

Surveillance Focus Group

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C/AFT Asia Pacific Meeting

Melbourne, Australia

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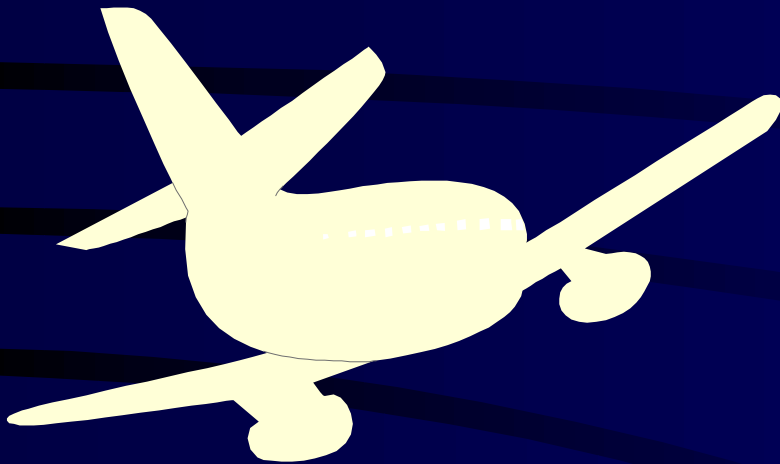
Melbourne Agenda

- I. Surveillance Overview
- II. Aviation Industry Activity
- III. Surveillance Focus Group Activity
- IV. Conclusion

I. Current Surveillance “Picture”

- Current Surveillance:
 - Radar
 - Procedural (voice reports)
- C/N/S Surveillance
 - Automatic Dependent Surveillance (ADS)
 - ADS (A/C) - Addressed/Contract
 - Uses VHF or SATCOM
 - In current use in FANS environments
 - ADS (B) - Broadcast
 - Several possibilities (Mode S, VDL, UAT)
 - Applications under evaluation

ADS-B



- *Automatic*
 - no pilot input required
- *Dependent*
 - extremely accurate position and velocity vector from GPS
- *Surveillance*
 - aircraft position, altitude, velocity vector, + . . .
- *Broadcast*
 - any ground station or aircraft can monitor

Cockpit Display of Traffic Information (CDTI)



ADS-B Attributes

- Increased Accuracy
 - GPS
 - Velocity Vector + Intent Data vs. “track file”
- Detection Range (120 + nmi)
- General Aviation Applicability

ADS-B Attributes

- Significantly Improved Coverage
 - from the *Ground* up (or gate onward...)
 - overcomes radar shadows
 - oceanic/ remote areas
- Numerous Applications...
 - aircraft
 - vehicles
 - obstacles

“Near Term” ADS-B Applications...

- Enhanced Visual Acquisition (See & Avoid)
 - Acquisition Time/Positive ID
- Enhanced Visual Approach
- Final Approach Spacing (VMC)
- Runway Incursion
 - “Rnwy/Final Approach Occupancy”
- Conflict Detection & Resolution

II. Industry Activity

- Asia Pacific/ Australia/ North Atlantic
- Europe
- United States

Asia Pacific/Australia /North Atlantic

- ADS A/C operational in...
 - Tahiti, Auckland, Brisbane, Melbourne and Fiji
- Up and running on trial basis in...
 - Tokyo, North Atlantic (Gander and Shanwick)
- Upcoming in...
 - Bay of Bengal, Northern Canada and South Africa

European Plans

- ADS-B is providing surveillance in areas where radar surveillance has not been provided
- Trials of ADS(B) are taking place
 - Initially as supplement to surveillance
 - Then as complementary system

United States - Safe Flite 21 Programs

- Alaska Capstone / FAA Alaska Region
 - General Aviation / Air Taxi using low-end GA
 - *Reduce accident rates*
 - Poor weather
 - Lack of radar coverage
 - Controlled Flight Into Terrain (CFIT)
 - Surveillance coverage in non-radar space
 - Integrated cockpit services
- Ohio Valley - Cargo Airline Association (CAA)
 - Airborne Express, UPS, & FedEx
 - Phase 1: *Enhanced See-and-Avoid*
 - Phase 2: *Conflict Detection; Improved Surface Navigation*
 - Phase 3: *Conflict Resolution; Improved low vis approaches*

OpEval '99: Applications

Terminal

- Airport Surface SA
- Enhanced See-and-Avoid
- Enhanced Visual Approach

EnRoute

- Station Keeping
- In-Trail Climb/Descents
- Lead Climb Descents
- Departure Spacing

