

Backup Strategy Update

Doug Helton

Aviation Management Associates

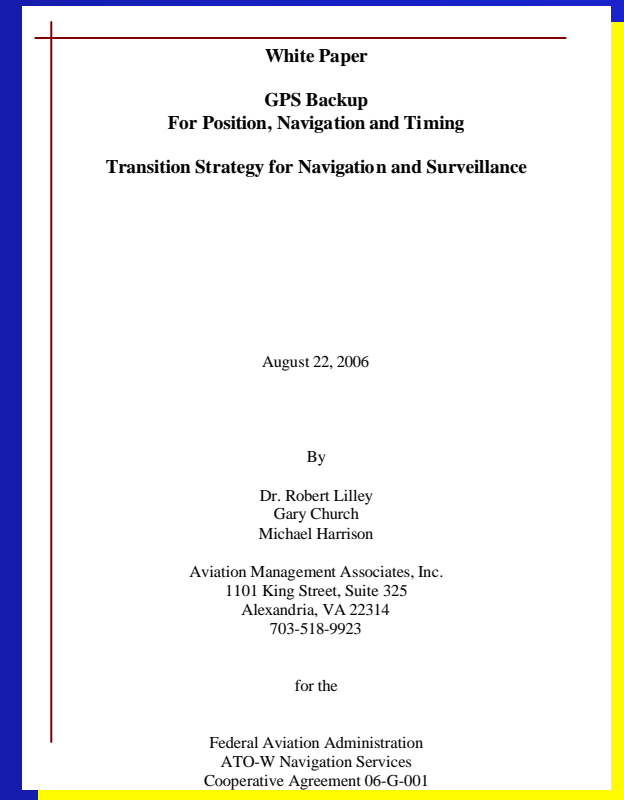
ILA 2007



An Update On Our Original Transition Strategy

The full August 2006 report is available at www.avmgt.com and the contents are standing up well through other reviews of backup strategies

- Institute for Defense Analyses (IDA) Independent Assessment Team (Dec 06)
- NGATS Institute ITT Satnav Backup Report (Jul 07)
- AOPA response to USCG Docket Number 2007-28460 (Aug 2007)





Operational Requirements AMA Report

- Aircraft shall be capable of safe flight to their destination or suitable alternate
- Instrument landings shall be guided by either:
 - An ILS for the runway or
 - RNP 0.3 non-precision approach
- Air carrier, cargo carriers and high end general aviation shall continue to be able to depart from an airport and land at an airport experiencing interference
- Other general aviation aircraft may be restricted to visual flight rules in the presence of interference
- ATC shall not be required to provide radar vectors - surveillance shall not serve as a backup to intentional interference



Basic Premise for Backup

GPS as a Target

- Target value dependent on ubiquitous use for PNT in absence of alternatives
- Target value grows with national dependency
- **First 30 minutes is a safety risk for aviation,** after that **economic**
- Best defense against intentional jamming is a little-to-no-impact backup strategy for air transportation

Backup's role is as an ***insurance policy*** against incapacitation of GPS and the safety, capacity, and economic impacts that could follow

Backup should be lowest cost to sustain continuing operations



NGATS Institute Satnav Backup

Candidate Technologies Operational Requirements

- DME/DME/INS
 - GNSS/INS
 - eLoran
 - VOR
 - Hardened GNSS
 - Terrain Mapping
 - Multilateration
- En Route RNP ≤ 2.0
 - Terminal RNP ≤ 1.0
 - Non-Precision Approach with RNP ≤ 0.3
 - Technical readiness 2015
 - Seamless failover
 - Support area navigation



