Federal Aviation Administration

Design and Implementation Team Technical Report

Cleveland/Detroit (CLE/DTW) Metroplex

November 7, 2017

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1.0 Executive Summary

The FAA Cleveland/Detroit Metroplex project Design and Implementation Team designed a total of 65 new Performance Based Navigation (PBN) procedures. These procedures include Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARs), and Required Navigation Procedures (RNPs) for the Detroit Metropolitan Wayne County Airport (DTW), Cleveland Hopkins Airport (CLE), and numerous smaller satellite airports. Dependent upon the completion of the Environmental Assessment (EA), these procedures, along with amendments to 10 existing Standard Instrument Approaches Procedures (SIAPs) are planned for publication on May 24, 2018. The following sections of this document describe in greater detail the impetus for this project and process used to design these procedures. Also included are the airports to be served by these procedures, the names of the procedures, the details about how these procedures were refined and who participated in their development.

2.0 The FAA Metroplex Program

The FAA Metroplex Program, formerly Optimization of Airspace and Procedures in the Metroplex, was developed in direct response to the RTCA's Task Force 5 Final Report on Mid-Term NextGen Implementation which addressed the quality, timeliness, and scope of metroplex solutions. The Metroplex Program is a systematic, integrated and expedited approach to implementing PBN procedures and associated airspace changes.

3.0 Overview of the Cleveland/Detroit Metroplex Study and Design Team Process

The CLE/DTW Study Team was the tenth collaborative Metroplex team deployed, and it was active from January 28, 2014 to May 16, 2014. The Study Team Final Report from May 2014 served as the foundation for the Design Team's scope of work. The CLE/DTW Design Phase was initiated on September 4, 2014 and has continued refinement of designs through October 2017. The Design Team focused on finalizing the Study Team's conceptual designs to address identified operational and efficiency issues through the application of PBN procedures and associated airspace changes within the Metroplex, with the goal of creating designs that support both FAA and Industry needs. The Design Team consisted of participants from the FAA Air Traffic Control (ATC) facilities, the National Air Traffic Controllers Association (NATCA), ATC subject matter experts (SMEs), Industry, representatives from the Central Service Center, other FAA lines of business such as PBN Policy and Support and Flight Procedures, MITRE CAASD, and various support contractors. The original 100% Designs Complete milestone was scheduled for October 2015, but was delayed because of the newly-developed Community Involvement activities and the requirements associated with new procedure design criteria. Feedback received during Community Involvement was considered and incorporated in the proposed designs, as appropriate.

4.0 Scope and Process

The CLE/DTW Metroplex consists of airspace delegated to the Cleveland Airport Traffic Control Tower (CLE ATCT), Detroit TRACON (D21), and Cleveland Air Route Traffic Control Center (ZOB). The CLE/DTW Design Team focused on aircraft operations at the Cleveland Hopkins International Airport (CLE) and Detroit Metropolitan Wayne County Airport (DTW), as well as numerous satellite airports including the Burke Lakefront Airport (BKL) in CLE ATCT airspace and the Oakland County International Airport (PTK) in D21 airspace. Due to conflicting traffic flows, the Team also considered operations at the Akron-Canton Regional Airport (CAK) and its two satellite airports. Although Toledo Express (TOL) and Wayne County Airport X (BJJ) airports were included in the official Study Area for the Environmental Assessment, the Design Team did not design procedures for those airports. Table 1 below lists the airports served by procedures proposed by this project:

Table 1. Airports Served by CLE/DTW Metroplex Proposed Procedures

Airport ID	Airport Name
KCLE	Cleveland-Hopkins International Airport
KBKL	Burke Lakefront Airport
KLNN	Willoughby Lost Nation Municipal Airport
KLPR	Lorain County Regional Airport
KCGF	Cuyahoga County Airport
KCAK	Akron-Canton Regional Airport
KAKR	Akron Fulton International Airport
K1G3	Kent State University Airport
KDTW	Detroit Metropolitan Wayne County International Airport
KVLL	Oakland/Troy Airport
CYQG	Windsor Airport (Canada)
KPTK	Oakland County International Airport
KYIP	Willow Run Airport
KARB	Ann Arbor Municipal Airport
KDET	Coleman A Young Municipal Airport
KOZW	Livingston County Spencer J. Hardy Airport
KONZ	Grosse Ile Municipal Airport
KTTF	Custer Airport
KFNT	Bishop International Airport (Flint)
KMTC	Selfridge Air National Guard Base

5.0 Proposed Solutions

The Design Team worked together with Industry, including regional carriers, in balancing diverse aircraft-type profiles and increased efficiency. The Team consulted with surrounding facilities when the design called for the efficiencies affecting their operation or airspace. The proposed designs are captured in 15 Final Design Packages and associated Change Control Sheets in Attachment I. The proposed designs include 75 new PBN procedures for CLE, DTW, PTK, DET, BKL and CAK airports, and amendments to ten CLE SIAPs. These packages contain SIDs, STARs, and SIAPs. Tables 2 and 3 below lists the Final Design Packages completed for this project and the procedures developed for each airport, respectively.

Table 2. Final Design Packages Completed for this Project

Design Package	Airports Served
CLE RNAV SIDs	KCLE, KBKL, KCGF, KLNN, KLPR
CLE RNAV STARs	KCLE, KBKL, KCGF, KLNN, KLPR, KCAK, KAKR, K1G3
CLE RNAV SIAPs	KCLE
BKL RNAV SIDs	KBKL, KCGF, KLNN, KLPR
CAK RNAV STARs	KCAK, KAKR, K1G3
DTW RNAV SIDs N	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW RNAV SIDs E	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW RNAV SIDs S	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW RNAV SIDs W	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW RNAV STARs NE	KDTW
DTW RNAV STARs SE	KDTW
DTW RNAV STARs SW	KDTW
DTW RNAV STARs NW	KDTW
DTW RNAV SIAPs	KDTW
PTK & DET RNAV STARs	KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC, KFNT

Table 3. Procedures Develop by Airport

Procedure Type	DTW	CLE	BKL	CAK	PTK	DET	Totals
RNAV SIDs New	11	5	2				18
RNAV STARs New	16	4		2	4	1	27
SIAPs New	16	4					20
SIAP Amendments		10					10
Totals	**43**	**23**	**2**	**2**	**4**	**1**	**75**

5.1 Cleveland Area Procedures

There are 25 procedures proposed for CLE and BKL, including 15 new Area Navigation (RNAV) procedures proposed for CLE and satellite airports, and amendments to ten existing CLE SIAPs. All four bi-directional STARs to CLE contain Optimum Profile Descents (OPDs). All five SIDs from CLE were designed to be RNAV-off-the-ground. Two RNAV SIDs for aircraft departing BKL and other satellite airports are proposed. Four RNAV Required Navigation Performance Authorization Required (RNP AR) approaches are proposed to the primary north and south runways. Amendments to ten existing CLE SIAPs; five Instrument Landing System (ILS) and five Global Positioning System (GPS) approaches at CLE are proposed to optimize designs and align them with the proposed RNP AR approaches. Table 4 and 5 below lists the proposed procedures serving CLE, BKL, and nearby airports:

Table 4. Proposed SIDs and STARs Serving CLE, BKL, and Nearby Airports

Airport	Procedure Name	Airports Served
CLE	CLE CAVVS (RNAV) SID	KCLE, KBKL, KCGF, KLNN, KLPR
CLE	CLE GTLKE (RNAV) SID	KCLE, KBKL, KCGF, KLNN, KLPR
CLE	CLE KKIDS (RNAV) SID	CLE
CLE	CLE PFLYD (RNAV) SID	CLE
CLE	CLE ZAAPA (RNAV) SID	KCLE, KBKL, KCGF, KLNN, KLPR
CLE	CLE BRWNZ (RNAV) STAR	KCLE, KBKL, KCGF, KLNN, KLPR, KCAK, KAKR, K1G3
CLE	CLE ROKNN (RNAV) STAR	KCLE, KBKL, KCGF, KLNN, KLPR
CLE	CLE ROLLN (RNAV) STAR	KCLE, KBKL, KCGF, KLNN, KLPR
CLE	CLE TRYBE (RNAV) STAR	KCLE, KBKL, KCGF, KLNN
BKL	BKL AHMET (RNAV) SID	KBKL, KCGF, KLNN, KLPR
BKL	BKL MYCAR (RNAV) SID	KBKL, KCGF, KLNN, KLPR

Table 5. RNP Approaches and Existing SIAP Amendments Proposed for CLE

Procedure Name
CLE RNAV (RNP) Z RWY 06L APCH
CLE RNAV (RNP) Z RWY 06R APCH
CLE RNAV (RNP) Z RWY 24L APCH
CLE RNAV (RNP) Z RWY 24R APCH
CLE ILS RWY 28 APCH
CLE RNAV (GPS) RWY 28 APCH
CLE ILS RWY 06L APCH
CLE RNAV (GPS) Y RWY 06L APCH
CLE ILS RWY 06R APCH
CLE RNAV (GPS) Y RWY 06R APCH
CLE ILS RWY 24L APCH
CLE RNAV (GPS) Y RWY 24L APCH
CLE ILS RWY 24R APCH
CLE RNAV (GPS) Y RWY 24R APCH

5.2 Detroit Area Procedures

There are 48 new RNAV procedures proposed for DTW and satellite airports. All 16 Directional STARs to DTW contain OPDs forming a four cornerpost system each with dual routes. All 11 SIDs from DTW were designed as RNAV-off-the-ground. Four additional RNAV STARs for PTK and one for DET and other satellite airports are proposed. Sixteen RNAV RNP AR approaches are proposed to the primary north/south runways. All procedures were designed to enhance the triple runway operation. Tables 6 and 7 below lists the proposed procedures serving DTW, PTK, DET, and nearby airports:

Table 6. Proposed SIDs and STARs Serving DTW, PTK, and Nearby Airports

Airport	Procedure Name	Airports Served
DTW	DTW BARII (RNAV) SID	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW	DTW CCOBB (RNAV) SID	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW	DTW CLVIN (RNAV) SID	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW	DTW GGIBY (RNAV) SID	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW	DTW HHOWE (RNAV) SID	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW	DTW KAYLN (RNAV) SID	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW	DTW LIDDS (RNAV) SID	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW	DTW MIGGY (RNAV) SID	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW	DTW PAVYL (RNAV) SID	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW	DTW SNDRS (RNAV) SID	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW	DTW ZETTR (RNAV) SID	KDTW, KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
DTW	DTW BONZZ (RNAV) STAR	DTW
DTW	DTW CRAKN (RNAV) STAR	DTW
DTW	DTW CUUGR (RNAV) STAR	DTW
DTW	DTW FERRL (RNAV) STAR	DTW
DTW	DTW GRAYT (RNAV) STAR	DTW
DTW	DTW HANBL (RNAV) STAR	DTW
DTW	DTW HAYLL (RNAV) STAR	DTW
DTW	DTW HTROD (RNAV) STAR	DTW
DTW	DTW KKISS (RNAV) STAR	DTW
DTW	DTW KLYNK (RNAV) STAR	DTW
DTW	DTW LAYKS (RNAV) STAR	DTW
DTW	DTW LECTR (RNAV) STAR	DTW
DTW	DTW RKCTY (RNAV) STAR	DTW
DTW	DTW TPGUN (RNAV) STAR	DTW
DTW	DTW VCTRZ (RNAV) STAR	DTW
DTW	DTW WNGNT (RNAV) STAR	DTW
KPTK	PTK FOREY (RNAV) STAR	KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC
KPTK	PTK OKLND (RNAV) STAR	KPTK, KYIP, KARB, KOZW, KVLL
KPTK	PTK PETTE (RNAV) STAR	KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC, KFNT
KPTK	PTK RRALF (RNAV) STAR	KPTK, KDET, CYQG, KYIP, KARB, KTTF, KOZW, KONZ, KVLL, KMTC, KFNT
KDET	DET GIGGY (RNAV) STAR	KDET, CYQG, KTTF, KOZW

Table 7. RNP Approaches Proposed for DTW

Procedure Name
DTW RNAV (RNP) U RWY 04L APCH
DTW RNAV (RNP) PRM U RWY 04L APCH
DTW RNAV (RNP) U RWY 22R APCH
DTW RNAV (RNP) PRM U RWY 22R APCH
DTW RNAV (RNP) W RWY 03R APCH
DTW RNAV (RNP) W RWY 04L APCH
DTW RNAV (RNP) W RWY 21L APCH
DTW RNAV (RNP) W RWY 22R APCH
DTW RNAV (RNP) X RWY 03R APCH
DTW RNAV (RNP) X RWY 04L APCH
DTW RNAV (RNP) X RWY 04R APCH
DTW RNAV (RNP) PRM X RWY 04R APCH
DTW RNAV (RNP) X RWY 21L APCH
DTW RNAV (RNP) X RWY 22L APCH
DTW RNAV (RNP) PRM X RWY 22L APCH
DTW RNAV (RNP) X RWY 22R APCH

5.3 Akron-Canton Area Procedures

Two new RNAV STARs are proposed for CAK to route traffic through the arrival and departure flows of CLE and DTW. Table 8 below lists the proposed procedures serving CAK and nearby airports:

Table 8. Proposed STARs Serving CAK and Nearby Airports

Airport	Procedure Name	Airports Served
CAK	CAK HUUVR (RNAV) STAR	KCAK, KAKR, K1G3
CAK	CAK ZZIPS (RNAV) STAR	KCAK, KAKR, K1G4

6.0 Procedure Refinement

Extensive industry flight simulator testing was conducted by Delta Airlines, United Airlines, FAA Flight Standards and other industry partners. These procedures were simulated at ZOB in May 2015 using I-SIM software. A high-fidelity Human-in-the-Loop (HITL) simulation was conducted at The MITRE Corporation in McLean, VA to validate DTW procedures in June 2015. Data from Aviation Safety Information Analysis and Sharing (ASIAS) runs were also reviewed and considered in developing these final designs. Additional changes were made in response to feedback from Community Involvement activities conducted in late 2016. Changes were also required due to criteria changes implementing mandatory descent gradients and deceleration distances. All changes to procedures made before the February 6, 2017 submission for EA were incorporated into the Final Design Packages in Attachment I, including updated graphics (annotated by change bars). The changes in the Change Control Sheets preceding each design package were made following the submission of the packages for EA on February 6, 2017. The following is a summary of the significant changes made:

- Added waypoints on two STARs just south of the ZOB/ZID airspace boundary to be use as transfer control points (KCLE ROLLN and KCAK HUUVR STARs)
- Added minimum altitudes at the beginning of the common route of 13 SIDs containing a vector component (all KDTW and KBKL SIDs)
- Added waypoints on the two short KDTW W RNPs to match those on the straight-in (final approach) segments of the long RNPs
- Corrected altitude restrictions intended to provide vertical separation during triple approach operations on the KDTW runway 21L ILS and RNAV (GPS) approaches
- Changed the nomenclature of the KDTW X and Z RNP approaches;
    - RNP X approaches changed to U
    - RNP Z approaches changed to X
- Disconnected four of the long side KDTW STARs, one on each cornerpost, and changed the bottom altitudes to 12,000 feet and terminus waypoints to ensure separation from the adjacent dual STARs; minor changes also made to the adjacent dual STARs (KDTW WNGNT, HTROD, VCTRZ, and GRAYT STARs)
- Disconnected four of the short side KDTW STARs, one on each cornerpost
- Added lost communications procedures and chart notes to indicate the runway to "expect" for the eight short side KDTW STARs (KDTW TPGUN, FERRL, KLYNK, CRAKN, LECTR/HAYLL, RKCTY, and LAYKS STARs)
- Deleted the initial altitude and speed restrictions on eight of the KDTW STARs (northeast and southeast cornerposts) in response to industry concerns that some aircraft would not properly meet those speed restrictions (KDTW TPGUN/CUUGR, FERRL/WNGNT, KLYNK/BONZZ, and CRAKN/HTROD STARs
- Added a holding pattern on the KDTW HAYLL and VCTRZ STARs
- Corrected altitude restriction at CCRIS waypoint on the KDTW RKCTY and KKISS STARs
- Deleted the chart note on all 16 KDTW STARs stating "For use by Turbojet and Turboprop aircraft only"
- Added waypoints to six KDTW SIDs using VA-DF legs to ensure divergence from the adjacent procedures (KDTW BARII, CLVIN, SNDRS for runway 22R, MIGGY and GIBBY for runway 03R, and ZETTR for runways 04L, 04R, and 03R)

- Split the previous KPTK AXXIS STAR into two STARs with the KPTK OKLND STAR serving the KPTK, KYIP, KARB, KOZW, and KVLL airports and the KDET GIGGY STAR serving the KDET, KYQG, KONZ, and KTTF airports
- Changed the name of the KDTW MTRCT SID to the KAYLN SID
- Numerous waypoint names were corrected to those on the reserved list

Table 9 below is a complete list of waypoint and procedure name changes made since February 6, 2017 when the procedures were submitted for EA.

Table 9. List of Waypoint and Procedure Name Changes Since February 6, 2017

Airport	Procedure	OLD Name	NEW Name
CLE	RNAV (RNP) Z, RNAV (GPS) Y, & ILS RWY 06L	BOWIE	BOEEE
CLE	BRWNZ STAR	DOZZR	DOZRR
DTW	BARII/CCOBB/CLVIN/SNDRS SIDs	FERMM	FERRM
DTW	GRAYT/LAYKS STARs	HHOGS	PNNTO
DTW	KAYLN SID (previously the MTRCT SID)	MTRCT SID	KAYLN SID
DTW	KAYLN SID (previously the MTRCT SID)	KAYLN	MTRCT
DTW	KAYLN SID (previously the MTRCT SID)	MTRCT	KAYLN
DTW	PAVYL SID	SLAVA	SLVVA
DTW	RNAV (RNP) X RWY 21L	WP2508	NOOVA
DTW	RNAV (RNP) X RWY 21L	WP2511	STTIK
DTW	RNAV (RNP) X RWY 21L	WP2512	JEEEP
DTW	RNAV (RNAV) X Approaches RWYS 04L & 22R	X	U
DTW	RNAV (RNAV) Z Approaches RWYS 04L/04R/03R & 21L/22L/22R	Z	X
DTW	BARII/CLVIN/LIDDS/SNDRS SIDs	WINRS	BESST
DTW	GGIBY/HHOWE/ZETTR SIDs	BESST	WINRS
DTW	TPGUN/CUUGR STARs	WNGMN	DONEO
DTW	GRAYT/LAYKS STARs	STUWT	WLEYE
PTK	OKLND STAR (previously the AXXIS STAR)	AXXIS STAR	OKLND STAR

7.0 Publication Date/s

The Design Team developed and coordinated a plan to publish the proposed Metroplex procedures on May 24, 2018. All new procedures for CLE, DTW, CAK, PTK, BKL, and DET are planned to be published on that date. All existing Cleveland and Detroit area conventional and RNAV SIDs and STARs, except one, will be cancelled two or more publication dates following the Metroplex implementation. The DTW ST. CLAIR ONE SID is being retained for use by non-GPS equipped aircraft. Table 10 below lists the 24 existing CLE, DTW, BKL, and PTK procedures proposed to be cancelled:

Table 10. Existing CLE, DTW, BKL, and PTK Procedures Proposed to be Cancelled

Cancellations	Cancellations
KBKL FAILS TWO STAR	KDTW GEMNI FOUR STAR
KCLE CHARDON THREE STAR	KDTW MIZAR FOUR STAR
KCLE HIMEZ FOUR STAR	KDTW POLAR SIX STAR
KCLE KEATN SIX STAR	KDTW SPICA TWO STAR
KCLE ZABER SIX STAR	KDTW WEEDA TWO STAR
KCLE ALPHE FOUR (RNAV) SID	KDTW AKRON FIVE SID
KCLE AMRST FIVE SID	KDTW ERRTH SIX SID
KCLE OBRLN FIVE SID	KDTW FORT WAYNE SEVEN SID
KPTK CRUXX SIX STAR	KDTW MOONN EIGHT SID
KPTK LLEEO TWO STAR	KDTW RICHMOND EIGHT SID
KPTK SPRTN THREE STAR	KDTW ROSEWOOD FIVE SID
KPTK SWWAN TWO STAR	

Attachment I. Final Design Packages and Change Control Sheets

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

OAPM Design Package Change Control Sheet			
Date	**Description**	**TARGETS File Reference**	**FAA/NATCA Co-Lead Initials**
20171020	No changes were made to the CLE SIDs after the submission of the procedure to the EA Team on February 6, 2017.	20171107_CLE_DTW_ MASTER_FINAL.tgs	RW / MT

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

Name of Change	Date
CLE PFLYD ONE SID - RNAV (NE1-2) **CLE KKIDS ONE SID - RNAV (SE)** **CLE CAVVS ONE SID - RNAV (S)** **CLE GTLKE ONE SID - RNAV (W1-2)** **CLE ZAAPA ONE SID - RNAV (W3)**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedure **RNAV SIDs**	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☒ **Proposed Final Design (PFD)** ☐ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
4.2.2.1 CLE NE 1 and 2 SIDs **4.2.2.2 CLE SE SID** **4.2.2.3 CLE S SID** **4.2.2.4 CLE W1, W2 and W3 SIDs**	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
CLE: D, R **ZOB: Area 2, 7, 8** **ZAU: East** **ZID:**	**Cleveland TRACON (CLE): James Branch, Nathan Jones** **Cleveland ARTCC (ZOB): Mike Ferrell, Rick Norris** **Chicago ARTCC (ZAU): Joseph Bocik, Sam Passialis** **Indianapolis ARTCC (ZID): Steven Balkevicius, Noble Brown**
Related/Dependent Submissions	**Associated Data Files**
Dependent: Airspace Design Packages **All CLE Standard Terminal Arrival Routes** **Related: CLE East/West T Route**	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose

The proposed departure procedures attempt to maintain unrestricted climbs as much as possible, while providing procedural segregation where practical from other Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs). It is fully expected that ATC will continue to tactically enable shorter routings and remove climb restrictions.

RNAV SIDs with flow-dependent transitions were designed for repeatable, predictable paths. Currently, there are four SIDs: one RNAV SID and three conventional SIDs serving CLE. The Study Team used the existing SIDs as the starting point for procedure development. The issues identified with the current CLE departure procedures are the lack of RNAV SIDs and the close proximy of the HUDDZ and BRUNZ departure gates.

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

Study Team Issues and Solutions – CLE NE1 and NE2 SIDs

The current northeast departures are on PDRs and account for approximately 27% of all CLE jet departures.

- Issues
  - Lack of repeatable predictable paths for departures
  - CAK arrivals interfere with the FAILS departures

- Solutions
  - RNAV departure procedure for traffic filed northeast bound via FAILS (NE 1)
  - RNAV departure procedure for traffic filed to the east (NE 2)

Study Team Issues and Solutions; CLE SE SID

The current southeast departures are on PDRs and account for approximately 16% of all CLE jet departures.

- Issue
  - Lack of repeatable predictable paths for departures
- Solution
  - RNAV departure procedure for traffic filed southeast bound via ACO

Study Team Issues and Solutions; CLE S SID

The current south departures are on PDRs and account for approximately 16% of all CLE jet departures.

- Issue
  - Lack of repeatable predictable paths for departures

- Solution
  - RNAV departure procedure for traffic filed southbound via HERAK

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

Study Team Issues and Solutions; CLE W1, W2 and W3 SIDs

The current west departures are on the ALPHE, AMRST and OBRLN SIDs and account for approximately 41% of all CLE jet departures.

- Issues
    - Lack of repeatable predictable path for departures
    - Lack of RNAV SIDs (AMRST, OBRLN)
    - Close proximity of HUDDZ and BRUNZ
- Solutions
    - RNAV departures procedures for traffic filed via: ALPHE (W1), AMRST (W2) and OBRLN (W3)
    - Increase lateral separation between HUDDZ and BRUNZ

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

Final Design (All CLE SIDs)

All five CLE SIDs:

- Are “RNAV-Off-The-Ground”procedures
- Are “Non-Flow Dependent” meaning they can be used in any CLE runway configuration
- Have a “Top Altitude” of 14,000 feet which coincides with the new ceiling of TRACON airspace
- Are intended for use by all aircraft; turbojets, turboprops, and props

Except for the CLE PFLYD and KKIDS SIDs, these procedures will serve Cleveland-Hopkins International Airport (KCLE) and the following satellite airports:

- KBKL Burke Lakefront Airport
- KLNN Willoughby Lost Nation Municipal Airport
- KLPR Lorain County Regional Airport
- KCGF Cuyahoga County Airport

Those aircraft departing satellite airports will be vectored to join the procedure within an area extending 90 degrees on either side of the outbound course.

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

Final Design; CLE PFLYD ONE SID

Changes from Study Team Recommendation:

- Moved transition to the south to shorten track miles
- Deleted second, more southerly transition to avoid other traffic flows
- Added enroute transitions to east coast destinations and Canada
- This procedure will serve the Cleveland-Hopkins International Airport (KCLE) only

This procedure was deconflicted from the following:

- CLE BRWNZ ONE STAR
- CLE ROKNN ONE STAR

Figures 1 and 2 below depict the CLE PFLYD ONE SID final design **(historical flight tracks not depicted)**.

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

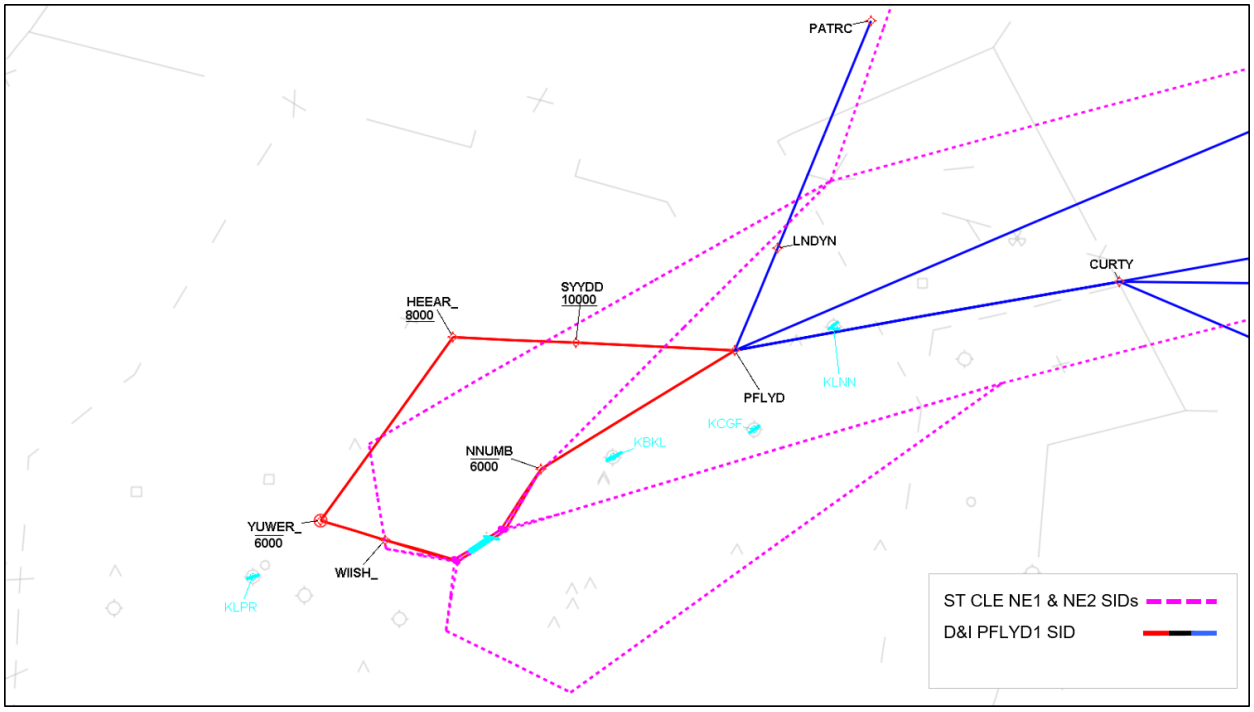

Figure 1. Final Design of the CLE PFLYD ONE SID - terminal view

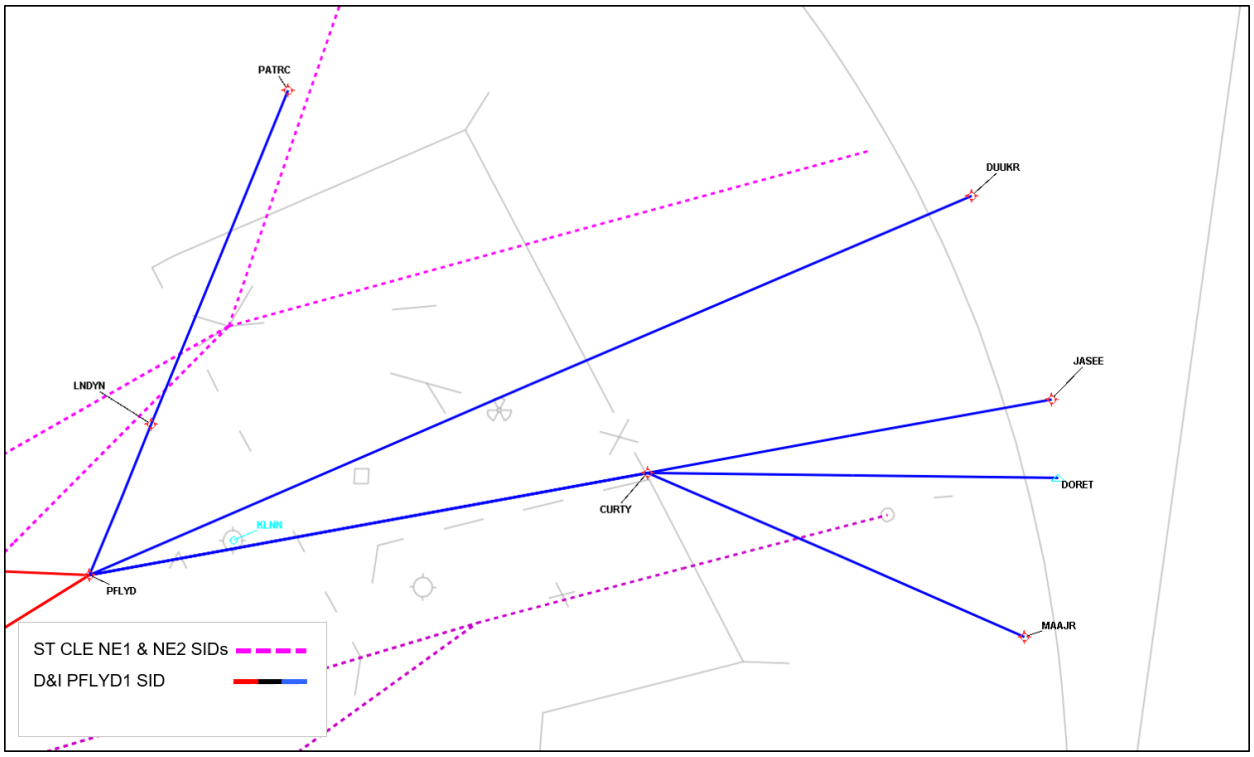

Figure 2. Final Design of the CLE PFLYD ONE SID - enroute view

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

Final Design; CLE KKIDS ONE SID

Changes from Study Team Recommendation:

- Extended the north flow runway transitions slightly east to deconflict from the CAVVS SID using ELSO
- Moved the beginning of the common route at KKIDS to deconflict with KPIT CUTTA arrival fix

This procedure was deconflicted from the following:

- CLE CAVVS ONE SID
- CLE ROKNN ONE STAR
- CLE ROLLN ONE STAR
- CLE TRYBE ONE STAR

Figures 3 and 4 below depict the CLE KKIDS ONE SID final design **(historical flight tracks not depicted)**.

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

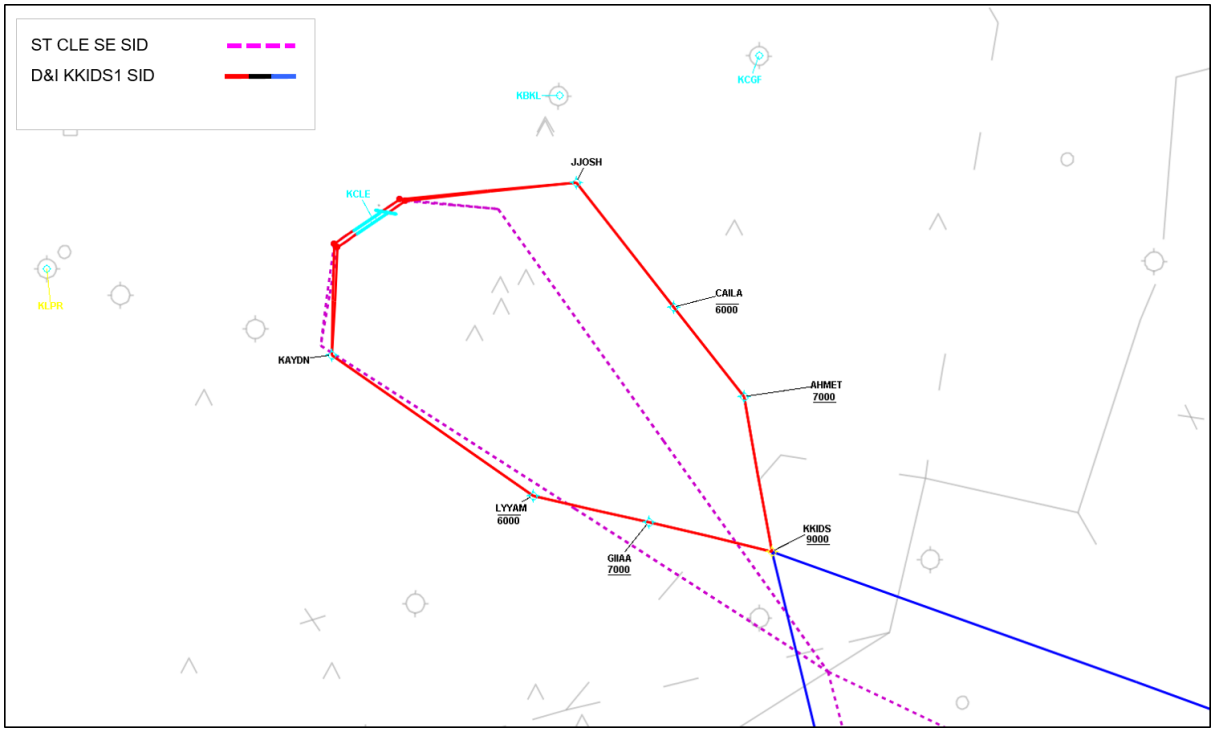

Figure 3. Final Design of the CLE KKIDS ONE SID - terminal view

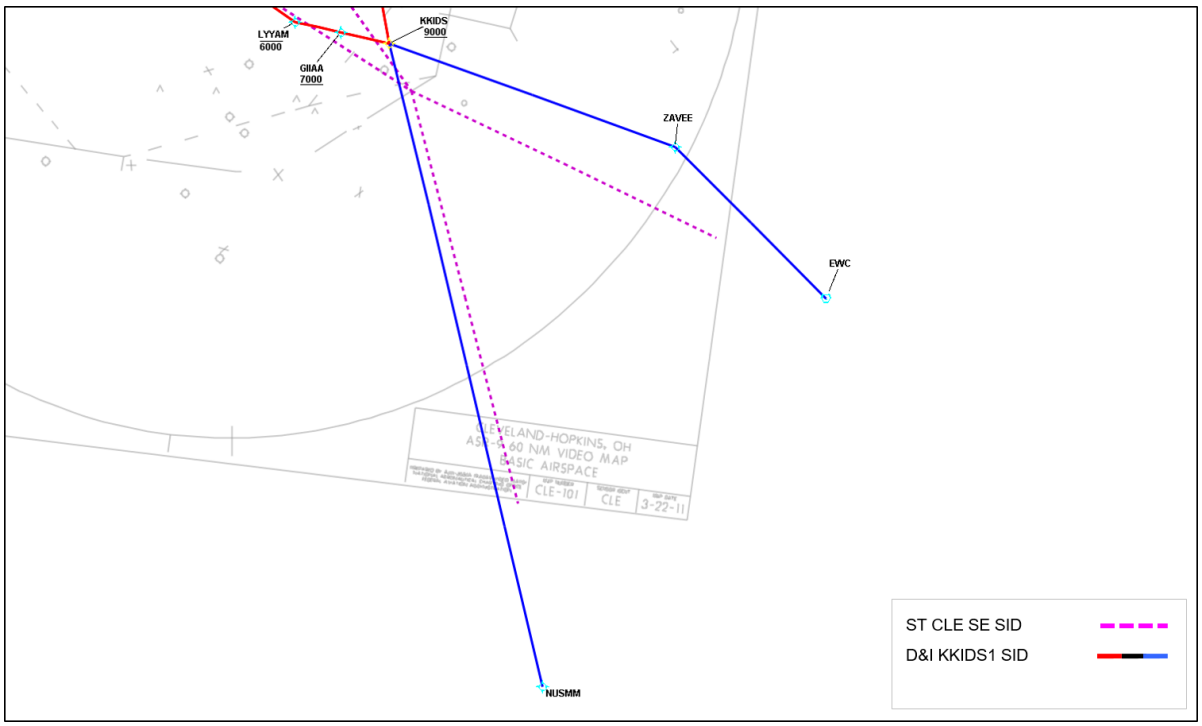

Figure 4. Final Design of the CLE KKIDS ONE SID - enroute view

<u>Final Design; CLE CAVVS ONE SID</u>

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

Changes from Study Team Recommendation:

- The end of the enroute transition was moved over APE to segregate from other enroute traffic flows

This procedure was deconflicted from the following:

- CLE ROKNN ONE STAR
- CLE ROLLN ONE STAR
- CLE TRYBE ONE STAR

Figures 5 and 6 below depict the CLE CAVVS ONE SID final design **(historical flight tracks not depicted)**.

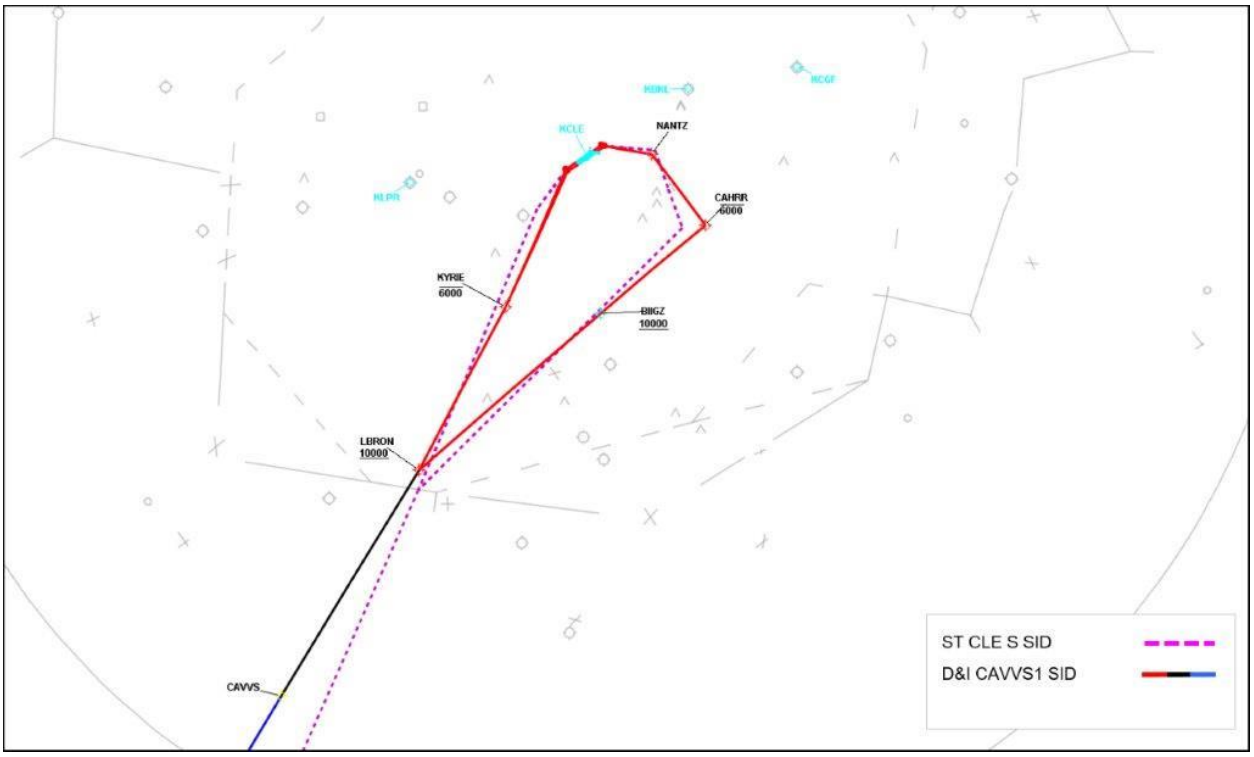

Figure 5. Final Design of the CLE CAVVS ONE SID - terminal view

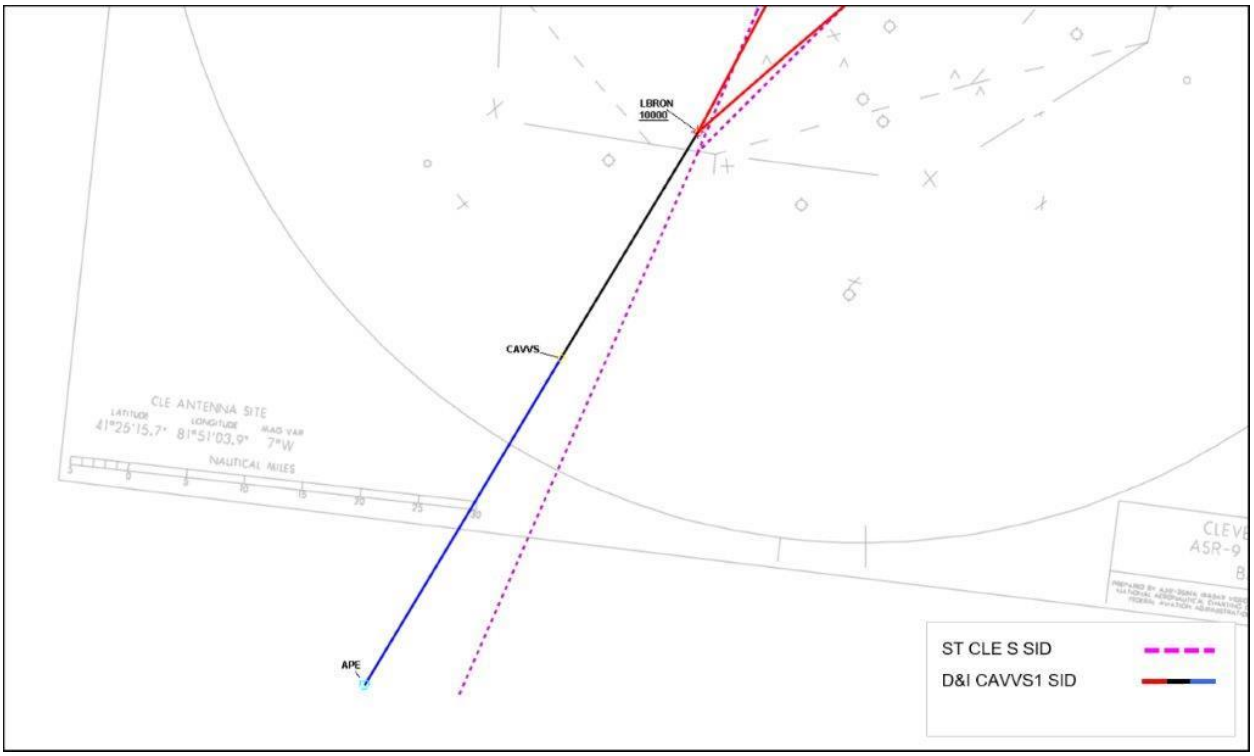

Figure 6. Final Design of the CLE CAVVS ONE SID - enroute view

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

Final Design; CLE GTLKE ONE SID

Changes from Study Team Recommendation:

- Deleted W1 option to segregate from KDTW arrivals and departures
- Repositioned route to allow for KDTW OPDs from the southeast
- Added YABRO transition for westbound overflight traffic destined for airports west of the Chicago terminal area
- BAGEL Transition: For use by aircraft landing MDW only, and ATC use as assigned
- DAIFE Transition: For use by aircraft landing ORD only, and ATC use as assigned

This procedure was deconflicted from the following:

- CLE BRWNZ ONE STAR
- CLE ROKNN ONE STAR

Figures 7 and 8 below depict the CLE GTLKE ONE SID final design **(historical flight tracks not depicted)**.

