CNS/ATM NextGen Briefing

CMC Navigation Systems

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FAA Next Gen Airspace: Intersecting Technologies

Communications
- Clearance delivery and frequency changes
- D-ATIS
- Digital delivery of flight specific Traffic Management Initiatives (e.g., re-routes) to the cockpit

Data Communications
- Uplink of RNAV/RNP procedures
- Negotiated optimized profile descents with required time of arrival (RTA)
- Further expanded capacity with Integrated Arrival Departure Management
- Tailored arrivals with FMS integration

Navigation
- Expanded use of performance-based navigation
- Integrated arrival/departure management
- Curved segments for de-conflicted flows between nearby airports
- Optimized profile descents

Surveillance
- Surveillance provided in areas without coverage today
- Enable improved separation management services
- Expanded STMS coverage
- ADS-B In surface safety with traffic and own ship on EFB moving map
- ADS-B In/CDTI assisted visual separation


COMPANY CONFIDENTIAL
FAA Next Gen Airspace: Intersecting Technologies

• Communications
  • CPDLC (FANS), ADS-A/C, AFN, AOC
    This is a DIRECT link between ATC/ATM automation and the FMS - FMS gets routing & various instructions WITHOUT voice comms
  • ATC Computer to FMS computer eliminates human error, allows for constant automated communication without causing human workload and error

• Surveillance
  • Allows precise aircraft position and intention reporting from computer to computer without any human involvement – reduces human work load and possible error

• Navigation
  • Precise knowledge of aircraft position and velocity – this is the key to flying in the NextGen Airspace – it is SBAS/GPS (GNSS) based.

• The “INTERSECTION” is really the FMS, SBAS/GBAS/GPS receiver, Transponder/Squitter working as “ONE”.
NextGen Airspace: The Big Picture

- **ADS-B**: 2020 Mandate
- **Airspace Transition**: RNP Airspace Q&T Direct-To Routes
- **ATM/ATC Comms**: CPDLC & FANS
- **Terminal Airspace**: SIDS & STARS
- **ILS CAT-I retirement**
- **SBAS**: RNP Nav + LP/LPV CAT-I ILS equivalent
- **GBAS & GLS**: Current GLS: CAT-I Future GLS: CAT-II/III
An Example: the problem Next Gen solves
NextGen-Compliant Equipage

NextGen Airspace is intended to reduce aviation fuel consumption, reduce emissions and congestion.

Access to the Next Gen Airspace determined solely by aircraft equipage, no equipage = no access

• Equipping for Next Gen driven by:
  1. access to more a more efficient NextGen airspace,
  2. savings in cost of time & fuel or face diversion
  3. violations met with stiff penalties.

• Minimum NextGen equipage needs:
  • Mandatory ADS-B compliance
    (Required: SBAS + Transponder)
    Solves air space congestion with better air traffic control
    Mandates: US 2020, Europe 2017, etc…
  • CPDLC and In-Flight Automation
    (Required: FMS + Data Link)
    ATC/ATM automation moves traffic faster, more safely
  • RNP0.3/RNP0.1/RNP-AR
    (Required: FMS/FANS + SBAS, possibly GBAS),
    Direct-To routes: T-Routes < FL 180 & Q-Routes > FL180
    Solves fuel consumption & emissions reduced
  • On-Time & On-Path RNAV SIDS and STARS
    (Required: FMS + SBAS, possibly GBAS)
    Solves dispatch reliability & eases fuel consumption
  • Transition to Satellite Landing System, retire ILS
    (Required: FMS + SBAS-CAT-I + GBAS-CAT-I/II/III)
    Solves runway down-time/congestion, every runway open for approach

Performance-Based Navigation In All Phases of Flight “Snapshot” of Current U.S. Implementations
Solution Providers: SBs Versus STCs

• SB solutions
  • Guaranteed by the OEM Airframe
  • Are on a planned roadmap for a finite airframe life
  • Generally no customization, narrow focus
  • Generally tied to new aircraft purchase
  • The Final Price – OEM style

