Flight Technologies and Procedures Division
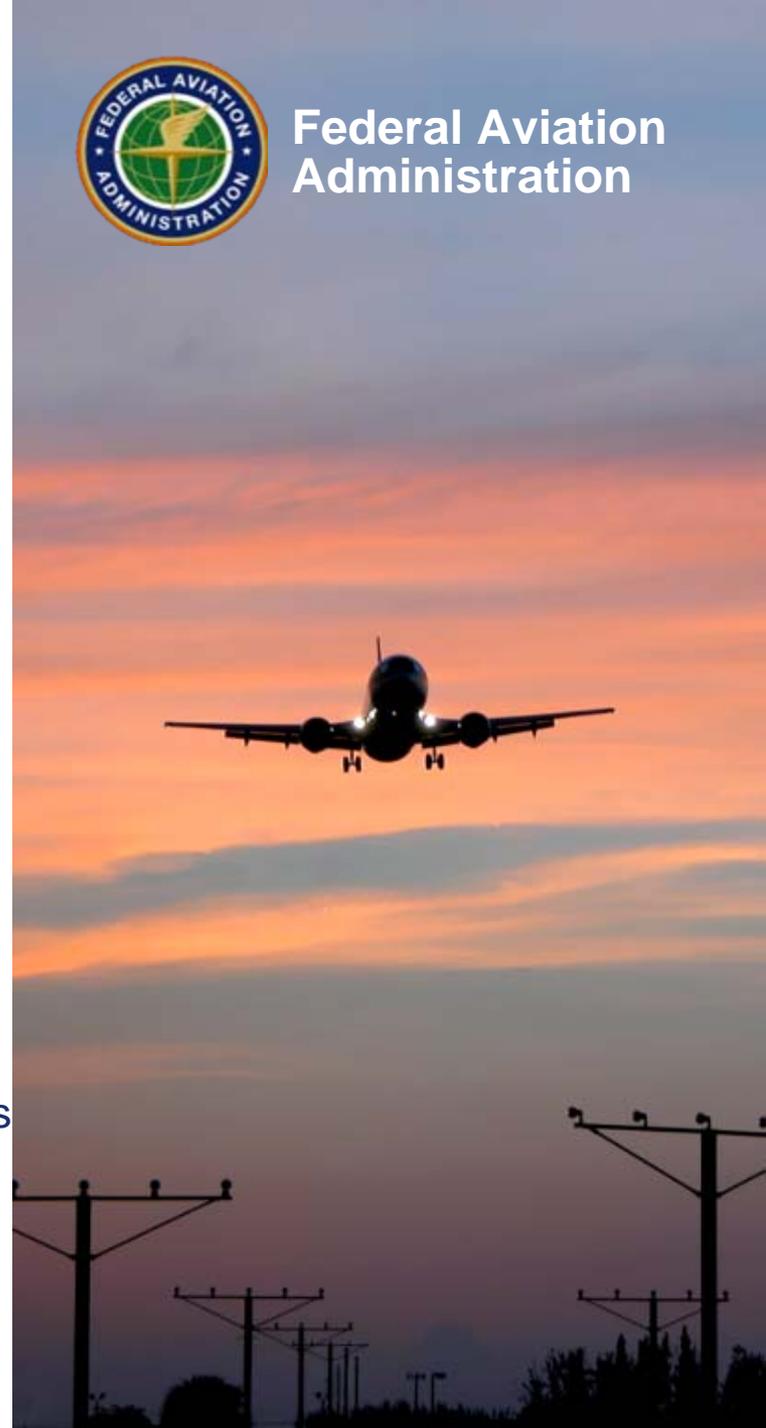
Performance-Based Navigation Update

