

Aircraft Working Group NextGen Avionics Evolution

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iCNS, Bethesda

Jeff Duven, Dave Nakamura, Frank Alexander, Steve Van Trees
JPDO Aircraft Working Group



Aircraft Working Group Overview

- The Mission of the Aircraft Working Group is to address all aircraft research, design, integration, certification, operation and support issues needed to achieve the NextGen vision.
- Scope of activities ---
 - Initiatives to provide capacity, efficiency, safety, security and environmental advances to support JPDO
 - All vehicle types & vehicle systems (present & future)
 - Operational, maintenance, certification & manufacturing considerations
 - Refinement of existing Operational Improvements with special consideration given to integration issues
 - Equipage issues (retrofit and future fit)
 - Related Research and Development issues
 - Vehicle related policy & regulatory issues
 - ...



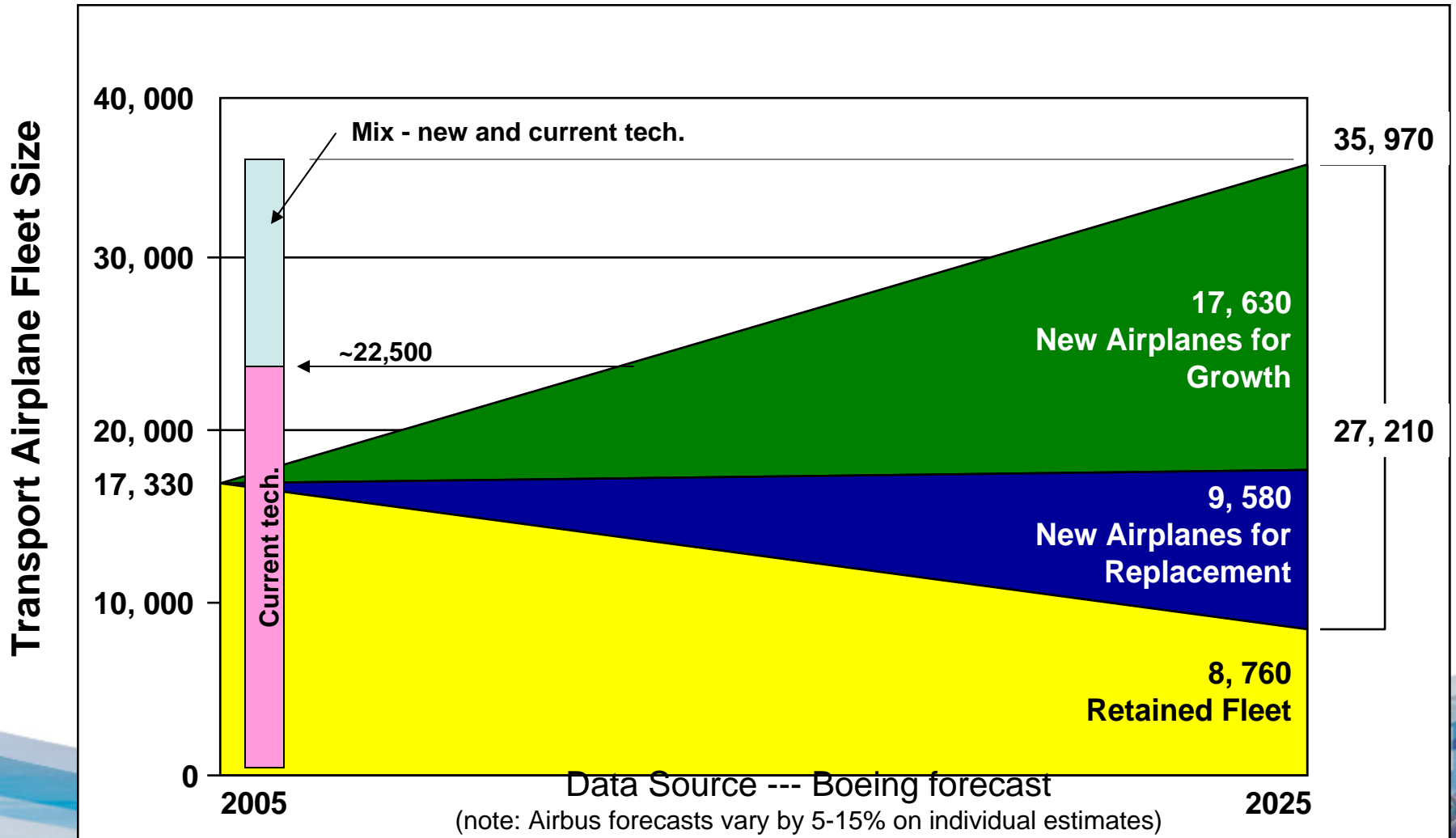
Aircraft Working Group 2008 Work Plan

- Primary objective for FY2008 --- develop Avionics Road Map
 - Key to developing consensus on direction, priority and early funding (industry & gov.) to achieve NextGen
 - Important input for OMB discussions and planning
 - Supports 2008 JPDO wide objective (maturing IWP)
 - Responsive to industry and agency comments
 - Results will be captured in fall 2008 IWP revision
 - Supports Global Harmonization efforts
 - Work with individual authorities
 - ICAO forum on NextGen/SESAR integration – Sept. 2008
- Non-avionics tasks included in 2008 work plan, although with lower priority



Aircraft Working Group 2008 Work Plan

Transport Fleet Evolution - Example



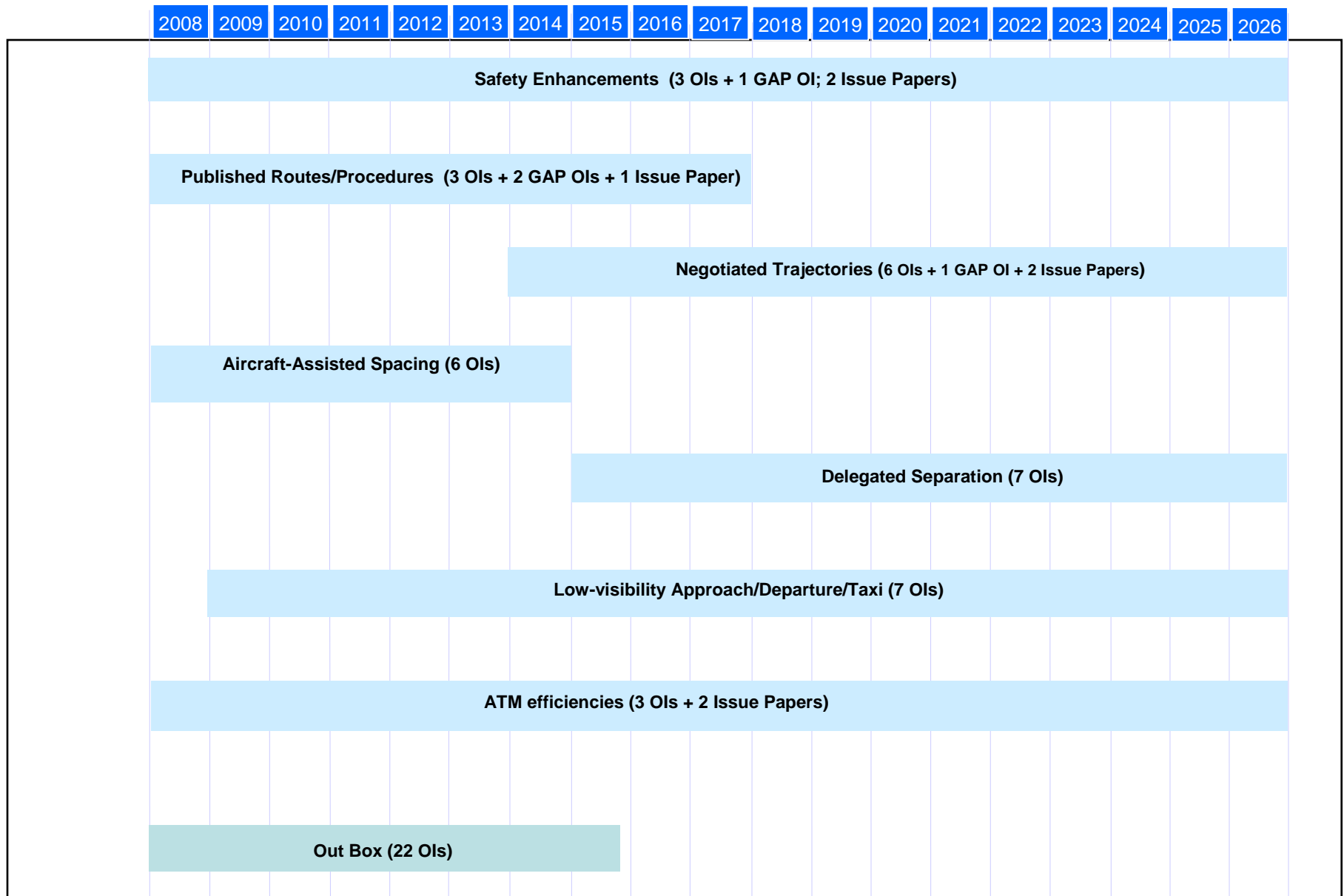
Key to Success --- Aligning NextGen Related Efforts to Enable Future Operations

