



*Development of  
System Safety  
Performance Measures  
in Support of GAIN*

*Phase 1 Findings*

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*Presentation Outline*

- Background to Project
- Phase 1 Tasks
- Related Programs
- Tools and Techniques
- Concept Definition
- Recommendations



## *Background to Project*

- Global Analysis and Information Network
  - Infrastructure for sharing aviation safety information
  - Analytical techniques to identify existing and emerging safety problems
- Airline Flight Operations Quality Assurance programs
  - Analysis of flight data recorder information



## *Background to Project (cont.)*

- Air traffic control system generates a large amount of detailed operational data
  - Generally only preserved for 15 days
  - Typically not analyzed unless an accident or incident occurs
  - Lack of accepted procedures to measure the safety performance of the system



## *Background to Project (cont.)*

- Recognition of the need for measures of aviation system safety performance
  - Monitor progress toward goal of 80 percent reduction in fatal accident rate
  - Determining effectiveness of operational changes
  - Timely identification of incipient problems from new technology, new procedures, or traffic growth



## *Phase 1 Tasks*

- Review current programs for aviation system monitoring and modeling
- Review current procedures to archive and analyze radar data
- Prepare concept paper on use of available data sources to develop system safety performance measures



## *Related Programs*

- Airline Flight Operations Quality Assurance (FOQA) programs
- NASA/FAA Aviation Performance Measurement Program (APMS)
- FAA Airport Movement Area Safety System (AMASS)
- NASA Surface Movement Advisor (SMA)
- FAA/NASA Performance Data Analysis and Reporting System (PDARS)



## *Industry Discussions*

- FAA
  - AAT, ATO, ATA, AFS, AND, AOS, ASC, ASY, AAR, ACT
- NASA Ames Research Center
  - SMA program
  - ASRS, APMS
- Airline industry
  - ATA
  - American Airlines
- Boeing



## *Tools and Techniques*

### → Digital Flight Data Analysis Tools

- Commercial software (GRAF, FLIDRAS)
- Canadian Transportation Safety Board (RAPS)
- Next generation (APMS)



## *Tools and Techniques (cont.)*

### → Radar Data Analysis Tools

- DART
- SATORI
- GRADE
- Flight Track Analysis System (*Leigh Fisher*)

### → Risk Analysis Models

- RASRAM



## *Concept Definition*

- Evolutionary process
  - Need to balance effort against payoff
- Identify potential safety performance measures
- Define initial proof-of-concept studies
- Assess resources required to implement proposed proof-of-concept studies



## *Potential Safety Performance Measures*

- Precursor situations to controller and flight crew errors
  - Analysis of OE, PDS and ASRS incident reports
- Controller workload
  - Delayed handoffs
  - Number of aircraft in sector
  - Extent of aircraft maneuvering



### *Potential Safety Performance Measures (cont.)*

- Deviations from normal operation
  - Unstabilized approaches
  - TCAS alerts
- Runway conflicts



### *Proof of Concept Studies*

- Obtain operational experience with real time data analysis and application
  - Well defined focus
  - Develop appropriate analysis tools
  - Address controller workforce concerns
- Engage operational personnel in the process
- Assess usefulness of alternative measures
  - Complement higher-level performance measures
  - Identification of response strategies



## *Recommendations*

- Implement initial proof of concept studies
  - Leverage off FAA/NASA development of PDARS
- Two proposed studies
  - Airspace operations
  - Surface operations
- Required level of effort
  - 1- 2 person-years per study



## *Airspace Operations Study*

- Selected TRACON facility
- Analyze radar track and system message data
- Integrate with TCAS resolution advisories
- Identify situations that depart from normal operations





## *Surface Operations Study*

- Study comparative utility of existing data sources
- Develop algorithms for extracting ground track data
- Explore usefulness for safety analysis
- Integrate with analysis of PDS surface incident data