• STC solutions
  • Are guaranteed by the FAA (TSO & STC)
  • Do not assume a finite airframe life – it will live forever
  • Highly flexible, wide focus – accommodates varied customers
  • Bolt-on implies minimal impact on existing certification
    • Bolt-on implies easy bolt-off if required (leases)
  • Generally tied needs the OEM can’t fulfill at reasonable price
  • The Final Price – STC style

• The Customer – the airlines: You have choices !!!
An STC Solution to GPS: CMA-5024 SBAS GLSSU

• Bolt-On SBAS receiver
  Certified to highest standards without any waiver
  TSO-C145c Beta-3 & TSO-C146c Delta-4

• Satisfies all ADS-B requirements without waiver or exception, meets Nac_vel=2

• Delivers RNP0.1 Navigation capability 100% of the time

• Is a **Self-Contained** SBAS Precision Approach Solution

• Certified/proven GPS/LPV Approach solution on B-737
  FAA/EASA/TCCA STC on B737 with or without MMR

• Upgradable to self-contained GBAS with a
  built-in VDB receiver, will meet or exceed all requirements RTCA/DO-253C or TSO-C161A/162A

**Will provide BOTH SBAS LPV & GBAS GLS**

• Future road map includes multi-constellation multi-frequency GNSS capability
CMA-5024 GBAS – In Development

- CMA-5024 certification will be to TSO-C161A and TSO-162A (RTCA?DO-253C) as a minimum GAST-C, in addition to existing certifications

- VDB will be integrated into the CMA-5024 for a self-contained GBAS capability.

- Will have 2 RF connectors
  - GPS/SBAS
  - VDB (for GBAS)

- Self-contained GBAS retrofit will be offered for all CMA-5024s

- GBAS/SBAS CMA-5024 is a “drop-in”, “bolt-on” solution & can reuse a VOR antenna (-6 dB splitter required)
An STC Solution to Air Transport FMS: CMA-9000 FMS

- RNP APCH Compliant (TSO-C115c, AC 20-138D)
- Curved approaches and RF legs
- RNP AR less than 0.3 Planned
- World-Wide database coverage

- FANS-1/A+ datalink (CPDLC, ADS-A/C, AFN, AOC)
- Fully-coupled Performance VNAV for all phases-of-flight

- Compliance with RNP & ICAO Performance Based Navigation
- Polar nav operations

- NAV Radio management including autotuning
- COM Radio management
- Control and display of ACARS, SATCOM and ACMS

- Interfaces to navigation radios and sensors, communications radios, digital moving map displays and other mission equipment
- Highly customizable for easy retrofits and forward-fits

- ARINC 610 simulator interface capability
- Full-function FMS computer-based trainer

- STCs & TSO approvals in-hand per FAA Advisory Circulars
Proven Solution For Many Platforms
Example GPS Installations

Current Product Description
CMA-5024 ADS-B Installation on the B-737

- CMA-5024 GLSSU

Annunciator Panel

Current Product Description
CMA-5024 CAT-I LPV Installation on the B-737

- LPV on MMR Aircraft

Current Product Description
CMA-5024 ADS-B Installation on the B-737

- FAA ADS-B STC using CMA-5024 on B737 Classic

- CMC GPS (all products) ADS-B compliance Service Information Letter

Current Product Description
CMA-5024 LPV CAT-I STCs

- TCCA/EASA/FAA LPV/GPS STC on B737 Classic
LPV Example: Tested with ATI Beluga

- CMA-9000 FMS & CMA-5024 GPS STCs in progress

- ATI conducted LPV in Toulouse Blagnac France September 16th, 2013
  EGNOS was the sole GPS Augmentation system
  LPV FAS for selected runway created by DGAC

- LPV test flight was flown in AUTOLAND/AUTO-FLARE mode
  touch-down in middle of touch-down box, on runway centerline

- Flight Test was a complete success, see actual pictures below

- LPV works for commercial air transport, same as for business
  and commuter aviation.

- Canadian North: a continuing LPV success story.
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Example: CMC Managed FMS Installation
DND Polaris A-310 Upgrade
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If the Canadian Prime Minister (equivalent to the President of the United States) can trust LPV & Next Gen, why not you?