Presented to: New Technology Workshop

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Performance-Based Flight Systems
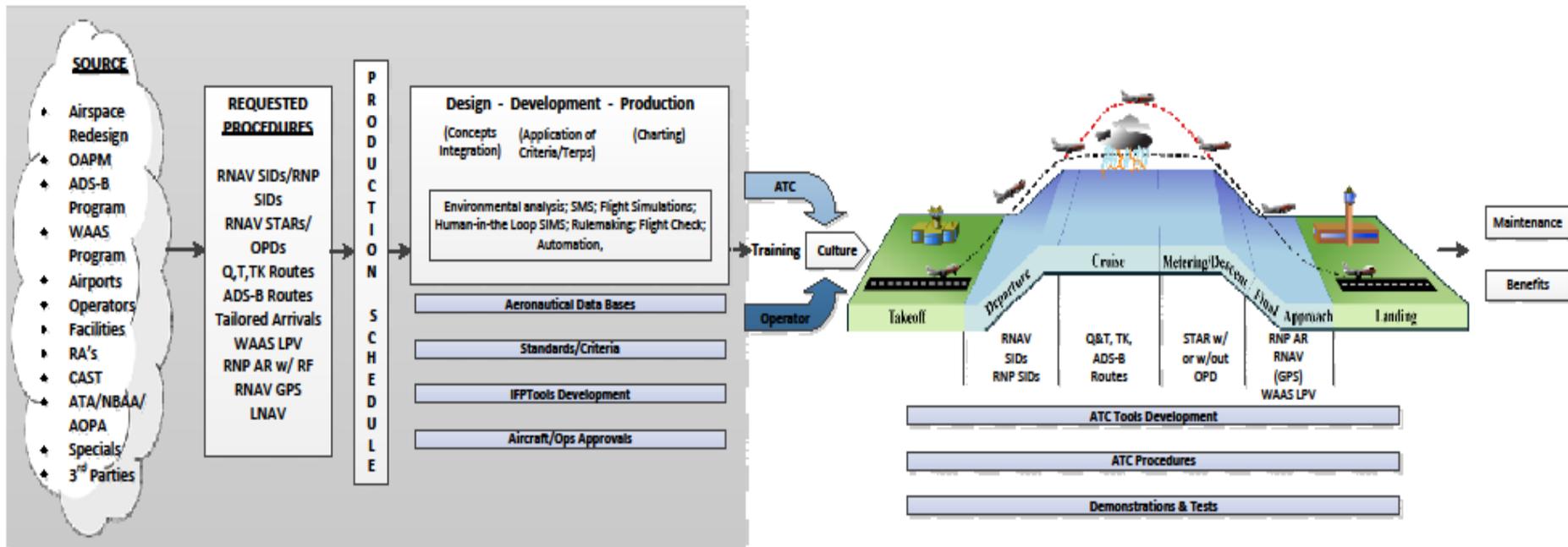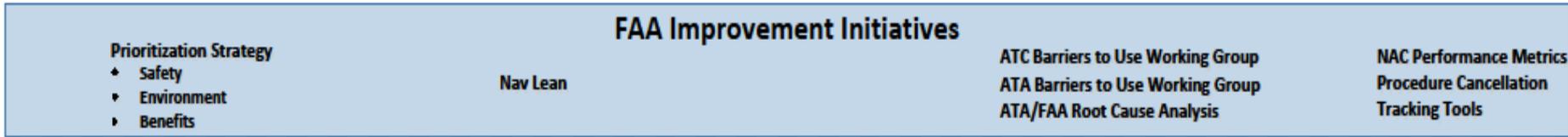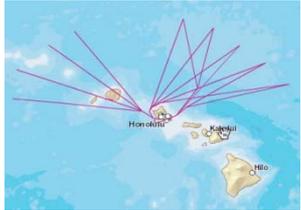Branch

Date: June 6, 2012

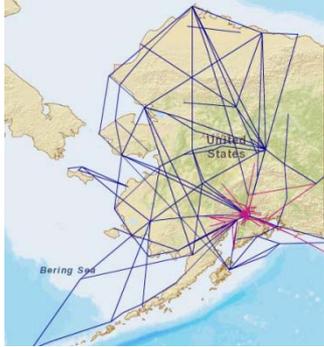# Overview

- **Current Status**

- **Update on Operator Approvals**

- **Guidance Materials**

Performance-Based Navigation

Current Status of PBN Routes and Procedures in the U.S. National Airspace System

• PBN Inventory: 408 SIDs; 367 STARs; 305 RNP ARs; 296 RNAV routes (includes 82 Enroute (Q), 73 Low Altitude (T), and 2 Helicopter (TK)