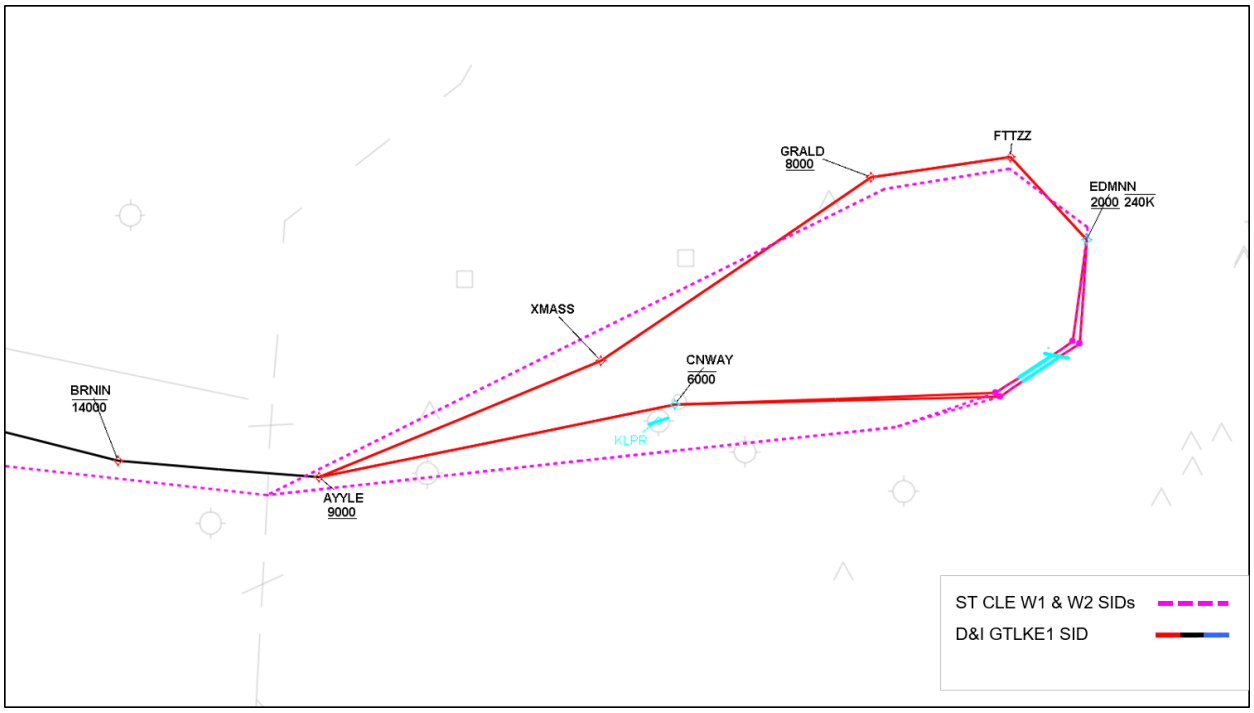

Figure 7. Final Design of the CLE GTLKE ONE SID - terminal view

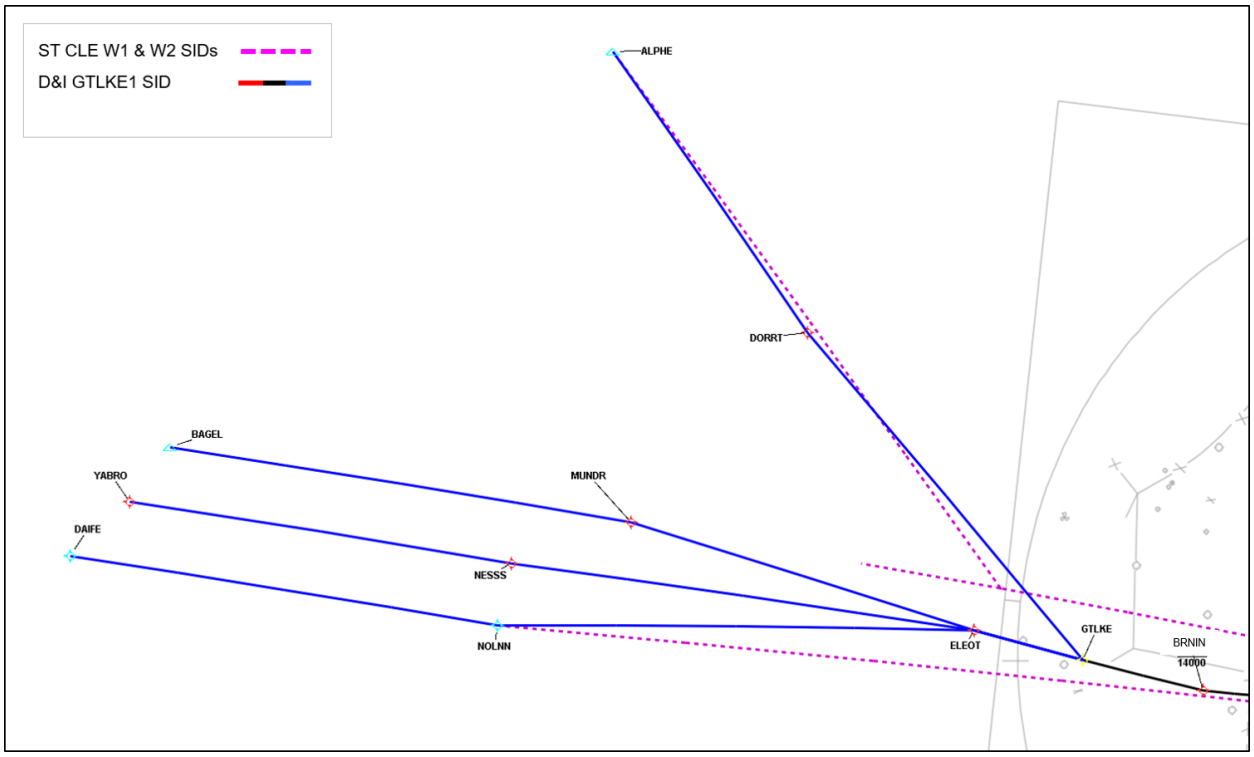

Figure 8. Final Design of the CLE GTLKE ONE SID - enroute view

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

Final Design; CLE ZAAPA ONE SID

Changes from Study Team Recommendation:

- Added DWEZL to deconflict with ROKNN STAR
- Extended routes to PUUDL, ARYTN, and SNNOH
    - PUUDL replaced ROD at the intersection of Q29 & Q65 for south and southwest departures
        - PUUDL waypoint will be added to Q29 & Q65 for south and southwest departures
    - ARYTN waypoint added to tie into Q28 for Texas area traffic
    - SNNOH waypoint used to capture westbound traffic and separate from KORD traffic
- PUUDL Transition: For use at or below FL220 only and ATC use as assigned

This procedure was deconflicted from the following:

- CLE BRWNZ ONE STAR
- CLE ROKNN ONE STAR

Figures 9 and 10 below depict the CLE ZAAPA ONE SID final design **(historical flight tracks not depicted)**.

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

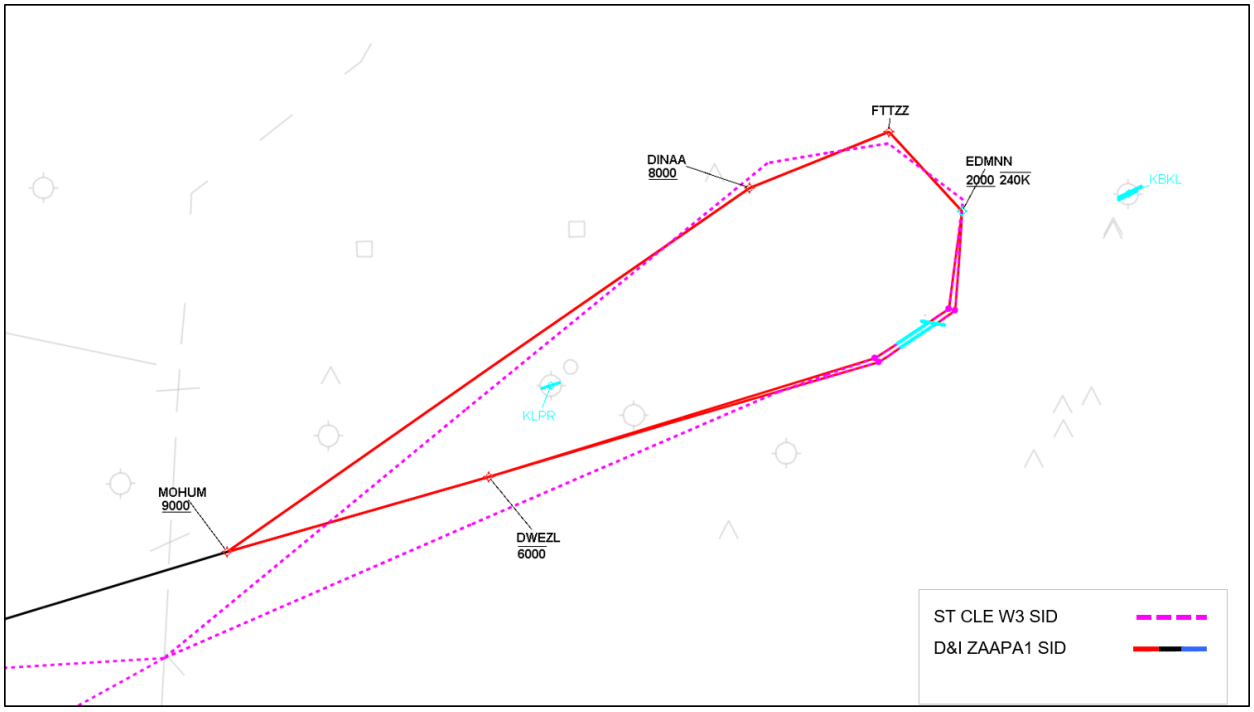

Figure 9. Final Design of the CLE ZAAPA ONE SID - terminal view

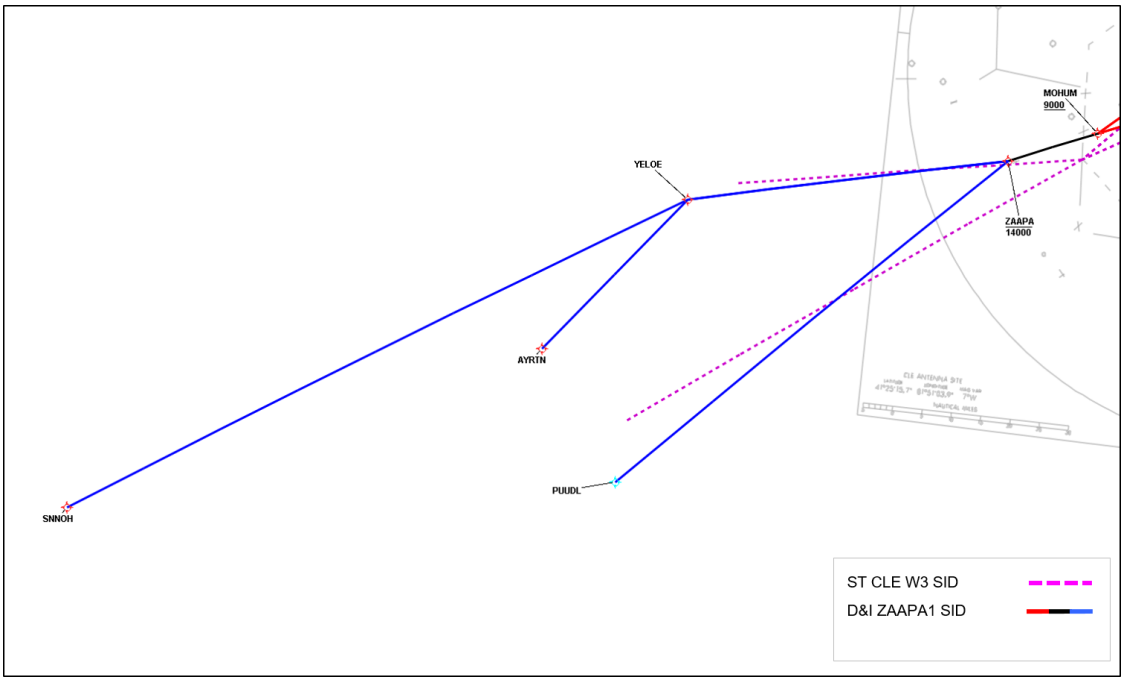

Figure 10. Final Design of the CLE ZAAPA ONE SID - enroute view

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

Figures 11 and 12 below depict a consolidated view of all CLE South and North Flow SIDs, respectively.

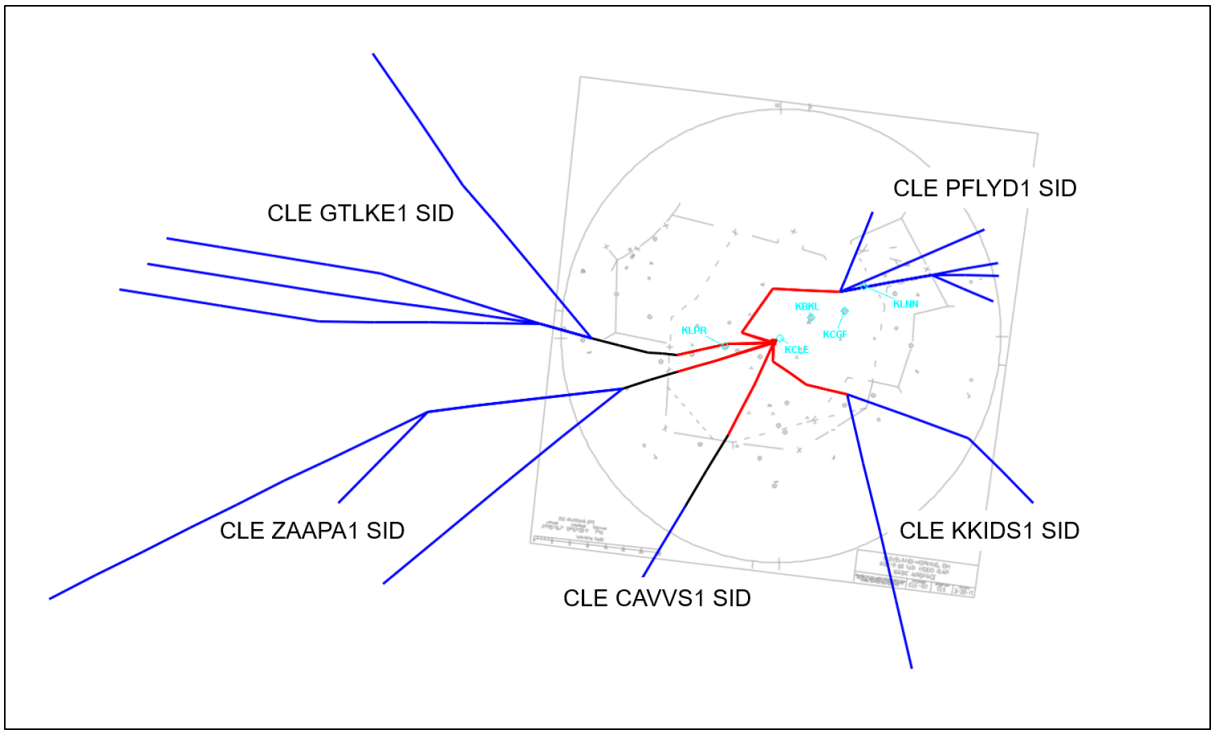

Figure 11. Consolidated view of all CLE SIDs - South Flow

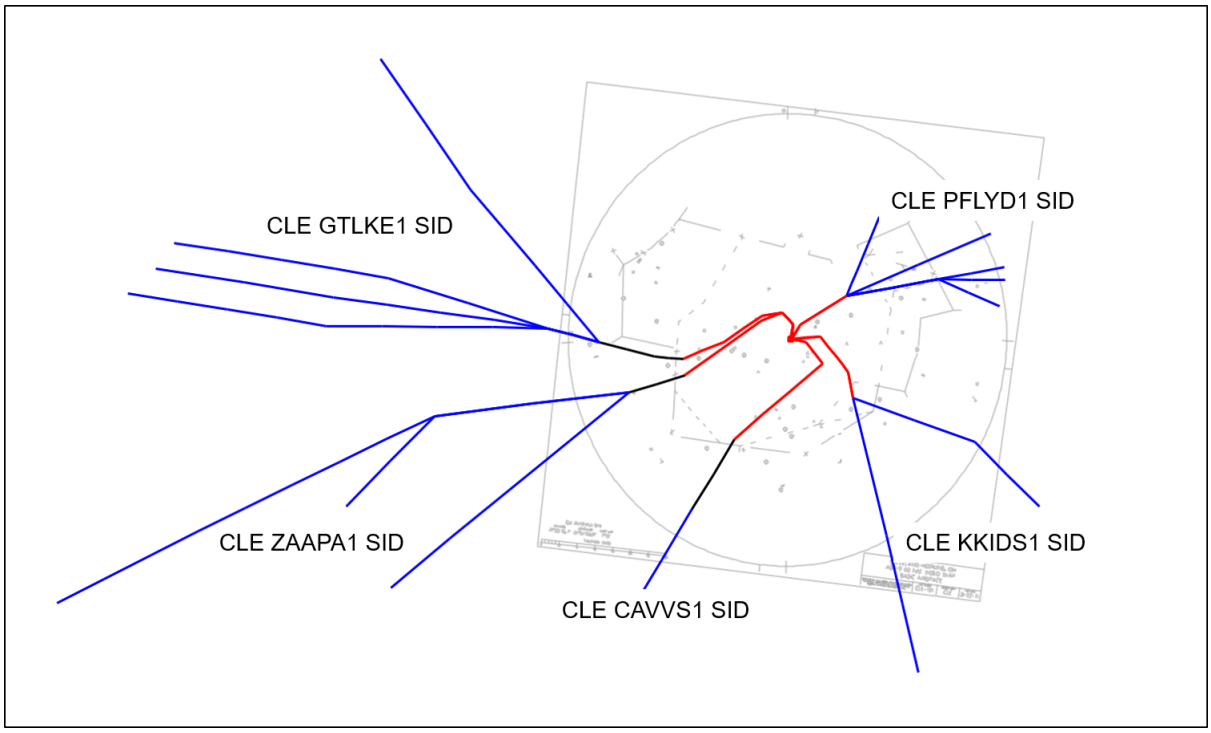

Figure 12. Consolidated view of all CLE SIDs - North Flow

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Departures (SIDs)

Additional Design Considerations

- A high-level ISIM simulation was conducted to validate these procedures in May 2015.
- Industry flight simulator testing was conducted through July 2015 to validate these procedures.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will be required.
- Terminal and enroute automation changes will be required.
- An increase in air traffic operations or changes to runway utilization is not anticipated.

Attachments

- CLE PFLYD ONE SID – RNAV TARGETS Distribution Package
- CLE KKIDS ONE SID – RNAV TARGETS Distribution Package
- CLE CAVVS ONE SID – RNAV TARGETS Distribution Package
- CLE GTLKE ONE SID – RNAV TARGETS Distribution Package
- CLE ZAAPA ONE SID – RNAV TARGETS Distribution Package

CLE-DTW Metroplex Design Package

CLE RNAV Standard Terminal Arrivals (STARs)

OAPM Design Package Change Control Sheet			
Date	**Description**	**TARGETS File Reference**	**FAA/NATCA Co-Lead Initials**
20170309	**CLE BRWNZ STAR**) Changed waypoint DOZZR to DOZRR. Purpose: DOZZR waypoint name not reserved, DOZRR was reserved.	20171107_CLE_DTW_ MASTER_FINAL.tgs	RW / MT
20170309	**CLE BRWNZ STAR**) Moved BENJO 0.355 NM north to 415308.45N/0851233.15W Purpose: To Correct the location of the waypoint in the NFDC per Instrument Flight Procedures Group Team 1. Submit corrected 8260-2 to correct position in AIRNAV2 database.	See above.	RW / MT
20170512	**CLE ROLLN STAR**) Deleted Altitude/Speed at JPLIN.) Added new waypoint GEDDY 3NM south ZID/ZOB boundary on current ground track at N40 32 11.21 W81 49 35.66) Added 170B230/280K at new waypoint GEDDY. Purpose: Restriction moved to be effective after ZOB clears flight for OPD.	See above.	RW / MT

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

CLE-DTW Metroplex Design Package

CLE RNAV Standard Terminal Arrivals (STARs)

Name of Change	Date
CLE TRYBE ONE STAR - RNAV (NE) **CLE ROLLN ONE STAR - RNAV (SE)** **CLE ROKNN ONE STAR - RNAV (SW)** **CLE BRWNZ ONE STAR - RNAV (NW)**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedure **RNAV STARs**	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☒ **Proposed Final Design (PFD)** ☐ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
4.2.1.1 CLE NE STAR **4.2.1.2 CLE SE STAR** **4.2.1.3 CLE SW STAR** **4.2.1.4 CLE NW STAR**	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
CLE Positions W, A, H **ZOB Areas 2, 7, 8** **ZAU Area East** **ZID**	**Cleveland TRACON (CLE): James Branch, Nathan Jones** **Cleveland ARTCC (ZOB): Mike Ferrell, Rick Norris** **Chicago ARTCC (ZAU): Joseph Bocik, Sam Passialis** **Indianapolis ARTCC (ZID): Steven Balkevicius, Noble Brown**
Related/Dependent Submissions	**Associated Data Files**
Dependent: Airspace Design Packages **All CLE Standard Instrument Departures** **Related: CLE East/West T Route** **All CLE Required Navigation Performance Procedures**	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose

These proposed STARs were designed to minimize level-offs and allow flexibility for multiple runway transitions. These procedures reduce controller complexity and add optimization for the user.

Use of Optimized Profile Descents (OPDs) will allow for less transmissions and verbiage between controllers and pilots, therefore reducing the possibility of hear back/read back errors. The advantage for the user is fewer level offs and a chance for significant fuel savings.

CLE-DTW Metroplex Design Package

CLE RNAV Standard Terminal Arrivals (STARs)

Study Team Issues and Solutions; CLE NE STAR

The CLE NE STAR accounts for approximately 39% of all CLE jet arrivals.

- Issues
  - There are excessive level-offs and inefficient lateral paths
  - Lack of RNAV STAR
  - Lack of vertical profile (OPD)
  - Actual flight tracks do not follow current arrival (procedure conformance)

- Solutions
  - Removed unused enroute transitions
  - Created enroute transitions that mirror current flight tracks
  - Created runway transitions for east and west flows that terminate in FM legs at 6,000 feet MSL
  - Added terminal speed constraints to manage compression
  - Created an RNAV STAR with an OPD

Study Team Issues and Solutions; CLE SE STAR

The CLE SE STAR accounts for approximately 18% of all CLE jet arrivals.

- Issues
  - There are excessive level-offs and inefficient lateral paths
  - Lack of RNAV STAR
  - Lack of vertical profile (OPD)
  - Actual flight tracks do not follow current arrival (procedure conformance)
- Solutions
  - Removed unused enroute transitions
  - Created enroute transitions that mirror current tracks
  - Created runway transitions for east and west flows that terminate in FM legs at 6,000 feet MSL
  - Added terminal speed constraints to manage compression
  - Created an RNAV STAR with an OPD

CLE-DTW Metroplex Design Package

CLE RNAV Standard Terminal Arrivals (STARs)

Study Team Issues and Solutions; CLE SW STAR

The CLE SW STAR accounts for approximately 16% of all CLE jet arrivals.

- Issues
  - There are excessive level-offs and inefficient lateral paths
  - Lack of RNAV STAR
  - Lack of vertical profile (OPD)
  - Actual flight tracks do not follow current arrival (procedure conformance)
  - ZABER arrival fix is aligned with the RWY06 final approach course
- Solutions
  - Removed unused enroute transitions
  - Created enroute transitions that mirror current flight tracks
  - Created runway transitions for east and west flows that terminate in FM legs at 6,000 feet MSL
  - Added terminal speed constraints to manage compression
  - Created an RNAV STAR with an OPD

Study Team Issues and Solutions – CLE NW STAR

The CLE NW STAR accounts for approximately 24% of all CLE jet arrivals.

- Issues
  - There are excessive level-offs and inefficient lateral paths
  - Lack of RNAV STAR
  - Lack of vertical profile (OPD)
  - Actual flight tracks do not follow current arrival (procedure conformance)
- Solutions
  - Removed unused enroute transitions
  - Created enroute transitions that mirror current flight tracks
  - Created runway transitions for east and west flows that terminate in FM legs at 6,000 feet MSL
  - Added terminal speed constraints to manage compression
  - Created an RNAV STAR with an OPD

CLE-DTW Metroplex Design Package

CLE RNAV Standard Terminal Arrivals (STARs)

Final Design (All CLE STARs)

All four CLE STARs:

- Are designed with "Optimized Profile Descents" (OPDs) intended for use by turbojet aircraft
- Are "Non-Flow Dependent" meaning they can be used in any CLE runway configuration
- Are intended for use by all aircraft; turbojets, turboprops, and props
- Are connected to the ILS, RNAV (GPS), and RNP approaches to runways 24L/R and 06L/R
- Are connected to the ILS and RNAV (GPS) approaches to runway 28 (except the ROKNN STAR)

All four CLE STARs will serve Cleveland-Hopkins International Airport (KCLE) and the following satellite airports:

- KBKL Burke Lakefront Airport
- KLNN Willoughby Lost Nation Municipal Airport
- KLPR Lorain County Regional Airport (ROKNN, ROLLN and BRWNZ STARs only)
- KCGF Cuyahoga County Airport

Cleveland Center will issue turbojets the "Descend Via" clearance and advise aircraft landing KCLE of the current flow: i.e. "Cleveland landing south" or "Cleveland landing north."

The following chart notes will be depicted on these procedures:

- Turbojet aircraft expect "Descend Via" clearance from Cleveland Center.
- Turbojet aircraft descend via Mach number until intercepting 280 knots. Maintain 280 knots until slowed by the STAR (TRYBE, ROKNN and ROLLN STARs only)
- When CLE Landing South; Fly the runway 24R transition.
- When CLE Landing North; Fly the runway 06L transition.
- Cleveland Approach Control may assign a different runway on initial contact.

CLE-DTW Metroplex Design Package

CLE RNAV Standard Terminal Arrivals (STARs)

Final Design; CLE TRYBE ONE STAR

Changes from Study Team Recommendation:

- Two enroute transitions from the southeast were combined into one transition
- Altitude restrictions were added to deconflict with New York area traffic
- RWY 24L/R transitions were moved south to shorten track miles
- Holding patterns added at TRYBE, HFNER and DECRR

The following SIDs were deconflicted from this procedure:

- CLE CAVVS ONE SID (North flow only)
- CLE KKIDS ONE SID (North flow only)

The following additional chart note will be depicted on this procedure:

- TRYBE – Vertical Navigation Planning Information; Props/Turboprops: Expect 6000 feet.

Figures 1 and 2 below depict the CLE TRYBE ONE STAR final design (historical flight tracks not depicted).

CLE-DTW Metroplex Design Package

CLE RNAV Standard Terminal Arrivals (STARs)

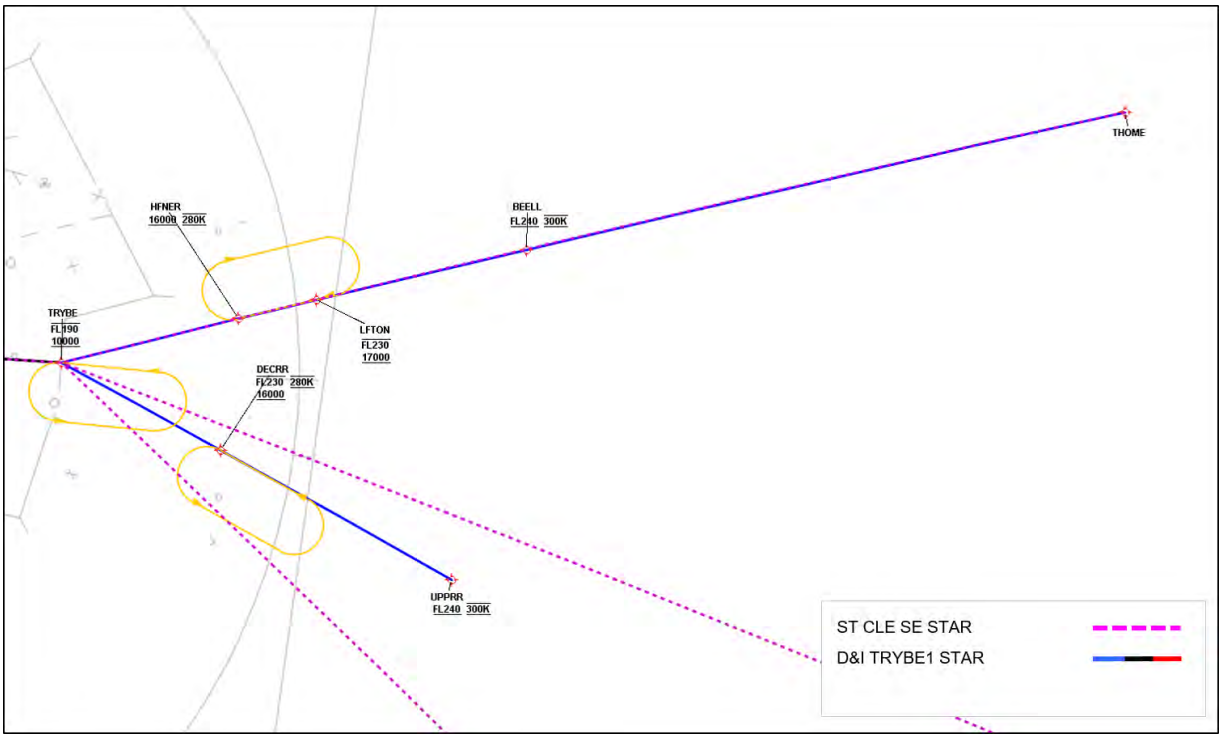

Figure 1. Final Design of the CLE TRYBE ONE STAR - enroute view

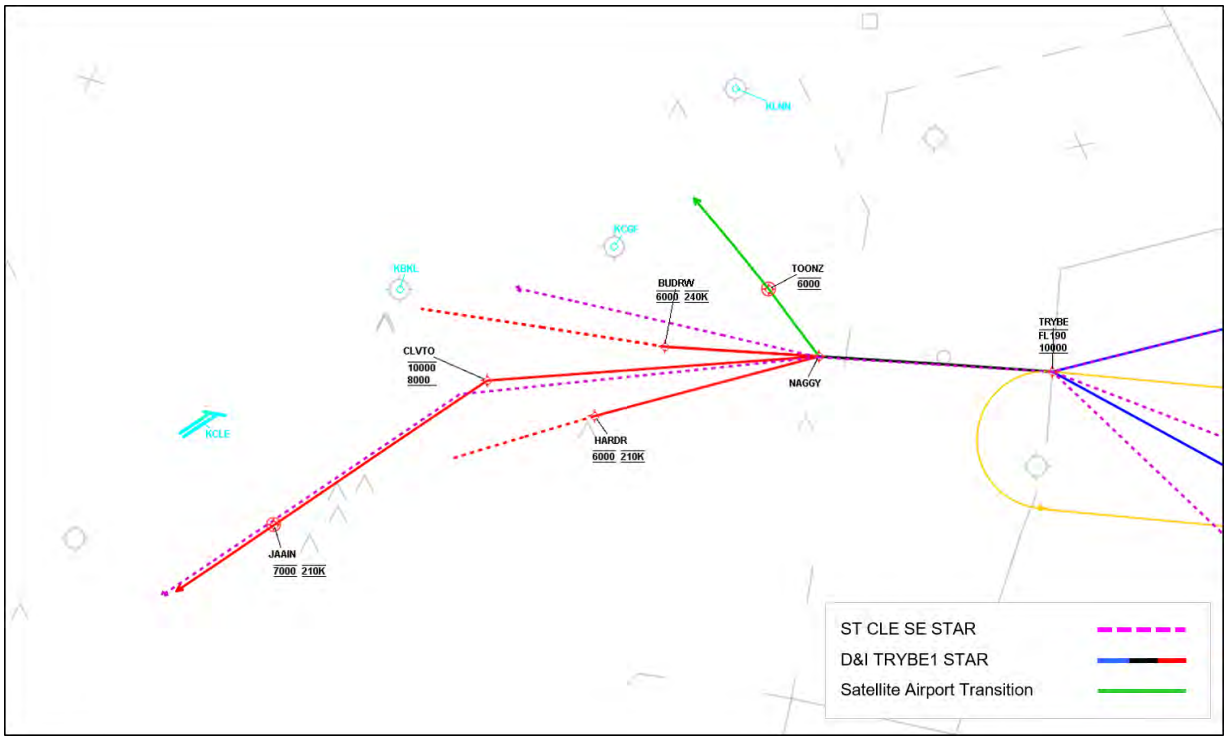

Figure 2. Final Design of the CLE TRYBE ONE STAR - terminal view

CLE-DTW Metroplex Design Package

CLE RNAV Standard Terminal Arrivals (STARs)

Final Design; CLE ROLLN ONE STAR

Changes from Study Team Recommendation:

- Entry point was moved to the west to align with downstream fix
- Primary runway arrival track route has been moved to the east to favor the south flow
- Holding pattern added at ROLLN

The following SIDs were deconflicted from this procedure:

- CLE CAVVS ONE SID (North flow only)
- CLE KKIDS ONE SID (South flow only)

The following additional chart notes will be depicted on this procedure:

- ROLLN – Vertical Navigation Planning Information; Props/Turboprops: Expect 9000 feet.

Figures 3 and 4 below depict the CLE ROLLN ONE STAR final design (historical flight tracks not depicted).

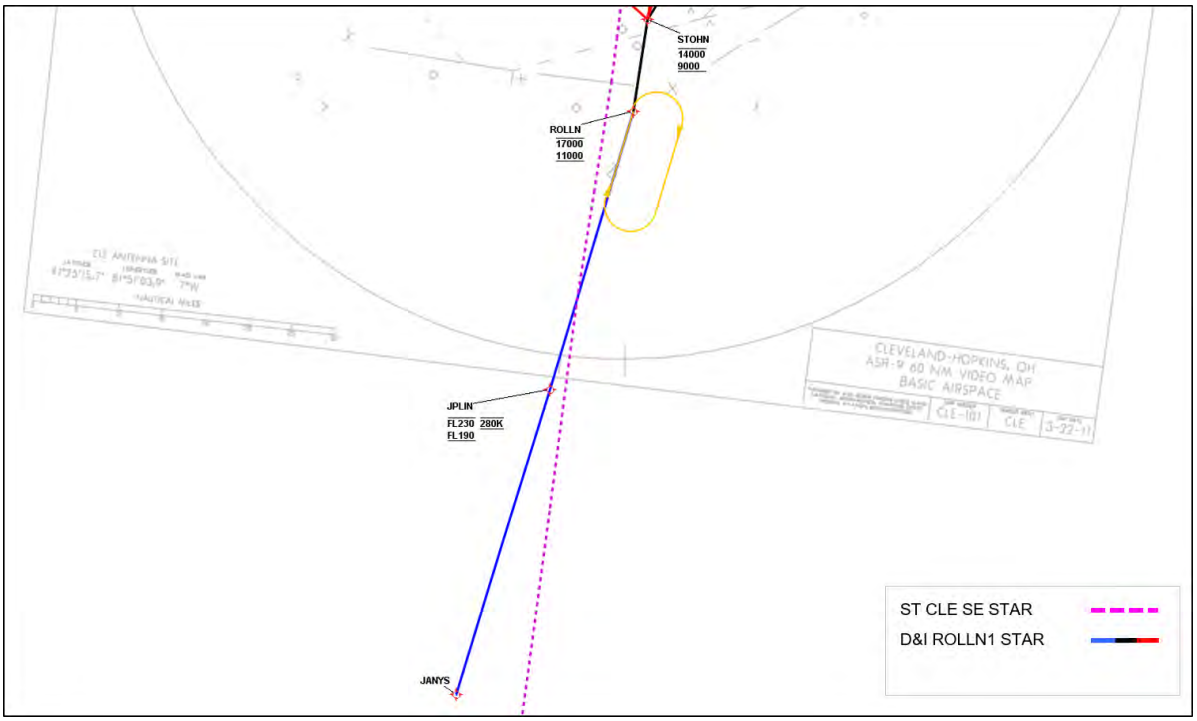

Figure 3. Final Design of the CLE ROLLN ONE STAR - enroute view

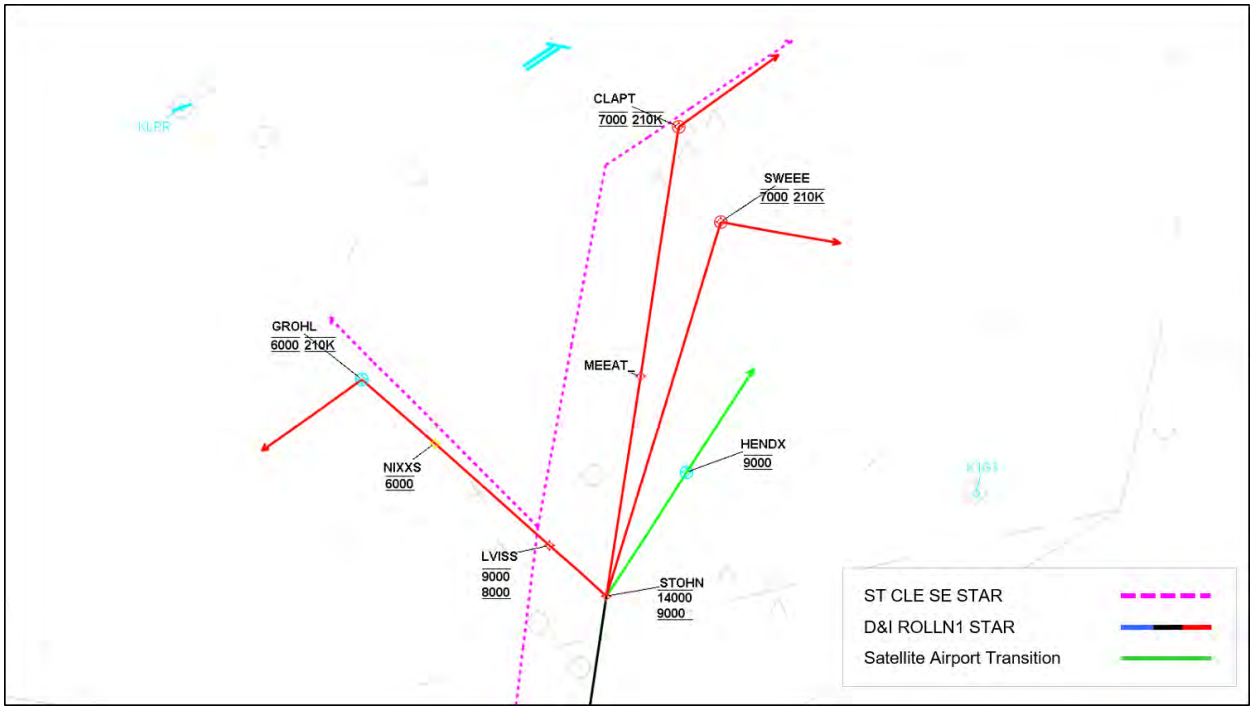

Figure 4. Final Design of the CLE ROLLN ONE STAR – terminal view

CLE-DTW Metroplex Design Package

CLE RNAV Standard Terminal Arrivals (STARs)

Final Design; CLE ROKNN ONE STAR

Changes from Study Team Recommendation:

- Added fix DEVOH to keep aircraft within CLE approach airspace
- Holding pattern added at ROKNN

The following SIDs were deconflicted from this procedure:

- CLE GTLKE ONE SID (South flow only)
- CLE ZAAPA ONE SID
- CLE PFLYD ONE SID (South flow only)
- CLE CAVVS ONE SID
- CLE KKIDS ONE SID (South flow only)

The following additional chart note will be depicted on this procedure:

- ROKNN – Vertical Navigation Planning Information; Props/Turboprops: Expect 7000 feet.

- Figures 5 and 6 below depict the CLE ROKNN ONE STAR final design (historical flight tracks not depicted).

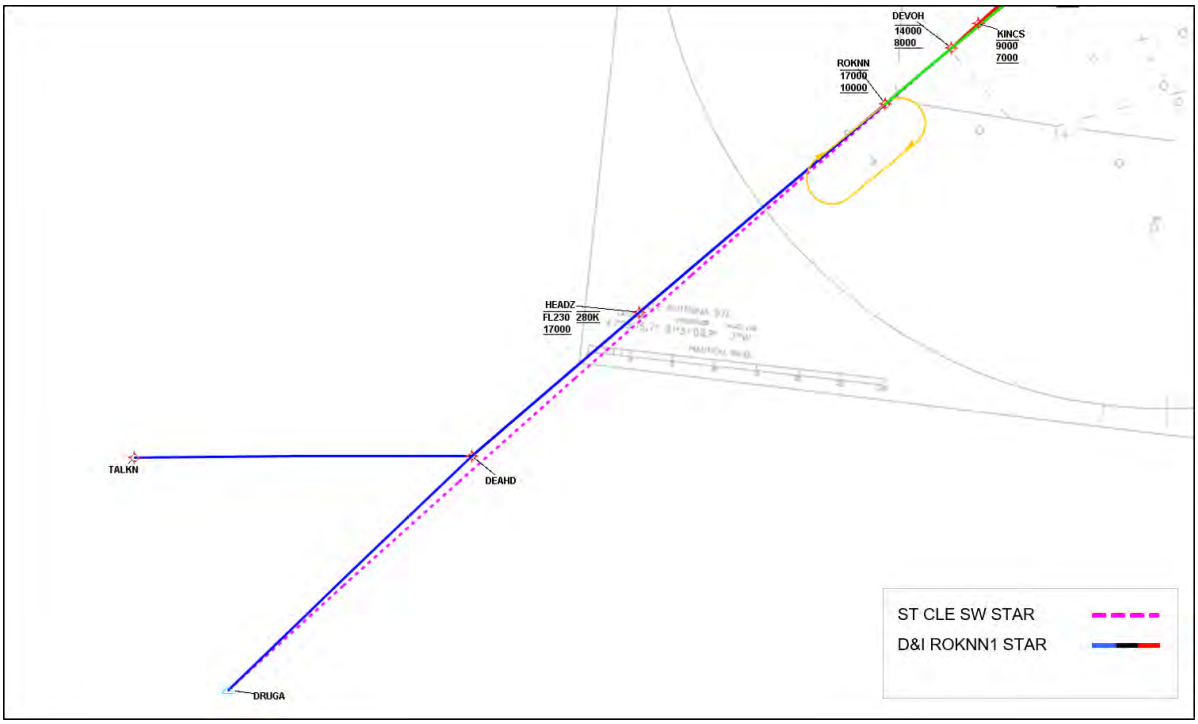

Figure 5. Final Design of the CLE ROKNN ONE STAR - enroute view

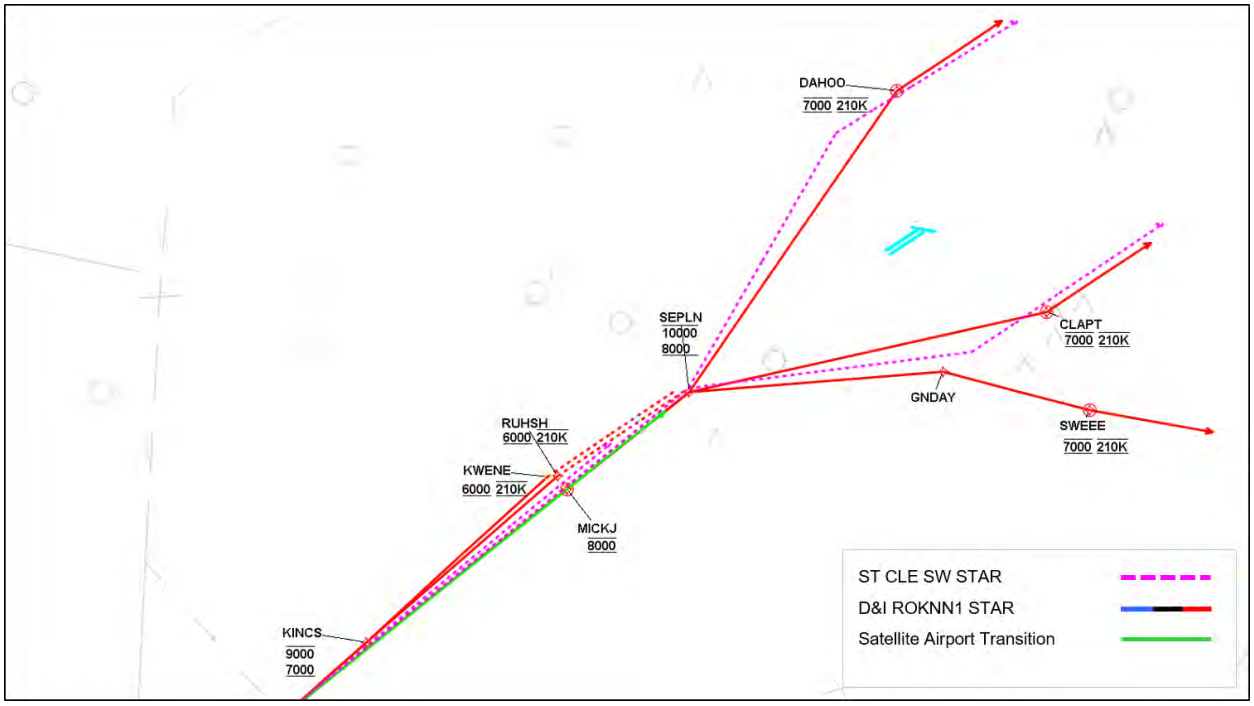

Figure 6. Final Design of the CLE ROKNN ONE STAR – terminal view

CLE-DTW Metroplex Design Package

CLE RNAV Standard Terminal Arrivals (STARs)

Final Design; CLE BRWNZ ONE STAR

Changes from Study Team Recommendation:

- Route moved south and closer to current HIMEZ route reducing track miles
- Merge point of enroute transitions (FRYYE) moved east and south to reduce track miles for primary transitions (ZIINE and LOGGR)
- Runway transitions track towards a base-leg entry at JIIMM and DEEKN (vs. downwind) to reduce track miles
- Added transitions for CLE Runways 10 & 28, satellite airports, and CAK
- Replaced VOR entry points with waypoints
- Added holding patterns at BRWNZ, FRYYE and DETMR

This procedure was deconflicted from the following:

- CLE GTLKE ONE SID (North flow only)
- CLE ZAAPA ONE SID (South flow only)
- CLE PFLYD ONE SID (South flow only)
- DTW LIDDS SID

The following additional chart notes will be depicted on this procedure:

- BRWNZ – Vertical Navigation Planning Information; Props/Turboprops: Expect 9000 feet.

- OLYEE transition: (Designed for low altitude traffic.) ATC use as assigned only.

- DOZZR transition: ATC use as assigned only.

Figures 7 and 8 below depict the CLE BRWNZ ONE STAR final design (historical flight tracks not depicted).

CLE-DTW Metroplex Design Package

CLE RNAV Standard Terminal Arrivals (STARs)

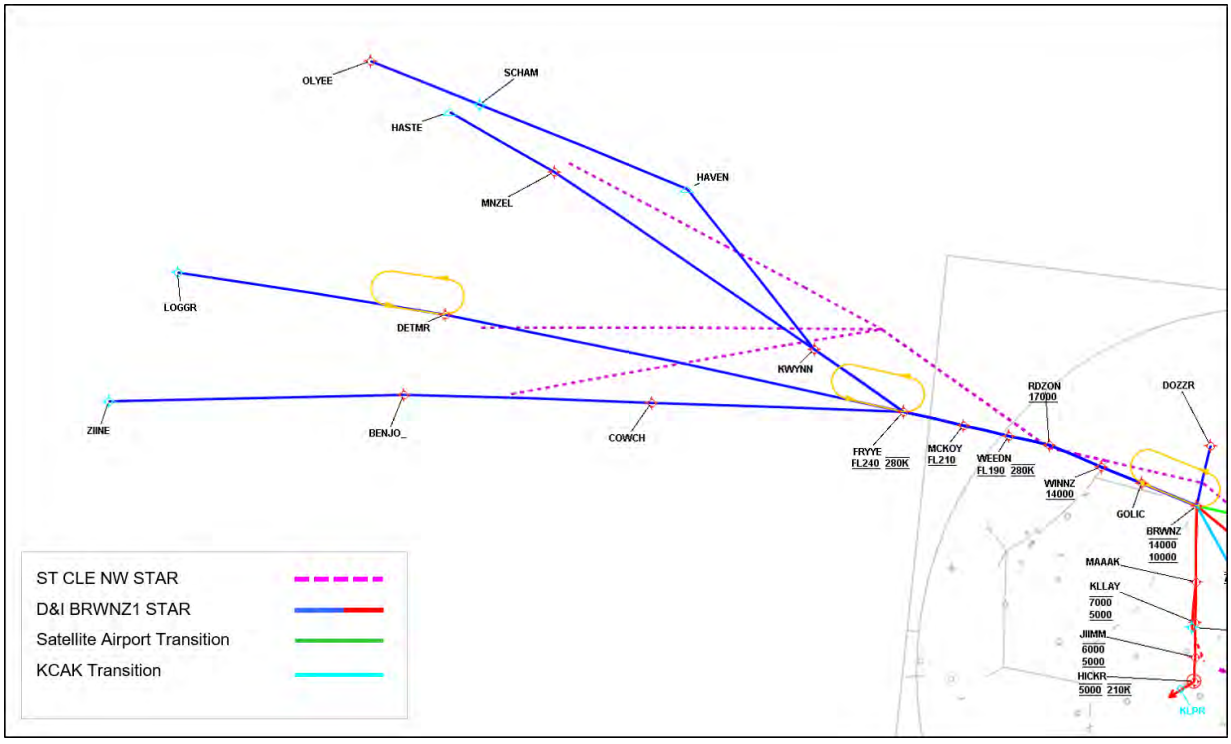

Figure 7. Final Design of the CLE BRWNZ ONE STAR - enroute view

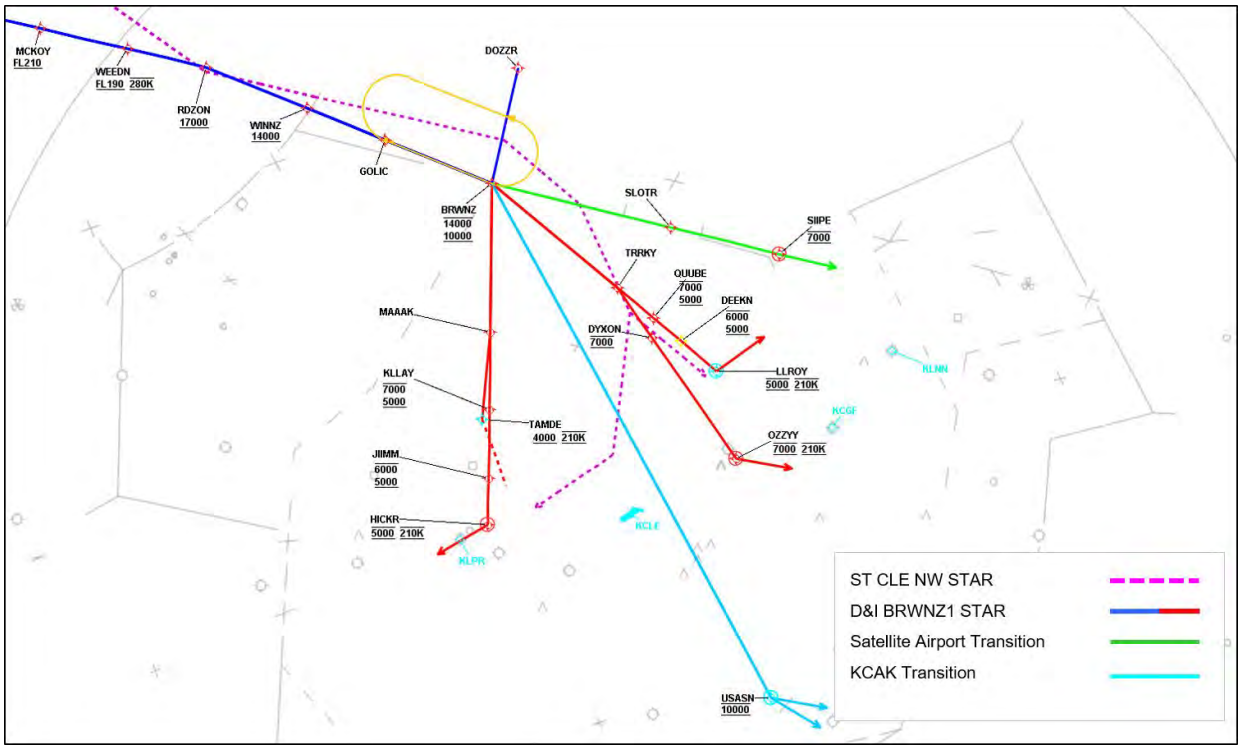

Figure 8. Final Design of the CLE BRWNZ ONE STAR - terminal view

CLE-DTW Metroplex Design Package

CLE RNAV Standard Terminal Arrivals (STARs)

Figures 9 and 10 below depict a consolidated view of all CLE South and North Flow STARs, respectively.

