

ADS-B Brass Ring

Sequencing at Louisville to save UPS nearly a million gallons of fuel per year

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After a decade of pioneering work on Automatic Dependent Surveillance-Broadcast, UPS aims to reap the benefits later this year by being the first U.S. airline to fly continuous-descent approaches on more than a trial basis.

CDAs are promising new procedures that will allow airlines to cut fuel burn, noise and emissions, and they're expected to grow in popularity.

On June 10, the cargo carrier completed a flight test for FAA certification of ADS-B SafeRoute software developed by ACSS, a Thales/L-3 Communications joint venture. The next day, this *Aviation Week & Space Technology* pilot observed the operation of the airport moving map with "own-ship position" on a Boeing 757 electronic flight bag. The 757 taxied out to midfield at UPS's hub at Louisville International Airport, and we could see all the other UPS aircraft taxiing for takeoff during the afternoon bank of departures (*AW&ST* Nov. 6, 2006, pp. 56-61).

The ACSS software runs on a Boeing Class 3 electronic flight bag from Astronautics Corp. The airport moving map showing other UPS aircraft was crystal-clear in broad daylight conditions on a high-resolution liquid crystal display.

SafeRoute's surface area movement management (SAMM) function will provide the first use by an airline of a cockpit display that can show pilots almost all aircraft on the airport surface. This capability is facilitated by the airline's commitment to equip a large part of its fleet with the latest ADS-B avionics so its 757s, 767s and soon-to-be-delivered 747-400s will all be able to broadcast their GPS positions to other aircraft and receive GPS data as well.

The second feature of the new ACSS software, also set to go operational this year, will help pay for the ADS-B system



The ACSS merging and spacing software will enable UPS aircraft to fly continuous-descent approaches to Louisville. Blue triangle shows "own-ship" merged behind UPS 2, which is following UPS 1. The pilot uses the speed command (234 kt. IAS) and fast/slow cues (both lower left) to maintain proper spacing. UPS 4 is last in line.

over many years of use. In conjunction with traffic-flow software on the ground (developed by Mitre, NASA and the FAA), the ACSS "merging and spacing" feature on the flight deck will allow the stream of UPS jets to line up in a consistent sequence for arrival at Louisville.

As a result, the airline will be able to avoid having aircraft arrive helter-skelter, only to be assigned a series of step-down altitudes as controllers vector them at low level to line them up for landing. Instead, the ground-based software will assign each aircraft another one to follow, and set the proper interval for them to maintain. Then the stream will edge in closer to the airport at high altitude. The descent will be at near-idle power most of the way to touchdown, with aircraft arriving over the threshold within seconds of the target time. UPS aircraft in the arrival stream will be displayed on the

Class 3 EFB. This is called a "cockpit display of traffic information," or CDTI.

Now the 108 UPS aircraft arriving for each nightly cargo sorting operation will be funneled to two runways using customized area navigation procedures. The procedures are expected to increase airport capacity 10-15%. In addition, the continuous-descent approach at idle power should save 250-465 lb. of fuel on each of the company's 22,000 annual arrivals in Louisville. Since CDAs are forecast to save UPS up to 900,000 gal. per year, and with fuel currently costing about \$1.92 per gal., the cost benefit far exceeds what was originally contemplated.

Each CDA will also cut noise by 30% (up to 6 dB.), NO_x (oxides of nitrogen) emissions by 34% below 3,000 ft.; CO₂ emissions will be reduced as well. ADS-B trials in 2004 also showed UPS it could save 2-4 mi. of flying for every approach.

The program is the culmination of 11 years of work by Karen Lee, director of flight operations at UPS, and technical pilot Bob Hilb. The airline first began using ADS-B as an alternative collision-avoidance system, and continued exploiting it for situational awareness after switching to the standard traffic-alert and collision avoidance system (TCAS). An FAA "tiger team" has accelerated progress toward certification of this new UPS/ACSS system.

Retrofitting Class 3 EFBs (the most capable type) on existing UPS aircraft and installing them on new 747-400s constitute a major financial commitment. The list price is \$190,000 for a Class 3 unit at Boeing. But the system will do more than just provide a display for ADS-B: It will allow UPS to move toward a paperless cockpit and to display a variety of digital documents.

A key question is whether what UPS is doing applies to other airlines. UPS flies its aircraft about 2.4 hr. per day each, and only in the U.S.; while major carriers such as American Airlines and Southwest fly theirs 12-15 hr. daily. "So you take our savings and apply them to American or Southwest, where they operate each airplane 12-15 hr. a day, and the business case rockets up," Lee says. ☐