# 2 Purpose and Need

Under NEPA, an Environmental Assessment (EA) must describe the purpose and need for the Proposed Action. The following sections discuss the need for the Proposed Action and provide specific examples of the overall problems in the Charlotte Metroplex. This discussion is followed by a description of the purpose for the Proposed Action, the criteria that will be used in this EA to evaluate the project alternatives, and the requested federal actions to facilitate completion of the Charlotte OAPM Project.

## 2.1 The Need for the CLT OAPM Project

In the context of an EA, the "need" refers to the problem that the Proposed Action is intended to resolve. The problem in this case is the inefficiency of the existing aircraft flight procedures in the Charlotte Metroplex. This inefficiency is due to constrained airspace design that prevents implementation of area navigation (RNAV) STARs with Optimized Profile Descents (OPDs) and lack of available RNAV procedures for CLT and the satellite airports in the Charlotte Metroplex. Efficiency in the Charlotte Metroplex can be substantially increased by updating existing area navigation (RNAV) procedures and supplementing conventional procedures that use older ground-based navigational aid (NAVAID) technology with procedures that employ newer RNAV technology.

Conventional procedures lack efficiencies inherent in RNAV-based procedures because they rely on technology that cannot provide specific navigational benefits for aircraft, including predetermined speeds or altitudes. Furthermore, as discussed in Section 1.2.5.1, conventional procedures are subject to lateral and vertical flight path limitations that are eliminated using RNAV technology. RNAV procedures can reduce the need for controllers to employ air traffic management tools, such as vectoring and speed adjustments, thus reducing controller and pilot workload. In turn, this adds efficiency to an air traffic system by enhancing predictability, flexibility, and route segregation. By taking advantage of the increased benefits associated with readily available RNAV technology, the FAA is better able to meet one of its primary missions as mandated by Congress – to provide for the efficient use of airspace– to develop plans and policy for the use of the navigable airspace, and to assign by regulation or order the use of the airspace necessary to ensure the safety of aircraft and the efficient use of airspace.[14]

The following sections describe in greater detail the problem and the factors that have caused the problem. Explanations of the technical terms and concepts used in this chapter are found in Chapter 1, *Background*.

### 2.1.1 Description of the Problem

As discussed in Chapter 1, the Charlotte Metroplex consists of the airspace and facilities that serve Charlotte Douglas International Airport (CLT) along with associated satellite airports. The principal air traffic control (ATC) facilities serving the Charlotte Metroplex include the Charlotte Terminal Radar Approach Control (CLT TRACON or CLT), Atlanta Air Route Traffic Control Center (ZTL ARTCC or Center), Washington ARTCC (ZDC), Jacksonville ARTCC (ZJX), and Indianapolis ARTCC (ZID). CLT airspace is characterized

[14] 49 U.S.C. § 40103(b).

by a four-corner post design, with arrivals routed over corner posts located to the northwest, northeast, southwest, and southeast. Departures are routed to the north, south, east, and west.

Several key issues have been identified that hinder optimal efficiency in the use of the Charlotte Metroplex airspace. These issues include a current airspace configuration that prevents the implementation of OPDs for arrivals from each corner post. Similarly, departing aircraft experience periods of level-off in both terminal and enroute airspace due to the current airspace configuration. In addition, there are an insufficient number of transitions for existing Standard Terminal Arrival Routes (STARs) and arrivals from the northwest corner-post require greater support. There are also an insufficient number of Standard Instrument Departures (SIDs). The current SIDs are inefficiently designed and require earlier route divergence to increase departure throughput. As a result of these inefficiencies, T-Routes that traverse the Charlotte Metroplex are not being effectively utilized by itinerant[15] aircraft.

The lack of predictability and accuracy that arises as from these issues results in increased controller and pilot workload. For example, controllers must frequently use airspace management tools and coordinating techniques such as issuing radar vectors to guide aircraft to their destinations. To ensure appropriate separation between aircraft along the common route, controllers may be required to employ airspace management tools, such as issuing speed control, vectors, or holding. This can result in more frequent controller-to-pilot and controller-to-controller communication. This increased communication may result in less predictable flight paths due to the time needed for a controller to issue an instruction to a pilot and for a pilot to confirm the instruction prior to execution. As a result, more airspace must be protected to allow aircraft the room to operate. This reduces flexibility in managing aircraft and results in less efficient operations as well as extended flight times. Combined, these factors form the basis for the problem within the Charlotte Metroplex.

It is important to note that a key design constraint is safety. Any proposed change to a procedure to resolve the problem must not compromise safety, and if possible must enhance it. The existing procedures meet FAA safety criteria. The Proposed Action is not being proposed to address any safety issues.

