

2 Purpose and Need

As discussed in Chapter 1, the FAA Modernization and Reform Act of 2012 (“the Act”) was enacted in February 2012 to help modernize the nation’s air transportation system. Among other provisions, the Act requires the implementation of performance-based airspace procedure enhancements at 35 of the nation’s busiest airports²⁸ and at any medium or small hub airports located within the same Metroplex area as determined by the FAA Administrator. The Act also requires that all performance-based procedures be certified, published, and implemented by June 30, 2015. Therefore, the purpose of the FAA’s Proposed Action is to comply with this federal mandate. Accordingly, the Federal Aviation Administration (FAA) proposes to increase the efficiency of the North Texas Metroplex airspace through the implementation of area navigation (RNAV) defined Instrument Flight Procedures (IFPs)²⁹ that improve upon existing, but less efficient ground-based and/or radar vector procedures.³⁰

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 reliance on land-based or conventional NAVAID technology in the North Texas Metroplex, which results in a less efficient airspace system when compared to one based on RNAV technology. This is due to the use of older NAVAID technology when newer RNAV technology is readily available. As described in Chapter 1, the majority of commercial aircraft operating in the North Texas Metroplex are RNAV equipped; however, most procedures currently used in the North Texas Metroplex are conventional and rely upon ground-based NAVAIDs. Because conventional procedures cannot provide more predictable controls inherent in RNAV procedures, such as specific speeds or altitudes, controllers use vectoring and speed adjustments to manage traffic. This leads to increased controller and pilot workload. By contrast, RNAV procedures are free of such lateral and vertical flight path limitations typical of conventional procedures.

This inefficient use of available technology impedes FAA’s ability to meet one of its primary missions as mandated by Congress – to provide for the efficient use of airspace. Furthermore, as discussed in Section 1.2.6.1, RNAV technology can add efficiency to an air traffic system with enhanced predictability, flexibility, and route segregation.

The following sections describe the problem in detail followed by a discussion of the causal factors that have contributed to the problem. A detailed explanation of the technical terms and concepts used in this chapter can be found in Chapter 1, *Background*.

2.1.1 Description of the Problem

Many existing Standard Instrument Departure (SID) and Standard Terminal Arrival Route (STAR) procedures require aircraft to use ground-based NAVAIDs to navigate to and from

²⁸ The 35 airports are identified under the Act as Operational Evolution Partnership (OEP) airports. OEP airports are commercial U.S. airports with significant activity. These airports serve major metropolitan areas and also serve as hubs for airline operations. More than 70 percent of U.S. passengers move through these airports.

²⁹ Instrument Flight Procedures (IFP) - Instrument flight procedures specify standard routings, maneuvering areas, flight altitudes, and visibility minimums for instrument flight rules (IFR). These procedures include airways, jet routes, off-airway routes, Standard Instrument Approach Procedures (SIAP(s)), Standard Instrument Departure Procedures/ Departure Procedures (SID(s))/ DP(s)), and Standard Terminal Arrival Routes (STAR(s)). (FAA Order 8200.1C United States Standard Flight Inspection Manual).

³⁰ “Procedure” is a predefined set of guidance instructions that define a route for a pilot to follow.

air carrier and General Aviation (GA) airports in the North Texas Metroplex. As discussed in Section 1.2.6.1, RNAV, conventional procedures are less accurate because of radio signal limitations that can arise between NAVAIDs and aircraft due to factors such as terrain. As a result, ground-based NAVAID procedures require large areas of clearance on either side of a route’s main path to account for potential obstructions. Furthermore, conventional procedures are dependent upon where ground-based NAVAIDs are located which can result in less efficient routing. Because conventional procedures are less accurate, the actual location of an aircraft both laterally and vertically, can be less predictable for both ATC and pilots.

The lack of accuracy and predictability requires ATC to use aircraft management tools and coordination techniques such as speed control, level flight segments, and vectoring to guide aircraft. These tools and coordination techniques are further discussed in Section 1.2.2., *Air Traffic Control within the National Airspace System*. Applying these tools and techniques without a more precise means to predict exactly where aircraft are located along an assigned procedure is complex. In most situations, these tools and techniques lead to less efficient aircraft operations and inefficient use of airspace. For example, Air Traffic Control (ATC) may issue instructions requiring an aircraft to level off during climb and descent to prevent conflicts with other aircraft. This leads to increased fuel burn and pilot/controller workload. Furthermore, more frequent communications may result in lag time between command and response and may lead to less precise flight paths. As a result, more airspace must be protected to allow aircraft the latitude to operate, leading to less efficient and less flexible operations.

The lack of precision resulting from the use of ground-based technology also lowers levels of predictability and accuracy and requires ATC to issue additional instructions to pilots, again increasing pilot/controller workload. Combined, these factors form the basis for the problem within the North Texas Metroplex.

The lack of RNAV SIDs and STARs adversely affects FAA’s ability to efficiently manage available airspace. Therefore, the problem is the inability to provide additional efficiency afforded by RNAV technology. **Table 2-1** presents the number of currently available standard instrument procedures dependent upon conventional navigation (radar vectors or ground-based NAVAIDs), the number of procedures dependent upon RNAV, and the total number of standard instrument procedures, unique to an individual airport or shared by multiple airports.

Table 2-1 **Currently Available Standard Instrument Procedure Counts**

Airport	Conventional Procedures	RNAV Procedures	Total Unique (Shared) Standard Procedures
KDFW	BONHAM FIVE, BOWIE ONE, CEDAR CREEK SIX, COYOTE FIVE, DALLAS NINE, DUMPY THREE, GARLAND THREE, GLEN ROSE NINE, HUBBARD SIX, JACKY FOUR, JAGGO THREE, JONEZ FOUR, JOE POOL FOUR,	AKUNA FOUR, ARDIA FOUR, BLECO FOUR, CEOLA FIVE, CLARE THREE, DARTZ FOUR, FERRA FIVE, GRABE FOUR, JASPA THREE, LOWGN FOUR, NEYLN THREE, NOBLY FOUR, PODDE FOUR, SLOTT FOUR, SOLDI THREE,	25 (13)

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Airport	Conventional Procedures	RNAV Procedures	Total Unique (Shared) Standard Procedures
	JUMBO THREE, KEENE SIX, KINGDOM SEVEN, MASTY TWO, TEXOMA ONE, TRI-GATE SIX, WILBR THREE, WORTH SIX, WYLIE FIVE	TRISS FOUR	
KDAL	BACHMAN SIX, BOWIE TWO, COYOTE FIVE, DALLAS NINE, DUMPY THREE, FINGR THREE, GARLAND THREE, GLEN ROSE NINE, GREGS SIX, HUBBARD SIX, JOE POOL FOUR, KINGDOM SEVEN, KRUMM FOUR, KNEAD SIX, LOVE TWO, TEXOMA ONE, TRINITY SIX, VENUS SEVEN, WORTH SIX, WYLIE FIVE	None	5 (15)
All Satellites	DALLAS NINE, DODJE THREE, GARLAND THREE, HUBBARD SIX, JOE POOL FOUR, KINGDOM SEVEN, TEXOMA ONE, WORTH SIX, WYLIE FIVE	None	1 (8)
East Satellites	DUMPY THREE, FINGR THREE, GLEN ROSE NINE, GREGS SIX, JONEZ FOUR*, KNEAD SIX	None	0 (6)
West Satellites	MOTZA SIX, SASIE TWO, SLUGG SIX	None	3 (0)
Total	17 (17)	16 (0)	34 (16)

Table Notes:

Counts in parentheses represent procedures shared by more than one airport.

Airports

4T2 - Kenneth Copeland	DFW- Dallas Fort Worth International	GKY – Arlington Municipal	NFW- Fort Worth Naval Air Station
50F- Bourland Field	DTO- Denton Municipal	GPM – Grand Prairie Municipal	Joint Reserve Base/Carswell Field
ADS- Addison Airport	F41- Ennis Municipal	HQZ – Mesquite Metro	RBD-Dallas Executive
AFW- Alliance Forth Worth	F46- Rockwall Municipal	JWY – Mid-Way Regional	Sats – Satellite Airports**
CPT-Cleburne Municipal	FTW- Fort Worth Meacham International	LNC – Lancaster Regional	TKI – Collin County Regional at McKinney
DAL-Dallas Love Field	FWS – Fort Worth Spinks	LUD – Decatur Municipal	WEA – Parker County

* ADS only

** East Satellites consist of the following airports: ADS, F41, F46, HQZ, JWY, LNC, RBD and TKI.

West Satellites consist of the following airports: AFW, CPT, DTO, FTW, FWS, GKY, GPM, LUD, NFW, WEA, 4T2 and 50F.

Source: National Flight Data Center (NFDC), 4/5/2012 charting cycle, accessed 3/12/2012.

Prepared By: HMMH Inc, July 2013.

To take full advantage of current RNAV technology, the number of RNAV procedures should be close to the total number of existing procedures. For the North Texas Metroplex, as of March 2012, there were 50 standard instrument procedures, 32 percent of which were RNAV based (16 unique procedures). The conventional procedures do not segregate traffic efficiently due to dependence on conventional navigation using ground-based NAVAIDs or a mix of conventional and RNAV navigation. Section 2.1.2 describes the current factors that lead to limited means of providing additional efficiency.

It is important to note that a key design constraint is safety. Any proposed change to a procedure must not degrade safety and must, if possible, should enhance safety. Current published procedures do not include any safety issues, because published procedures must have already met defined safety criteria; accordingly, the Proposed Action reflects changes aimed at improving efficiency while maintaining safety.

