

ADS-B: One Operator's View



Demonstration of Concepts in Revenue Service

Captain Don Campbell

UPS Airlines

Agenda

- History
- 2004 – Present
- Moving Forward
- One Voice of Experience

History 1996 - 2000

- January 1996 launches ADS-B development effort to leapfrog TCAS technology for collision avoidance
- Working with Cargo Airline Association, FAA, NASA, MITRE and many others in industry
- Operational evaluation flight trials in 1999 and 2000 in conjunction with FAA Safe Flight 21
- Program led to certification of ADS-B in and out and CDTI on B757/767s

History 2000 - 2005

- Working with Safe Flight 21 – equipped 107 B-757/767s with ADS-B/CDTI
- Enhanced “See and Avoid” – the only application approved
- Accumulated thousands of hours of operational experience and data
- Benefits in Louisville International Airport terminal area – reduced average fly miles and minutes due to increased Situational Awareness

History 2000 - 2005

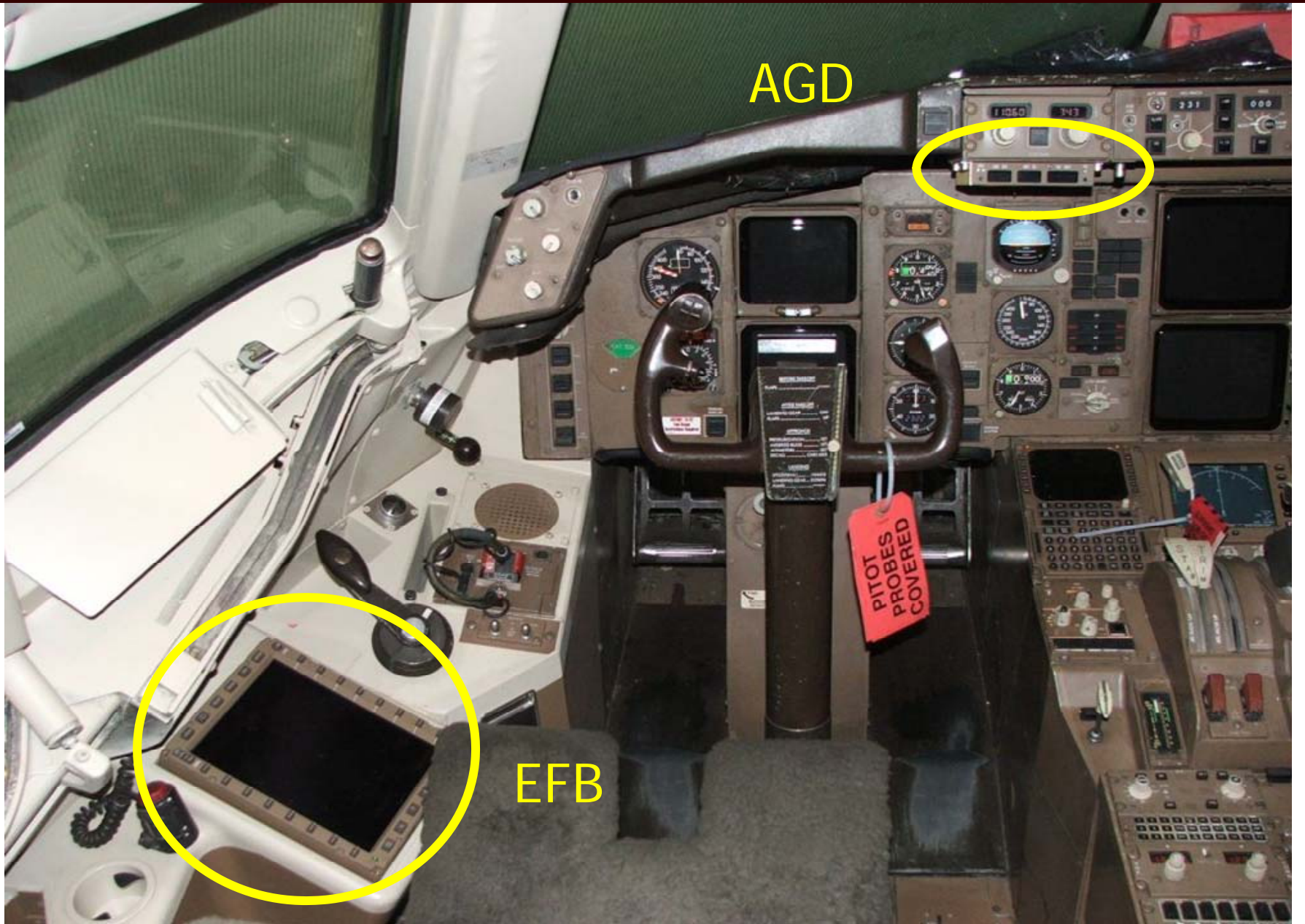
- 2002-05: Congress funds Louisville Technology Initiative based on our ADS-B equipage
- Brought together a suite of advanced technologies to...
 - Demonstrate future operating concepts in medium density terminal operations
 - Demonstrate safety and operational improvements
 - Demonstrate future concepts in the changing roles of pilots and controllers
 - Develop a model for modernizing other medium- to-high density airports