### 2.1.2 Causal Factors

A problem (or need) is best addressed by examining the circumstances or factors that when combined together result in its cause. For the Charlotte Metroplex, the FAA considers the current configuration of CLT airspace and the inefficiency of the existing SID and STAR procedures to be the primary foundation for the problem. Addressing the causal factors behind the problem will ultimately facilitate development of a reasonable alternative designed to resolve the problem (i.e., meet the "purpose").

As summarized above, several issues have been identified as causes for the inefficiencies in the Metroplex. For purposes of this EA, these issues were grouped into three key causal factors:

- Lack of predictable standard routes defined by procedures to/from airport runways to/from en route airspace;

[15] Itinerant aircraft are aircraft that arrive and depart to an airport from outside the airport area.

- Complex converging interactions between arrival and departure flight paths; and,
- Lack of flexibility in the efficient transfer of traffic between the enroute and terminal area airspace.

These three causal factors are discussed in the following sections.

2.1.2.1 Lack of Predictable Standard Routes Defined by Procedures to/from Airport Runways to/from Enroute Airspace

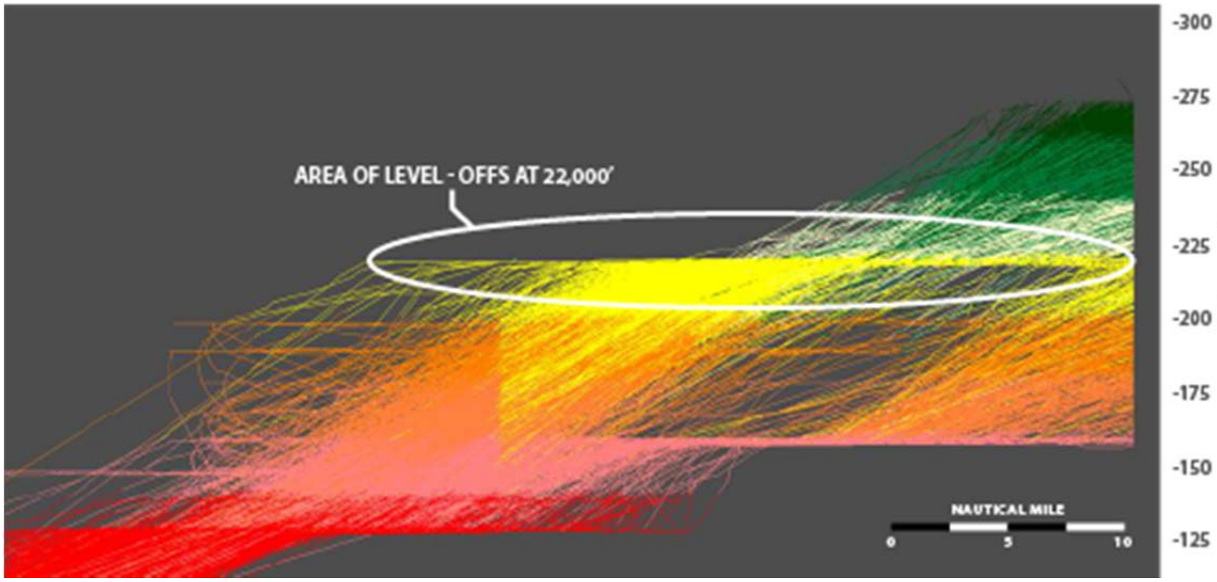
Predictable, defined routes provide pilots and controllers the ability to know ahead of time how, where, and when an aircraft should be operated. This allows for better planning of airspace use and aircraft control within a given volume of airspace. A predictable route may include expected locations (i.e., where), altitudes (i.e., where and how high), and speeds (i.e., how fast and when) at key points along a flight path. A procedure that provides these elements results in more predictable routes for both pilots and controllers. There are currently several factors that reduce the predictability of operating within the Charlotte Metroplex, including inefficient vertical paths for aircraft arriving to terminal airspace, inefficient RNAV SID design, and limited use of T-Routes. The following sections describe these factors and how they reduce predictable air traffic management.

***Vertical Path***

In guiding aircraft along their routes, controllers direct aircraft to climb, descend, or level off. During climb, the point when an aircraft reaches an assigned altitude may vary depending upon a combination of factors, including aircraft performance, weather conditions, and/or piloting technique. Aircraft arriving to or departing from the Study Airports are often required to level off during descent or climb to maintain adequate vertical separation from other aircraft travelling nearby. Flight time and distance can be increased for traffic flows with interrupted climbs and descents as the aircraft exit/enter the terminal airspace or transition to/from the runway approach environment. Unpredictable vertical guidance resulting from conflicting traffic can lead to increased controller workload and inefficient aircraft operation.

