Final Environmental Assessment for the Cleveland-Detroit Metroplex Project

APRIL 2018

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1 Introduction

The National Environmental Policy Act of 1969 (NEPA) [42 United States Code (U.S.C.) § 4321 *et seq.*] requires federal agencies to disclose to decision makers and the interested public a clear, accurate description of the potential environmental impacts that could arise from proposed federal actions. Through NEPA, Congress has directed federal agencies to consider environmental factors in their planning and decision-making processes and to encourage public involvement in decisions that affect the quality of the human environment. As part of the NEPA process, federal agencies are required to consider the environmental effects of a proposed action, reasonable alternatives to the Proposed Action, and a No Action Alternative (i.e., analyzing the potential environmental effects of not undertaking the Proposed Action). The Federal Aviation Administration (FAA) has established a process to ensure compliance with the provisions of NEPA through FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* (FAA Order 1050.1F).

The Proposed Action, the subject of this Environmental Assessment (EA), is called the Cleveland-Detroit Metroplex or "CLE-DTW Metroplex" Project.[1] The procedures designed for the CLE-DTW Metroplex Project would be used by arriving and departing aircraft operating under Instrument Flight Rules at the study area airports ("the Study Airports").

This EA, prepared in accordance with FAA Order 1050.1F, documents the potential effects to the environment that may result from the optimization of Air Traffic Control (ATC) procedures at the Study Airports. These airports were selected based on whether they would be directly served by a proposed procedure and, if so, whether they served the required number of annual Instrument Flight Rules filed operations under FAA Order 1050.1F. The Study Airports are:

- Cleveland Hopkins (CLE)
- Toledo Express (TOL)
- Detroit Wayne (DTW)
- Akron-Canton Regional Airport (CAK)
- Oakland County International Airport (PTK)
- Willow Run Airport (YIP)
- Cuyahoga County Airport (CGF)
- Burke Lakefront Airport (BKL)
- Coleman A. Young Municipal Airport (DET)
- Selfridge Air National Guard Base (MTC)
- Wayne County Airport (BJJ)
- Windsor International Airport (CYQG)

This EA includes the following chapters and appendices:

- **Chapter 1: Introduction.** Chapter 1 provides basic background information on the air traffic system, the Next Generation Air Transportation System (NextGen) program, Performance-Based Navigation (PBN), the FAA's Metroplex initiative, and information on the Cleveland-Detroit Metroplex and the Study Airports.

[1] The Metroplex initiative was formerly referred to as the Optimization of Airspace and Procedures in the Metroplex (OAPM) initiative. A Metroplex is a geographic area covering several airports, serving major metropolitan areas and diverse aviation stakeholders.

- **Chapter 2: Purpose and Need.** Chapter 2 discusses the need (i.e., problem) and purpose (i.e., solution) for airspace and procedure optimization in the Cleveland-Detroit Metroplex area and identifies the Proposed Action.
- **Chapter 3: Alternatives.** Chapter 3 discusses the Proposed Action and the No Action Alternative analyzed as part of the environmental review process.
- **Chapter 4: Affected Environment.** Chapter 4 discusses existing environmental conditions within the Cleveland-Detroit Metroplex area.
- **Chapter 5: Environmental Consequences.** Chapter 5 discusses the potential environmental impacts associated with the Proposed Action and the No Action Alternative.
- **Appendix A: Agency Coordination, Community Involvement, and List of Receiving Parties.** Appendix A documents agency coordination and community involvement associated with the EA process, the design and implementation team community involvement parties, and lists the local agencies and parties identified to receive notice of the Draft and Final EA documents.
- **Appendix B: List of Preparers.** Appendix B lists the names and qualifications of the principal persons contributing information to this EA.
- **Appendix C: References.** Appendix C provides references to documents used to prepare the EA document.
- **Appendix D: List of Acronyms and Glossary.** Appendix D lists acronyms and provides a glossary of terms used in the EA.
- **Appendix E: Basics of Noise.** Appendix E presents information on aircraft noise, as well as the general methodology used to analyze noise associated with aviation projects.
- **Appendix F:** Appendix F presents the comments received by the FAA on the Draft EA and presents the responses to each comment.

1.1 Project Background

On January 16, 2009, the FAA asked RTCA[2] to create a joint government-industry task force to make recommendations for implementation of Next Generation Air Transportation System (NextGen) operational improvements for the nation's air transportation system. In response, RTCA assembled the NextGen Mid-Term Implementation Task Force (Task Force 5), which included more than 300 representatives from commercial airlines, general aviation, the military, aerospace manufacturers, and airport stakeholders.[3] Section 1.2.5 discusses the NextGen Program in more detail.[4]

[2] RTCA, Inc. is a private, not-for-profit corporation that develops consensus-based recommendations regarding communications, navigation, surveillance (CNS), and air traffic management (ATM) system issues. RTCA functions as a federal advisory committee and includes roughly 400 government, industry, and academic organizations from the United States and around the world. Members represent all facets of the aviation community, including government organizations, airlines, airspace users, airport associations, labor unions, and aviation service and equipment suppliers. More information is available at http://www.rtca.org.

[3] RTCA, Inc. Executive Summary, *NextGen Mid-Term Implementation Task Force Report*, September 9, 2009.

[4] Id.

On September 9, 2009, RTCA issued the *NextGen Mid-Term Implementation Task Force Report*, which provided the Task Force 5 recommendations. One of these recommendations directed the FAA to undertake planning for implementing Performance-Based Navigation (PBN)[5] procedures on a metroplex basis, including Area Navigation (RNAV) and Required Navigation Performance (RNP), which are discussed further in Sections 1.2.5.1 and 1.2.5.2. Based on this recommendation, the FAA began the Metroplex initiative.

The purpose of the Metroplex initiative is to optimize air traffic procedures and airspace on a regional scale. This is accomplished by developing procedures that take advantage of technological advances in navigation, such as RNAV, while ensuring that aircraft not equipped to use RNAV continue to have access to the National Airspace System (NAS). This approach addresses airspace congestion and other factors that reduce efficiency in busy metroplex areas and accounts for key operating airports and airspace in the Metroplex. The CLE-DTW Metroplex Study Airports are further discussed in Section 1.4. The Metroplex initiative also addresses connectivity with other metroplex areas. The overall intent is to use limited airspace as efficiently as possible for congested metroplex areas.[6]

1.2 Air Traffic Control and the National Airspace System

The following sections provide basic background information on air traffic control and the NAS. This information includes a description of the NAS, the role of Air Traffic Control (ATC), the methods air traffic controllers use to provide services within the Air Traffic Control system, and the different phases of aircraft flight within the NAS. Following this discussion, information is provided on the FAA's NextGen program and the Metroplex initiative.

1.2.1 National Airspace System

Under the Federal Aviation Act of 1958 (49 USC § 40101 *et seq*.), the FAA is delegated control over use of the nation's navigable airspace and regulation of domestic civil and military aircraft operations in the interest of maintaining safety and efficiency. To help fulfill this mandate, the FAA established the NAS. Within the NAS, the FAA provides air traffic services for aircraft takeoffs, landings, and the flow of aircraft between airports through a system of infrastructure (e.g., air traffic control facilities), people (e.g., air traffic controllers, maintenance, and support personnel), and technology (e.g., radar, communications equipment, ground-based navigational aids [NAVAIDs],[7] etc.). The NAS is governed by various FAA rules and regulations.

The NAS comprises one of the most complex aviation networks in the world. The FAA continuously reviews the design of all NAS resources to ensure they are effectively and efficiently managed. The FAA Air Traffic Organization (ATO) is the primary organization responsible for managing airspace and flight procedures in the NAS. When changes are

[5] Additional information on Performance-Based Navigation (PBN) is provided on the FAA website at https://www.faa.gov/nextgen/update/progress_and_plans/pbn/ (accessed October 12, 2017).

[6] U.S. Department of Transportation, Federal Aviation Administration, *FAA Response to Recommendations of the RTCA NextGen Mid-Term Implementation Task Force*, January 2010, p. 14.

