ICAO UNITING AVIATION

Technologies for Cleaner, Quieter Air Traffic Operations

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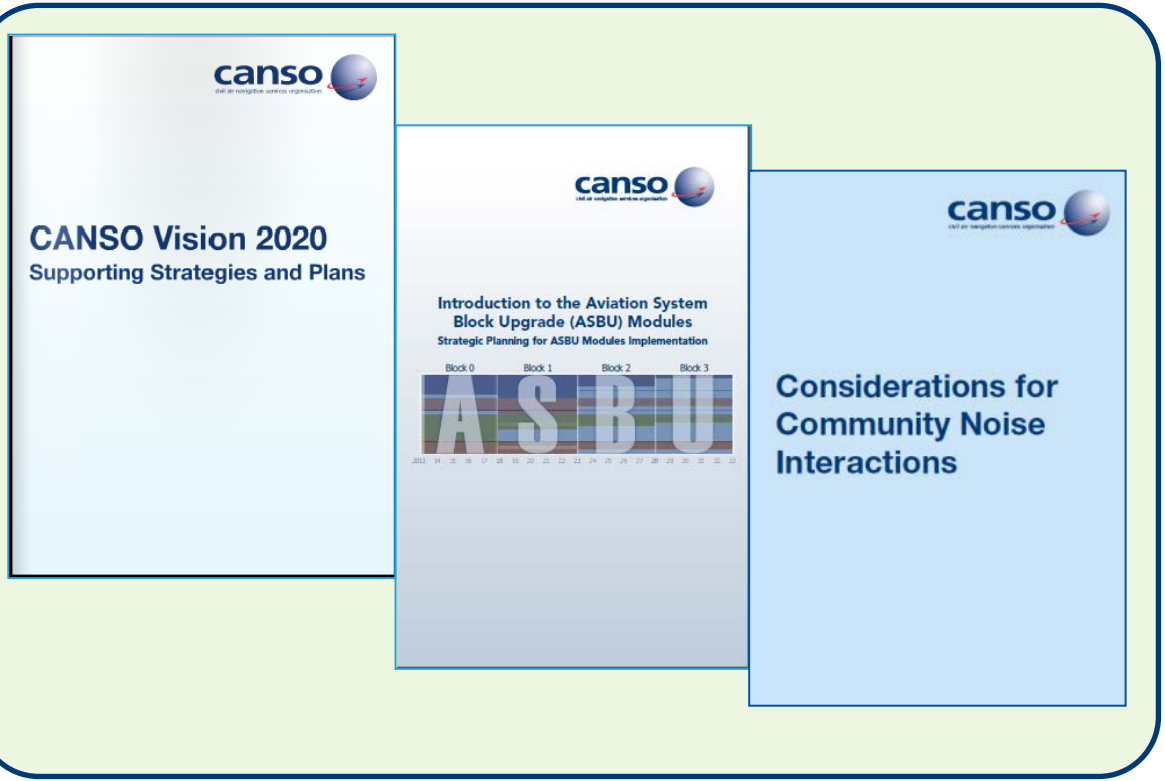
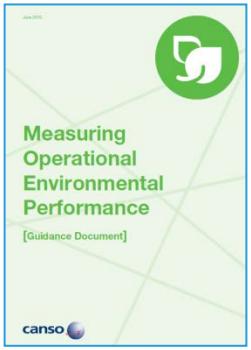
Civil Air Navigation Services Organization

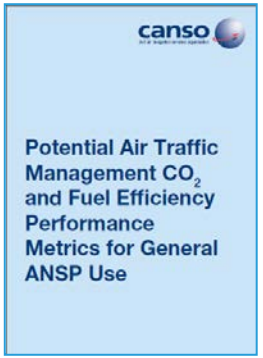
- Transform global ATM performance
- Operations Standing Committee
  - Share ATM best practices
  - Help ANSPs understand ASBU
- Environment Workgroup
  - Understand and help limit aviation's environmental footprint
  - Share efficiency and noise reduction metrics/methods

