NextGen Charlotte Douglas International Airport

A number of NextGen solutions are improving the efficiency of operations at Charlotte Douglas International Airport (CLT), including En Route Automation Modernization, System Wide Information Management, Wake Recategorization and the Charlotte Metroplex project. CLT is the second largest airport on the East Coast. In 2014, it was the sixth busiest airport in North America. Passenger traffic grew 1.9 percent in 2014 to more than 44 million and 105,845 metric tons of cargo passed through CLT's facilities. US Airways, with merger partner American Airlines and its regional affiliates, was the largest carrier at CLT in terms of average daily domestic flights.

All airport information shown above is reported by Calendar Year (CY).

NextGen Capabilities

Airport Surface Detection Equipment — Model X (ASDE-X)
8/2007
Adapted for Adjacent Center Metering (ACM)
4/2008
Area Navigation (RNAV) Standard Terminal Arrival Routes (STARs)
5/2009
Area Navigation (RNAV) Global Positioning System (GPS) Approaches
2/2010
Required Navigation Performance Authorization Required (RNP AR) Approaches
2/2010
Area Navigation (RNAV) Standard Instrument Departures (SIDs)
2/2010
External Surface Data Release
FY 2011
Automated Terminal Proximity Alert (ATPA) Phase 1
6/2013
Optimized Profile Descents (OPDs)
1/2013
Deployment of Time Based Flow Management (TBFM)
by 8/2013
Wake Recategorization Phase 1 — Aircraft Recategorization
3/2015
Expanded Low-Visibility Operations Using Lower Runway Visual Range (RVR) Minima
4/2015
Area Navigation (RNAV) Standard Terminal Arrival Routes (STARs)
1/2013
Situational Awareness and Alerting of Ground Vehicles
3/2016
Departure Clearance Tower Service Initial Operating Capability
CY 2016 Q2

- Featured capabilities have extended descriptions.

This timeline reflects programmatic milestones, and excludes capabilities implemented across the National Airspace System.

Information as of July 13, 2016.

Airport Surface Detection Equipment — Model X (ASDE-X)

Learn more about surface surveillance capabilities in the 2016 NextGen Update.

Read how ASDE-X is used at other locations in the National Airspace System.

Deployment of Time Based Flow Management (TBFM)

Learn more about TBFM in the 2016 NextGen Update.

Read how TBFM is used at other locations in the National Airspace System.

Adapted for Adjacent Center Metering (ACM)

Read how ACM is used at other locations in the National Airspace System.

Area Navigation (RNAV) Standard Terminal Arrival Routes (STARs)

Read about Performance Based Navigation and RNAV in the 2016 NextGen Update.

Area Navigation (RNAV) Global Positioning System (GPS) Approaches

Read how RNAV GPS Approaches and other NextGen technology are used at other locations in the National Airspace System.

Required Navigation Performance Authorization Required (RNP AR) Approaches

Read how RNP Approaches are used at other locations in the National Airspace System.

Area Navigation (RNAV) Standard Instrument Departures (SIDs)

View a training video for using the RNAV SID phraseology.

External Surface Data Release

Read how increased surface information is helping aircraft operators throughout the National Airspace System.

Automated Terminal Proximity Alert (ATPA) Phase 1

Read how ATPA can help operations across the National Airspace System.

Optimized Profile Descents

What are Optimized Profile Descents?

Conventional arrival procedures—the published routes and instructions that guide aircraft to the runway—are constrained by the availability and proximity of ground-based navigation aids. The advent of more precise Area Navigation (RNAV) technologies (based on GPS) eliminated this constraint and enabled the design of more efficient arrival procedures. Optimized Profile Descents (or OPDs) are a type of RNAV arrival procedure that aims to reduce the number of altitude "step-descents" common in conventional procedures. OPD procedures can be used by arrival aircraft to facilitate descent from cruise altitude at or near idle power, eliminating the need for fuel-sapping changes to power settings. This allows aircraft to fly longer at more fuel efficient cruise altitudes before initiating the descent to their final destination. While step descents may still be required for safe aircraft merging and sequencing, OPDs can reduce the time aircraft spend in level flight, and shift level flight to higher, more fuel efficient altitudes.

