Information Technology and Air Traffic Management

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NASA TGIR Conference 22 May, 2002
Technology

Major Advances over Last 20 Years with Potential to Impact ATM

- Small Computers and Reliable Software
  - Aircraft Flight Management Systems
- Universal Timing Accuracy to 3 nano seconds
  - GPS State Vectors for every Aircraft
- Data Base Management Systems and the Internet
  - ETMS and Weather Data Collection and Dissemination thru FAA CDM System
Technology Could Enable

- Complete Knowledge of Aircraft 4-D State Vector
  - Trajectory Based Flight Management and Required Time of Arrival Capability to < 30 Seconds
  - Aircraft Based Separation Assurance

- Dissemination of Common Weather Prediction and Aircraft State Vector Information to All Flight Planers and Decisions Makers over the Internet
  - Optimum Use of the Air Transportation Network

- Development of Small Unattended Airport Flight Separation Assurance System
  - Better Utilization of Nation’s Runway Infrastructure
Technology Has Not Provided

Sharing Information Between Aircraft for Conflict Detection and Collision Avoidance
- No Agreement on Policy
- No Agreement on Wireless Data Links

Ability to Deal with Weather Prediction Uncertainty over a 3-6 Hour Period of Time
- Inability to Accurately Forecast Convective Weather
- Inability to make Flight Planning Decisions in an Inherently Uncertain Environment

Minimum Aircraft Spacing, Required Time of Arrival Airport Efficiency
- Imprecise Arrival Slot Controls Policy
- Static Wake Vortex Separation
Capacity vs. Safety

- LGA in IMC
  - N=124
  - AR/HR

Safety
Lost Capacity
Research Required

**Airport Arrival Slot Allocations for Maximum Efficient Use of Runways**
- A New RW Slot Auction Market Exchange System Needs to be Developed
- Ability to use ~90% of Maximum Safe Capacity with ~10% Uncertainty due to Weather and Equipment
  - Improved Decision Aids need Development
- **Transfer of Separation Assurance to Aircraft under Mixed Equipage Conditions**
  - ADS-B Data Links Decision and new ATC Paradigm Needs to be Developed and DEMONSTRATED
- **Removal of Wake Vortex Static Safety Buffers**
  - Dynamic WV Separation System needs to be Developed
- **Stochastic Modeling & Optimization of Traffic Management**
  - New Models need to be Developed to Facilitate Designs of Above