2.1.2 Causal Factors

A problem (or need) is best addressed by examining the circumstances or causal factors that gave rise to the problem. As previously described, the problem for the North Texas Metroplex is the prevalence of existing SID and STAR procedures that are dependent on older ground-based NAVAID technology, which has led to inefficiencies in the North Texas Metroplex airspace.

The need for the Proposed Action can be better understood and addressed based on the specific factors causing the problem.

Three key factors were identified by the North Texas Metroplex Study Team as causes for lower efficiency in the North Texas Metroplex air space:

- Lack of flexibility in the efficient transfer of traffic between the en route and terminal area airspace;
- Complex converging interactions between arrival and departure flight paths; and,
- Lack of predictable standard routes defined by procedures to/from airport runways to/from en route airspace.

The following sections describe these three causal factors in detail.

2.1.2.1 Lack of Flexibility for the Efficient Transfer of Traffic between the En Route and Terminal Area Airspace

This section describes the relationship between the flexibility in transfers of traffic between the en route and terminal airspace and the efficiency of operations. Flexibility allows ATC to plan and adapt to traffic and weather demands, which change frequently within any given hour. Even though flights are scheduled, delays in other regions of the U.S. or severe weather along an aircraft's route may cause aircraft to enter or exit the en route and terminal area airspace at times other than those previously scheduled. Controllers require options to manage dynamic traffic demand.

Elements such as additional entry and exit points, individual procedures for each Study Airport, and the ability to diverge aircraft (turn aircraft on different headings away from each other) earlier, reduces the amount of vectoring needed to merge traffic and maintain safe separation. These elements also provide additional options when one procedure is too busy to accommodate additional traffic.

The “four corner post” airspace design presents the most efficient way to transfer aircraft to an airport from an entry gate and from an airport to an exit gate. In a typical four-corner post system, aircraft depart the terminal airspace through exit gates to the north, east, south, and west. Aircraft arrive at the terminal airspace through entry gates to the northeast, southeast, southwest, and northwest (see Exhibit 2-1).

Need for Separation of Entry Points

The limited number of terminal airspace entry points in the North Texas Metroplex, results in gaps in arrival flows to the Study Airports within the D10 terminal area airspace³⁴ to maintain safe separation between merging aircraft, controllers must create sufficient gaps between arriving aircraft to safely line up multiple arrival flows. For example, the arrival flows for DFW and DAL must be merged over two of the four corner posts (see Exhibit 2-1). At times due to the timing and sequence of the arriving aircraft, the gaps created by controllers result in unused arrival slots. Consequently merging flows for the two major study airports, that could otherwise operate independently with dedicated arrival procedures, results in reduced efficiency.

Tailored Departure Point locations (known as “floating fixes”) to Correlate with Specific Flow Conditions

Departure flow inefficiencies under current airspace design are a result of the location of exit points being static regardless of the flow conditions at airports inside of D10. To illustrate this point, when in south flow, a number of aircraft departing for southern destinations are flown north to a specific departure fix before being routed back south again. As a result, departing aircraft are forced to fly miles off optimal course, adding miles flown. Most of the extra mileage could have been avoided if the departure fix was located further south while in south flow. Redesigning the procedures to tailor the exit point locations (known as “floating fixes”) to correlate with specific flow conditions would enable controllers to continue to organize the traffic into departure streams. This would facilitate orderly air traffic management as aircraft transition from terminal to en route airspace, and reduce overall miles flown.

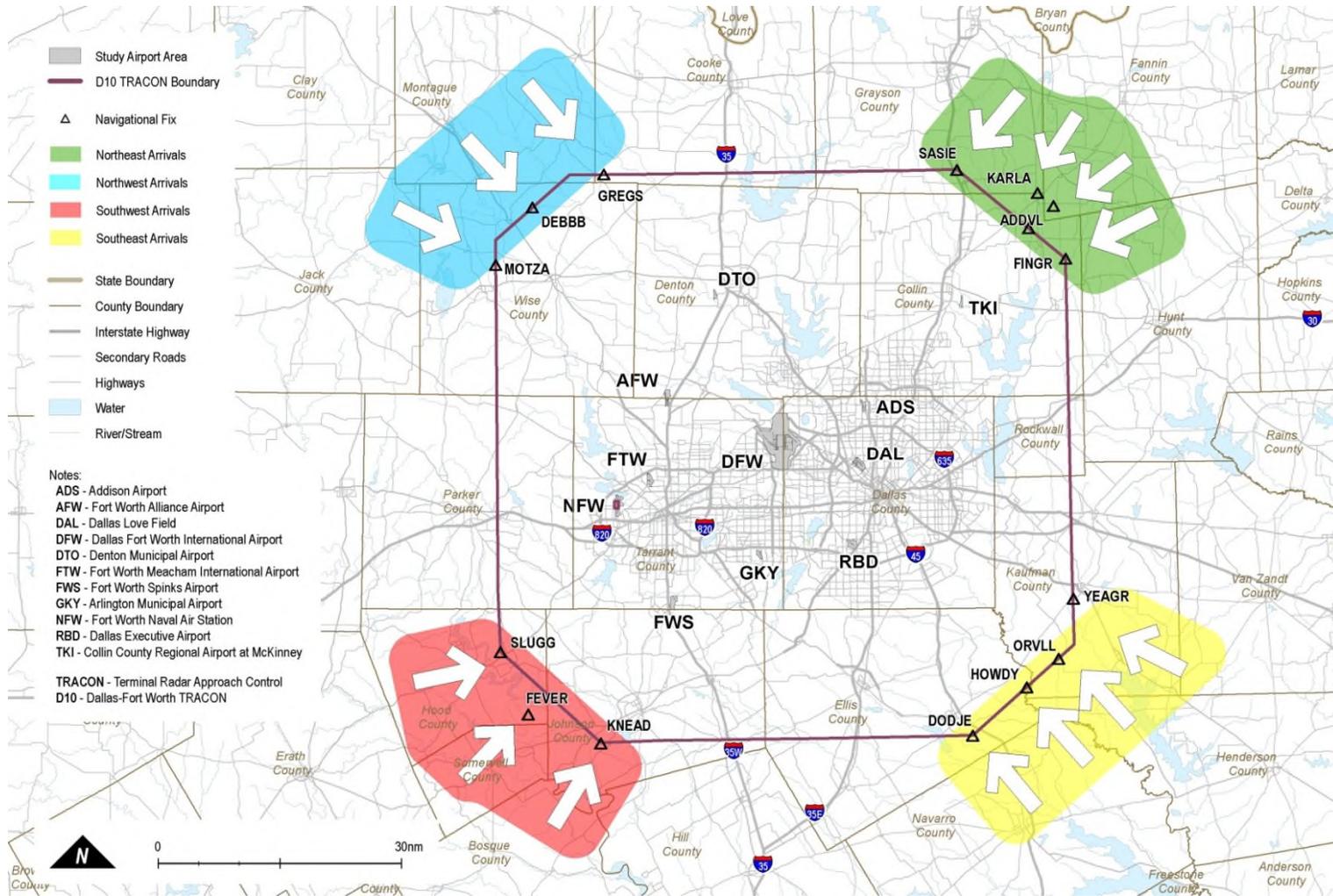
The following sections further discuss flexibility issues specific to the terminal area airspace entry and exit points.

Entry Points

Exhibit 2-1 depicts the entry points into the D10 terminal airspace where control is transferred from en route airspace (ZFW) to terminal airspace (D10). These entry points are often shared by aircraft arriving at different Study Airports. **Table 2-2** lists the STAR procedures and associated transition points for the major Study Airports.

³¹ Flow: multiple aircraft operations assigned to a procedure that operate along the same route, and includes variation in aircraft location over the ground. A traffic flow is typically defined by several days of radar flight tracks. Traffic flows may also be represented by corridors based on a frequently traveled area characterized by one or more well-traveled routes.

Exhibit 2-1 Terminal Airspace Control Transfer Areas – Arrivals



Source: National Flight Data Center (NFDC), 4/5/2012 charting cycle, accessed 3/12/2012
 Prepared By: HMMH Inc, July 2013.