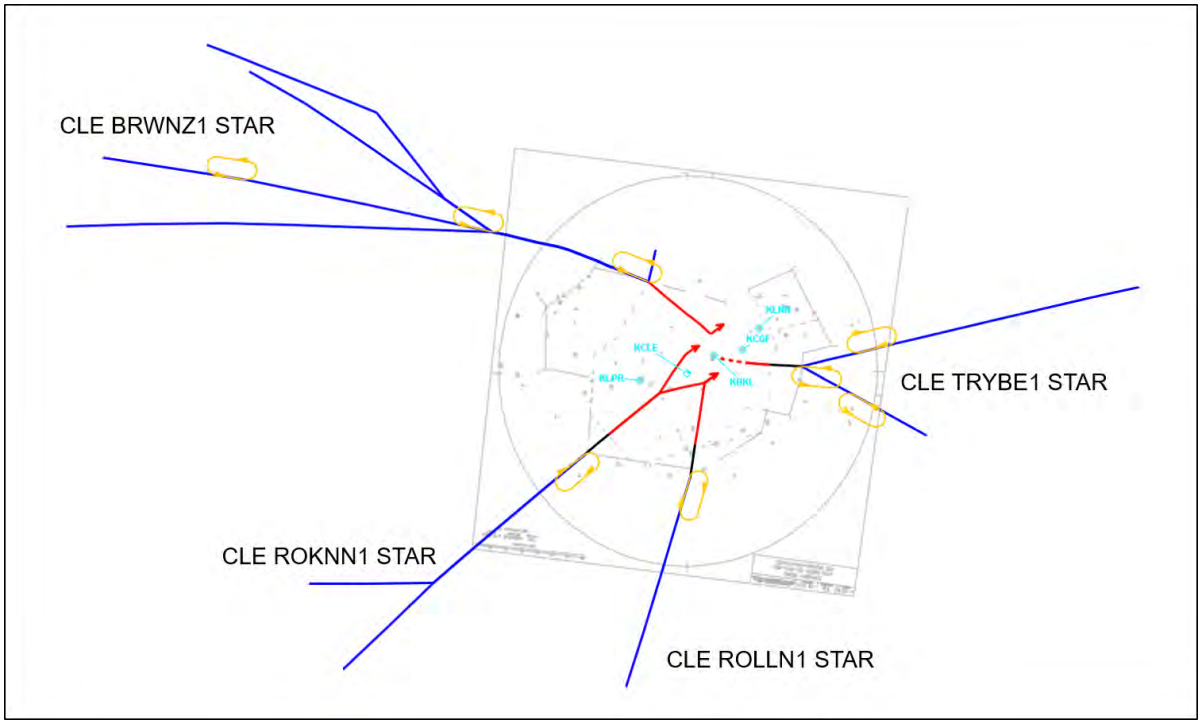

Figure 9. Consolidated view of all CLE STARs - South Flow

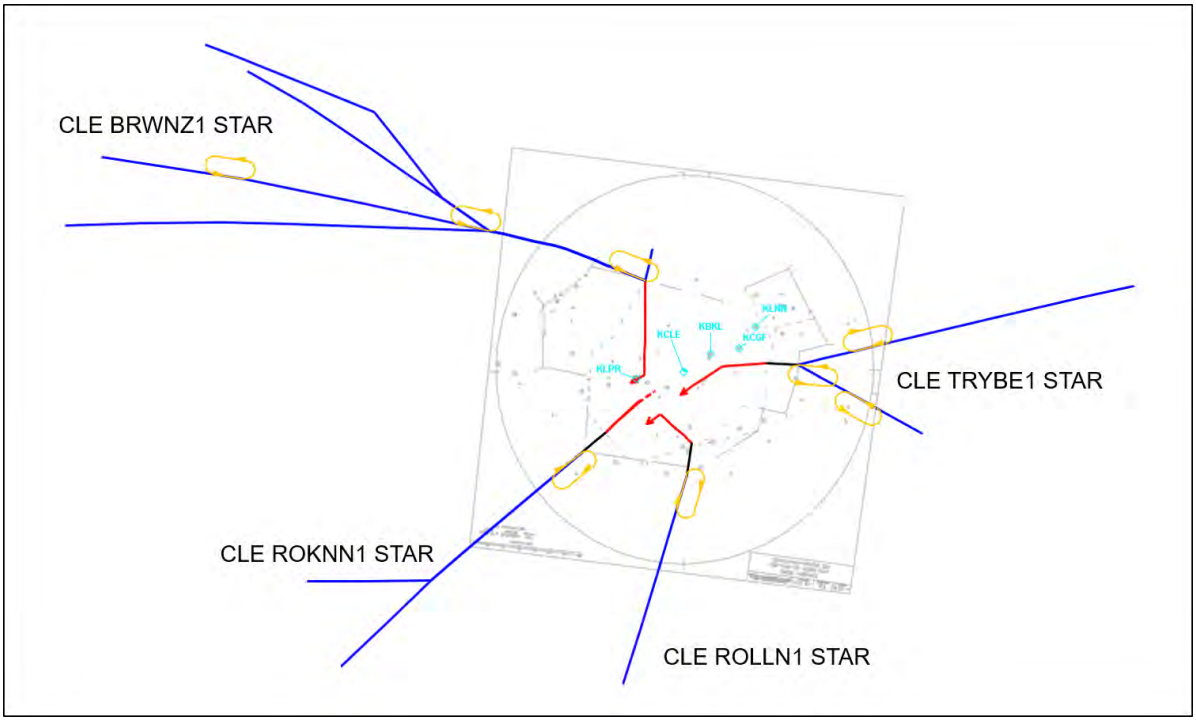

Figure 10. Consolidated view of all CLE STARs - North Flow

CLE-DTW Metroplex Design Package

CLE RNAV Standard Terminal Arrivals (STARs)

Additional Design Considerations

- A high-level ISIM simulation was conducted to validate these procedures in May 2015.
- Industry flight simulator testing was conducted through July 2015 to validate these procedures.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will be required.
- Terminal and enroute automation changes will be required.
- An increase in air traffic operations or changes to runway utilization is not anticipated.

Attachments

- CLE TRYBE ONE STAR RNAV TARGETS Distribution Package
- CLE ROLLN ONE STAR RNAV TARGETS Distribution Package
- CLE ROKNN ONE STAR RNAV TARGETS Distribution Package
- CLE BRWNZ ONE STAR RNAV TARGETS Distribution Package

CLE-DTW Metroplex Design Package

CLE RNAV Standard Instrument Approach Procedures (SIAPs)

OAPM Design Package Change Control Sheet			
Date	**Description**	**TARGETS File Reference**	**FAA/NATCA Co-Lead Initials**
20170309	**CLE RNAV (RNP) Z, RNAV (GPS) Y, and ILS RWY 06L**) Changed waypoint BOWIE to BOEEE. Purpose: BOWIE waypoint name not reserved. BOEEE is reserved.	20171107_CLE_DTW_ MASTER_FINAL.tgs	RW / MT

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

CLE-DTW Metroplex Design Package

CLE Standard Instrument Approach Procedures (SIAPs)

Name of Change	Date
CLE ILS Runway 24R CLE RNAV (GPS) Y Runway 24R CLE RNAV (RNP) Z Runway 24R CLE ILS Runway 24L CLE RNAV (GPS) Y Runway 24L CLE RNAV (RNP) Z Runway 24L CLE ILS Runway 06L CLE RNAV (GPS) Y Runway 06L CLE RNAV (RNP) Z Runway 06L CLE ILS Runway 06R CLE RNAV (GPS) Y Runway 06R CLE RNAV (RNP) Z Runway 06R CLE ILS Runway 28 CLE RNAV (GPS) Runway 28	03 February 2017
Change Classification	**Current Phase of Design**
Terminal Procedures, Standard Instrument Approach Procedures (SIAPs)	☐ Preliminary Design (PD) ☐ Operational Design (OD) ☐ Operational Design Complete (ODC) ☒ Proposed Final Design (PFD) ☐ Final Design (FD)
OAPM Study Team Reference(s)	**Implementation Date**
4.1 Design Concepts	May 24, 2018
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
CLE TRACON	Cleveland TRACON (CLE): James Branch and Nathan Jones
Related/Dependent Submissions	**Associated Data Files**
Related: All CLE STARs CLE ATCT/TRACON Airspace Design Packages	20170203_CLE_DTW_MASTER_FINAL.tgs

CLE-DTW Metroplex Design Package

CLE Standard Instrument Approach Procedures (SIAPs)

Purpose

Required Navigation Performance Authorization Required (RNAV (RNP)) approaches will reduce pilot/controller communications and cockpit workload. Connecting the runway transitions on the Standard Terminal Arrivals (STARs) and the approach transitions will provide for an efficient transition from the Optimized Profile Descent (OPD) on the arrival phase to the approach phase to landing.

Study Team Issues and Solutions

There are no existing RNAV (RNP) approaches at CLE. The Study Team did not recommend specific designs or specific runways for approaches. The Study Team Final Report stated in Section 4.1, Design Concepts, “The primary goals of the Cleveland/Detroit MST were to use RNAV everywhere and RNP where beneficial.”

CLE-DTW Metroplex Design Package

CLE Standard Instrument Approach Procedures (SIAPs)

Final Design

The Design Team and the lead industry carrier determined it to be beneficial to develop RNAV (RNP) Z approaches to the primary south/north arrival runways. The following procedures were developed:

- CLE RNAV (RNP) Z Runway 24R
- CLE RNAV (RNP) Z Runway 24L
- CLE RNAV (RNP) Z Runway 06L
- CLE RNAV (RNP) Z Runway 06R

The following procedures were optimized to align them with the proposed RNAV (RNP) Z approaches with respect to final and intermediate segments, procedure ground track, missed approach, altitudes, fix/locations/names, glidepath angles (GPAs), and threshold crossing heights (TCHs) in accordance with FAAO 8260.19F: Section 4-7: RNAV DEVELOPMENT, Para 4-7-2b.
Tables 1 and 2 reflect the procedures to be amended in a south and north flow, respectively; Table 3 reflects the procedures to be amended for Runway 28.

Table 1. South Flow Procedures

CLE ILS RWY 24R - all categories
CLE RNAV (GPS) RWY 24R (rename to Y)
CLE ILS RWY 24L- all categories
CLE RNAV (GPS) RWY 24L (rename to Y)

Table 2. North Flow Procedures

CLE ILS RWY 06L - all categories
CLE RNAV (GPS) RWY 06L (rename to Y)
CLE ILS RWY 06R - all categories
CLE RNAV (GPS) RWY 06R (rename to Y)

Table 3. Runway 28 Procedures

CLE ILS RWY 28 - all categories
CLE RNAV (GPS) RWY 28

The RNAV (RNP) Z approaches were connected to each of the STARs on a base leg or downwind, as appropriate, with the common waypoint having the same altitude and numerical airspeed value. Speed restrictions on the IAPs are maximum speeds as required by the Director, Air Traffic Procedures, AJV-8.

Table 4 indicates the common waypoint on each of the STARs and the approaches.

Table 4. Common Waypoints on STARS and Approaches

STAR	24R	24L	06L	06R	28
CLE BRWNZ ONE STAR	LLROY	LLROY	HICKR	HICKR	OZZYY
CLE ROKNN ONE STAR	DAHOO[1]	CLAPT[1]	KWENE	RUHSH	N/A
CLE ROLLN ONE STAR	CLAPT[1]	CLAPT[1]	GROHL	GROHL	SWEEE
CLE TRYBE ONE STAR	BUDRW	BUDRW	JAAIN[1]	JAAIN[1]	HARDR

[1] Common waypoint on STAR and RNP AR approach only.

CLE-DTW Metroplex Design Package

CLE Standard Instrument Approach Procedures (SIAPs)

Figures 1 and 2 depict the final designs of the three Runway 24R procedures:

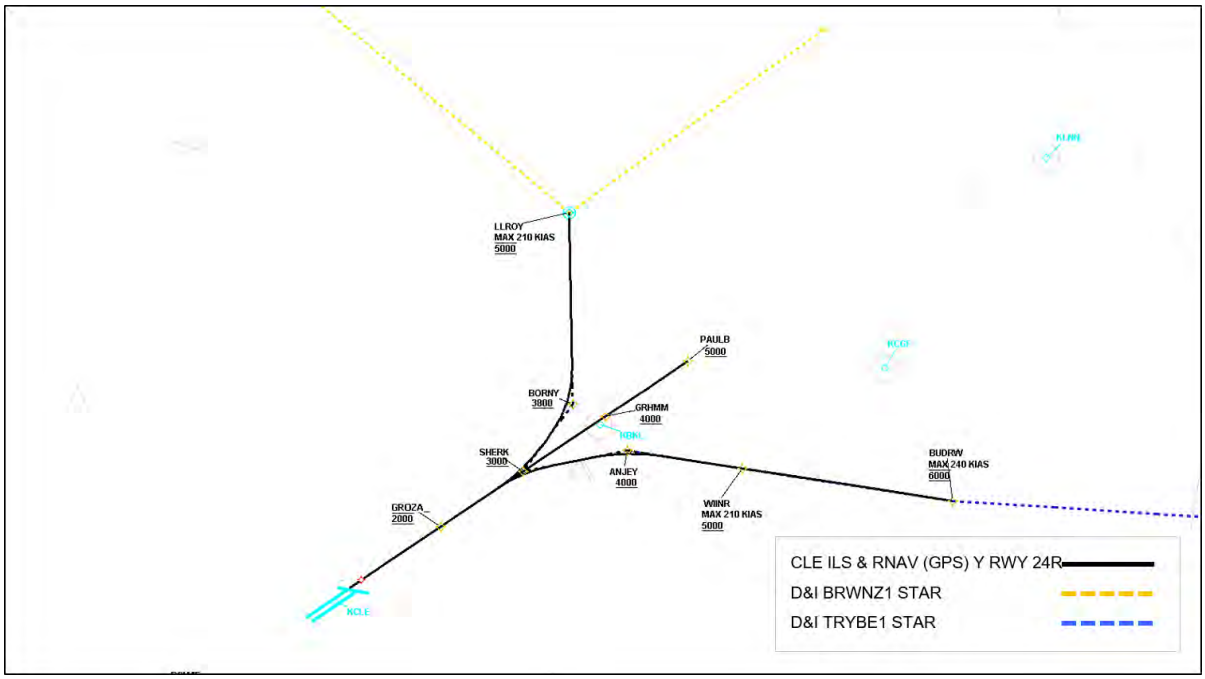

Figure 1. Final Design of the CLE ILS and RNAV (GPS) Y Runway 24R approaches

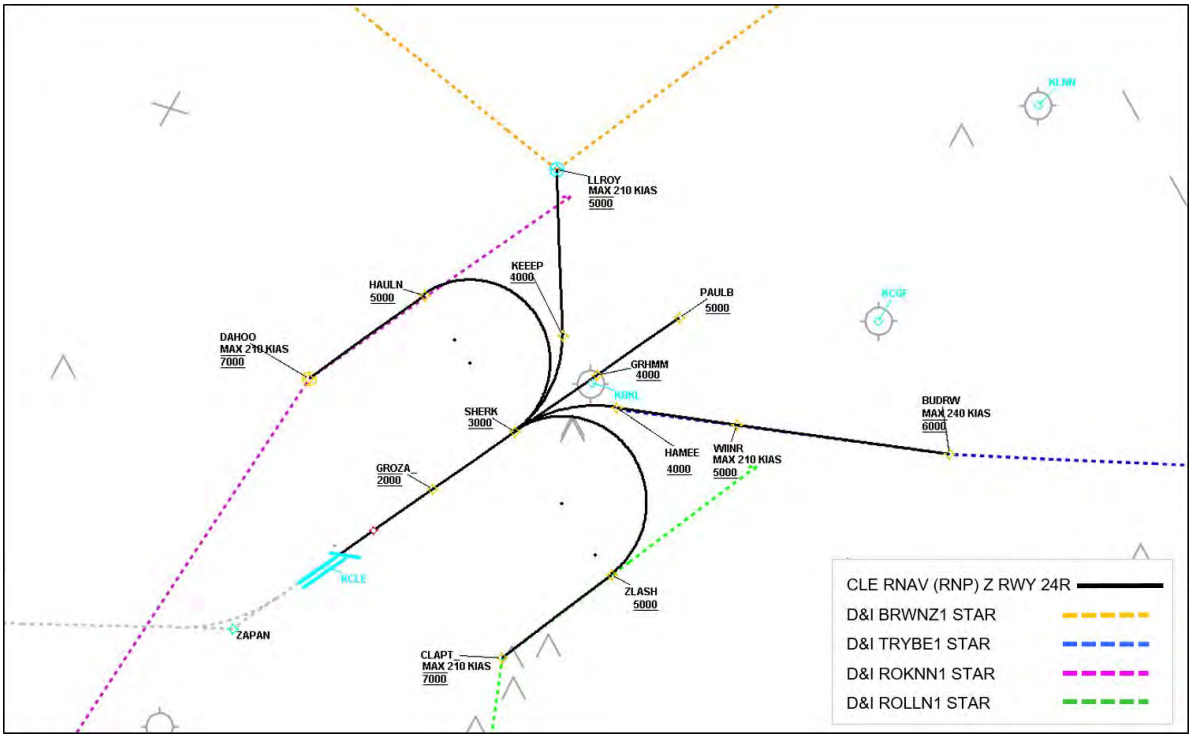

Figure 2. Final Design of the CLE RNAV (RNP) Z Runway 24R approach

Figures 3 and 4 depict the final designs of the three Runway 24L procedures:

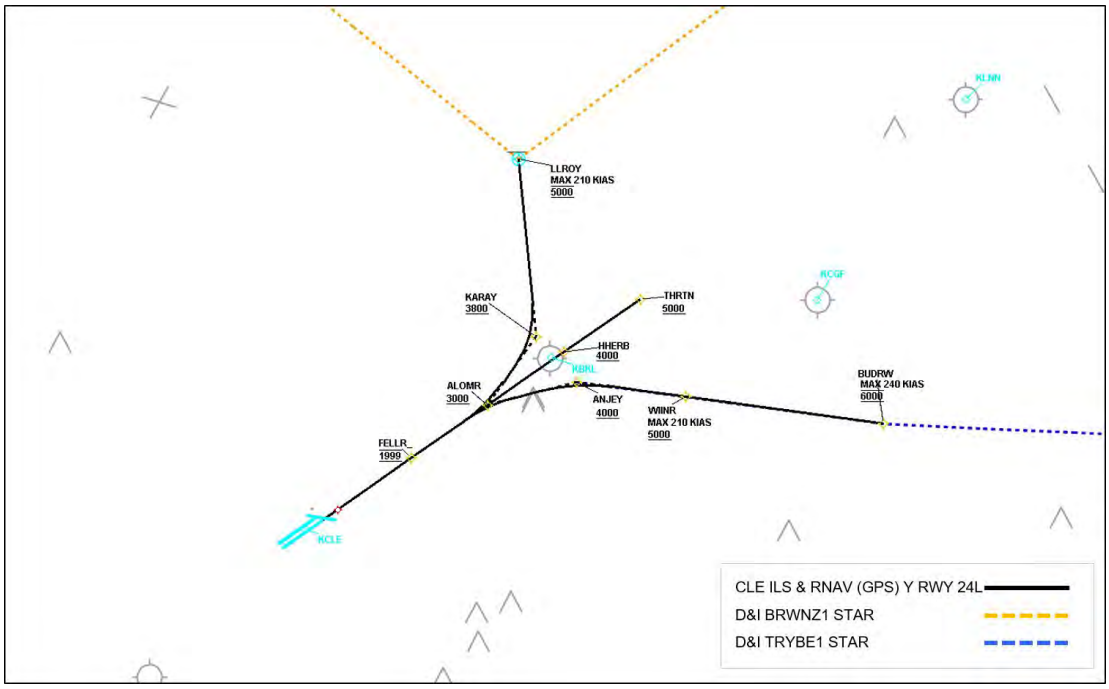

Figure 3. Final Design of the CLE ILS and RNAV (GPS) Y Runway 24L approaches

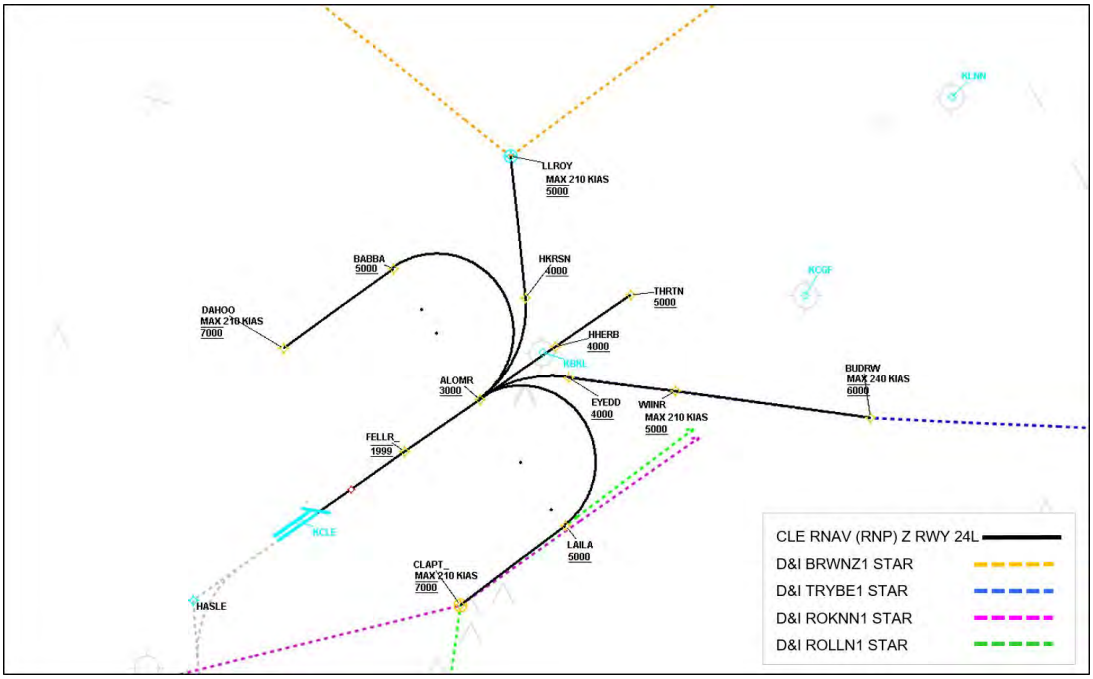

Figure 4. Final Design of the CLE RNAV (RNP) Z Runway 24L approach

CLE-DTW Metroplex Design Package

CLE Standard Instrument Approach Procedures (SIAPs)

Figures 5 and 6 depict the final designs of the three Runway 6L procedures:

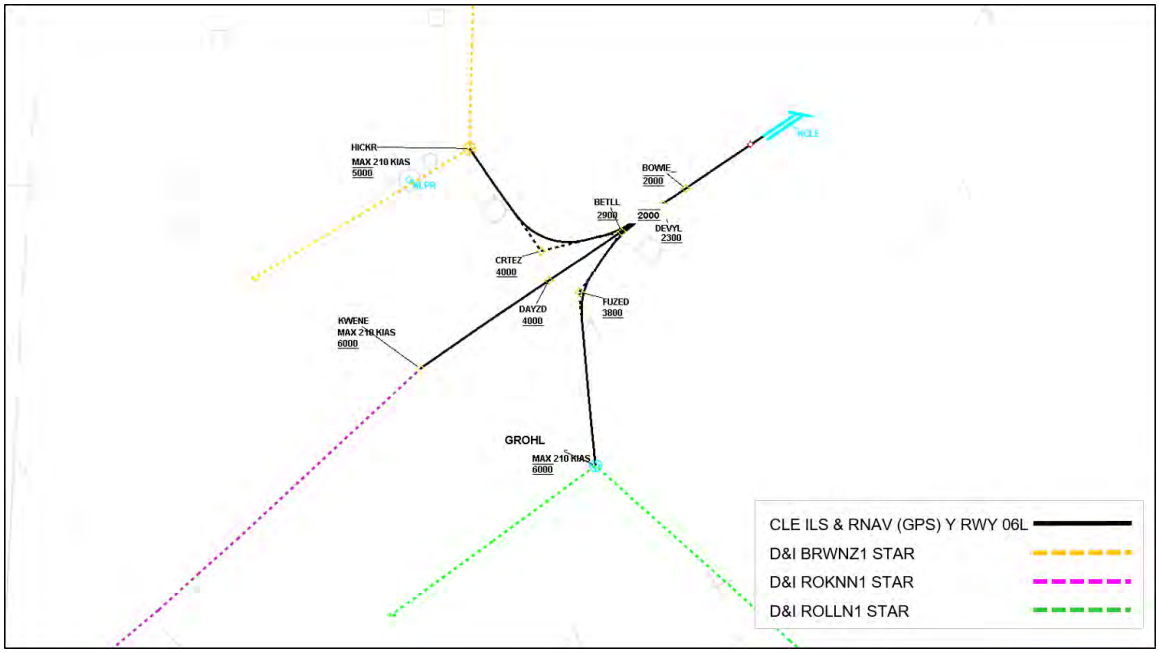

Figure 5. Final Design of the CLE ILS and RNAV (GPS) Y Runway 6L approaches

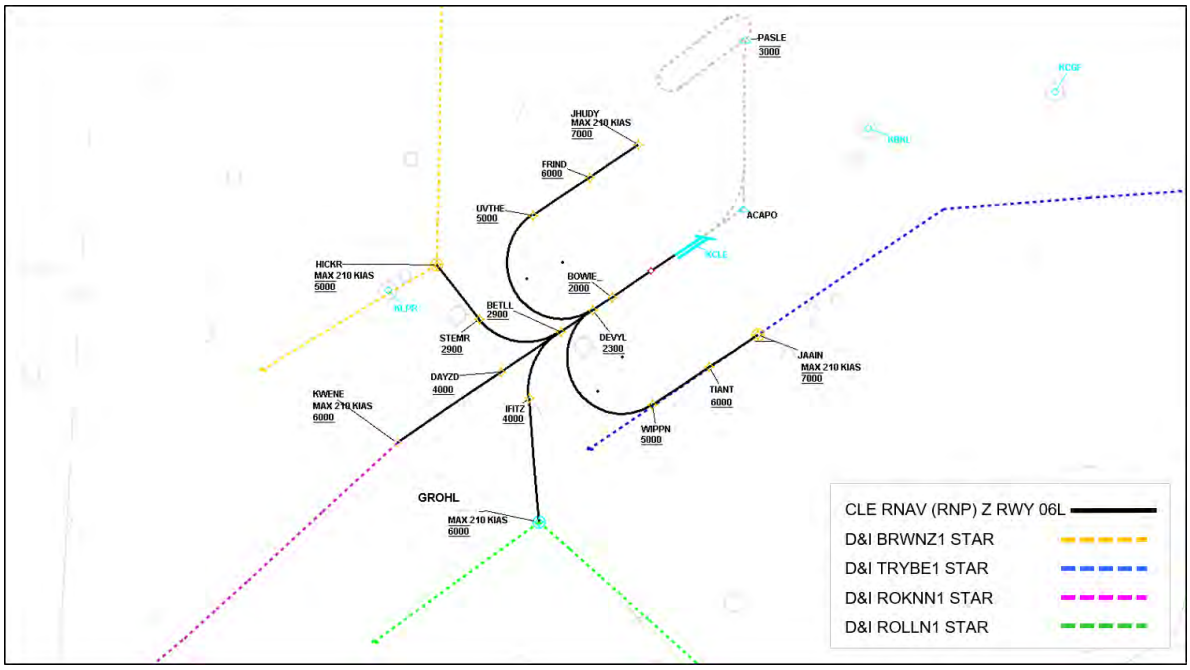

Figure 6. Final Design of the CLE RNAV (RNP) Z Runway 6L approach

CLE-DTW Metroplex Design Package

CLE Standard Instrument Approach Procedures (SIAPs)

Figures 7 and 8 depict the final designs of the three Runway 6R procedures:

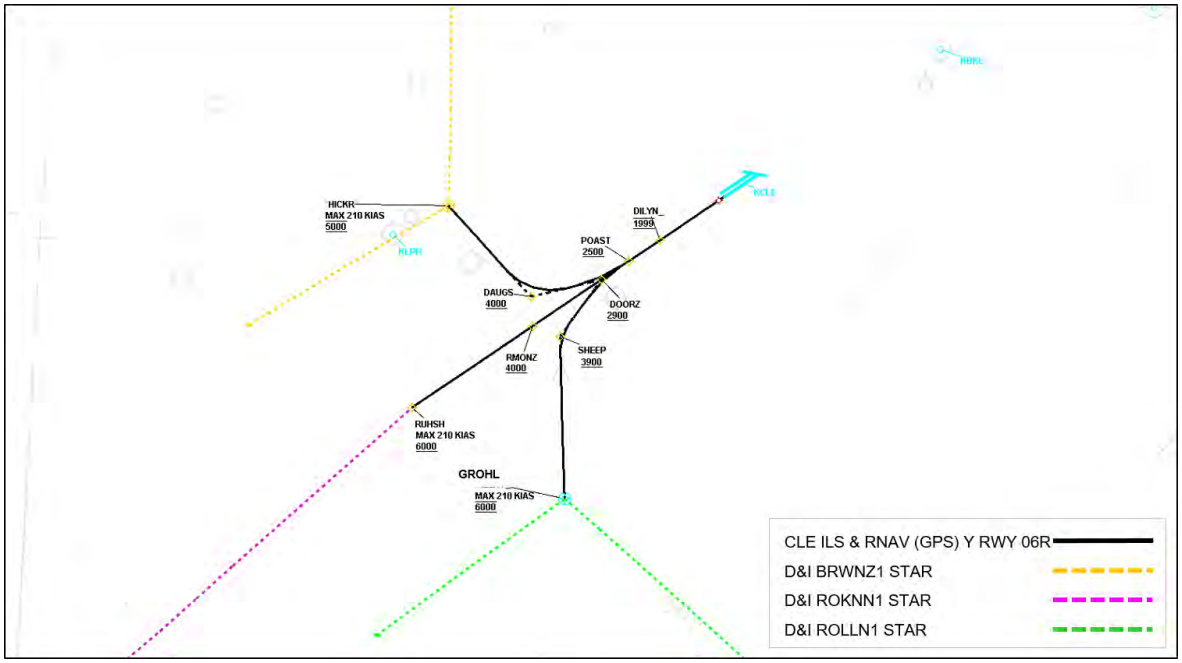

Figure 7. Final Design of the CLE ILS and RNAV (GPS) Y Runway 6R approaches

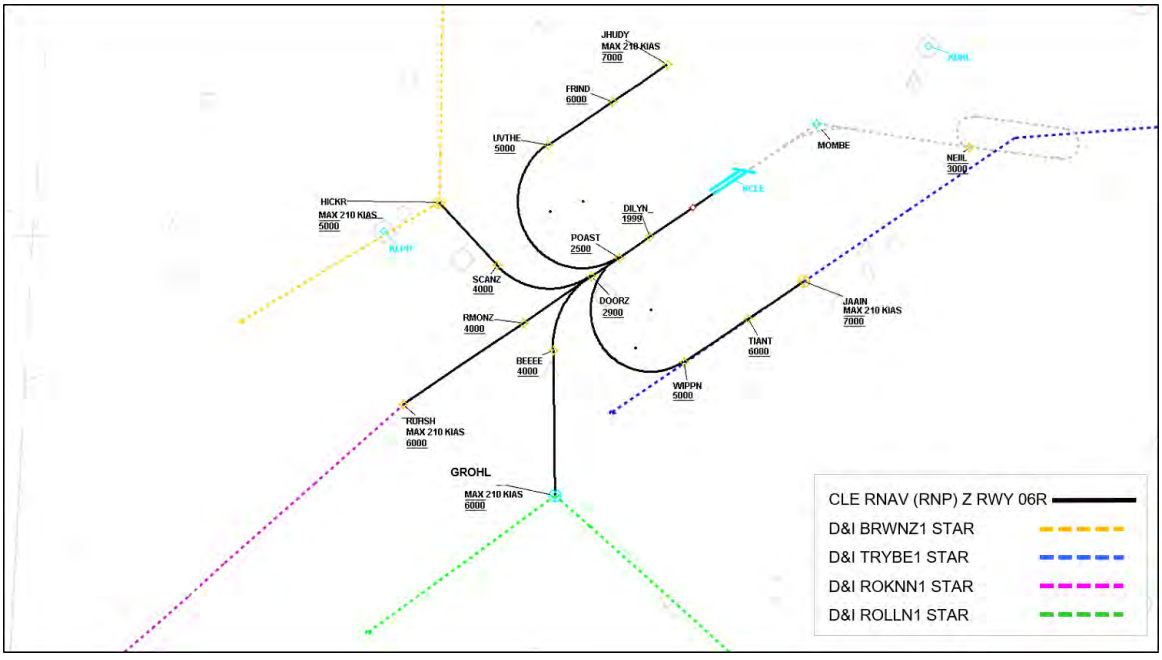

Figure 8. Final Design of the CLE RNAV (RNP) Z Runway 6R approach

Figure 9 depicts the final design of the Runway 28 procedures:

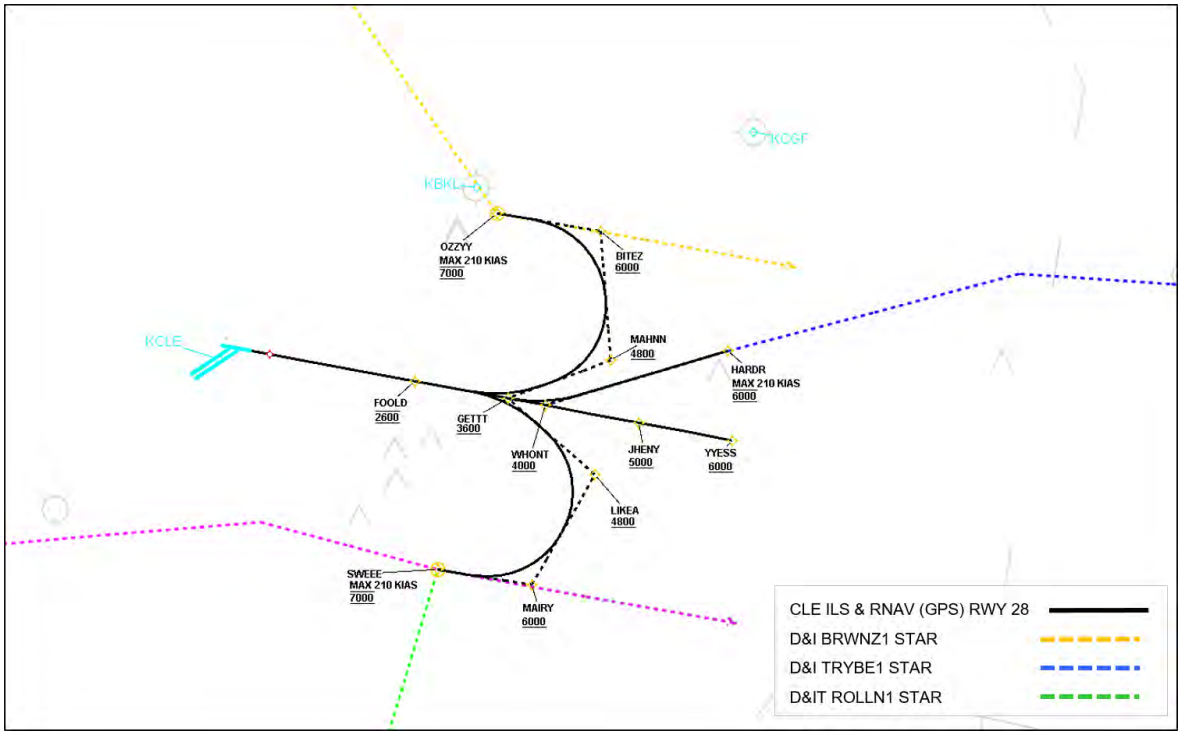

Figure 9. Final Design of the CLE ILS and RNAV (GPS) Runway 28 approaches

CLE-DTW Metroplex Design Package

CLE Standard Instrument Approach Procedures (SIAPs)

Additional Design Considerations

- A high-level ISIM simulation was conducted to validate these procedures in May 2015.
- Industry flight simulator testing was conducted through July 2015 to validate these procedures.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will be required.
- Terminal and enroute automation changes will be required.
- An increase in air traffic operations or changes to runway utilization is not anticipated.

Attachments

- TARGETS Distribution Package CLE ILS Runway 24R
- TARGETS Distribution Package CLE RNAV (GPS) Y Runway 24R
- TARGETS Distribution Package CLE RNAV (RNP) Z Runway 24R
- TARGETS Distribution Package CLE ILS Runway 24L
- TARGETS Distribution Package CLE RNAV (GPS) Y Runway 24L
- TARGETS Distribution Package CLE RNAV (RNP) Z Runway 24L
- TARGETS Distribution Package CLE ILS Runway 06L
- TARGETS Distribution Package CLE RNAV (GPS) Y Runway 06L
- TARGETS Distribution Package CLE RNAV (RNP) Z Runway 06L
- TARGETS Distribution Package CLE ILS Runway 06R
- TARGETS Distribution Package CLE RNAV (GPS) Y Runway 06R
- TARGETS Distribution Package CLE RNAV (RNP) Z Runway 06R
- TARGETS Distribution Package CLE ILS Runway 28
- TARGETS Distribution Package CLE RNAV (GPS) Runway 28

CLE-DTW Metroplex Design Package

Cleveland Satellite RNAV Standard Instrument Departures (SIDs)

OAPM Design Package Change Control Sheet			
Date	**Description**	**TARGETS File Reference**	**FAA/NATCA Co-Lead Initials**
20170724	**BKL AHMET SID**) Added AOA30 at AHMET Purpose: To correct a criteria failure for required minimum or mandatory altitude at the IDF for SIDs with a radar vector component.	20171107_CLE_DTW_ MASTER_FINAL.tgs	RW / MT
20170724	**BKL MYCAR SID**) Added AOA30 at OCIFR Purpose: To correct a criteria failure for required minimum or mandatory altitude at the IDF for SIDs with a radar vector component.	See above.	RW / MT

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

CLE-DTW Metroplex Design Package

CLE Satellite Standard Instrument Departures (SIDs)

Name of Change	Date
MYCAR ONE SID – RNAV (NE) **AHMET ONE SID – RNAV (SE)**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedure **RNAV SID**	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☐ **Proposed Final Design (PFD)** ☒ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
4.2.3 CLE SAT Departures Issues	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
CLE **ZOB: Areas 7,8**	**Cleveland TRACON (CLE): Jim Branch, Nathan Jones** **Cleveland ARTCC (ZOB): Mike Ferrell, Rick Norris**
Related/Dependent Submissions	**Associated Data Files**
Dependent: Airspace Design Packages	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose

These SIDs are designed to be used in conjunction with the CLE PFLYD SID (NE) and the CLE KKIDS SID (SE).

Study Team Issues and Solutions

CLE SAT airports account for approximately 23% of all CLE TRACON departures.

- Issue
  - No existing RNAV procedures for satellite airports, except for the ALPHE THREE (RNAV)
- Solution
  - Use PDRs utilizing CLE RNAV SID waypoints located at the terminal boundary and on enroute transitions

CLE-DTW Metroplex Design Package

CLE Satellite Standard Instrument Departures (SIDs)

Proposed Final Design

These satellite SIDs:

- Have a "Top Altitude" of 14,000 feet which coincides with the new ceiling of TRACON airspace
- Are intended for use by all aircraft; turbojets, turboprops, and props
- Serve the following satellite airports:
    1. KBKL Burke Lakefront Airport
    2. KLNN Willoughby Lost Nation Municipal Airport
    3. KLPR Lorain County Regional Airport
    4. KCGF Cuyahoga County Airport

Aircraft will be vectored to join the procedure within a defined 45 degree pilot navigation area (PNA).

Figure 1 below depicts the MYCAR ONE SID final design.

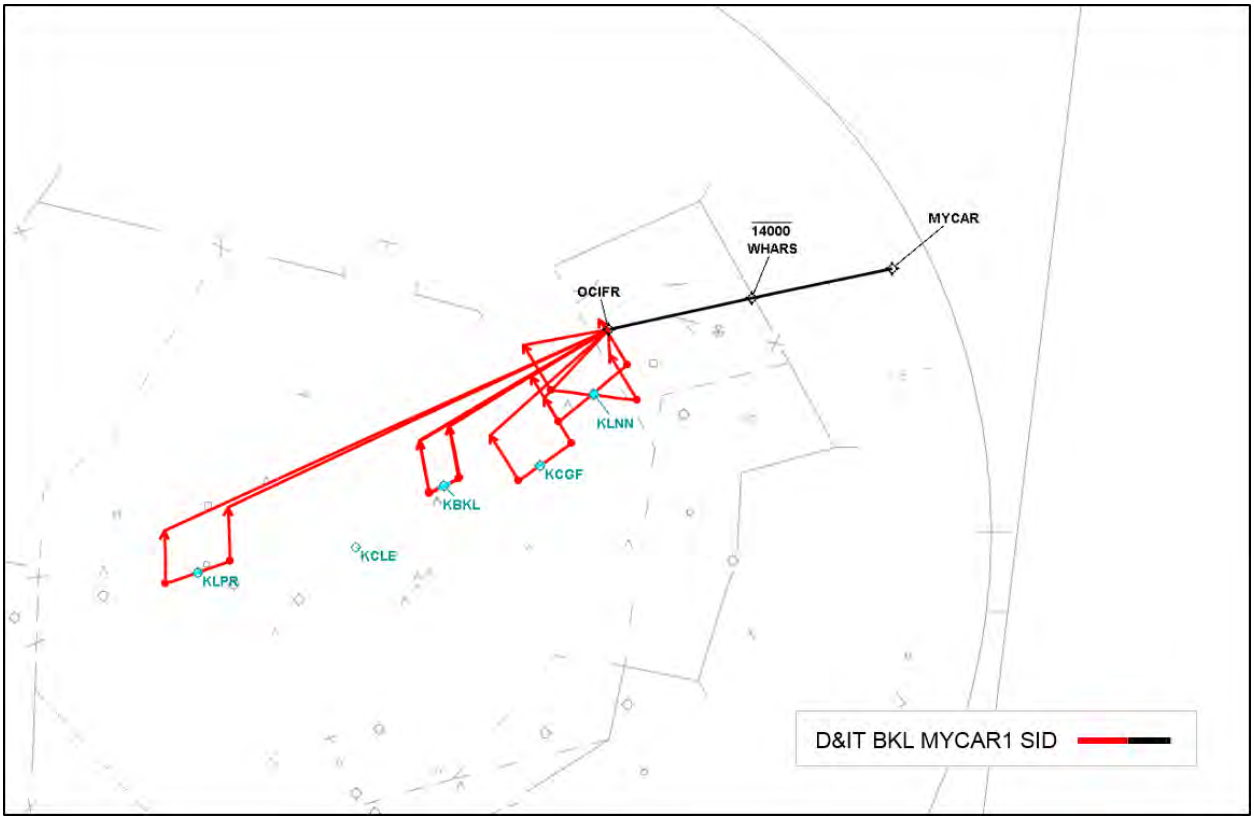

Figure 1. Final Design of the MYCAR ONE SID

CLE-DTW Metroplex Design Package

CLE Satellite Standard Instrument Departures (SIDs)

Figure 2 below depicts the AHMET ONE SID final design.

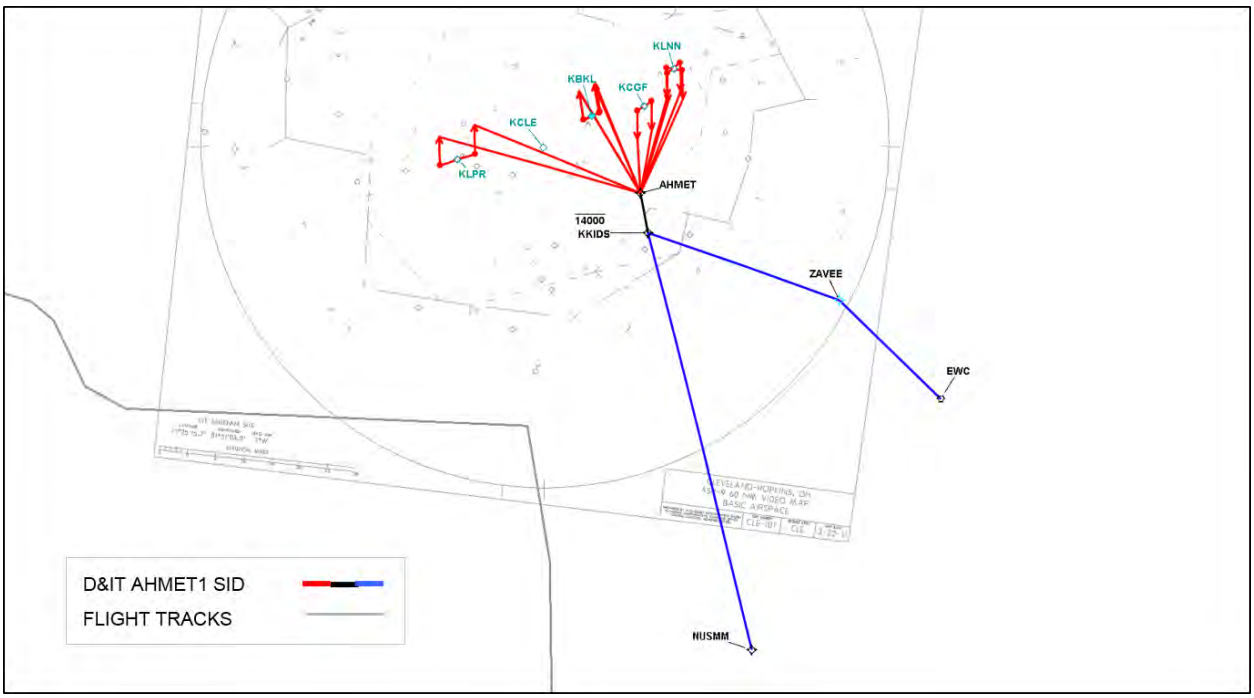

Figure 2. Final Design of the AHMET ONE SID

CLE-DTW Metroplex Design Package

CLE Satellite Standard Instrument Departures (SIDs)

Additional Design Considerations

- A high-level ISIM simulation was conducted to validate this procedure in May 2015.
- Industry flight simulator testing to validate this procedure was not conducted.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will not be required.
- Terminal and enroute automation changes will be required.
- An increase in air traffic operations or changes to runway utilization is not anticipated.

