Joint Precision Approach And Landing System (JPALS)

FAA - European GBAS meeting

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Overview

- **Program Description**
  - **The need**
- **Accomplishments and Progress**
- **Present Day**
- **Schedule**
- **Way Ahead**

Capability Gap

- Today, no single precision approach and landing system meets DoD needs
  - Only 30% of Navy and 50% of Army aircraft have ILS
  - PAR is not suitable for most commercial carriers
- Legacy mobile systems have significant limitations
  - PAR
    - Size, age, transportability, sustainability challenges
  - MMLS
    - Navy and Army not MLS capable, footprint and transportability issues
  - Both systems too large for SOF
- Emerging shipboard operations cannot be met by any of the existing precision approach and landing systems

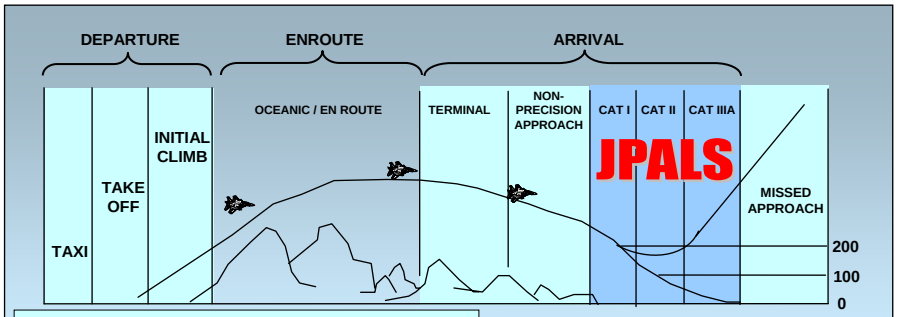
What JPALS Does For Us

- JPALS is the DoD's "single precision approach" solution
- Provide growth path to incorporate SARPS compliant SPS correction signals
  - Military avionics will be able to use civil GBAS signal
  - JPALS fixed-based and tactical systems will be able to broadcast SARPS compliant SPS corrections
- Growth path to increased capability beyond core function of precision approach
  - Currently exploring uses beyond straight-in precision approach

MNS / Phases of Flight

JROC validated Mission Need Statement, Aug 95

"…a rapidly deployable, adverse weather, adverse terrain, survivable, maintainable, and interoperable precision approach and landing system (on land and at sea) that supports the warfighter when ceiling and visibility are limiting factors…"



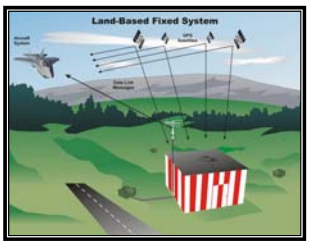
Note: Taxi, departure, missed and complex approaches and holding are all supported by JPALS, but not core requirements. Not all operations available in all mission environments.

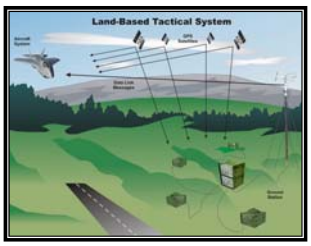
Category (CAT) I - 200 FT DH & 1/2 Mile Vis
CAT II - 100 FT DH & 1/4 Mile Vis
CAT IIIA - 0 FT DH & 700 FT Vis

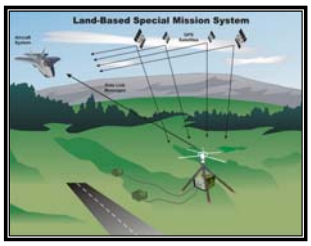
Operational Environments

Land-Based JPALS

- Land-based JPALS uses local area differential GPS (LDGPS) to provide a PALS capability for fixed, tactical and special mission operations.
- The aircraft system receives data link messages from the ground station containing GPS range corrections and runway data. This data is then used to derive a differentially corrected navigation solution.
- Enabling technologies
  - Differential Global Positioning System (GPS) with advanced anti-jam
  - Military differential GPS accuracy and integrity solutions
  - Tactical VHF data link – with Info Assurance attributes for combat operations



