2 Purpose and Need

Under NEPA, an 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 problems in the DEN Metroplex. This discussion is followed by a description of the purpose for the Proposed Action, the criteria that the FAA will use to evaluate the project alternatives, and the requested federal actions needed to complete the DEN Metroplex Project.

2.1 The Need for the Proposed Action

In the context of an EA, "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 air traffic control (ATC) procedures in the DEN Metroplex. This problem is due to the use of older area navigation (RNAV) ATC procedure techniques and strategies applied in a 2012 ATC procedure design for the Denver region. As described in Chapter 1, more than 90 percent of U.S. scheduled air carriers are equipped for some level of RNAV. Under Existing Conditions,[30] 16 of the existing 21 SID ATC procedures currently used in the DEN Metroplex are RNAV ATC procedures.

While conventional ATC procedures lack efficiencies inherent in RNAV-based ATC procedures, the techniques and strategies of air traffic management applied to RNAV ATC procedures are evolving rapidly to take advantage of RNAV capabilities among aircraft, air crews and air traffic controllers. These techniques and strategies provide specific navigational benefits for aircraft, including predetermined speeds or altitudes that aircraft can been directed to achieve at a specific point in the airspace. Refined procedures, strategies, and techniques associated with air traffic management have adjusted and improved to better take advantage of RNAV capabilities and to reduce complexity.

As discussed in Section 1.2.5.1, conventional ATC procedures are subject to lateral and vertical flight path limitations that are eliminated using RNAV technology. RNAV ATC procedures can reduce the need for controllers to employ 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 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.[31]

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*.

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[30] For purposes of this Environmental Assessment, "existing conditions" pertains to conditions for the period of July 1, 2016 – June 30, 2017 (the most recent year of radar data available). Existing conditions are further discussed in Chapter 4, Affected Environment.

[31] 49 U.S.C. § 40103(b).

2.1.1 Description of the Problem

As previously stated, the DEN Metroplex airspace can be improved to increase efficiency. Under Existing Conditions, five of the existing 21 SID ATC procedures are conventional ATC procedures which are less efficient than RNAV ATC procedures. The efficiency decreases and the procedural complexity increases in the DEN Metroplex when ATC is required to use aircraft management tools and coordination techniques to provide separation services. These can include speed control, level flight segments, and vectoring.

In many situations, applying these tools and techniques increases the complexity of providing air traffic services and leads to less efficient aircraft operations and use of airspace. As noted in Section 1.3.1, the 2012 FAA RNAV and RNP ATC procedures deployment, while intended to take full advantage of RNAV technology, had a number of consequences that merit attention under the FAA's Metroplex initiative. Aircraft management tools and coordination techniques are further discussed in Section 1.2.2.

As described in Section 1.2.5.1, conventional ATC procedures, compared to RNAV ATC procedures, require larger areas of clearance to ensure accurate signal reception. As a result, conventional ATC procedures typically require more airspace, are less efficient, and may result in increased controller and pilot workload due to the accuracy of the ATC procedures. For example, it may be necessary for aircraft to fly an extended common route prior to diverging on their separate courses to their assigned exit fixes. To ensure appropriate separation between aircraft along the common route, controllers may employ airspace management tools, such as issuing speed control and/or vectors. This may result in more frequent controller/pilot, and controller/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 executing it. As a result, even more airspace must be protected to allow aircraft the room to operate. This reduces flexibility by limiting the airspace in which air traffic services can be provided to aircraft and results in less efficient operations.

Currently, controllers rely on an assortment of conventional and RNAV departure ATC procedures using both vectors and route structures to maintain adequate separation. This results in excessive vectoring, speed control and limitation issues, in-trail spacing issues, and excessive level-offs as aircraft are climbing or departing DEN Metroplex airspace. Aircraft arriving to or departing from DEN or the Study Airports experience these issues frequently.

In general, the issues associated with the current arrival ATC procedures to DEN are related to inefficient lateral and vertical paths, conflicts with departure traffic, and underutilized en route transitions. As a result, controllers must issue vectors or require aircraft to level-off more frequently to maintain required separation between aircraft. This results in prolonged flight times, as well as increased workload for controllers and pilots as communication must be maintained between controllers and pilots as long as the aircraft is operating on the ATC procedure. Combined, these factors form the basis for the problem within the Denver Metroplex.

It is important to note that a key design constraint is safety. Any proposed change to an ATC procedure to resolve a problem must not compromise safety, and if possible must enhance safety. Although the current ATC procedures are less efficient, they meet current FAA safety criteria.

2.1.2 Causal Factors

The inefficiencies and resulting complexities associated with existing SID and STAR ATC procedures are the primary foundation for the problem in the Denver Metroplex. A problem (or need) is best addressed by examining the circumstances or factors that cause it. Addressing the causal factors behind the problem will help develop 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 Denver Metroplex. For purposes of this EA, these issues were grouped into three key causal factors:

- Lack of flexibility in the efficient transfer of traffic between the en route and terminal area airspace;
- Complex converging and dependent route ATC procedure interactions; and,
- Lack of predictability in the efficient transfer of traffic between en route and terminal area airspace.

These three causal factors are discussed in the following sections.

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

Lack of procedural flexibility limits air traffic controllers' ability to adapt to often changing traffic demands. For example, constraints associated with SUA, delays in other regions, or severe weather along an air traffic route may cause aircraft to enter or exit the en route 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. Additional en route transitions can reduce the need for the vectoring needed to maintain separation between aircraft. Additional transitions can also provide additional options to better balance traffic and controller workload. Transitions were further discussed in Section 1.2.4.1.

Less efficient ATC procedures, with fixes based on ground-based navigational aids (NAVAIDs), may only allow for a limited number of transitions. This can result in some transitions experiencing heavy traffic and congestion while others may go unused. Some existing conventional transitions go unused because they are excessively long and result in inefficient lateral paths for aircraft travelling on them. Other transitions go unused because they conflict with other ATC procedures.