Table 2-2 STAR Arrival Entry Points and Arrival Transitions

Airport	Procedure Name (STAR)	Corner Post	Arrival Metering Fix (Entry Point)	Arrival Transitions
DFW	BONHAM FIVE	Northeast	KARLA	MCALESTER (MLC) VOR, TULSA (TUL) VOR, FORT SMITH (FSM) VOR, LITTLE ROCK (LIT) VOR, TEXARKANA (TXK) VOR, PARIS (PRX) VOR,
DFW	WILBR THREE	Northeast	ADDVL	MLC, TUL, FSM, LIT, TXK, PRX
DFW (ATC Assigned) & ADS	JONEZ FOUR	Northeast	SASIE	JONEZ Intersection
DAL/East Satellite Airports	FINGR THREE	Northeast	FINGR	ARDMORE (ADM) VOR, WILL ROGERS (IRW) VOR, BONHAM VOR (BYP), MLC, TUL, FSM, LIT, TXK, PRX
West Satellite Airports	SASIE TWO	Northeast	SASIE	ADM, BYP, MLC, TUL, FSM, LIT, TXK, PRX
DFW (Propeller) & DAL/East Satellite Airports	DUMPY THREE	Southeast	YEAGR	ELM GROVE (EMG) VOR, GREGG COUNTY (GGG) VOR, HERRI INT, QUITMAN (UIM) VOR, SIDON (SQS) VOR, JACKSON (JAN) VOR, ALEXANDRIA (AEX) VOR, MONROE (MLU) VOR,
DFW (Propeller) & DAL/East Satellite Airports	DUMPY THREE	Southeast	ORVLL	HUMBLE (IAH) VOR, LEONA (LOA) VOR, CENTEX (CWK) VOR, CEDAR CREEK (CQY), NAVYS INT, WACO (ACT) VOR
DFW	CEDAR CREEK SIX	Southeast	HOWDY	ACT, EMG, GGG, HERRI INT, UIM, SQS, JAN, AEX, IAH, LOA, CWK, MLU, NAVYS INT
DFW (ATC Assigned)	JAGGO THREE	Southeast	DODJE	JAGGO Intersection
Satellite Airports	DODJE THREE	Southeast	DODJE	UIM, SQS, JAN, AEX, IAH, LOA, CWK, CQY, EMG, GGG, HERRI INT, MLU, NAVYS INT, ACT
DFW DAL/East Satellite Airports	GLEN ROSE NINE	Southwest	FEVER	CWK, SAN ANTONIO (SAT) VOR, WINK (INK) VOR, GEENI INT, JUMBO INT, ACT,
DFW (ATC Assigned)	JUMBO THREE	Southwest	KNEAD	CWK, SAT
DAL/East Satellite Airports	KNEAD SIX	Southwest	KNEAD	ACT, TEMPLE (TPL) VOR, CWK, SAT, INK, ABILENE (ABI) VOR, JEN, JUMBO INT
West Satellite Airports	SLUGG SIX	Southwest	SLUGG	ACT, CWK, SAT, INK, ABI, JEN, JUMBO INT
DFW & DAL	BOWIE ONE	Northwest	DEBBB	GUTHRIE (GTH) VOR, TEXICO (TXO) VOR, PANHANDLE (PNH) VOR, BORGER (BGD) VOR, IRW, TUL, WICHITA FALLS (SPS) VOR

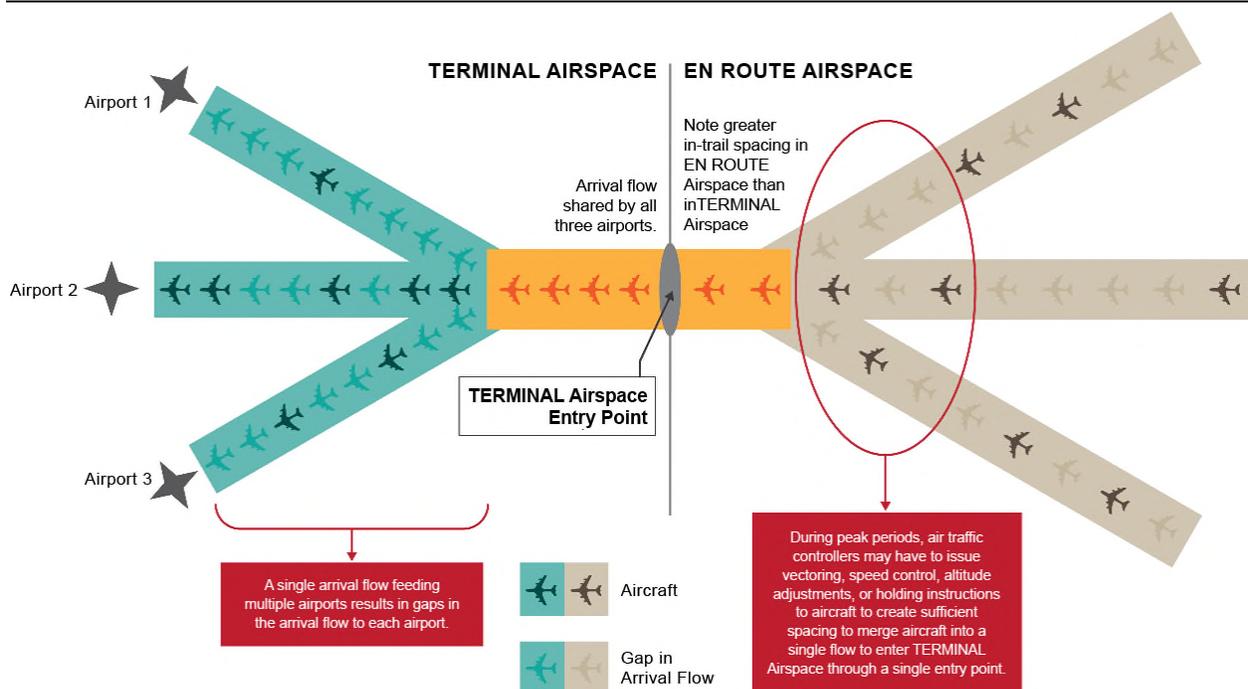
Airport	Procedure Name (STAR)	Corner Post	Arrival Metering Fix (Entry Point)	Arrival Transitions
DAL/East Satellite Airports	GREGS SIX	Northwest	GREGS	GTH, TXO, PNH, BGD, HYDES INT, IRW, TUL, SPS, BOWIE (UKW) VOR
DFW (ATC Assigned)	MASTY TWO	Northwest	GREGS	HYDES INT, TUL, SPS, IRW
West Satellite Airports	MOTZA SIX	Northwest	MOTZA	GTH, TXO, PNH, BGD, IRW, TUL, UKW, SPS

Source: National Flight Data Center (NFDC), 4/5/2012 charting cycle, accessed 3/12/2012
 Prepared by: Harris Miller Miller & Hanson Inc., November 2012

The limited number of entry points results in challenges that affect the efficient management of aircraft traffic. Given the geographic location of the North Texas Metroplex area, the greatest proportion of aircraft enters the terminal airspace from the northeast followed by the northwest and southwest. Approximately 33 percent of all traffic arriving to the North Texas Metroplex passes through the northeast entry points, 26 percent passes through the southeast entry point, 25 percent passes through the northwest entry point, and 16 percent passes through the southwest entry point.³² Given the limited number of entry points, airspace congestion occurs at the busiest entry points during periods of high demand. The resulting congestion requires the issuance of air traffic instructions such as vectoring, controlling speed, holding aircraft, leveling off aircraft, or rerouting aircraft to other entry points, which, as described in Section 2.1.1, increases pilot and controller workload, increases complexity for both controllers and pilots, and can result in delays.

Exhibit 2-2 illustrates how aircraft arrivals are sequenced in the en route airspace and then merged to enter terminal airspace at a single point.

Exhibit 2-2 Illustration of Single Terminal Airspace Entry Point and Single Arrival Flow with Traffic Sequenced to Multiple Airports



Source: Federal Aviation Administration, July 2012.
Prepared by: ATAC Corporation, June 2012.

Aircraft destined for each of the Study Airports share standard instrument arrival procedures and must enter the terminal airspace on a single arrival flow through one of the D10 entry points. Aircraft are then split from a single arrival flow by ATC and receive instructions for final approaches to the various runways at the Study Airports. The following section provides specific examples of these interactions within the North Texas Metroplex area.

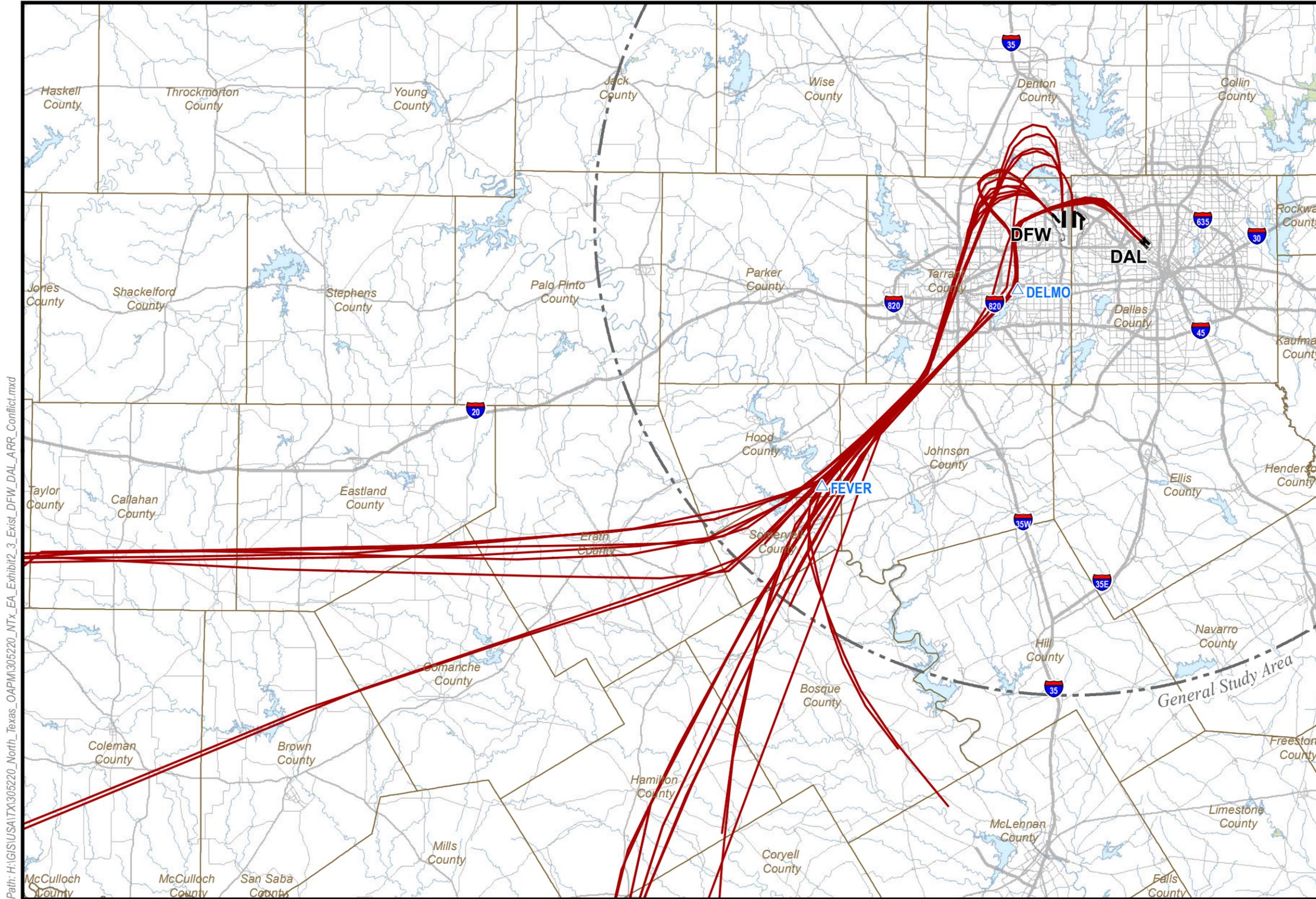
³² PDARS 2011 Radar data analysis, November, 2012