Attachments

MYCAR ONE SID RNAV TARGETS Distribution Package
AHMET ONE SID RNAV TARGETS Distribution Package

CLE-DTW Metroplex Design Package

CAK RNAV Standard Terminal Arrivals (STARs)

OAPM Design Package Change Control Sheet			
Date	**Description**	**TARGETS File Reference**	**FAA/NATCA Co-Lead Initials**
20171024	**KCAK HUUVR STAR:** J Added LAYES waypoint on the track between JUUNY and HUUVR in ZID airspace 3.0 NM from the ZOB/ZID boundary Purpose: Coordination waypoint for ZOB and ZID needed.	20171107_CLE_DTW_ MASTER_FINAL.tgs	RW / MT

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

CLE-DTW Metroplex Design Package

CAK RNAV Standard Terminal Arrivals (STARs)

Name of Change	Date
CAK HUUVR ONE STAR – RNAV (W) **CAK ZZIPS ONE STAR – RNAV (S)**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedure **RNAV STARs**	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☐ **Proposed Final Design (PFD)** ☒ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
N/A	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
CAK ATCT **ZOB Areas: 5 and 8** **ZID**	**Akron-Canton ATCT: Michael Silvius, Omoro Lewis** **Cleveland ARTCC (ZOB): Mike Ferrell, Rick Norris** **Indianapolis ARTCC (ZID): Steven Balkevicius, Noble Brown**
Related/Dependent Submissions	**Associated Data Files**
Dependent: Airspace Design Packages	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose

These STARs were designed to deconflict CAK arrivals from the new Cleveland procedures due to the close proximity of the arrival traffic of the two airports. These procedures do not utilize Optimized Profile Descents (OPDs).

Study Team Issues and Solutions

There are no existing STARs published for CAK. The Study Team did not make recommendations for procedures at CAK, however the Design Team determined the need for new STARs to facilitate the use of OPDs at CLE.

Final Design

Both CAK STARs:

- Serve the Akron-Canton Regional Airport (CAK) and the following satellite airports:
  - AKR Akron Fulton International Airport
  - 1G3 Kent State University Airport

- Are intended for use by all aircraft; turbojets, turboprops, and props

CLE-DTW Metroplex Design Package

CAK RNAV Standard Terminal Arrivals (STARs)

Figures 1 and 2 below depict the CAK HUUVR ONE STAR final design.

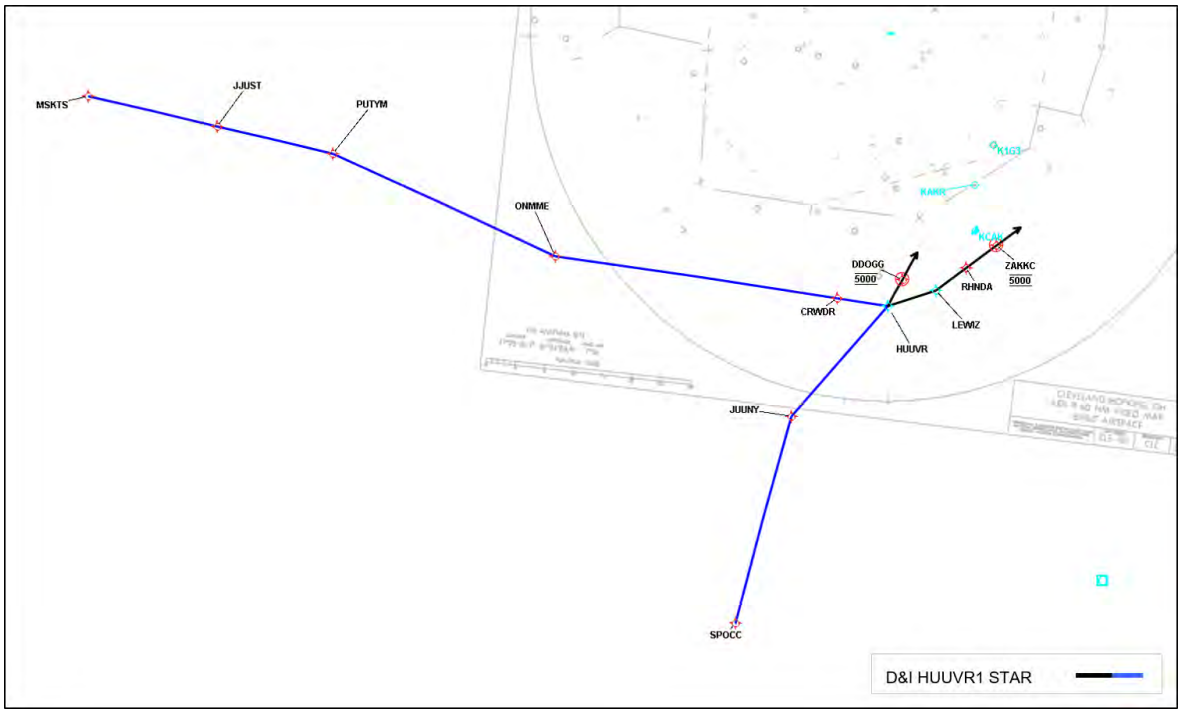

Figure 1. Final Design of the CAK HUUVR ONE STAR – Enroute View

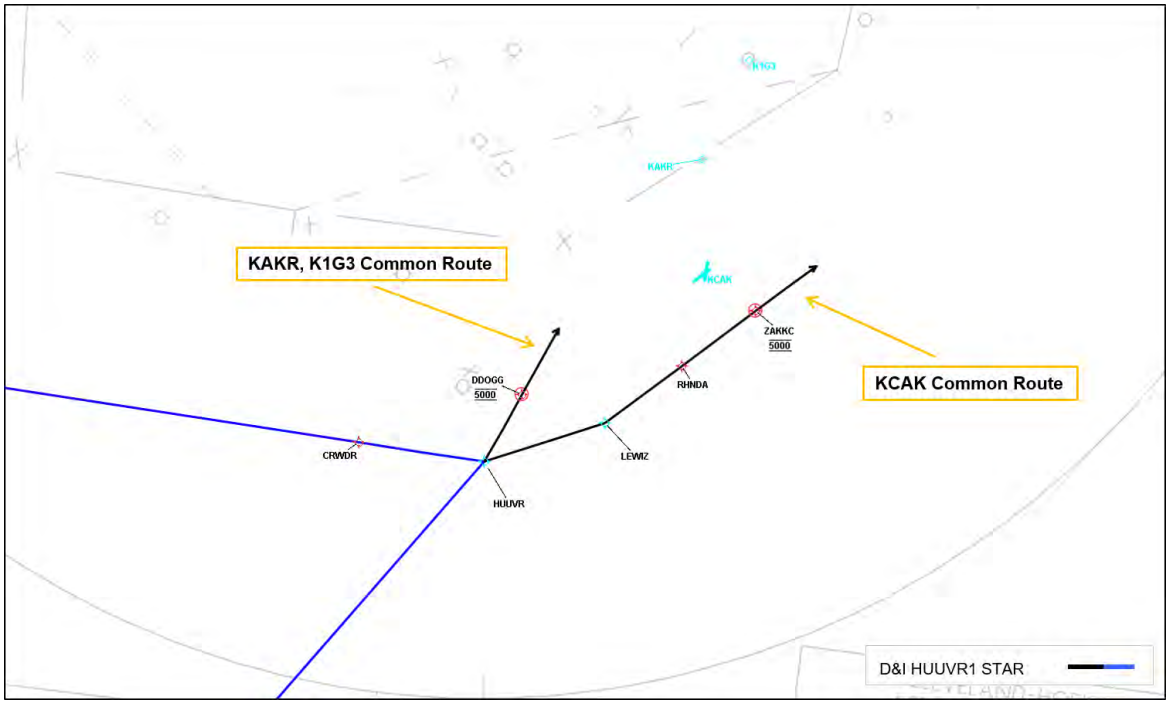

Figure 2. Final Design of the CAK HUUVR ONE STAR – Terminal View

CLE-DTW Metroplex Design Package

CAK RNAV Standard Terminal Arrivals (STARs)

Figures 3 and 4 below depict the CAK ZZIPS ONE STAR final design.

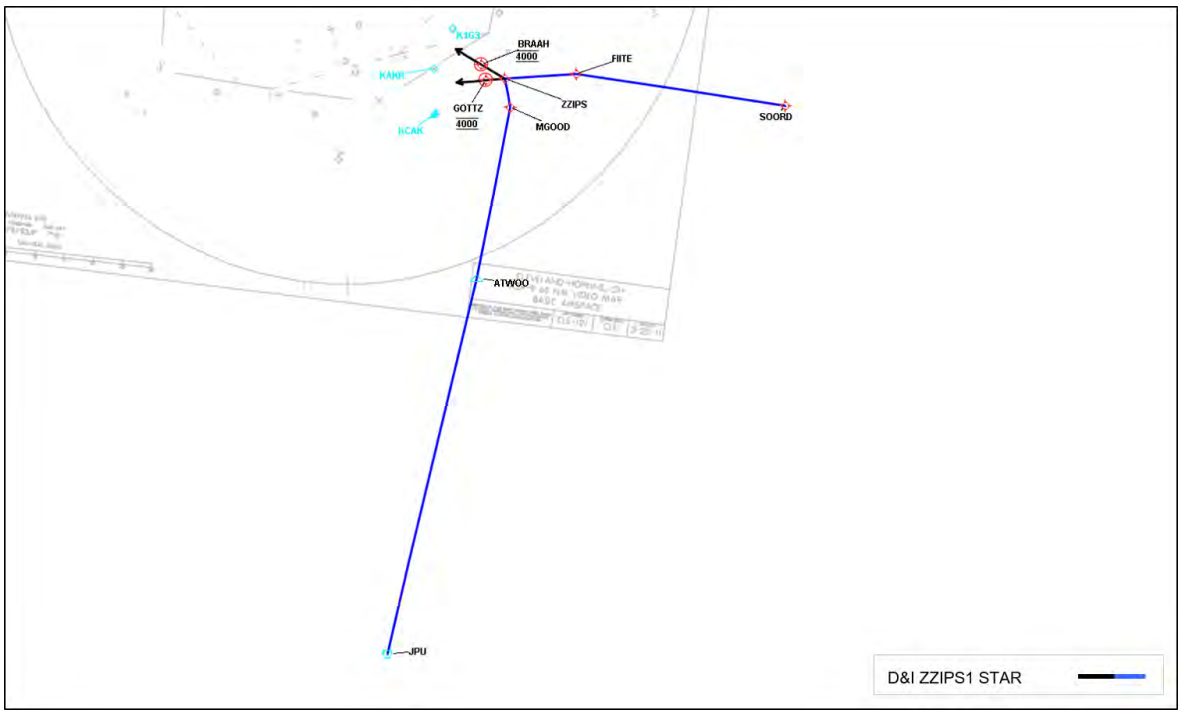

Figure 3. Final Design of the CAK ZZIPS ONE STAR – Enroute View

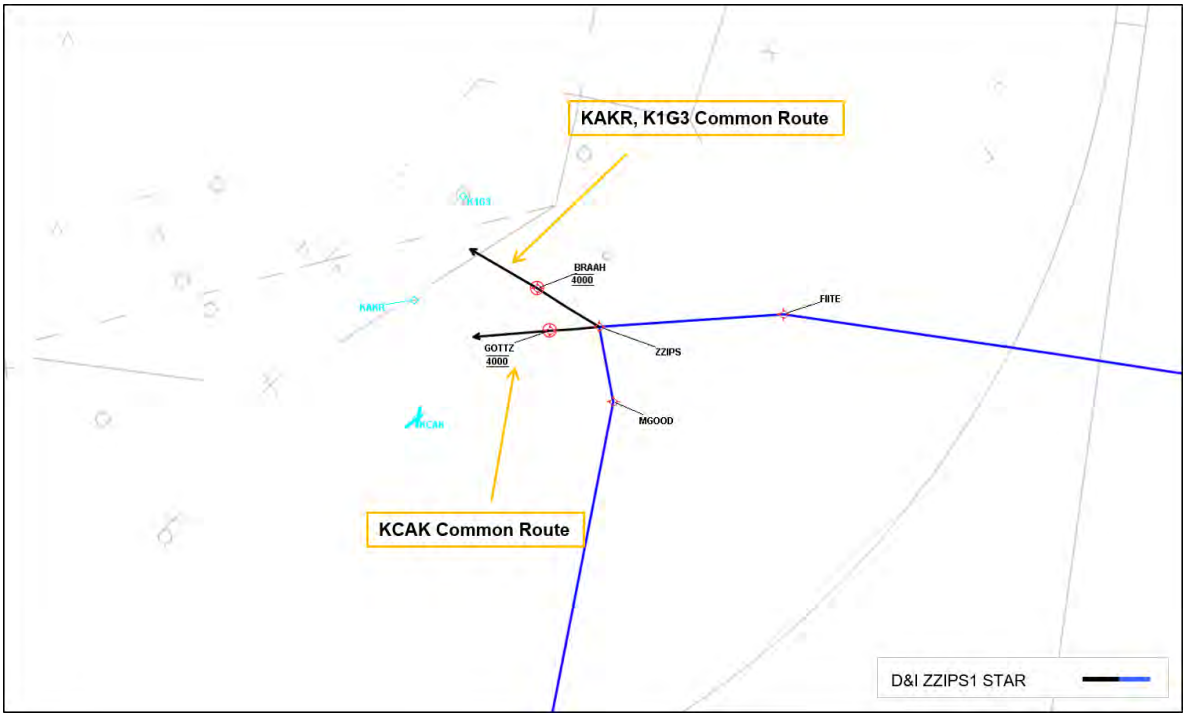

Figure 4. Final Design of the CAK ZZIPS ONE STAR – Terminal View

CLE-DTW Metroplex Design Package

CAK RNAV Standard Terminal Arrivals (STARs)

Additional Design Considerations

- A Human-in-the-Loop Simulation (HITLS) to validate these procedures was not conducted.
- Industry flight simulator testing to validate these procedures was not conducted.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will be required.
- Terminal and enroute automation changes will be required.
- Changes to staffing or Facilities and Equipment (F&E) are not anticipated.
- An increase in air traffic operations or changes to runway utilization is not anticipated.

Attachments

- TARGETS Distribution Package CAK HUUVR ONE STAR RNAV
- TARGETS Distribution Package CAK ZZIPS ONE STAR RNAV

CLE-DTW Metroplex Design Package

DTW NORTH RNAV Standard Instrument Departures (SIDs)

OAPM Design Package Change Control Sheet			
Date	**Description**	**TARGETS File Reference**	**FAA/NATCA Co-Lead Initials**
20170724	**DTW GGIBY SID** ✓ Renamed BESST waypoint to WINRS Purpose: To avoid confusion between WINGZ and WINRS (requested by DTW ATCT).	20171107_CLE_DTW_ MASTER_FINAL.tgs	RW / MT
20170724	**DTW GGIBY SID** ✓ Added AOA40 at LOALA Purpose: To correct a criteria failure for required minimum or mandatory altitude at the IDF for SIDs with a radar vector component.	See above.	RW / MT
20170802	**DTW GGIBY SID** ✓ Moved the 03R transition over new waypoint BURPZ then HOYAR. Purpose: To deconflict the GGIBY/MIGGY from the transitions on the westbound SIDs.	See above.	RW / MT
20170724	**DTW MIGGY SID** ✓ Added AOA40 at JAXII Purpose: To correct a criteria failure for required minimum or mandatory altitude at the IDF for SIDs with a radar vector component.	See above.	RW / MT
20170802	**DTW MIGGY SID** ✓ Moved the 03R transition over new waypoint BURPZ then HOYAR. Purpose: To deconflict the GGIBY/MIGGY from the transitions on the westbound SIDs.	See above.	RW / MT
20170505	**DTW ZETTR SID** ✓ Changed the TANKO (identify as TANKO_) waypoint geographic coordinates from to read “lat. 43°01’32.48” N., long. 082°23’02.38” W.” Purpose: Location as defined on Q-818 and Q-822 is being updated; actual location will not change.	See above.	RW / MT
20170607	**DTW ZETTR SID** ✓ Moved the 04R transition over new waypoint KKELL then FLOKA (was over DCATS). ✓ Moved the 04L transition over new waypoint MINDY then FLOKA (was over DCATS). ✓ Moved the 03R transition over new waypoint BURPZ then FLOKA (was over DCATS). Purpose: To deconflict the ZETTR from the transitions on the eastbound SIDs.	See above.	RW / MT

CLE-DTW Metroplex Design Package

DTW NORTH RNAV Standard Instrument Departures (SIDs)

20170724	**DTW ZETTR SID** J Added AOA40 at FLOKA, delete AOB170 at FLOKA, add AOB170 at ZETTR Purpose: To correct a criteria failure for required minimum or mandatory altitude at the IDF for SIDs with a radar vector component.	See above.	RW / MT
20170724	**DTW ZETTR SID** J Renamed BESST waypoint to WINRS Purpose: To avoid confusion between WINGZ and WINRS (requested by DTW ATCT).	See above.	RW / MT

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

CLE-DTW Metroplex Design Package

DTW North RNAV Standard Instrument Departures (SIDs) ZETTR GGIBY MIGGY

Name of Change	Date
ZETTR ONE SID – RNAV **GGIBY ONE SID - RNAV** **MIGGY ONE SID - RNAV**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedure (RNAV SID)	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☒ **Proposed Final Design (PFD)** ☐ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
4.3.2 DTW Departures	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
D21 Positions: W, E, P, S, Y, F, K **ZOB Area: 1** **ZMP Area: 1** **ZAU Area: NE** **CZYZ** **DTW**	**D21: Steve Mack, Alex Huttenga** **ZOB: Mike Ferrell, Rick Norris** **ZAU: Joseph Bocik, Sam Passialis** **ZMP: Todd Amerman, Daniel Albing** **DTW: Brian Yax, John Overman**
Related/Dependent Submissions	**Associated Data Files**
All 16 new DTW STARs **Airspace Design Packages**	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose

The original RNAV procedure was redesigned to reduce track miles and minimize level-offs. The Study Team identified several areas where miles could be saved and level-offs minimized. The Study Team recommended optimization of lateral paths of current RNAV SIDs, as well as the creation of additional RNAV SIDS to support DTW departure flows.

Study Team Issues and Solutions

The current STCLR SIX and PALCE SEVEN SIDs account for approximately 12% of all DTW jet departures.

- Issues
    - Lack of RNAV SIDs
    - Departures not contained within appropriate ZOB sector (south flow)
- Solutions
    - RNAV departure procedure for traffic filed via PISTN (N1)
    - RNAV departure procedure for traffic filed via LAYNE (N2)
    - New RNAV departure procedure west of LAYNE (N3)

CLE-DTW Metroplex Design Package

DTW North RNAV Standard Instrument Departures (SIDs) ZETTR GGIBY MIGGY

Proposed Final Design

All eleven DTW SIDs:

- Are "RNAV-Off-The-Ground" when departing DTW (all runways except 27L/R)
- Are "Non-Flow Dependent" meaning they can be used when departing any DTW runway
- Have a "Top Altitude" of 17,000 feet which coincides with the new ceiling of TRACON airspace
- Are intended for use by all aircraft; turbojets, turboprops, and props

These procedures will serve Detroit Metropolitan Wayne County International Airport (DTW) and the following satellite airports:

- CYQG Windsor Airport
- KARB Ann Arbor Municipal Airport
- KDET Coleman A Young Municipal Airport
- KMTC Selfridge Air National Guard Base
- KONZ Grosse Ile Municipal Airport
- KOZW Livingston County Spencer J. Hardy Airport
- KPTK Oakland County International Airport (Pontiac)
- KTTF Custer Airport
- KYIP Willow Run Airport
- KVLL Oakland/Troy Airport

The following airports will not be served by the new procedures: Oakland Southwest Airport (Y47), Canton-Plymouth Mettetal Airport (1D2), Myers-Diver's Airport (3TE), St Clair County International Airport (PHN), and Romeo State Airport (D98).

Those aircraft departing satellite airports will be vectored to join the procedure within an area extending 90 degrees on either side of the outbound course.

The Design Team proposal for these SIDs contains multiple departure headings and bi-directional flows utilizing Equivalent Lateral Spacing Operation (ELSO) to maximize runway departure efficiency and cross utilization of runways from both the east and west complexes.

CLE-DTW Metroplex Design Package

DTW North RNAV Standard Instrument Departures (SIDs) ZETTR GGIBY MIGGY

Changes from Study Team Recommendation:

ZETTR SID

- Transition to the west was extended to deconflict with the DTW HANBL and VCTRZ STARs
- Enroute portion splits into two transitions, both of which reduce current track miles; the IIICE transition serves YUL area airports and international traffic
- Altitude restrictions, except those needed to deconflict from downwind arrivals, were removed from the earlier design of this procedure

GGIBY SID

- Transition to the west was extended to deconflict with the DTW HANBL and VCTRZ STARs
- Enroute transition was moved west to avoid restricted airspace
- GNZOE transition serves SSM area airports and international traffic
- Altitude restrictions, except those needed to deconflict from downwind arrivals, were removed from the earlier design of this procedure

MIGGY SID

- Transition to the west was extended to deconflict with the DTW HANBL and VCTRZ STARs
- Removed proposed eastbound transition to reduce track miles
- MIGGY departure gate is the combination of the N3 and W1 SIDS
- MIGGY route was positioned between the dual NW STARs to reduce ground delays for traffic departing on the MTRCT SID and to reduce track miles; its anticipated use is for MSP, MKE, SEA and airports northwest
- Altitude restrictions, except those needed to deconflict from downwind arrivals, were removed from the earlier design of this procedure

Figures 1, 2, 3, 4, 5 and 6 below depict the Proposed Final Designs.

CLE-DTW Metroplex Design Package

DTW North RNAV Standard Instrument Departures (SIDs) ZETTR GGIBY MIGGY

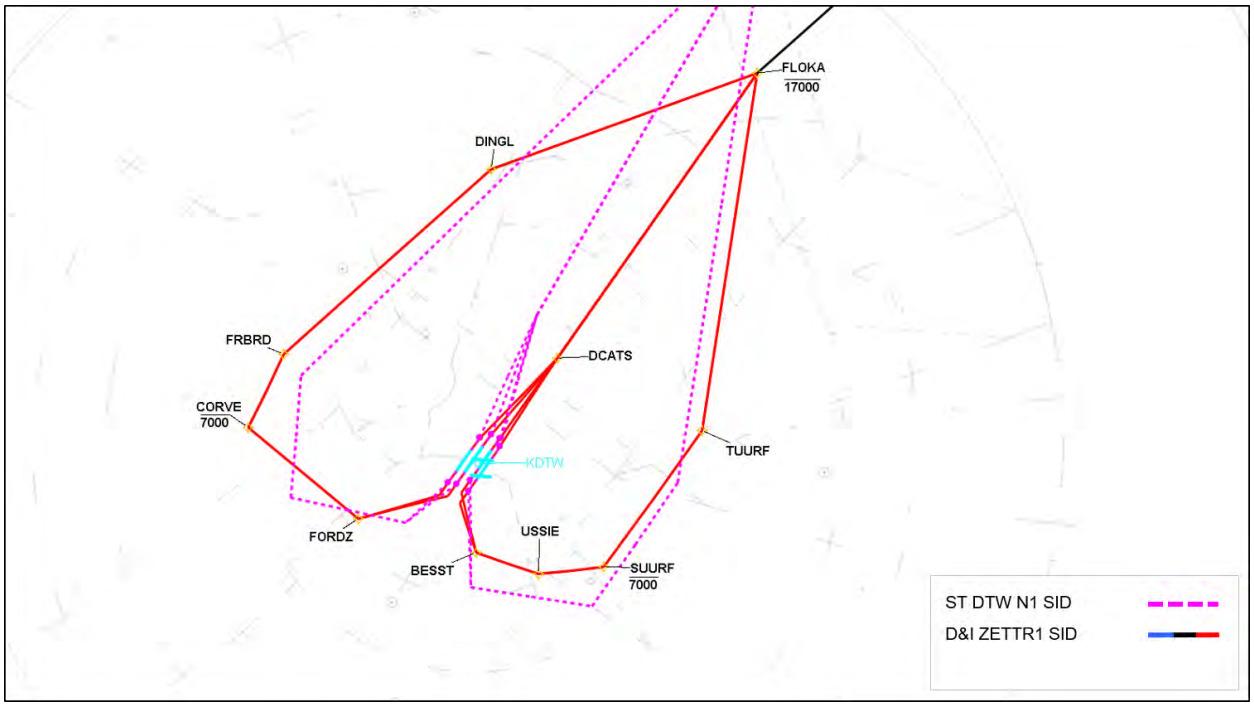

Figure 1. Proposed Final Design DTW ZETTR ONE SID – Terminal View

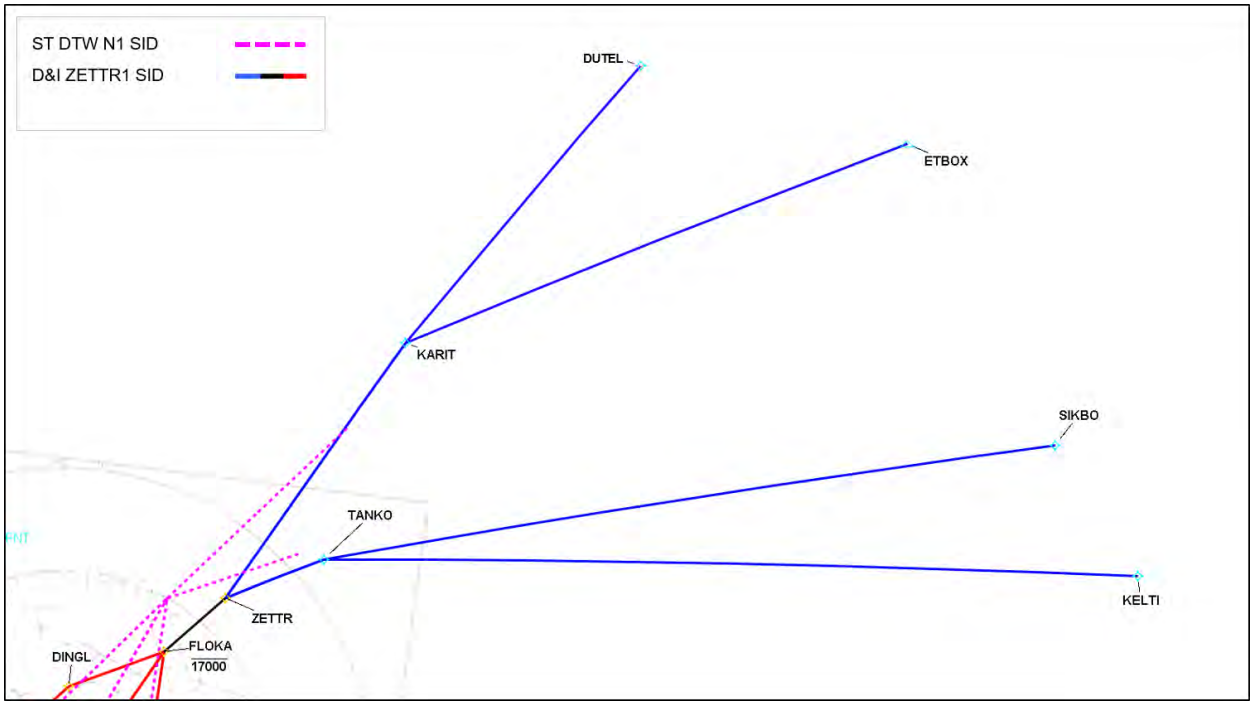

Figure 2. Proposed Final Design DTW ZETTR ONE SID – Enroute View

CLE-DTW Metroplex Design Package

DTW North RNAV Standard Instrument Departures (SIDs) ZETTR GGIBY MIGGY

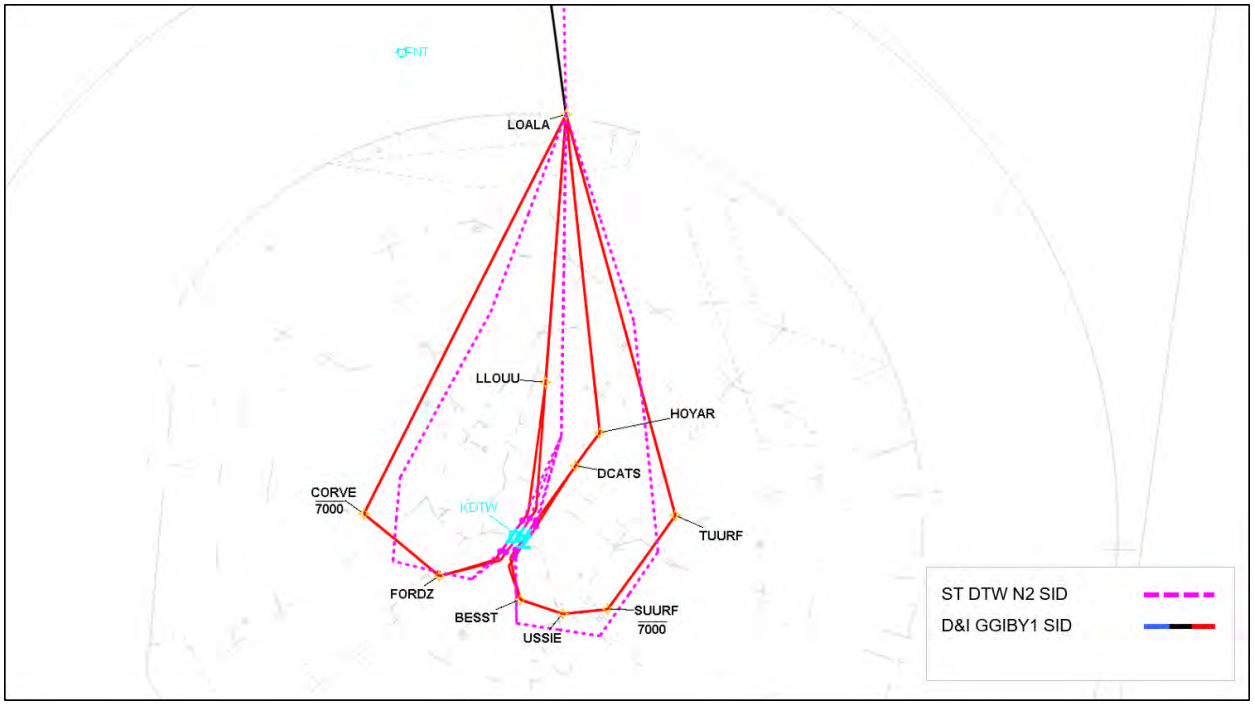

Figure 3. Proposed Final Design DTW GGIBY ONE SID – Terminal View

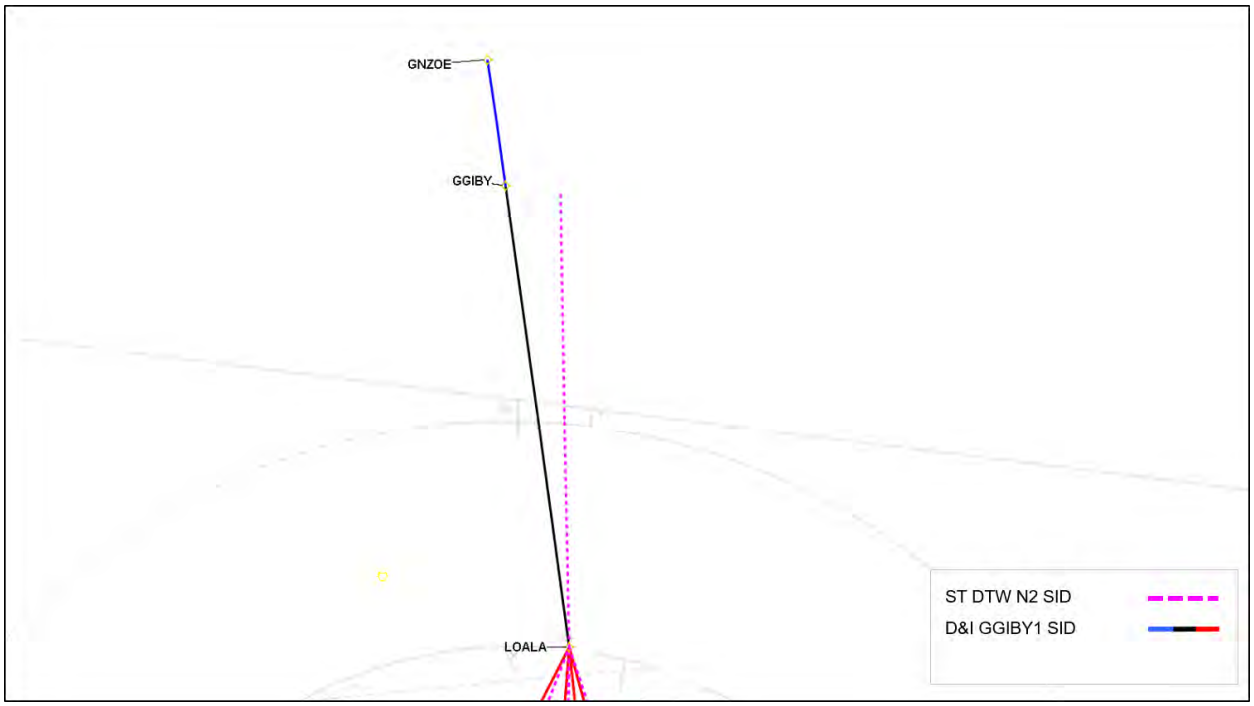

Figure 4. Proposed Final Design DTW GGIBY ONE SID – Enroute View

CLE-DTW Metroplex Design Package

DTW North RNAV Standard Instrument Departures (SIDs) ZETTR GGIBY MIGGY

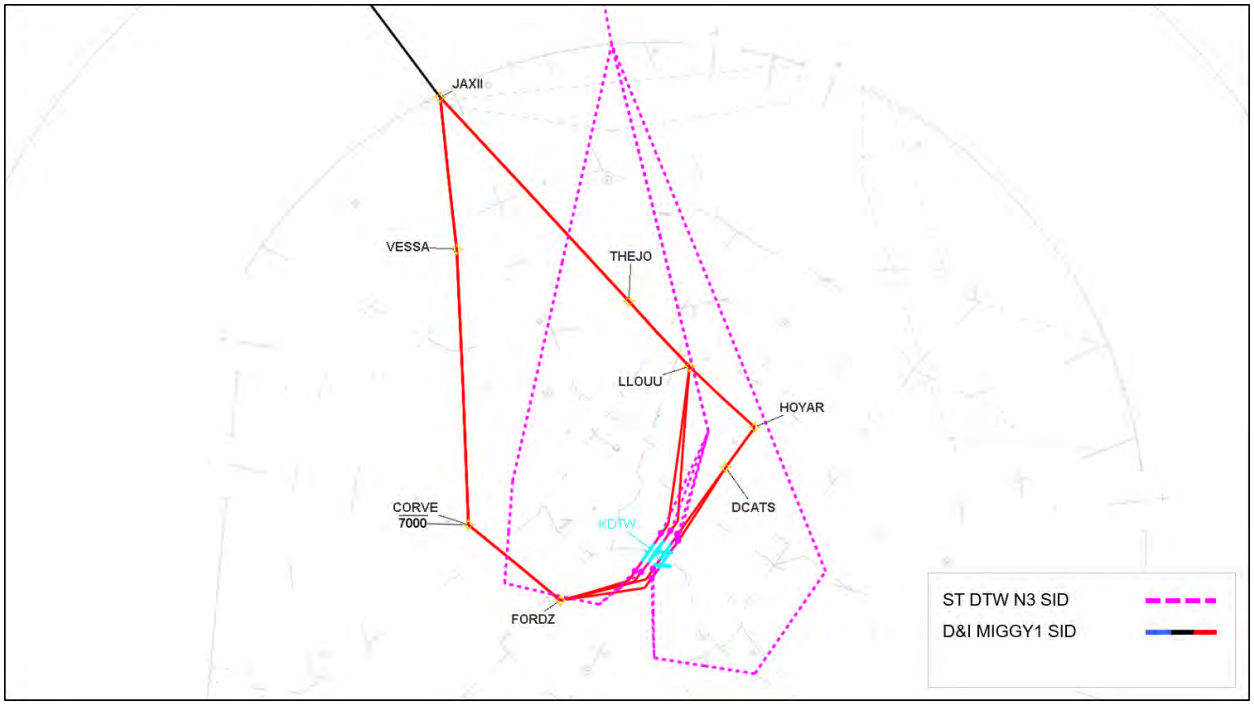

Figure 5. Proposed Final Design DTW MIGGY ONE SID – Terminal View

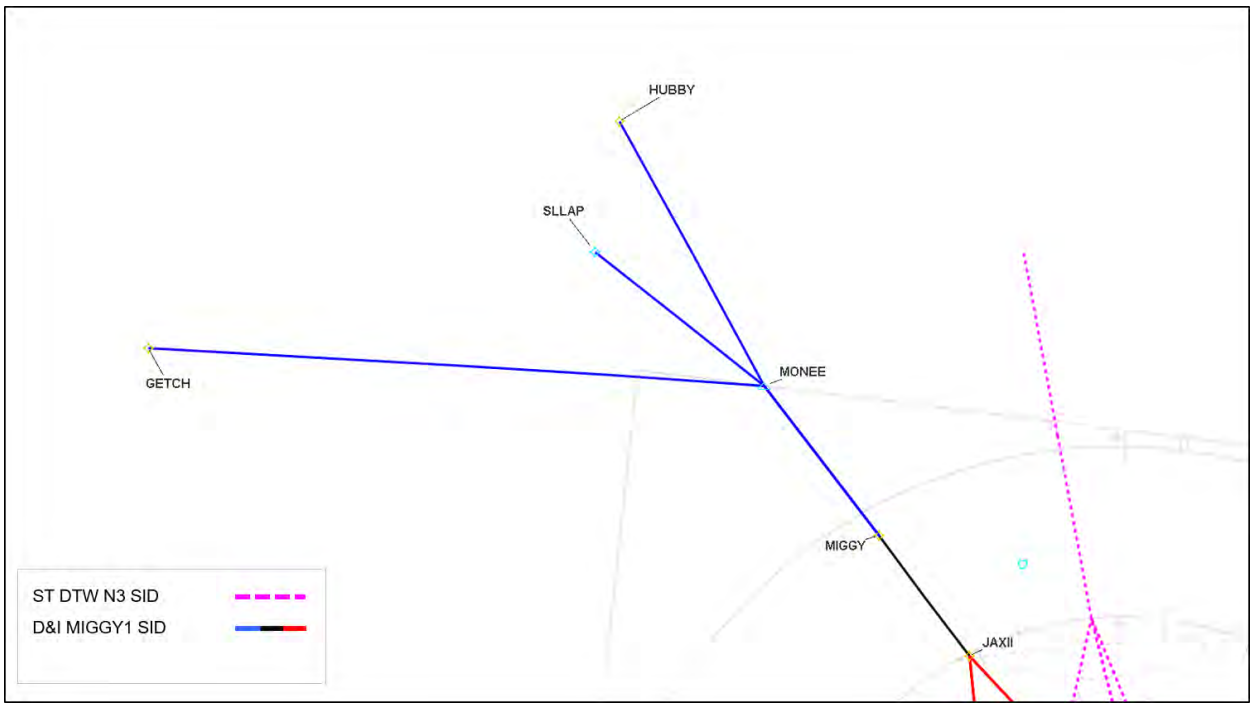

Figure 6. Proposed Final Design DTW MIGGY ONE SID – Enroute View

CLE-DTW Metroplex Design Package

DTW North RNAV Standard Instrument Departures (SIDs) ZETTR GGIBY MIGGY

Additional Design Considerations

- A high-level ISIM simulation was conducted to validate ZOB airspace in May 2015.
- A high fidelity Human-in-the-Loop (HITL) simulation was conducted to validate D21 TRACON airspace in June 2015.
- Industry flight simulator testing was conducted through July 2015 to validate these procedures.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will be required.
- Terminal and enroute automation changes will be required.

Attachments

1. DTW ZETTR ONE DEPARTURE RNAV Distribution Package
2. DTW GGIBY ONE DEPARTURE RNAV Distribution Package
3. DTW MIGGY ONE DEPARTURE RNAV Distribution Package

CLE-DTW Metroplex Design Package

DTW EAST RNAV Standard Instrument Departures (SIDs)

OAPM Design Package Change Control Sheet			
Date	**Description**	**TARGETS File Reference**	**FAA/NATCA Co-Lead Initials**
20170724	**DTW HHOWE SID** ✓ Renamed BESST waypoint to WINRS Purpose: To avoid confusion between WINGZ and WINRS (requested by DTW ATCT).	20171107_CLE_DTW_ MASTER_FINAL.tgs	RW / MT
20170724	**DTW HHOWE SID** ✓ Added AOA40 at MALTB Purpose: To correct a criteria failure for required minimum or mandatory altitude at the IDF for SIDs with a radar vector component.	See above.	RW / MT
20170724	**DTW LIDDS SID** ✓ Renamed WINRS waypoint to BESST Purpose: To avoid confusion between WINGZ and WINRS (requested by DTW ATCT).	See above.	RW / MT
20170808	**DTW LIDDS SID** ✓ Deleted AOB150 at LIDDS ✓ Changed KZLOV to 40B150 Purpose: Industry request to return to AOB150 to the waypoint where it is needed (KZLOV).	See above.	RW / MT
20170724	**DTW LIDDS SID** ✓ Added AOA40 at SLVVA, deleted AOB150 at SLVVA, added AOB150 at LIDDS (see subsequent change to LIDDS on 20170808) Purpose: To correct a criteria failure for required minimum or mandatory altitude at the IDF for SIDs with a radar vector component.	See above.	RW / MT
20170309	**DTW PAVYL SID** ✓ Changed waypoint SLAVA to SLVVA. Purpose: SLAVA waypoint name not reserved. SLVVA is reserved.	See above.	RW / MT
20170724	**DTW PAVYL SID** ✓ Added AOA40 at KZLOV Purpose: To correct a criteria failure for required minimum or mandatory altitude at the IDF for SIDs with a radar vector component.	See above.	RW / MT

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

CLE-DTW Metroplex Design Package

DTW East RNAV Standard Instrument Departures (SIDs) LIDDS PAVYL HHOWE

Name of Change	Date
LIDDS ONE SID – RNAV **PAVYL ONE SID - RNAV** **HHOWE ONE SID - RNAV**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedure (RNAV SID)	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☒ **Proposed Final Design (PFD)** ☐ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
4.3.2 DTW Departures	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
D21 Positions: W, E, K, D, F **ZOB Areas: 2, 4** **DTW**	**D21: Steve Mack, Alex Huttenga** **ZOB: Mike Ferrell, Rick Norris** **DTW: Brian Yax, John Overman**
Related/Dependent Submissions	**Associated Data Files**
All 16 new DTW STARs **CLE BRWNZ STAR** **DTW Satellite FOREY STAR** **Airspace Design Packages**	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose

The original RNAV procedure was redesigned to reduce track miles and minimize level-offs. The Study Team identified several areas where miles could be saved and level-offs minimized. The Study Team recommended optimization of lateral paths of current RNAV SIDs, as well as the creation of additional RNAV SIDS to support DTW departure flows.

CLE-DTW Metroplex Design Package

DTW East RNAV Standard Instrument Departures (SIDs) LIDDS PAVYL HHOWE

Name of Change	Date
LIDDS ONE SID – RNAV **PAVYL ONE SID - RNAV** **HHOWE ONE SID - RNAV**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedure (RNAV SID)	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☒ **Proposed Final Design (PFD)** ☐ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
4.3.2 DTW Departures	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
D21 Positions: W, E, K, D, F **ZOB Areas: 2, 4** **DTW**	**D21: Steve Mack, Alex Huttenga** **ZOB: Mike Ferrell, Rick Norris** **DTW: Brian Yax, John Overman**
Related/Dependent Submissions	**Associated Data Files**
All 16 new DTW STARs **CLE BRWNZ STAR** **DTW Satellite FOREY STAR** **Airspace Design Packages**	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose

The original RNAV procedure was redesigned to reduce track miles and minimize level-offs. The Study Team identified several areas where miles could be saved and level-offs minimized. The Study Team recommended optimization of lateral paths of current RNAV SIDs, as well as the creation of additional RNAV SIDS to support DTW departure flows.

CLE-DTW Metroplex Design Package

DTW East RNAV Standard Instrument Departures (SIDs) LIDDS PAVYL HHOWE

Study Team Issues and Solutions

The current ERRTH THREE, MOONN FOUR, STCLR SIX and AKRON THREE SIDs account for approximately 33% of all DTW jet departures.

- Issues
    - Lack of RNAV SIDs
    - Too many departure fixes
    - Vectors required around HIMEZ shelf (south flow)
    - Departures not contained within appropriate ZOB sector (south flow)
    - Departures level off or vectored off course to climb
    - Conflicts with SPICA arrival traffic (north flow)
    - Aircraft incorrectly file via DKK
- Solutions
    - RNAV departure procedure for traffic filed via MAARS (E1)
    - RNAV departure procedure for traffic filed via ERRTH (E2)
    - RNAV departure procedure for traffic filed via MOONN (E3) to segregate traffic from SPICA arrivals and removes DKK transition

CLE-DTW Metroplex Design Package

DTW East RNAV Standard Instrument Departures (SIDs) LIDDS PAVYL HHOWE

Proposed Final Design

All eleven DTW SIDs:

- Are "RNAV-Off-The-Ground" when departing DTW (all runways except 27L/R)
- Are "Non-Flow Dependent" meaning they can be used when departing any DTW runway
- Have a "Top Altitude" of 17,000 feet which coincides with the new ceiling of TRACON airspace
- Are intended for use by all aircraft; turbojets, turboprops, and props

These procedures will serve Detroit Metropolitan Wayne County International Airport (DTW) and the following satellite airports:

- CYQG Windsor Airport
- KARB Ann Arbor Municipal Airport
- KDET Coleman A Young Municipal Airport
- KMTC Selfridge Air National Guard Base
- KONZ Grosse Ile Municipal Airport
- KOZW Livingston County Spencer J. Hardy Airport
- KPTK Oakland County International Airport (Pontiac)
- KTTF Custer Airport
- KYIP Willow Run Airport
- KVLL Oakland/Troy Airport

The following airports will not be served by the new procedures: Oakland Southwest Airport (Y47), Canton-Plymouth Mettetal Airport (1D2), Myers-Diver's Airport (3TE), St Clair County International Airport (PHN), and Romeo State Airport (D98).