[7] NAVAIDs are any visual or electronic device, airborne or on the surface, which provides point-to-point guidance information or position data to aircraft in flight. http://www.fly.faa.gov/Products/Glossary_of_Terms/glossary_of_terms.html (Accessed October 12, 2017).

proposed to the NAS, the FAA works to ensure that the changes maintain or enhance system safety and improve efficiency.[8]

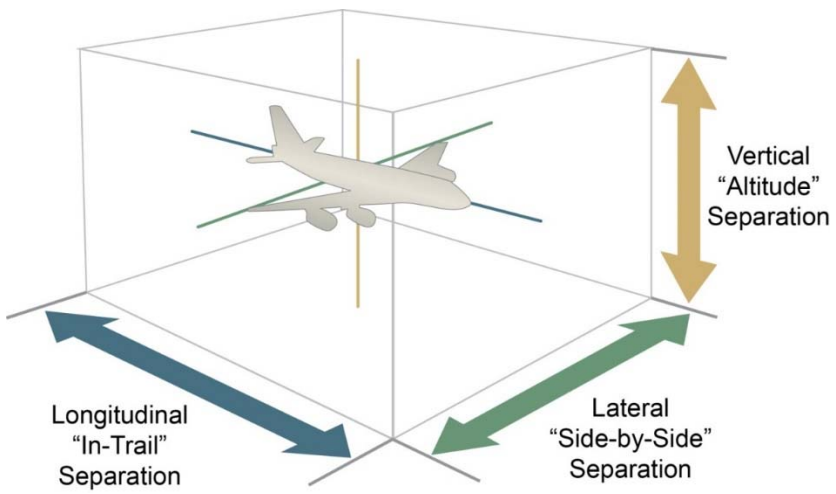
1.2.2 Air Traffic Control within the National Airspace System

The combination of infrastructure, people, and technology used to monitor and guide (or direct) aircraft within the NAS is referred to collectively as ATC. One of ATC's responsibilities is to maintain safety and expedite the flow of traffic in the NAS by applying defined minimum distances or altitude between aircraft (referred to as "separation"). This is accomplished through required communications between air traffic controllers and pilots and the use of navigational technologies.

Aircraft operate under two distinct categories of flight rules: Visual Flight Rules (VFR) and Instrument Flight Rules (IFR).[9] Under VFR, pilots are responsible to "see and avoid" other aircraft and obstacles such as terrain to maintain safe separation. Under IFR, aircraft operators are required to file flight plans and use navigational instruments to operate within the NAS. The majority of commercial air traffic operates under IFR.

Exhibit 1-1 depicts the three dimensions around an aircraft used to determine separation.

Exhibit 1-1 Three Dimensions Around an Aircraft



Source: ATAC Corporation, December 2012.
Prepared by: ATAC Corporation, July 2015.

Depending on whether aircraft are operating under IFR or VFR, air traffic controllers apply various techniques to maintain separation between aircraft,[10] including the following:

- **Vertical or "Altitude" Separation:** separation between aircraft operating at different altitudes
- **Longitudinal or "In-Trail" Separation:** separation between two aircraft operating along the same flight route, referring to the distance between a lead and a following aircraft

[8] U.S. Department of Transportation, Federal Aviation Administration, Order JO 7400.2L, Change 2, Procedures for Handling Airspace Matters, April 27, 2017.
[9] 14 Code of Federal Regulations (C.F.R.), Part 91.

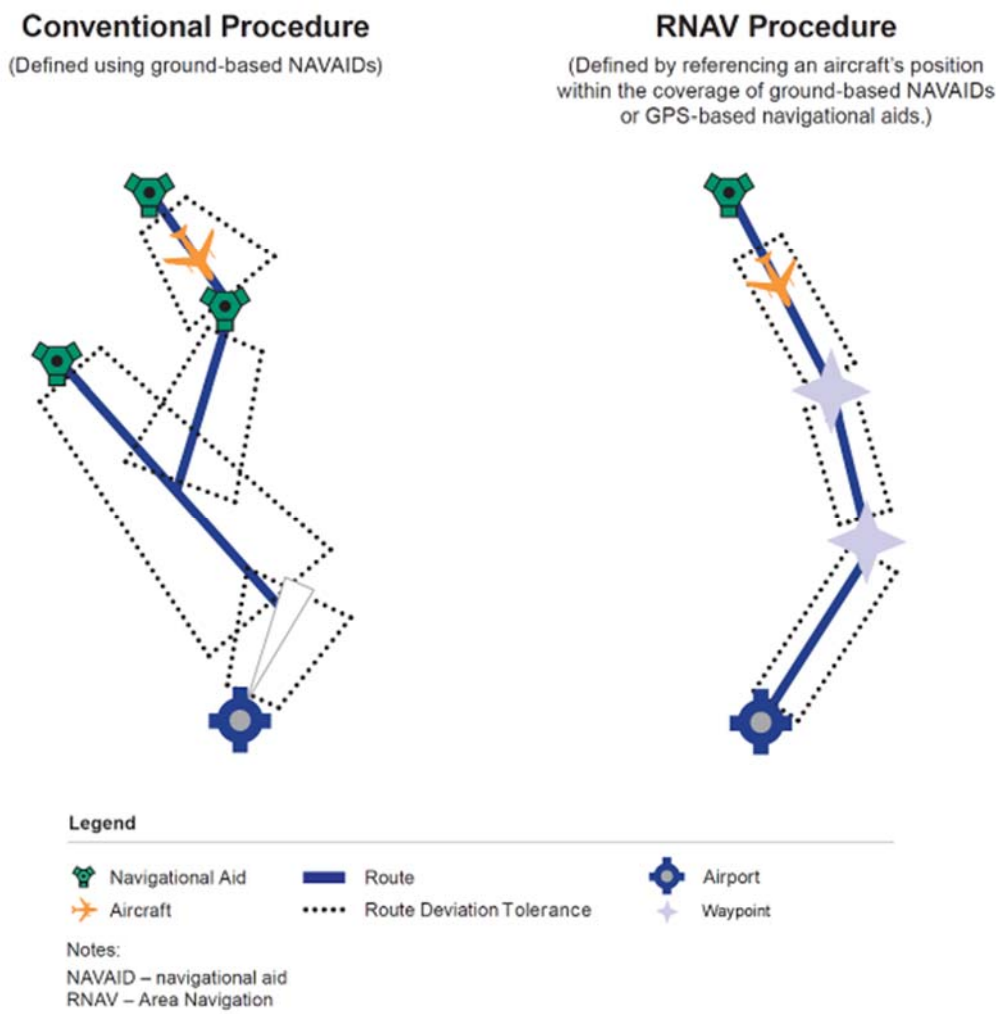
[10] Defined in FAA JO 7110.65X, *Air Traffic Control*.

- **Lateral or "Side-by-Side" Separation:** separation between aircraft (left or right side) operating along two separate but nearby flight routes

Air traffic controllers use radar to monitor aircraft and provide services that ensure separation. Published instrument procedures provide predictable, efficient routes that move aircraft through the NAS in a safe and orderly manner. These procedures reduce verbal communication between air traffic controllers and pilots. Published instrument procedures are described as "conventional" procedures when they use ground-based NAVAIDs only.

In its effort to modernize the NAS, the FAA is developing instrument procedures that use advanced technologies. A primary technology in this effort is RNAV. RNAV uses technology, including Global Positioning System (GPS), to allow an RNAV-equipped aircraft to fly a more efficient route. This route is based on instrument guidance that references an aircraft's position relative to ground-based NAVAIDs or satellites. **Exhibit 1-2** compares a conventional procedure and an RNAV procedure.

Exhibit 1-2 Comparison of Routes Following Conventional versus RNAV Procedures



Source: U.S. Department of Transportation, Federal Aviation Administration, "Performance-Based Navigation (PBN)" brochure, 2009.
Prepared by: ATAC Corporation, July 2015.