Merging arrival streams at the arrival metering fix (entry point) FEVER:

As depicted in **Exhibit 2-3** below, in south flow, to enter the D10 terminal airspace over the southwest corner post for landing at DFW and DAL, multiple arrival streams use a single STAR, the GLEN ROSE NINE arrival procedure. This instrument flight procedure (IFP) has traffic merging at the FEVER arrival metering fix, only to be separated again at DELMO waypoint for landing at the individual airports. The inefficiencies of such design were described in the preceding paragraphs. Furthermore, a shared STAR prevents the use of automated traffic management tools that examine, forecast, and assist in efficient sequencing of near-term arrival demand.

Exit Points

Exhibit 2-4 depicts the exit points where control is transferred from D10 terminal airspace to ZFW for aircraft departing the North Texas Metroplex airspace. As indicated in **Exhibit 2-4**, there are 16 existing exit points: four to the north, four to the south, four to the west, and four to the east.



LEGEND

- General Study Area
- Airport
- GLEN ROSE NINE Arrival Tracks
- Intersection
- VORTAC
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

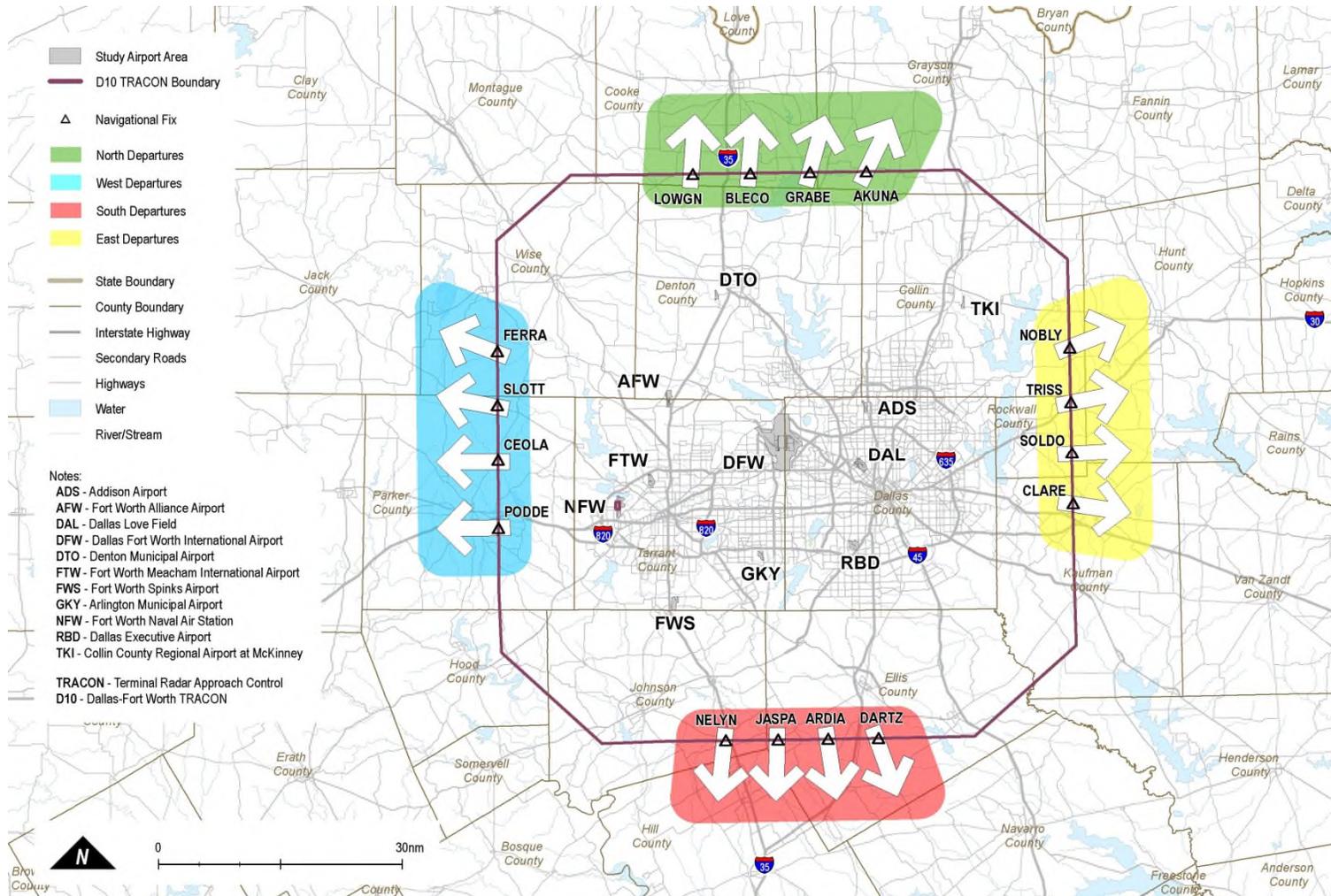
Notes:
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport



Path: H:\GIS\USAITX\305220_North_Texas_OAPM\305220_NTx_EA_Exhibit2_3_Exist_DFW_DAL_ARR_Conflict.mxd

Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; Texas Water Development Board (Reservoirs), October 19, 2012; HMMH Analysis, 2012 (Study Area Boundary); PDARS (Traffic Flow Data); Digital En-Route Supplement (Navigation Fixes); Prepared By: Harris Miller Miller & Hanson Inc., August, 2013

Exhibit 2-4 Terminal Airspace Control Transfer Areas - Departures



Source: National Flight Data Center (NFDC), 4/5/2012 charting cycle
 Prepared by: HMMH, November 2012.

Table 2-3 lists the departure exit points and departure transitions for each SID that serves the North Texas Metroplex airspace. During peak departure periods, controllers must merge departures from multiple Study Airports into a limited number of departure streams due to the limited number of exit points. The exit points are located on the long-sides of the D10/ZFW boundary to separate departure streams from arrival streams coming into the D10 airspace over the corner posts. Merging departing aircraft leads to delays because controllers must frequently employ management tools such as holding departing aircraft on the ground before takeoff to control air traffic sequencing in the surrounding airspace. This directly affects departure efficiency at the Study Airports.

In addition to holding aircraft on the ground, controllers may also assign vectors and level-offs to aircraft during their departure climbs to provide adequate spacing as aircraft are gradually merged into a departure route. The need to merge aircraft into departure routes increases the complexity of managing the terminal airspace and can decrease the efficiency of the airspace. Vectoring can also increase flight distances and reduce predictability, as aircraft are assigned less direct routes which they must continue to follow as they proceed further away from an airport.

Table 2-3 SID Departure Exit Points and Departure Transitions

Airport	Procedure Name (SID)	Boundary Side	Exit Point	Departure Transitions
DFW, DAL, & Satellites	DALLAS NINE	East	NOBLY, TRISS, SOLDO, CLARE	LIT, TXK, SQS, MERIDIAN (MEI) VOR, BELCHER (EIC)VOR AND SAWMILL (SWB) VOR
DFW, DAL, & Satellites	GARLAND THREE	East	NOBLY, TRISS, SOLDO, CLARE	PRX, TXK, UIM, GREGG COUNTY (GGG) VOR, TYR
DFW, DAL, & Satellites	HUBBARD SIX	East	NOBLY, TRISS, SOLDO, CLARE	PRX, TXK, UIM, GGG, TYR
DFW & DAL	WYLIE FIVE	East	NOBLY, TRISS, SOLDO, CLARE	LIT, TXK, SQS, MEI, EIC, SWB
DFW	NOBLY FOUR RNAV	East	NOBLY	LIT
DFW	TRISS FOUR RNAV	East	TRISS	TXK
DFW	SOLDO THREE RNAV	East	SOLDO	EL DORADO (ELD) VOR, MEI, UIM, SQS
DFW	CLARE THREE RNAV	East	CLARE	EIC, SWB
DAL	BACHMAN SIX	East	NOBLY, TRISS, SOLDO, CLARE	LIT, TXK, SQS, MEI, EIC, SWB
DFW	TRI-GATE SIX	Southeast	N/A	N/A
DAL (Rwy 13R Only)	TRINITY SIX	Southeast	N/A	N/A
DFW, DAL, & Satellites	JOE POOL FOUR	South	DARTZ, ARDIA, JASPA, NELYN	NAVASOTA (TNV) VOR, COLLEGE STATION (CLL) VOR, CWK, SAT
DFW	DARTZ FOUR	South	DARTZ	TNV
DFW	ARDIA FOUR	South	ARDIA	CLL, ELLVR Intersection
DFW	JASPA THREE	South	JASPA	WINDU Intersection
DFW	NELYN THREE	South	NELYN	ACT, HOARY Intersection, SAT
DAL (Rwy 13 R Only)	VENUS SEVEN	South	DARTZ, ARDIA, JASPA, NELYN	TNV, CLL, CWK, SAT