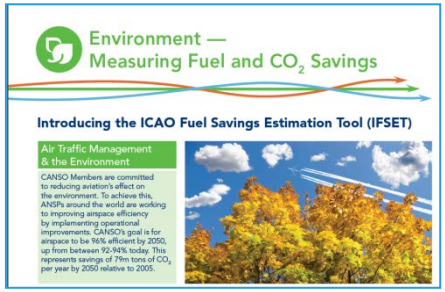


CANSO Environment Workgroup

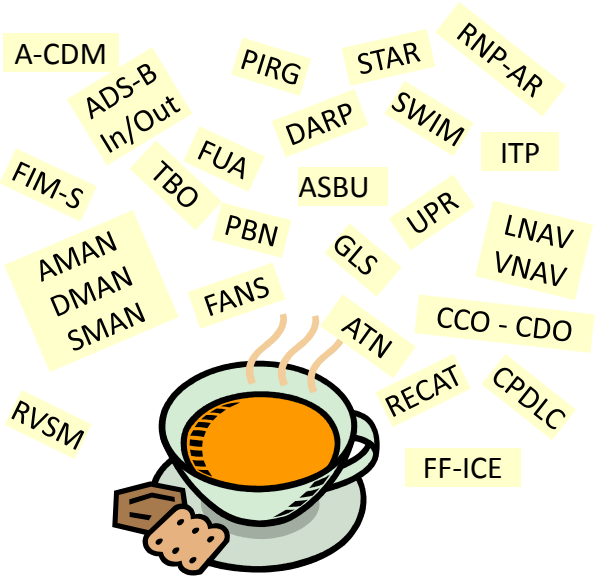
- Publications and activities promoting environmental stewardship
- ATM (Operational) Efficiency
- Metrics and methods to evaluate inefficiencies
- Community noise mitigation
- Best practices workshops