**Exhibit 2-1** shows the vertical arrival flow profile for traffic arriving to CLT from the northeast on the SUDSY STAR. To avoid ZTL high altitude sectors, aircraft on the SUDSY STAR must descend to 22,000’ (Flight Level [FL] 220) once over the MAYOS intersection. This reflects a typical pattern experienced by traffic arriving over all four corner posts. Level-offs during descent requires application of thrust for aircraft set up to land (e.g., flaps extended) to maintain approach speeds and altitude. This results in increased flight time and distance. Unpredictable vertical guidance resulting from avoidance of neighboring airspace sectors also leads to increased ATC controller workload.

**Exhibit 2-1 Vertical Arrival Flow Profile Example (SUDSY STAR)**




Source: ATAC (PDARS radar data), October 2014.
Prepared by: ATAC Corporation, October 2014.

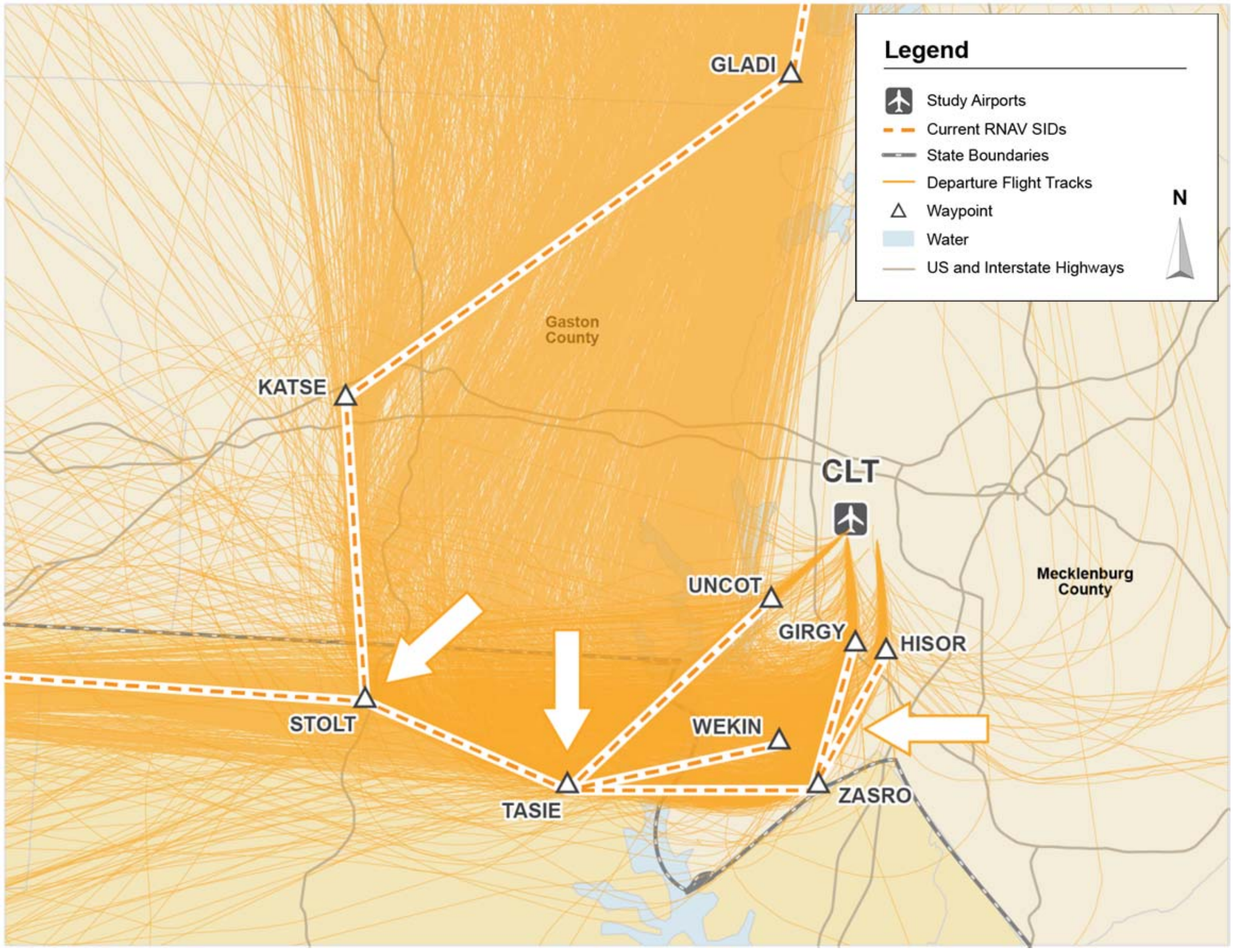
There are also routes and areas of crossing aircraft in the Charlotte Metroplex that require climbing aircraft to level-off in order to accommodate aircraft above them in a route crossing situation. For example, aircraft departing CLT are frequently directed to level-off at 8,000 feet above mean sea level (MSL) to avoid overhead arrival traffic crossing at 9,000 feet MSL. In these instances, aircraft efficiency suffers and the level-off typically leads to the aircraft taking longer to reach the enroute altitude and exit the terminal airspace.