- NextGen Integrated Plan (Operational Needs)
- NextGen ConOps and Enterprise Architecture
- NextGen Integrated Work Plan
 - Operational & performance requirements drive equipage
 - Aircraft operational improvements clearly captured in IWP
 - Avionics Road Map will reference other relevant road maps
 - Annotate any needed road map changes to support NextGen
- FAA Operational Evolution Partnership
- FAA Aircraft Enterprise Architecture
 - Enabling ATO policies and procedures
- FAA AVS enabling policy
- Aircraft/system implementation
 - Cost/benefit analysis

Continuity ... & increased specificity



Chapter 2 Aircraft-centric Capability Groups (57 Legacy OIs)



Capability Group 5: Delegated Separation

CORE Capability

2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026

V1.0 OI #14

Delegated Separation for Specific Operations

- OI-0313 Virtual Towers – Level 1 Sequencing, Separation, and Spacing
- OI-0315 Virtual Towers – Level 2 Sequencing, Separation, Spacing, and Surface Management
- OI-0337 Flow Corridors – Level 1 Static
- OI-0356 Delegated Separation – Pairwise Mergers
- OI-0359 Delegated Separation – Oceanic

Proposed IWP v1.0 OIs

V1.0 OI #15

Delegated Separation for Complex Procedures

- OI-0368 Flow Corridors – Level 2 Dynamic
- OI-0363 Delegated Separation – Complex procedures
- OI-XXXX Sample OI with Issue Paper Required

Legacy OIs, Gaps & Issue Papers

- GAP-XX Sample GAP OI
- GAP-XX Sample GAP OI with Issue Paper

Functional Capabilities

Surv: ADS-B (Out, In, TIS-B, CDTI), Onboard Conflict Detection & Alerting, Self Separation, Merging and Sequencing

Nav: RNP, RNAV

FMS: Sequencing and Spacing Calculations and Commands, ^{4DT}

TCAS: Improvements

Enablers

'Gap' OI

Issue paper required

'Gap' OI with issue paper required

SAMPLE

Capability Group 1: Safety Enhancements/Hazard Avoidance & Mitigation



2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026

Midterm: 2012-2018

Natural Hazards V1.0 OI #01

1-001 Terrain Awareness and Warning

OI -3010 Reduced Controlled Flight into terrain

Aircraft-based alternatives: SVS, EVS, Trajectory-based TAWS, Terrain Awareness Moving Maps,
Ground-based alternatives: Future ground-based system (air/ground safety net, enhanced MSAW ??),