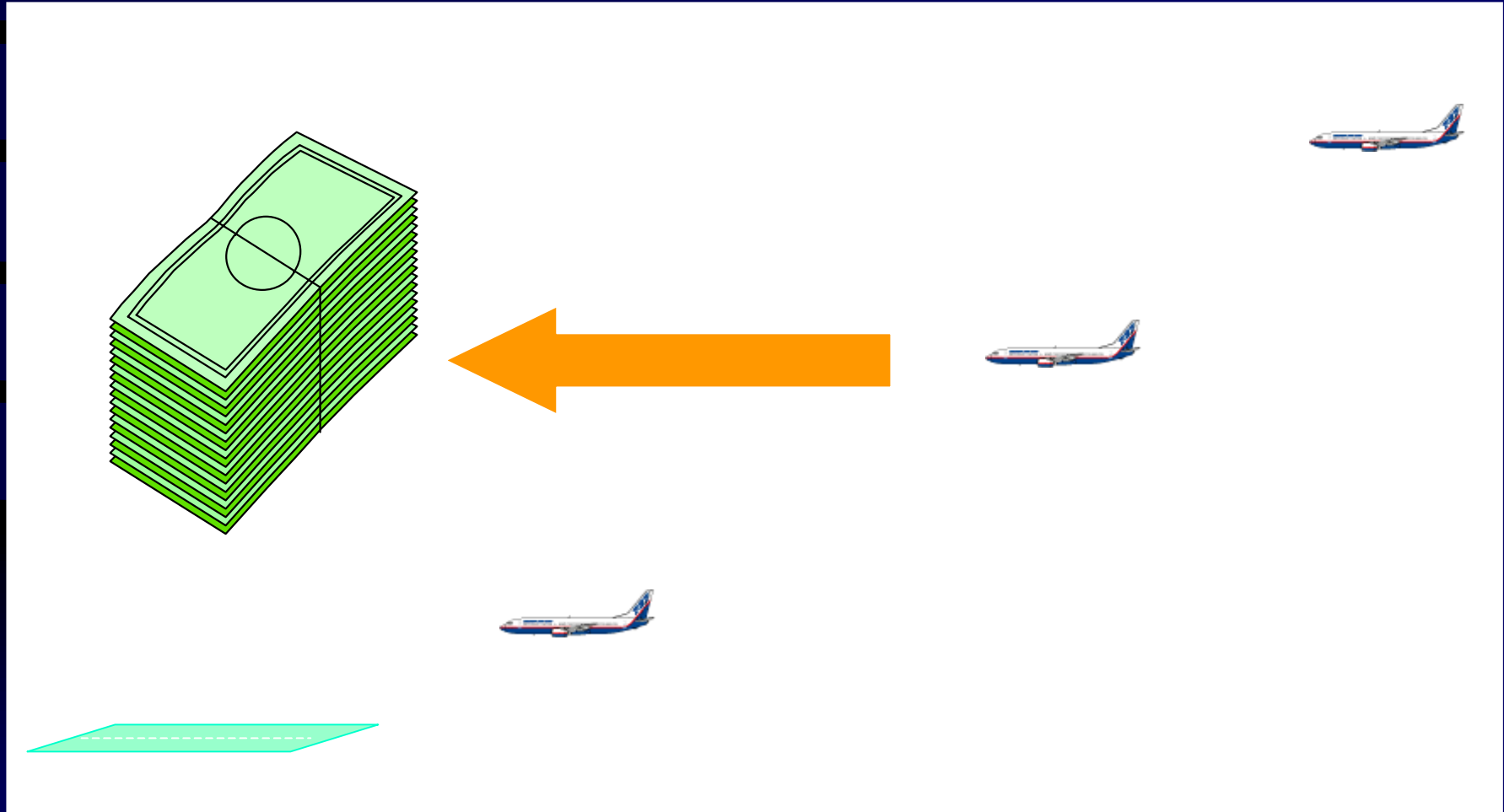
CAA OpEval Results

- ADS-B Technology
 - No “show stoppers...”
- Human Factors
 - +: SA, Utility
 - -: Clutter, Ground Display
- Significant Interest in ADS-B
 - Visual Acquisition/ Visual Approach Spacing
- George Mason University Study
 - Focused on delay minutes saved

