

Very High Frequency Omni-directional Range (VOR) Minimum Operational Network (MON) Implementation Program Status Update

Presented to: Aeronautical Charting Forum

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Federal Aviation
Administration



Agenda

- **Background**
- **Program Status**
- **Actions Required**
- **Notional Timeline**
- **Challenges**
- **Next Steps**
- **Summary**



Background

- **The FAA will transition from VOR-defined route structures as the primary means of navigation to Performance-Based Navigation (PBN)**
 - PBN uses Area Navigation (RNAV) and Required Navigation Performance (RNP)
 - PBN provides an opportunity to reduce the aging infrastructure
- **The FAA currently has ~967 federally-owned and operated VORs (including VORTACs and VOR/DMEs)**
 - Most are 30+ years old
 - Estimated \$1 billion to replace
- **The objective of the VOR MON Program is to reduce the number of VORs in the NAS by 50%, while retaining the capability for a safe landing in case of a GPS outage (under IFR or proceeding VMC)**
 - Retains limited capability for navigation without GPS (e.g., through an outage)



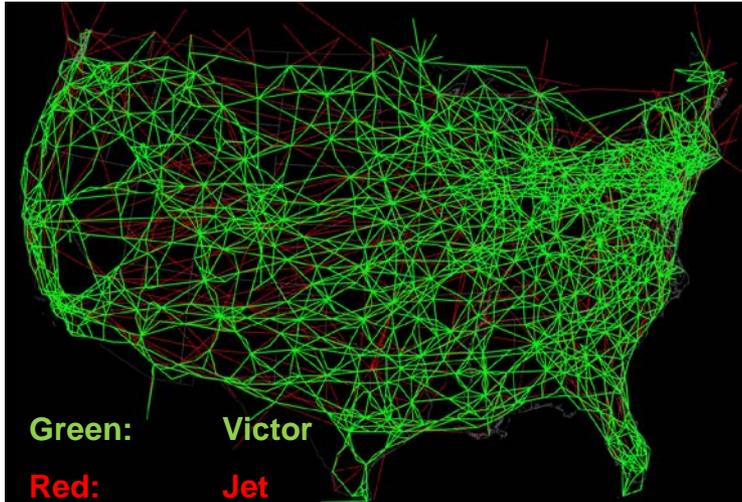
Background Continued

- **VORs in Western Mountain Area, Alaska, Islands and Territories, and international Atlantic/Pacific arrival routes will be retained**
- **VORs must give way to a more efficient means of air navigation**
 - Objective is to provide improved accuracy, availability, integrity, and continuity to support PBN