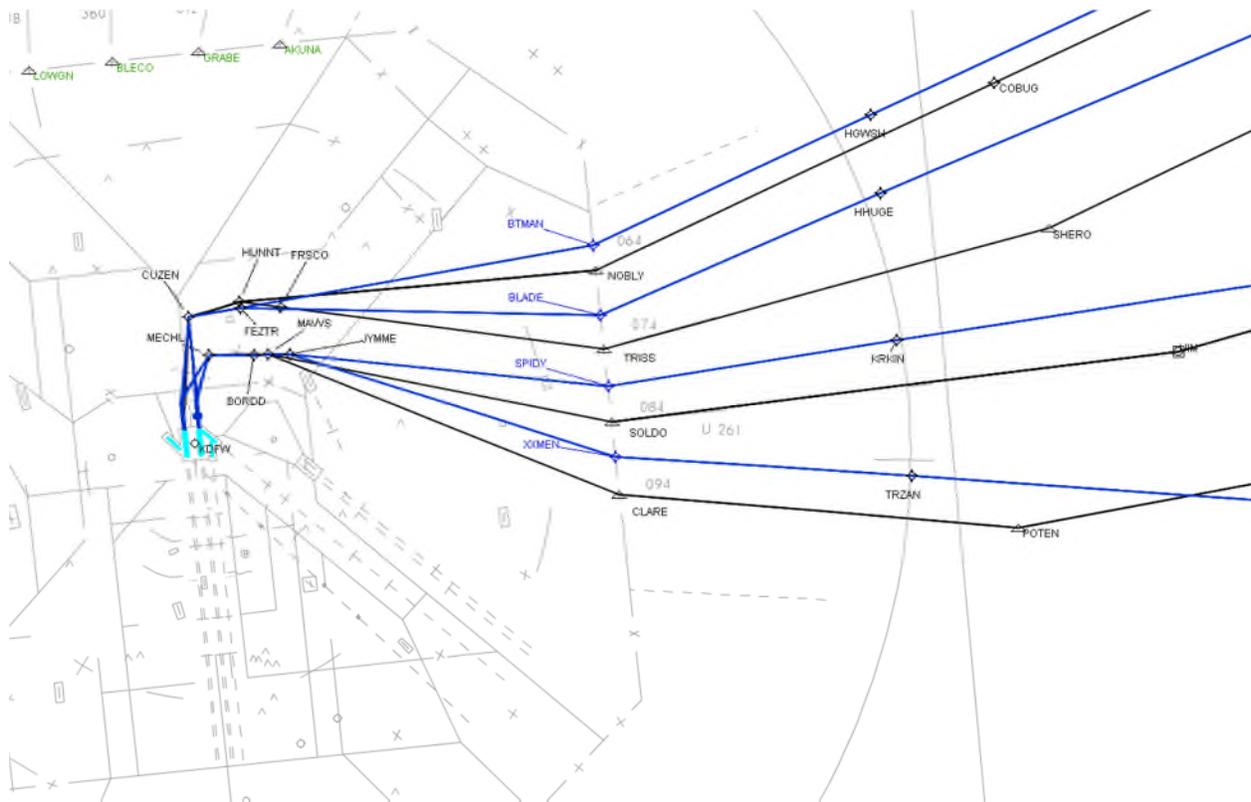
Airport	Procedure Name (SID)	Boundary Side	Exit Point	Departure Transitions
DFW	KEENE SIX	Southwest	N/A	N/A
DFW, DAL, & Satellites	WORTH SIX	West	PODDE, CEOLA, SLOTT, FERRA	ABI, CNX, TXO, TUCUMCARI (TCC) VOR, PNH
DFW, DAL, & Satellites	KINGDOM SEVEN	West	PODDE, CEOLA, FERRA	MILLSAP (MQP) VOR, GTH, SPS
DFW & DAL	COYOTE FIVE	West	PODDE, CEOLA, SLOTT, FERRA	ABI, CNX, TXO, TCC, PNH
DFW	POODE FOUR	West	PODDE	ABI
DFW	CEOLA FIVE	West	CEOLA	CNX, TXO
DFW	SLOTT FOUR	West	SLOTT	TCC
DFW	FERRA FIVE	West	FERRA	PNH
DAL	LOVE TWO	West	PODDE, CEOLA, SLOTT, FERRA	ABI, CNX, TXO, TCC,PNH
DFW	TRI-GATE SIX	Northeast Corner	N/A	N/A
DFW, DAL & Satellites	TEXOMA ONE	North	LOWGN, BLECO, GRABE, AKUNA	ROLLS INTERSECTION, IRW, TUL, OKMULGEE (OKM) VOR, MLC
DFW	LOWGN FOUR	North	LOWGN	ROLLS
DFW	BLECO FOUR	North	BLECO	IRW, TUL
DFW	GRABE FOUR	North	GRABE	OKM
DFW	AKUNA FOUR	North	AKUNA	MLC
DAL	KRUMM FOUR	North	LOWGN, BLECO, GRABE, AKUNA	ROLLS, IRW, TUL, OKM, MLC

Notes: **Bold** indicates shared exit points.

Source: National Flight Data Center (NFDC), 4/5/2012 Charting cycle
Prepared by: HMMH, November 2012

The location of exit points being static regardless of the flow conditions at airports inside of D10 further limits the efficiency of departure flows. Redesigning the procedures to tailor the exit point locations to correlate with specific flow conditions (known as “floating fixes”) would enable controllers to continue to organize the traffic into departure flows, facilitating orderly air traffic management as aircraft transition from terminal to en route airspace, while reducing overall miles flown. **Exhibit 2-5** shows that, in a north flow, aircraft would fly to the blue waypoints as opposed to today’s boundary fixes shown in black (BTMAN vs. NOBLY, BLADE vs. TRISS, etc.,). In doing so, the aircraft would not fly as far south before turning back north as they do with today’s RNAV SIDs.

Exhibit 2-5 Floating Fixes in North Flow



Source: MITRE Corporation
Prepared by: MITRE analysis, email 8/12/2013

In short, sharing entry and exit points for the D10 airspace between multiple flows into several airports results in the following inefficiencies:

- The need to merge arriving aircraft into a single arrival flow at each entry point can increase flight time and distances.
- Gaps in the final arrival flows do not allow for the formation of a constant stream of aircraft to the Study Airports. This prevents the full use of the potential arrival throughput at the Study Airports.
- Holding aircraft on the runway to create the necessary gaps in the departure routes leads to departure delays at all Study Airports, especially during peak travel periods. This prevents full use of the potential departure throughput at the Study Airports.
- The need for additional controller-to-pilot communication to issue the variety of instructions required to merge and desegregate the flow of aircraft adds to the workload of both controllers and pilots.

2.1.2.2 Complex Converging Interactions between Arrival and Departure Flight Paths

This section provides three general examples of complex converging interactions between flight routes, followed by specific demonstrations of these examples in the North Texas Metroplex. In some areas, the required separation between flight paths prevents efficient use of the airspace. Examples of such interactions and complexities are presented below.

1. **Many arrival and departure routes converge or cross.** This is necessary to move aircraft to an airport from the appropriate entry point and from an airport to the appropriate exit point. To maintain appropriate separation between aircraft, the controller issues altitude assignments that rely on vertical distances of 1,000 ft. or more. Crossing routes include level flight segment “bridges” where, at key points, aircraft stop their descent or climb and level off to allow departures to cross and climb away from the departing aircraft’s path. Aircraft may then fly at this altitude until they have moved away from other aircraft crossing the same area.
2. **ATC typically splits arrival and departure control responsibilities.** Control of aircraft is passed on from one controller to the next as the aircraft progresses through airspace. Vertical separation between aircraft arrivals and departures is maintained primarily through defined ceiling and floor altitudes. An arriving aircraft cannot descend until the aircraft is clear of the dimensional airspace reserved for departures. When an aircraft clears one airspace area, it is transferred by a controller to the next airspace area controlled by another controller. During this handoff between controllers, aircraft may have to level off until the next controller acknowledges control and the aircraft is able to resume its climb.
3. **Two aircraft must be separated laterally by at least three nautical miles (NM) in the terminal environment, and 5 NM in the en route airspace setting.** This separation is achieved in the terminal environment by keeping aircraft at least 1.5 NM (or 2.5 NM in the en route setting) from an airspace boundary assigned to a specific air traffic controller prior to handoff. As conventional navigation is not as accurate as RNAV, two to three nautical mile buffers from the boundary are used to ensure the 1.5 (or 2.5) NM distances are always met. These limitations create unusable airspace.

The scenarios described above require additional verbal communication among air traffic controllers or between controllers and pilots, thus increasing pilot/controller workload and system complexity. In addition, vectoring and level flight segments reduce airspace efficiency and flight efficiency. Vectoring and interrupted climbs and descents (i.e., level flight segments) add distance and time to flights operating in the North Texas Metroplex.

The following sections provided more specific examples of these interactions within the North Texas Metroplex area.