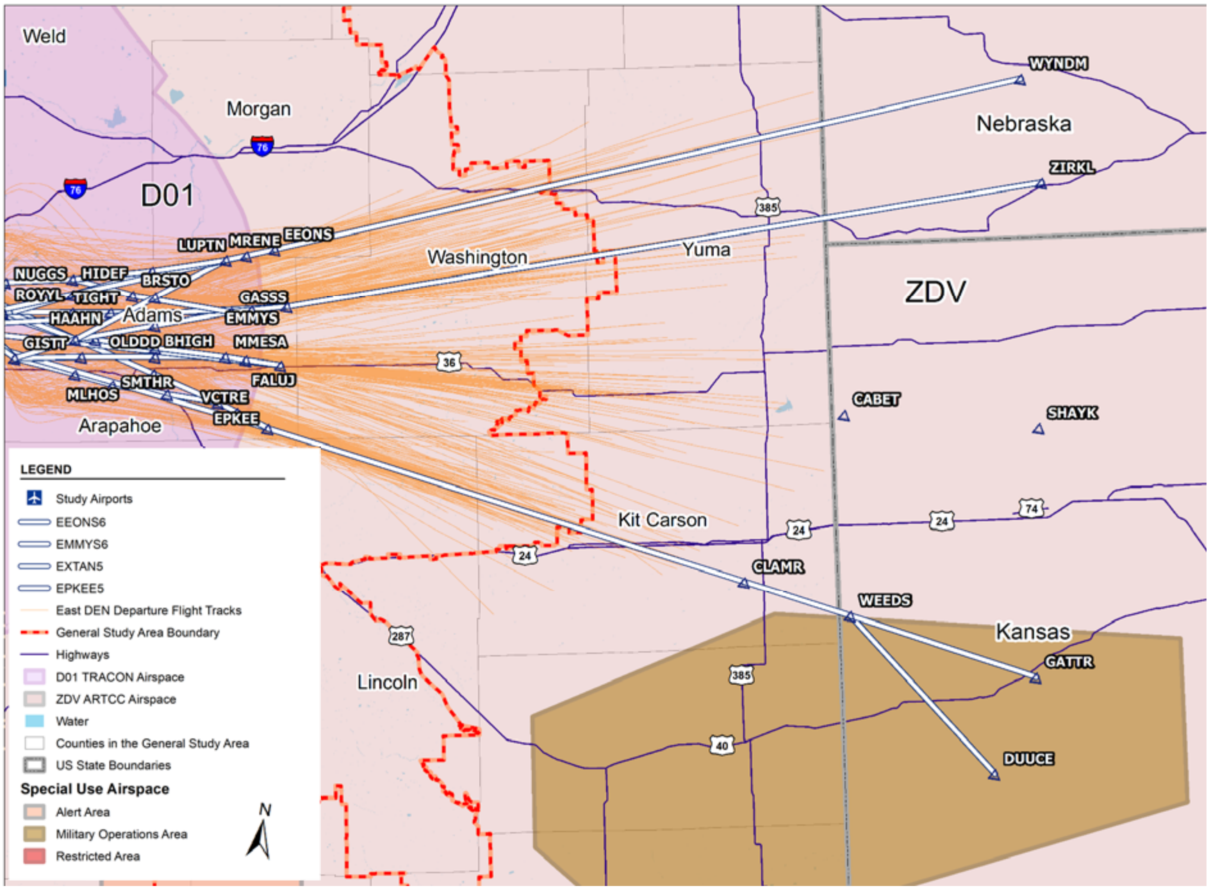
Some current transitions can provide additional challenges. For example, transitions that are used by both propeller and jet aircraft are often constrained because lower-performing aircraft are unable to maintain sufficient speed and altitude to ensure adequate separation from higher-performing aircraft on the route without additional intervention by air traffic controllers. As a result, controllers must employ airspace management tools, such as issuing vectors, to maintain separation between aircraft.

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

DEN EEONS, EMMYS, EXTAN, and EPKEE Eastbound Departures

Exhibit 2-1 (macro view) and **Exhibit 2-2** (micro-view) depict the DEN eastbound departure ATC procedures. These departure ATC procedures account for approximately 36 percent of all DEN jet departures. The eastbound DEN departures conflict with the Front Range Airport Class D airspace immediately east of DEN on the EEONS and EMMYS SIDs. The eastbound departures on the EPKEE conflict with the Cougar MOA as shown in **Exhibit 2-1**.

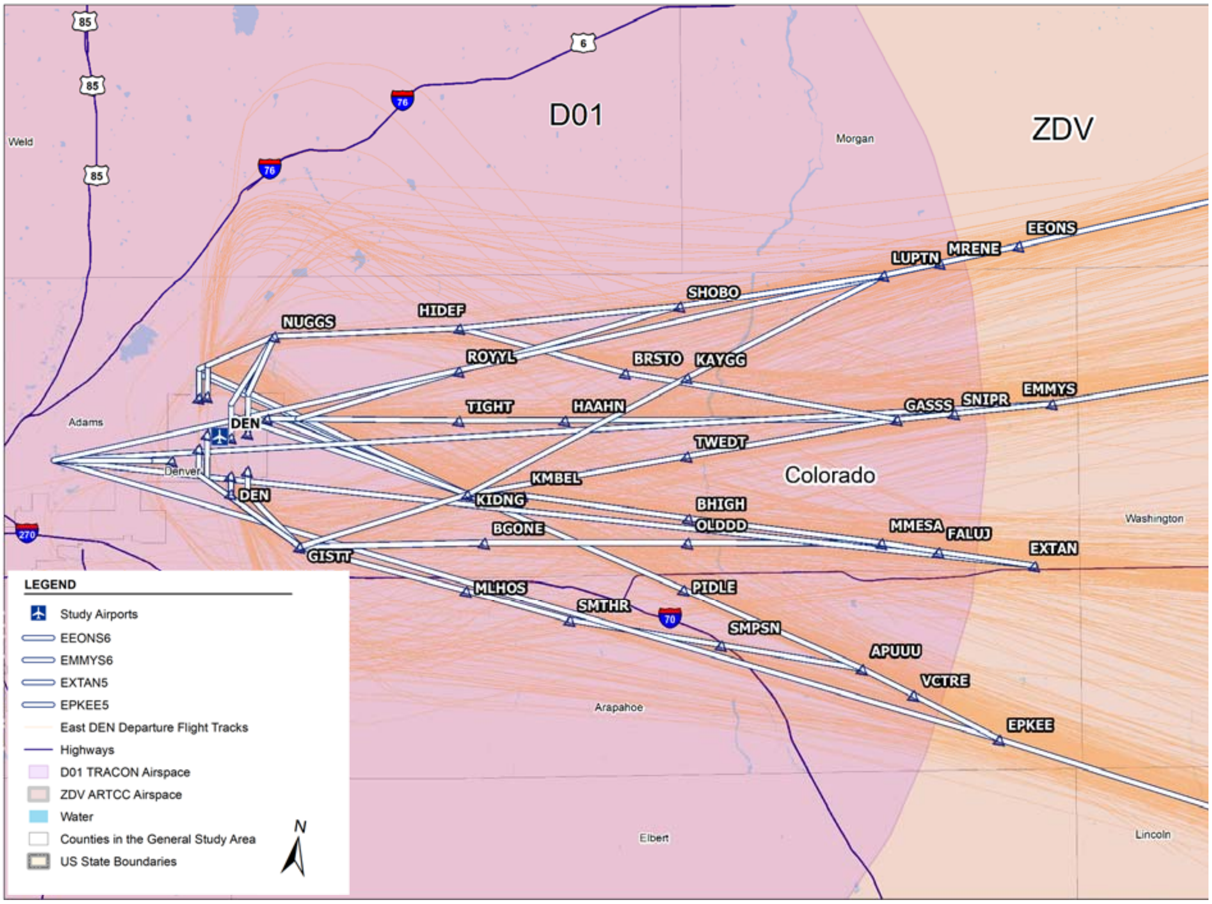
Exhibit 2-1 DEN EEONS, EMMYS, EXTAN, and EPKEE Eastbound Departures (Macro)



Sources: U.S. Department of Transportation, Federal Aviation Administration, National Flight Data Center, National Airspace System Resources, Airport, and Runway databases, accessed January 2019 (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); ATAC Corporation (Flight Track Data); DEN Metroplex Study Team, *Study Team Final Report*, November 2014.

Prepared by: ATAC Corporation, February 2019.