History 2000 - 2005

- Technology infrastructure implemented under Safe Flight 21 – still in operational use today
 - ASDE-X and ADS-B surveillance
 - Common ARTs IIIe color displays – now receiving ADS-B data as a result of the recent ADS-B IOC declaration
 - Surface Management System
 - Certified Data Distribution Module for sharing surveillance data between FAA and operator
 - Ground based sequencing and spacing tools developed by MITRE and NASA
 - Airport vehicles equipped with ADS-B out

History 2004 – Present

- ACSS/Boeing/Jeppesen/Gables team to develop and implement next generation ADS-B In application of Merging and Spacing
 - B757 certified 2007, B767 certified 2008
 - Ops approval experienced ~12 month schedule overrun
- Goal was to realize the full potential of our airport and aircraft reliably and predictably into the future utilizing NextGen concepts
 - Eliminate dive and drive – low level vectoring
 - Precisely and safely maintain optimal time intervals between arriving aircraft from enroute altitude to the runways
 - Consistently utilize nearly 100% of arrival capacity



AGD

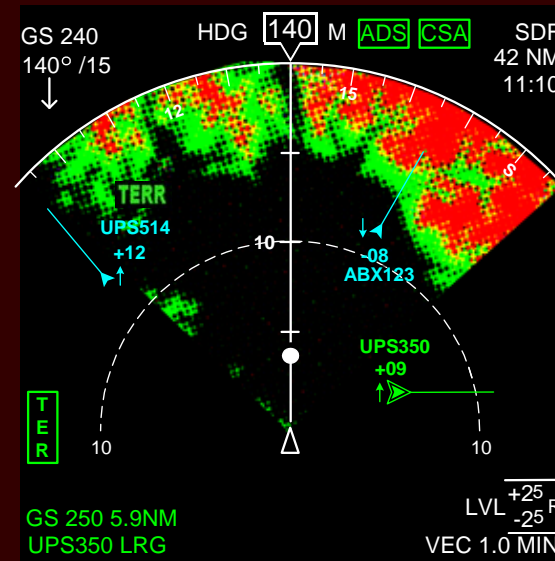
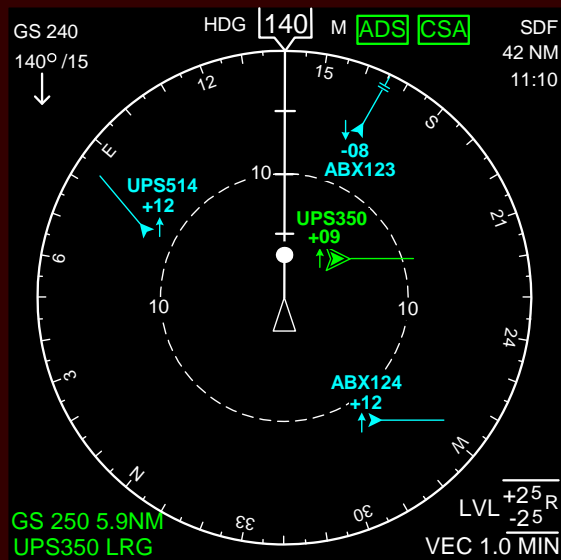
EFB