Those aircraft departing satellite airports will be vectored to join the procedure within an area extending 90 degrees on either side of the outbound course.

The Design Team proposal for these SIDs contains multiple departure headings and bi-directional flows utilizing Equivalent Lateral Spacing Operation (ELSO) to maximize runway departure efficiency and cross utilization of runways from both the east and west complexes.

CLE-DTW Metroplex Design Package

DTW East RNAV Standard Instrument Departures (SIDs) LIDDS PAVYL HHOWE

Changes from Study Team Recommendation:

LIDDS SID

- Departure gate (LIDDS) moved south for efficiency and reduce track miles
- North flow was shortened to reduce track miles
- Moved south flow transition over KZLOV to deconflict from the CLE BRWNZ STAR and to optimize operations by minimizing ground delay
- GRIVY transition added for routing to DCA and southeastern seaboard area airports
- Altitude restrictions, except those needed to deconflict from downwind arrivals and the CLE BRWNZ STAR, were removed from the earlier design of this procedure
- The procedure now utilizes an open SID design to provide operational flexibility on the south flow

PAVYL SID

- Departure gate (PAVYL) moved south for efficiency
- North flow was shortened to reduce track miles
- Moved south flow transition to JOELU to minimize ground delay
- Procedure splits into two transitions; the ESSBE transition serves JFK and EWR satellite area airports and the MRDOC transition serves EWR, PHL and LGA area airports
- Altitude restrictions were removed from the earlier design of this procedure
- The procedure now utilizes an open SID design to provide operational flexibility on both the south and north flows

HHOWE SID

- Departure gate (HHOWE) moved south for efficiency, reduce track miles and to deconflict with the DTW WNGNT and CUUGR
- North flow was shortened to reduce track miles
- South flow transition moved north to reduce track miles.
- Optimized for efficiency as it is the busiest east departure gate
- Procedure splits into two transitions; the BROKK transition serves BUF, ROC, and lower-altitude upstate New York airports and the LWEMA transition serves BOS and New England area airports
- Altitude restrictions, except those needed to deconflict from downwind arrivals, were removed from the earlier design of this procedure
- The procedure now utilizes an open SID design to provide operational flexibility on the north flow

Figures 1, 2, 3, 4, 5, and 6 below depict the Proposed Final Designs.

CLE-DTW Metroplex Design Package

DTW East RNAV Standard Instrument Departures (SIDs) LIDDS PAVYL HHOWE

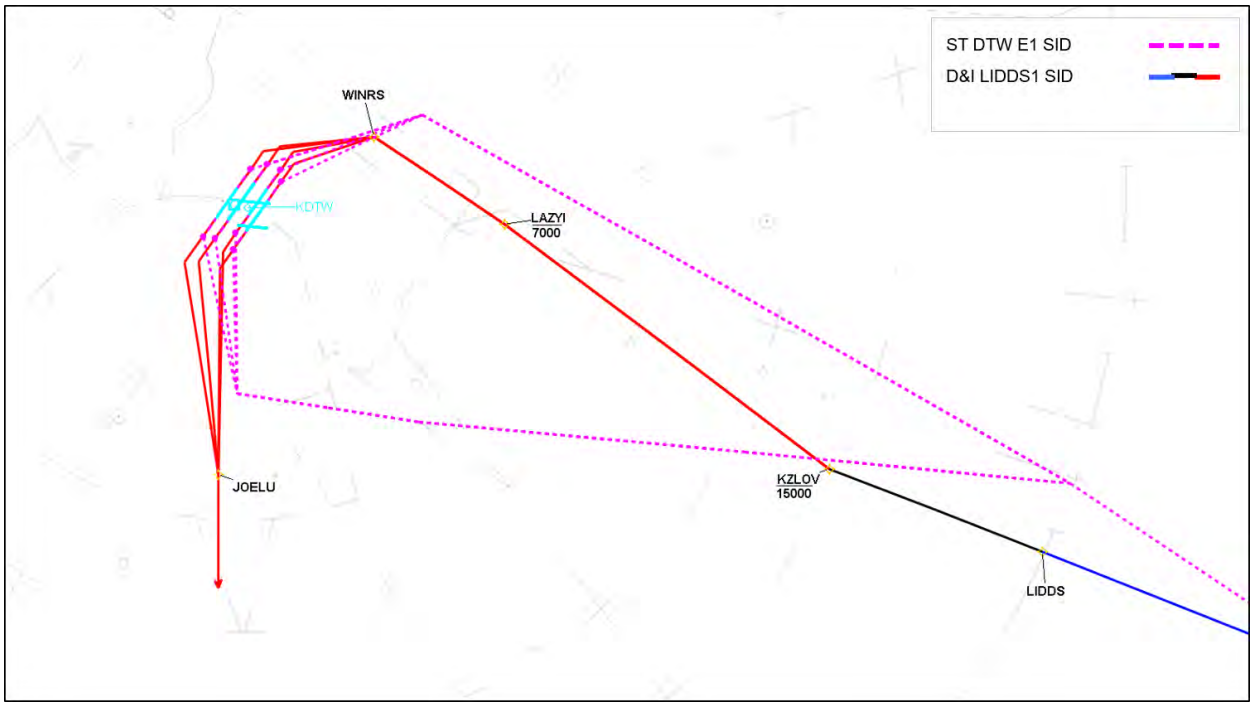

Figure 1. Proposed Final Design DTW LIDDS ONE SID – Terminal View

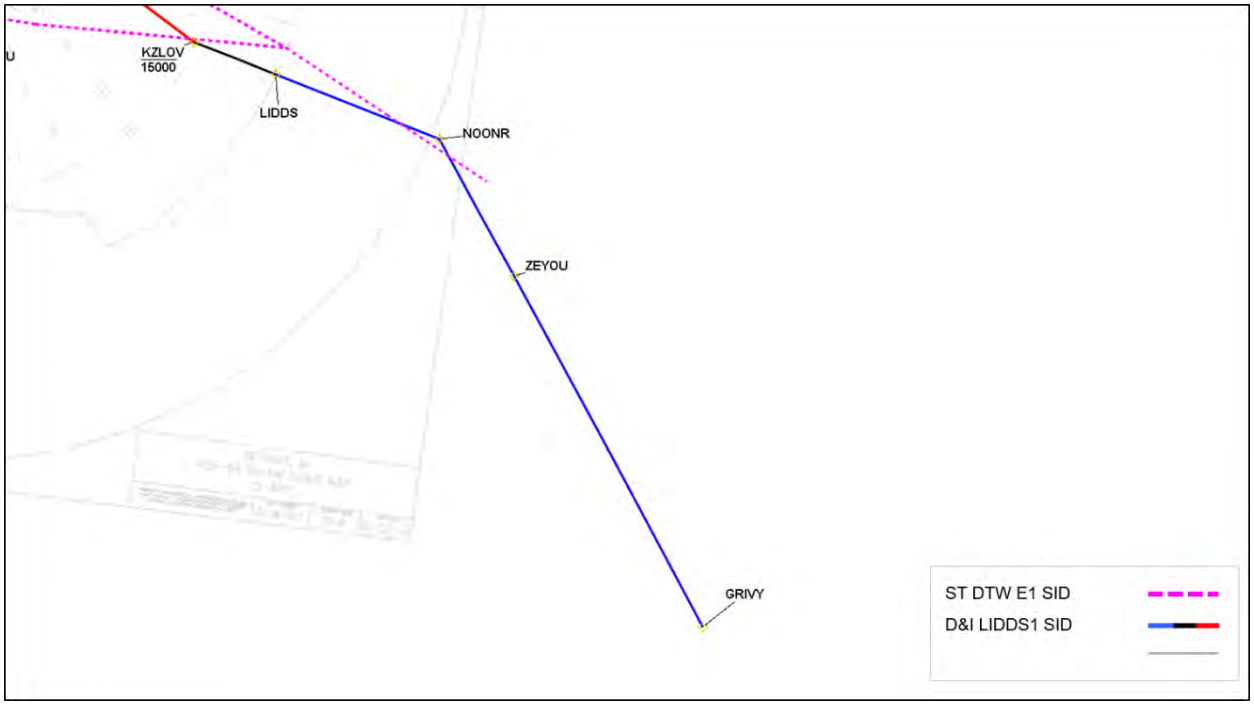

Figure 2. Proposed Final Design DTW LIDDS ONE SID – Enroute View

CLE-DTW Metroplex Design Package

DTW <u>East</u> RNAV Standard Instrument Departures (SIDs) <u>LIDDS PAVYL HHOWE</u>

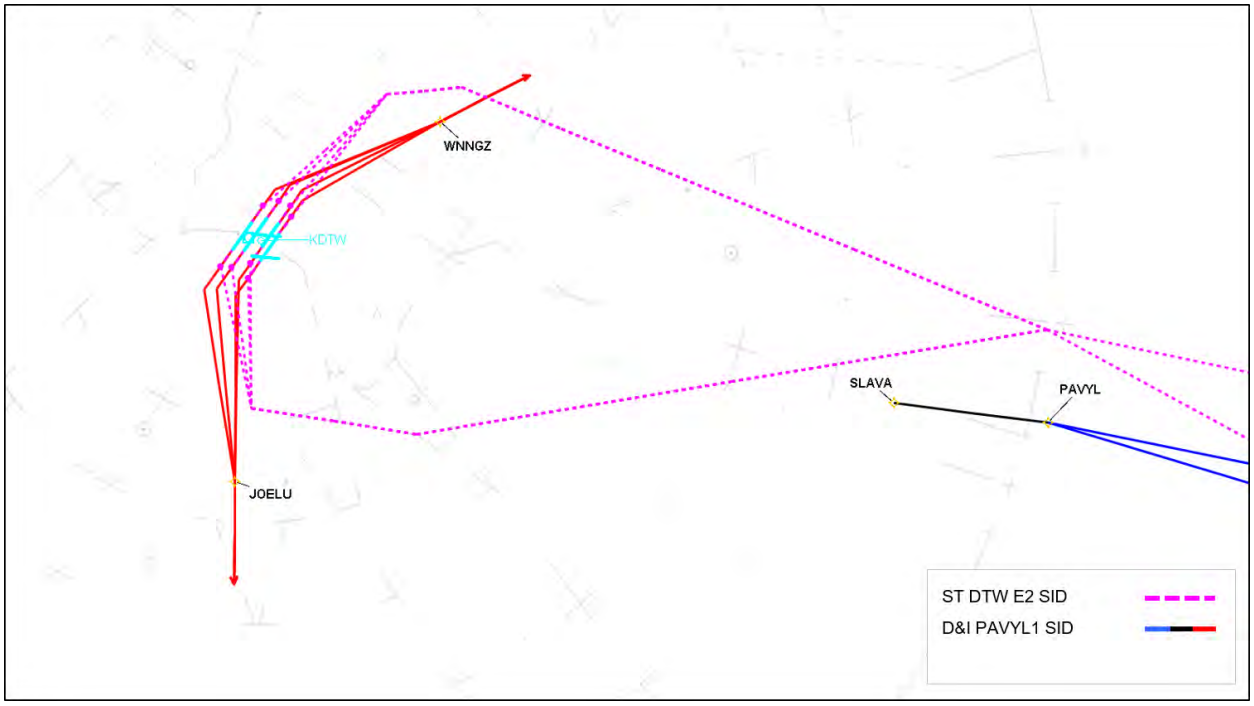

Figure 3. Proposed Final Design DTW PAVYL ONE SID – Terminal View

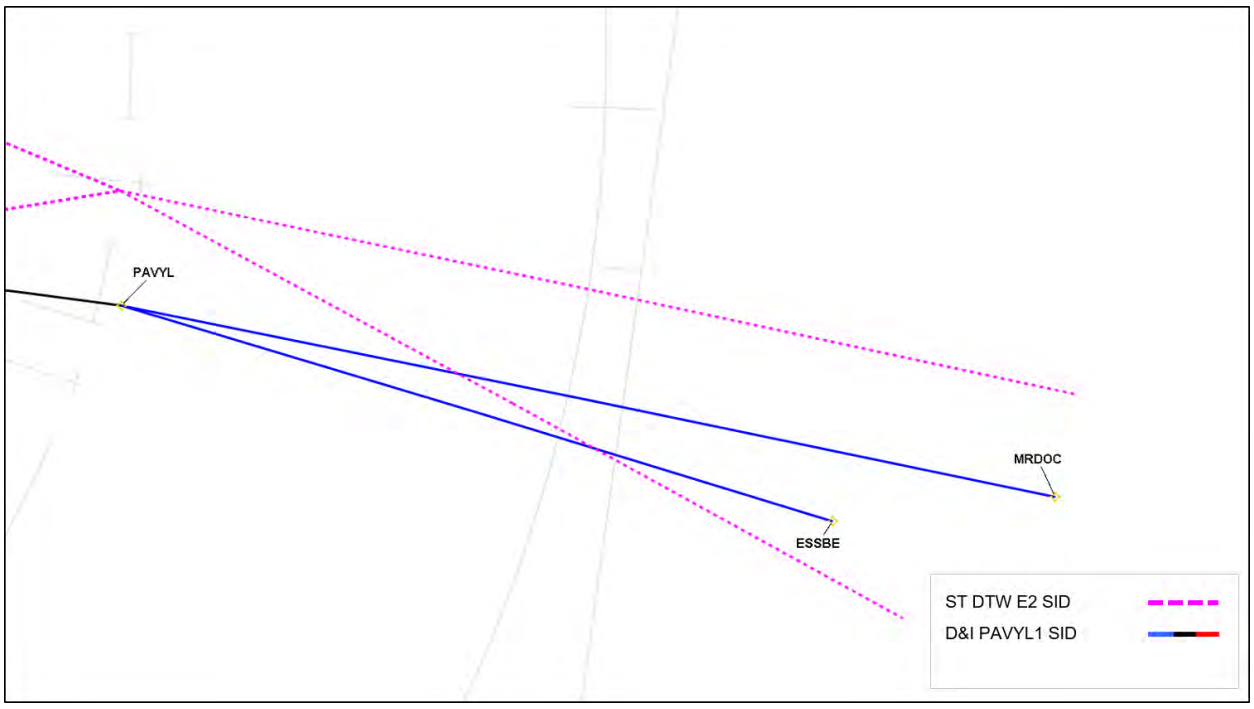

Figure 4. Proposed Final Design DTW PAVYL ONE SID – Enroute View

CLE-DTW Metroplex Design Package

DTW <u>East</u> RNAV Standard Instrument Departures (SIDs) <u>LIDDS PAVYL HHOWE</u>

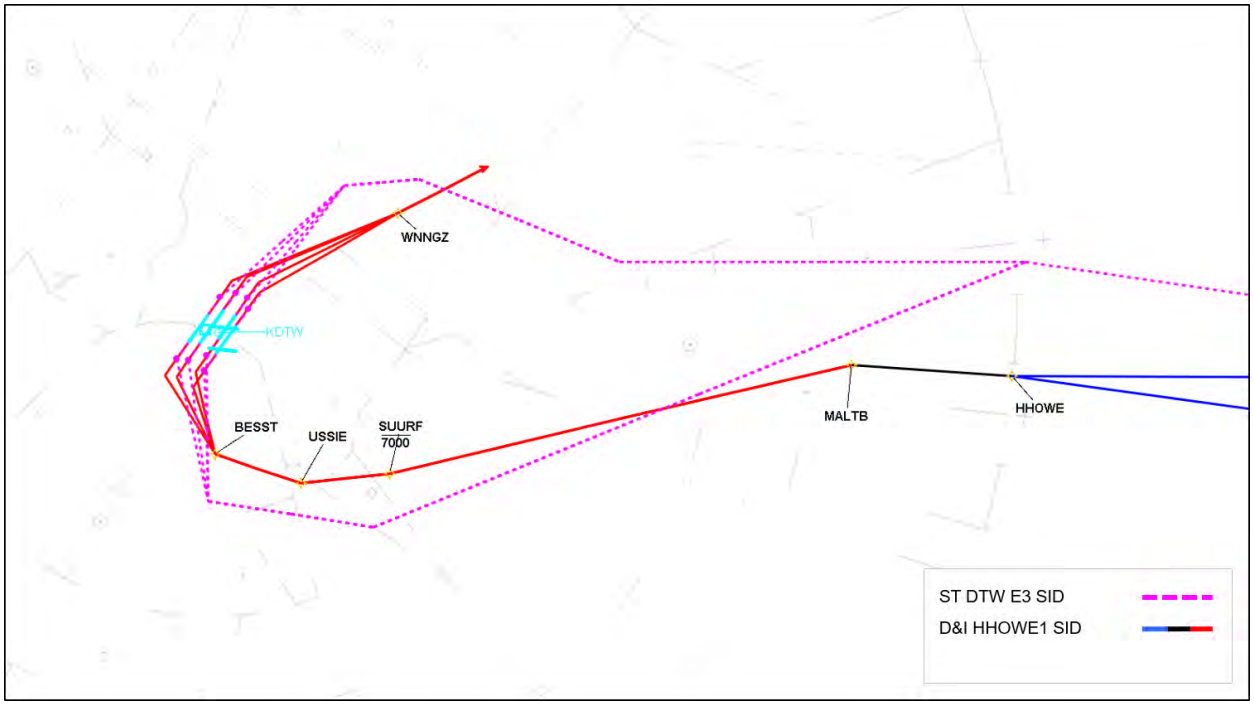

Figure 5. Proposed Final Design DTW HHOWE ONE SID – Terminal View

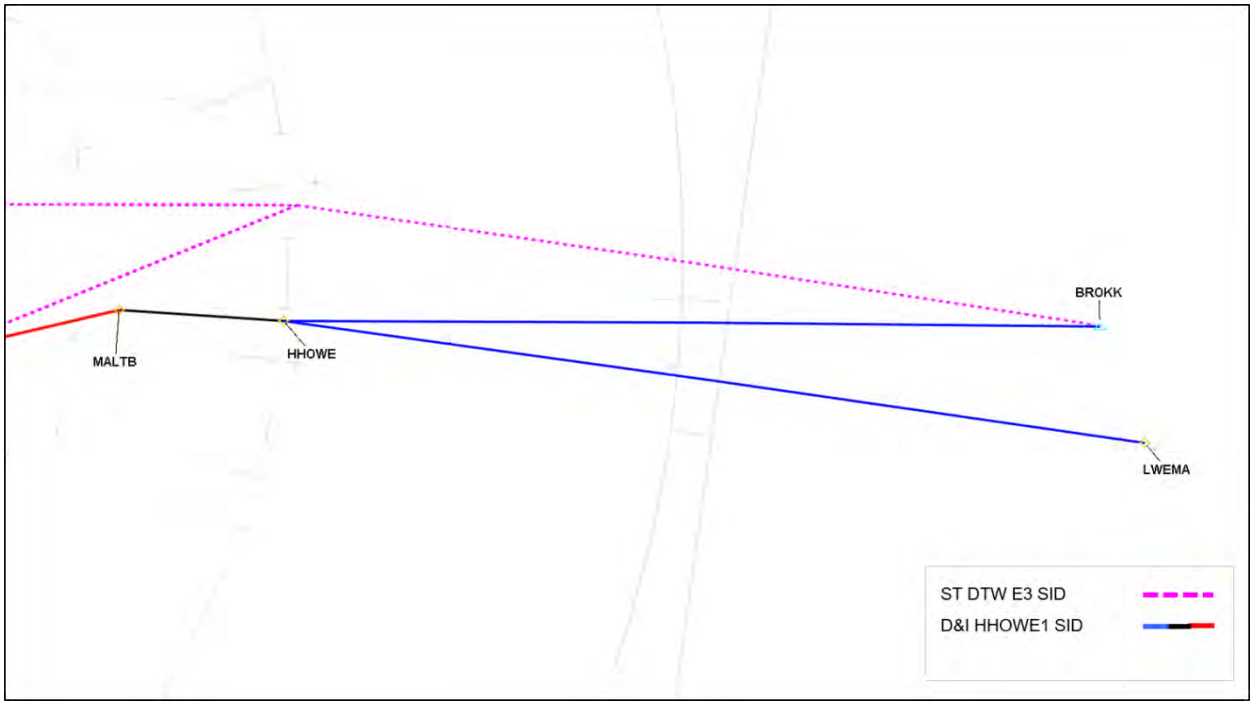

Figure 6. Proposed Final Design DTW HHOWE ONE SID – Enroute View

CLE-DTW Metroplex Design Package

DTW East RNAV Standard Instrument Departures (SIDs) LIDDS PAVYL HHOWE

Additional Design Considerations

- A high-level ISIM simulation was conducted to validate ZOB airspace in May 2015.
- A high fidelity Human-in-the-Loop (HITL) simulation was conducted to validate D21 TRACON airspace in June 2015.
- Industry flight simulator testing was conducted through July 2015 to validate these procedures.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will be required.
- Terminal and enroute automation changes will be required.

Attachments

1. DTW LIDDS ONE DEPARTURE RNAV Distribution Package
2. DTW PAVYL ONE DEPARTURE RNAV Distribution Package
3. DTW HHOWE ONE DEPARTURE RNAV Distribution Package

CLE-DTW Metroplex Design Package

DTW SOUTH RNAV Standard Instrument Departures (SIDs)

OAPM Design Package Change Control Sheet			
Date	**Description**	**TARGETS File Reference**	**FAA/NATCA Co-Lead Initials**
20170309	**DTW BARII SID** • Changed waypoint FERMM to FERRM. Purpose: FERMM waypoint name not reserved. FERRM is reserved.	20171107_CLE_DTW_ MASTER_FINAL.tgs	RW / MT
20170607	**DTW BARII SID** • Moved BOOSE waypoint to N42 10 08.18 W83 23 45.01 • Moved the 22R transition over new waypoint EEERI then RATIO (was over BOOSE). Purpose: To deconflict the BARII/CLVIN/SNDRS from the transitions on the westbound SIDs.	See above.	RW / MT
20170724	**DTW BARII SID** • Added AOA40 at HUUTZ • Renamed WINRS waypoint to BESST Purpose: To correct a criteria failure for required minimum or mandatory altitude at the IDF for SIDs with a radar vector component. To avoid confusion between WINGZ and WINRS (DTW ATCT requested)	See above.	RW / MT
20170309	**DTW CLVIN SID** • Changed waypoint FERMM to FERRM. Purpose: FERMM waypoint name not reserved. FERRM is reserved.	See above.	RW / MT
20170607	**DTW CLVIN SID** • Moved BOOSE waypoint to N42 10 08.18 W83 23 45.01 • Moved the 22R transition over new waypoint EEERI then RATIO (was over BOOSE). Purpose: To deconflict the BARII/CLVIN/SNDRS from the transitions on the westbound SIDs.	See above.	RW / MT
20170724	**DTW CLVIN SID** • Added AOA40 at PHAUL • Renamed WINRS waypoint to BESST Purpose: To correct a criteria failure for required minimum or mandatory altitude at the IDF for SIDs with a radar vector component. To avoid confusion between WINGZ and WINRS (DTW ATCT requested)	See above.	RW / MT
20170309	**DTW SNDRS SID** • Changed waypoint FERMM to FERRM. Purpose: FERMM waypoint name not reserved. FERRM is reserved.	See above.	RW / MT

CLE-DTW Metroplex Design Package

DTW SOUTH RNAV Standard Instrument Departures (SIDs)

20170607	**DTW SNDRS SID** • Moved BOOSE waypoint to N42 10 08.18 W83 23 45.01 • Moved the 22R transition over new waypoint EEERI then RATIO (was over BOOSE). Purpose: To deconflict the BARII/CLVIN/SNDRS from the transitions on the westbound SIDs.	See above.	RW / MT
20170724	**DTW SNDRS SID** • Added AOA40 at JWELS • Renamed WINRS waypoint to BESST Purpose: To correct a criteria failure for required minimum or mandatory altitude at the IDF for SIDs with a radar vector component. To avoid confusion between WINGZ and WINRS (DTW ATCT requested)	See above.	RW / MT

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

CLE-DTW Metroplex Design Package

DTW South RNAV Standard Instrument Departures (SIDs) SNDRS_BARII_CLVIN

Name of Change	Date
SNDRS ONE SID – RNAV **BARII ONE SID - RNAV** **CLVIN ONE SID - RNAV**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedure (RNAV SID)	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☒ **Proposed Final Design (PFD)** ☐ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
4.3.2 DTW Departures	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
D21 Positions: W, E, K, P, F, S, Y **DTW** **ZOB Area: 8** **ZID Area: 5, 6** **ZAU Area: SE**	**D21: Steve Mack, Alex Huttenga** **ZOB: Mike Ferrell, Rick Norris** **ZAU: Joseph Bocik, Sam Passialis** **ZID: Steven Balkevicius, Noble Brown** **DTW: Brian Yax, John Overman**
Related/Dependent Submissions	**Associated Data Files**
All 16 new DTW STARs **CLE GTLKE SID** **CLE BRWNZ STAR** **STING recovery route** **Airspace Design Packages**	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose

The original RNAV procedure was redesigned to reduce track miles and minimize level-offs. The Study Team identified several areas where miles could be saved and level-offs minimized. The Study Team recommended optimization of lateral paths of current RNAV SIDs, as well as the creation of additional RNAV SIDS to support DTW departure flows.

CLE-DTW Metroplex Design Package

DTW South RNAV Standard Instrument Departures (SIDs) SNDRS BARII CLVIN

Study Team Issues and Solutions

The current STCLR SIX, ROD THREE, RID FIVE, FWA FOUR and PALCE SEVEN SIDs account for approximately 32% of all DTW jet departures.

- Issues
    - Lack of RNAV SIDs
    - Too many departure fixes
    - Departures not contained within appropriate ZOB sector (south flow)

- Solutions
    - RNAV departure procedure for traffic filed via ANNTS (S 1)
    - RNAV departure procedure for traffic filed via CAVVS (S 2)
    - RNAV departure procedure for traffic filed via SCORR (S 3)

CLE-DTW Metroplex Design Package

DTW South RNAV Standard Instrument Departures (SIDs) SNDRS BARII CLVIN

Proposed Final Design

All eleven DTW SIDs:

- Are "RNAV-Off-The-Ground" when departing DTW (all runways except 27L/R)
- Are "Non-Flow Dependent" meaning they can be used when departing any DTW runway
- Have a "Top Altitude" of 17,000 feet which coincides with the new ceiling of TRACON airspace
- Are intended for use by all aircraft; turbojets, turboprops, and props

These procedures will serve Detroit Metropolitan Wayne County International Airport (DTW) and the following satellite airports:

- CYQG Windsor Airport
- KARB Ann Arbor Municipal Airport
- KDET Coleman A Young Municipal Airport
- KMTC Selfridge Air National Guard Base
- KONZ Grosse Ile Municipal Airport
- KOZW Livingston County Spencer J. Hardy Airport
- KPTK Oakland County International Airport (Pontiac)
- KTTF Custer Airport
- KYIP Willow Run Airport
- KVLL Oakland/Troy Airport

The following airports will not be served by the new procedures: Oakland Southwest Airport (Y47), Canton-Plymouth Mettetal Airport (1D2), Myers-Diver's Airport (3TE), St Clair County International Airport (PHN), and Romeo State Airport (D98).

Those aircraft departing satellite airports will be vectored to join the procedure within an area extending 90 degrees on either side of the outbound course.

The Design Team proposal for these SIDs contains multiple departure headings and bi-directional flows utilizing Equivalent Lateral Spacing Operation (ELSO) to maximize runway departure efficiency and cross utilization of runways from both the east and west complexes.

CLE-DTW Metroplex Design Package

DTW South RNAV Standard Instrument Departures (SIDs) SNDRS BARII CLVIN

Changes from Study Team Recommendation:

SNDRS SID

- Removed the proposed eastbound transition to reduce track miles
- South flow transitions were moved to ensure separation when employing ELSO (10 degree divergence)
- TORRR transition moved to allow aircraft to join CVG and IND STARs
- FEZIK transition overlays Study Team proposal and is extended into ZAU airspace
- Altitude restrictions, except those needed to deconflict from downwind arrivals, were removed from the earlier design of this procedure

BARII SID

- Southern transitions were moved to ensure separation when employing ELSO (10 degree divergence)
- BARII departure gate moved as far west as possible to reduce track miles and accommodate the newly developed TOL Sting route
- Enroute segment parallels Study Team proposal
- Altitude restrictions, except those needed to deconflict from downwind arrivals, were removed from the earlier design of this procedure

CLVIN SID

- South flow transitions were moved to ensure separation when employing ELSO (10 degree divergence)
- CLVIN departure gate moved as far west as possible to reduce track miles and accommodate the newly developed TOL Sting route
- Enroute segment in ZID was moved west to avoid restricted airspace
- Altitude restrictions, except those needed to deconflict from downwind arrivals, were removed from the earlier design of this procedure

Figures 1, 2, 3, 4, 5 and 6 below depict the Proposed Final Designs.

CLE-DTW Metroplex Design Package

DTW South RNAV Standard Instrument Departures (SIDs) SNDRS BARII CLVIN

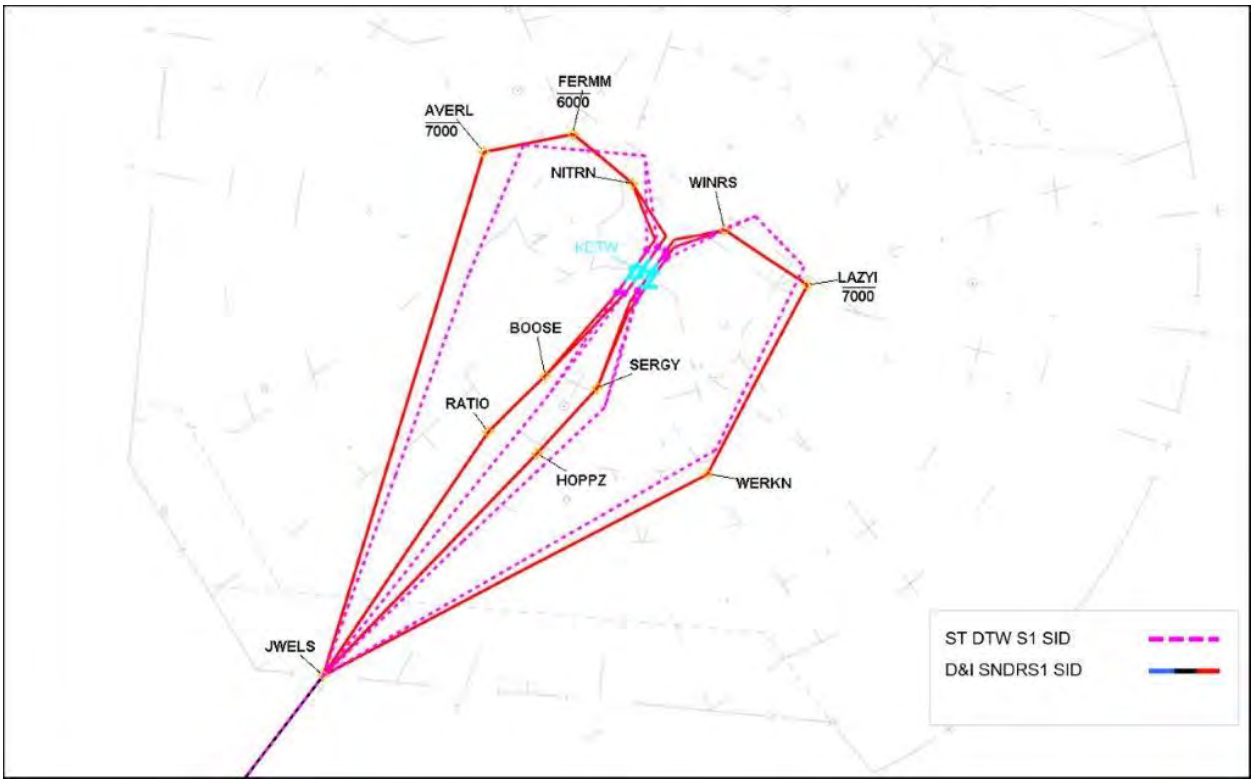

Figure 1. Proposed Final Design DTW SNDRS ONE SID – Terminal View

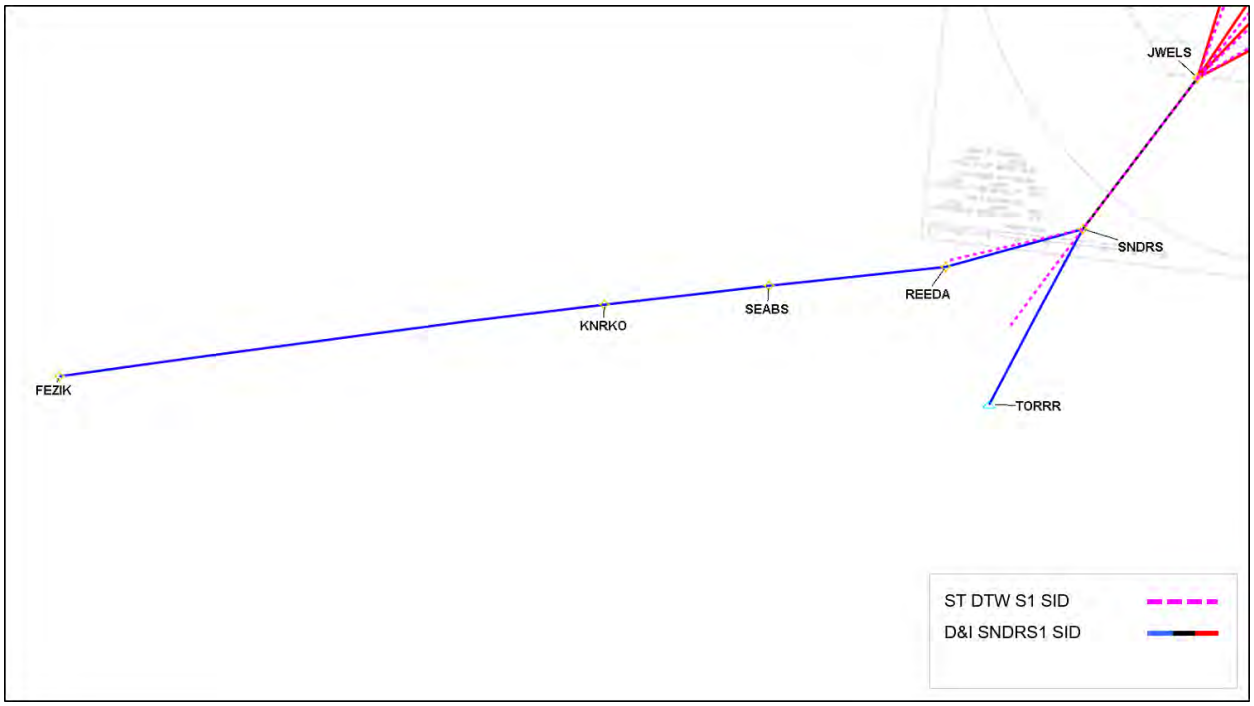

Figure 2. Proposed Final Design DTW SNDRS ONE SID – Enroute View

CLE-DTW Metroplex Design Package

DTW South RNAV Standard Instrument Departures (SIDs) SNDRS BARII CLVIN

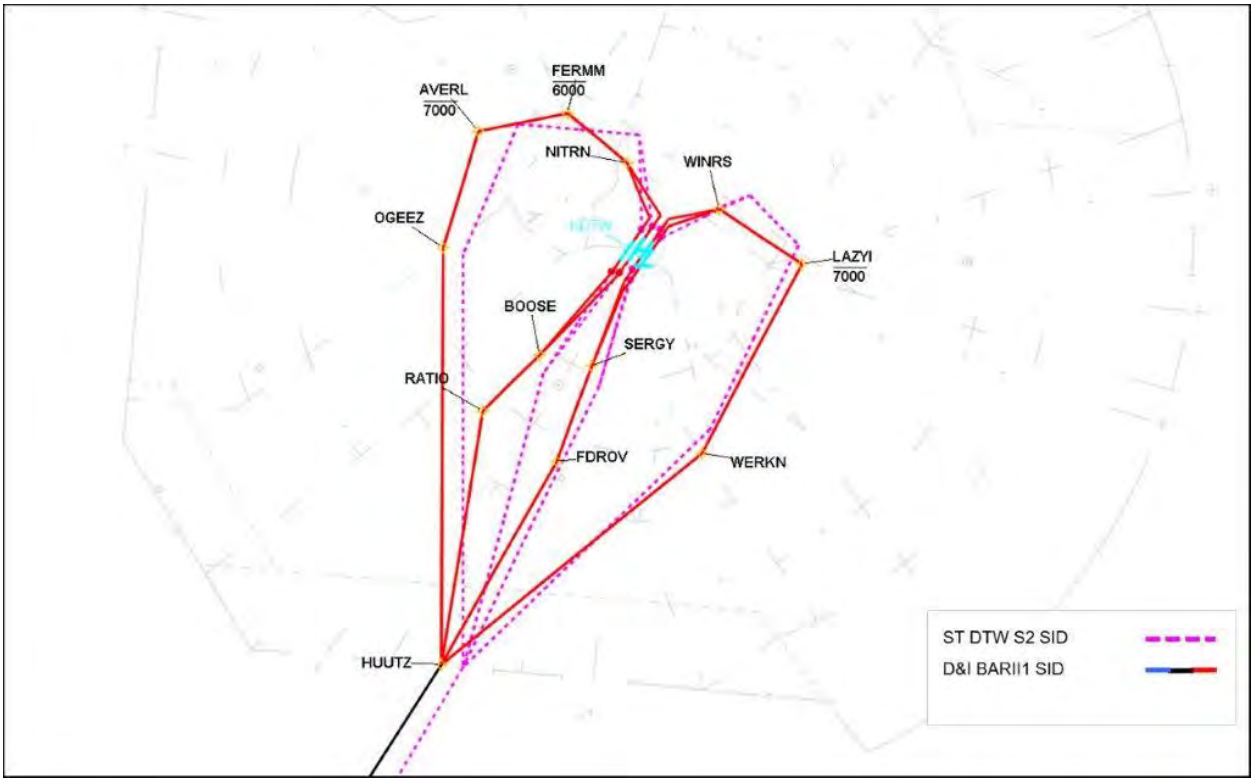

Figure 3. Proposed Final Design DTW BARII ONE SID – Terminal View

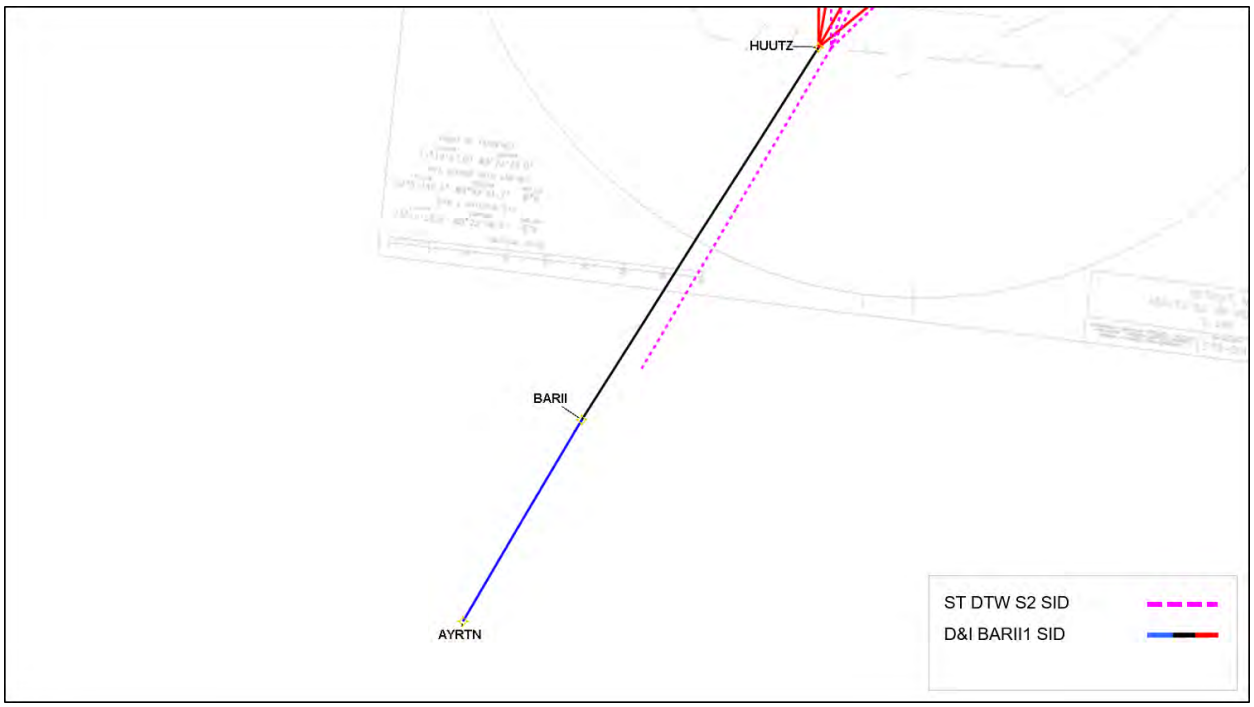

Figure 4. Proposed Final Design DTW BARII ONE SID – Enroute View

CLE-DTW Metroplex Design Package

DTW South RNAV Standard Instrument Departures (SIDs) SNDRS BARII CLVIN

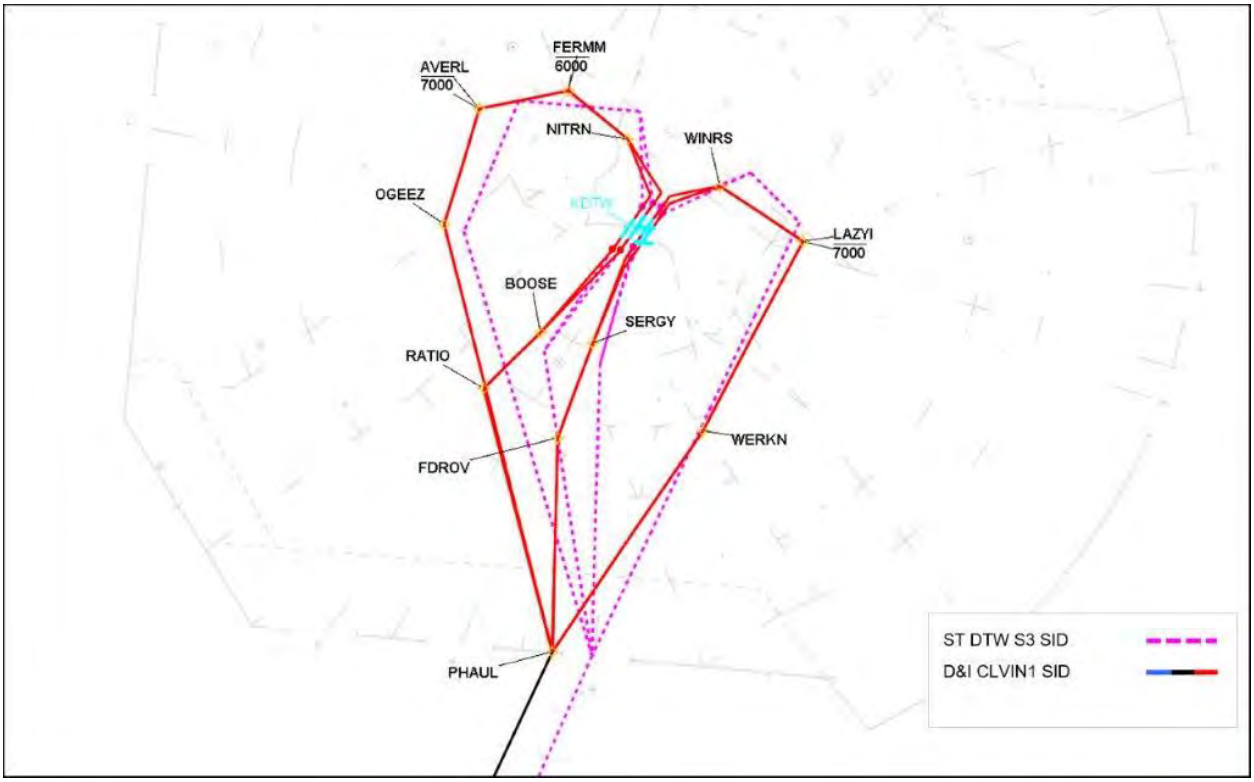

Figure 5. Proposed Final Design DTW CLVIN ONE SID – Terminal View

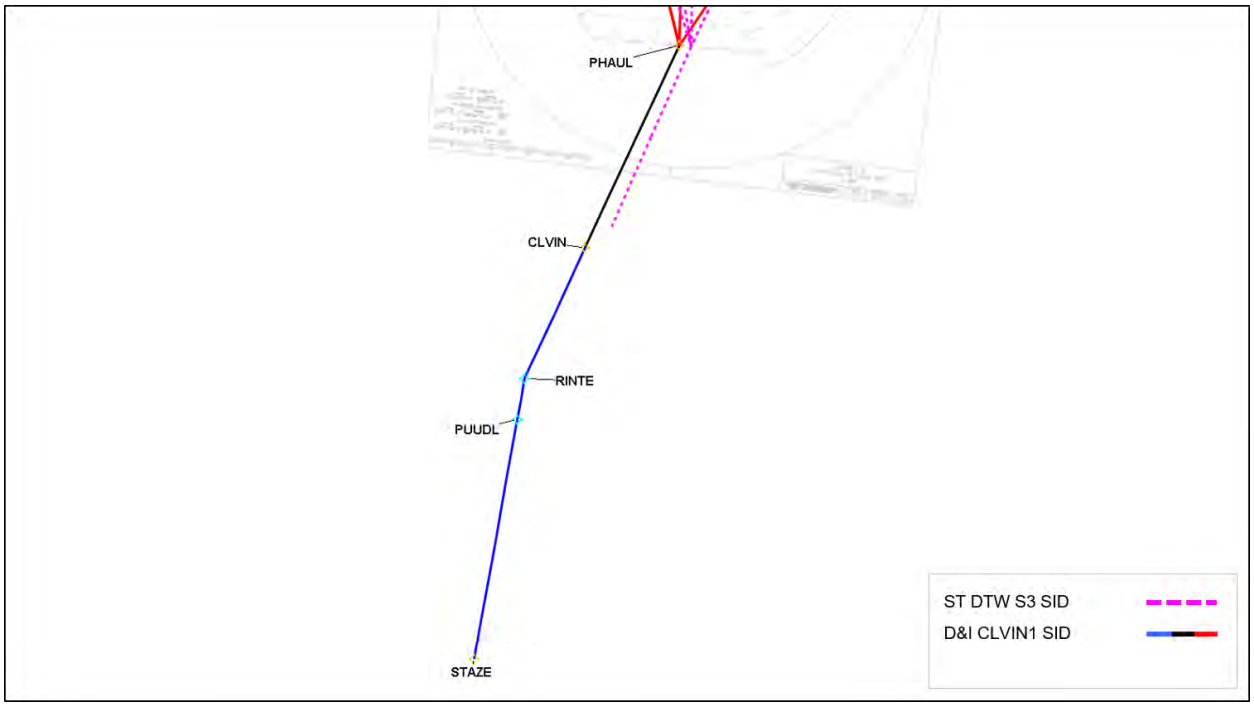

Figure 6. Proposed Final Design DTW CLVIN ONE SID – Enroute View

CLE-DTW Metroplex Design Package

DTW South RNAV Standard Instrument Departures (SIDs) SNDRS BARII CLVIN

Additional Design Considerations

- A high-level ISIM simulation was conducted to validate ZOB airspace in May 2015.
- A high fidelity Human-in-the-Loop (HITL) simulation was conducted to validate D21 TRACON airspace in June 2015.
- Industry flight simulator testing was conducted through July 2015 to validate these procedures.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will be required.
- Terminal and enroute automation changes will be required.