III. Surveillance Focus Group Activity

- Enhanced Visual Acquisition (EVA)
- Approach Spacing Optimization

The Target Benefit - Final Approach Throughput Example



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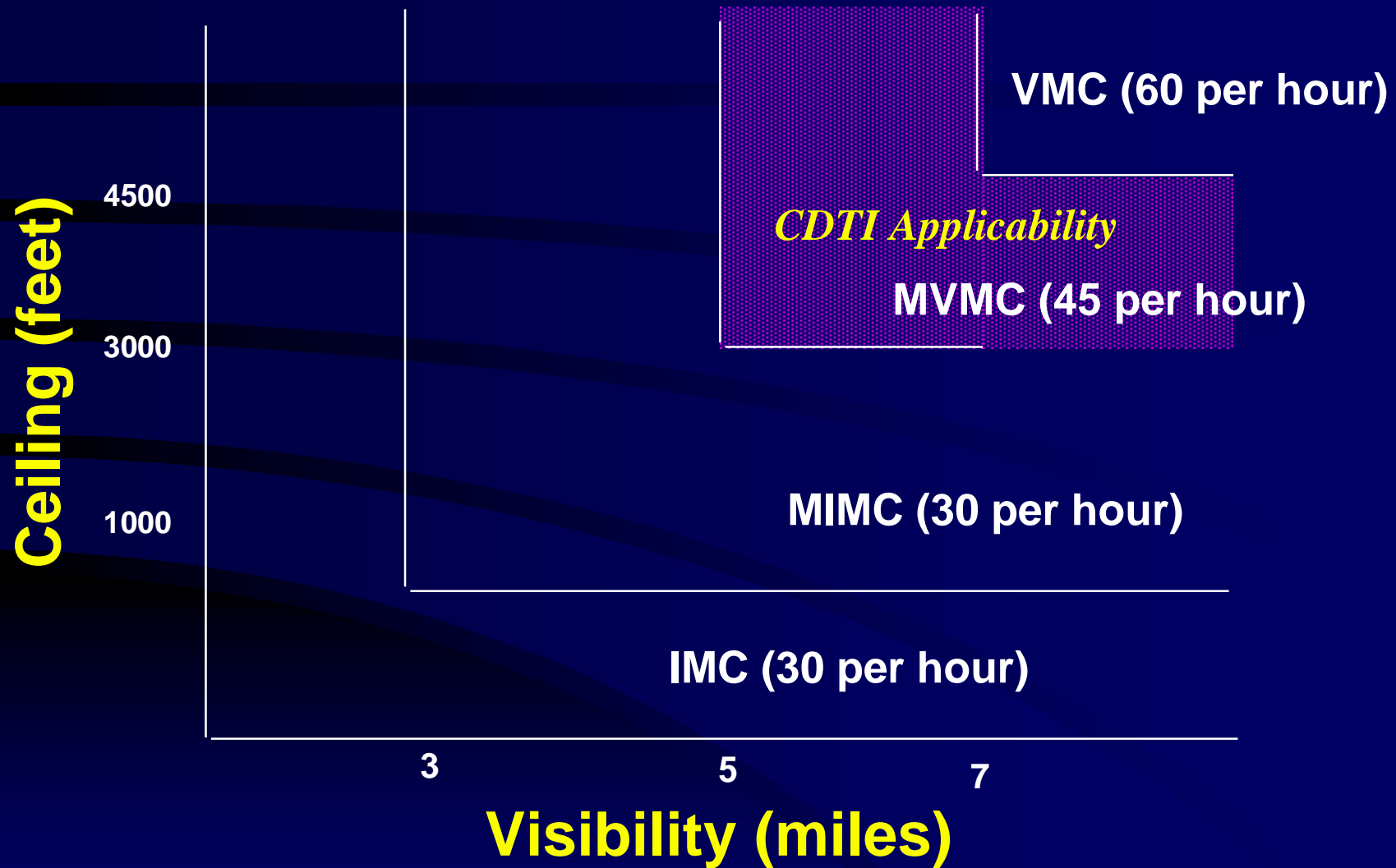
SFG Melbourne

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Enhanced Visual Acquisition (EVA)

- More Effective Traffic Acquisition
 - Positive ID
 - Reduced Time-to-Acquire
- Near Term Benefits:
 - Safety
 - Maintain VMC approach during MVMC conditions
 - Reduced Nose-Tail Spacing during Visual Approaches

EVA: Weather Analysis (SFO)



EVA: Weather Analysis

- Results
 - Continued VMC rates in MVMC conditions
 - “Some benefit” identified
 - Appeared insufficient to justify wide-scale equipage
 - Benefits would increase with additional applications

Approach Spacing Optimization (Cargo Analysis)

Description:

- Current bank of cargo aircraft takes on the order of 2 hours to get all arrivals at Louisville
- Current bank has 80 aircraft

Benefit Mechanism:

- Reduce bank from 2 hours to about 90 minutes

Operational Assumptions:

- No change to existing separation standards
- No change to current weather minima for visual approach ops