Exhibit 2-2 DEN EEONS, EMMYS, EXTAN, and EPKEE Eastbound Departures (Micro)



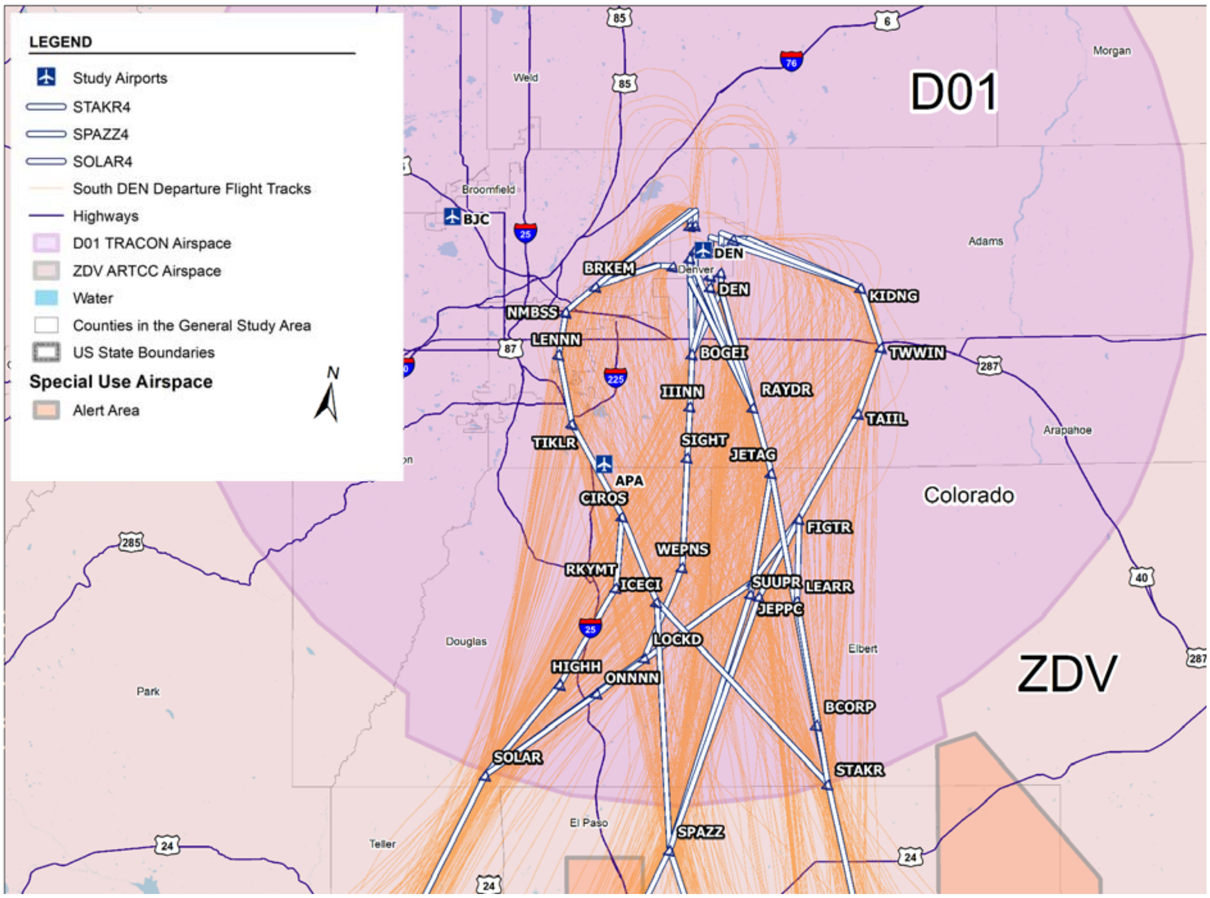
Sources: U.S. Department of Transportation, Federal Aviation Administration, National Flight Data Center, National Airspace System Resources, Airport, and Runway databases, accessed January 2019 (airspace boundaries); National Atlas of the United States of America (U.S. County and State Boundaries, Water Bodies); Bureau of Transportation Statistics, National Transportation Atlas Database (U.S. and Interstate Highways); ATAC Corporation (Flight Track Data); DEN Metroplex Study Team, *Study Team Final Report*, November 2014.

Prepared by: ATAC Corporation, February 2019.

DEN STAKR, SPAZZ, and SOLAR Southbound SIDs

Exhibit 2-3 (macro view) and **Exhibit 2-4** (micro view) depict the DEN southbound departure ATC procedures. These departure ATC procedures account for approximately 17 percent of all DEN jet departures. Currently, the southbound departures routed through SPAZZ result in an inefficient congestion within that en route transition. The Two Buttes MOA to the south also creates a lack of flexibility for routing aircraft to the en route environment.

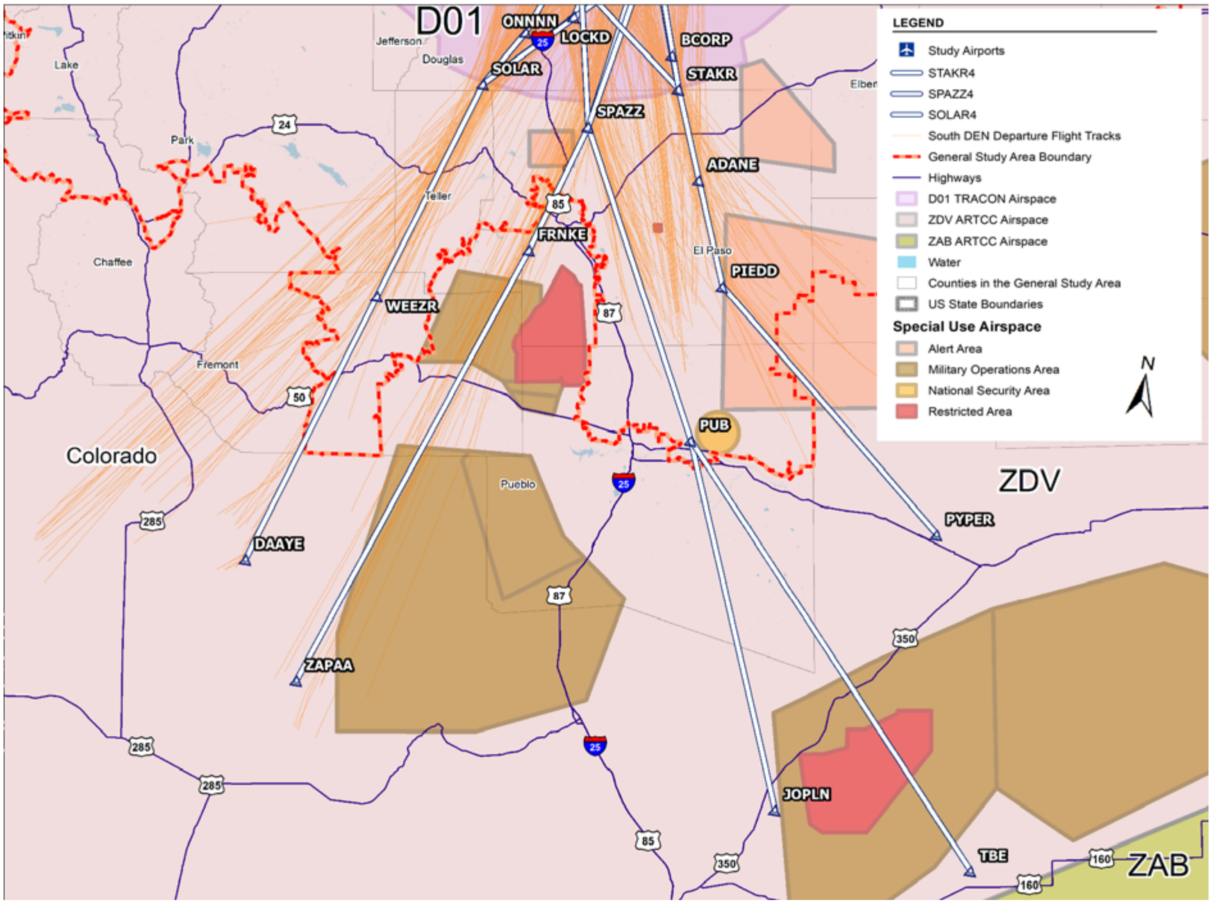
Exhibit 2-3 DEN STAKR, SPAZZ, and SOLAR Southbound SIDs (Macro)



Sources: U.S. Department of Transportation, Federal Aviation Administration, National Flight Data Center, National Airspace System Resources, Airport, and Runway databases, accessed January 2019 (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); ATAC Corporation (Flight Track Data); DEN Metroplex Study Team, *Study Team Final Report*, November 2014.