• Over 9,000 LPVs, LNAV/VNAV, and GPS procedures

RNAV 1 and RNP AR Authorization Status

- **838 U.S. operators and 90 foreign air carriers with RNAV 1 departure and arrival procedure authorization**

- **Approximately 2,300 aircraft associated with RNP AR approvals**

RNAV 1 and RNP AR Authorization Status

- **11 airlines (including 2 foreign air carriers) have been approved for RNP AR operations in the U.S.**
  - Airbus A-320
  - Boeing B-737NG, 757, 767, and 777
  - Bombardier Q-400
  - Embraer E-170/190

- **22 corporate, charter, and fractional operators**
  - Gulfstream G-350/450/500/550
  - B-737NG and B-777

Upcoming Efforts for PBN

- **Near-term**
  - Continue updates to FAA Advisory Circulars (ACs), inspector guidance, and other relevant standards/criteria
  - Greater use of radius-to-fix (RF) curved paths outside of RNP Authorization Required (AR) procedures
  - RNP AR departure procedures

Upcoming Efforts for PBN

- **Late Mid-term**
  - "Advanced RNP" which will take advantage of modern aircraft capabilities but require less "overhead" than RNP AR

Questions?

Aviation Safety (AVS) Guidance Materials

Performance Based Navigation (PBN)

New

ICAO Navigation Specification (from Doc 9613 PBN Manual)		Ops/Airworthiness and *Procedure Design*[1] (Additional guidance may also apply in the form of ACs, TSOs, etc.)	Planned Updates in FY12 and FY13 (not including updates to Order 8900.1 and OpsSpecs/MSpecs/LOAs)
Nav Spec / Attachment	**Flight Phase(s)**		
RNP APCH [to LNAV/VNAV, LNAV, LP, and LPV lines of minima]	Approach	AC 90-105 Note 2: Basic-RNP 1 designated as RNP 1 in United States Order 8260.54A	AC 90-105A • Advanced RNP (Scaleable RNP + Baro-VNAV + current and additional advanced features) • RNP 0.3 (Helicopter) • RNP 2 • Additional "advanced features" –RNAV holding, lateral offset, TOAC/RTA, and fixed radius transitions • Baro-VNAV +- 75' (optional?)
Baro-VNAV [Attachment]	Approach		
Radius-to-Fix (RF)[2] [Proposed Attachment]	Departure, Arrival, and Approach (except final and 1st segment of MA)	AC 90-107 (for LPV and LP) Order 8260.54A	
Basic-RNP 1	Departure and Arrival		
Advanced-RNP 1* [Renamed as Advanced RNP]	Departure, En Route, Arrival, and Approach (except MA)		AC 90-107 (for LPV and LP) • PinS-HLPV Update Order 8260.PBN • Scaleable accuracy • RNP 0.3 • RNP 2 • RNAV Holding Update • FRT • PinS/HLPV
RNP 0.3* [May be helicopter specific]	Departure, En Route (limited or not at all), Arrival, and MA		
RNP 2*	En Route (Primarily Remote or Continental)		
RNP AR APCH [RNP AR Departures]	Approach (Departure and Arrival TBD)	AC 90-101A Order 8260.52	AC 90-101B For RNP AR Departures Order 8260.PBN
RNAV 1 and RNAV 2	Departure, En Route, and Arrival	AC 90-100A Order 8260.44 (for Departure, Arrival TBD) Order 8260.3 (for En Route)	AC 90-100 Chg 1 (or -100B) - RAIM updates, Gulf Q-route changes, and Tailored Arrivals Order 8260.44 Order 8260.PBN
RNAV 5	En Route (N/A for U.S.)	AC 90-96A N/A	N/A N/A
RNP 4	Oceanic/Remote	Order 8400.33 N/A	TBD - NAT N/A
RNAV 10 [Designated as RNP 10]	Oceanic/Remote	Order 8400.12B N/A	TBD –WATRS, GOMEX, and NP/CP N/A

*Draft

[1] Orders 8260.19 and 8260.46 also apply
[2] Associated with RNP APCH (optional capability and outside final), RNP 1 (optional capability), RNP 0.3 (optional capability), and Advanced-RNP (required capability)