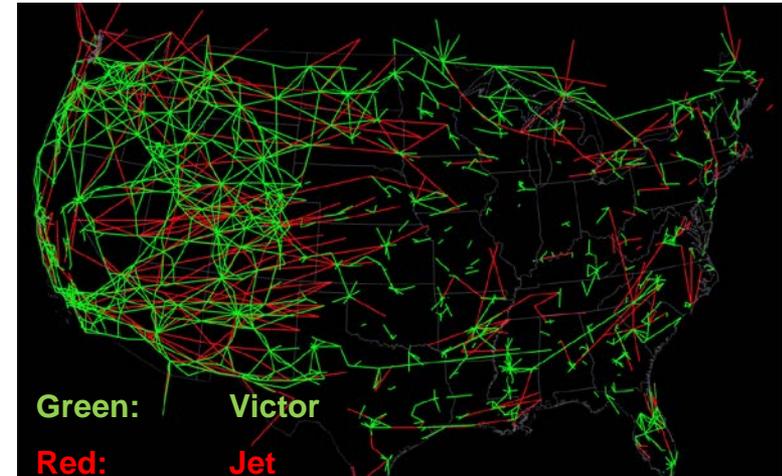


VORS

TODAY



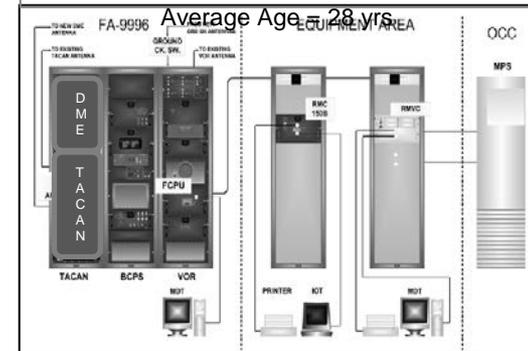
VOR MON



VOR in VORTAC / TACAN TACR Configuration

2nd Generation 534

Average Age: 28 yrs



VOR MON Implementation Program
October 30, 2013



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Actions Required

- **Extend service volume coverage from 40nm to 77nm for remaining VORs**
 - Conduct spectrum engineering analysis (projected to take a year)
 - Synchronize VOR modification and flight check to MON waterfall
- **Finalize Discontinuance list**
 - Establish National VOR Discontinuance Policy and Strategy
- **Safety Risk Management Assessment (SRM, SRMD)**
- **Analyze and relocate HIWAS, ATIS, and RCO service dependencies to other VORs**
- **Rule-making**
 - Complete Part 97 rule-making
- **Address maintenance concept and Update the ILSP**
 - 2nd Level Engineering tasking

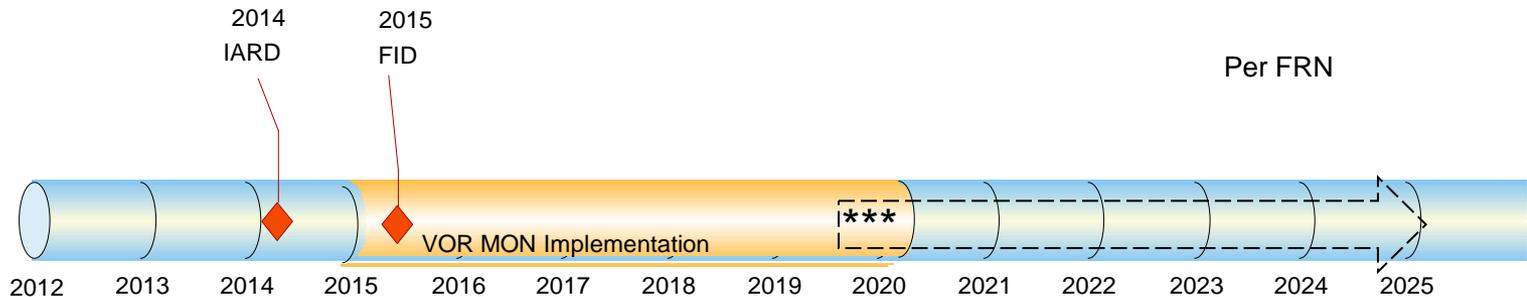
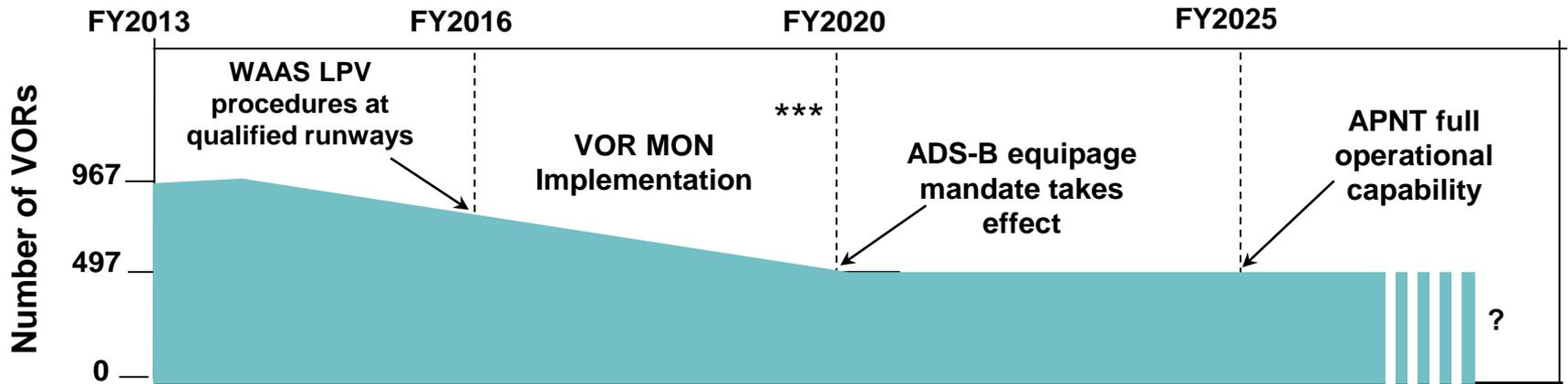
Actions Required (Continued)