NGATS Institute Satnav Backup Results

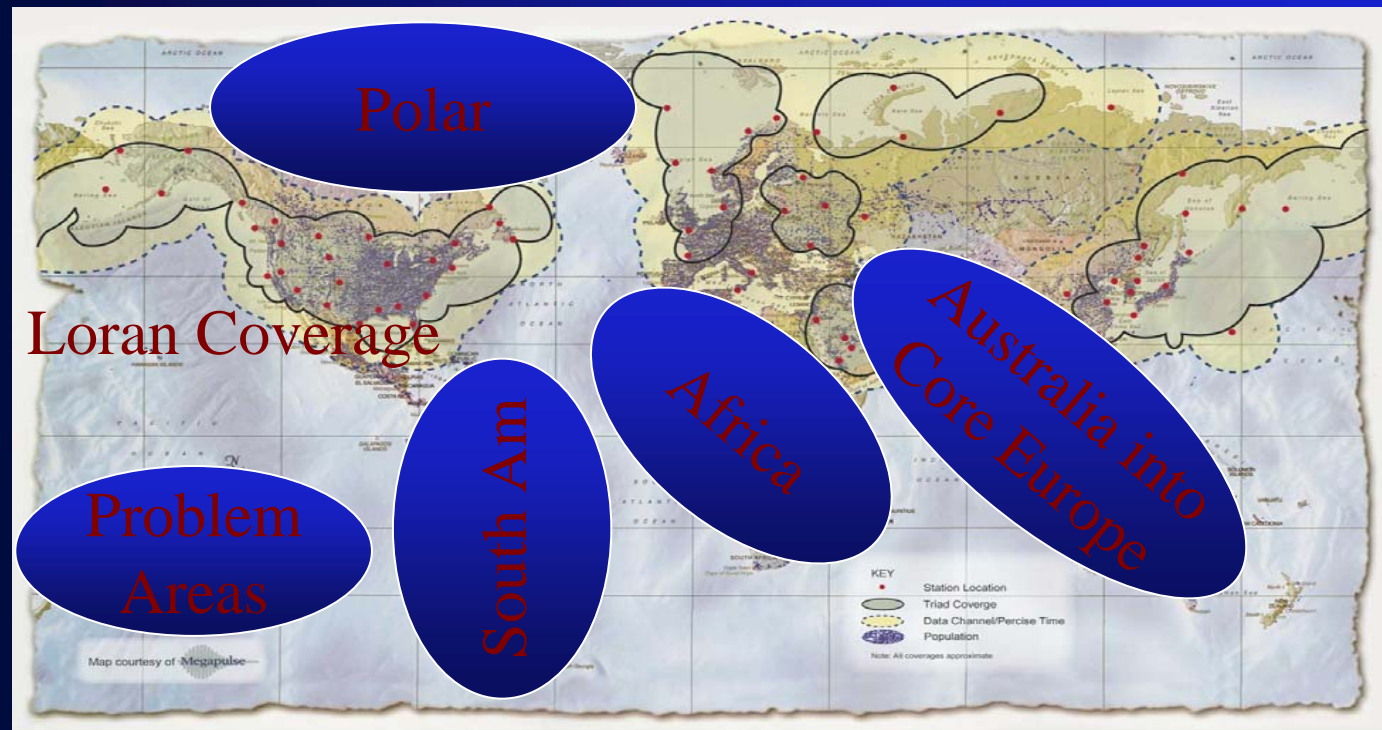
- eLoran scored highest overall preference rating, particularly so in the United States
- eLoran scored significantly highest for GA
- GNSS/eLoran/FMS integration appears to be a viable and capable solution for high-end GA and certain air carriers
- Uncertainties on global interoperability outside of existing eLoran coverage leading to a GNSS/INS complementary backup



Global Interoperability Remains a Concern for Air Carriers

2015 - 2025 targeted capability

Gaps in backup coverage favor en route GNSS/INS backup





AOPA Identifies Requirements

- Backup source of positioning for both navigation and ADS-B
- Not fully redundant and optional - user decides
- Meets, but does not exceed requirement for backup - lowest cost insurance
- AOPA members currently retaining VOR as backup
 - Service widely available
 - Equipment and antenna already installed
 - Dual function receivers support ILS
 - Does not support RNAV or ADS-B



AOPA Identifies Attributes for Backup

- Available for instrument operations throughout North America/Caribbean 100% of time
- Accurate enough to support non-precision GPS-like approaches supported by RNP (e.g., RNP 0.3) - no special approaches for backup
- Provide navigation guidance from en route to start of ground-based approach procedure
- Suitable for both en route and terminal navigation and surveillance in all airspace areas
- Ample performance to continue uninterrupted for 30 minutes after GPS becomes unavailable
- Add no more than 10 percent to the cost of a navigation or dependant surveillance system



Consensus on Requirements

- Consensus is emerging around using the backup for **both** navigation and surveillance
- Timeframe for backup 2015 and beyond
- Consensus on RNP 2.0, 1.0, 0.3
- Cost a major driver for AOPA - just another positioning source transparent to the pilot
- Consensus on USCG and FAA getting their policy act aligned from a national PNT perspective
- Continuing flight operations best deterrent to intentional jamming with positioning backup for spoofing



AOPA Stance on eLoran

- Will not take a leading role on eLoran - preserve the options until policies in place
 - Membership responded negatively to first endorsement and possible mandates
 - Membership wants the option to carry or not carry a backup - unlikely to change as long as VORs still in service
- Major drivers continue to be cost and access to airspace (benefit/cost)
- Some 80,000 IFR users within low-end GA



Aviation Management Associates

- Continues to support consensus development
- Participating in the Navigation Evolution Customer Committee (NECC) under RTCA
- Creating alternative funding strategies for low-end avionics - Government credits that allow earlier decommissioning of VORs to offset avionics costs
- Examining the Nexus of Glonass/Galileo/GPS multiple frequencies as an opportunity for upgrade to GNSS and insertion of backup (maybe Compass)
- Developing MOPS shell to jumpstart RTCA activities
- Completing analysis and test of antennas and p-static
- Waiting for the DHS/DOT decision(s)