Extended level-offs often result in increased controller-to-pilot communication and may require traffic alerts to pilots of the proximity of other aircraft or point-outs to other controllers responsible for neighboring airspace sectors. This adds to complexity (e.g., higher controller workload, the number of times controller-to-pilot communication occurs, and inefficient use of aircraft performance capabilities during a descent or climb.) This results in less predictable routes and reduced airspace efficiency.

### *Ground Path*

The RNAV SIDs that are available in the Charlotte Metroplex provide routes that are inefficiently designed. Operations on these procedures provide an example of inaccurate ground path. The ground path is the track, or trace, along the surface of the earth directly below an aircraft that represents where it is flying. **Exhibit 2-2** shows how aircraft using multiple RNAV SID routes currently follow an extended common path prior to course divergence. Because of the shared common path, in-trail spacing, or the distance between aircraft over the route, must be increased to allow for greater separation between subsequent departures. The increased use of airspace management tools results in more frequent controller-to-pilot and controller-to-controller communication, increasing controller and pilot workload and reducing predictability.

**Exhibit 2-2 Common Path and Course Divergence – ZAVER, DEBIE, and JACAL RNAV SIDs**




Source: ATAC (PDARS radar data), October 2014.
Prepared by: ATAC Corporation, October 2014.

In addition, some RNAV SID routes incorporate unnecessary sharp angles (doglegs) which could be avoided by routing aircraft directly to exit fixes. The current route design also results in an increase in flight distance and time.

### *Rarely Used T-Routes*

T-Routes are low-altitude RNAV routes established to allow aircraft to navigate through and around busy terminal airspace without requiring ATC to issue vectors to avoid potential conflicting operations. Four T-Routes (T-200 and T-202, oriented east-to-west and T-201 and T-203 oriented north-to-south) traverse CLT airspace; however, aircraft are rarely assigned to these routes most likely due their close proximity with congested CLT airspace. Additionally, the high Minimum En Route Altitude (MEA) on T-200 through CLT airspace limits its practicality. Inefficient use of T-Routes by aircraft traversing CLT airspace leads to increased congestion and decreased predictability.

#### 2.1.2.2 Complex Converging Interactions between Arrival and Departure Flight Paths

In some areas, the separation between arrival and departure flight routes (e.g., lateral separation between two routes or vertical separation between crossing routes) does not allow for fully efficient use of airspace. This requires that controllers carefully observe aircraft activity along the proximate or crossing flight routes and be prepared to manage aircraft to maintain safe separation distances.[16] For example, where arrival and departure flight routes intersect, flight level-offs may be required for either arrivals or departures to ensure adequate vertical separation between aircraft. In some cases, arriving and departing aircraft on nearby flight routes may need to be vectored to ensure safe lateral separation. In other cases, controllers may need to issue point-outs.

All of the actions described above require verbal controller-to-controller and/or controller-to-pilot communication. This increases pilot and controller workload and system complexity. In addition, vectoring and level-offs can reduce airspace and flight efficiency by adding time and distance to flights as aircraft enter/exit terminal airspace.

The following sections provide specific examples of how these interactions function within the Charlotte Metroplex.