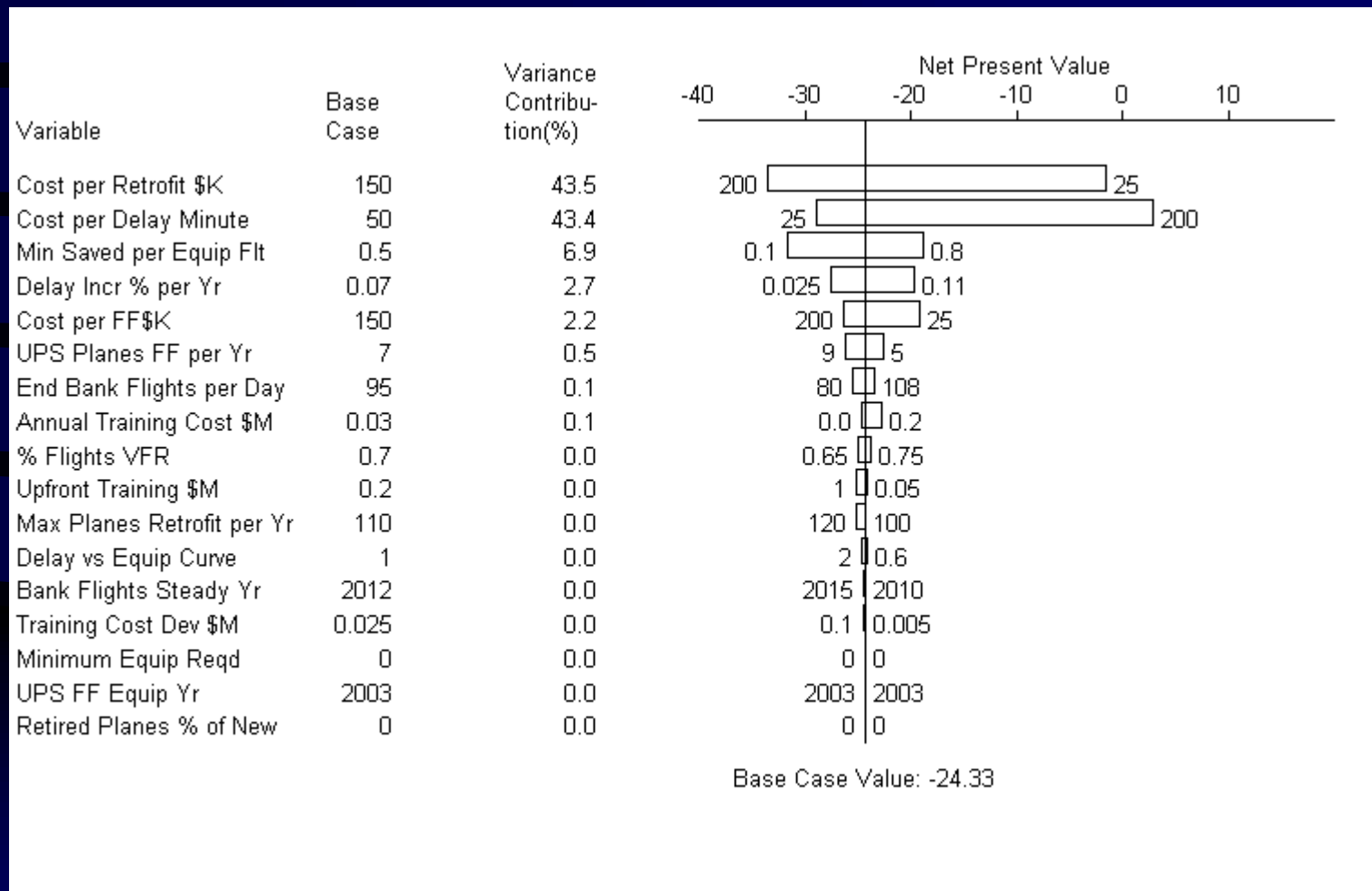
Approach Spacing Optimization

Cargo Analysis

- **Cost Baseline**
 - Costs of \$25K/50K/200K for Forward Fit and Retrofit
- **Benefit Baseline**
 - Revenue Enhancement-Later “Pickup” at outstations
 - Cost Avoidance--Increased “Sort Window”
 - Cost per Delay Minute \$25/50/200 was used (actual cost proprietary to UPS)
- **Scenario**
 - UPS at Louisville
 - 100 % Equipage
 - Negligible ATC delay variable

Approach Spacing Optimization

Tornado Diagram



Approach Spacing Optimization

Conclusions--Cargo Operations

- This cargo operations business case was not positive:
 - Delay savings was limited to less than one minute per flight
 - Benefits constrained to a single bank of flights (80) per night
 - Requires equipping 223 aircraft (entire fleet)
 - Revenue enhancement was not considered due to proprietary data

Follow-On Activities

- Cargo airlines intend to conduct other analyses to evaluate other applications
- Develop surveillance model for passenger operations, if sufficient participation from passenger airlines is provided

Questions?

www.ads-b.com

www.boeing.com/commercial/caft