ATC uses a variety of methods and coordination techniques to maintain safety within the NAS, including:

- **Vectors:** Directional headings issued to aircraft to provide navigational guidance and to maintain separation between aircraft and/or obstacles.
- **Speed Control:** Instructions issued to aircraft to reduce or increase aircraft speed to maintain separation between aircraft.
- **Reroute:** Controllers may change an aircraft's route for a variety of reasons, such as avoidance of inclement weather, to maintain separation between aircraft, and/or to protect airspace.
- **Point-out:** Notification issued by one controller when an aircraft might pass through or affects another controller's airspace and radio communications will not be transferred.
- **Holding Pattern/Ground Hold:** Controllers assign aircraft to a holding pattern in the air or hold aircraft on the ground before departure to maintain separation between aircraft and to manage arrival/departure volume.
- **Altitude Assignment/Level-off:** Controllers assign altitudes to maintain separation between aircraft and/or to protect airspace. This may result in aircraft "leveling off" during ascent or descent.

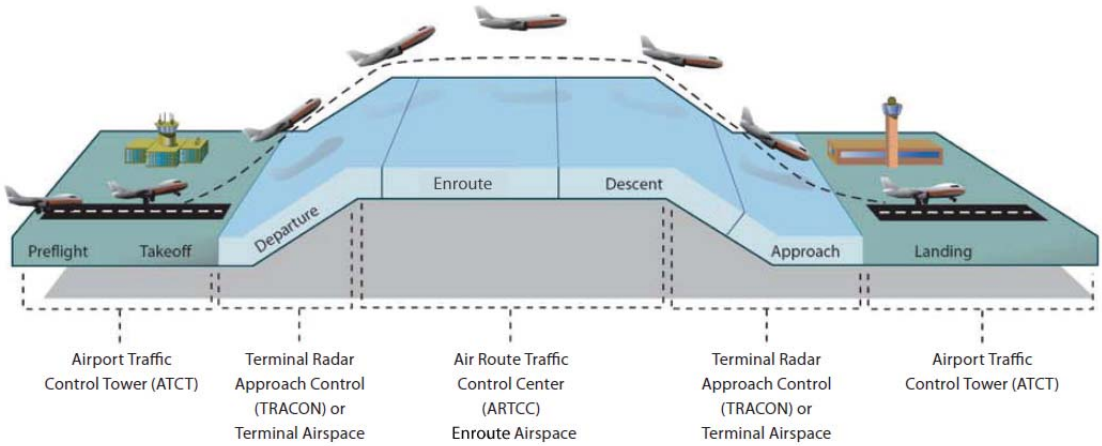
As an aircraft moves from origin to destination, ATC personnel function as a team and transfer control of the aircraft from one controller to the next and from one ATC facility to the next.

1.2.3 Aircraft Flow within the NAS

An aircraft traveling from airport to airport typically operates through six phases of flight (plus a "preflight" phase). **Exhibit 1-3** depicts the typical phases of flight for a commercial aircraft. These phases include:

- **Preflight (Flight Planning):** The preflight route planning and flight checks performed in preparation for takeoff
- **Push Back/Taxi/Takeoff:** The aircraft's transition across the airfield from push-back at the gate, taxiing to an assigned runway, and takeoff from the runway
- **Departure:** The aircraft's in-flight transition from takeoff to the enroute phase of flight, during which it climbs to the assigned cruising altitude
- **Enroute:** Generally, the level segment of flight (i.e., cruising altitude) between the departure and destination airports
- **Descent:** The aircraft's in-flight transition from an assigned cruising altitude to the point at which the pilot initiates the approach to a runway at the destination airport
- **Approach:** The segment of flight during which an aircraft follows a standard procedure that guides the aircraft to the landing runway
- **Landing:** Touch-down of the aircraft at the destination airport and taxiing from the runway to the gate or parking position

Exhibit 1-3 Typical Phases of a Commercial Aircraft Flight



Source: U.S. Department of Transportation, Federal Aviation Administration, Houston Area Air Traffic System (HAATS), Airspace Redesign, Final Environmental Assessment, Figure 1.1.1-1, March 2008.
Prepared by: ATAC Corporation, July 2015.

1.2.4 ATC Facilities

The NAS is organized into three-dimensional areas of navigable airspace that are defined by a floor, a ceiling, and a lateral boundary. Each is controlled by different types of ATC facilities including:

- **Airport Traffic Control Tower (ATCT or "Tower"):** Controllers at an ATCT located at an airport provide air traffic services for phases of flight associated with aircraft takeoff and landing. The ATCT typically controls airspace extending from the airport out to a distance of several miles. Excluding BJJ, all Study Airports have ATCTs.
- **Terminal Radar Approach Control (TRACON):** Controllers at a TRACON provide radar-monitored air traffic service to aircraft as they transition between an airport and the enroute phase of flight, and from the enroute phase of flight to an airport. This includes the departure, climb, descent, and approach phases of flights. The TRACON airspace is broken down into sectors. As an aircraft moves between sectors, responsibility for it transfers from controller to controller. Controllers maintain separation between aircraft that operate within their sectors. The Primary TRACON facilities in the Cleveland-Detroit Metroplex are the Detroit TRACON (D21) serving the Detroit area; and the Cleveland TRACON (CLE) serving the Cleveland Area. The terminal airspace in the Cleveland-Detroit Metroplex area is shown in **Exhibit 1-4**.
- **Air Route Traffic Control Centers:** Controllers at Air Route Traffic Control Centers (ARTCCs or "Centers") provide radar-monitored air traffic services during the enroute phase of flight. Similar to TRACON airspace, the Center airspace is broken down into sectors. As shown in **Exhibit 1-4**, the Cleveland-Detroit Metroplex is comprised of airspace delegated to the Cleveland ARTCC (ZOB) and Toronto Area Control Centre operated by NavCanada (ZYZ).

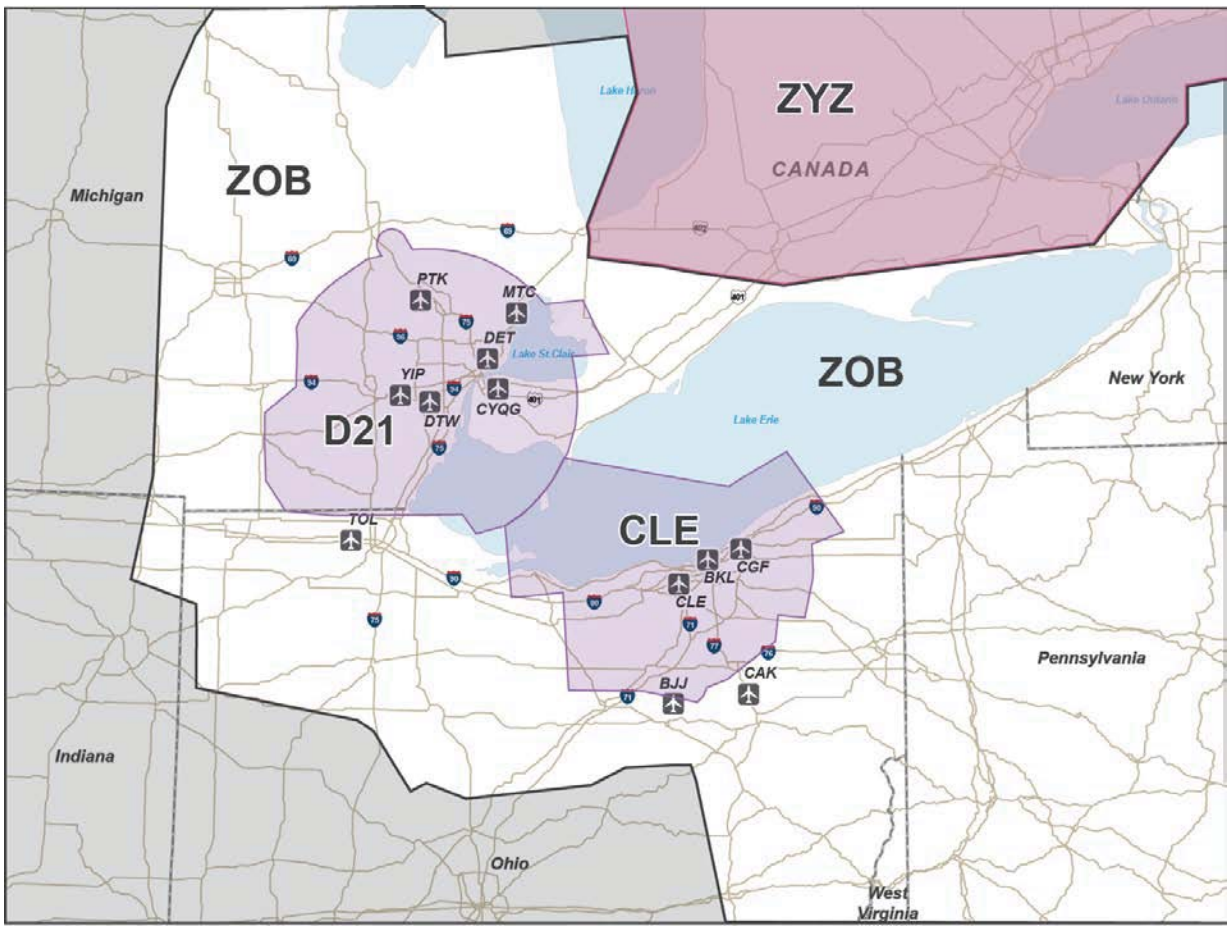
The following sections discuss how air traffic controllers at these ATC facilities control the phases of flight for aircraft operating under IFR.