***Multiple Transitions***

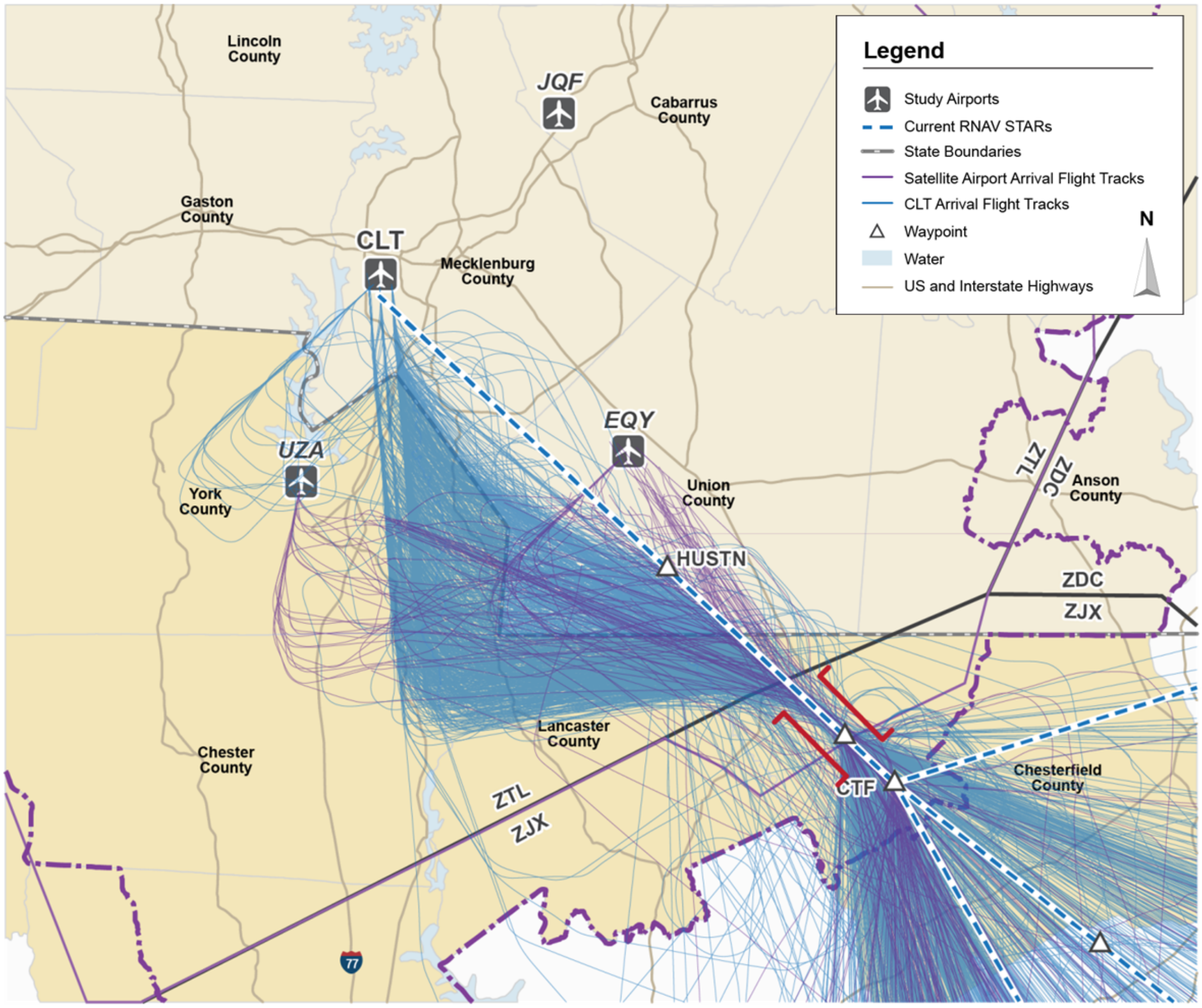
Although aircraft are routinely assigned to different runways, arrivals to CLT must be merged from several streams into a single arrival flow over the corner posts at the CLT boundary. This can result in delays due to the need to maintain appropriate in-trail separation between aircraft. Furthermore, different weather conditions that affect multiple routes can increase spacing needed between aircraft travelling at dissimilar speeds. Due to arrival demand during peak periods, delay vectors are issued to arrivals in enroute airspace. These factors can lead to delays and increased flight time and distance. Letters of Agreement (LOA) between airports, the TRACON, and the Centers and airspace limitations negate the ability to deliver more than one aircraft at a time over a fix.

***Satellite Airports***

Overall system efficiency has been decreased as a result of current interactions between CLT and satellite airport traffic. For example, as shown on **Exhibit 2-3**, arrival traffic to CLT and certain satellite airports is currently sequenced together on the HUSTN RNAV and Chesterfield (CTF) conventional STARs. Because of the complexity associated with sequencing aircraft destined for different airports along the same route, controller workload is increased, as is the potential for possible delays for arrivals to CLT and the satellite airports.

[16] Areas where the lateral or vertical separation distances are inadequate to allow efficient use of the airspace are referred to as "confliction points" by air traffic controllers.