1-002 Weather Avoidance

1-003 Convective Weather Penetration

Man-Made Hazards V1.0 OI #02

1-004 Obstacle Avoidance

1-005 Airborne Collision Avoidance

1-006 Surface Alerts

OI-0332 Ground-based and On-board Runway Incursion Alerting Equipment

1-007 Flight Envelope Protection

OI-3002 Improved Aircraft Upset Prevention and Recovery

1-008 Airspace Avoidance

1-009 Wake Avoidance & Mitigation



Capability Group 2: Publish Routes and Procedures

2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026

Midterm: 2012-2018

RNP Approaches, SIDs and STARs

2-001 Reduced Separation < 3nm IN TMA

OI-0348 Reduced Separation – High Density Terminal, Less Than 3 Miles

2-002 Integrated Arrival/Departure Airspace Management

OEP / Hi Density: Integrated Arrival/Departure Airspace Management [2012-2017] RNAV-1, RNP-x

2-003 Metering, Merging and Sequencing Using RNP and RNAV Routing Assignments

OI-0311 Enhanced Arrival/Departure Routing and Access

OEP / Hi Density: Time Based Metering with RNAV/RNP [2012-2018] RNAV, RNP, Single Time of Arrival Control

2-004 Use Optimized Descent Profiles (FMS only)

OI-0330 Time-Based and Metered Routes with CDA

OEP/ Flex: Use Optimized Descent Profiles [2010-2017] RNAV; Baro VNAV; FMS

2-005 Use 3D RNP Arrival and Departure Operations

Reduced Oceanic Separation

2-006 Reduced Oceanic Separation – Altitude Change Pair-wise Maneuvers

OI-0353 Reduced Oceanic Separation - Altitude Change Pair-wise Maneuvers

Capability Group 3: Negotiated Trajectories

•2006 •2007 •2008 •2009 •2010 •2011 •2012 •2013 •2014 •2015 •2016 •2017 •2018 •2019 •2020 •2021 •2022 •2023 •2024 •2025 •2026

Midterm: 2012-2018

Negotiated Trajectory Outside Radar Control

3-001 Direct-to below Minimum Vector Altitude (e.g. use RNP-x)

Improve Traffic Management with Aircraft Trajectory

3-002 Ground System Provides Expected Trajectory (Airborne, Taxi)

3-003 Airborne System Provides Expected Trajectory

OI-0304 Improved Collaborative Oceanic Routing

Improve Traffic Management with RTA

3-004 Route Clearance with RTA

3-005 Route Clearance with RTA and downlink of expected trajectory

3-006 Trajectory Clearance with RTA and Downlink of Expected Trajectory

OI-0357 Trajectory Based Management – Level 1 Route/Trajectory Digital Exchange

OI-0358 Trajectory Based Management – Level 2 Trajectory Based Decision Support

OI-0360 Trajectory-Based Mgmt - Level 3 Automation-Assisted Trajectory Negotiation

OI-0369 Trajectory Based Management – Level 4 Automated Negotiation/Separation Management

Improve Traffic Management with full 4DT

OI-0357, OI-0358, OI-360, OI-369

OI-0370 Trajectory Based Management – Level 5 Full Gate-to-Gate

3-007 Airborne Lateral / Vertical / Time Clearance

3-008 Taxi Lateral / Time Clearance

Issue Paper – How Do Non-AOC Users Participate (High & Low Altitude Users)

Issue Paper – TOAC on Routes

Capability Group 4: Aircraft Assisted Spacing

•2006 •2007 •2008 •2009 •2010 •2011 •2012 •2013 •2014 •2015 •2016 •2017 •2018 •2019 •2020 •2021 •2022 •2023 •2024 •2025 •2026