Prepared by: ATAC Corporation, February 2019.

Exhibit 2-4 DEN STAKR, SPAZZ, and SOLAR Southbound SIDs (Micro)



Sources:	U.S. Department of Transportation, Federal Aviation Administration, National Flight Data Center, National Airspace System Resources, Airport, and Runway databases, accessed January 2019 (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); ATAC Corporation (Flight Track Data); DEN Metroplex Study Team, *Study Team Final Report*, November 2014.
Prepared by:	ATAC Corporation, February 2019.

2.1.2.2 Complex Converging and Dependent Route Procedure Interactions

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 efficient airspace use. This requires that controllers carefully observe aircraft activity along proximate or crossing flight routes and be prepared to provide air traffic services to ensure standard separation is maintained.[32] 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.

[32] 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.

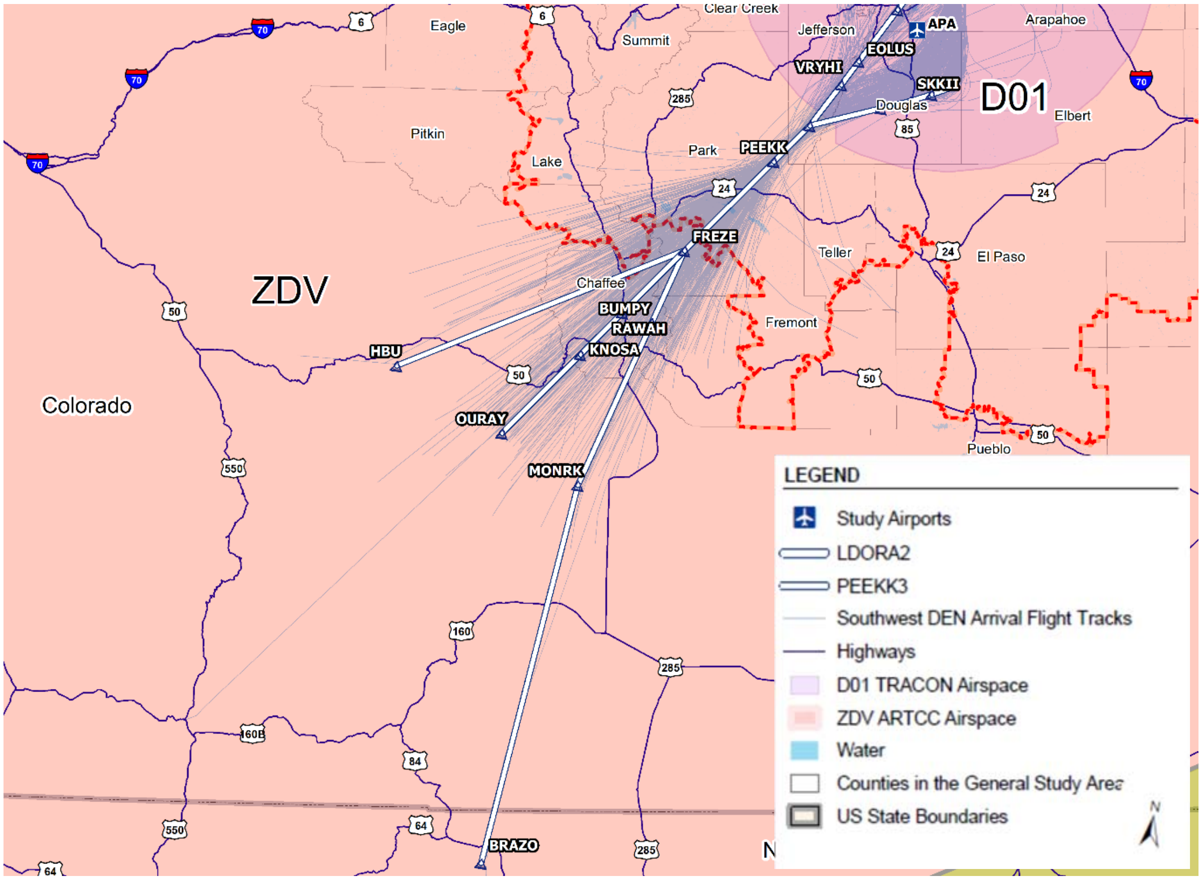
The limited number of ground-based NAVAIDs often results in multiple ATC procedures sharing the same NAVAIDs. This can cause areas of congestion and routes that are dependent on each other. For example, propeller-driven and jet aircraft are frequently placed on different routes that share the same ground based NAVAIDs. This may result in conflicts such as aircraft flying at different speeds along adjacent routes, requiring greater separation to prevent operations at similar altitudes or occupation of the same airspace. To avoid potential conflicts, controllers may need to reroute aircraft by issuing vectors or directing aircraft to level off. This increases pilot and controller workload and system complexity.

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

Southwest STARs Limit Flexibility and Increase Complexity

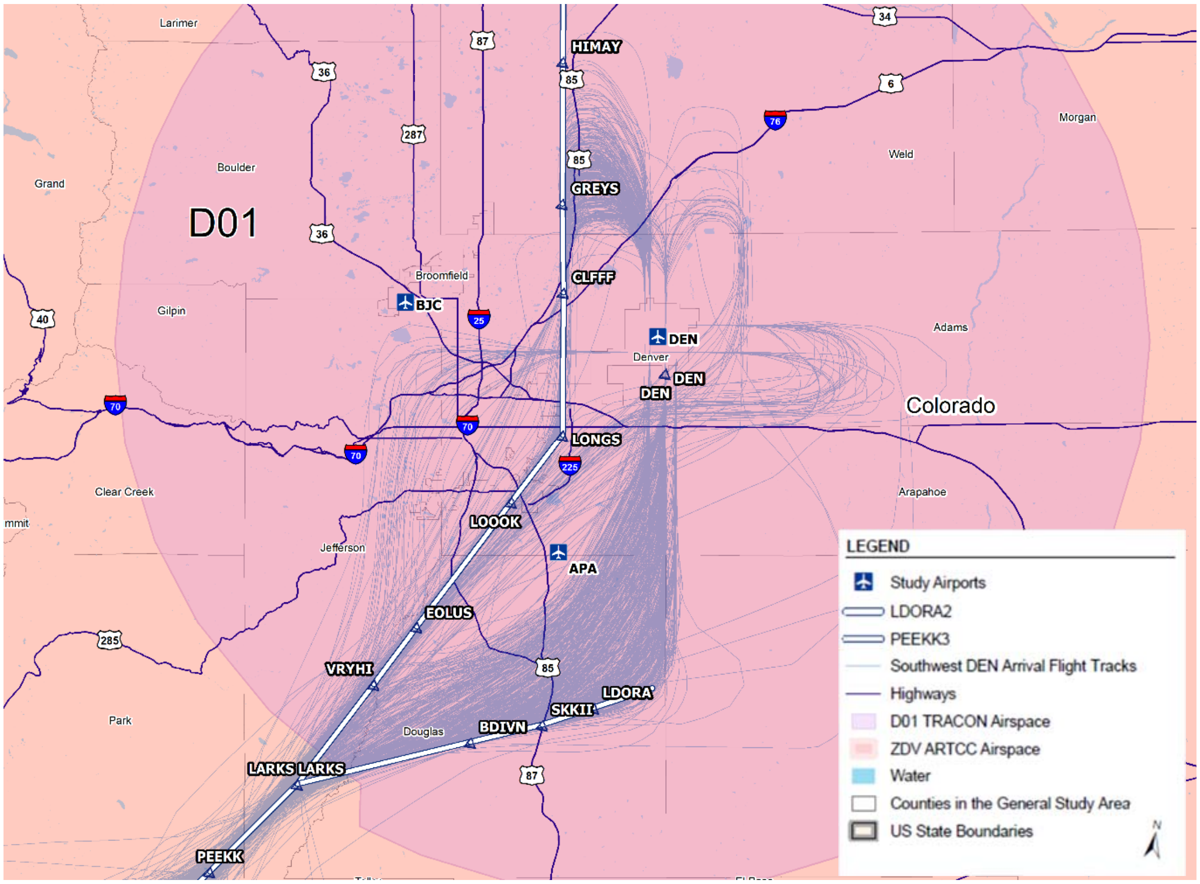
Exhibit 2-5 and **Exhibit 2-6** depict traffic operating on the PEEKK and LDORA arrival routes from the southwest. These STARs account for 10 percent of jet arrivals to DEN. The current ATC procedures do not provide RNAV runway transitions to Runways 7 or 26 which results in additional pilot and controller complexity. With only two STARs for north/south flows, the configuration changes due to variance in wind conditions common at DEN negatively impact pilot/controller flexibility. Additionally, aircraft assigned the procedure and beginning and remaining within 1 nautical mile on the full length of the ATC procedure is fairly low and the flight track analysis of these existing ATC procedures demonstrates aircraft are not completely flying the lateral ATC procedure paths.