**Exhibit 2-3 CLT and Satellite Airport Arrivals – HUSTN and CTF STARs**




Source: ATAC (PDARS radar data), October 2014.
Prepared by: ATAC Corporation, October 2014.

In addition, southbound departures from CLT fly head on with aircraft arriving from the south to Hickory Regional Airport (HKY) and Statesville Regional Airport (SVH). This leads to an increase in controller and pilot workload as a result of necessary vectoring and aircraft level-offs necessary to avoid conflict.

Other interactions observed between CLT and satellite airport operations that result in a decrease in efficiency include:

- Northwest arrivals to Columbia Metropolitan Airport (CAE) and southwest arrivals to CLT;
- Northbound and eastbound departures from CAE and southwest and southeast arrivals to CLT and southbound departures from CLT;
- Southwest arrivals to Greenville Spartanburg International Airport (GSP) and southwest arrivals to CLT;

- Northeast arrivals to GSP and departures and northwest arrivals to CLT;
- Northwest arrivals to GSP and northwest arrivals to CLT;
- Westbound departures from Raleigh-Durham International Airport (RDU) and northeast arrivals to CLT and arrivals to GSP; and,
- Southbound and eastbound departures from Piedmont Triad International Airport (GSO) and northeast arrivals to CLT.

### *Conflicting Military Activity*

Aerial refueling of military aircraft operating from Charleston Air Force Base occurs along a flight track (AR600) that can affect aircraft arriving to CLT from the southeast on the HUSTON/CTF STARs. When refueling operations are in effect, these arriving aircraft must either begin to descend prior to the NAVEE fix or use vectors to avoid military aircraft. This can result in in increased flight time and distance and increased workload for controllers and pilots.

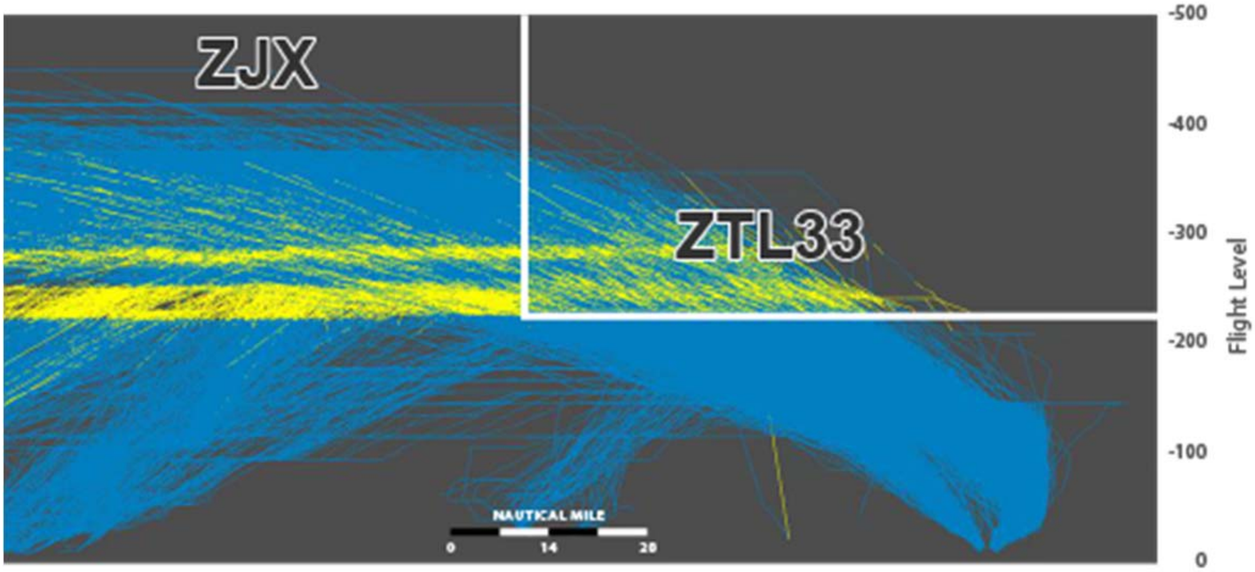
#### 2.1.2.3 Lack of Flexibility in the Efficient Transfer of Traffic between the Enroute and Terminal Area Airspace

Lack of flexibility limits air traffic controllers' ability to adapt to oft-changing traffic demands. For example, although flights are scheduled, delays in other regions or severe weather along an air traffic route may cause aircraft to enter/exit the enroute or terminal area airspace at times and locations other than those previously planned. Controllers require options to manage traffic when faced with these kinds of demands. Elements such as constrained airspace design, a lack of adequate runway transitions for existing STARs, available RNAV SIDs for departing aircraft, and the rerouting of aircraft during Ground Delay Programs are all factors identified as negatively affecting airspace flexibility within the CLT Metroplex. The following sections discuss each of these issues in greater detail.