DFW and DAL Proximity and Conflicting Runway Alignment

Performance characteristics of the jet and turboprop aircraft types operating from DFW and DAL, in conjunction with a conflicting runway alignment of these two airports with center points separated by less than 10 NM from each other, presents a separation challenge for controllers. The distance between the departure flight routes from DFW and DAL is insufficient for the airspace to be used efficiently, requiring controllers to carefully observe aircraft activity along the proximate or crossing flight routes to be prepared to actively

manage aircraft to maintain safe separation. For example, many departure flight routes from DAL cross over or under departure flight routes from DFW, particularly for operations taking off from south to north at DFW, while operations at DAL are taking off from southeast to northwest.

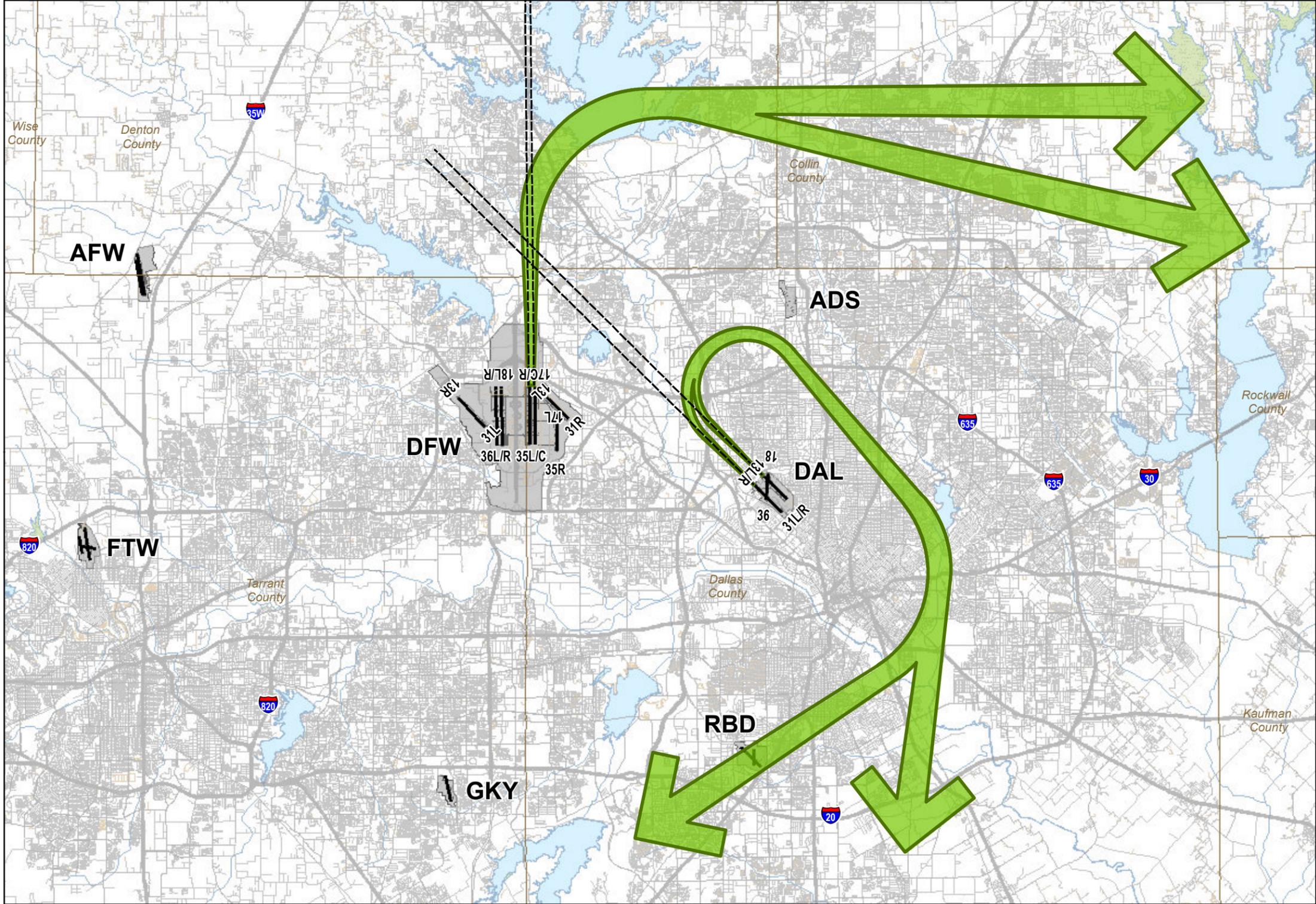
As previously mentioned air traffic controllers use level flight segments to maintain aircraft separation. A specific instance of this occurs for those aircraft departing DAL that are destined to the south or southwest (e.g., San Antonio) when DFW is operating in a north flow (i.e., takeoffs and landings are occurring from south-to-north). As a result, the southwest bound DAL departures flying a greater distance than would otherwise be required if DFW traffic were not present. The right (clockwise) turn to the south or southwest that is required to avoid the DFW traffic is longer than the more direct left (counterclockwise) turn would be from a northwest takeoff heading.

In other cases, departing aircraft on nearby flight routes will be vectored to ensure safe lateral separation. For example, aircraft departing DAL and taking off from southeast to northwest, but headed eastbound, conflict at times with eastbound departures from DFW. In order to prevent traffic conflicts, DFW aircraft are vectored further toward the north than would otherwise necessary before being allowed to resume their desired course and turning eastbound.

As depicted in **Exhibit 2-6**, during north flow conditions, those DFW departures ultimately headed to the east must delay their turn to the right to avoid converging traffic departing from DAL. During this same flow condition, the DAL departures headed to the southwest are required to turn quickly to the right, as opposed to turning left for a more direct route, to avoid the DFW departures. Issues regarding this interaction include crossing restrictions and level-off requirements, which prevent optimized departures.

Southeast DFW Jet Arrival (Cedar Creek Six) and South DAL Departure (Joe Pool Four) Conflict

Current arrival procedures for aircraft landing at DFW and arriving over the southeast corner post can often present traffic conflicts with southbound DAL departure routes during a south flow condition. As depicted in **Exhibit 2-7**, DFW arrivals from the southeast (in red) interact with DAL departures to the south (in green). Inefficiencies involved in this interaction include required level flight segments and limited use of arrival transitions due to conflicting altitudes. For example: the current JOE POOL FOUR departures from DAL are forced to fly runway heading longer than optimal before turning south in order to avoid overflying DFW landing traffic.



LEGEND

- Study Airport Area
- Runway Centerline Extension
- Departure Flow
- State Boundary
- County Boundary
- Interstate Highway
- Highways
- Water
- River/Stream

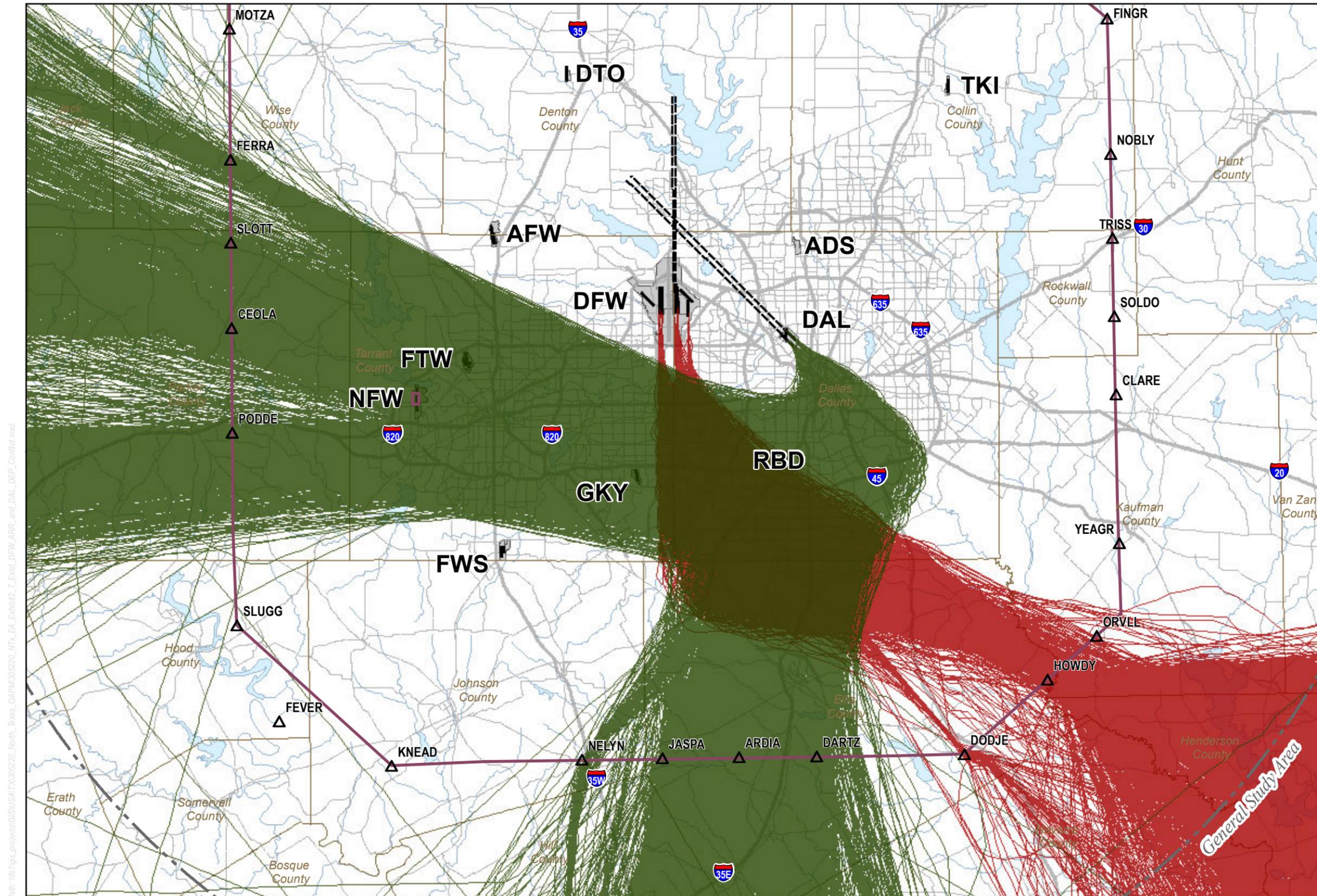
Notes:
ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
FTW - Fort Worth Meacham International Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport



Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; Texas Water Development Board (Reservoirs), October 19, 2012; Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 2-6

DFW and DAL Proximity and Conflicting Runway Alignment



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- Navigational Fix
- DFW Arrival Flight Track from Southeast
- DAL Departure Flight Track to South and West
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

- Notes:
- ADS - Addison Airport
 - AFW - Fort Worth Alliance Airport
 - DAL - Dallas Love Field
 - DFW - Dallas Fort Worth International Airport
 - DTO - Denton Municipal Airport
 - FTW - Fort Worth Meacham International Airport
 - FWS - Fort Worth Spinks Airport
 - GKY - Arlington Municipal Airport
 - NFW - Fort Worth Naval Air Station
 - RBD - Dallas Executive Airport
 - TKI - Collin County Regional Airport at McKinney

Path: \\fs1\p\proj\GIS\USMTX\06220_North_Texas_OAPM\06220_NTX_EA_Ext\Map2_7_East_DFW_APP_and_DAL_DEP_Conflict.mxd

Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; Texas Water Development Board (Reservoirs), October 19, 2012; HMMH Analysis, 2012 (Study Area Boundary); MITRE (TRACON Boundary), August 22, 2012; PDARS (Traffic Flow Data); Digital En-Route Supplement (Navigation Fixes)
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 2-7

**DFW Arrival and DAL Departure Conflicts
(Southeast Corner)**

2.1.2.3 Lack of Predictable Standard Procedures

This section describes the correlation between the increased use of RNAV procedures and the predictability of aircraft operations.Predictability provides pilots and controllers the ability to know ahead of time how, where, and when an aircraft should be operated along a defined route allowing them to better plan airspace use and the control of aircraft in the given volume of airspace. A predictable route may include expected locations (where), altitudes (where and how high), and speeds (how fast and when) at key points. A procedure that provides these elements results in a more predictable route for the pilot and controller.

Aircraft performance and/or piloting technique can vary, and as a result, may also play a factor in reducing predictability. Because conventional procedures are less precise than RNAV procedures and less predictable, controllers will use vectoring as well as instructions governing speed and altitude level-offs to ensure safe vertical and lateral separation between aircraft. As discussed in Section 1.2.6.1, RNAV procedures enable aircraft to follow more accurate and better defined, direct flight routes in areas covered by GPS-based navigational aids. This allows for predictable routes with fixed locations and altitudes that can be planned ahead of time by the pilot and air traffic control. Fixed routes help maintain segregation between aircraft by allowing defined vertical and horizontal separation of traffic. As a result, some routes can be shortened and the need for level-offs can be reduced. This allows for improved use of the airspace. Therefore, the greater the number of RNAV procedures in a Metroplex the greater the degree of predictability.

Table 2-4 summarizes current availability of conventional and RNAV-based procedures for the Study Airports.

Table 2-4 Current Procedures by Type in the North Texas Metroplex

Airport	Current Procedures			
	Conventional		RNAV	
	Arrival	Departure	Arrival	Departure
DFW	10	12	0	16
DAL	4	5	0	0
Satellites	3	0	0	0
TOTAL	17	17	0	16

Notes:

1. Certain conventional navigation SIDs and STARs serve more than one airport. In those cases, an IFP jointly serving DFW and other Study Airports is counted only once, and is shown under the DFW data. An IFP serving jointly DAL and a satellite airport is counted only once, under the DAL data. There are no conventional navigation SIDs that serve only a satellite airport without also serving either DFW or DAL. There are, however, three conventional navigation STARs that serve west side satellite airports without also serving either DFW or DAL.
2. There are currently no RNAV STARs published for use at airports in the North Texas Metroplex.
3. The only RNAV SIDs currently published for use at airports in the North Texas Metroplex serve DFW.

Source: National Flight Data Center (NFDC), 4/5/2012 charting cycle
Prepared by: HMMH, November 2012

The following sections describe the three areas - ground path, vertical path, and runway transitions - in which conventional procedures in the North Texas Metroplex result in less

predictable air traffic management as compared to RNAV-based procedures. The following sections describe the conditions that reduce predictable air traffic management.

Ground Path

Airports with a significant volume of aircraft operating under Instrument Flight Rules (IFR) need SID and STAR procedures to direct air traffic flows and various runway configurations to achieve optimal efficiency. The intention of SID and STAR procedures is to maintain a predictable flow of aircraft to/from an airport. This is achieved by establishing consistent flight route expectations, reducing the need for communications between controllers and pilots. These procedures also reduce the need to hold aircraft on the ground or in the air, or to make use of other aircraft management tools and coordination techniques to satisfy aircraft separation requirements.

Several STAR and SID procedure designs use ground-based NAVAIDs. As discussed in Section 2.1.1, navigation based on ground-based NAVAIDs can be hindered by line-of-site issues and signal degradation that limits where conventional procedure routes can be located. Due to these factors, it can be difficult for a non-RNAV equipped aircraft to follow an accurate ground path. The ground path is the track or trace along the surface of the earth directly below the aircraft which represents where the aircraft should be flying. Because these procedures cannot provide more predictable controls such as specific speeds or altitudes, controllers use vectoring and speed adjustments to manage traffic. This leads to increased controller and pilot workload. **Table 2-5** shows the current number of procedures for the five major study airports as of December 2011.

Table 2-5 Existing STAR and SID Procedures for DFW, DAL and Satellite Airports (1 of 2)

Airport	Current Procedures			
	Conventional		RNAV	
	STAR	SID	STAR	SID
KDFW	BONHAM FIVE, BOWIE ONE, CEDAR CREEK SIX, DUMPY THREE, GLEN ROSE NINE, JAGGO THREE, JONEZ FOUR, JUMBO THREE, MASTY TWO, WILBR THREE	COYOTE FIVE, DALLAS NINE, GARLAND THREE, HUBBARD SIX, JACKY FOUR, JOE POOL FOUR, KEENE SIX, KINGDOM SEVEN, TEXOMA ONE, TRI-GATE SIX, WORTH SIX, WYLIE FIVE	NONE	AKUNA FOUR, ARDIA FOUR, BLECO FOUR, CEOLA FIVE, CLARE THREE, DARTZ FOUR, FERRA FIVE, GRABE FOUR, JASPA THREE, LOWGN FOUR, NELYN THREE, NOBLY FOUR, PODDE FOUR, SLOTT FOUR, SOLDI THREE, TRISS FOUR
KDAL	BOWIE ONE, DUMPY THREE, FINGR THREE, GLEN ROSE NINE, GREGS SIX, KNEAD SIX	BACHMAN SIX, COYOTE FIVE, DALLAS NINE, GARLAND THREE, HUBBARD SIX, JOE POOL FOUR, KINGDOM SEVEN, KRUMM FOUR, LOVE TWO, TEXOMA ONE, TRINITY SIX, VENUS SEVEN, WORTH SIX, WYLIE FIVE		
All Satellites	DODJE THREE,	DALLAS NINE, JOE POOL FOUR, TEXOMA ONE, WORTH SIX		

Table 2-5 Existing STAR and SID Procedures for DFW, DAL and Satellite Airports (2 of 2)

Airport	Current Procedures			
	Conventional		RNAV	
	STAR	SID	STAR	SID
East Satellites	DUMPY THREE, FINGR THREE, GLEN ROSE NINE, GREGS SIX, JONEZ FOUR*, KNEAD SIX,	GARLAND THREE, HUBBARD SIX, KINGDOM SEVEN, WYLIE FIVE	NONE	NONE
West Satellites	MOTZA SIX, SASIE TWO, SLUGG SIX		NONE	NONE

Table Notes:

*-ADS only

Source: National Flight Data Center (NFDC), 4/5/2012 charting cycle
Prepared By: HMMH, MITRE Corporation, August 2013

Vertical Path

Aircraft climb or descend when instructed by a controller. 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 frequently required to level off during descent/climb to maintain vertical separation from other arriving and departing aircraft. Unpredictable vertical guidance resulting from conflicting traffic leads to increased controller workload and inefficient aircraft operation.