1.2.4.1 Departure Flow

As an aircraft operating under IFR, also known as an "IFR aircraft," departs a runway and follows its assigned heading, it moves from the ATCT airspace, through the terminal airspace, and into enroute airspace where it proceeds on a specific route to its destination airport.

Within the terminal airspace, TRACON controllers provide services to aircraft departing from the ATCT airspace to transfer control points referred to as "exit points." An exit point represents an area along the boundary between terminal airspace and enroute airspace. Exit points are generally established near commonly used routes to efficiently transfer aircraft between terminal and enroute airspace. When aircraft pass through the exit point, control transfers from TRACON to ARTCC controllers as the aircraft joins a specific route.

Exhibit 1-4 Airspace in the Cleveland-Detroit Metroplex Area



Notes:

CLE – Cleveland TRACON	*D21 – Detroit TRACON*	*ZOB – Cleveland ARTCC*	*ZYZ – Toronto Area Control Centre*
BKL – Burke Lakefront Airport	*BJJ – Wayne County Airport*	*CAK – Akron-Canton Regional Airport*	*CGF – Cuyahoga County Airport*
CLE – Cleveland-Hopkins International Airport	*CYQG – Windsor Airport*	*DET – Coleman A. Young Airport*	*DTW – Detroit Metropolitan Wayne County Airport*
MTC – Selfridge Air National Guard Base	*PTK – Oakland County International Airport*	*TOL – Toledo Express Airport*	*YIP – Willow Run Airport*

Sources: U.S. Department of Transportation, Federal Aviation Administration, National Flight Data Center, National Airspace System Resources, Airport, and Runway databases, accessed June 2017 (airspace boundaries); National Atlas of the United States of America (U.S. County and State Boundaries, Water Bodies); Bureau of Transportation Statistics, National Transportation Atlas Database (U.S. and Interstate Highways).

Prepared by: ATAC Corporation, October 2017.

Standard Instrument Departures

Departing IFR aircraft use a procedure called a Standard Instrument Departure (SID). A SID provides pilots with defined lateral and vertical guidance to facilitate safe and predictable navigation from an airport through the terminal airspace to a specific route in the enroute airspace.

A “conventional” SID may follow a route defined by ground-based NAVAIDs, be based on vectoring, or both. Because of the increased precision inherent in RNAV technology, an

RNAV SID defines a more predictable route through the airspace than a conventional SID. Some RNAV SIDs may be designed to include paths called "runway transitions" that serve particular runways at airports. Transitions are a series of fixes leading to/from a common route. They serve as the entry and exit points into terminal and enroute airspace. A SID may have several runway transitions serving one or more runways at one or more airports. From the runway transition, aircraft may follow a common path before being directed along one or several diverging routes referred to as "enroute transitions." Enroute transitions may terminate at exit fixes or continue into enroute airspace where aircraft join a specific route.

1.2.4.2 Arrival Flow

An aircraft begins the descent phase of flight within the enroute airspace. During descent, the aircraft transitions into the terminal airspace through an "entry point," bound for the destination airport. The entry point represents a point along the boundary between terminal airspace and enroute airspace where control of the aircraft transfers from ARTCC to TRACON controllers.

Standard Terminal Arrival Routes

Aircraft that arrive in the terminal airspace normally follow an instrument procedure called a Standard Terminal Arrival Route (STAR). Aircraft leaving enroute airspace and entering terminal airspace may follow an enroute transition from an entry fix to the STAR's common route in the terminal airspace. From the common route segment, aircraft may follow a runway transition before making an approach to the airport.

1.2.4.3 Required Aircraft Separation

As controllers manage the flow of aircraft into, out of, and within the NAS, they maintain some of the following separation distances between aircraft:[11]

- **Altitude Separation (vertical):** Between the surface and 29,000 feet above mean sea level (MSL) the standard vertical separation between aircraft is 2,000 feet. In areas between 29,000 feet MSL and 41,000 feet MSL where Reduced Vertical Separation Minima (RVSM) applies, appropriately equipped aircraft must be at least 1,000 feet above/below each other until or unless lateral separation is ensured. Non-RVSM approved aircraft are not authorized to operate in areas where RVSM is in effect.
- **In-Trail Separation (longitudinal):** Within a radar-controlled area, the minimum distance between two aircraft on the same route (i.e., in-trail) can be between 2.5 to 10 nautical miles (NM),[12] depending on factors such as aircraft class, weight, and type of airspace.
- **Side-by-Side Separation (lateral):** Similar to in-trail separation, the minimum side-by-side separation between aircraft must be at least three NM in terminal airspace and five NM in enroute airspace.
- **Visual Separation:** Aircraft may be separated by visual means when other approved separation is assured before and after the application of visual separation.

[11] For a detailed explanation of separation standards, see FAA JO 7110.65X.

[12] A nautical mile is equivalent to 1.15 statute miles

1.2.5 Next Generation Air Transportation System (NextGen)

The NextGen program includes the FAA's long-term plan to deliver improved air traffic control throughout the NAS to a satellite-based system that provides more direct routes, and increased efficiencies at metropolitan areas through the Metroplex program.[13] The Metroplex initiative is a key step in the overall process of transitioning to the NextGen system. Achieving the NextGen system requires implementing RNAV and RNP PBN procedures, and aircraft "auto-pilot" and Flight Management System (FMS) capabilities.[14] RNAV and RNP capabilities are now readily available, and PBN can serve as the primary means aircraft use to navigate along a route. More than 90 percent of U.S. scheduled air carriers are equipped for some level of RNAV. The following sections describe PBN procedures in greater detail.

1.2.5.1 RNAV

Exhibit 1-5 compares conventional and RNAV routes. RNAV uses technology, including GPS, to allow an RNAV-equipped aircraft to fly a more efficient route. This route is based on instrument guidance that references an aircraft's position relative to ground-based NAVAIDs or satellites. RNAV enables aircraft traveling through terminal and enroute airspace to follow more accurate and better-defined routes. This results in more predictable routes and altitudes that can be pre-planned by the pilot and air traffic control. Predictable routes improve the ability to ensure vertical, longitudinal, and lateral separation between aircraft.