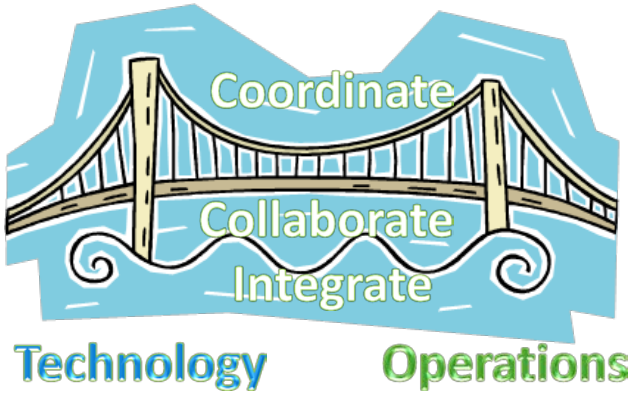


The alphabet soup of Technology & Operations



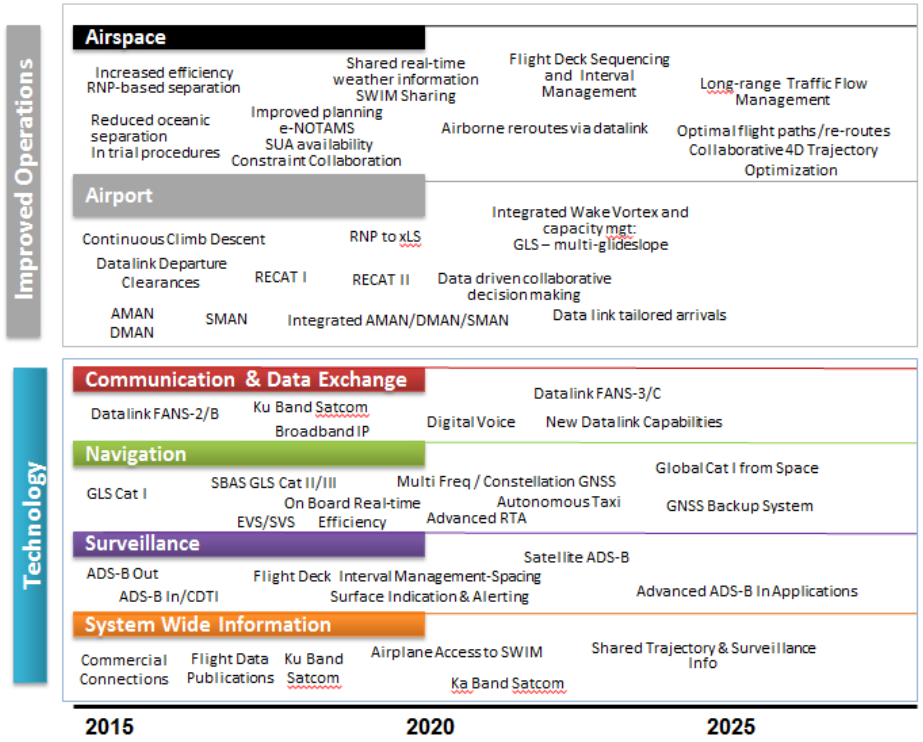
We know the objective

- Getting across the Chasm
  - Aviation System Block Upgrades
  - Existing and new technology
  - Coordination and Collaboration
    - Research, trials, integration
    - Harmonization, sharing
- New airspace/airport operations



The future is being built

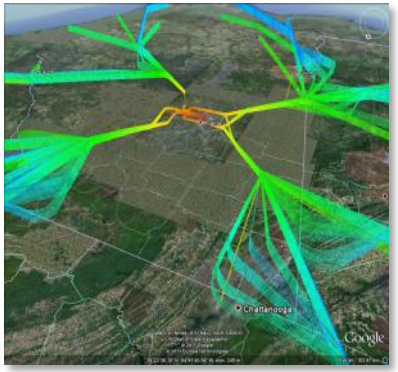
- New operations today – better use of existing technologies
  - Performance Based Navigation
  - Datalink
  - ADS-B Out/In
  - New ground automation
- New operations tomorrow
  - Advanced landing systems
  - New ADS-B Out/ In applications
  - Advanced Datalink for procedure approval coordination
  - Wide-band shared data

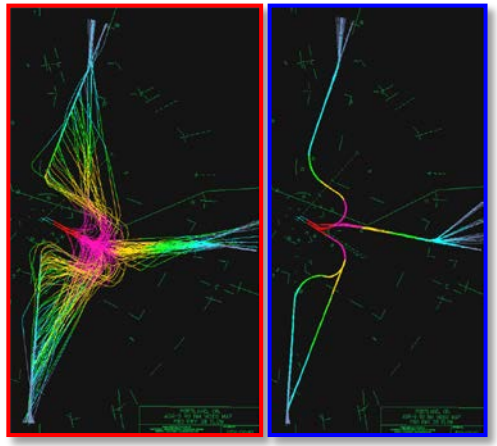


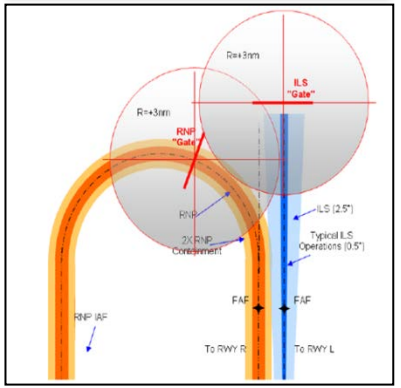
Modified from Boeing concept for ATM evolution. Used with permission.

Airport Operations

- RNAV/RNP Technology
- Improved arrival management (sequencing and spacing)
- RNP-AR (RNP-established)
- Independent precision approaches to closely spaced parallel runways
- ADS-B Out/In
- Reduced track miles/fuel burn