- **Determine impact to procedures and routes**
 - Assess current procedures and route dependency's based on National Route Plan
 - High Altitude Route Structure (Jet Routes)
 - Low Altitude Route Structure (Victor Airways, Conventional Fixes)
 - Instrument Approach Procedures
 - Complete environmental assessment if required
 - Conduct flight inspections
 - Update aeronautical and automation charts
 - Other Issues
 - Advisory Services and General Charting
 - Relocate, decommission, or retain associated facilities (TACAN, DME,...etc.)

Program Status

- **Investment Analysis Readiness (IARD) CY 2014, Q1**
- **Final Investment Decision (FID) planned for CY 2015, Q1**
- **Final Draft VOR MON list provided to the Department of Defense (DoD) and Tactical Operations Committee (TOC)**
 - Analyzing the initial inputs from DoD
- **Analyzing the TACAN list feedback received from DoD**

Notional Timeline



*** Detailed discontinuance plan needs to be worked, the end date will be changed accordingly

VOR MON Program Challenges

- **Integrated Strategy – Competing Priorities**
 - Performance - Based Navigation (PBN) Coordination
 - Procedure/Route Redesign
 - Rulemaking
 - Airspace Redesign
 - Optimization of Airspace and Procedures in the Metroplex (OAPM)
- **Coordination with all internal FAA stakeholders**

VOR MON Program Challenges Continued



Next Steps

- **Continue Working IARD Artifacts**
- **Continue Analyzing the Initial Inputs Received from DoD**
- **Stakeholder Briefings Planned**
 - IATA, ALPA, NBAA, AAAE



Summary

- **The FAA will transition from a VOR-defined route structures as the primary means of navigation to Performance-Based Navigation (PBN)**
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Backup Slides