Attachments

1. DTW SNDRS ONE DEPARTURE RNAV Distribution Package
2. DTW BARII ONE DEPARTURE RNAV Distribution Package
3. DTW CLVIN ONE DEPARTURE RNAV Distribution Package

CLE-DTW Metroplex Design Package

DTW WEST RNAV Standard Instrument Departures (SIDs)

OAPM Design Package Change Control Sheet			
Date	**Description**	**TARGETS File Reference**	**FAA/NATCA Co-Lead Initials**
20170309	**DTW CCOBB SID** J Changed waypoint FERMM to FERRM. Purpose: FERMM waypoint name not reserved. FERRM is reserved.	20171107_CLE_DTW_ MASTER_FINAL.tgs	RW / MT
20170724	**DTW CCOBB SID** J Added AOA40 at BROZZ Purpose: To correct a criteria failure for required minimum or mandatory altitude at the IDF for SIDs with a radar vector component.	See above.	RW / MT
20170309	**DTW KAYLN SID** J Changed waypoint KALYN to KAYLN. Purpose: KALYN waypoint name not reserved, KAYLN was reserved.	See above.	RW / MT
20170530	**DTW KAYLN SID** J Swapped names of waypoints MTRCT and KAYLN. J Changed name of the procedure to KAYLN. Purpose: DTW ATCT concern about being able to pronounce the MTRCT Departure.	See above.	RW / MT
20170724	**DTW KAYLN SID** J Added AOA40 at MTRCT Purpose: To correct a criteria failure for required minimum or mandatory altitude at the IDF for SIDs with a radar vector component.	See above.	RW / MT

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

CLE-DTW Metroplex Design Package

DTW West RNAV Standard Instrument Departures (SIDs) KAYLN CCOBB

Name of Change	Date
MTRCT ONE SID - RNAV **CCOBB ONE SID - RNAV**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedure (RNAV SID)	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☒ **Proposed Final Design (PFD)** ☐ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
4.3.2 DTW Departures	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
D21 Positions: W, E, Y, P, S **DTW** **ZOB Area: 1, 2** **ZAU Area: NE, E**	**D21: Steve Mack, Alex Huttenga** **ZOB: Mike Ferrell, Rick Norris** **ZAU: Joseph Bocik, Sam Passialis** **DTW: Brian Yax, John Overman**
Related/Dependent Submissions	**Associated Data Files**
All 16 new DTW STARs **Airspace Design Packages**	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose

The original RNAV procedure was redesigned to reduce track miles and minimize level-offs. The Study Team identified several areas where miles could be saved and level-offs minimized. The Study Team recommended optimization of lateral paths of current RNAV SIDs, as well as the creation of additional RNAV SIDS to support DTW departure flows.

CLE-DTW Metroplex Design Package

DTW West RNAV Standard Instrument Departures (SIDs) KAYLN CCOBB

Study Team Issues and Solutions

The current PALCE SEVEN SID accounts for approximately 23% of all DTW jet departures.

- Issues
    - Lack of RNAV SIDs
    - Departures not contained within appropriate ZOB sector (south flow)
- Solutions
    - RNAV departure procedure for traffic filed via DUNKS (W1)
    - RNAV departure procedure for traffic filed via HARWL (W2)
    - RNAV departure procedure for southwest bound traffic (W3)

CLE-DTW Metroplex Design Package

DTW West RNAV Standard Instrument Departures (SIDs) KAYLN CCOBB

Proposed Final Design

All eleven DTW SIDs:

- Are "RNAV-Off-The-Ground" when departing DTW (all runways except 27L/R)
- Are "Non-Flow Dependent" meaning they can be used when departing any DTW runway
- Have a "Top Altitude" of 17,000 feet which coincides with the new ceiling of TRACON airspace
- Are intended for use by all aircraft; turbojets, turboprops, and props

These procedures will serve Detroit Metropolitan Wayne County International Airport (DTW) and the following satellite airports:

- CYQG Windsor Airport
- KARB Ann Arbor Municipal Airport
- KDET Coleman A. Young Municipal Airport
- KMTC Selfridge Air National Guard Base
- KONZ Grosse Ile Municipal Airport
- KOZW Livingston County Spencer J. Hardy Airport
- KPTK Oakland County International Airport (Pontiac)
- KTTF Custer Airport
- KYIP Willow Run Airport
- KVLL Oakland/Troy Airport

The following airports will not be served by the new procedures: Oakland Southwest Airport (Y47), Canton-Plymouth Mettetal Airport (1D2), Myers-Diver's Airport (3TE), St Clair County International Airport (PHN), and Romeo State Airport (D98).

Those aircraft departing satellite airports will be vectored to join the procedure within an area extending 90 degrees on either side of the outbound course.

The Design Team proposal for these SIDs contains multiple departure headings and bi-directional flows utilizing Equivalent Lateral Spacing Operation (ELSO) to maximize runway departure efficiency and cross utilization of runways from both the east and west complexes.

CLE-DTW Metroplex Design Package

DTW West RNAV Standard Instrument Departures (SIDs) KAYLN CCOBB

Changes from Study Team Recommendation:

MTRCT SID

- Used new available departure routes to the south reducing track miles and increasing efficiency
- North flow transition was moved to the north to deconflict from DTW STARs
- Combined the Study Team W2 and W3 SIDs into the MTRCT SID with the intent that some of the volume would be moved to the new MIGGY SID
- Procedure splits into two transitions; the KAINR transition serves Denver and airports west and the WILZZ transition serves Minneapolis and airports northwest
- Altitude restrictions were removed from the earlier design of this procedure
- The procedure now utilizes an open SID design to provide operational flexibility on both the south and north flows

CCOBB SID

- Moved southern transitions in approach control airspace to the south to deconflict with DTW STARs
- The CCOBB departure gate was moved north to ensure separation from Chicago area departures and for the new VCTRZ STAR
- Altitude restrictions, except those needed to deconflict from downwind arrivals, were removed from the earlier design of this procedure
- The procedure now utilizes an open SID design to provide operational flexibility on the south flow

Figures 1, 2, 3 and 4 below depict the Proposed Final Designs.

CLE-DTW Metroplex Design Package

DTW West RNAV Standard Instrument Departures (SIDs) KAYLN CCOBB

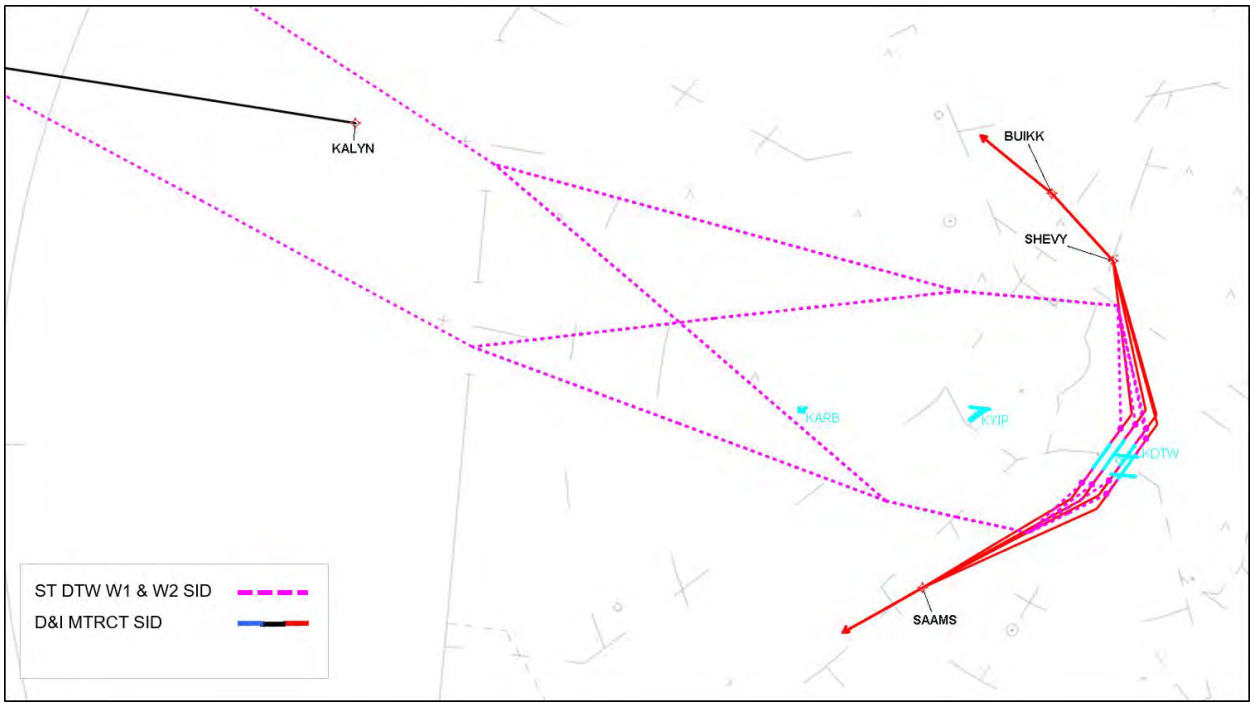

Figure 1. Proposed Final Design DTW MTRCT ONE SID – Terminal View

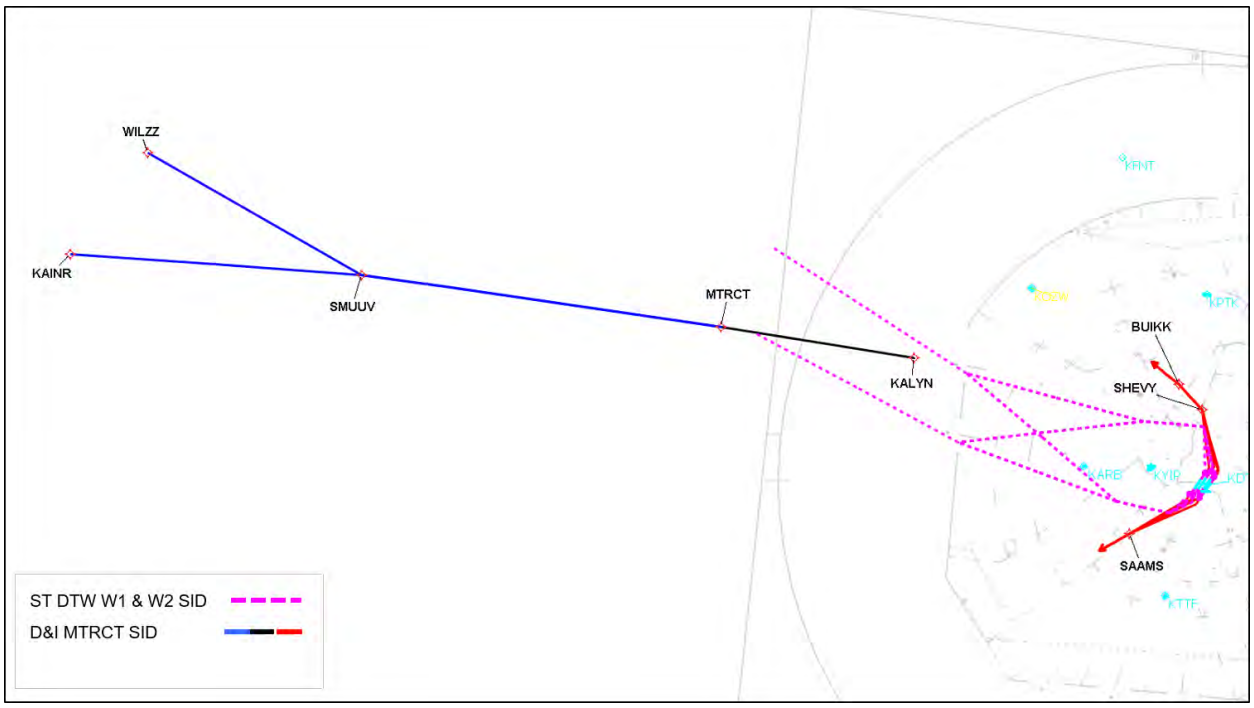

Figure 2. Proposed Final Design DTW MTRCT ONE SID – Enroute View

CLE-DTW Metroplex Design Package

DTW West RNAV Standard Instrument Departures (SIDs) KAYLN CCOBB

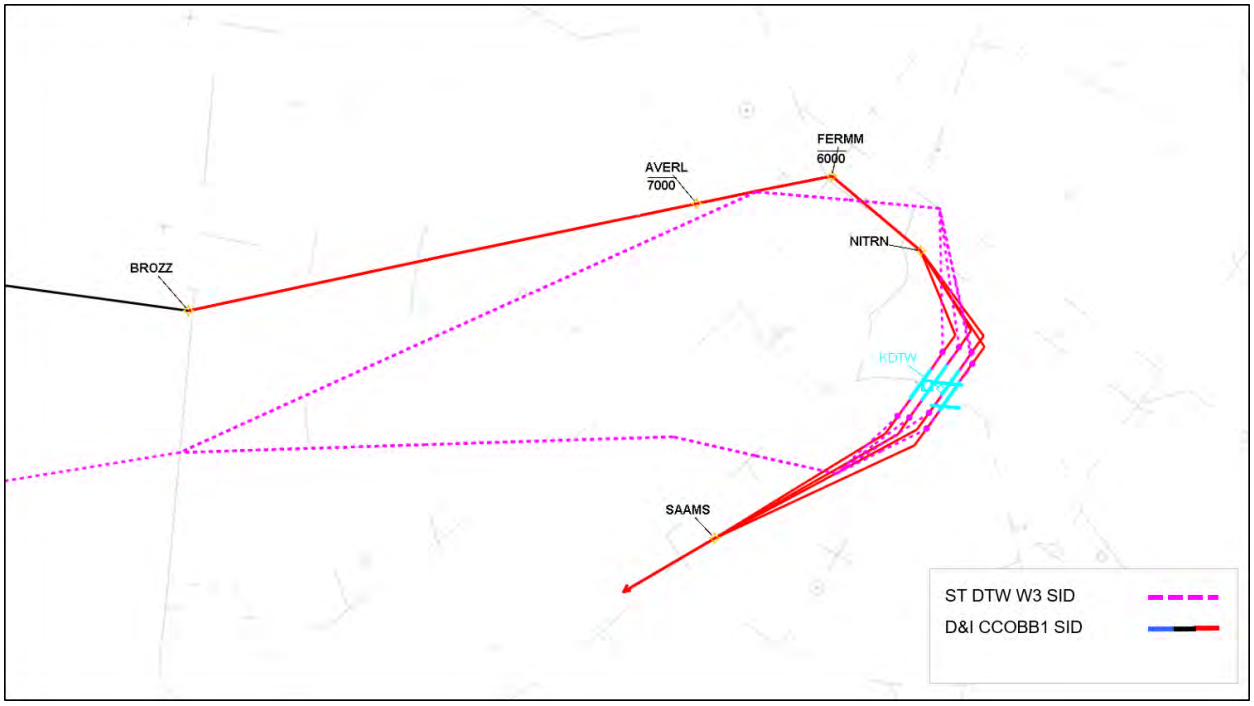

Figure 3. Proposed Final Design DTW CCOBB ONE SID – Terminal View

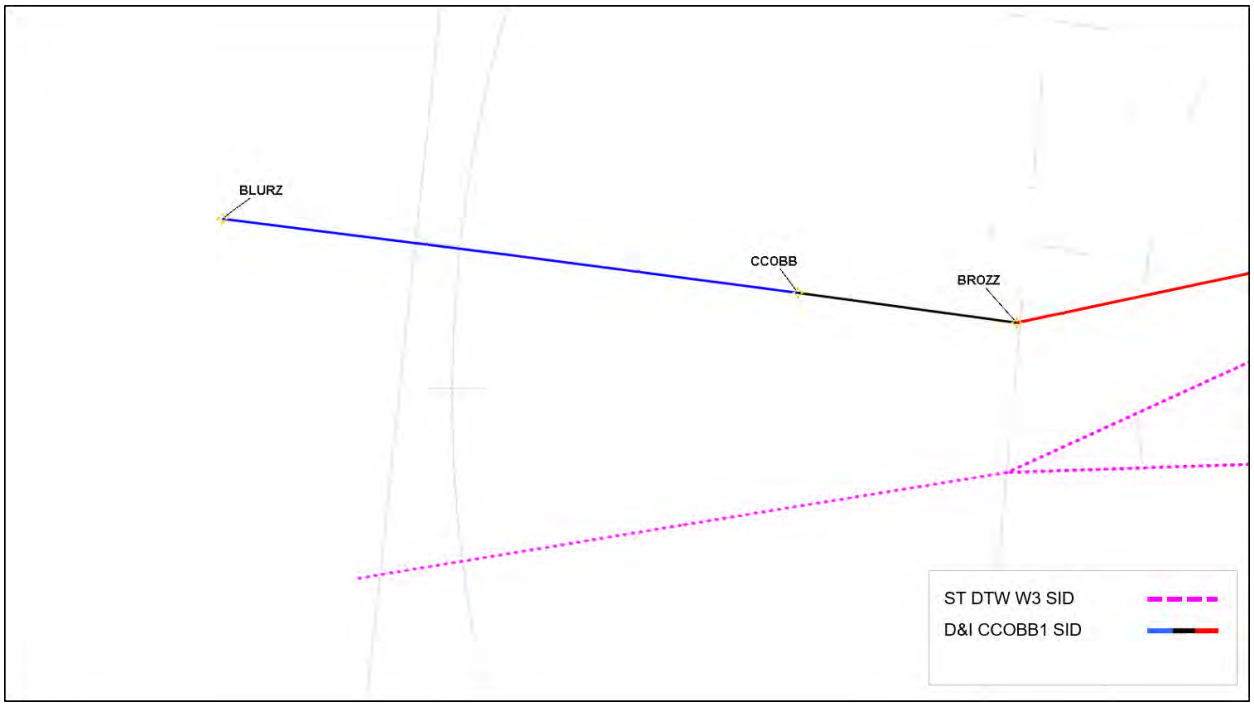

Figure 4. Proposed Final Design DTW CCOBB ONE SID – Enroute View

CLE-DTW Metroplex Design Package

DTW West RNAV Standard Instrument Departures (SIDs) KAYLN CCOBB

Additional Design Considerations

- A high-level ISIM simulation was conducted to validate ZOB airspace in May 2015.
- A high fidelity Human-in-the-Loop (HITL) simulation was conducted to validate D21 TRACON airspace in June 2015.
- Industry flight simulator testing was conducted through July 2015 to validate these procedures.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will be required.
- Terminal and enroute automation changes will be required.

Attachments

1. DTW MTRCT ONE DEPARTURE RNAV Distribution Package
2. DTW CCOBB ONE DEPARTURE RNAV Distribution Package

CLE-DTW Metroplex Design Package

DTW NE RNAV Standard Terminal Arrivals (STARs

OAPM Design Package Change Control Sheet			
Date	**Description**	**TARGETS File Reference**	**FAA/NATCA Co-Lead Initials**
20170808	**DTW CUUGR STAR** - Changed CUUGR to 100B110 (was AOA100) - Changed ROOAD to AOA100 - Deleted old SPRTS waypoint (was cross-over waypoint). - Changed FM leg from SKRUG to 218.18m - Changed FM leg from ROYYY to 215.68m - Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: To deconflict dual routes on the same cornerpost.	20171107_CLE_DTW_MASTER_FINAL.tgs	RW / MT
20170915	**DTW CUUGR STAR** - Remove speed and altitude restrictions at ROOAD (was 100B120 and 250K) - Add 250k speed restriction at CUUGR. - ROOAD waypoint to be retained per ATC/D21 request Purpose: Industry request to delete restriction at ROOAD.	See above.	RW / MT
20170928	**DTW CUUGR STAR** - Remove restrictions at VYPRE - Remove restrictions at JAIBE - No restrictions at GGUCE - Move WLFMN 1 NM east (same track) - Change WLFMN 240B250 @280k - MAVVV no change - Change WNGMN waypoint to DONEO Purpose: Collaborative FAA and industry solution to mitigating issues with 280 knot speed restrictions at or near the beginning of these 8 arrival procedures.	See above.	RW / MT
20170808	**DTW FERRL STAR** - Note: Expect runway 21L - Lost communications: Execute ILS RWY 21L from COBBO - Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: Add runway to expect and loss communications procedure on the short side STARs.	See above.	RW / MT

CLE-DTW Metroplex Design Package

DTW NE RNAV Standard Terminal Arrivals (STARs

20170928	**DTW FERRL STAR** - Remove restrictions at VOLPE - Change SAYCH 240B260 @280k Purpose: Collaborative FAA and industry solution to mitigating issues with 280 knot speed restrictions at or near the beginning of these 8 arrival procedures.	See above.	RW / MT
20170808	**DTW TPGUN STAR** - Note: Expect runway 21L - Lost communications: Execute ILS RWY 21L from RYDER - Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: Add runway to expect and loss communications procedure on the short side STARs.	See above.	RW / MT
20170915	**DTW TPGUN STAR** - Delete RYDER on this procedure (will remain on the SIAP) - Add new waypoint STRKR as new termination fix at altitude 10,000, no speed - Delete altitude/speed restrictions at waypoints CHZTR and GOHST - Change HLIWD to @10,000 260k Purpose: To disconnect this procedure from the SIAP. No change to lateral tracks.	See above.	RW / MT
20170928	**DTW TPGUN STAR** - Remove restrictions at VYPRE - Remove restrictions at JAIBE - No restrictions at GGUCE - Move WLFMN 1 NM east (same track) - Change WLFMN 240B250 @280k - MAVVV no change - Change WNGMN waypoint to DONEO Purpose: Collaborative FAA and industry solution to mitigating issues with 280 knot speed restrictions at or near the beginning of these 8 arrival procedures.	See above.	RW / MT

CLE-DTW Metroplex Design Package

DTW NE RNAV Standard Terminal Arrivals (STARs

20170808	**DTW WNGNT STAR** - Changed ROOAD to @120 (was 100B120) - Deleted old CADLC waypoint - Deleted SKRUG & ROYYY waypoints, disconnected SIAPs - After YNDER, added new flyover waypoint CADLC at N42 12 10.38 W83 31 27.78 alt @120, FM leg 218.18m - After ROOAD, added new flyover waypoint SPRTS at N42 06 27.28 W83 16 28.71 alt @120, FM leg 215.68 - Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: To deconflict dual routes on the same cornerpost.	See above.	RW / MT
20170928	**DTW WNGNT STAR** - Remove restrictions at VOLPE - Change SAYCH 240B260 @280k Purpose: Collaborative FAA and industry solution to mitigating issues with 280 knot speed restrictions at or near the beginning of these 8 arrival procedures.	See above.	RW / MT

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

CLE-DTW Metroplex Design Package

DTW NE Cornerpost –South/W Flow FERRL_TPGUN & North Flow WNGNT_CUUGR RNAV STARs

Name of Change	Date
DTW FERRL ONE STAR – RNAV (NE1 – S/W) **DTW TPGUN ONE STAR – RNAV (NE2 –S/W)** **DTW WNGNT ONE STAR – RNAV (NE1 - N)** **DTW CUUGR ONE STAR – RNAV (NE2 - N)**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedure (RNAV STAR)	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☒ **Proposed Final Design (PFD)** ☐ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
4.3.1.2 DTW NE 1 and NE 2 SOUTH/W STARs **4.3.1.1 DTW NE 1 and NE 2 NORTH STARs**	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
D21: Positions E, F, D, B, P **ZOB: Areas 2, 3** **MTC** **CZYZ**	**D21: Steve Mack, Alex Huttenga** **ZOB: Mike Ferrell, Rick Norris**
Related/Dependent Submissions	**Associated Data Files**
All new DTW SIDs **RNP/RNAV Tie ins** **AXXIS SAT STAR** **D21, ZOB, & MTC Airspace Design Packages**	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose:

These proposed STARs were designed to minimize level-offs and allow flexibility for multiple runway transitions. These procedures reduce controller complexity and add optimization for the user. Use of Optimized Profile Descents (OPDs) will allow for less verbiage between controllers and pilots, therefore reducing the possibility of hear back/read back errors. The advantage for the user is fewer level offs and a chance for significant fuel savings.

The Study Team recommended the creation of RNAV STARs with OPDs for all primary DTW arrival flows at each corner post. In addition, the Study Team proposed individual solutions for each corner post arrival flow. Dual RNAV STARs were created parallel to the current STARs with more direct routing to the approach courses, similar to flows which are in use today. This design would reduce miles flown, fuel burn and CO2 emissions.

CLE-DTW Metroplex Design Package

DTW NE Cornerpost –South/W Flow FERRL_TPGUN & North Flow WNGNT_CUUGR RNAV STARs

Study Team Issues and Solutions

The DTW SPICA TWO STAR accounts for 23% of all DTW jet arrivals.

- Issues
    - Lack of RNAV STAR from the southeast
    - Enroute traffic sequenced near terminal boundary
    - Actual flight tracks do not follow current arrival procedures
    - Level segments and inefficient later paths
    - Lack of dual arrivals for triple ILS operation
    - Lack of OPDs
- Solutions
    - Dual RNAV STARs with OPDs that are flow specific
    - Dual RNAV STARs allow independent operations when appropriate conditions exist, including Triple ILS

CLE-DTW Metroplex Design Package

DTW NE Cornerpost –South/W Flow FERRL_TPGUN & North Flow WNGNT_CUUGR RNAV STARs

Final Design

The Design Team is proposing the implementation of four RNAV STARs for the Northeast (NE) cornerpost, two for each flow (south/west and north flows) at DTW.

These DTW STARs:

- Will serve Detroit Metropolitan Wayne County International Airport (DTW) only.
- Are intended for use by all turbojet and turboprop aircraft
    - "Optimized Profile Descents" (OPDs) were designed for use by turbojet aircraft
    - Turboprop aircraft will utilize the same ground tracks but will be delivered to the TRACON at hard altitudes charted as Vertical Navigation Planning Information
    - Propeller aircraft will be delivered via routing as determined by LOA
- Are "Flow Dependent" meaning the procedures are designed for use when on a particular flow; south or north, but not both flows
- Are connected to DTW ILS, RNAV (GPS), and RNP approaches to runways 22R/21L and 04L/03R as appropriate (see the Design Package for DTW SIAP
- Are compliant with new descent gradient and deceleration criteria, IAW FAA 8260.3C

When appropriate, Cleveland Center will issue turbojets the "Descend Via" clearance.

Changes from the Study Team Recommendation - Enroute:

The enroute portions of FERRL/WNGNT and TPGUN/CUUGR STARs were moved south and north, respectively. This ensures that the routes are separated by eight miles where they cross the D21/ZOB boundary to facilitate holding. This also deconflicts the routes with overflight traffic on Q436 to ORD and airports further west. A transition to the TPGUN route from BOBTA to GGUCE was created to overlay Q806 to GGUCE to coincide with newly implemented WTM routing and to avoid creating a duplicate and/or parallel route. Fix GGUCE was created at YQO because the NAVAID is scheduled for future decommissioning and it provides an intersection for crossing restrictions to be added to the OPD.

A transition via AXXIS (CYYZ) was eliminated due to the necessity of placing TPGUN arrival fix further east to facilitate descents when DTW is on a south flow. Additionally, the AXXIS transition would cause a late merge into the stream of traffic already established on the TPGUN/CUUGR OPD. Further, the late merge would be very difficult to accommodate in TBFM and on an OPD.

The crossover sections of the STARs were eliminated because of conflicts with overflight traffic, and because the crossover point fell inside the Time Based Flow Management (TBFM) freeze horizon.

CLE-DTW Metroplex Design Package

DTW NE Cornerpost –South/W Flow FERRL_TPGUN & North Flow WNGNT_CUUGR RNAV STARs

Changes from Study Team Recommendation – Terminal South/West Flow DTW FERRL and TPGUN ONE STARs:

- DTW FERRL ONE
    - The route was moved north to accommodate an intercept point approximately three miles northeast of the current location of COUNT and TIGRZ intersections. The new intercept points are located outside the triple Instrument Landing System bar to facilitate future utilization of triple ILS approach procedures. These changes reduced track miles and simplified the arrival.
    - Holding patterns were added at WNGNT and VOLPE
    - All runway transitions were removed from the earlier design of this procedure, in favor or creating a single common route to the termination waypoint
    - Additional chart notes:
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 21L transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Speed restriction: Turbojet aircraft descend via Mach number until intercepting 280K. Maintain 280K until slowed by STAR.
        - Corresponding RNAV STAR is WNGNT Expect WNGNT when DTW is landing north.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

- DTW TPGUN ONE
    - The route was moved north to accommodate an intercept point approximately three miles northeast of the current location of COUNT and TIGRZ intersections. The new intercept points are located outside the triple Instrument Landing System (ILS) bar to facilitate future utilization of triple ILS approach procedures. These changes reduced track miles and simplified the arrival.
    - Holding patterns were added at TPGUN and WNGMN
    - All runway transitions were removed from the earlier design of this procedure, in favor or creating a single common route to the termination waypoint
    - Additional chart notes:
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 21L transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Speed restriction: Turbojet aircraft descend via Mach number until intercepting 280K. Maintain 280K until slowed by STAR.
        - Corresponding RNAV STAR is CUUGR Expect CUUGR when DTW is landing north.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

CLE-DTW Metroplex Design Package

DTW NE Cornerpost –South/W Flow FERRL_TPGUN & North Flow WNGNT_CUUGR RNAV STARs

Figures 1 and 2 below depict the proposed final design for the south/west flow.

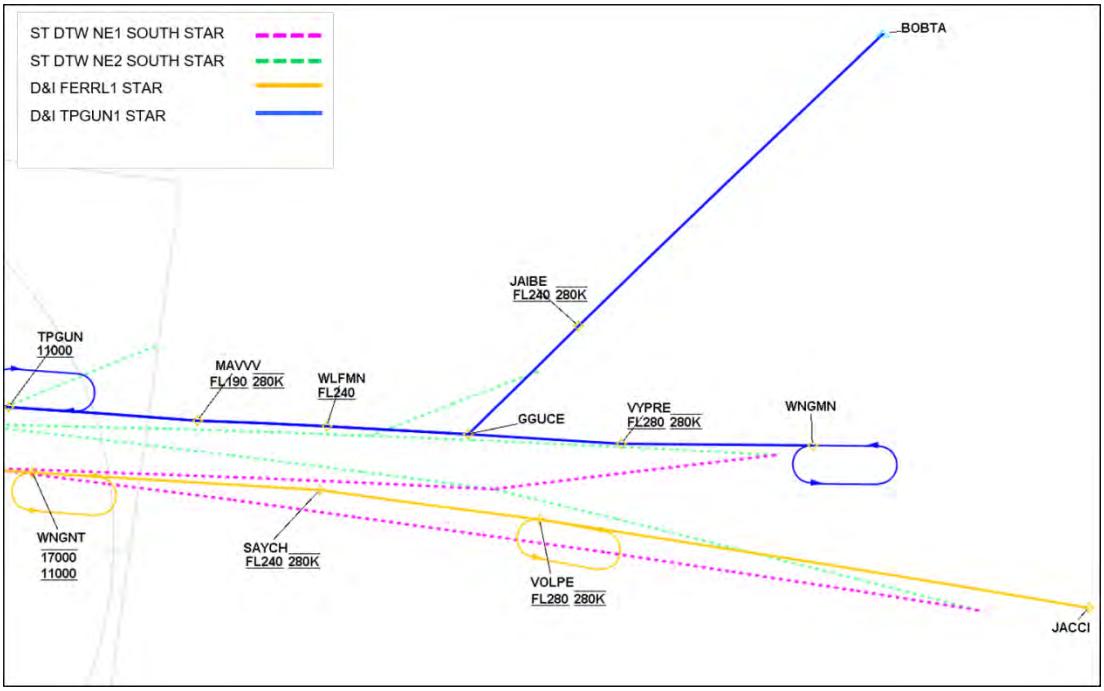

Figure 1. Proposed Design of the DTW FERRL & TPGUN ONE STARs South/W Flow Enroute View

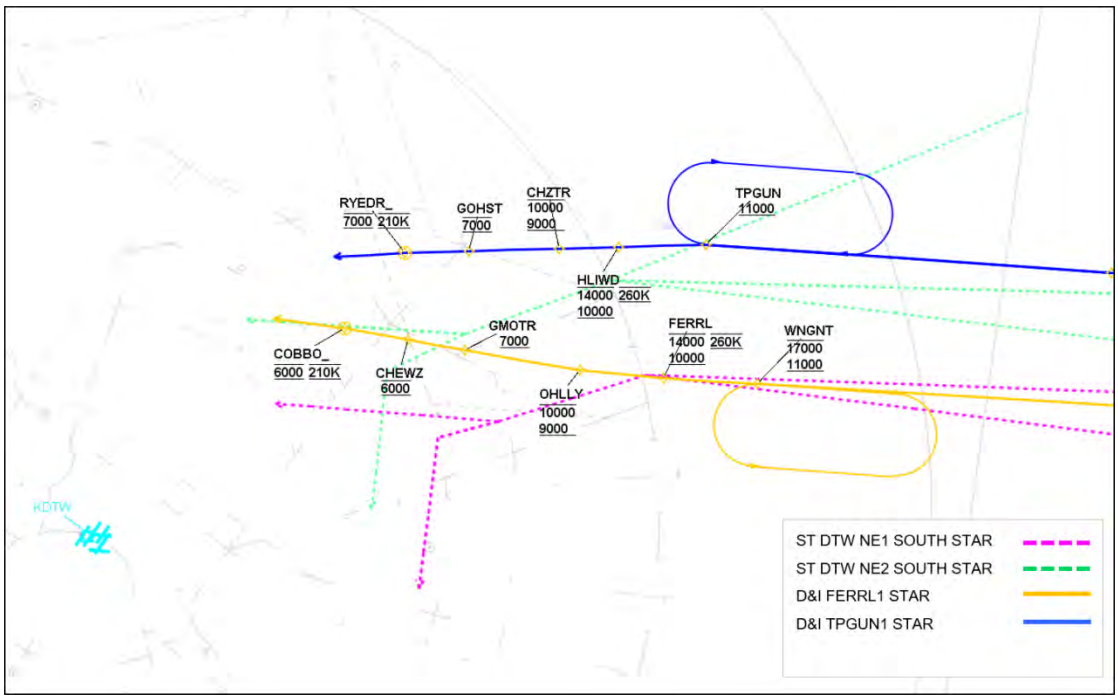

Figure 2. Proposed Design of the DTW FERRL & TPGUN ONE STARs South/W Flow Terminal View

CLE-DTW Metroplex Design Package

DTW NE Cornerpost –South/W Flow FERRL_TPGUN & North Flow WNGNT_CUUGR RNAV STARs

Changes from Study Team Recommendation – Terminal North Flow DTW WNGNT and CUUGR ONE STARs:

- DTW WNGNT ONE
    - The terminal portion of the procedure mirrors the study team proposal.
    - Holding patterns were added at WNGNT and VOLPE
    - The runway transition for runway 04R was combined with the runway 03R transition
    - Additional chart notes:
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 03R transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Speed restriction: Turbojet aircraft descend via Mach number until intercepting 280K. Maintain 280K until slowed by STAR.
        - Corresponding RNAV STAR is FERRL Expect FERRL when DTW is landing south/west.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

- DTW CUUGR ONE
    - The terminal portion of the procedure mirrors the study team proposal.
    - Holding patterns were added at TPGUN and WNGMN
    - The runway transition for runway 04R was combined with the runway 03R transition
    - Additional Chart Notes:
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 03R transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Speed restriction: Turbojet aircraft descend via Mach number until intercepting 280K. Maintain 280K until slowed by STAR.
        - Corresponding RNAV STAR is TPGUN Expect TPGUN when DTW is landing south/west.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

Figures 3 and 4 below depict the proposed final design for the north flow.

CLE-DTW Metroplex Design Package

DTW NE Cornerpost –South/W Flow FERRL_TPGUN & North Flow WNGNT_CUUGR RNAV STARs

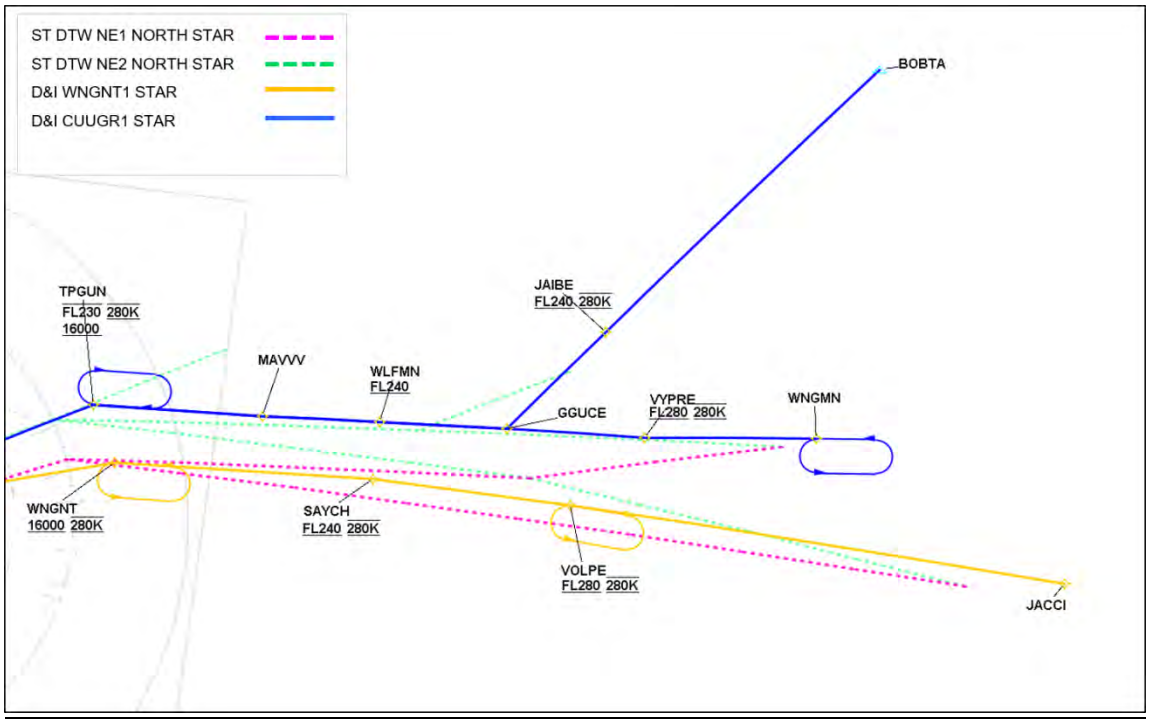

Figure 3. Proposed Design of the DTW WNGNT & CUUGR ONE STARs North Flow Enroute View

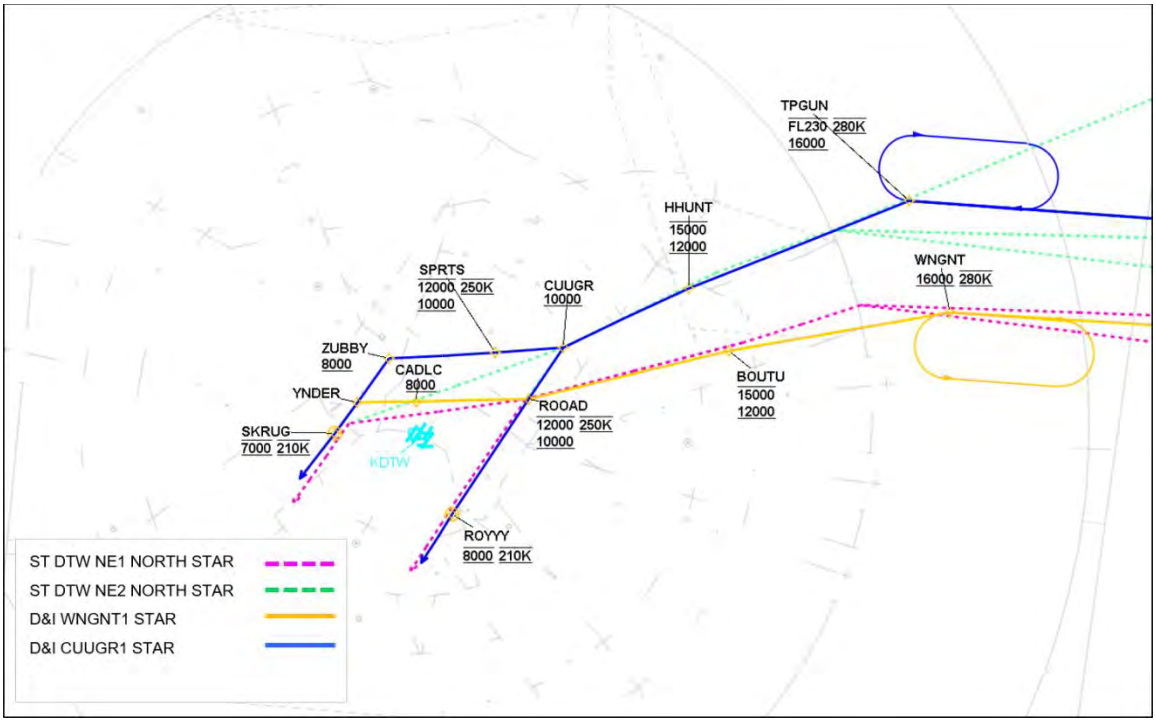

Figure 4. Proposed Design of the DTW WNGNT & CUUGR ONE STARs - North Flow Terminal View

CLE-DTW Metroplex Design Package

DTW NE Cornerpost –South/W Flow FERRL_TPGUN & North Flow WNGNT_CUUGR RNAV STARs

Additional Design Considerations

- A high-level ISIM simulation was conducted to validate ZOB airspace in May 2015.
- A high fidelity Human-in-the-Loop (HITL) simulation was conducted to validate D21 TRACON airspace in June 2015.
- Industry flight simulator testing was conducted through July 2015 to validate these procedures.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will be required.
- Terminal and enroute automation changes will be required.

Attachments

1. DTW FERRL ONE ARRIVAL RNAV Distribution Package
2. DTW TPGUN ONE ARRIVAL RNAV Distribution Package
3. DTW WNGNT ONE ARRIVAL RNAV Distribution Package
4. DTW CUUGR ONE ARRIVAL RNAV Distribution Package

CLE-DTW Metroplex Design Package

DTW SE RNAV Standard Terminal Arrivals (STARs

OAPM Design Package Change Control Sheet			
Date	**Description**	**TARGETS File Reference**	**FAA/NATCA Co-Lead Initials**
20170808	**DTW BONZZ STAR** • Changed TMBIT to 100B110 (was 100B120) • Changed FM leg from DZMND to 033.32m • Changed FM leg from TBRRD to 035.75m • Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: To deconflict dual routes on the same cornerpost.	20171107_CLE_DTW_ MASTER_FINAL.tgs	RW / MT
20170928	**DTW BONZZ STAR** • Remove restrictions at BOBCT • Remove restrictions at KOZAR • No restrictions at SSAID • Change WHHAT 240B270 @280k Purpose: Collaborative FAA and industry solution to mitigating issues with 280 knot speed restrictions at or near the beginning of these 8 arrival procedures.	See above.	RW / MT
20170808	**DTW CRAKN STAR** • Note: Expect runway 03R • Lost communications: Execute ILS RWY 03R from MERCA • Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: Add runway to expect and loss communications procedure on the short side STARs.	See above.	RW / MT
20170928	**DTW CRAKN STAR** • Remove restrictions at COLTZ • Change MYMOM 240B270 @280k Purpose: Collaborative FAA and industry solution to mitigating issues with 280 knot speed restrictions at or near the beginning of these 8 arrival procedures.	See above.	RW / MT

CLE-DTW Metroplex Design Package

DTW SE RNAV Standard Terminal Arrivals (STARs

20170808	**DTW HTROD STAR** • Changed HTROD to @120 (was 100B120) • Deleted TBRRD & DZMND waypoints, disconnected SIAPs • Deleted altitude restriction at TRPRS (was AOA80) • After TRPRS, added new flyover waypoint SEEGR at N42 18 23.33 W83 26 50.40 alt @120, FM leg 033.32m • After FFORK, added new flyover waypoint MODLT at N42 13 44.82 W83 11 09.72 alt @120, FM leg 035.72m • Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: To deconflict dual routes on the same cornerpost.	See above.	RW / MT
20170928	**DTW HTROD STAR** • Remove restrictions at COLTZ • Change MYMOM 240B270 @280k Purpose: Collaborative FAA and industry solution to mitigating issues with 280 knot speed restrictions at or near the beginning of these 8 arrival procedures.	See above.	RW / MT
20170808	**DTW KLYNK STAR** • Note: Expect runway 03R • Lost communications: Execute ILS RWY 03R from BRDER • Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: Add runway to expect and loss communications procedure on the short side STARs.	See above.	RW / MT
20170915	**DTW KLYNK STAR** • Delete BRDER on this procedure (will remain on the SIAP) • Add new waypoint GUTTR as new termination fix at altitude 12,000, no speed • Delete altitude restrictions at waypoints KLYNK • Change BONZZ to @12,000 260k Purpose: To disconnect this procedure from the SIAP. No change to lateral tracks	See above.	RW / MT
20170928	**DTW KLYNK STAR** • Remove restrictions at BOBCT • Remove restrictions at KOZAR • No restrictions at SSAID • Change WHHAT 240B270 @280k Purpose: Collaborative FAA and industry solution to mitigating issues with 280 knot speed restrictions at or near the beginning of these 8 arrival procedures.	See above.	RW / MT

CLE-DTW Metroplex Design Package

DTW SE Cornerpost – South Flow BONZZ/HTROD & North/W Flow CRAKN/KLYNK RNAV STARs

Name of Change	Date
DTW BONZZ ONE STAR – RNAV (SE1 - S) **DTW HTROD ONE STAR – RNAV (SE2 – S)** **DTW CRAKN ONE STAR – RNAV (SE1 – N/W)** **DTW KLYNK ONE STAR – RNAV (SE2 –N/W)**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedure (RNAV STAR)	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☒ **Proposed Final Design (PFD)** ☐ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
4.3.1.3 DTW SE 1 and SE 2 SOUTH STARs **4.3.1.4 DTW SE 1 and SE 2 NORTH/W STARs**	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
D21 Positions E, F, K, B **ZOB Areas 4, 6, 8** **ZID 87, 97** **TOL**	**D21: Steve Mack, Alex Huttenga** **ZOB: Mike Ferrell, Rick Norris** **ZID: Steven Balkevicius, Noble Brown**
Related/Dependent Submissions	**Associated Data Files**
All new DTW SIDs **RNP/RNAV Tie ins** **FOREY SAT STAR** **D21, ZOB, TOL & CLE Airspace Design Packages** **CLE GTLKE & ZAAPA SIDs**	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose:

These proposed STARs were designed to minimize level-offs and allow flexibility for multiple runway transitions. These procedures reduce controller complexity and add optimization for the user. Use of Optimized Profile Descents (OPDs) will allow for less verbiage between controllers and pilots, therefore reducing the possibility of hear back/read back errors. The advantage for the user is fewer level offs and a chance for significant fuel savings.

The Study Team recommended the creation of RNAV STARs with OPDs for all primary DTW arrival flows at each corner post. In addition, the Study Team proposed individual solutions for each corner post arrival flow. Dual RNAV STARs were created parallel to the current STARs with more direct routing to the approach courses, similar to flows which are in use today. This design would reduce miles flown, fuel burn and CO2 emissions.

CLE-DTW Metroplex Design Package

DTW SE Cornerpost – South Flow BONZZ/HTROD & North/W Flow CRAKN/KLYNK RNAV STARs

Study Team Issues and Solutions

The DTW GEMNI THREE and WEEDA ONE STAR accounts for 29% of all DTW jet arrivals.

