a



Summary

- **GBAS system approval completed**
- **Effort continue to finalize facility and service approval for Memphis and Newark**
- **CAT II/III standards/evaluation through FAA Technical Center prototype**
- **CAT II/III FAA acquisition decision preparation**