How is OPD used in Charlotte?

An Area Navigation (RNAV) Optimized Profile Descent (OPD) arrival procedure for Charlotte Douglas International Airport (CLT) named "IVANE FIVE" was published in FY 2013. At the time, about 25 percent of arrivals at CLT approached the airport on flows that potentially benefited from this procedure. Subsequent Performance Based Navigation (PBN) implementations at Charlotte have been conducted through FAA's Metroplex initiative, which takes a systematic approach to implementing PBN procedures and associated changes in airspace design for large geographic areas, rather than single airports.

Each Metroplex project is supported by broad stakeholder participation through its five phases: Study, Design, Evaluation, Implementation, and Post-Implementation. The Charlotte Metroplex project—currently in the Implementation phase—will address many of the 40 operational issues identified by the Charlotte Study Team in 2011. The solutions being implemented include the development of OPDs, improved lateral and vertical paths for both Standard Terminal Arrivals (STARs) and Standard Instrument Departures (SIDs) to reduce fuel burn and emissions, and earlier divergence on departures. Where applicable, arrival and departure procedures were de-conflicted and designed to create repeatable and more predictable paths, reduce controller task complexity, and enhance safety.

How did it impact operations?

As an initial step toward wider use of Area Navigation (RNAV) procedures at Charlotte Douglas International Airport (CLT), little impact was expected and observed over all CLT operations in the months following implementation. This was due in part to the relatively small share of airport arrivals positioned to benefit from the lone RNAV procedure implemented in CLT. However, over all Optimized Profile Descent (OPD) implementations in FY13 (spanning 11 airports) we found significant improvements in the efficiency of descents by airport arrivals. Specifically, we observed two significant kinds of impacts that indicate improved fuel efficiency:

- Aircraft were 6 percent more likely to perform continuous descents
- Flights that conducted step-descents did so more efficiently, exhibiting:
  - An 8 percent reduction in the average number of level segments. This reflects fewer "step-descents", which consume more fuel than continuous descents.
  - A 6 percent reductions in the average time and distance in level flight, respectively. This reflects more time in continuous descent, which is more fuel efficient than level flight.
  - A 5 percent increase in the average altitude in level flight. Aircraft are generally more fuel efficient at higher altitudes.

Not surprisingly, these improvements tended to be greater at airports where the new OPDs could be used by a higher proportion of arrivals.

Click here for a full description of the NextGen Operational Performance Assessment.

What is the value of this improvement?

The FAA estimates that these observed efficiency gains from the 41 Optimized Profile Descents (OPDs) at 11 airports implemented in FY13 translated to $4M in fuel cost savings to aircraft operators between 2013 and 2014. These savings, expressed in 2015 dollars, apply only to the share of flights at each of the airports that were in position to use the newly implemented OPD procedures. FAA monetized the observed reductions in level flight time using fleet-specific cost factors that reflect the lower fuel burn associated with idle descent.

Where else is it implemented?

In Fiscal Year 2013, the FAA published 41 Area Navigation Standard Terminal Approach Route procedures with Optimized Profile Descents (OPDs) at 11 airports. As of March 31, 2016, there are a total of 225 active OPD procedures at 116 airports in the National Airspace System.

Additional information available on the NextGen Portfolio pages.

Wake Recategorization Phase 1 — Aircraft Recategorization

See page two of the NextGen Priorities Joint Implementation Plan- Revision I for additional information about Wake Recategorization Implementation in the National Airspace System.

Read how Wake Recategorization is used at another location in the National Airspace System.

Expanded Low-Visibility Operations Using Lower Runway Visual Range (RVR) Minima

Read how expanded low visibility operations have impacted the National Airspace System.

Area Navigation (RNAV) Standard Terminal Arrival Routes (STARs)

Read about Performance Based Navigation and RNAV in the 2016 NextGen Update.

Situational Awareness and Alerting of Ground Vehicles

Read more about System Wide Information Management (SWIM).

Departure Clearance Tower Service Initial Operating Capability

Read more about Data Comm in the 2016 NextGen Update.