Routes based on ground-based NAVAIDs rely on the aircraft equipment directly communicating with the NAVAID radio signal and are often limited by issues such as line-of-sight and signal reception accuracy. NAVAIDs such as VHF Omnidirectional Ranges (VORs) are affected by variable terrain and other obstructions that can limit their signal accuracy. Consequently, a route that is dependent upon ground-based NAVAIDS requires at least four NM of clearance on either side of its main path to a distance of 51 NM to ensure accurate signal reception. The 51 NM mark is considered the ideal distance to the change-over point (COP) where aircraft would begin navigating from one NAVAID to another. However, as it is uncommon for NAVAIDs to be spaced at exact intervals that would allow for this scenario, clearance extends an additional two NM beyond the original four NM. The dashed lines in **Exhibit 1-5** depict how the clearance requirement increases the farther an aircraft is from the VOR. In comparison, RNAV signal accuracy requires only two NM of clearance on either side of a route's main path.

RNAV routes can mirror conventional routes or, by using satellite technology, provide paths within the airspace that were not previously possible with ground-based NAVAIDs.

1.2.5.2 Required Navigation Performance (RNP)

RNP is an RNAV procedure with signal accuracy that is increased through the use of onboard performance monitoring and alerting systems. An RNP is an RNAV procedure that requires greater accuracy of on-board performance monitoring and alerting equipment, as well as special pilot training. A defining characteristic of an RNP operation is the ability for an RNP-capable aircraft navigation system to monitor the accuracy of its navigation (based on the

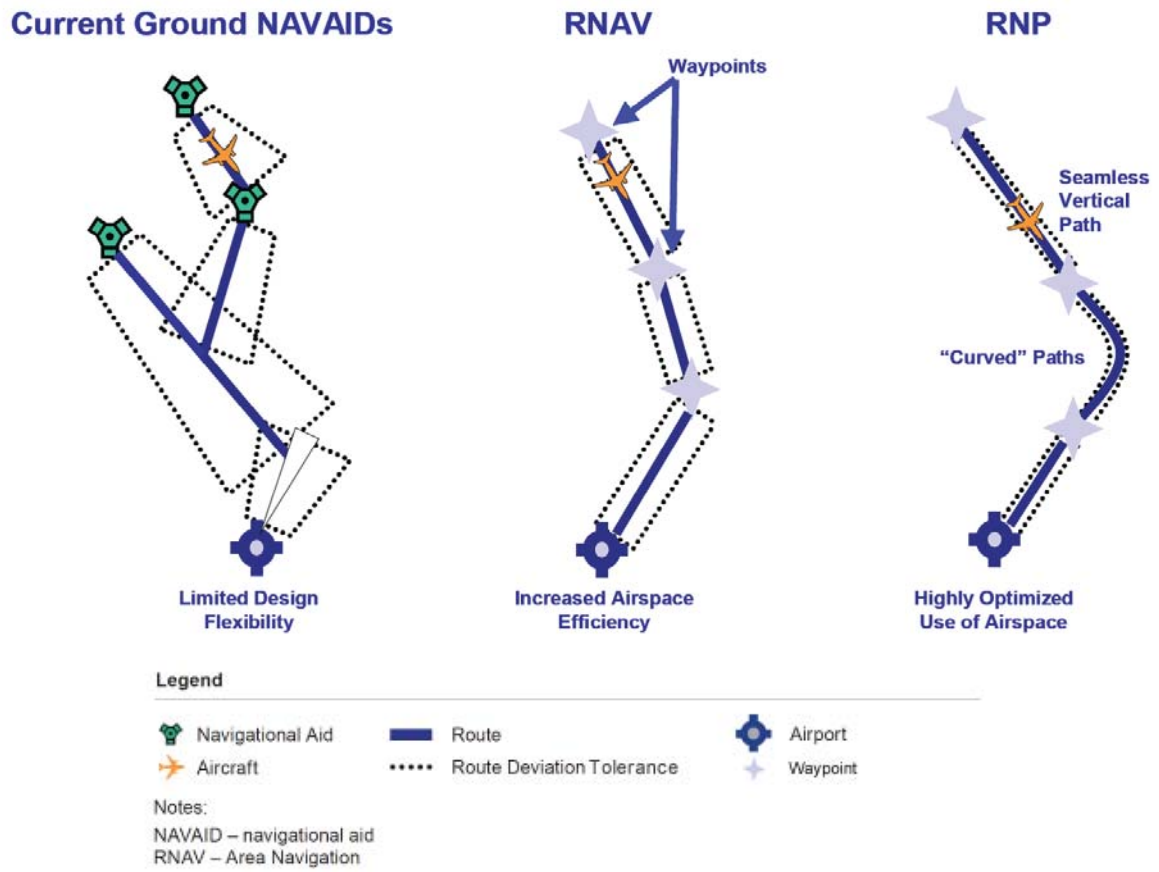
[13] https://www.faa.gov/nextgen/works/ (accessed October 27, 2017).

[14] A Flight Management System (FMS) is an onboard computer that uses inputs from various sensors (e.g., GPS and inertial navigation systems) to determine the geographic position of an aircraft and help guide it along its flight path.

number of GPS satellite signals available to pinpoint the aircraft location) and inform the crew if the required data becomes unavailable.

Exhibit 1-5 compares conventional, RNAV, and RNP procedures. It shows how an RNP-capable aircraft navigation system provides a more accurate location (down to less than a mile from the intended path) and will follow a highly predictable path. The enhanced accuracy and predictability make it possible to implement procedures within controlled airspace that are not always possible under the current air traffic system.

Exhibit 1-5 Navigational Comparison – Conventional/RNAV/RNP



Source: U.S. Department of Transportation, Federal Aviation Administration, "Performance-Based (PBN)" Brochure, October 2009.
Prepared by: ATAC Corporation, July 2015.

1.2.5.3 Optimized Profile Descent

An Optimized Profile Descent (OPD) is a flight procedure that allows an aircraft using FMS to fly continuously from the top of descent to landing with minimal level-off segments. **Exhibit 1-6** illustrates an OPD procedure compared to a conventional descent. Aircraft that fly OPDs can maintain higher altitudes and lower thrust for longer periods. As level-off segments are minimized, OPDs reduce the need for communication between controllers and pilots.

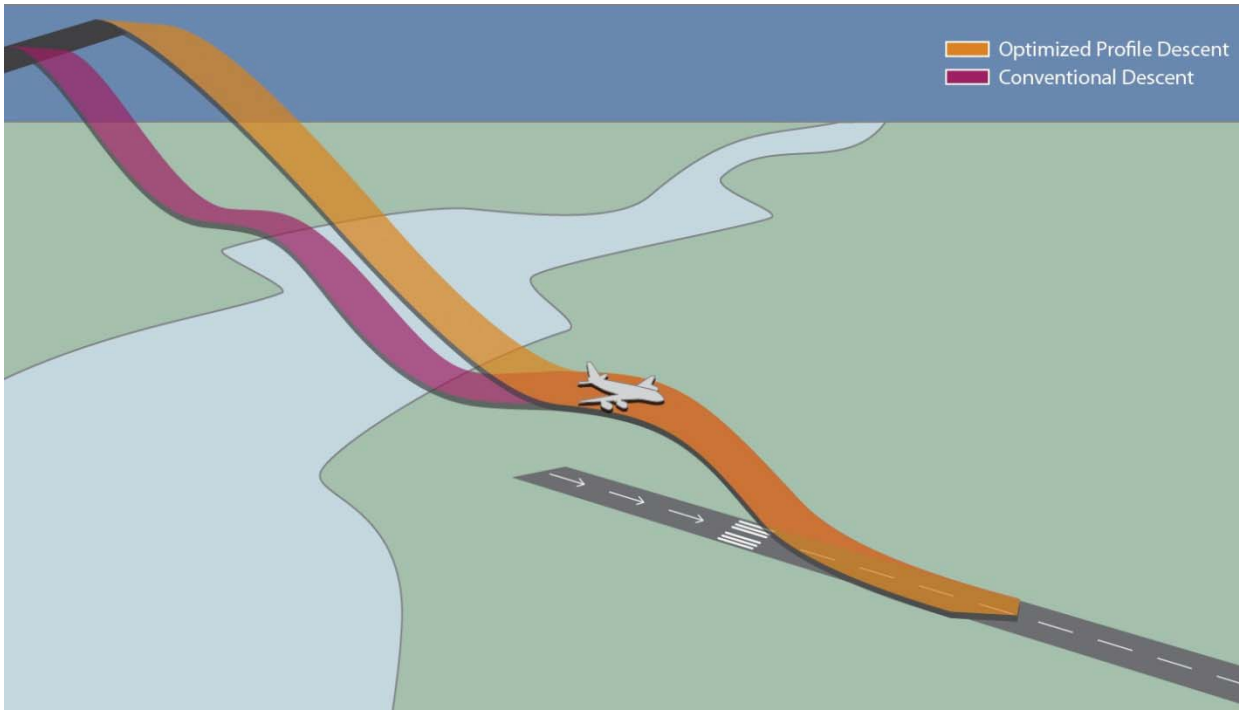
1.2.5.4 Optimized Profile Climb

An Optimized Profile Climb (OPC) is a flight procedure that allows an aircraft using FMS to fly continuously from the runway to top of climb with minimal level-off segments. Aircraft that fly OPCs can get to higher altitudes sooner with fewer changes in thrust. As level-off segments are shorter and/or fewer in number, OPCs reduce the need for communication between controllers and pilots.