Exhibit 2-6 Southwest STARs Limit Flexibility and Increase Complexity (Macro)



Sources:	U.S. Department of Transportation, Federal Aviation Administration, National Flight Data Center, National Airspace System Resources, Airport, and Runway databases, accessed January 2019 (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); ATAC Corporation (Flight Track Data); DEN Metroplex Study Team, *Study Team Final Report*, November 2014.
Prepared by:	ATAC Corporation, February 2019.

Exhibit 2-5 Southwest STARs Limit Flexibility and Increase Complexity (Micro)



Sources: U.S. Department of Transportation, Federal Aviation Administration, National Flight Data Center, National Airspace System Resources, Airport, and Runway databases, accessed January 2019 (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); ATAC Corporation (Flight Track Data); DEN Metroplex Study Team, *Study Team Final Report*, November 2014.

Prepared by: ATAC Corporation, February 2019.

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

Airports with a significant volume of IFR aircraft need SID and STAR ATC procedures to help achieve optimal airspace efficiency. SID and STAR ATC procedures establish consistent flight routes, which help maintain a predictable flow of aircraft to and from an airport. Runway transitions are encoded to the procedure so that predictable, defined routes enable pilots and controllers 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. Aircraft performance and/or piloting technique can vary and may be a factor in reducing predictability. Because conventional ATC procedures are less predictable than RNAV ATC procedures, controllers use vectoring and verbal instructions governing speed, runway transitions, and altitude level-offs to ensure standard separation between aircraft. As discussed in Section 1.2.5.1, RNAV ATC procedures enable aircraft to follow more accurate and better-defined flight routes. This allows for more predictable routes, with fixed locations and altitudes that can be planned ahead of time by the pilot and air traffic control. Fixed routes help segregate traffic by providing separation between aircraft on the routes and an incorporated runway transition enable predictable paths to an alternate landing runway. This allows for improved use of the airspace. Therefore, increased availability of RNAV ATC procedures in a metroplex provides a greater degree of predictability. **Table 2-1** summarizes the conventional and RNAV-based ATC procedures for the Study Airports under Existing Conditions.

Table 2-1 Existing Conditions (2017) STAR and SID Procedures at the Study Airports

	ATC Procedures			
	Conventional Procedures		RNAV Procedures	
Airport	STAR	SID	STAR	SID
APA	DANDD EIGHT LANDR SEVEN LARKS EIGHT POWDR EIGHT QUAIL EIGHT RAMMS SIX SAYGE EIGHT TOMSN SIX	DENVER NINE PIKES EIGHT PLAINS SEVEN ROCKIES TWO YELLOWSTONE NINE	DUNNN TWO PUFFR FOUR ZOMBZ ONE	BAYLR THREE BRYCC THREE CONNR THREE COORZ THREE EEONS FIVE EMMYS FIVE EPKEE THREE EXTAN FOUR FOOOT THREE RIKKK THREE SOLAR THREE SPAZZ THREE STAKR THREE YAMMI THREE YOKES FIVE
BJC	DANDD EIGHT LANDR SEVEN LARKS EIGHT POWDR EIGHT QUAIL EIGHT RAMMS SIX SAYGE EIGHT TOMSN SIX	DENVER NINE PIKES EIGHT PLAINS SEVEN ROCKIES TWO YELLOWSTONE NINE	DUNNN TWO KIPPR FOUR	BAYLR THREE BRYCC THREE CONNR THREE COORZ THREE EEONS FIVE EMMYS FIVE EPKEE THREE EXTAN FOUR FOOOT THREE RIKKK THREE SOLAR THREE SPAZZ THREE STAKR THREE YAMMI THREE YOKES FIVE
GXY	DANDD EIGHT LANDR SEVEN LARKS EIGHT POWDR EIGHT QUAIL EIGHT RAMMS SIX SAYGE EIGHT TOMSN SIX	DENVER NINE PIKES EIGHT PLAINS SEVEN ROCKIES TWO YELLOWSTONE NINE	KIPPR FOUR TSHNR TWO	

Notes:
APA – Centennial Airport *BJC– Rocky Mountain Metropolitan Airport* *DEN – Denver International Airport*
GXY – Greeley-Weld County Airport *FNL – Northern Colorado Regional Airport*

Table 2-1 Existing Conditions (2017) STAR and SID Procedures at the Study Airports

	ATC Procedures			
	Conventional Procedures		RNAV Procedures	
Airport	**STAR**	**SID**	**STAR**	**SID**
DEN	DANDD EIGHT LANDR SEVEN LARKS EIGHT POWDR EIGHT QUAIL EIGHT RAMMS SIX SAYGE EIGHT TOMSN SIX	DENVER NINE PIKES EIGHT PLAINS SEVEN ROCKIES TWO YELLOWSTONE NINE	ANCHR FOUR BOSSS TWO CREDE THREE FRNCH THREE JAGGR THREE KAILE TWO KIPPR FOUR KOHOE THREE LDORA TWO MOLTN THREE PEEKK THREE PURRL TWO TELLR TWO TSHNR TWO ZPLYN THREE	BAYLR THREE BYRCC THREE CONNR THREE COORZ THREE EEONS FIVE EMMYS FIVE EPKEE THREE EXTAN FOUR FOOOT THREE JMPRS TWO RIKKK THREE SOLAR THREE SPAZZ THREE STAKR THREE YAMMI THREE YOKES FIVE
FNL	DANDD EIGHT LANDR SEVEN LARKS EIGHT POWDR EIGHT QUAIL EIGHT RAMMS SIX SAYGE EIGHT TOMSN SIX	DENVER NINE PIKES EIGHT PLAINS SEVEN ROCKIES TWO YELLOWSTONE NINE	KIPPR FOUR TSHNR TWO	BAYLR THREE BRYCC THREE CONNR THREE COORZ THREE EEONS FIVE EMMYS FIVE EPKEE THREE EXTAN FOUR FOOOT THREE RIKKK THREE SOLAR THREE SPAZZ THREE STAKR THREE YAMMI THREE YOKES FIVE

Notes:

APA – Centennial Airport
BJC– Rocky Mountain Metropolitan Airport
DEN – Denver International Airport
GXY – Greeley-Weld County Airport
FNL – Northern Colorado Regional Airport

Sources: DEN Metroplex *Study Team Final Report*, November 2014; NFDC, accessed June 30, 2017.
Prepared by: ATAC Corporation, February 2019.