### *Airspace Configuration*

Airspace configuration in the Charlotte Metroplex presents challenges to departing and arriving aircraft. Aircraft are often directed to interrupt climbs and descents to avoid interacting with adjacent airspace sectors. For example, because of the stratification of ZTL and ZJX airspace, aircraft departing CLT to the south during north flow conditions must frequently level-off at 23,000' and/or 27,000' (FL 230 and/or 270) until they are within the lateral boundaries of the ZJX66 airspace sector or unless they can achieve coordination with the controller responsible for the ZTL33 airspace sector that would allow passage through ZTL airspace. **Exhibit 2-4** shows areas of level-off in yellow and depicts how aircraft avoid ZTL airspace.

**Exhibit 2-4 Departure Level Offs in Enroute Airspace**




Source: ATAC (PDARS radar data), October 2014.
Prepared by: ATAC Corporation, October 2014.

Similarly, unless coordination can be achieved with the controller responsible for the ZTL30 airspace sector, aircraft departing from CLT to the north using the JACAL SID are frequently directed to level-off at 14,000' (or FL140) until they are within the lateral boundaries of the ZTL47 airspace sector. This lack of flexibility results in extended flight time and distance travelled as well as increased controller and pilot workload.

### *Runway Transitions*

As discussed in Section 1.4.2, airports such as CLT use different runway operating configurations based on factors such as weather, prevailing wind, and the type and amount of air traffic. At an airport with a high level of traffic, especially during peak periods, the availability of STARs serving each runway can increase efficiency. STARs with one or multiple runway transition routes (routes that guide an aircraft to an airport final approach that typically ends at an Initial Approach Fix) enhance efficiency by minimizing the need for controller-to-pilot communication when an aircraft moves from enroute to terminal airspace

Currently, RNAV STARs serving CLT are designed with a single downwind approach to the Airport. As a result, controllers at CLT are routinely required to vector aircraft to runways other than the primary runway to ensure that arrival traffic is efficiently balanced across runways. The lack of published runway transitions results in increased controller and pilot workload.

### *Rerouting Arriving Aircraft*

During periods of inclement weather or heavy traffic congestion, ATC may implement a ground delay program (GDP) to reduce the volume of aircraft arriving to an airport. The purpose of the GDP is to avoid exceeding the airport's capacity to accommodate arriving aircraft. Typically, this is accomplished by holding aircraft on the ground at their origin airports until arrival volumes at the affected destination airport can be brought down to an acceptable level. To avoid delaying aircraft bound for CLT, some aircraft routed to arrive from the northeast using the SUDSY STAR are being rerouted to arrive from the southeast using the HUSTN STAR. While rerouting aircraft can reduce the need to hold aircraft on the ground or for controllers to issue delay vectors, once departed from their origin airports, aircraft arriving from the northeast on the HUSTIN STAR are not able to reroute to the SUDSY STAR for arrival to CLT. This results in extended flight times and distance.

***Lack of RNAV SIDs***

There are not enough RNAV SIDS serving CLT. The lack of SIDs reduces efficiency for aircraft and increases delays by decreasing the rate at which aircraft can depart terminal airspace and increasing inter-departure times.

## 2.2 Purpose of the CLT OAPM Project

The purpose (solution) of the Proposed Action is to address the problems described in the previous sections by improving the efficient use of the navigable airspace within the Charlotte Metroplex. To meet this goal, the Proposed Action would optimize procedures serving the Study Airports, while maintaining or enhancing safety, in accordance with FAA's mandate under federal law. Specifically, the objectives of the Proposed Action are as follows:

- Improve predictability in transitioning traffic between enroute and terminal area airspace;
- Improve the segregation of arrivals and departures in the airspace; and,
- Improve flexibility in transitioning traffic between enroute and terminal area airspace and between terminal area airspace and the runways.

The frequency of controller-to-pilot communication would be expected to decrease reducing the complexity of both controller and pilot workload. Improvements in arrival and departure segregation among the Study Airports would reduce the need for vectoring and level flight segments, resulting in more predictable flows.

Each objective of the Proposed Action is discussed in greater detail below.