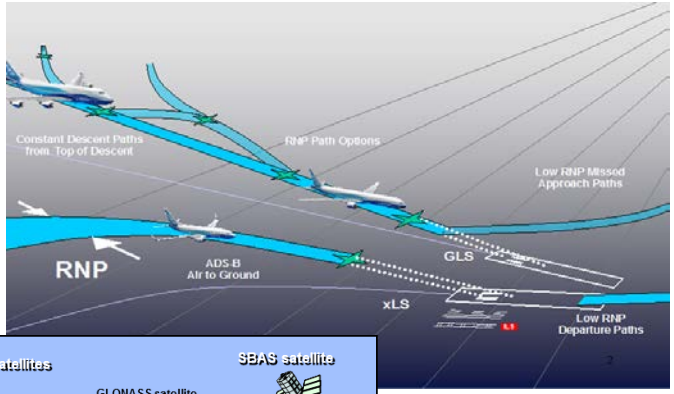


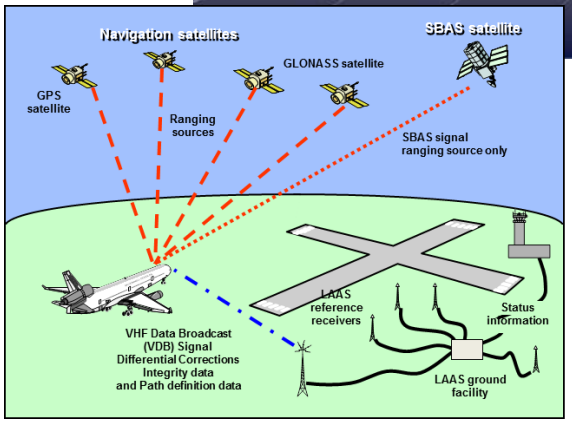




Global Navigation Satellite Landing System (GLS)

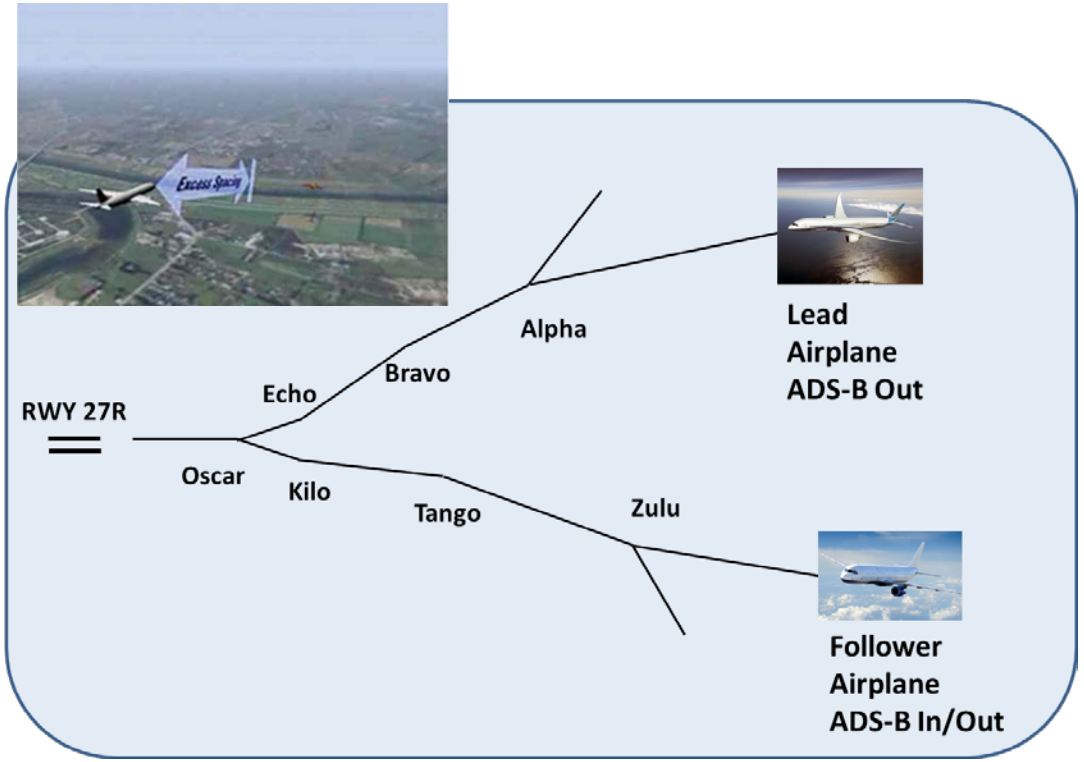
- Multiple constellation capability
  - GPS, GLONASS, Galileo, BeiDou
  - New multi-mode receiver on airplanes
- SBAS/WAAS
  - Satellite Based Augmentation System
  - Wide Area Augmentation System
- GBAS/LAAS
  - Ground Based Augmentation System
  - Local Area Augmentation System
- RNP to xLS (ILS, GLS, LPV/SLS)
- GLS – Cat I, II , III