Midterm: 2012-2018

Flight-Deck Merging and Spacing

4-001 Merging and Spacing – Single Runway

OI-0326 Airborne Merging and Spacing – Single Runway

4-002 Merging and Spacing – Other

OI-0338 Airborne Merging and Spacing for Metroplex

OI-0355 En Route Airborne Merging and Spacing

OI-0333 Airborne Merging and Spacing for Multiple Runways

4-003 Use Optimized Profile Descents (FMS + FDMS)

OI-0329 Airborne Merging and Spacing with CDA

Capability Group 5: Delegated Separation

2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026

Midterm: 2012-2018

Delegated Separation Operations

5-001 Reduced Oceanic and Non-Radar Separation

OI-0347 Reduced Separation Non-Radar Airspace 5 Miles

5-002 Delegated Separation for Specific Operations

OI-0356 Delegated Separation – Pair-wise Maneuvers
OI-0359 Delegated Separation – Oceanic

Passing/crossing and turn behind (less than standard spacing)

5-003 Delegated Separation for Complex Operations

OI-0363 Delegated Separation – Complex procedures

5-004 Delegated Separation in Flow Corridors

OI-0337 Flow Corridors – Level 1 Static
OI-0368 Flow Corridors – Level 2 Dynamic

CSPA and Converging In Low Visibility

5-005 Paired Approach in IMC to Closely Spaced Parallel Runways

5-006 Independent IMC Approaches to Closely Spaced Parallel Runways

5-007 Linked IMC Approaches to Closely Spaced Parallel Runways

5-008 Optimized IMC Converging Approaches

OI-0334 Independent Parallel or Converging Approaches in IMC
OI-0335 Dependent Multiple Approaches in IMC

5-009 Enhanced Visual Approach

OI-0316 Enhanced Visual Separation for Successive Approaches

5-010 IMC CAVS

Capability Group 6: Low-Visibility Approach/Departure/Taxi

2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026

Midterm: 2012-2018

Enhanced Approach, Landing and Takeoff Operations

6-001 Low Visibility Approach Operations

6-002 Low Visibility Landing Operations

6-003 Low Visibility Takeoff Operations

Enhanced Surface Operations

6-004 Low Visibility Surface Operations

Capability Group 7: ATM Efficiencies

2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026

Midterm: 2012-2018

Enhance Aircraft/ATM Information Exchange

7-001 Enhance Aircraft/ANSP Information Exchange

- OI-0321 Surface Management – Level 2 Datalink/Departures
- OI-0327 Surface Management – Level 3 Arrivals/Winter Operations/Runway Configuration
- OI-0352 Automated Clearance Delivery and Frequency Changes

Issue Paper #2: SWIM-Air

Increase Access and Throughput at Non-Towered/Uncontrolled Airports

7-002 Increase Access and Throughput at Non-Towered/Uncontrolled Airports

- OI-0313 Virtual Towers – Level 1 Sequencing, Separation, and Spacing
- OI-0315 Virtual Towers – Level 2 Sequencing, Separation, Spacing, and Surface Management

Issue Paper #4: Different a/c requirements for VFR vs. IFR services from Staffed Virtual Tower?

?? Possibly just an Issue Paper, possibly an OI ??

Issue Paper #1: Gathering, processing, distributing and using weather data gathered by airborne sensors to enhance aircraft operations.

Issue Paper #3: Inter-domain flight object data security

Issue Paper #5: Mixed Equipage Considerations

OUT BOX (22 OIs deferred)