### 2.2.1 Improve Predictability in Transitioning Traffic between Enroute and Terminal Area Airspace

As discussed in Section 2.1.2.2, current procedures in the Charlotte Metroplex are inefficiently designed. The use of optimized descent and climb profiles is restrained by the current configuration of the airspace. Current SIDs are inefficiently designed and lack sufficient course divergence. Finally, RNAV T-Routes that traverse the Charlotte Metroplex are insufficiently used. The objective of the Proposed Action is to improve predictability by optimizing the efficient transfer of traffic between terminal and enroute airspace. This objective can be measured with the following criteria:

- Increase the number of RNAV procedures with altitude controls intended to optimize descent or climb patterns (measured by the count of procedures with altitude controls.)
- Increase the number of RNAV procedures with runway transitions routes to designated runways and enroute transitions (measured by the count of runway and enroute transitions.)

### 2.2.2 Improve the Segregation of Arrivals and Departures in Terminal Area and Enroute Airspace

As discussed in Section 2.1.2.2, in some portions of the airspace, arrival and departure routes cross, converge, or are within close proximity of each other. This requires controllers to manage the traffic to ensure that adequate separation between aircraft is maintained. RNAV procedures can be designed with capabilities such as speed control and altitude restrictions that maintain segregation of aircraft while reducing the complexity of controller and pilot workload. One objective of the Proposed Action is to implement procedures that would achieve better segregation of arrivals and departures within the airspace. This objective can be measured with the following criterion:

- Segregate Study Airport traffic (measured by the count of RNAV SIDs and/or STARs to/from Study Airports.)

### 2.2.3 Improve Flexibility in Transitioning Traffic between Enroute and Terminal Area Airspace and between Terminal Area Airspace and the Runways

As discussed in Section 2.1.2.3, the current airspace configuration prevents implementation of OPDs. The efficiency of the air traffic routes in the terminal airspace is further constrained by the lack of runway transitions for arriving aircraft traffic, rerouted arrivals due to GDPs, and a lack of sufficient SIDs. The objective of the Proposed Action is to improve the flexibility in transitioning traffic between enroute and terminal area airspace and between terminal area airspace area and the runways. This objective can be measured with the following criteria:

- Implement RNAV STARs with OPDs.
- Increase the number of enroute and runway transitions (measured by count of enroute and runway transitions for all SID and STAR procedures.)
- Segregate CLT traffic from satellite Study Airport traffic to/from Study Airports by increasing the number of STARs and/or SIDs to/from Study Airports.

## 2.3 Criteria Application

The Proposed Action is evaluated to determine how well it meets the purpose and need based on the measurable criteria and objectives described above. The evaluation of alternatives will include the No Action Alternative, under which the existing (2011) air traffic procedures serving the Study Airports would remain unchanged except for planned procedure modifications that were approved for implementation. The criteria are intended to aid in comparing the Proposed Action with the No Action Alternative.

## 2.4 Description of the Proposed Action

The Proposed Action considered in this EA would implement optimized RNAV SID and STAR procedures in the Charlotte Metroplex. This would improve the predictability and segregation of routes, as well as increase flexibility in the management of air traffic. The Proposed Action is described in detail in Chapter 3, *Alternatives*.

Implementation of the Proposed Action would not result in an increase in the number of aircraft operations at the Study Airports. Furthermore, the Proposed Action does not involve physical construction of any facilities such as additional runways or taxiways, and does not require permitting or other approvals or actions on a state or local level. Therefore, the implementation of the proposed changes to procedures in the Charlotte Metroplex would not require any physical alterations to environmental resources identified in Appendix A to FAA Order 1050.1E, Chg.1.

## 2.5 Required Federal Actions to Implement Proposed Action

Implementation of the Proposed Action requires the FAA to publish new or revised STARs and SIDs.

## 2.6 Agency and Tribal Coordination

On June 11, 2014, the FAA distributed an early notification letter to 356 federal, state, regional, and local officials as well as to three tribes. As detailed under 40 C.F.R. 1501.2 and 1501.7, the FAA sent the early notification letter to provide notice of the initiation of the EA; to request background information related to the EA study area; and to gain an understanding of issues, concern, policies, and/or regulations that may affect the environmental analysis. The FAA sent the early notification letter to serve the following purposes:

1. To advise agencies and tribes of the initiation of the EA study
2. To request background information regarding the study area established for the EA
3. To provide an opportunity to advise the FAA of any issues, concerns, policies or regulations regarding the environmental analysis that will be undertaken in the EA

**Appendix A**, *Agency Coordination, Public Involvement, and List of Receiving Parties*, includes a copy of the early notification letter (and attachments), a list of the receiving agencies and tribes, as well as correspondence received in response to the early notification letter.