PITOT
PROBES
COVERED

CDTI Display

- Complete Situational Awareness

- Traffic
- Weather
- Terrain



2004 – Present

- 11 SafeRoute equipped B757/767
- Initiated 60 B-757 and B-767 M&S flights in 2008/2009 – 44 in-trail spacing operations successful
 - 12 failed due to operational reasons
 - GPS dropout, restricted area activation
 - 4 failed due to weather and runway changes
- 1 successful 4-ship, 2 successful 3-ship
- Collective fuel savings for last 25 min of flight
 - B-757 - 21%
 - B-767 - 31%
- Lead ship to trail ship landing separation has varied from 4.8 to 7.3 miles at 150 or 145 second intervals
 - pilot technique
 - headwinds

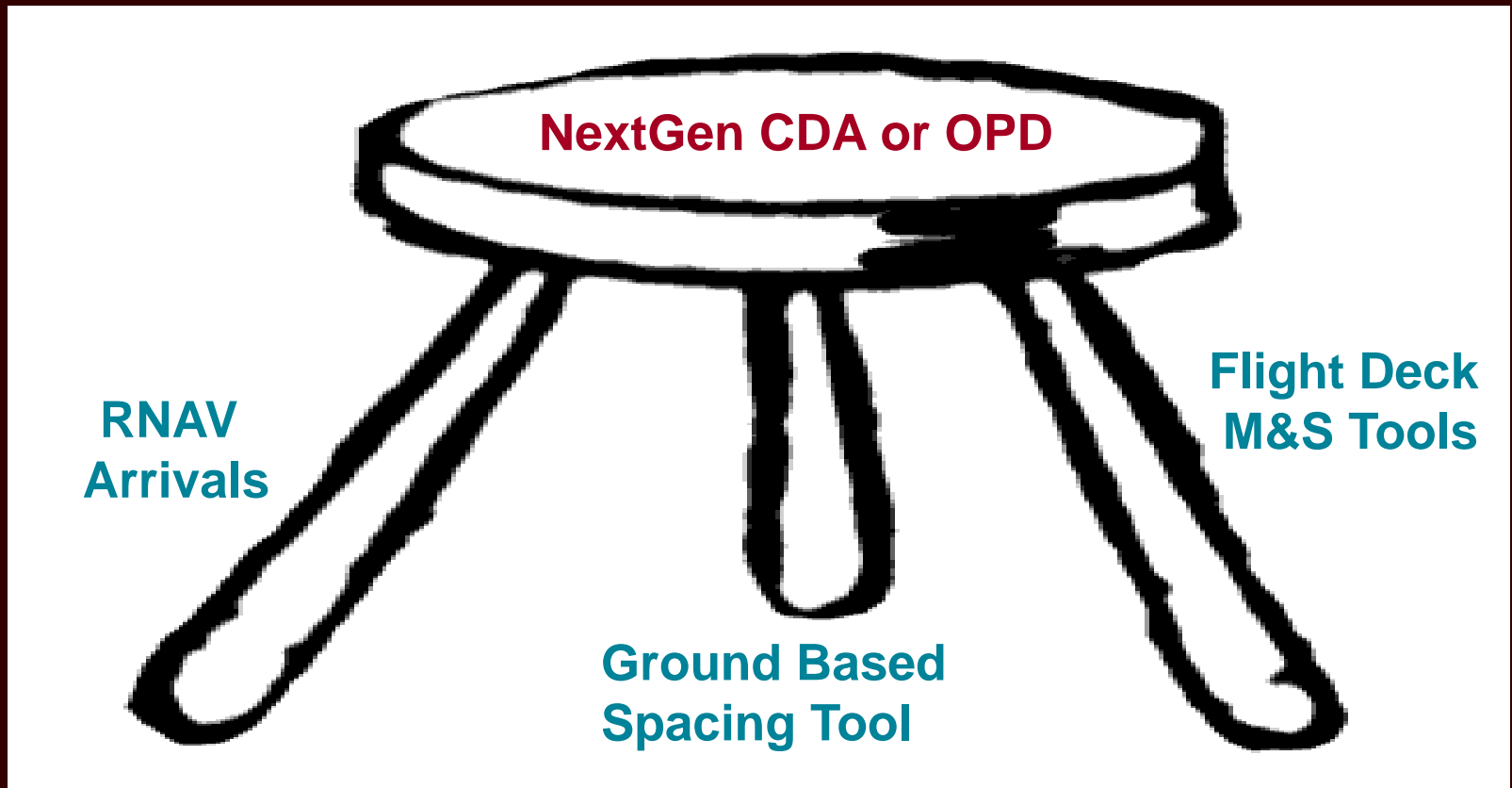
2004 – Present

Equipment installations stopped in Fall 2007 due to economy and higher than anticipated costs