- OI-0336 Wake-based spacing - Level 3 Dynamic Drift and Decay
- OI-0340 Zero-Visibility Surface Operations
- OI-0341 Limited Simultaneous Runway Occupancy
- OI-0354 Reduced Oceanic Separation - Altitude Pair-wise Maneuvers
- OI-0360 Trajectory-Based Mgmt - Level 3 Automation-Assisted Trajectory Negotiation
- OI-0362 Self-Separation - Self-Separation Airspace
- OI-0364 Improved Airframes to Reduce Wake Generation
- OI-0381 Near All Weather Airport Access
- OI-2030 Weather Mitigation - Aircraft Systems
- OI-3000 Increased Crash Survivability - Energy Absorbing Structures
- OI-3001 Increased Crash Survivability - Fire Prevention and Suppression
- OI-3008 Reduced Human Errors in Nominal and Off-Nominal Conditions
- OI-3009 Reduced Component Failures
- OI-3011 Reduced Human Errors in Operation of Automated Systems
- OI-3012 Reduced Weather-Related Incidents
- OI-3013 Reduce Icing-related Incidents
- OI-4512 Improved Restricted Airspace Planning/Management - Level 3 Flight Risk
- OI-4600 Reduced Threat of Aircraft and UAS Destruction or used as a Weapon
- OI-4601 External Aircraft/UAS Threat Protection
- OI-5111 Advanced Winter Weather Operations - Level 3
- OI-6012 Implement NextGen Environmental Engine and Aircraft Technologies
- OI-6017 Increased use of Alternative Aviation Fuels



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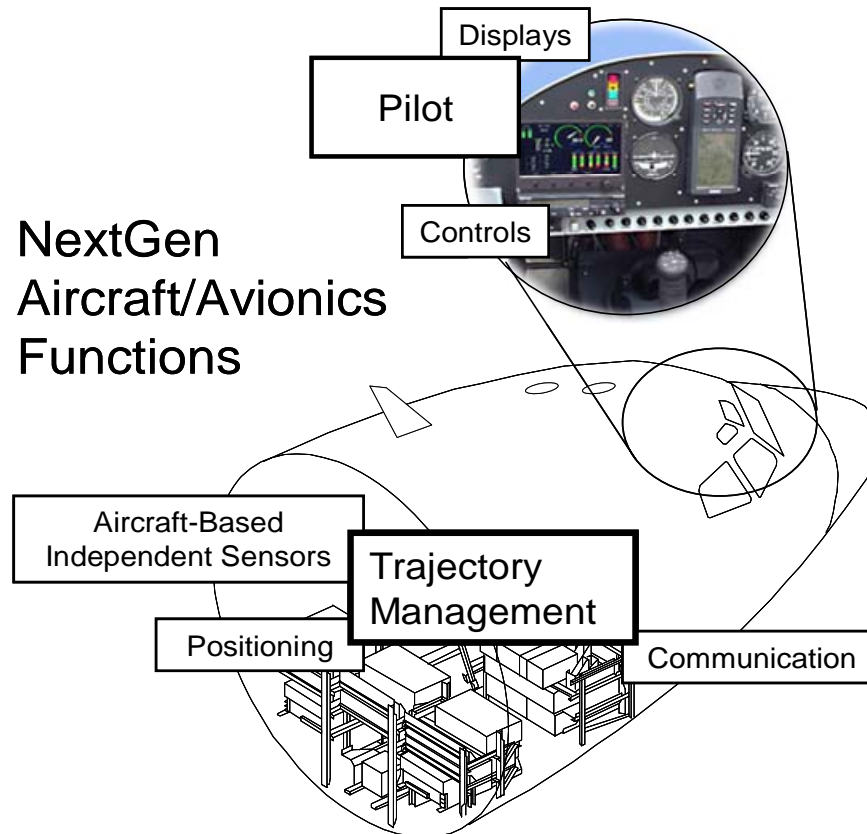
- Summary---
- Team is in place and committed to support JPDO and NextGen success
 - True partnership approach and spirit evident
 - 2008 priority is developing avionics road map
 - Integration with other work groups and JPDO divisions recognized and being addressed
 - Opportunities will be provided outside JPDO this spring/summer for broader industry awareness and input
 - Continued support/involvement of all work group members is key
 - Continued integration with industry, FAA OEP, FAA EA