1.2.6 The Metroplex Initiative

As part of the Metroplex initiative, the FAA is designing and implementing RNAV procedures that take advantage of the technology available in a majority of commercial service aircraft. The Metroplex initiative specifically addresses congestion, airports in close geographical proximity, and other limiting factors that reduce efficiency in busy metroplex airspace. Efficiency is improved by implementing more RNAV-based standard instrument procedures and connecting the routes defined by the standard instrument procedures to high- and low-altitude RNAV routes. Efficiency is further improved by using RNAV to optimize the use of the limited airspace in congested metroplex environments.

Exhibit 1-6 Optimized Profile Descent Compared to a Conventional Descent



Source: ATAC Corporation, December 2012.
Prepared by: ATAC Corporation, July 2015.

1.3 The Cleveland-Detroit Metroplex

The following sections describe the airspace structure and existing standard instrument procedures of the Cleveland-Detroit Metroplex that would be affected by the CLE-DTW Metroplex Project.

1.3.1 Cleveland-Detroit Metroplex Airspace

Exhibit 1-4 (on page 1-9) depicts the airspace structure in the Cleveland-Detroit Metroplex. The Cleveland-Detroit Metroplex consists of airspace delegated to ZOB, CLE TRACON, D21 TRACON, and Toronto Area Control Centre (ZYZ) operated by NavCanada. ZOB provides air traffic services for 68,024 square miles of enroute airspace covering the central and eastern Great Lakes region of the United States and Canada. The airspace overlies portions of the states of New York, Pennsylvania, Ohio, Indiana, Michigan, and the province of Ontario, Canada. It abuts Minneapolis (ZMP), Chicago (ZAU), Indianapolis (ZID), Washington, DC (ZDC) New York (ZNY), and Boston (ZBW) ARTCCs in the US and Toronto (ZYZ) in Canada. ZOB is responsible for all private and commercial aircraft landing, departing, and traversing inside its lateral boundaries when they are operating under IFR and offers select services to aircraft operating under VFR. ZOB provides air traffic control service to United States and foreign military aircraft operating both IFR and VFR in ZOB airspace. ZOB controllers provide air traffic services in the airspace above and adjacent to the TRACON airspace for facilities noted in **Exhibit 1-4**.

TRACON controllers provide air traffic services for terminal airspace from the surface to as high as 13,000 feet MSL over Detroit and 12,000 feet MSL over Cleveland, covering 9,204 square miles of airspace over the Cleveland-Detroit Metroplex area.[15] The lateral boundary of the D21 TRACON airspace extends approximately 45 to 55 miles from DTW in a roughly circular shape. D21 touches the CLE TRACON airspace to the southeast, roughly above the Bass Islands in Lake Erie. The CLE TRACON airspace extends outward from CLE at varying distances between approximately 30 to 55 miles.

TRACON facilities in the General Study Area are typically the last radar facilities responsible for aircraft that are landing at airports in their airspace and the first radar facilities responsible for aircraft that are departing from airports in their airspace. This responsibility includes the sequencing and separating of aircraft, and providing safe and expeditious flows of traffic within the TRACON airspace boundaries. The TRACON facilities provide air traffic control services to IFR-filed aircraft and, when requested or required, VFR aircraft. As with ZOB, the noted TRACON facilities also offer these services to military aircraft that are operating in its airspace. The D21 TRACON provides positive control for all IFR arrivals and departures for CYQG in Canada.

NavCanada operates as the Air Navigation Service Provider (ANSP) for Canadian airspace and operates seven Area Control Centres. The Area Control Centres are the Canadian equivalent of ARTCCs. ZYZ serves the Toronto Flight Information Region (FIR) that covers most of southern Ontario and abuts and overlaps with ZOB airspace. ZOB controls portions of airspace over Canadian territory, and ZYZ controls portions of airspace over US territory. This arrangement is by treaty and represents the principal reason this EA includes ZOB-controlled airspace over Canada.

1.3.2 Cleveland-Detroit Metroplex Airspace Constraints

The following sections provide a general overview of the constraints related to controlling aircraft within the Cleveland-Detroit Metroplex airspace.

[15] The Cleveland-Detroit area contains one local approach control facility along with airport traffic control towers located at numerous airports. The responsibilities for airspace in these facilities are generally more localized to individual airports. Additionally, one military facility provides air traffic control into and out of their airfield.

1.3.2.1 International Boundary

The geographic location of the Cleveland-Detroit Metroplex includes the northern tier of states in the Great Lakes region of the United States and a portion of Southern Ontario immediately adjacent to the Detroit area. The FAA and NavCanada exchanged certain portions of airspace for positive control resulting in airspace the US controls over Canada and airspace NavCanada controls over the United States. As a result, the Cleveland-Detroit Metroplex straddles and crosses international boundaries. These political boundaries do not pose significant challenges to the separation and positive control of aircraft in the Cleveland-Detroit Metroplex airspace and operate through letters of agreement between control facilities.

1.3.2.2 Class Bravo Airspace

Class Bravo airspace is regulatory airspace, generally located around major airports, such as CLE and DTW. The rules for flying inside of Class Bravo airspace are more restrictive than for other types of terminal airspace. These rules make for a safer and more orderly flow of traffic within Class Bravo airspace. Class Bravo airspace design has a direct impact on the flow of traffic within the Cleveland-Detroit Metroplex.