Criteria for Selecting VORs for the MON

- **General**

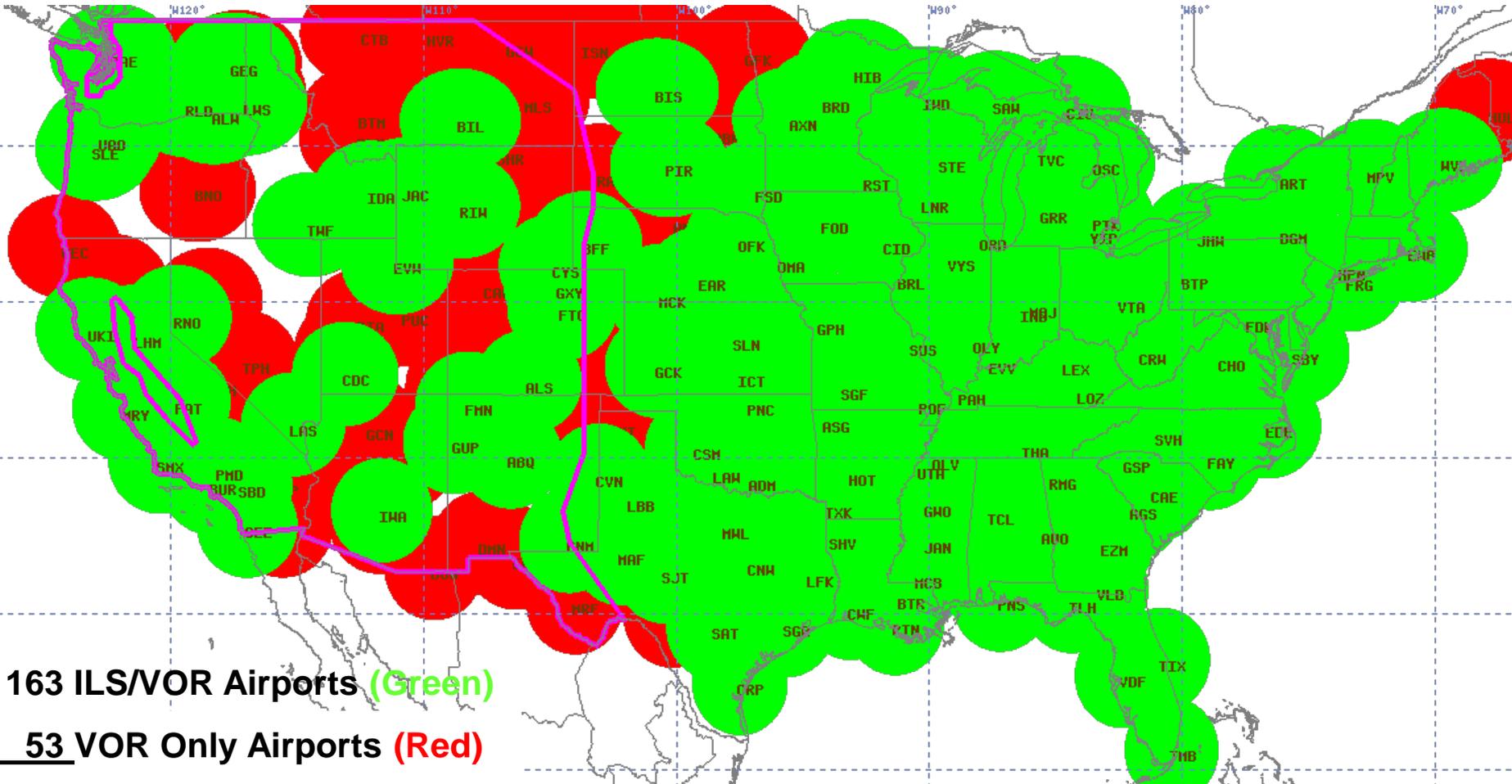
- Retain VORs outside of CONUS
- Only FAA owned/operated VORs will be considered
- DMEs and TACANS will generally be retained (and/or enhanced)
 - If VOR service is removed from a site, any DME or TACAN at the site would, in general, be retained

- **Coverage for Approaches and Landings**

- Retain sufficient VOR ground stations to enable aircraft to proceed safely to another VOR or to a suitable destination with a GPS-independent approach (ILS, LOC or VOR) within 100 NM of any location within CONUS
- Retain VORs to support international arrival airways from the Atlantic, Pacific, the Caribbean, and at the Core 30 airports

Notional MON Airports

Coverage for Approaches and Landings



- 163 ILS/VOR Airports (Green)

- 53 VOR Only Airports (Red)

- 216 airports provide an ILS or VOR approach within 100nm of any location in CONUS

Criteria for Selecting VORs for the MON (cont.)

- **Enroute Coverage**

- Retain most VORs in designated mountainous areas to maintain adequate coverage during a GPS outage
- Provide seamless coverage at and above 5000ft AGL
- Support VOR-to-VOR navigation capability (VOR service volume becomes 77 nmi radius at 5000 ft AGL)



Notional VOR MON at 5000 ft AGL

En route Coverage

