FAA APNT Update

Federal Aviation Administration

Presented by: Deborah Lawrence, FAA Manager of Navigation Programs

Presented to: Munich Satellite Navigation Summit

Date: March 2015

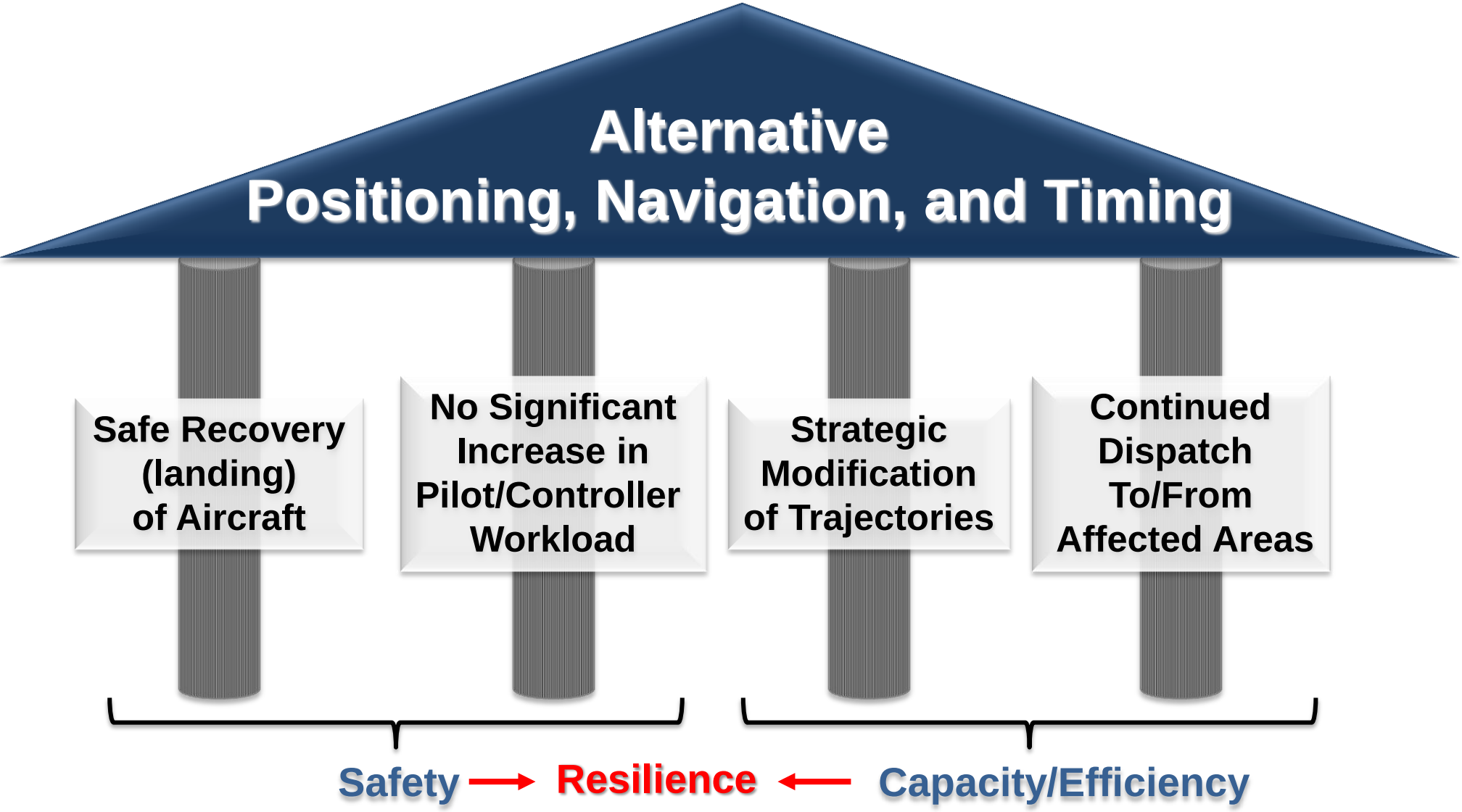
Topics

- APNT Overview
- Scoping Background
- Re-Scoping Status
- Updated Timeline

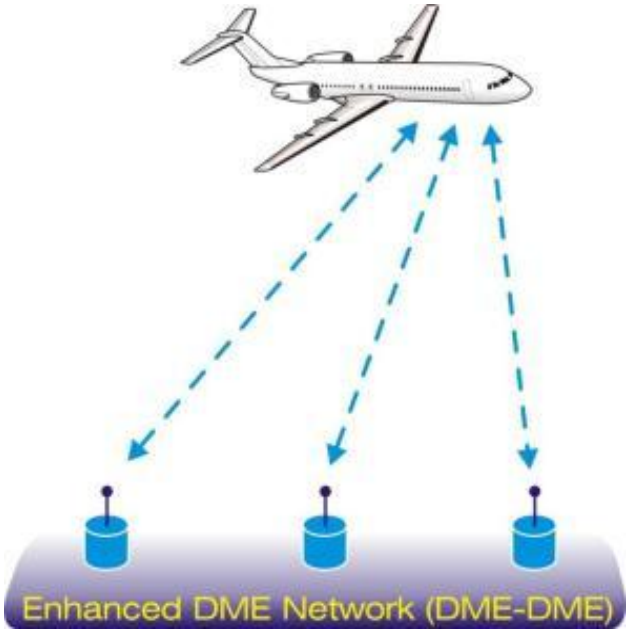
APNT Overview

- **Program Description**
  - FAA APNT project investigating alternatives for providing higher precision back-up for GPS-based PNT services. GPS PNT services are the enablers of performance-based navigation (PBN) and Automatic Dependent Surveillance Broadcast (ADS-B) services that, in turn, enable Trajectory-Based Operations (TBO), area navigation (RNAV), Required Navigation Performance (RNP), and other NextGen improvements.