- Issues
    - Lack of RNAV STAR from the southeast
    - Enroute traffic sequenced near terminal boundary
    - Actual flight tracks do not follow current arrival procedures
    - Level segments and inefficient later paths
    - Lack of dual arrivals for triple ILS operation
    - Lack of OPDs
- Solutions
    - Dual RNAV STARs with OPDs that are flow specific
    - Dual RNAV STARs allow independent operations when appropriate conditions exist, including Triple ILS

CLE-DTW Metroplex Design Package

DTW SE Cornerpost – South Flow BONZZ/HTROD & North/W Flow CRAKN/KLYNK RNAV STARs

Proposed Final Design

The Design Team is proposing the implementation of four RNAV STARs for the Southeast (SE) cornerpost, two for each flow (south and north/west flows) at DTW.

These DTW STARs:

- Will serve Detroit Metropolitan Wayne County International Airport (DTW) only.
- Are intended for use by all turbojets and turboprop aircraft
    - "Optimized Profile Descents" (OPDs) were designed for use by turbojet aircraft
    - Turboprop and prop aircraft will utilize the same ground tracks but will be delivered to the TRACON at hard altitudes charted as Vertical Navigation Planning Information
- Are "Flow Dependent" meaning the procedures are designed for use when on a particular flow; south or north, but not both flows
- Are connected to DTW ILS, RNAV (GPS), and RNP approaches to runways 22R/21L and 04L/03R as appropriate (see the Design Package for DTW SIAPs)
- Are compliant with new descent gradient and deceleration criteria, IAW FAA 8260.3C

When appropriate, Cleveland Center will issue turbojets the "Descend Via" clearance.

Changes from the Study Team Recommendation - Enroute:

The enroute portion of the BONZZ and HTROD STARs was moved east approximately 2 miles (overlays original WEEDA STAR routing) to accommodate TOL military arrival and departure traffic, and to prevent restricting the climb of CLE westbound departures. A more direct routing towards the airport was precluded by the current Class B shelf south of DTW; the placement of the route was required to maintain Class B containment of DTW arrivals. The route begins at the SUBWY intersection and extends to the existing COLTZ intersection. Waypoint MYMOM was added to mark the top of descent (TOD) at FL240, and THATZ was added for the purpose of issuing a crossing restriction at or above FL200 to clear CLE departures.

The south transition of the CRAKN and KLYNK STARs beginning at JAMOX overlays the study team proposal. The east transition beginning at KOZAR to WHHAT was modified by moving the arrival route west to provide adequate lateral distance from the proposed FOREY satellite arrival. The change also facilitated moving the proposed merge point of the two study team transitions to waypoint WHHAT, 10 miles south of the study team proposed merge point. The revised merge point accommodates TBFM metering and allows room to blend the two arrival streams as required. An altitude restriction of at or above FL240 was added at WHHAT intersection to clear CLE departure traffic climbing westbound.

CLE-DTW Metroplex Design Package

DTW SE Cornerpost – South Flow BONZZ/HTROD & North/W Flow CRAKN/KLYNK RNAV STARs

Changes from Study Team Recommendation – Terminal South Flow DTW BONZZ and HTROD ONE STARs:

- DTW BONZZ ONE
    - The terminal portion of the BONZZ 1 STAR parallels the study team proposal after the design team route merges at WP811. Both the BONZZ 1 and HTROD 1 routes remain in a single stream to avoid having two separate routes cross the southbound departure corridors.
    - Holding patterns were added at BONZZ and WHHAT
    - The runway transition for runway 22L was combined with the runway 21L transition
    - Additional chart notes:
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 21L transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Speed restriction: Turbojet aircraft descend via Mach number until intercepting 280K. Maintain 280K until slowed by STAR.
        - Corresponding RNAV STAR is KLYNK Expect KLYNK when DTW is landing north/west.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

- DTW HTROD ONE
    - The terminal portion of the HTROD 1 STAR overlays the study team proposal, except that the BONZZ 1 and HTROD 1 routes remain in a single stream to avoid having two separate routes cross the southbound departure corridors.
    - Holding patterns were added at CRAKN and MYMOM
    - The runway transition for runway 22L was combined with the runway 021L transition
    - Additional chart notes:
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 21L transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Speed restriction: Turbojet aircraft descend via Mach number until intercepting 280K. Maintain 280K until slowed by STAR.
        - Corresponding RNAV STAR is CRAKN Expect CRAKN when DTW is landing north/west.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

Figures 1 and 2 below depict the proposed final design for the south flow.

CLE-DTW Metroplex Design Package

DTW SE Cornerpost – South Flow BONZZ/HTROD & North/W Flow CRAKN/KLYNK RNAV STARs

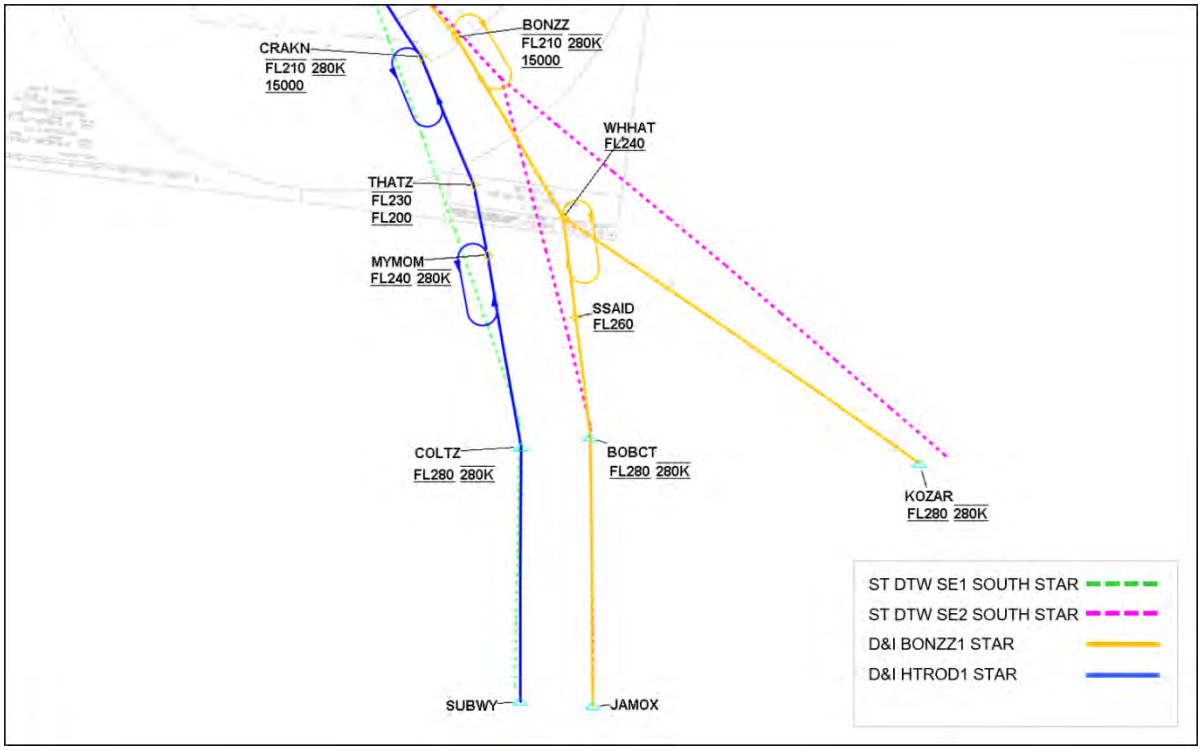

Figure 1. Proposed Design of the DTW BONZZ and HTROD ONE STARs South Flow Enroute View

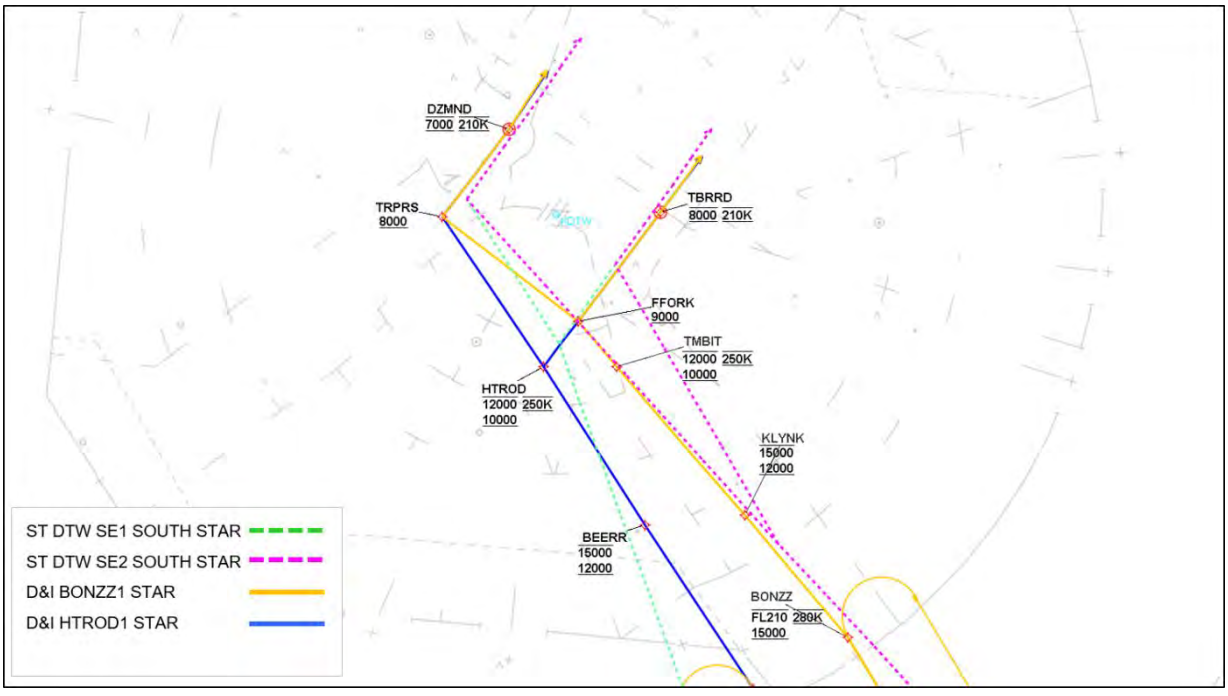

Figure 2. Proposed Design of the DTW BONZZ & HTROD ONE STARs South Flow Terminal View

CLE-DTW Metroplex Design Package

DTW SE Cornerpost – South Flow BONZZ/HTROD & North/W Flow CRAKN/KLYNK RNAV STARs

Changes from Study Team Recommendation – Terminal North/West Flow DTW CRAKN and KLYNK ONE STARs:

- DTW CRAKN ONE
    - The terminal portion of the SE 1 CRAKN STAR parallels the study team proposal to CLDON.
    - Holding patterns were added at CRAKN and MYMOM
    - All runway transitions were removed from the earlier design of this procedure, in favor or creating a single common route to the termination waypoint
    - Additional Chart Notes
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 03R transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Speed restriction: Turbojet aircraft descend via Mach number until intercepting 280K. Maintain 280K until slowed by STAR.
        - Corresponding RNAV STAR is HTROD Expect HTROD when DTW is landing south.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

- DTW KLYNK ONE
    - The terminal portion of the SE 2 KLYNK STAR parallels the study team proposal beginning at BONZZ, however the route does not split until FFORK. The location of the split was chosen for safety reasons to allow climbing and crossing southbound DTW departure traffic to cross one arrival route instead of two.
    - Holding patterns were added at BONZZ and WHHAT
    - All runway transitions were removed from the earlier design of this procedure, in favor or creating a single common route to the termination waypoint
    - Additional Chart Notes:
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 03R transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Speed restriction: Turbojet aircraft descend via Mach number until intercepting 280K. Maintain 280K until slowed by STAR.
        - Corresponding RNAV STAR is BONZZ Expect BONZZ when DTW is landing south.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

Figures 3 and 4 below depict the proposed final design for the north/west flow.

CLE-DTW Metroplex Design Package

DTW SE Cornerpost – South Flow BONZZ/HTROD & North/W Flow CRAKN/KLYNK RNAV STARs

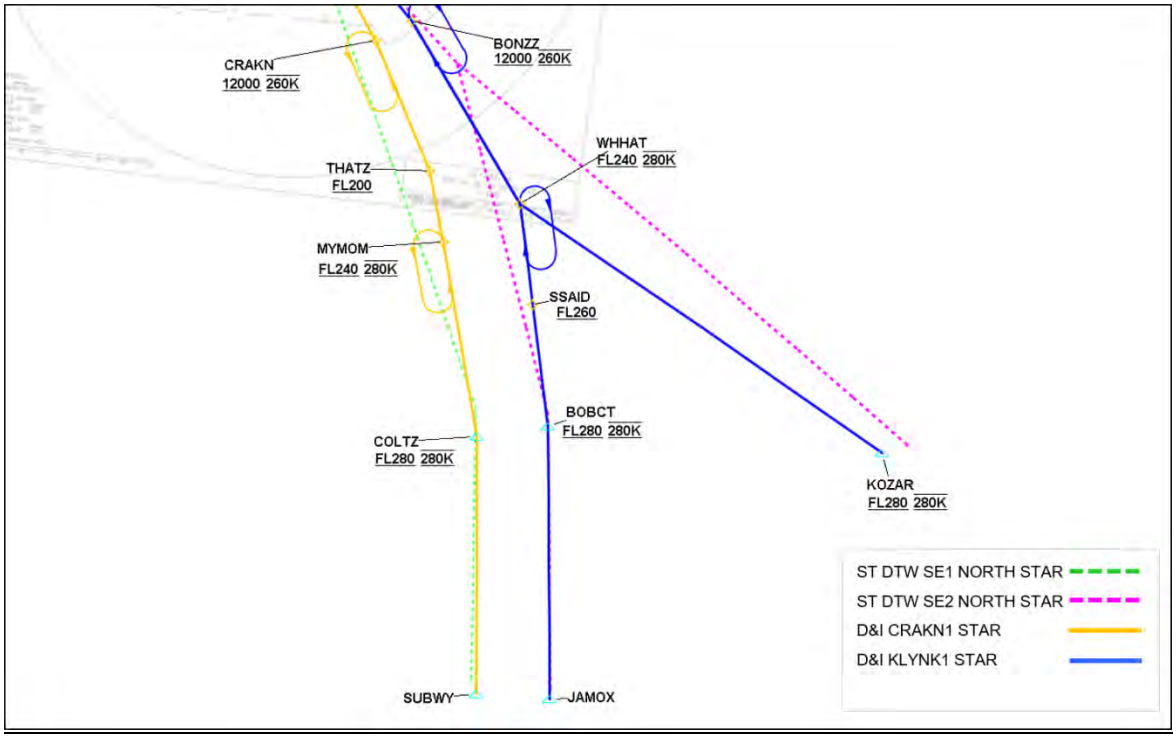

Figure 3. Proposed Design of the DTW CRAKN & KLYNK ONE STARs North/West Flow Enroute View

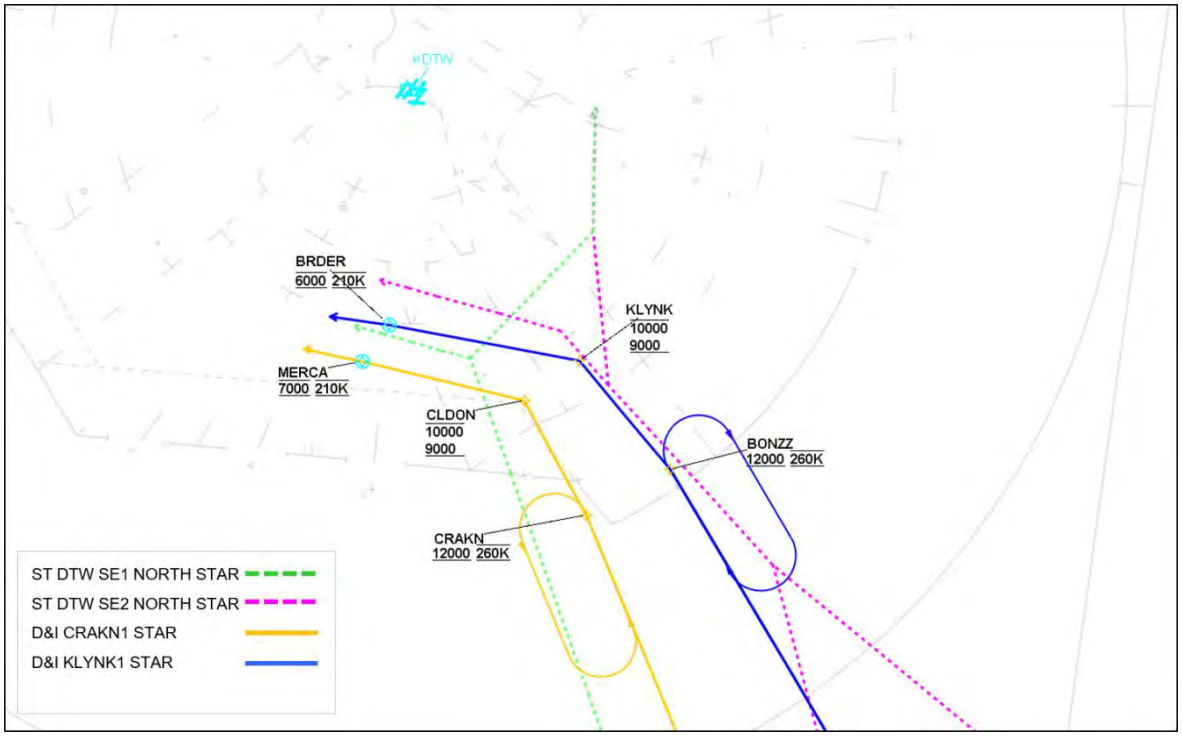

Figure 4. Proposed Design of the DTW CRAKN & KLYNK ONE STARs - North/West Flow Terminal View

CLE-DTW Metroplex Design Package

DTW SE Cornerpost – South Flow BONZZ/HTROD & North/W Flow CRAKN/KLYNK RNAV STARs

Additional Design Considerations

- A high-level ISIM simulation was conducted to validate ZOB airspace in May 2015.
- A high fidelity Human-in-the-Loop (HITL) simulation was conducted to validate D21 TRACON airspace in June 2015.
- Industry flight simulator testing was conducted through July 2015 to validate these procedures.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will be required.
- Terminal and enroute automation changes will be required.

Attachments

1. DTW BONZZ ONE ARRIVAL RNAV Distribution Package
2. DTW HTROD ONE ARRIVAL RNAV Distribution Package
3. DTW CRAKN ONE ARRIVAL RNAV Distribution Package
4. DTW KLYNK ONE ARRIVAL RNAV Distribution Package

CLE-DTW Metroplex Design Package

DTW SW RNAV Standard Terminal Arrivals (STARs

OAPM Design Package Change Control Sheet			
Date	**Description**	**TARGETS File Reference**	**FAA/NATCA Co-Lead Initials**
20170808	**DTW HANBL STAR** • Changed HEMIE to 100B110 (was 100B120) • Changed FM leg from DZMND to 033.32m • Changed FM leg from TBRRD to 035.75m • Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: To deconflict dual routes on the same cornerpost.	20171107_CLE_DTW_ MASTER_FINAL.tgs	RW / MT
20170515	**DTW HAYLL STAR** • Added standard holding pattern at HAYLL, right turns. Purpose: Originally omitted in error.	See above.	RW / MT
20170808	**DTW HAYLL STAR** • Note: Expect runway 04L • Lost communications: Execute ILS Z RWY 04L from GRBAC • Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: Add runway to expect and loss communications procedure on the short side STARs.	See above.	RW / MT
20170915	**DTW HAYLL STAR** • Delete GRBAC on this procedure (will remain on the SIAP) • Add new waypoint BRDDY as new termination fix at altitude 11,000, no speed • Delete altitude restrictions at waypoints VCTRZ • Change HAYLL to @11,000 260k Purpose: To disconnect this procedure from the SIAP. No change to lateral tracks.	See above.	RW / MT
20170808	**DTW LECTR STAR** • Note: Expect runway 04L • Lost communications: Execute ILS Z RWY 04L from SYKOE • Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: Add runway to expect and loss communications procedure on the short side STARs.	See above.	RW / MT
20170505	**DTW VCTRZ STAR** • Added standard holding pattern at HAYLL, right turns. Purpose: Originally omitted in error.	See above.	RW / MT

CLE-DTW Metroplex Design Package

DTW SW RNAV Standard Terminal Arrivals (STARs

20170808	**DTW VCTRZ STAR** - Changed UUOFM to @120 (was 100B120) - Deleted altitude restriction at HRMON (was AOA80) - Deleted TBRRD & DZMND waypoints, disconnected SIAPs - After TRPRS, added new flyover waypoint SEEGR at N42 18 23.33 W83 26 50.40 alt @120, FM leg 033.32m - After RAAMM, added new flyover waypoint MODLT at N42 13 44.82 W83 11 09.72 alt @120, FM leg 035.72m - Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: To deconflict dual routes on the same cornerpost.	See above.	RW / MT

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

CLE-DTW Metroplex Design Package

DTW SW Cornerpost – South/W Flow HANBL/VCTRZ & North Flow LECTR/HAYLL RNAV STARs

Name of Change	Date
DTW HANBL ONE STAR – RNAV (SW1 – S/W) **DTW VCTRZ ONE STAR – RNAV (SW2 – S/W)** **DTW LECTR ONE STAR – RNAV (SW1 – N)** **DTW HAYLL ONE STAR – RNAV (SW2 –N)**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedure (RNAV STAR)	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☒ **Proposed Final Design (PFD)** ☐ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
4.3.1.6 DTW SW 1 and SW 2 SOUTH/W STARs **4.3.1.5 DTW SW 1 and SW 2 NORTH STARs**	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
D21 Positions S, E, Y, W, A **ZOB Areas 1, 8** **ZAU** **ZID** **TOL**	**D21: Steve Mack, Alex Huttenga** **ZOB: Mike Ferrell, Rick Norris** **ZAU: Joseph Bocik, Sam Passialis** **ZID: Steven Balkevicius, Noble Brown**
Related/Dependent Submissions	**Associated Data Files**
All new DTW SIDs **RNP/RNAV Tie ins** **PETTE SAT STAR** **D21, ZOB, TOL & CLE Airspace Design Packages**	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose:

These proposed STARs were designed to minimize level-offs and allow flexibility for multiple runway transitions. These procedures reduce controller complexity and add optimization for the user. Use of Optimized Profile Descents (OPDs) will allow for less verbiage between controllers and pilots, therefore reducing the possibility of hear back/read back errors. The advantage for the user is fewer level offs and a chance for significant fuel savings.

The Study Team recommended the creation of RNAV STARs with OPDs for all primary DTW arrival flows at each corner post. In addition, the Study Team proposed individual solutions for each corner post arrival flow. Dual RNAV STARs were created parallel to the current STARs with more direct routing to the approach courses, similar to flows which are in use today. This design would reduce miles flown, fuel burn and CO2 emissions.

CLE-DTW Metroplex Design Package

DTW SW Cornerpost – South/W Flow HANBL/VCTRZ & North Flow LECTR/HAYLL RNAV STARs

Study Team Issues and Solutions

The DTW MIZAR THREE STAR accounts for 26% of all DTW jet arrivals.

- Issues
    - Lack of RNAV STAR from the southwest
    - Enroute traffic sequenced near terminal boundary
    - Actual flight tracks do not follow current arrival procedures
    - Level segments and inefficient lateral paths
    - Lack of dual arrivals for triple ILS operation
    - Lack of OPDs
- Solutions
    - Dual RNAV STARs with OPDs that are flow specific
    - Dual RNAV STARs allow independent operations when appropriate conditions exist, including Triple ILS

CLE-DTW Metroplex Design Package

DTW SW Cornerpost – South/W Flow HANBL/VCTRZ & North Flow LECTR/HAYLL RNAV STARs

Proposed Final Design

The Design Team is proposing the implementation of four RNAV STARs for the Southwest (SW) cornerpost, two for each flow (south/west and north flows) at DTW.

These DTW STARs:

- Will serve Detroit Metropolitan Wayne County International Airport (DTW) only.
- Are intended for use by all turbojet and turboprop aircraft
    - "Optimized Profile Descents" (OPDs) were designed for use by turbojet aircraft
    - Turboprop and prop aircraft will utilize the same ground tracks but will be delivered to the TRACON at hard altitudes charted as Vertical Navigation Planning Information
- Are "Flow Dependent" meaning the procedures are designed for use when on a particular flow; south or north, but not both flows
- Are connected to DTW ILS, RNAV (GPS), and RNP approaches to runways 22R/21L and 04L/03R as appropriate (see the Design Package for DTW SIAPs)
- Are compliant with new descent gradient and deceleration criteria, IAW FAA 8260.3C

When appropriate, Cleveland Center will issue turbojets the "Descend Via" clearance.

Changes from the Study Team Recommendation - Enroute:

The enroute portion of the HANBL and LECTR STARs was moved approximately 3 miles west of the Study Team proposal because of the close proximity to ZAU adjacent airspace; the move will reduce controller workload by reducing the number of point-outs of aircraft on the STAR. The STAR begins at WWODD which is 6 miles north of VHP (scheduled for future decommissioning). The route parallels the Study Team proposal and the transition from the south via TORRR to SHANX overlays the original proposal.

The enroute portion of the VCTRZ and HAYLL STARs from GIJ was relocated north approximately 6.5 miles at SAMPL intersection to not interfere with ORD and MDW departures crossing over the route. The route was considered to be operationally infeasible when traffic was superimposed over ORD and MDW eastbound departure routes. HOSSA waypoint was moved approximately 3 miles west of the common ZAU/ZOB boundary to facilitate holding. The south transition from WP02 to WP04 was removed because its utilization would involve verbal coordination with the three centers and it would be a significant workload to blend a single stream on this route. The middle transition from WP07 to WP04 was also removed as this route was considered unusable because of traffic conflicts with westbound ORD and MDW arrival traffic. Additionally, no track data exists to mimic the middle route.

CLE-DTW Metroplex Design Package

DTW SW Cornerpost – South/W Flow HANBL/VCTRZ & North Flow LECTR/HAYLL RNAV STARs

Changes from Study Team Recommendation – Terminal South/West Flow DTW HANBL and VCTRZ ONE STARs:

- DTW HANBL ONE
    - The transition to the opposing downwind legs was split at HEMIE, allowing a softer turn and optimizing the south flow operation.
    - Holding patterns were added at SWAYD, VDUUB, SHANX, and HANBL
    - The runway transition for runway 22L was combined with the runway 22R transition
    - The runway transition for runways 27L/R was removed from the earlier design
    - Additional chart notes:
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 22R transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Corresponding RNAV STAR is LECTR Expect LECTR when DTW is landing north.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

- DTW VCTRZ ONE
    - The terminal portion of the VCTRZ STAR joins the proposed route inside D21 airspace at DZMND and overlays the remainder of the STAR.
    - A holding pattern was added at SAADD
    - The runway transition for runway 22L was combined with the runway 22R transition
    - The runway transition for runways 27L/R was removed from the earlier design
    - Additional chart notes:
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 22R transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Corresponding RNAV STAR is HAYLL Expect HAYLL when DTW is landing north.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

Figures 1 and 2 below depict the proposed final design for the south/west flow.

CLE-DTW Metroplex Design Package

DTW SW Cornerpost – South/W Flow HANBL/VCTRZ & North Flow LECTR/HAYLL RNAV STARs

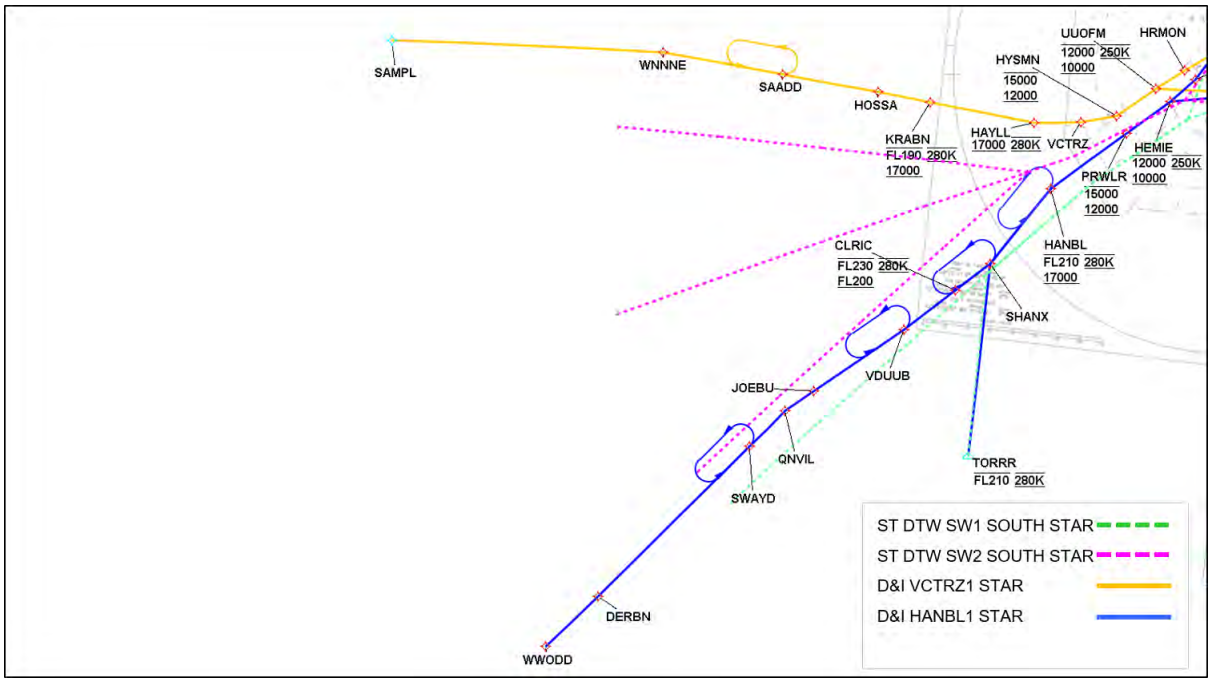

Figure 1. Proposed Design of the DTW HANBL & VCTRZ ONE STARs – South/W Flow Enroute View

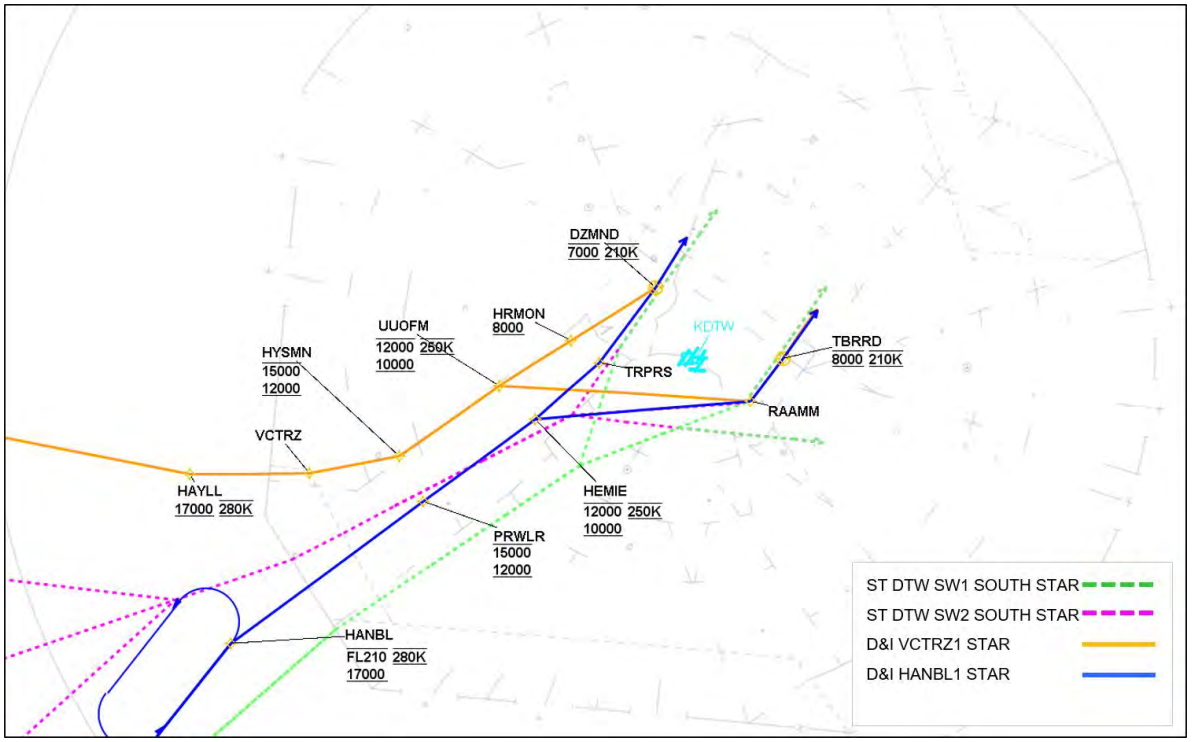

Figure 2. Proposed Design of the DTW HANBL & VCTRZ ONE STARs – South/W Flow Terminal View

CLE-DTW Metroplex Design Package

DTW SW Cornerpost – South/W Flow HANBL/VCTRZ & North Flow LECTR/HAYLL RNAV STARs

Changes from Study Team Recommendation – Terminal North Flow DTW LECTR and HAYLL ONE STARs:

- DTW LECTR ONE
    - The east/west runway complex split occurs at LECTR by moving the route west thus allowing for transitions to the base legs, allowing a softer turn and to optimize the south flow operation.
    - Holding patterns were added at SWAYD, VDUUB, SHANX, and HANBL
    - All runway transitions were removed from the earlier design of this procedure, in favor or creating a single common route to the termination waypoint
    - Additional Chart Notes
        - For use by turbojet and turboprop aircraft only
        - Fly the runway 04L transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Corresponding RNAV STAR is HANBL Expect HANBL when DTW is landing south/west.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

- DTW HAYLL ONE
    - The design diverges from the Study Team proposal after VCTRZ using base leg entries to join the final approach course.
    - A holding pattern was added at SAADD
    - All runway transitions were removed from the earlier design of this procedure, in favor or creating a single common route to the termination waypoint
    - Additional Chart Notes:
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 04L transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Corresponding RNAV STAR is VCTRZ Expect VCTRZ when DTW is landing south/west.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

Figures 3 and 4 below depict the proposed final design for the north flow.

CLE-DTW Metroplex Design Package

DTW SW Cornerpost – South/W Flow HANBL/VCTRZ & North Flow LECTR/HAYLL RNAV STARs

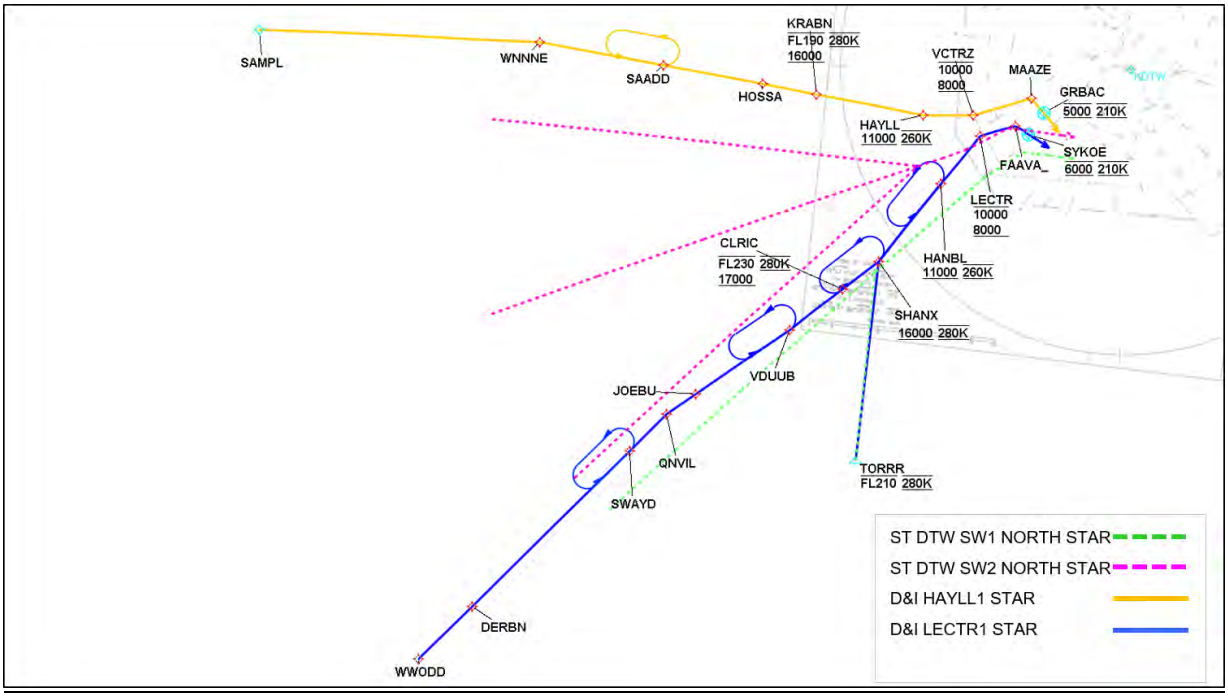

Figure 3. Proposed Design of the DTW LECTR & HAYLL ONE STARs – North Flow Enroute View

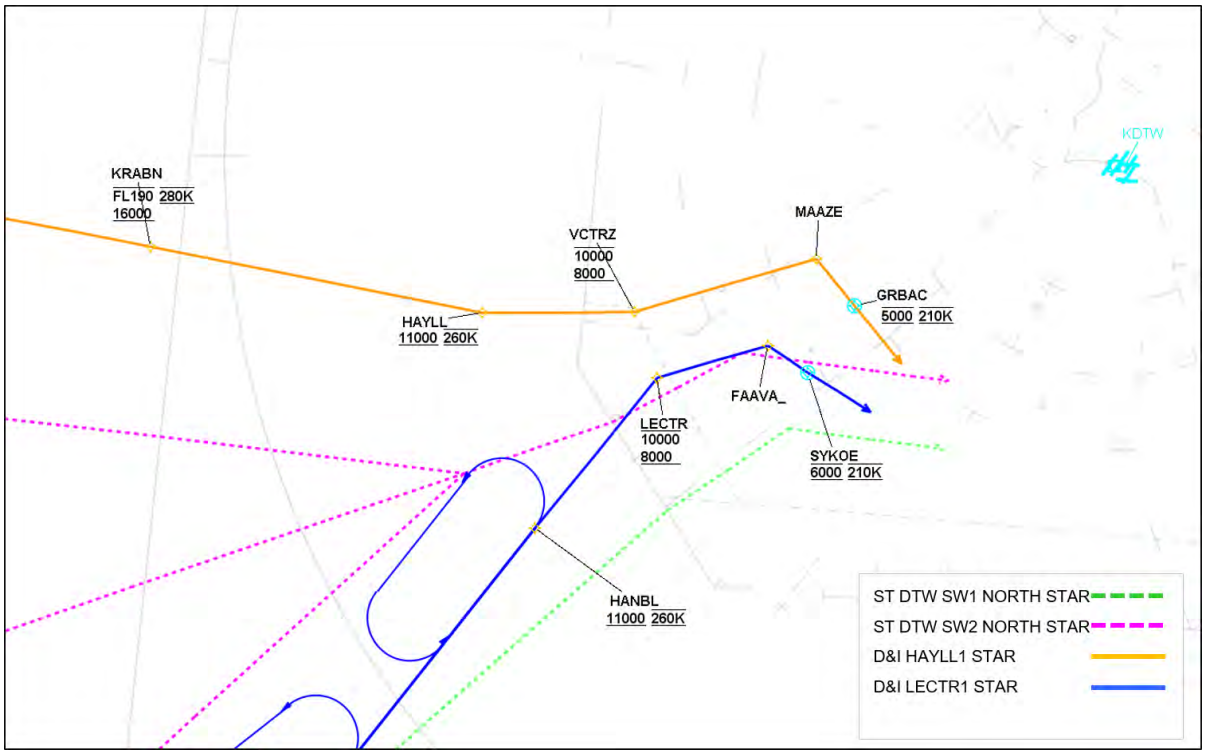

Figure 4. Proposed Design of the DTW LECTR & HAYLL ONE STARs - North Flow Terminal View

CLE-DTW Metroplex Design Package

DTW SW Cornerpost – South/W Flow HANBL/VCTRZ & North Flow LECTR/HAYLL RNAV STARs

Additional Design Considerations

- A high-level ISIM simulation was conducted to validate ZOB airspace in May 2015.
- A high fidelity Human-in-the-Loop (HITL) simulation was conducted to validate D21 TRACON airspace in June 2015.
- Industry flight simulator testing was conducted through July 2015 to validate these procedures.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will be required.
- Terminal and enroute automation changes will be required.

Attachments

1. DTW HANBL ONE ARRIVAL RNAV Distribution Package
2. DTW VCTRZ ONE ARRIVAL RNAV Distribution Package
3. DTW LECTR ONE ARRIVAL RNAV Distribution Package
4. DTW HAYLL ONE ARRIVAL RNAV Distribution Package

CLE-DTW Metroplex Design Package

DTW NW RNAV Standard Terminal Arrivals (STARs

OAPM Design Package Change Control Sheet			
Date	**Description**	**TARGETS File Reference**	**FAA/NATCA Co-Lead Initials**
20170309	**DTW GRAYT STAR** • Renamed HHOGS to PNNTO. Purpose: Waypoint published on a KMSP procedure; must rename.	20171107_CLE_DTW_ MASTER_FINAL.tgs	RW / MT
20170808	**DTW GRAYT STAR** • Changed MERFI to @120 (was 100B120) • Deleted SKRUG & ROYYY waypoints, disconnected SIAPs • Deleted altitude restriction at ZUBBY (was AOA80) • After ZUBBY, added new flyover waypoint CADLC at N42 12 10.38 W83 31 27.78 alt @120, FM leg 218.18m • After QWYNN, added new flyover waypoint SPRTS at N42 06 27.28 W83 16 28.71 alt @120, FM leg 215.68 • Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: To deconflict dual routes on the same cornerpost	See above.	RW / MT
20170928	**DTW GRAYT STAR** • Change STUWT waypoint to WLEYE Purpose: Collaborative FAA and industry solution to mitigating issues with 280 knot speed restrictions at or near the beginning of these 8 arrival procedures.	See above.	RW / MT
20170505	**DTW KKISS STAR** • Changed CCRIS to AOB230 (from AOB240). Purpose: Incorrect altitude placed on procedure.	See above.	RW / MT
20170808	**DTW KKISS STAR** • Changed STLEY to 100B110 (was 100B120) • Changed FM leg from SKRUG to 218.18m • Changed FM leg from ROYYY to 215.68m • Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: To deconflict dual routes on the same cornerpost.	See above.	RW / MT
20170309	**DTW LAYKS STAR** • Renamed HHOGS to PNNTO. Purpose: Waypoint published on a KMSP procedure; must rename.	See above.	RW / MT

CLE-DTW Metroplex Design Package

DTW NW RNAV Standard Terminal Arrivals (STARs

20170808	**DTW LAYKS STAR** • Note: Expect runway 22R • Lost communications: Execute ILS Z RWY 22R from HRRON • Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: Add runway to expect and loss communications procedure on the short side STARs.	See above.	RW / MT
20170915	**DTW LAYKS STAR** • Delete HRRON on this procedure (will remain on the SIAP) • Add new waypoint MITTE as new termination fix at altitude 10,000, no speed • Delete altitude restrictions at waypoints STAAT and MCHGN • Change LAYKS to @10,000 Purpose: To disconnect this procedure from the SIAP. No change to lateral tracks.	See above.	RW / MT
20170928	**DTW LAYKS STAR** • Change STUWT waypoint to WLEYE Purpose: Collaborative FAA and industry solution to mitigating issues with 280 knot speed restrictions at or near the beginning of these 8 arrival procedures.	See above.	RW / MT
20170505	**DTW RKCTY STAR** • Changed CCRIS to 210B230 (from 210B240). Purpose: Incorrect altitude placed on procedure.	See above.	RW / MT
20170808	**DTW RKCTY STAR** • Note: Expect runway 22R • Lost communications: Execute ILS Z RWY 22R from VALLI • Remove the note: "For use by Turbojet and Turboprop aircraft only." Purpose: Add runway to expect and loss communications procedure on the short side STARs.	See above.	RW / MT

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

CLE-DTW Metroplex Design Package

DTW NW Cornerpost – South Flow RKCTY/LAYKS & North/W Flow KKISS/GRAYT RNAV STARs

Name of Change	Date
DTW RKCTY ONE STAR - RNAV (NW1 – S) **DTW LAYKS ONE STAR - RNAV (NW2 – S)** **DTW KKISS ONE STAR – RNAV (NW1 – N/W)** **DTW GRAYT ONE STAR – RNAV (NW2 –N/W)**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedure (RNAV STAR)	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☒ **Proposed Final Design (PFD)** ☐ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
4.3.1.7 DTW NW 1 and NW 2 SOUTH STARs **4.3.1.8 DTW NW 1 and NW 2 NORTH/W STARs**	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
D21 Positions S, P, Y, W, A **ZOB Areas 1** **ZAU** **ZMP** **FNT**	**D21: Steve Mack, Alex Huttenga** **ZOB: Mike Ferrell, Rick Norris** **ZAU: Joseph Bocik, Sam Passialis** **ZMP: Todd Amerman, Daniel Albing**
Related/Dependent Submissions	**Associated Data Files**
All new DTW SIDs **RNP/RNAV Tie ins** **RRALF SAT STAR** **D21, ZOB & FNT Airspace Design Packages**	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose:

These proposed STARs were designed to minimize level-offs and allow flexibility for multiple runway transitions. These procedures reduce controller complexity and add optimization for the user. Use of Optimized Profile Descents (OPDs) will allow for less verbiage between controllers and pilots, therefore reducing the possibility of hear back/read back errors. The advantage for the user is fewer level offs and a chance for significant fuel savings.

The Study Team recommended the creation of RNAV STARs with OPDs for all primary DTW arrival flows at each corner post. In addition, the Study Team proposed individual solutions for each corner post arrival flow. Dual RNAV STARs were created parallel to the current STARs with more direct routing to the approach courses, similar to flows which are in use today. This design would reduce miles flown, fuel burn and CO2 emissions.

CLE-DTW Metroplex Design Package

DTW NW Cornerpost – South Flow RKCTY/LAYKS & North/W Flow KKISS/GRAYT RNAV STARs

Study Team Issues and Solutions

The DTW POLAR THREE STAR accounts for 22% of all DTW jet arrivals.

- Issues
    - Lack of RNAV STAR from the northwest
    - En route traffic sequenced near terminal boundary
    - Actual flight tracks do not follow current arrival procedures
    - Level segments and inefficient later paths
    - Lack of dual arrivals for triple ILS operation
    - Lack of OPDs
- Solutions
    - Dual RNAV STARs with OPDs that are flow specific
    - Dual RNAV STARs allow independent operations when appropriate conditions exist, including Triple ILS

CLE-DTW Metroplex Design Package

DTW NW Cornerpost – South Flow RKCTY/LAYKS & North/W Flow KKISS/GRAYT RNAV STARs

Proposed Final Design

The Design Team is proposing the implementation of four RNAV STARs for the Northwest (NW) cornerpost, two for each flow (south and north/west flows) at DTW.