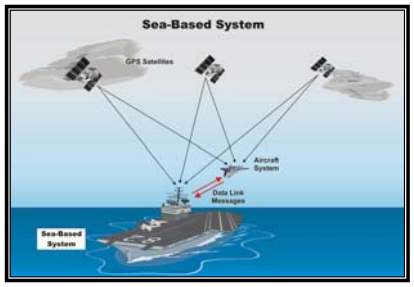




Sea-Based JPALS

- Sea-based JPALS uses shipboard relative differential GPS (SRGPS) combined with an Inertial Navigation System solution to provide a PALS capability.
- Ship and aircraft, through a two-way data link, calculate a highly accurate relative solution as a means to remove common GPS errors.
- Enabling technologies
  - Differential Global Positioning System (GPS) with advanced anti-jam
  - Inertial Navigation System (INS)
  - Low Probability of Intercept/Detection (LPI/LPD) 2-way data link network

Core capability for CVN-21



JPALS TD Accomplishments

- Conducted shipboard test of SRGPS aboard the USS Roosevelt (CVN 71) accomplishing 10 fully auto-coupled landings in Apr 01.
- Holloman AFB, NM (twice)

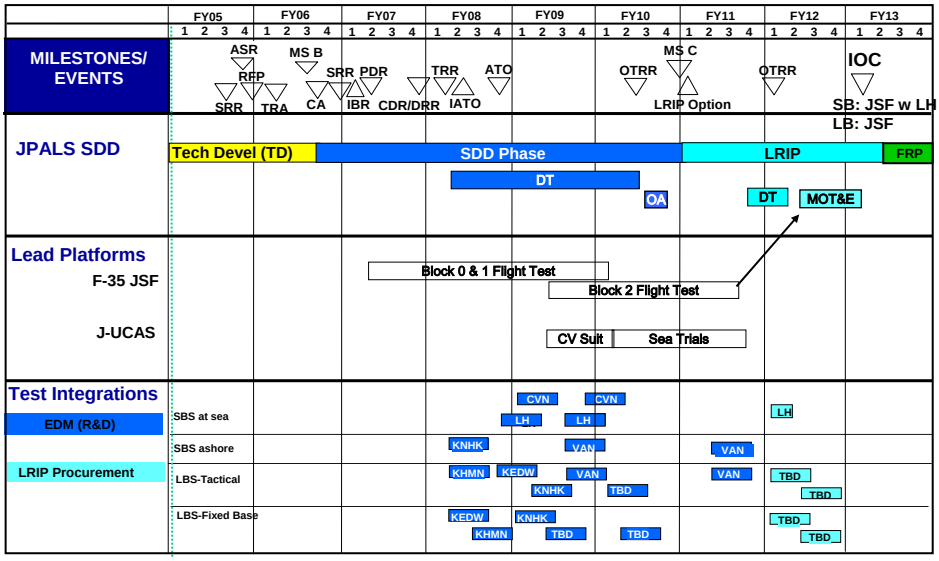
  Aug 01

  Apr 04
- Flew LAAS avionics (FedEx 727) against the JPALS ground station to perform 10 auto-coupled landings (Aug 01).
- Pegasus X-47A Naval UCAV demonstrator first flight in Feb 03 achieved 4 inch GPS error on landing

Current JPALS Activities

- Mitigate technical risks to achieve precision approach guidance quality and availability
- Develop system requirements and architecture
- Technical maturation of:
  - Differential/Navigation Processing
  - Integrity Design
  - Multipath Mitigation
  - Anti-Jam Technologies
  - Data Link
  - Air/Ship Integration
- Use modeling and simulation (M&S), hardware in the loop (HITL) lab testing, and open air flight tests in jamming, to validate requirements and architecture
- Coordination with JSF and J-UCAS JPOs and contractors
- Evaluate incorporating JPALS capability into the military Embedded GPS/Inertial (EGI) system

JPALS High-Level Schedule



Summary

- JPALS 'Way Ahead' is:
  - Making steady technical progress
  - Develop surface, airborne and signal in space specifications
  - Work with platform program offices for smooth integration
  - Program Leadership change at Milestone B decision point

Services committed to development of Joint Precision Approach & Landing System

Questions?