  - The FAA currently relies on existing legacy systems for GPS alternative navigation which does not fully support RNAV, RNP, or TBO.
- **Primary Benefits**
  - Provides a backup to GPS in the event of a GPS interference event or outage
  - Leverages existing infrastructure
  - Safe recovery of aircraft (landing)
  - No significant increase in pilot/controller workload
  - Strategic Modifications of trajectories
  - Continued dispatch To/From affected area(s)

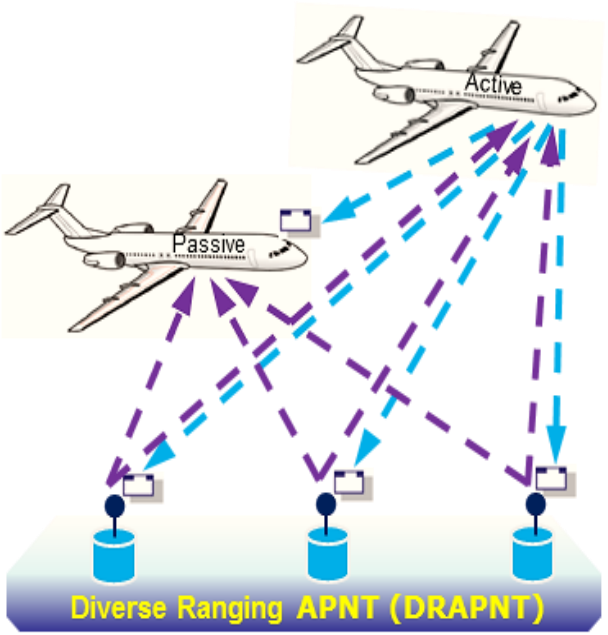
APNT Overview



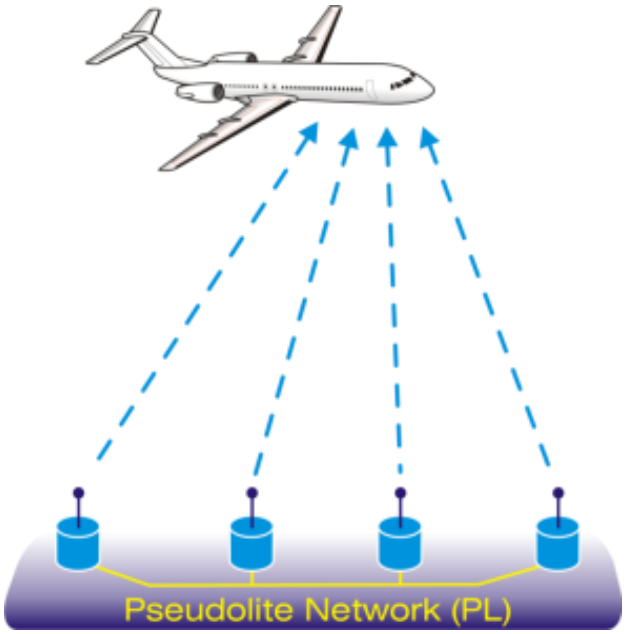
Original Target of Technology



- Leverages Existing DME/DME Technology
- Evaluating means to support both Inertial Reference Unit (IRU) and non-IRU aircraft
- RNAV Today; Impacts to Avionics to realize RNP



