Presented to: Chinese Delegation Participants
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Presentation Overview

• LAAS Siting Background
  – Siting Working Group.
  – LAAS Object Consideration Areas (LOCAs) and Models.
  – LAAS Model Validation.

• LAAS Siting Evolution
  – Incorporation of updated capabilities and hardware testing.
  – Critical Areas vs Selective Masking.
  – Knowledge gained from the LAAS HMI working group.
  – Draft LAAS Order Creation June/2009

• LAAS Siting Efforts and Key Factors
  – Project Newark “Siting Plan” evaluation and example
  – Some important tangibles for LAAS siting
LAAS Siting Work Background - SWG

• LAAS Siting Working Group (SWG)
  – The SWG was a multi-organizational, multi-year effort, to identify and validate/verify LAAS specific siting criteria.

• The SWG roster consisted of (Legacy Org Names);
  – ASR-100 (Spectrum)
  – AAS-100 (Airport Engineering Division)
  – AND-710 (PO Navigation Systems Acquisition)
  – AND-720 (PO Navigation Systems Implementation)
  – ANI-90 (NAS Implementation)
  – AOP-21 (NAS In-service Management)
  – AVN-230 (Flight Inspection)
  – Ohio University
  – Oakland University
  – ACT-360 (Technical Center – LAAS Group)
Model and LOCA Development – OU SWG 1/02

Single Dominant Object Scenario

- VDB Clear Area will consist of cleared "corridors," since multipath interference is not limited by time-delay
Model Validation and LOCA Testing

Federal Aviation Administration
LAAS Ground Facility Siting Test Program

LGF Object Clearance Area (LOCA)
Test Case #4
Initial Provisional Model Validation Study

NEA - LOCA Model Validation Test Plan
(LOCA Penetration Case)
May 30, 2002
Author: Carmen Delgado
The FAA LAAS Siting Handbook 8/05

- The LAAS Ground Facility Siting Handbook was the venue chosen to document LAAS Siting knowledge in the absence of a Siting Order.

Figure 11: Guidance

Figure C3 VDB Coverage Volume
LAAS Siting Evolution and Efforts

• The LGF Siting Handbook needed updating and refinements
  - Incorporation of updated capabilities, and hardware testing.
  - Critical Areas vs Selective Masking.
  - BAE vs IMLA (DGPS Sensors / RRAs)
    - The RRA LOCA section was based on the IMLA.
    - New testing conducted for the BAE (Field/Chamber)
  - Incorporation of knowledge gained from the LAAS HMI working group, and other testing.
  - Despite Siting flexibility of a LGF, many “Key Factors” for successful LGF Siting are still required.
    - The Siting Order would include “Key Factors” up front.
    - The HI SLS-4000 Siting Plan had yet to be tested.
Draft LAAS Siting Order Creation June/2009

• FAA Approvers requested an FAA Siting Order for Non-Fed GBAS
  – Airports (AAS-100) was the primary organization that needed an order to clarify Airports responsibilities.

• Work to create a LAAS Category I (CAT I) Siting Order begins ~ in Spring ‘09.
  – The Order will aid players involved now, and will be used for future adaptation for CAT II/III.
  – Handbook content extracted and updated (i.e., LOCA dissection)
    • Utilized ILS Siting Order as a template.
  – Draft Order in review – 1st draft Spring 2009
Siting Order Content and Application

• Some Key Factors, and Considerations.
  – LAAS is not fixed by function, but…
  – Installed in an AOA / Security Area
  – VDBA < 3 nm radius from Desired Serviced Thresholds
  – RRA Centroid < 6 km from Decision Height Points
  – VDBA > 200* m from any Operational Aircraft Venues (*NTE)
  – No 3 RRAs can be collinear
  – RRA common object distance staggering, and PC height staggering (max 4m AGL)
  – VDBA Safety Area, and LOS to DHs
  – RRA separation > 100 meters
  – RRA and VDB LOCAs are well defined
  – Obstruction, and Keep Out Zones (Part 77, etc.)
  – Performance Evaluation, Site Selection Trade Offs
Remember the RRA LOCA when conceiving a layout

Objects beyond 155m, @ greater than 3 degrees elevation (on the LOCA Horizon) should also be masked.

Interior RRA LOCA
- RRA Distortion
- Protection Area - No Objects, Vegetation and Transients Restricted

Intermediate RRA LOCA
- Selective masking of objects. Coordinated transients.
- Infrequent transients below antenna base permissible.

Outer RRA LOCA
- Transients below antenna base permissible.
- Infrequent persistent transients OK.

Selective Masking of objects. Infrequent transients OK.

Drawing Not To Scale
Interaction of LOCA and Airport

Selective AZ/EL masking required

3° LOCA horizon

Transient Predictive AZ/EL Selective Masking Required for anticipated Taxiway traffic

RRAs heights staggered due to common "flat" surface (Taxiway) inside the LOCAs

Minimum 100 meter separation maintained.

RRA Distances from common multi-path object (fence) staggered.

LOCAs Intersections - may require RRA site companion AZ/EL masking

LAAS Shelter

VDB Outside of 200 meters from nearest aircraft venue (Taxiway)

Constrained siting example (not ideal). Drawing NOT to scale

LAAS Siting Order, and Siting Application for Newark
October 19th - 2010
Project Newark (EWR) Siting Example

• Satisfy 3 nm (VDBA) to Thresholds, and 6 km (RRAs) to DHs
Satisfy VDBA > 200 (Max) meters from aircraft.

Most of EWR’s AOA is excluded for VDBA.
Identify Several Sites for Performance Evaluation
Perform Data Collection and Evaluate Candidate Site(s) w/ Tradeoffs

- EWR “Site C” was convenient for infrastructure, but performance was dismal.

- EWR “Site B” performed well, but is in a tight “trafficy” area with construction restrictions.
Perform VDB Placement – “LOS Study”
The Winner, “Site E”

• Proved to be the least restrictive while satisfying all the “must-dos” in the Siting Order

• The VDBA site was not welcome in the green zone because of the 200 meter requirement (Max).

• Survey work on “Site E” began on 7/30/09.
IAH Category I GBAS Siting Constraints
IAH Category II/III (Proposed) GBAS Constraints
Future Work

• Incorporate FAA feedback into the Draft Siting Order, and prepare for publication.
• Continue to evaluate siting of the non-fed systems.
• Provide technical expertise in future LAAS Siting work and technical evolutions.
  – Pre-commissioning Flight Checks
  – Local Monitoring
  – Updating Requirements
Question or Comments

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