Short term goals

- Build on existing infrastructure
- Continue maturing arrival procedures from the west using 11 equipped aircraft
- Continue data collection and gaining experience
- Implement new optimized descent arrival procedures from all quadrants in flexible tubes – similar to TF5 Metroplex recommendation

October 2004 – Present: NextGen Demonstration



RNAV Arrival

LOUISVILLE INTL-STANDIFORD D-ATIS 118.72



1 Aug 08

10-2T1

CDA/EMA ARRIVALS

LOUISVILLE, KY

LOUISVILLE INTL-STANDIFORD

SOUTH EMA ARRIVALS
CALKS ONE ARRIVAL (CALKS 2)
SEA BISCUIT ONE ARRIVAL (CBSKT 2)

VALID FOR WEST COAST ARRIVALS
0500Z TO 0800Z

CALKS
N38 41.0 W087 40.0



104°

59

HMRUN

N38 29.7 W086 26.0
Cross at 11000' and
at 240 Kts



098°

29

WP UP01

N 38 27.2 W085 49.2
Cross at 5500' and at
195 Kts



170°

5

BASMN

N38 24.5 W086 52.4
Cross at or above 4000'
and at 210 Kts



107°

3

THUND

N38 24.3 W085 48.3
Cross at 4500'
and at 180 Kts



160°

6

PRINC

N38 19.7 W087 37.0



092°

CBSKT TWO

51

CBSKT

N38 20.4 W086 31.8
Cross at 11000' and
at 240 Kts



085°

31

SPYRS

N38 23.8 W085 49.1
Cross at or above 3300'
and at 210 Kts



160°

3

RACRR

N38 21.3 W085 47.3
Cross at 4000' and
at 170 Kts



160°

3

BLGRS

N38 20.9 W085 48.1
Cross at 3000' and at
180 Kts



160°

3

CHRCL

N38 16.5 W085 46.7
Cross at 2500' (2348'
with glide path guidance)
and at 170 Kts or less



160°

3

SLGRR

N38 16.6 W085 45.7
Cross at 2500' (2362'
with glide path guidance)
and at 170 Kts or less



160°

3

Louisville Intl-
Standiford
501

N
Not to Scale

EMA SOUTH ARRIVAL PILOT NOTES

1. For M & S trail aircraft, upon initial contact with each controller, announce, "COMPANY SPACING." All aircraft must be at 170 Kts or less at FAF.
2. Load the ILS prior to loading the arrival. Verify speed/altitude constraints for the arrival and approach. Do not put the final approach speed in either the runway or FAF waypoint.
3. Set the FMS descent speed to .80/310.
4. Set the altitude window to the lowest assigned ATC altitude.
5. **B757/767/747-400:** Use VNAV.
6. **A300:** Use the appropriate vertical mode to meet crossing and speed restrictions.
7. **MD-11:** Use Profile Mode.
8. Maintain speed \pm 10 knots IAS of published speeds, unless M & S trail aircraft.
9. Aim the localizer after receiving ILS approach clearance.
10. After capturing the localizer, fly path or glide slope to the FAF.
11. No later than 1 mile prior to the final approach fix, select gear down and

Moving Forward

- Participate as much as possible in furthering the progress of the TF5 recommendations
 - Louisville is an ideal site with existing NextGenNow technology
 - The only missing pieces are UPS Surface Management System data in the tower and a metering tool for enroute controllers such as TMA or TBFM
 - Implement RNAV SIDs & STARs in SDF
- Leverage participation to realize benefits under principals of “best equipped, best served”
- Solve funding issues associated with aircraft equipment installations

One Voice of Experience

- This work is NOT easy or simple
- Demonstrating in revenue service is crucial as it reduces total overall effort but...
 - Requirements have to be locked down
 - Stakeholders *must* work toward a common goal
 - Results have to be repeatable by other operators with different equipment types at other airports
 - Certification/Ops Approval process must be streamlined and synchronized from operator to operator
 - Pioneer operators must receive early benefits and should be funded to reduce risk

Thank you