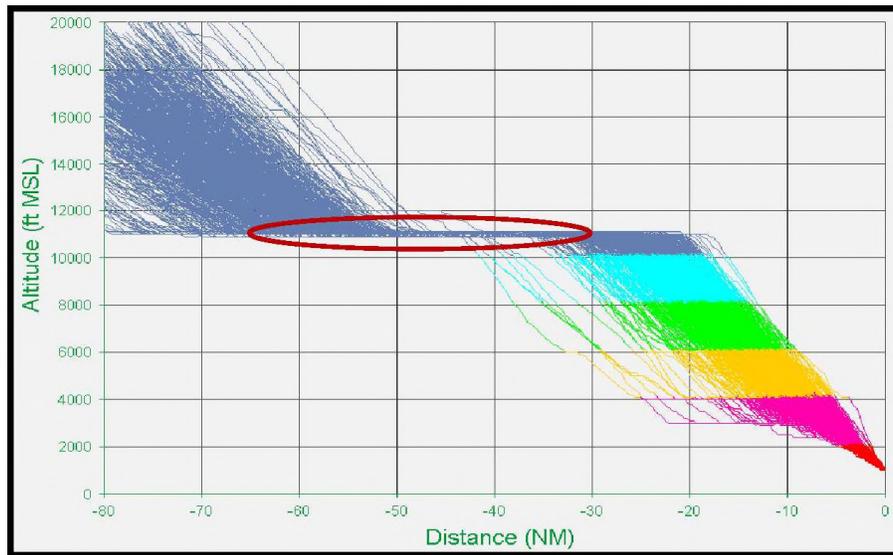
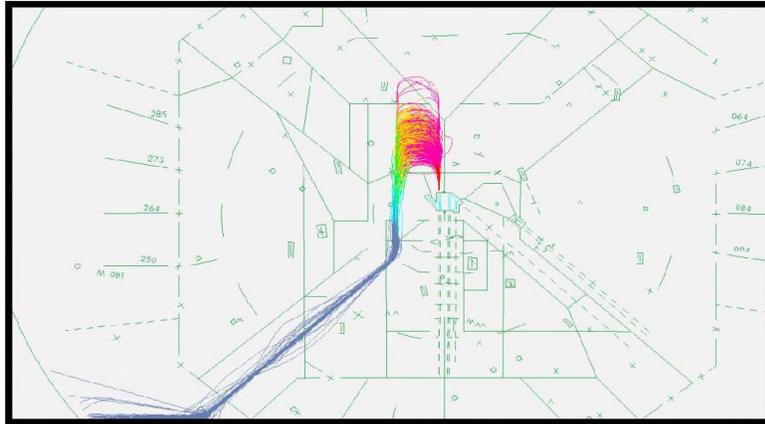
Some routes in the North Texas Metroplex require climbing or descending aircraft to level-off to accommodate aircraft crossing above or below. In these instances, aircraft efficiency suffers due to: 1) power variability during leveling-off; 2) power variability in reinitiating the climb or descent; and 3) increased fuel consumption. The level-off in the climb phase typically results in aircraft taking longer to reach final altitude and decreases fuel efficiency. During the descent phase, the level-off requires application of thrust for aircraft preparing to land to maintain altitude. This results in extended fuel burn.

For example, the current GLEN ROSE NINE arrival over the GLEN ROSE VOR, crossing the southwest corner post entry point at FEVER, currently must level-off at 11,000 ft. MSL in order to maintain vertical separation from other, primarily departing aircraft. The lateral course routes and vertical profiles of flight tracks crossing over GLEN ROSE VOR in the southwest corner post area of D10 airspace are portrayed in **Exhibit 2-8**. The extended level flight segment is noted by the dark blue flight track collection in an area circled in red. This situation involves additional pilot-controller communications, including additional point-outs,³³ which add to complexity and reduce airspace efficiency.

³³ While the aircraft is in a climb or descent, controllers may need to alert adjacent aircraft or another controller, who is responsible for a nearby airspace sector, of the proximity of a nearby aircraft. This notification is called a "point-out." This adds to the airspace complexity, because of the communication requirement and time taken to provide the point-out and receive confirmation from the recipient. Reducing point-outs improves efficiency in communications.

Exhibit 2-8 Vertical Arrival Flow Profile Example

Selected Altitudes (ft MSL)	11000
Avg Time in Level Flight (MM:SS)	06:04



Note: Color Bands are in 2,000-foot increments up to 10,000 ft. MSL

Source: North Texas OAPM Metroplex Study Team Site Package, September 2010

Prepared by: North Texas OAPM Metroplex Study Team

RNP-ARs

RNP-ARs are approach procedures designed to offer the ability to fly predictable ground-tracks to the runway, similar to visual approaches flown under VMC, during IMC conditions. This increases flight track predictability in all weather conditions and may reduce miles flown and pilot/controller communication and workload. There are currently no RNP-ARs available in the North Texas Metroplex airspace.

Satellite Airports

Currently, aircraft operating to North Texas Metroplex satellite airports, which serve both GA and military air traffic while functioning as reliever airports for DFW and DAL, make use of conventional navigation SIDs and STARs. However, these IFPs are shared with aircraft

departing from or arriving to DFW and DAL, which mixes aircraft of varying performance capabilities in arrival or departure streams, adversely affecting system efficiency.

2.2 Purpose of the Proposed Action

The purpose of the Proposed Action is to take advantage of the benefits of performance based navigation by implementing RNAV procedures that will help improve the efficiency of the airspace in the North Texas Metroplex. Implementing RNAV procedures will also comply with direction issued by Congress in the Modernization and Reform Act of 2012. To meet this goal, the Proposed Action would optimize procedures serving the North Texas Metroplex Study Airports while maintaining or enhancing safety in accordance with FAA's mandate under federal law. This would be achieved by reducing dependence on ground-based NAVAID technology in favor of more efficient satellite-based navigation. 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 reduce complex converging flight paths; and
- Provide RNAV arrival and departure en route transitional and terminal area airspace procedures to provide a more predictable ground and vertical path.

With implementation of the Proposed Action, air traffic controller workload and controller-to-pilot communication would be expected to decrease, reducing both workload and airspace complexity. Improvements in arrival and departure segregation among the North Texas Metroplex Study Airports would reduce the need for vectoring and level flight segments, resulting in shorter and more predictable routes.

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

2.2.1 Improve Flexibility in Transitioning Aircraft

One objective of the Proposed Action is to minimize the need for merging by increasing the number of entry/exit points and procedures dedicated to specific Study Airports. As discussed in Section 2.1.2.1, the limited number of entry and exit points and associated procedures constrains the efficiency of the air traffic routes in the terminal and en route transitional airspace; this is a result of the need to merge multiple routes prior to arrival to and departure from terminal airspace. This objective can be measured with the following criteria:

- Where possible, increase the number of entry and exit points compared with the No Action Alternative (measured by number of exit/entry points).
- Segregate major Study Airport traffic from other major Study Airport and/or satellite Study Airport traffic to/from Study Airports (measured by count of RNAV STARs and/or SIDs that can be used independently to/from Study Airports).

2.2.2 Segregate Arrivals and Departures

A second objective of the Proposed Action is to implement procedures that would achieve better segregation of arrivals and departures within the terminal airspace. As discussed in Section 2.1.2.2, arrival and departure flight routes frequently cross, converge, or are located

within close proximity of each other in some portions of the en route and terminal airspace. This requires controllers to actively manage the traffic using the tools available to them to ensure that safe vertical and lateral separation between aircraft is maintained. This objective can be measured with the following criterion:

- Where possible, increase the number of RNAV STARs and SIDs compared with the No Action Alternative (measured by total count of RNAV STARs and RNAV SIDs for the North Texas Metroplex.)

2.2.3 Improve the Predictability of Air Traffic Flow

A third objective is to improve the predictability of air traffic flows. As discussed in Section 2.1.2.3, current procedures in the North Texas Metroplex do not take full advantage of RNAV capabilities. RNAV procedures can increase predictability by taking better advantage of aircraft performance capabilities (e.g., speed control and altitude restrictions) and by designing procedures that reflect these capabilities. These enhancements would provide for more predictable, repeatable, and efficient routes than is currently possible with most conventional procedure designs.

In addition, RNAV departure procedures with runway transitions and RNP-ARs approaches to DAL provide for a more predictable flow of air traffic through the airspace and require less controller-to-controller coordination and controller-to-pilot communications to manage air traffic flows. Additional runway transitions from each runway would provide controllers more flexibility to balance demand, maintain runway departure separations, and segregate routes without the need for controller intervention. This objective can be measured with the following criteria:

- 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);
- Increase the number of runway transitions in the RNAV SIDs and RNP-AR approaches in comparison to the No Action Alternative. (measured by count of procedures that include runway transitions from runways and RNP-ARs); and,
- Increase the number of climbs and descents with predictable altitudes along a route (measured by number of procedures with an Optimized Descent Profile (OPD) design component).

2.3 Criteria Application

The Proposed Action is evaluated to determine how well it meets the project purpose and need based on the measurable criteria for each objective 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 be maintained, along with approved procedure modifications already planned and approved for implementation. The criteria are intended to aid in comparing the Proposed Action Alternative with the No Action Alternative.

2.4 Description of the Proposed Action

The Proposed Action considered in this study would include the implementation of optimized RNAV SID and STAR procedures and RNP-AR approaches that would reduce reliance on conventional procedures. The primary objectives of the Proposed Action are to

redesign standard instrument arrival and departure procedures to more efficiently serve the Study Airports and to improve the flexibility and predictability of air traffic routes. 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. Instead, inefficiencies in the air traffic routes currently serving the Study Airports would be reduced. The Proposed Action does not involve physical construction of any facilities, such as additional runways or taxiways, or such as permitting. Therefore, the implementation of the proposed changes to procedures in the North Texas Metroplex would not require any physical alterations to environmental resources identified in FAA Order 1050.1E.

2.5 Required Federal Actions to Implement Proposed Action

Implementation of the Proposed Action requires the following actions to be taken by the FAA:

- Controller training; and,
- Publication of new or revised STARs, SIDs, transitions, RNP-ARs.

2.6 Agency Coordination

On May 6, 2013, the FAA distributed an early notification letter to 210 federal, state, regional, and local officials. The purpose of the letter was to provide notice of the initiation of the EA; 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. A subsequent notification letter was sent to an additional 10 federal, state, local, and tribal officials on June 12, June 14, and July 9, 2013.

Appendix A, *Agency Coordination, Agency Consultation, and Public Involvement*, includes a copy of the early coordination letter (and attachments) as well as a list of the receiving agencies and tribes.