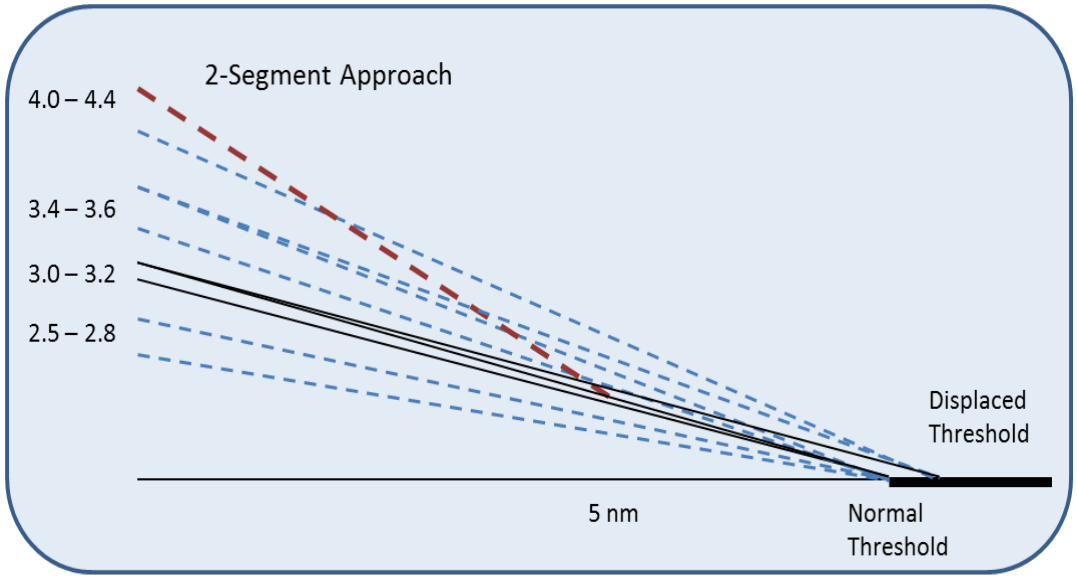
Flight Interval Management - Spacing

- Enhance arrival efficiency at busy airports
- Ground automation for sequencing and prediction
- Airplane Technologies:
  - ADS-B Out
  - ADS-B In
  - Flight deck displays
  - Speed control