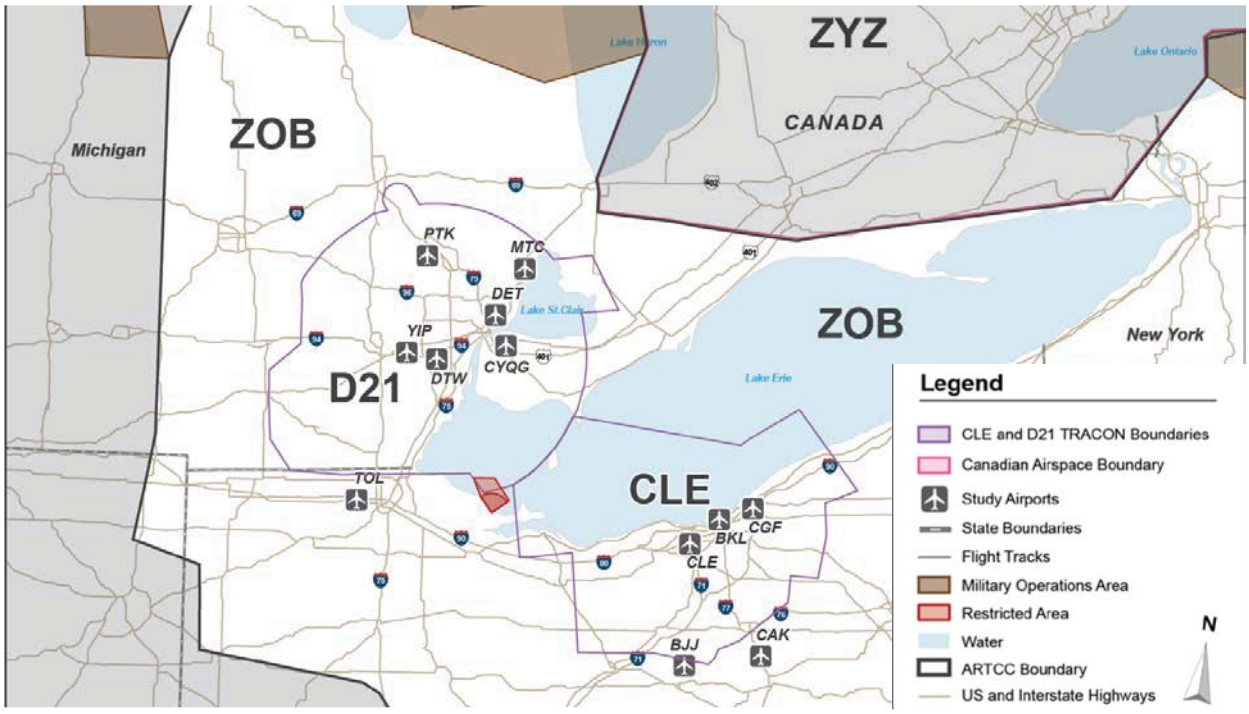
Due to Class Bravo airspace design, ZOB delivers arrival flow traffic to TRACON airspace via multiple arrival flows with sequenced aircraft. The multiple arrival flows generally operate in a four corner-post system. The four corner-posts reflect compass headings (i.e. Northeast, Southeast, Southwest, and Northwest). The transfer of control points, where control transfers from the Center to the TRACON, are generally located along the common lateral boundary of each facility's airspace.

1.3.2.3 Cleveland-Detroit Metroplex Special Use Airspace

Exhibit 1-7 depicts the boundaries of Special Use Airspace (SUA) in the Cleveland-Detroit Metroplex. SUA is airspace with defined vertical and lateral boundaries in which certain activities such as military flight training and air-to-ground military exercises must be confined. These areas either restrict other aircraft from entering or limit aircraft activity allowed within the airspace. There are two types of SUA located within the Cleveland-Detroit Metroplex:

- **Restricted Area:** Restricted areas contain airspace within which aircraft, while not wholly prohibited, are subject to restrictions when the area is used. The area denotes the existence of unusual, often invisible hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Entering a restricted area without authorization may be extremely hazardous to the aircraft and its occupants. When the area is not being used, control of the airspace is released to the FAA, and ATC can use the area for normal operations.
- **Military Operating Area:** Military Operating Areas (MOAs) consist of airspace with defined vertical and lateral limits established for the purpose of separating certain military training activities (e.g., air combat tactics, air intercepts, aerobatics, formation training, and low-altitude tactics) from IFR traffic. Whenever an MOA is used, nonparticipating IFR traffic are cleared through an MOA if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict nonparticipating IFR traffic.

Exhibit 1-7 Special Use Airspace



Notes:

CLE – Cleveland TRACON	*D21 – Detroit TRACON*	*ZOB – Cleveland ARTCC*	*ZYZ – Toronto Area Control Centre*
BKL – Burke Lakefront Airport	*BJJ – Wayne County Airport*	*CAK – Akron-Canton Regional Airport*	*CGF – Cuyahoga County Airport*
CLE – Cleveland-Hopkins International Airport	*CYQG – Windsor Airport*	*DET – Coleman A. Young Airport*	*DTW – Detroit Metropolitan Wayne County Airport*
MTC – Selfridge Air National Guard Base	*PTK – Oakland County International Airport*	*TOL – Toledo Express Airport*	*YIP – Willow Run Airport*

Sources: U.S. Department of Transportation, Federal Aviation Administration, National Flight Data Center, National Airspace System Resources, Airport, and Runway databases, accessed June 2017 (airspace boundaries); National Atlas of the United States of America (U.S. County and State Boundaries, Water Bodies); Bureau of Transportation Statistics, National Transportation Atlas Database (U.S. and Interstate Highways).

Prepared by: ATAC Corporation, October 2017.

As shown in **Exhibit 1-7**, excluding a restricted area above Lake Erie near Camp Perry and the Steelhead MOA above portions of Huron, Tuscola, and Sanilac Counties, there is no other SUA in ZOB airspace.

1.3.3 STARs and SIDs Serving Study Airports

As of November 2013, 31 published STARs and SIDs serve the Study Airports within the Cleveland-Detroit Metroplex. Of these, 30 are conventional procedures. One RNAV SID serves Cleveland area Study Airports, and no RNAV procedures serve the Detroit area Study Airports.

1.4 Cleveland-Detroit Metroplex Major Study Airports

Exhibit 1-8 shows the locations of the 12 CLE-DTW Metroplex Project Study Airports. The Study Airports were selected based on specific FAA criteria: each airport must have a minimum of 700 annual IFR-filed jet operations or 90,000 or more annual propeller aircraft operations. Airports that did not meet these thresholds were not included as Study Airports, because the Proposed Action would result in little or no change to their operations. In addition, airports where the majority of traffic operates under VFR were also excluded from selection as Study Airports, because they are not expected to be affected by the Proposed Action. VFR aircraft operating outside controlled airspace are not required to be in contact with ATC. Because these aircraft operate at the discretion of the pilot on a "see and be seen" basis and are not required to file flight plans, the FAA generally has very limited information for these operations.

Exhibit 1-8 Study Airport Locations

Sources: U.S. Department of Transportation, Federal Aviation Administration, National Flight Data Center, National Airspace System Resources, Airport, and Runway databases, accessed June 2017 (airspace boundaries); National Atlas of the United States of America (U.S. County and State Boundaries, Water Bodies); Bureau of Transportation Statistics, National Transportation Atlas Database (U.S. and Interstate Highways).
Prepared by: ATAC Corporation, June 2017.

Of the 12 airports included in the CLE-DTW Metroplex Project, the Study Team identified the following as the Major Study Airports:

Cleveland-Hopkins International Airport (CLE) is located approximately nine miles southwest of downtown Cleveland and approximately 93 miles southeast of DTW. CLE is classified as a medium-hub commercial service airport in the 2015-2019 National Plan of Integrated Airport Systems (NPIAS). CLE has six runways, described in **Table 1-1**. As of November 2013, CLE IFR arrivals may be assigned one of four conventional STARs. Departing IFR aircraft may be assigned one of three conventional SIDs or one RNAV SID.

Detroit Wayne County International Airport (DTW) is located approximately 16 miles southwest of downtown Detroit. DTW is classified as a large-hub commercial service airport

under the 2015-2019 NPIAS. DTW has twelve runways, described in **Table 1-1**. As of November 2013, DTW IFR arrivals may be assigned one of five conventional STARs. Departing IFR aircraft may be assigned one of eight conventional SIDs.

Table 1-1 Cleveland-Detroit Metroplex EA Major Study Airports

Airport Name	Airport Code	Location	Runways[1/]
Notes:			
Major Airports			
Cleveland-Hopkins International Airport	CLE	Cleveland, OH	6L,6R, 10, 24L, 24R, 28
Detroit Metropolitan Wayne County Airport	DTW	Detroit MI	3L, 3R, 4L, 4R, 9L, 9R, 21L, 21R, 22L, 22R, 27L, 27R

1/ A runway can be used in both directions, but are named in each direction separately. Runway number is based on the magnetic direction of the runway (e.g., Runway 09 points to the east direction). The two numbers on either side always differ by 180 degrees. If there is more than one runway pointing in the same direction, each runway number includes an 'L,' 'C,' or 'R' at the end. This is based on which side a runway is next to another one in the same direction.

Source: Department of Transportation, Federal Aviation Administration. digital-Airport/Facility Directory. (http://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dafd/; Accessed June 27, 2017).
Prepared by: ATAC Corporation, June 2017.

As shown in **Table 1-2**, in 2014, approximately 51 percent of all IFR traffic within the Cleveland-Detroit Metroplex area operated at the major Study Airports.