Scorecard

The following metrics summarize performance over a large set of diverse operations at this location. As such, their purpose is to reflect general trends as experienced by aircraft operators and passengers, without regard to their underlying drivers. For this reason, metric values should not be compared to operational impacts attributed to specific NextGen capabilities, where these are provided.

Reportable Hours for CLT
07:00 - 22:59 local time
All Information below is in Fiscal Years (October 1 - September 30).

Efficiency
Capacity

Efficiency Performance Indicators

Performance Indicator (FY)	2009	2010	2011	2012	2013	2014	2015

Average Gate Arrival Delay *Minutes per Flight* **During reportable hours, the yearly average of the difference between the Actual Gate-In Time and the Scheduled Gate-In Time for flights to the selected airport from any of the ASPM airports. The delay for each fiscal year (FY) is calculated based on the 0.5th — 99.5th percentile of the distributions for the year. Flights may depart outside reportable hours, but must arrive during them. The reportable hours vary by airport.**	2.5	0.7	3.5	-2.5	1.9	2.3	0.9
Average Number of Level-offs per Flight *Counts per Flight* **The count of level-offs as flights descend from cruise altitudes to the arrival airport, averaged for the fiscal year.**	[1]	[1]	3.1	3.1	3.1	2.9	3.0
Distance in Level Flight from Top of Descent to Runway Threshold *Nautical Miles per Flight* **The distance flown during level-off segments as flights descend from cruise altitudes to the arrival airport, averaged for the fiscal year (FY).**	[1]	[1]	44.6	44.1	44.7	42.1	41.7
Effective Gate-to-Gate Time *Minutes per Flight* **During reportable hours, the difference between the Actual Gate-In Time at the destination (selected) airport and the Scheduled Gate-Out Time at the origin airport. Flights may depart outside reportable hours, but must arrive during them. The reportable hours vary by airport and the results are reported by fiscal year (FY).**	120.1	121.3	123.8	118.1	121.0	128.7	131.4
Taxi-In Time *Minutes per Flight* **During reportable hours, the yearly average of the difference between Wheels-On Time and Gate-In Time for flights arriving at the selected airport from any of the Aviation System Performance Metrics (ASPM) airports. Flights may depart outside reportable hours, but must arrive during them. The reportable hours vary by airport.**	6.8	7.5	9.1	8.6	9.0	9.2	9.7
Taxi-Out Time *Minutes per Flight* **During reportable hours, the yearly average of the difference between Gate-Out Time and Wheels-Off Time for flights from the selected airport to any of the ASPM airports. Flights must depart during reportable hours, but may arrive outside them. The reportable hours vary by airport.**	21.2	19.8	19.8	18.8	19.3	18.9	19.4

[1] **Consistent data for the time period prior to FY 2011 are not available.**

As described by the International Civil Aviation Organization (ICAO), *efficiency addresses the operational and economic cost-effectiveness of gate-to-gate flight operations from a single-flight perspective. In all phases of flight, airspace users want to depart and arrive at the times they select and fly the trajectory they determine to be optimum.*

Capacity Performance Indicator

Performance Indicator (FY)	2009	2010	2011	2012	2013	2014	2015

Average Daily Capacity *Number of Operations* **During reportable hours, the average daily sum of the Airport Departure Rate (ADR) and Airport Arrival Rate (AAR) reported by fiscal year (FY). The reportable hours vary by airport.**	2,116	2,341	2,459	2,561	2,516	2,462	2,527
Average Hourly Capacity During Instrument Meteorological Conditions (IMC) *Number of Operations* **The average hourly capacity reported during IMC weather conditions (as defined by ASPM). Capacity is defined as the sum of Airport Departure Rate (ADR) and Airport Arrival Rate (AAR). It is calculated based on the reportable hours at the destination airport. The reportable hours vary by airport.**	121	128	137	146	145	139	141

As described by the International Civil Aviation Organization (ICAO): *The global Air Traffic Management (ATM) system should exploit the inherent capacity to meet airspace user demands at peak times and locations while minimizing restrictions on traffic flow. ICAO also notes: The ATM system must be resilient to service disruption and the resulting temporary loss of capacity.*

Additional Links

NextGen Implementation Plan

View City Pairs Data