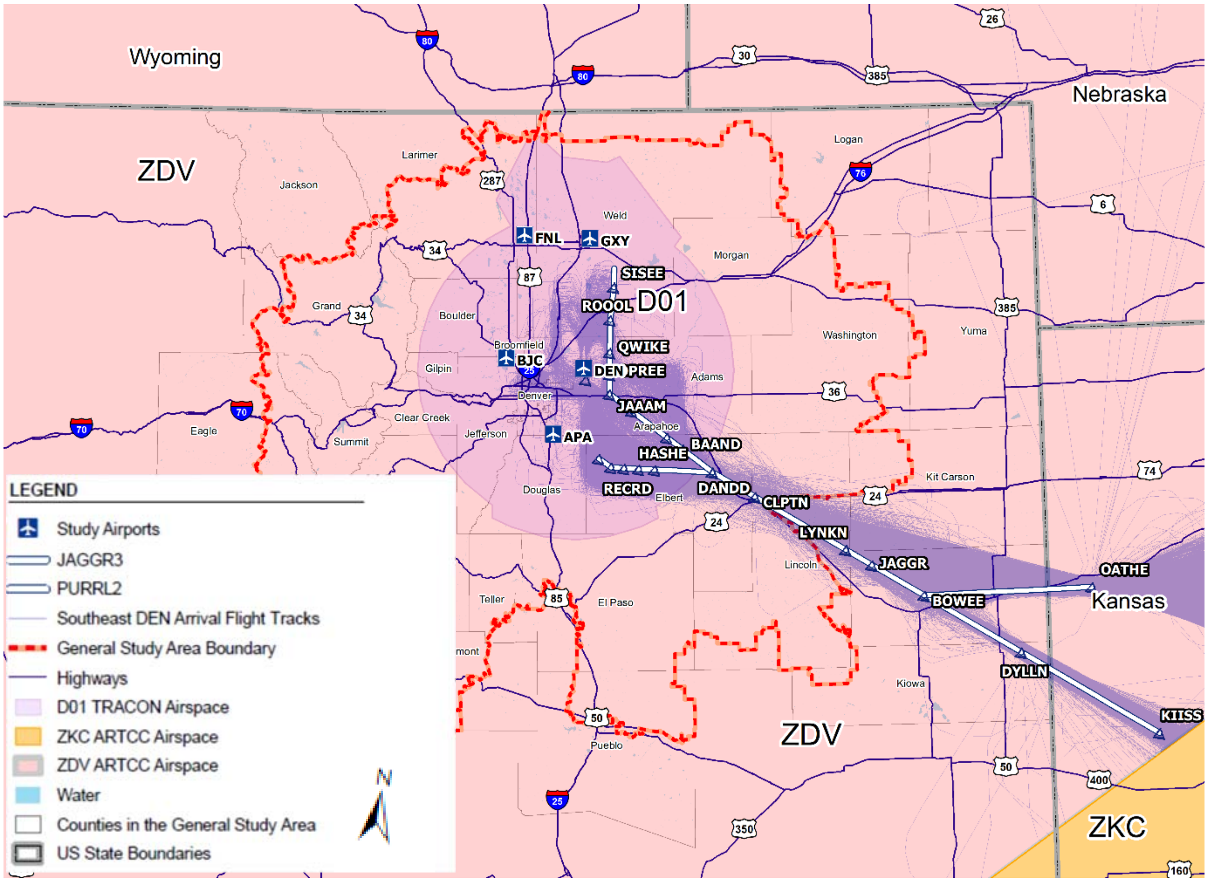
The following sections describe the two areas - ground path and vertical path - in which conventional ATC procedures in the DEN Metroplex are less predictable than RNAV ATC procedures.

Ground Path (Lateral Path)

The ground path is the track along the surface of the earth directly below an aircraft that represents where it is flying. When some of the STAR and SID ATC procedures in the Denver Metroplex airspace use ground-based NAVAIDs, navigation can be affected by line-of-sight and signal degradation issues associated with this type of technology. This limits where conventional ATC procedure routes can be located. Because the NAVAIDs are less precise, conventional ATC procedures require wider areas of airspace to protect aircraft flying on neighboring routes. This can result in aircraft flying routes that vary from those that are published.

Exhibit 2-7 shows how aircraft using multiple conventional SIDs 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 separations 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 2-7 DEN JAGGR Three and PURRL Two Southeast Arrivals



Sources: U.S. Department of Transportation, Federal Aviation Administration, National Flight Data Center, National Airspace System Resources, Airport, and Runway databases, accessed January 2019 (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); ATAC Corporation (Flight Track Data); DEN Metroplex Study Team, *Study Team Final Report*, November 2014.

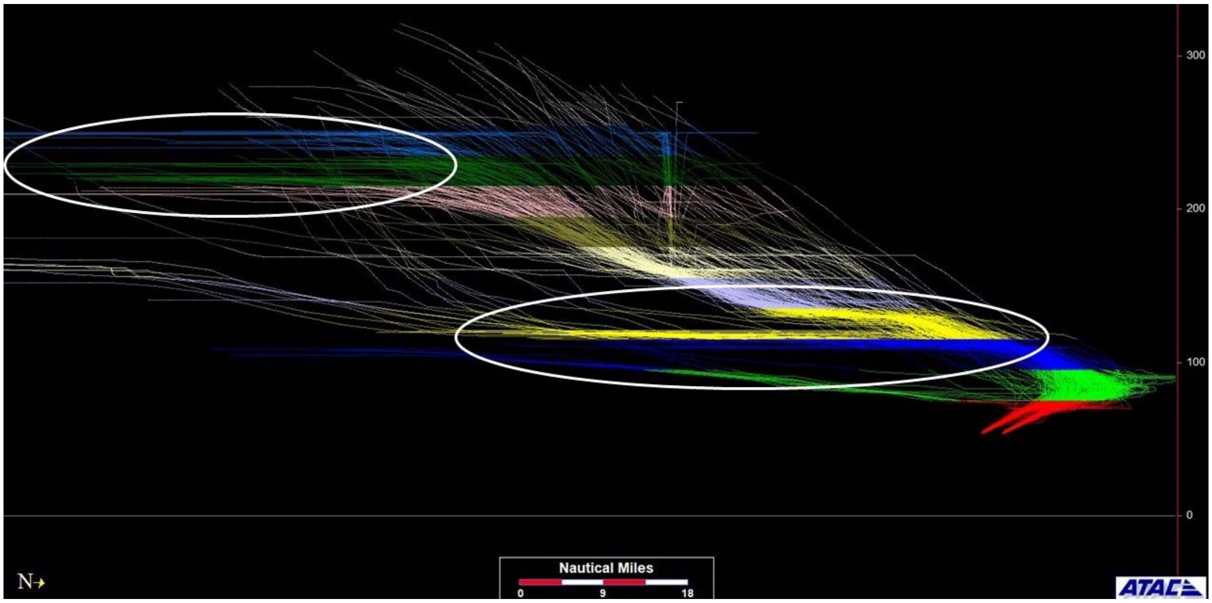
Prepared by: ATAC Corporation, February 2019.

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 factors such as aircraft performance, weather conditions and piloting technique. Aircraft arriving at or departing from the Study Airports are often required to level off during climb and descent to maintain vertical separation from other aircraft. Interrupted climbs and descents can increase flight time and distance as the aircraft exit/enter the terminal airspace or transition to/from the runway approach environment.

Exhibit 2-8 depicts vertical profiles for aircraft arriving on the LARKS Eight STAR into DEN indicating the excessive level-offs throughout all phases of the ATC procedure. 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 conflicting traffic leads to increased controller workload and inefficient aircraft operation.