Table 1-2 Distribution of 2014 IFR Traffic under FAA Control Among Study Airports

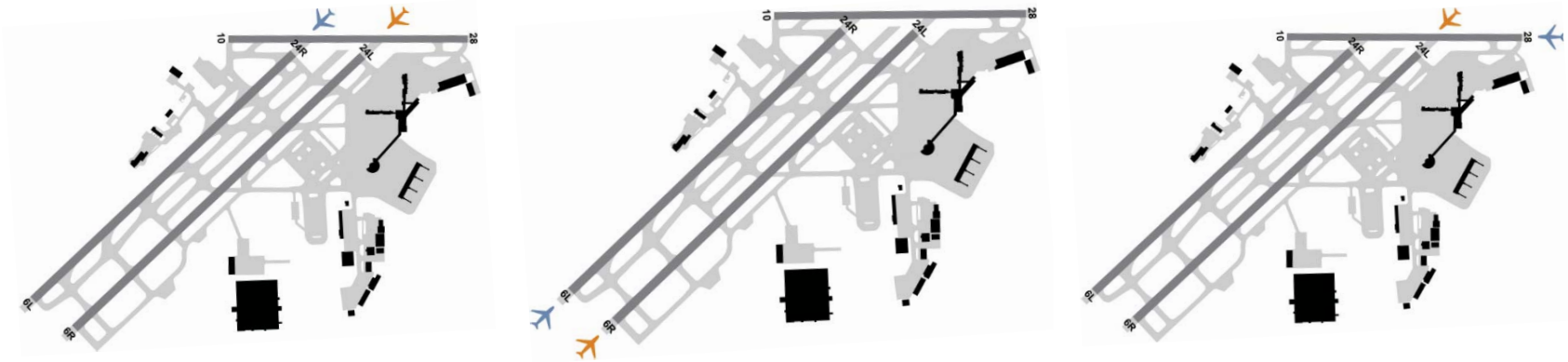
Airport	IFR Operations	Percent of Total Operations
Cleveland Hopkins International Airport (CLE)	137,363	95.7%
Detroit Metropolitan Wayne County Airport (DTW)	394,790	99.5%
Toledo Express Airport (TOL)	40,029	65.2%
Akron-Canton Regional Airport (CAK)	101,706	75.2%
Oakland County International Airport (PTK)	114,958	45.2%
Willow Run Airport (YIP)	68,341	58.6%
Cuyahoga County Airport (CGF)	45,246	36.1%
Burke Lakefront Airport (BKL)	66,862	22.1%
Coleman A. Young Municipal Airport (DET)	66,644	17.4%
Selfridge Air National Guard Base (MTC)	N/A	N/A
Wayne County Airport (BJJ)	N/A	N/A
Windsor Airport (CYQG)	9,243	44.8%
Total IFR Operations	1,045,182	95.7%
Total DTW & CLE IFR Operations	532,153	99.5%

Sources: Department of Transportation, Federal Aviation Administration. Operations Network: Tower Counts (https://aspm.faa.gov/opsnet/sys/Tower.asp; accessed June 27, 2017.). Statistics Canada (http://www.statcan.gc.ca/pub/51-209-x/2015001/t007-eng.htm; accessed June 27, 2017.)
Prepared by: ATAC Corporation, June 2017.

1.4.1 Major Study Airports Runway Operating Configurations

The major Study Airports often operate under several different runway operating configurations depending on factors such as weather, prevailing wind, airport maintenance or construction, and air traffic conditions. As a result, it is possible for the runway ends used for arrivals and departures to change several times throughout a day. Controllers at these airports use different runway operating configurations. **Exhibits 1-9** and **1-10** illustrate the primary runway operating configurations at CLE and DTW, respectively.

Exhibit 1-9 CLE Runway Operating Configurations



Runways 24 L/R
Operating Configuration – South
Arrivals 60.3% Departures 61.6%

Runways 6L/R
Operating Configuration – North
Arrivals 39.5% Departures 38.2%

Runways 28, 24L
Operating Configuration – 28
Arrivals 0.2% Departures 0.1%

Primary Arrival Secondary Arrival Primary Departure Secondary Departure

Sources: U.S. Department of Transportation, Federal Aviation Administration, Airport Diagrams [http://www.faa.gov/airports/runway_safety/diagrams/ (accessed June 2017)]; FAA ASPM (retrieved June 2017).
Prepared By: ATAC Corporation, October 2017.

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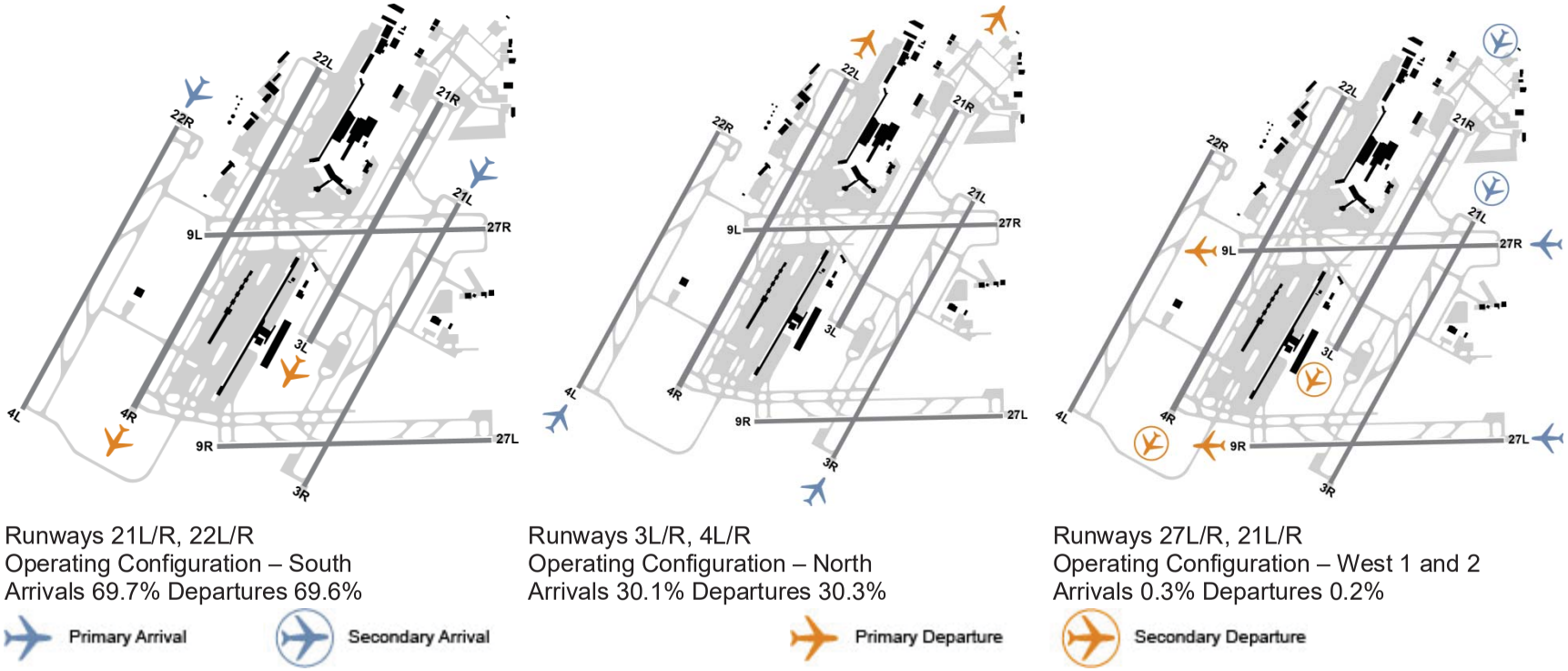
Exhibit 1-10 DTW Runway Operating Configurations



Sources: U.S. Department of Transportation, Federal Aviation Administration, Airport Diagrams [http://www.faa.gov/airports/runway_safety/diagrams/ (accessed June 2017)]; FAA ASPM (retrieved June 2017).

Prepared By: ATAC Corporation, October 2017.

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