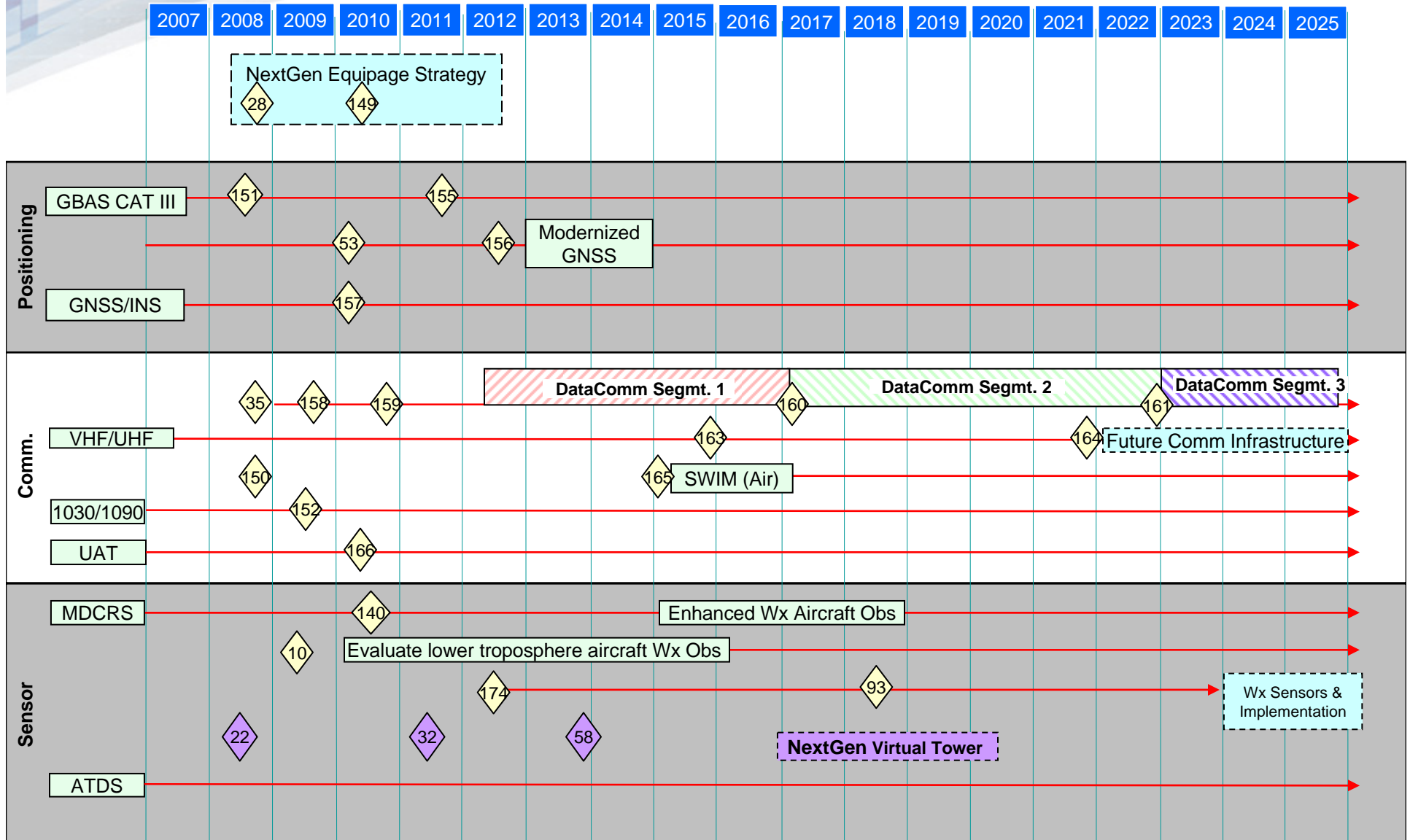
BACKUP



NextGen Aircraft Functions



EA: Aircraft Roadmap (1 of 2)



EA: Aircraft Roadmap (2 of 2)