Exhibit 2-8 Vertical Arrival Flow Profile Example (LARKS Eight STAR)



Note: Circled areas of radar flight track data indicate areas of aircraft level-off arriving to DEN via the LARKS eight arrival. Color banding is indicative of increasing altitude from red (lowest) to grey (highest). The view is a side view of arrivals looking northward.

Sources: ATAC Corporation (radar track data), June 2016-June 2017.
Prepared by: ATAC Corporation, February 2019.

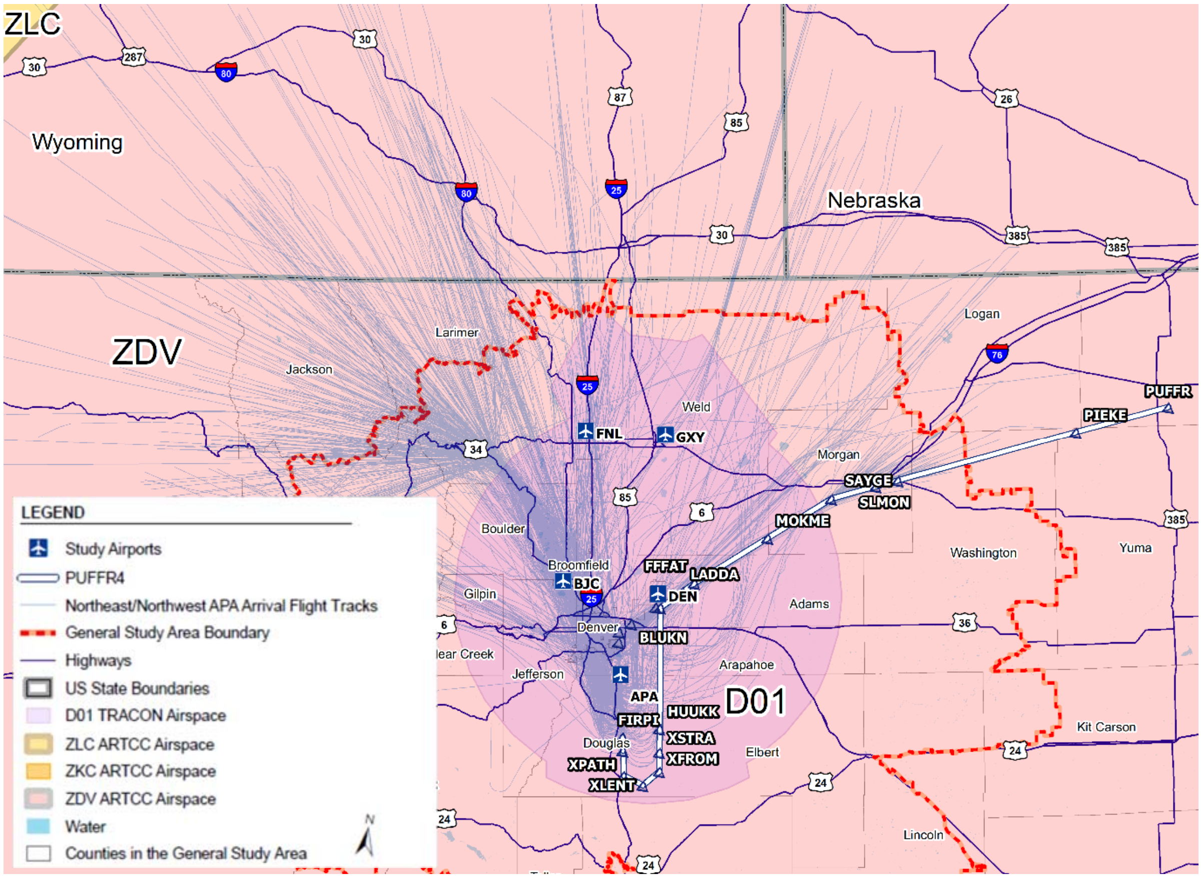
Extended level-offs often result in increased controller/pilot communication. They also may require increased traffic advisories to pilots about the proximity of other aircraft or point-outs to other controllers responsible for neighboring airspace sectors. This adds to complexity and inefficient aircraft performance during a descent or climb.) This results in less predictable routes and reduced airspace efficiency.

Lack of DEN Satellite Arrival Procedures

Aircraft arriving to Denver area satellite airports account for approximately 14 percent of all Denver TRACON arrival traffic.[33] Currently, dedicated satellite airport STARs do not efficiently segregate arriving satellite aircraft from arriving DEN traffic. Aircraft are frequently vectored on de-conflicted headings and altitudes to the destination facility. For example, aircraft arriving to APA currently share arrival flows with DEN arrivals and impede the DEN Optimized Profile Descents (OPDs) which are designed to reduce level segments. As a result, airspace efficiency is affected by the lack of more predictable and dedicated STAR ATC procedures at the DEN area satellite Study Airports. There are also no dedicated arrival ATC procedures for GXY, FNL, and BJC Study Airports. **Exhibit 2-9** depicts the existing PUFFR arrival to APA and demonstrates the lack of dedicated satellite arrivals.

[33] ATAC Corporation, Existing Conditions Radar Track Data. July 1, 2016 – June 30, 2017

Exhibit 2-9 Lack of DEN Satellite Arrival Procedures



Sources: U.S. Department of Transportation, Federal Aviation Administration, National Flight Data Center, National Airspace System Resources, Airport, and Runway databases, accessed January 2019 (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); ATAC Corporation (Flight Track Data); DEN Metroplex Study Team, *Study Team Final Report*, November 2014.

Prepared by: ATAC Corporation, February 2019.

2.2 Purpose of the Proposed Action

The purpose of the Proposed Action is to improve the airspace efficiency of the ATC procedures and airspace utilization in the Denver Metroplex. To meet this goal, the Proposed Action would optimize ATC procedures serving the Study Airports, while maintaining or enhancing safety, in accordance with FAA's mandate under federal law. This goal would be achieved by reducing dependence on ground-based NAVAID technology in favor of more efficient satellite-based navigation, such as RNAV. Specifically, the objectives of the Proposed Action are as follows:

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

The FAA expects that the frequency of controller/pilot communication would decrease, reducing both controller and pilot workload. Improvements from RNAV ATC procedures would reduce the need for vectoring and level flight segments, resulting in more predictable traffic flows.

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

2.2.1 Improve Flexibility in Transitioning Aircraft

As discussed in Section 2.1.2.1, the limited number of practically available transitions and associated ATC procedures constrain efficiency in the terminal and en route transitional airspace. This requires merging multiple traffic flows before aircraft arrive at and depart from terminal airspace. One objective of the Proposed Action is to minimize the need for merging traffic flows by increasing the number of transitions and ATC procedures that are dedicated to specific Study Airports. This objective can be measured with the following criteria:

- Where possible, increase the number of available transitions compared with the No Action (measured by number of exit/entry points).
- Where possible, increase the number of RNAV STARs and SIDs compared with the No Action (measured by total count of RNAV STARs and RNAV SIDs for each of the Study Airports.)

2.2.2 Segregate Arrivals and Departures

As discussed in Section 2.1.2.2, arrival and departure routes cross, converge, or are within close proximity of each other in some portions of the airspace. RNAV ATC procedures can be designed with capabilities such as speed control and altitude restrictions that segregate aircraft on the route while reducing controller and pilot workload. One objective of the Proposed Action is to implement ATC procedures that would better segregate arrivals and departures within the airspace. This objective can be measured with the following criterion:

- Segregate arrival and departure traffic (measured by number of RNAV STARs and/or SIDs that can be used independently to/from Study Airports).