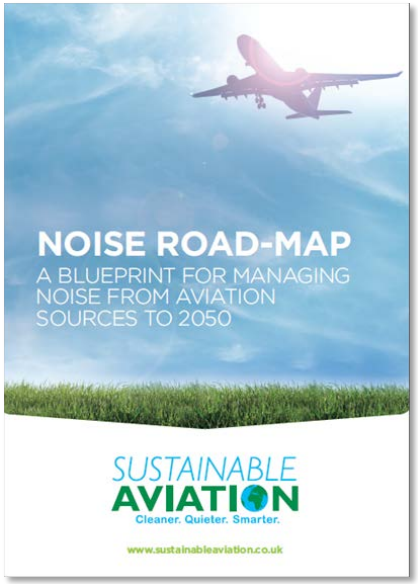


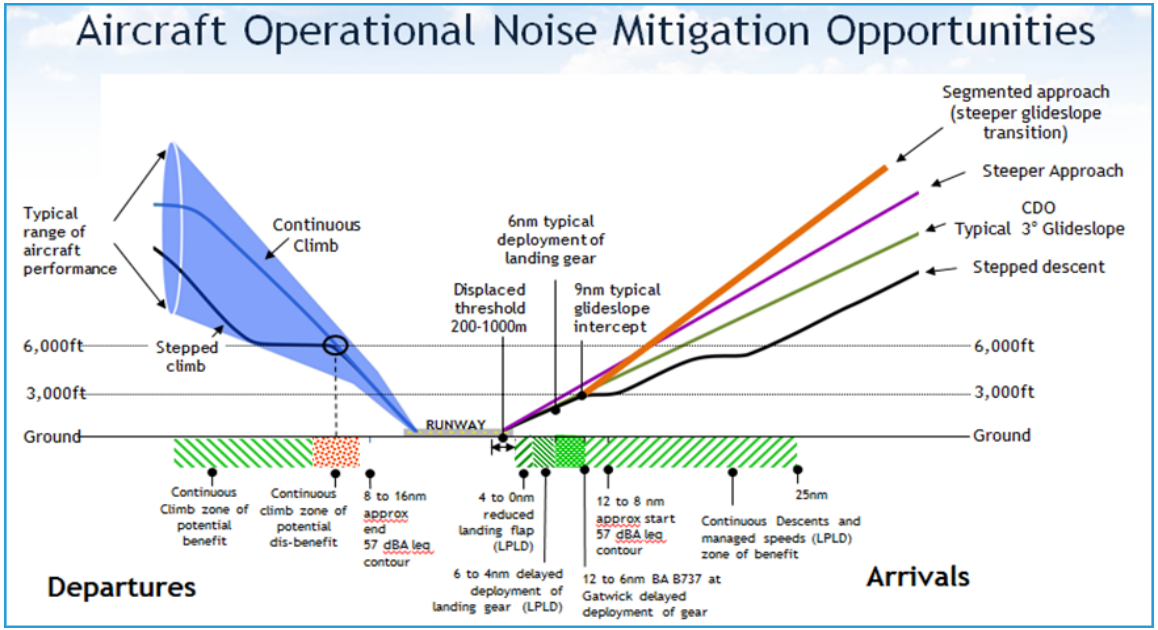
Capacity Enhancement and Noise Reduction

- **GBAS/SBAS technology**
  - Multiple published approaches
  - Variations for hot/cold days
  - Wake vortex mitigation
    - *Parallel runways*
    - *Displaced threshold*
- **Community Noise Reduction**
  - Slightly increased descent angles
  - 2-Segment Approaches
  - Displaced Threshold



Concept derived from presentation at International GBAS Working Group 15 by Dubai Air Navigation Services (June 2014).

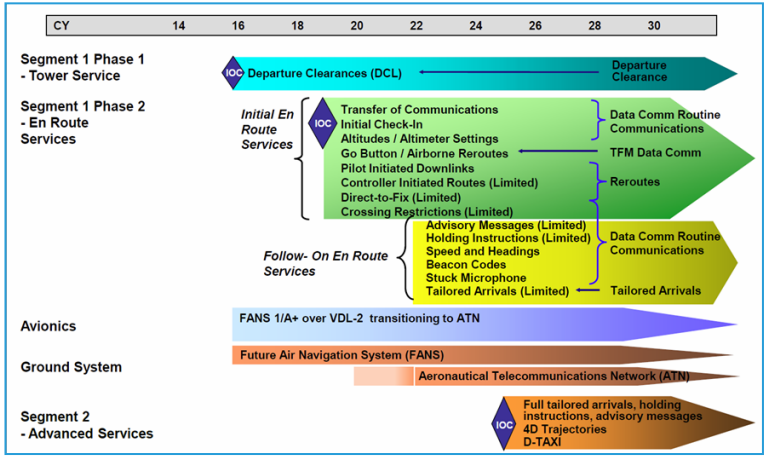




Efficiency *and* Noise Reduction

Other Technologies/Concepts

- Advanced data link – digital data exchange
  - Departure Clearance
  - Weather re-routes (detailed)
  - Tailored Arrival Clearance
  - Trajectory coordination and updates
  - Long range arrival coordination
  - Airplane/airplane negotiation
  - Local conditions exchange: weather, turbulence, new winds…
- Collaborative Trajectories
  - Wake Vortex Surfing, (“Flying like geese”)
  - Military trials, MARSA
  - Increased traffic density with significant fuel savings



FAA briefing to airlines – Air/ground Data comm.

Collaboration for Operational Efficiency Acceleration

- Research Sharing
- Technology demonstrations
- Coordinated Trials
- Best Practices
- Fulfilling ASBU intent

Thank you