- Uses Ground and Aircraft-based emitters for coverage
- Leverages Planned and Existing Automate Dependent Surveillance-Broadcast (ADS-B) Technology and Air/Ground Infrastructure
- Provides precise time to aircraft
- Impact to Avionics



- Leverages DME/Ground Based Transmitter Infrastructure
- Leverages Planned and Existing Automate Dependent Surveillance-Broadcast (ADS-B) Technology and Air/Ground Infrastructure
- Provides precise time to aircraft
- Impact to Avionics

APNT Scoping Background (Original Proposal)

- **Maintain the four pillars of APNT**
  - Safe recovery (landing) of aircraft
  - No significant increase in pilot/controller workload
  - Strategic modification of trajectories to avoid areas of interference
  - Continued dispatch to/from affected areas
- **Targeted Objective – support 80% - 90% of commercial aviation operations**
  - FL 240* and above: RNAV 2
  - Class B airspace: RNAV 1
  - Transition from class B to FL 240*: RNAV 2

*Note: Coverage Requirements are evaluated on Mean Sea Level Altitudes (MSL) and not Flight Levels

APNT Scoping Background (Original Proposal)

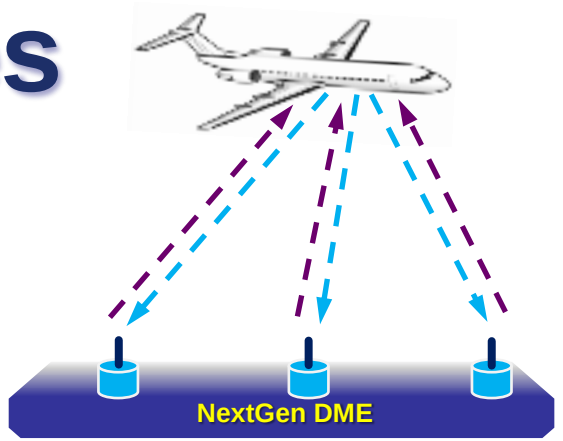
Near Term Objectives

- Coverage zones for Class B And Core 30 Airports, and at FL 240 and Above En Route
- No Avionics Change
- RNAV Only
- No Critical DMEs
- IRU Required
- TSE At 1NM Without Monitor And Alert
- No Support To ADS-B
- Separation standards: 5 NM en route, 3 NM in the terminal area

Far Term Objectives

- Expand Coverage
- Avionics Change Required
- Monitor And Alerting (Dynamic RNP CONOPS (Datalink RNP values on a leg-by-leg basis (scalable RNP), Radius to Fix (RF) Legs and Fixed Radius Transitions (FRT), and reduced lateral separation)
- Provide Position Source For ADS-B
- Provide Timing Synchronization With Ground
- Enable further reduction of legacy NAVAID infrastructure

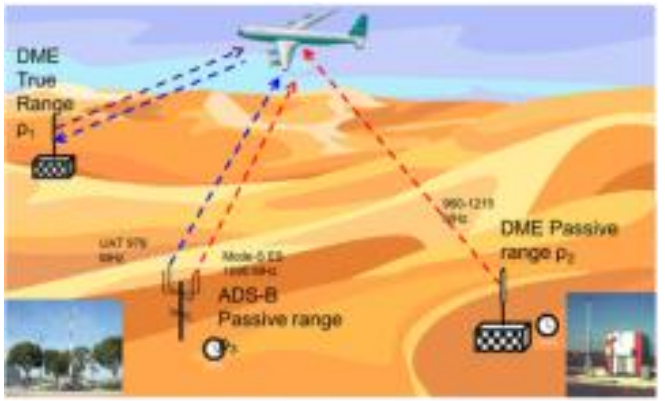
Re-scoping Alternatives



- **Near Term Objectives**
  - NextGen DME
    - Reconfigure Network
    - Deploy Enroute DMEs
    - Deploy Terminal DMEs for Core 30/Class B/Other High Volume Terminal Areas
    - Potential DME Reduction Of 30%
    - Supports Commercial Operations
      - Except RAA Community Until Aircraft Equip With IRUs
  - Continue Research And Development To Support Targeted Objectives
    - Messaging Capability: Pseudolite/Time & Distribution/Authentication
    - Incorporate ADS-B In Capability As A Means Of Providing Ranging Data (Not Actual Position) To Aircraft