2.2.3 Improve the Predictability of Air Traffic Flow

As discussed in Section 2.1.2.3, the lack of up-to-date airspace ATC procedures requires controllers to use vectoring, speed control and level-offs to ensure safe vertical and lateral separation between aircraft during the arrival and departure phases of flight. As a result, controllers and pilots experience more complex workload. Some STARS are underused because of flow restrictions.[34] There are also a limited number of ATC procedures with runway transitions to and from the runways at each of the Study Airports. In addition, there is a lack of RNAV ATC procedures to and from the Satellite Airports, preventing air crews from selecting their preferential arrival or departure with predictable flight expectations. These factors affect predictability within the Denver Metroplex.

This objective can be measured with the following criteria:

- RNAV ATC procedures with altitude controls intended to optimize descent or climb patterns;
- Ensure that the majority of STARs and SIDs to and from the Study Airports are based on RNAV technology (measured by count of RNAV STARs and SIDs for an individual Study Airport).

2.3 Criteria Application

The FAA will evaluate the Proposed Action 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, under which the existing (2017) procedures serving the Study Airports would remain unchanged except for planned ATC procedure modifications from other FAA actions that were or are expected to be approved for implementation.

2.4 Description of the Proposed Action

The Proposed Action would implement optimized RNAV SID and STAR ATC procedures and RNP approaches, where feasible, in the Denver Metroplex. This would improve the predictability and segregation of routes, as well as increase flexibility in providing air traffic services. The Proposed Action is described in detail in Chapter 3, *Alternatives*.

Implementation of the Proposed Action would not increase 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 ATC procedures in the Denver Metroplex would not require any physical alterations to environmental resources identified in FAA Order 1050.1F.

2.5 Required Federal Actions to Implement Proposed Action

Implementing the Proposed Action requires the FAA to

- undertake controller training;

[34] Those air traffic control processes and decisions made to avoid overloads and to ensure that airspace and airport capacity is fully exploited.

- publish new or revised STARs
- publish new or revised SIDs; and
- publish new or revised transitions.

2.6 Agency Coordination

On May 6, 2016, the FAA distributed a letter containing the notice of intent to prepare an EA for the DEN Metroplex Project to 395 federal, state, regional, and local officials. The FAA sent the early notification letter to:

1. Advise agencies of the initiation of the EA study;
2. Request background information about the study area established for the EA; and
3. Provide an opportunity to advise the FAA of any issues, concerns, policies or regulations that may affect the environmental analysis that the FAA will undertake in the EA.

On May 8, 2016, a notice of intent to prepare an EA was published in the Denver Post. 11 comments were received in response to the notice of intent and were considered in preparation of the Draft EA. These comments are contained in **Appendix A***: Agency Coordination, Community Involvement, and List of Receiving Parties.*

On April 8, 2019 the FAA initiated Section 106 consultation with the Colorado SHPO office. There are no federally recognized tribes in the General Study Area, however, the Colorado State Historic Preservation Officer (SHPO) maintains a listing of tribes with a potential historic or cultural interest in the State of Colorado, of which the General Study Area environs are a subset. Because of this potential historic interest, the FAA initiated government to government consultation on April 9, 2019 with 99 parties listed by the Colorado SHPO. **Appendix A**, *Agency Coordination, Community Involvement, and List of Receiving Parties*, includes a copy of the notice of intent letter (and attachments), affidavits of newspaper publication, as well as a list of the receiving agencies.

2.7 Listing of Federal Laws and Regulations Considered

Table 2-2 lists the relevant federal laws and statutes, Executive Orders, and regulations applicable to the Proposed Action and the No Action and considered in preparation of this EA.

Table 2-2 List of Federal Laws and Regulations Considered

Federal Laws and Statutes	Citation
National Environmental Policy Act of 1969	42 U.S.C. § 4321 *et seq.*
Clean Air Act of 1970, as amended	42 U.S.C. § 7401 *et seq.*
American Indian Religious Freedom Act of 1978	42 U.S.C. § 1996
Department of Transportation Act of 1966, Section 4(f)	49 U.S.C. § 303(c)
Aviation Safety and Noise Abatement Act of 1979	49 U.S.C. § 47501 et seq.
Federal Aviation Act of 1958, as amended	49 U.S.C. § 40101 et seq.
Endangered Species Act of 1973	16 U.S.C. § 1531 *et seq*.
Fish and Wildlife Coordination Act of 1958	16 U.S.C. § 661 *et seq*.
The Bald and Golden Eagle Protection Act of 1940	16 U.S.C. § 668 *et seq*.
Lacey Act of 1900	16 U.S.C. § 3371 *et seq*.
Migratory Bird Treaty Act of 1918	16 U.S.C. § 703 *et seq.*
National Historic Preservation Act of 1966, as amended	16 U.S.C. § 470
The Wilderness Act of 1964	16 U.S.C. § 1131-1136
Archaeological and Historic Preservation Act of 1974, as amended	16 U.S.C. § 469 *et seq*.
Executive Orders	**Citation**
11593, Protection and Enhancement of the Cultural Environment	36 Federal Register (FR) 8921
12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	59 FR 7629
13045, Protection of Children from Environmental Health Risks and Safety Risks	62 FR 19885
13423, Strengthening Federal Environmental, Energy, and Transportation Management	72 FR 3919
Federal Regulations	**Citation**
Council for Environmental Quality Regulations	40 C.F.R. Part 1500 to Part 1508
General Conformity Regulations	40 C.F.R. Part 93 Subpart B
Protection of Historic Properties Regulations	36 C.F.R. 800
Airport Noise Compatibility Planning Regulations	14 C.F.R. Part 150
Federal Aviation Regulations (FAR) Part 71: Designation of Class A, Class B, Class C, Class D, and Class E Airspace Areas; Airways; Routes; and Reporting Points, December 17 1991.	14 C.F.R. Part 71
FAA/U.S. Department of Transportation Orders	
U.S. DOT Order 5610.2a: Final Order to Address Environmental Justice in Low-Income and Minority Populations, 2012.	
FAA Order 8260.58A, The United States Standard Performance Based Navigation (PBN) Instrument Procedure Design, March 14, 2016.	
FAA Order 8260.43B, *Flight Procedures Management Program*, April 22, 2013.	
FAA Joint Order 7110.65X, *Air Traffic Control*, September 12, 2017.	
FAA Order 1050.1F: Environmental Impacts: Policies and Procedures, June 16, 2015.	
FAA, Order JO 7400.2M, *Procedures for Handling Airspace Matters*, February 28, 2019.	
FAA Order 7100.41A, Performance Based Navigation Implementation Process, April 29, 2016.	
FAA Order 8260.3D, United States Standard for Terminal Instrument Procedures (TERPS), February 16, 2018.	
FAA Order 8040.4B, *Safety Risk Management Policy*, May 02, 2017	
FAA Joint Order 1000.37A, Air Traffic Organization Safety Management System, May 30, 2014.	
FAA Order 8260.19H, *Flight Procedures and Airspace*, July 20, 2017.	
FAA Order 8260.46F, *Departure Procedure (DP) Program*, December 15, 2015.	

Table 2-2 List of Federal Laws and Regulations Considered

FAA Advisory Circulars
FAA Advisory Circular 150/5020-1: Noise Control and Compatibility Planning for Airports, August 5, 1983.
FAA Advisory Circular 150/5200-33B: *Hazardous Wildlife Attractants on or near Airports*, August 28, 2007.
FAA Advisory Circular 36-3H: Estimated Airplane Noise Levels in A-Weighted Decibels, April 25, 2002.

Source: ATAC Corporation, April 2019.
Prepared by: ATAC Corporation, April 2019.