Re-scoping Alternatives (con't)

- **Far Term Objectives (increase accuracy and integrity)**
  - Enhanced DME (eDME)
    - Supports Commercial Operations
      - Except RAA Community Until Aircraft Equip With IRUs
      - RNAV And RNP Operations
    - Precise Time Distribution



  - Hybrid (DME/ADS-B)
    - Supports Position Source For ADS-B
    - Highest Performance Of All Alternatives
    - Supports All Commercial And GA Operations

APNT Re-scoping Status

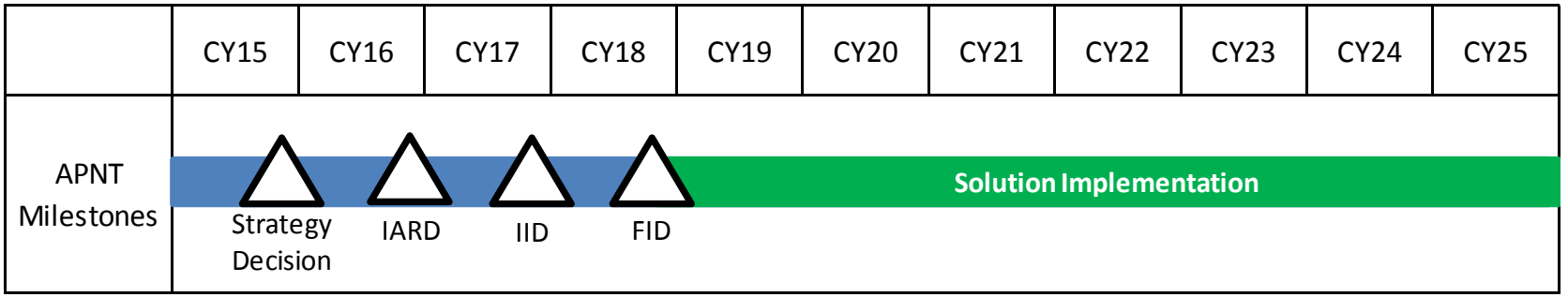
- **Engage internal and external stakeholders to define minimum navigation operational service levels during a GPS outage**
  - Technical/Risk assessment driven
  - Leverages work/analyses completed to date
  - Operational service levels will drive Acquisition Management System artifacts
    - Shortfall Analysis, updated ConOps, operational requirements
- **Align with FAA's enterprise strategies**
  - Navigation Strategy, PBN Strategy, etc.

APNT Re-scoping Status

- **Define Service levels objectives**
  - Scenario based approach by event type (i.e., scheduled, accidental, deliberate)
    Example – Deliberate interference event occurs in a Terminal environment
    - » Assumptions (e.g., Specific coverage's (nm) and varied durations)
    - » Asses impacts to efficiency and capacity
  - Define minimum operational service levels objectives
- **Coordinate and socialize results externally**
  - TOC, PARC, RTCA, AOPA, ALPA, etc.
- **Update APNT Documents**
  - Shortfall Analysis, Con Ops, etc.
- **Develop Operational Requirements**
  - Conduct functional analysis
  - Derive/validate operational requirements
  - Update APNT preliminary Requirements Document

Updated Timeline

- **<u>New</u> AMS Decision Point dates per approved Enterprise Architecture Roadmap, Version 9.0, January 2015**
  - APNT Strategy Decision (<u>new milestone</u>) in Dec. 2015
  - Investment Analysis Readiness Decision (IARD) originally Dec. 2015, amended to Dec. 2016
  - Initial Investment Decision (IID) originally Dec. 2016, amended to Dec. 2017
  - Final Investment Decision (FID) originally Dec. 2017, amended to Dec. 2018



Questions