These DTW STARs:

- Will serve Detroit Metropolitan Wayne County International Airport (DTW) only.
- Are intended for use by all turbojet and turboprop aircraft
    - "Optimized Profile Descents" (OPDs) were designed for use by turbojet aircraft
    - Turboprop and prop aircraft will utilize the same ground tracks but will be delivered to the TRACON at hard altitudes charted as Vertical Navigation Planning Information
- Are "Flow Dependent" meaning the procedures are designed for use when on a particular flow; south or north, but not both flows
- Are connected to DTW ILS, RNAV (GPS), and RNP approaches to runways 22R/21L and 04L/03R as appropriate (see the Design Package for DTW SIAPs)
- Are compliant with new descent gradient and deceleration criteria, IAW FAA 8260.3C

When appropriate, Cleveland Center will issue the "Descend Via" clearance.

Changes from the Study Team Recommendation - Enroute:

The Study Team recommendation was modified to allow the creation of the additional MIGGY Standard Instrument Departure (SID). The MIGGY SID is positioned between the RKCTY/KKISS and LAYKS/GRAYT STARs.

Within the RKCTY and KKISS enroute portion of the STAR, the Study Team middle transition proposal was removed, and two parallel transitions were added from the west (south of the remaining Study Team transition). The transitions accommodate arrival traffic from multiple airports in lieu of blending three flows into a single stream at one merge point. The three transitions are as follows:

- PORZL to BUCKE – moved approximately two miles north of the Study Team proposal to maintain adequate lateral separation from the DUUDA transition.
- DUUDA to CCRIS transition – added to original Study Team proposal for use by MKE and ORD traffic destined to DTW. The route was also designed to provide lateral enroute separation with the MKE eastbound departure track.
- OLYEE TO FRELE – added to original Study Team proposal for use by departures from GRR and other traffic departing from close-in airports that are altitude-restricted. The placement of the OLYEE transition ensures adequate lateral separation from the DUUDA transition.

The enroute portions of the LAYKS and GRAYT STARs were moved approximately 8 miles east of the proposed design to allow adequate lateral separation from the MIGGY SID. The STARs have dual entry routes that begin at fixes DAYYY and LEFSA. ZMP will blend the streams in lieu of the two streams merging at the common ZOB/D21 boundary. The routes merge at HHOGS and the route via HHOGS to HYPED then parallels the study team proposal.

CLE-DTW Metroplex Design Package

DTW NW Cornerpost – South Flow RKCTY/LAYKS & North/W Flow KKISS/GRAYT RNAV STARs

Changes from Study Team Recommendation – Terminal South Flow DTW RKCTY and LAYKS ONE STARs:

- DTW RKCTY ONE
    - The terminal portion of the STAR provides a more direct route to intercept the final approach course
    - Holding patterns were added at SMMNS, BUCKE, STIDL, CHEFE, and PORZL
    - All runway transitions were removed from the earlier design of this procedure, in favor or creating a single common route to the termination waypoint
    - Additional chart notes:
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 22R transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Corresponding RNAV STAR is KKISS Expect KKISS when DTW is landing north/west.
        - DME/DME/IRU or GPS required.
        - RNAV 1.
- DTW LAYKS ONE
    - LAYKS is parallel and west of the STUDY TEAM proposal due to the relocated enroute portion of the STAR
    - A holding pattern was added at THEEE
    - All runway transitions were removed from the earlier design of this procedure, in favor or creating a single common route to the termination waypoint
    - Additional chart notes:
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 22R transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Corresponding RNAV STAR is GRAYT Expect GRAYT when DTW is landing north/west.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

Figures 1 and 2 below depict the proposed final design for the <u>south</u> flow.

CLE-DTW Metroplex Design Package

DTW NW Cornerpost – South Flow RKCTY/LAYKS & North/W Flow KKISS/GRAYT RNAV STARs

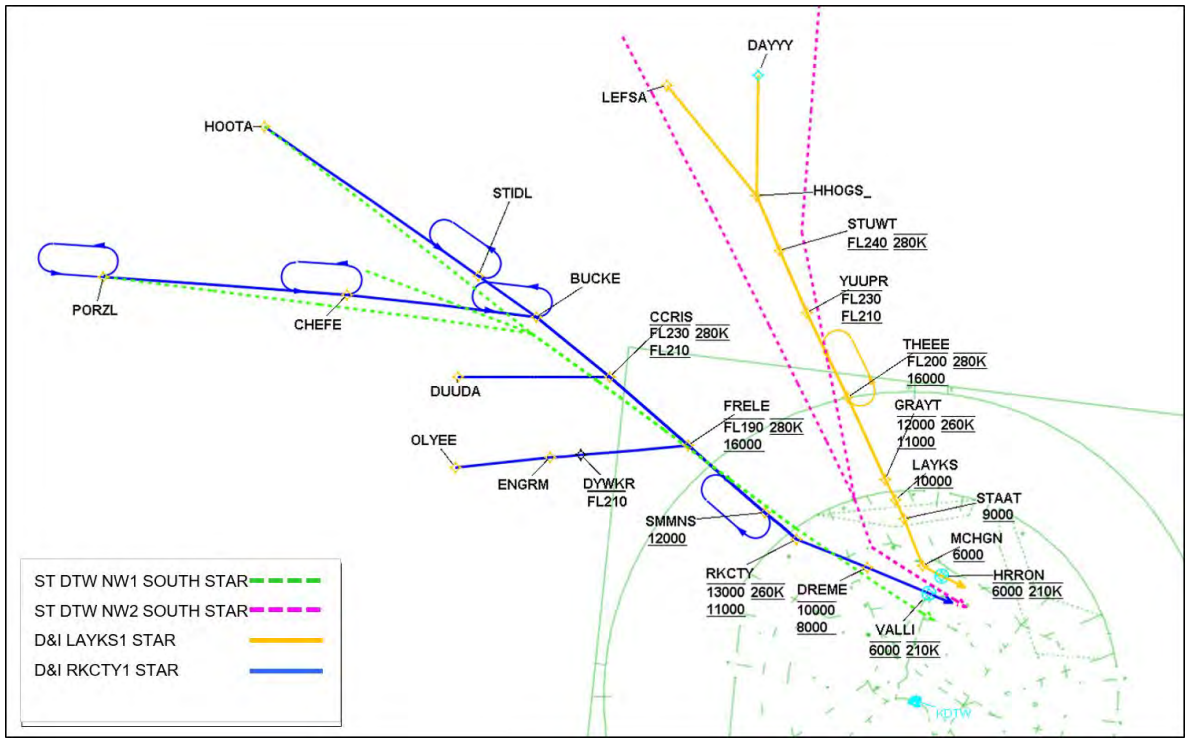

Figure 1. Proposed Design of the DTW RKCTY & LAYKS ONE STARs – South Flow Enroute View

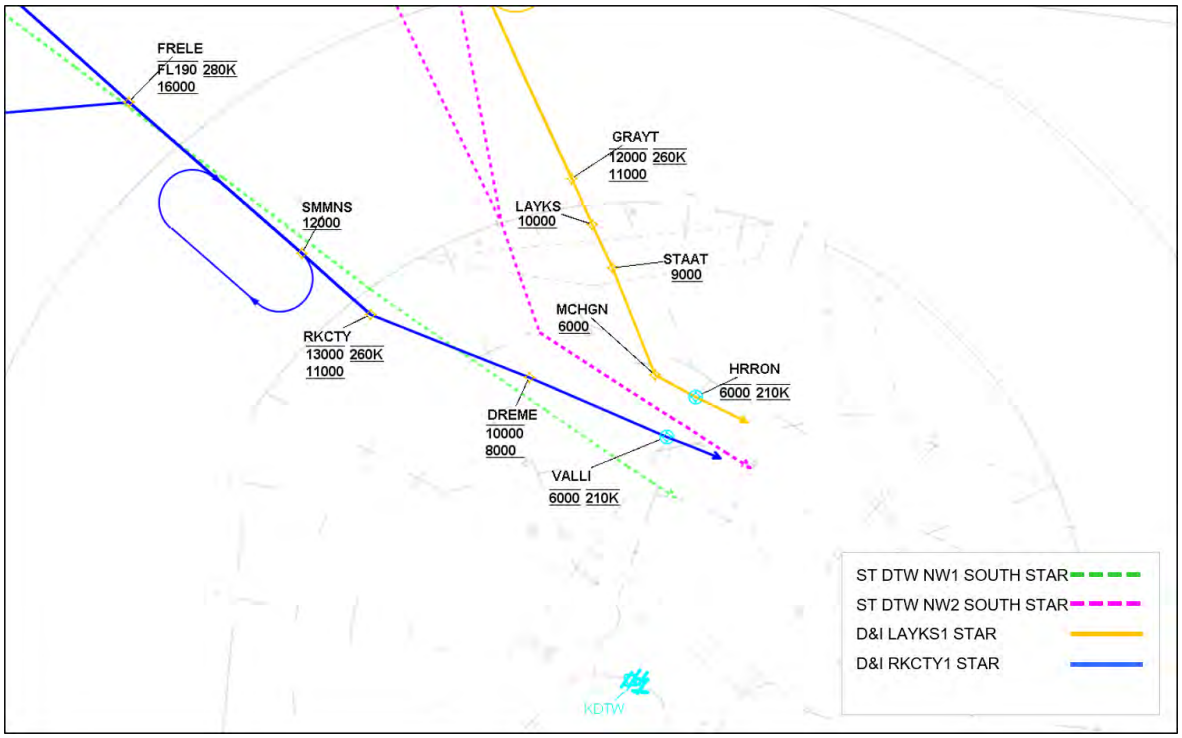

Figure 2. Proposed Design of the DTW RKCTY & LAYKS ONE STARs – South Flow Terminal View

CLE-DTW Metroplex Design Package

DTW NW Cornerpost – South Flow RKCTY/LAYKS & North/W Flow KKISS/GRAYT RNAV STARs

Changes from Study Team Recommendation – Terminal North/West Flow DTW KKISS and GRAYT ONE STARs:

- DTW KKISS ONE
    - The KKISS route overlays the STUDY TEAM proposal.
    - Holding patterns were added at SMMNS, BUCKE, STIDL, CHEFE, and PORZL
    - The runway transition for runway 04R was combined with the runway 04L transition
    - The runway transition for runways 27L/R was removed from the earlier design
    - Additional chart notes:
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 04L transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Corresponding RNAV STAR is RKCTY Expect RKCTY when DTW is landing south.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

- DTW GRAYT ONE
    - Was moved approximately 4 miles east and parallel to the Study Team original proposal to accommodate the position of MIGGY SID.
    - A holding patterns was added at THEEE
    - The runway transition for runway 04R was combined with the runway 04L transition
    - The runway transition for runways 27L/R was removed from the earlier design
    - Additional chart notes:
        - For use by turbojet and turboprop aircraft only.
        - Fly the runway 04L transition or as assigned by ATC.
        - Expect runway assignment from Detroit TRACON upon initial contact.
        - Corresponding RNAV STAR is LAYKS Expect LAYKS when DTW is landing south.
        - DME/DME/IRU or GPS required.
        - RNAV 1.

Figures 3 and 4 below depict the proposed final design for the north/west flow.

CLE-DTW Metroplex Design Package

DTW NW Cornerpost – South Flow RKCTY/LAYKS & North/W Flow KKISS/GRAYT RNAV STARs

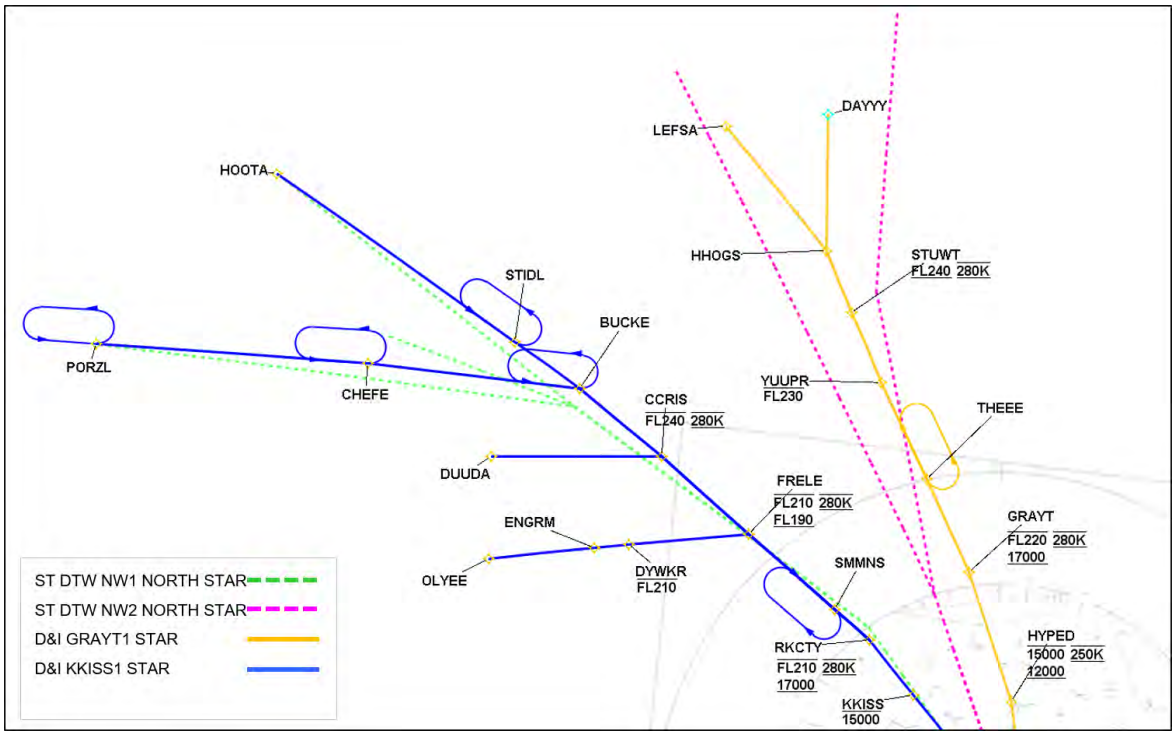

Figure 3. Proposed Design of the DTW KKISS & GRAYT ONE STARs – North/W Flow Enroute View

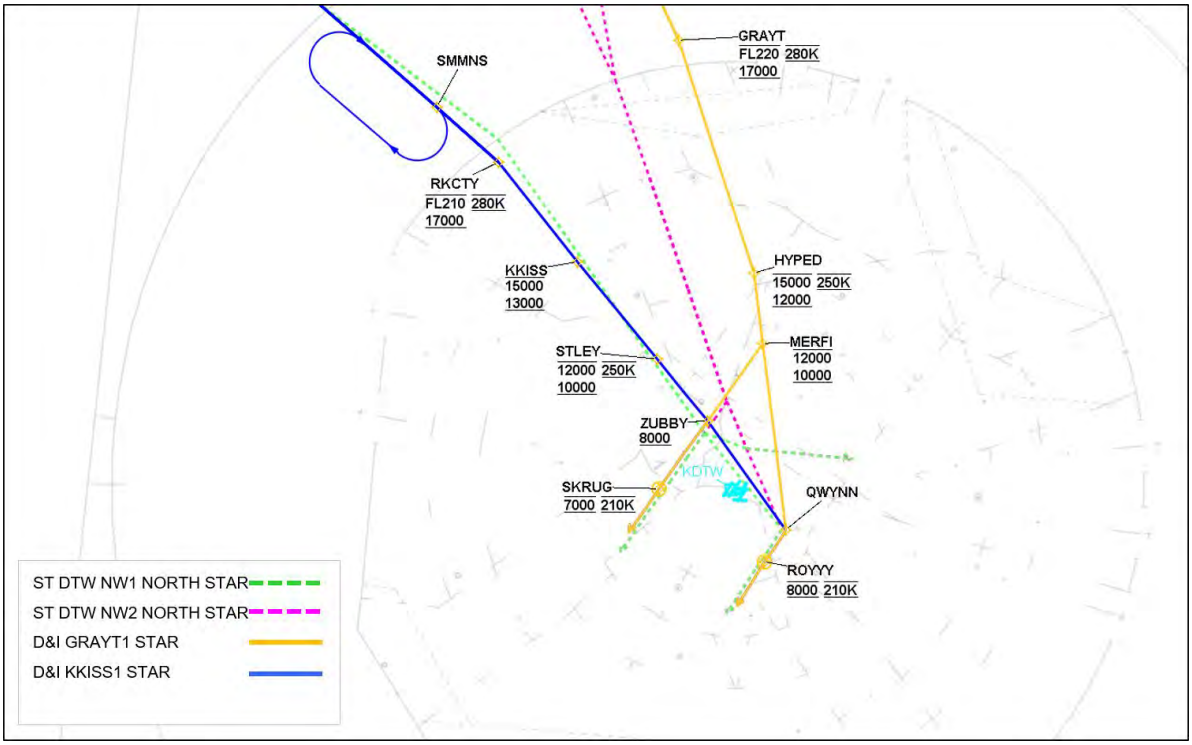

Figure 4. Proposed Design of the DTW KKISS & GRAYT ONE STARs – North/W Flow Terminal View

CLE-DTW Metroplex Design Package

DTW NW Cornerpost – South Flow RKCTY/LAYKS & North/W Flow KKISS/GRAYT RNAV STARs

Additional Design Considerations

- A high-level ISIM simulation was conducted to validate ZOB airspace in May 2015.
- A high fidelity Human-in-the-Loop (HITL) simulation was conducted to validate D21 TRACON airspace in June 2015.
- Industry flight simulator testing was conducted through July 2015 to validate these procedures.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will be required.
- Terminal and enroute automation changes will be required.

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Attachments

1. DTW RKCTY ONE ARRIVAL RNAV Distribution Package
2. DTW LAYKS ONE ARRIVAL RNAV Distribution Package
3. DTW KKISS ONE ARRIVAL RNAV Distribution Package
4. DTW GRAYT ONE ARRIVAL RNAV Distribution Package

CLE-DTW Metroplex Design Package

DTW RNAV Standard Instrument Approach Procedures (SIAPs)

Date	Description of Changes	TARGETS File Reference	FAA/NATCA Co-Lead Initials
20170309	**DTW RNAV (RNP) W RWY 22R** • Added waypoints GUYVE, TARAH, FUDDJ, INKSR to the straight-in segment. Purpose: Increase flexibility for aircraft assigned the W approach from the downwind, but which must be extended/vectored for sequencing/spacing.	20171107_CLE_DTW_ MASTER_FINAL.tgs	RW / MT
20170309	**DTW RNAV (RNP) W RWY 21L** • Added waypoints TIGRZ, COUNT_MOVE to the straight-in segment. Purpose: Increase flexibility for aircraft assigned the W approach from the downwind, but which must be extended/vectored for sequencing/spacing.	See above.	RW / MT
20170309	**DTW RNAV (RNP) X RWY 21L** • Renamed WP2512/IAF to JEEEP. • Renamed WP2508 to NOOVA. • Renamed WP2511 to STTIK. Purpose: Name unnamed waypoints.	See above.	RW / MT
20170530	**DTW RNAV (RNP) X RWY 21L** • Moved STRNG 0.743 NM east to 3.01 from MCOMB/22L. • Changed altitude at STRNG to AOB60 (was AOA50). Purpose: To deconflict with 22L approaches.	See above.	RW / MT
20170309	**DTW RNAV (RNP) W RWY 04L** • Added waypoints ASLLI, ACIRA, NBSTN to the straight-in segment. Purpose: Increase flexibility for aircraft assigned the W approach from the downwind, but which must be extended/vectored for sequencing/spacing.	See above.	RW / MT
20170309	**DTW RNAV (RNP) W RWY 03R** • Added waypoints HARLA, LEWUK, WILOO_MOVE to the straight-in segment. Purpose: Increase flexibility for aircraft assigned the W approach from the downwind, but which must be extended/vectored for sequencing/spacing.	See above.	RW / MT

CLE-DTW Metroplex Design Package

DTW RNAV Standard Instrument Approach Procedures (SIAPs)

20170530	**DTW SIAPs (RNPs)** - RNAV (RNP) X Rwy04L changed to RNAV (RNP) U Rwy 04L - RNAV (RNP) X Rwy22R changed to RNAV (RNP) U Rwy22R - RNAV (RNP) Z Rwy03R changed to RNAV (RNP) X Rwy 03R - RNAV (RNP) Z Rwy04L changed to RNAV (RNP) X Rwy 04L - RNAV (RNP) Z Rwy04R changed to RNAV (RNP) X Rwy 04R - RNAV (RNP) Z Rwy21L changed to RNAV (RNP) X Rwy 21L - RNAV (RNP) Z Rwy22L changed to RNAV (RNP) X Rwy 22L - RNAV (RNP) Z Rwy22R changed to RNAV (RNP) X Rwy 22R Purpose: To reduce likelihood of confusion when issuing approach/runway assignments and clearances.	See above.	RW / MT

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

CLE-DTW Metroplex Design Package

DTW Standard Instrument Approach Procedures (SIAPs)

Name of Change	Date
DTW RNAV (RNP) Z Runway 22R **DTW RNAV (RNP) X Runway 22R** **DTW RNAV (RNP) W Runway 22R** **DTW RNAV (RNP) Z Runway 22L** **DTW RNAV (GPS) Y Runway 22L (amendment)** **DTW ILS Runway 22L (amendment)** **DTW RNAV (RNP) Z Runway 21L** **DTW RNAV (GPS) Y Runway 21L (amendment)** **DTW ILS Runway 21L (amendment)** **DTW RNAV (RNP) W Runway 21L** **DTW RNAV (RNP) Z Runway 04L** **DTW RNAV (RNP) X Runway 04L** **DTW RNAV (RNP) W Runway 04L** **DTW RNAV (RNP) Z Runway 04R** **DTW RNAV (GPS) Y Runway 04R (amendment)** **DTW ILS Runway 04R (amendment)** **DTW RNAV (RNP) Z Runway 03R** **DTW RNAV (GPS) Y Runway 03R (amendment)** **DTW ILS Runway 03R (amendment)** **DTW RNAV (RNP) W Runway 03R**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedures, Standard Instrument Approach Procedures (SIAPs)	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☒ **Proposed Final Design (PFD)** ☐ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
4.1 Design Concepts	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
Detroit TRACON (D21)	**Detroit TRACON (D21): Steven Mack and Alex Huttenga**
Related/Dependent Submissions	**Associated Data Files**
Related: **All DTW STARs** **D21 TRACON Airspace Design Packages**	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose

Required Navigation Performance Authorization Required (RNP AR) approaches will reduce pilot/controller communications and cockpit workload. Connecting the runway transitions on the Standard Terminal Arrivals (STARs) and the approach transitions will provide for an efficient transition from the Optimized Profile Descent (OPD) on the arrival phase to the approach phase to landing.

CLE-DTW Metroplex Design Package

DTW Standard Instrument Approach Procedures (SIAPs)

Study Team Issues and Solutions

There are no existing RNP AR approaches at DTW. The Study Team did not recommend specific designs or specific runways for approaches. The Study Team Final Report stated in Section 4.1, Design Concepts, "The primary goals of the Cleveland/Detroit MST were to use RNAV everywhere and RNP where beneficial."

CLE-DTW Metroplex Design Package

DTW Standard Instrument Approach Procedures (SIAPs)

Final Design

The Design Team and the lead industry carrier determined it to be beneficial to develop RNAV (RNP) approaches to the primary south/north arrival runways. Offset versions of the procedures were also developed to runways 22R and 04L. The following procedures were developed:

1. DTW RNAV (RNP) Z Runway 22R (Straight-in)
2. DTW RNAV (RNP) X Runway 22R (Offset for Duals/Trips)
3. DTW RNAV (RNP) W Runway 22R (Offset Short Downwind)
4. DTW RNAV (RNP) W Runway 22L (For Trips)
5. DTW RNAV (RNP) X Runway 21L (For Duals, For Trips from RYDER only)
6. DTW RNAV (RNP) W Runway 21L (Short Downwind)
7. DTW RNAV (RNP) Z Runway 04L (Straight-in)
8. DTW RNAV (RNP) X Runway 04L (Offset for Duals/Trips)
9. DTW RNAV (RNP) W Runway 04L (Offset Short Downwind)
10. DTW RNAV (RNP) W Runway 04R (For Trips)
11. DTW RNAV (RNP) X Runway 03R (For Duals, For Trips from MERCA only)
12. DTW RNAV (RNP) W Runway 03R (Short Downwind)

The following procedures were optimized to align them with the proposed RNAV (RNP) approaches with respect to final and intermediate segments, procedure ground track, missed approach, altitudes, fix/locations/names, glidepath angles (GPAs), and threshold crossing heights (TCHs) in accordance with FAAO 8260.19F: Section 4-7: RNAV DEVELOPMENT, Para 4-7-2b.

Tables 1 and 2 reflect the procedures to be amended in a south and north flow, respectively.

Table 1. South Flow Procedures

DTW ILS RWY 22L - all categories
DTW RNAV (GPS) RWY 22L **(rename to Y)**
DTW ILS RWY 21L - all categories
DTW RNAV (GPS) RWY 21L **(rename to Y)**

Table 2. North Flow Procedures

DTW ILS RWY 04R - all categories
DTW RNAV (GPS) RWY 04R **(rename to Y)**
DTW ILS RWY 03R - all categories
DTW RNAV (GPS) RWY 03R **(rename to Y)**

The RNAV (RNP) approaches, and the corresponding ILS and RNAV (GPS) approaches, were designed to be used during simultaneous dual and in some cases for triple parallel approach operations, establishing the aircraft on the final approach course and at an altitude to provide the required lateral/vertical separation. A Precision Runway Monitor (PRM) version of all approaches to the following runways will be required/amended: 22L, 22R X, 04L X, and 04R.

The straight-in version of the RNAV (GPS) approaches to runways 22R and 04L were deleted from this project because these approaches were replaced with offset (Y) versions of the approaches published on 11/10/2016.

CLE-DTW Metroplex Design Package

DTW Standard Instrument Approach Procedures (SIAPs)

The RNAV (RNP) approaches to 22R (W, X, and Z), 21L Z, 04L (W, X, and Z), and 03R Z were connected to each of the STARs on a base leg or downwind, as appropriate (W approaches at the downwind, X approaches at the base legs only), with the common waypoint having the same altitude and numerical airspeed value. Speed restrictions on the IAPs are maximum speeds as required by the Director, Air Traffic Procedures, AJV-8.

Table 3 and 4 indicate the common waypoint on each of the STARs and the approaches.

Table 3. South Flow - Common Waypoints on STARS and Approaches

STAR	21L Z	22L	22R Z	22R Y
DTW LAYKS ONE	n/a	n/a	HRRON	HRRON
DTW RKCTY ONE	n/a	n/a	VALLI	VALLI
DTW TPGUN ONE	RYEDR	n/a	n/a	n/a
DTW FERRL ONE	COBBO	n/a	n/a	n/a
DTW VCTRZ ONE	TBRRD	n/a	DZMND	DZMND
DTW HANBL ONE	TBRRD	n/a	DZMND	DZMND
DTW BONZZ ONE	TBRRD	n/a	DZMND	DZMND
DTW HTROD ONE	TBRRD	n/a	DZMND	DZMND

Table 4. North Flow - Common Waypoints on STARS and Approaches

STAR	04L Y	04L Z	04R	03R Z
DTW LECTR ONE	SYKOE	SYKOE	n/a	n/a
DTW HAYLL ONE	GRBAC	GRBAC	n/a	n/a
DTW CRAKN ONE	n/a	n/a	n/a	MERCA
DTW KLYNK ONE	n/a	n/a	n/a	BRDER
DTW KKISS ONE	SKRUG	SKRUG	n/a	ROYYY
DTW GRAYT ONE	SKRUG	SKRUG	n/a	ROYYY
DTW WNGNT ONE	SKRUG	SKRUG	n/a	ROYYY
DTW CUUGR ONE	SKRUG	SKRUG	n/a	ROYYY

CLE-DTW Metroplex Design Package

DTW Standard Instrument Approach Procedures (SIAPs)

Figures 1 and 2 depict the final designs of the runway 22R Z (straight-in) procedures:

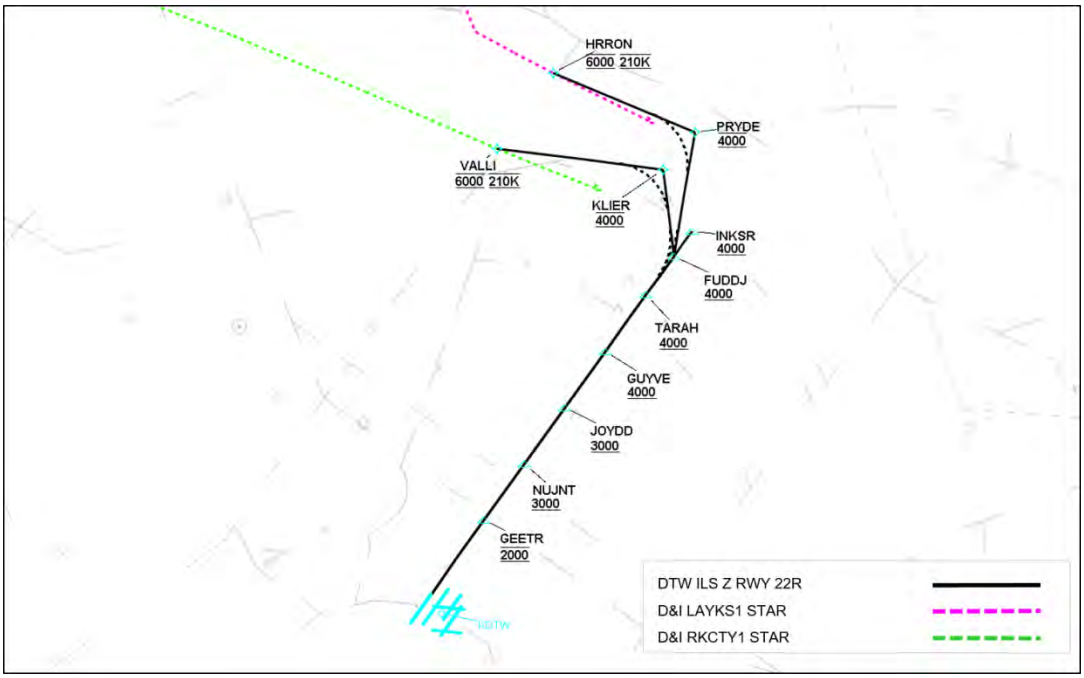

Figure 1. CURRENT DTW ILS Z Runway 22R approach (straight-in), published 11/10/16

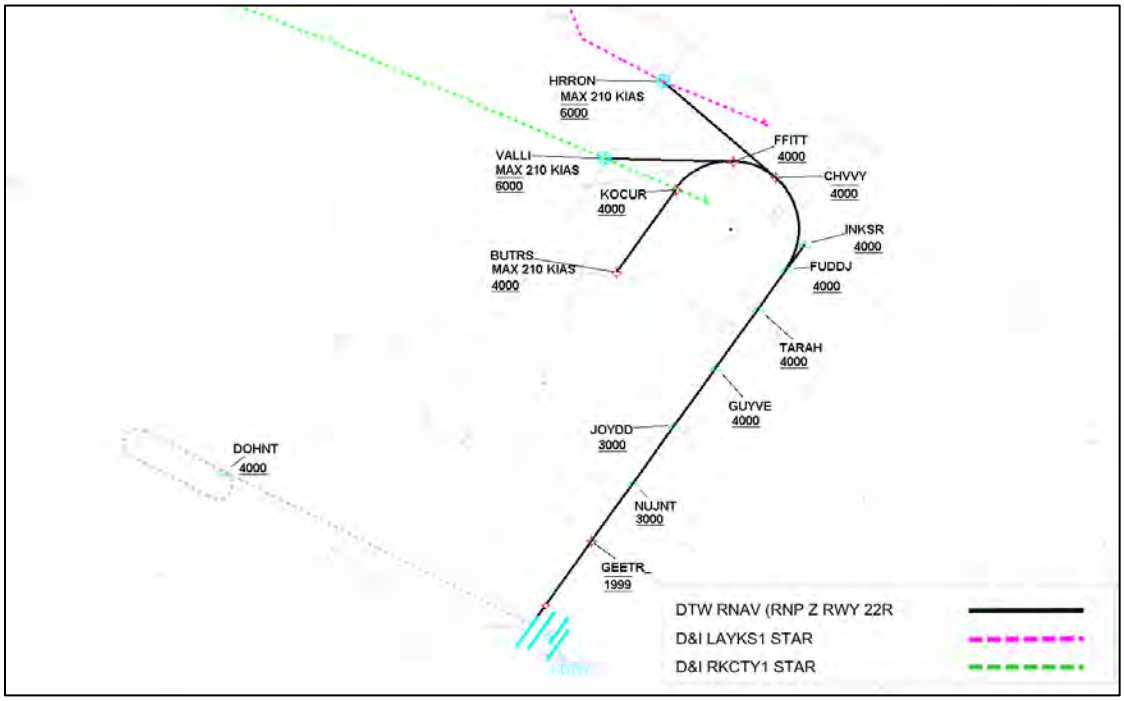

Figure 2. Final Design of the DTW RNAV (RNP) Z Runway 22R approach (straight-in),

CLE-DTW Metroplex Design Package

DTW Standard Instrument Approach Procedures (SIAPs)

Figures 3. 4, and 5 depict the final designs of the runway 22R Y, X, and W (offset) procedures:

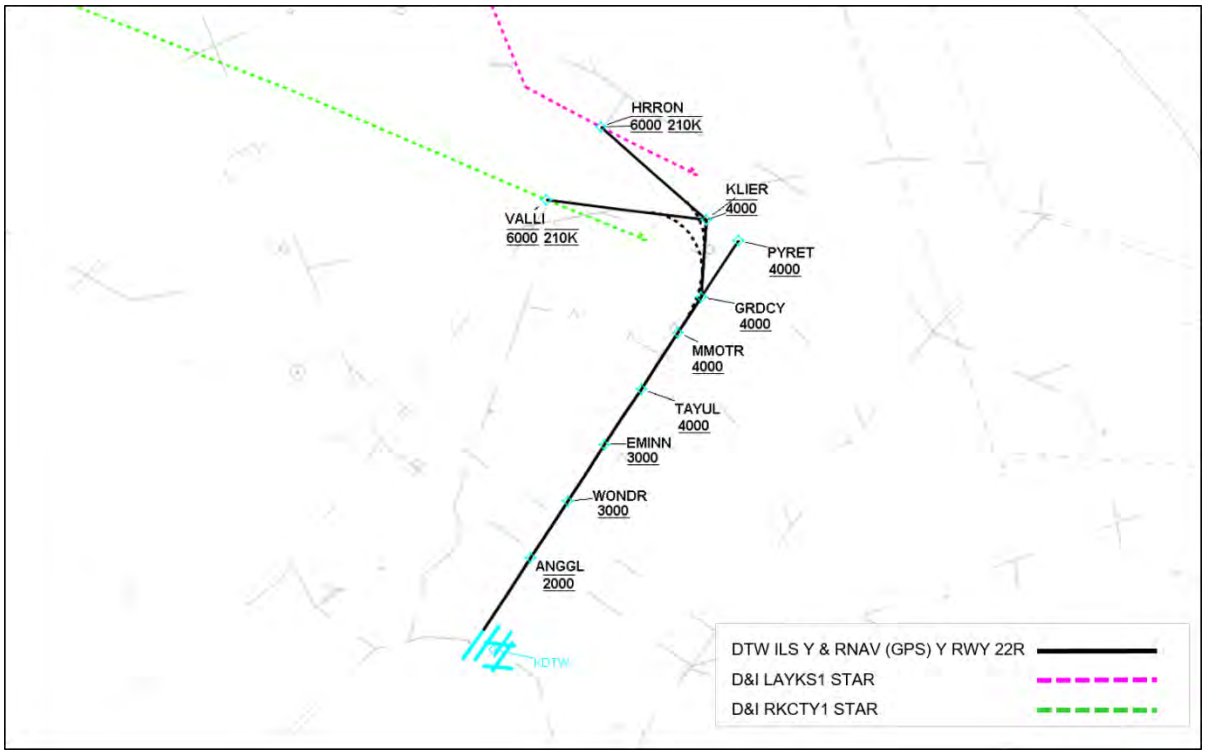

Figure 3. CURRENT DTW ILS Y & RNAV (GPS) Y Runway 22R approaches (Offset), published 11/10/16

CLE-DTW Metroplex Design Package

DTW Standard Instrument Approach Procedures (SIAPs)

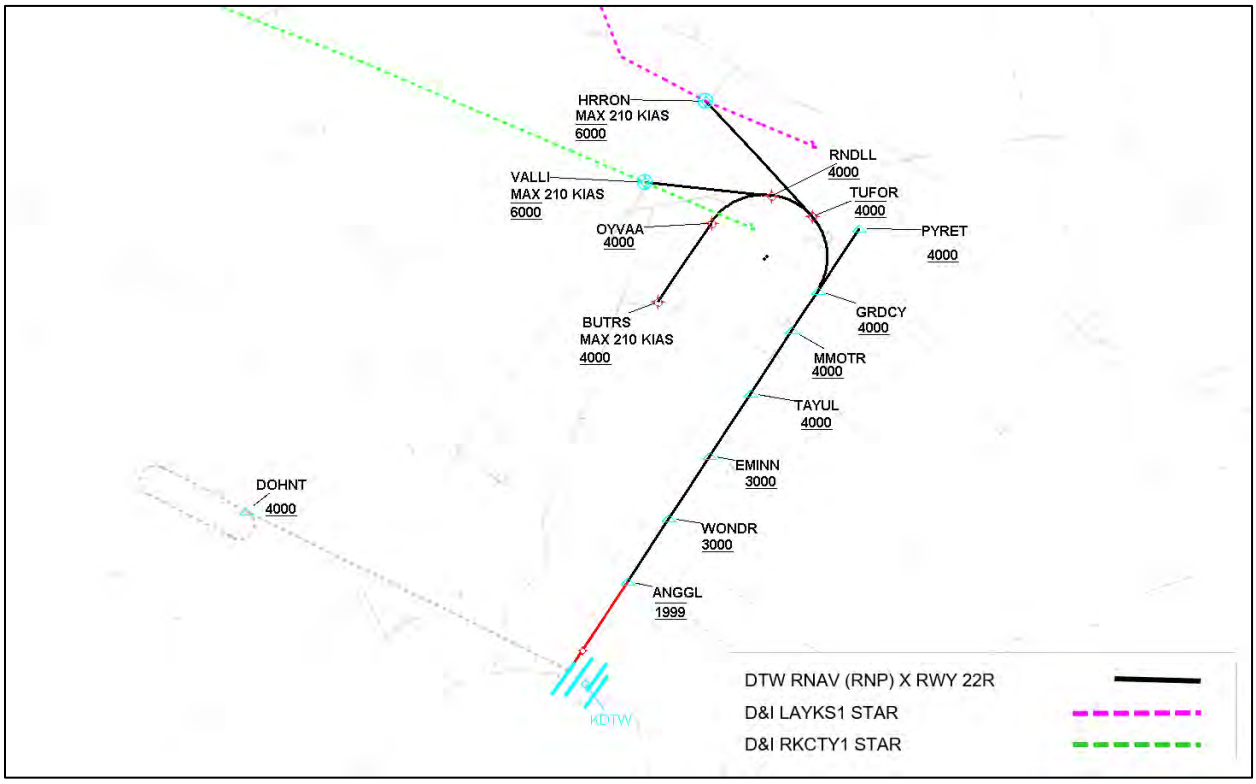

Figure 4. Final Design of the DTW RNAV (RNP) X Runway 22R approach (Offset/Long)

CLE-DTW Metroplex Design Package

DTW Standard Instrument Approach Procedures (SIAPs)

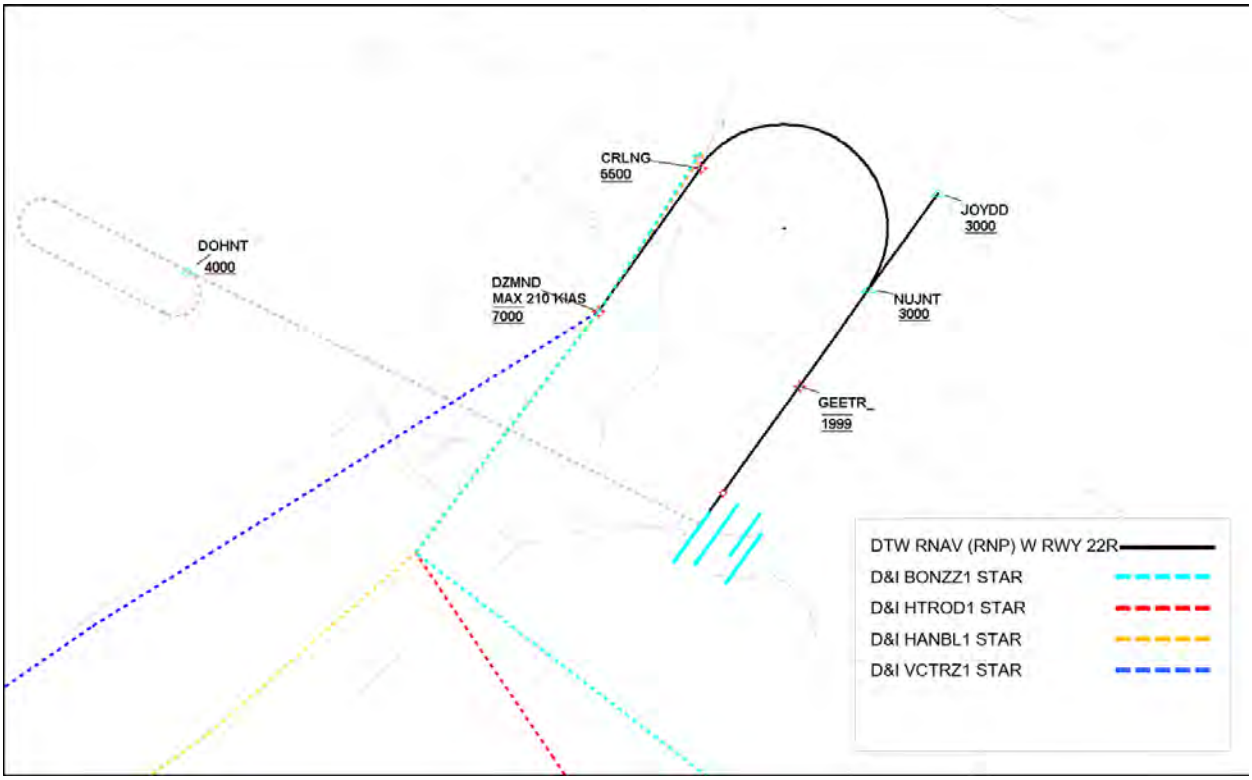

Figure 5. Final Design of the DTW RNAV (RNP) W Runway 22R approach (Offset/Short)

Figure 6 and 7 depicts the final designs of the runway 22L procedures:

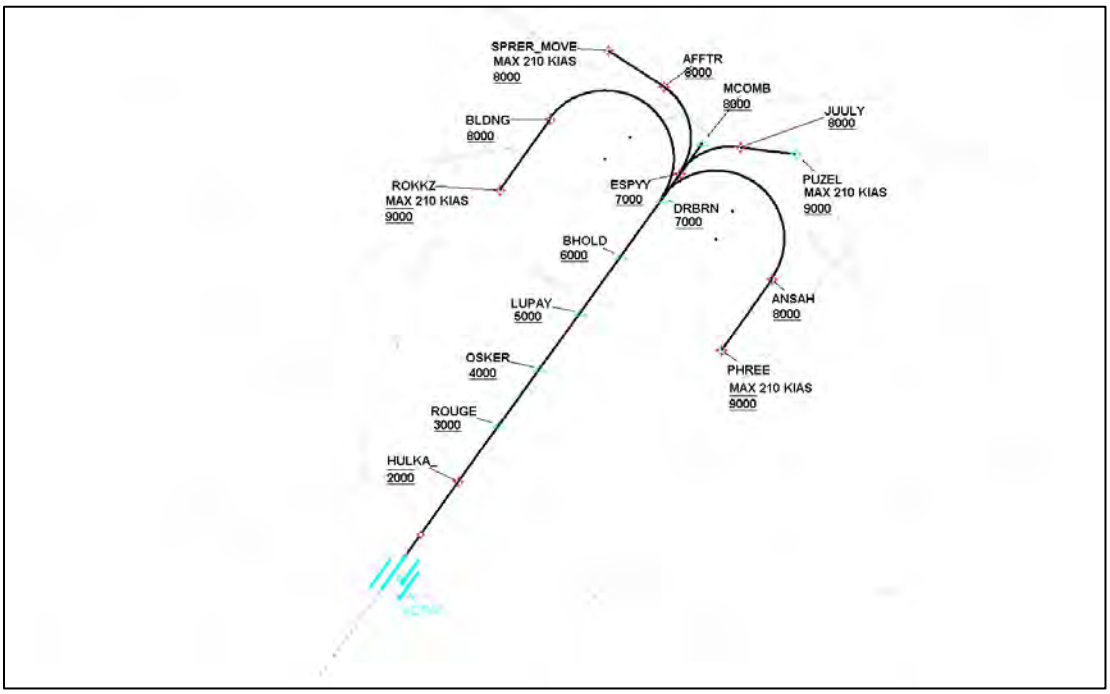

Figure 6. Final Design of the DTW RNAV (RNP) Z Runway 22L approach

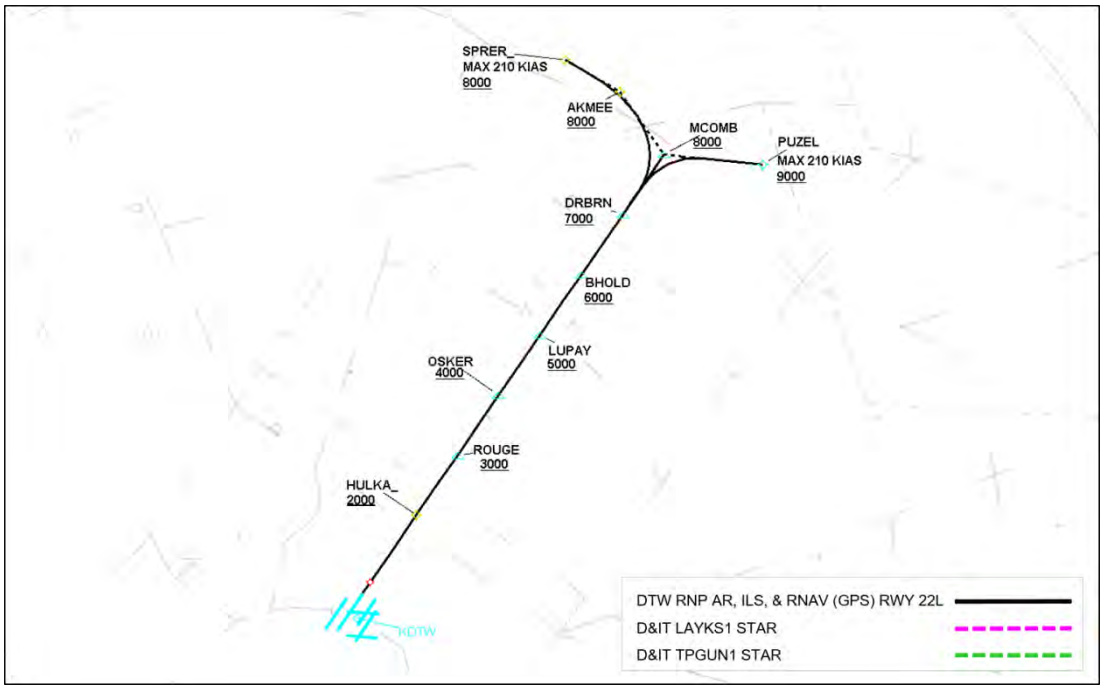

Figure 7. Final Design of the ILS and RNAV (GPS) Y approaches to DTW Runway 22L

Figures 8, 9, and 10 depict the final designs of the runway 21L procedures:

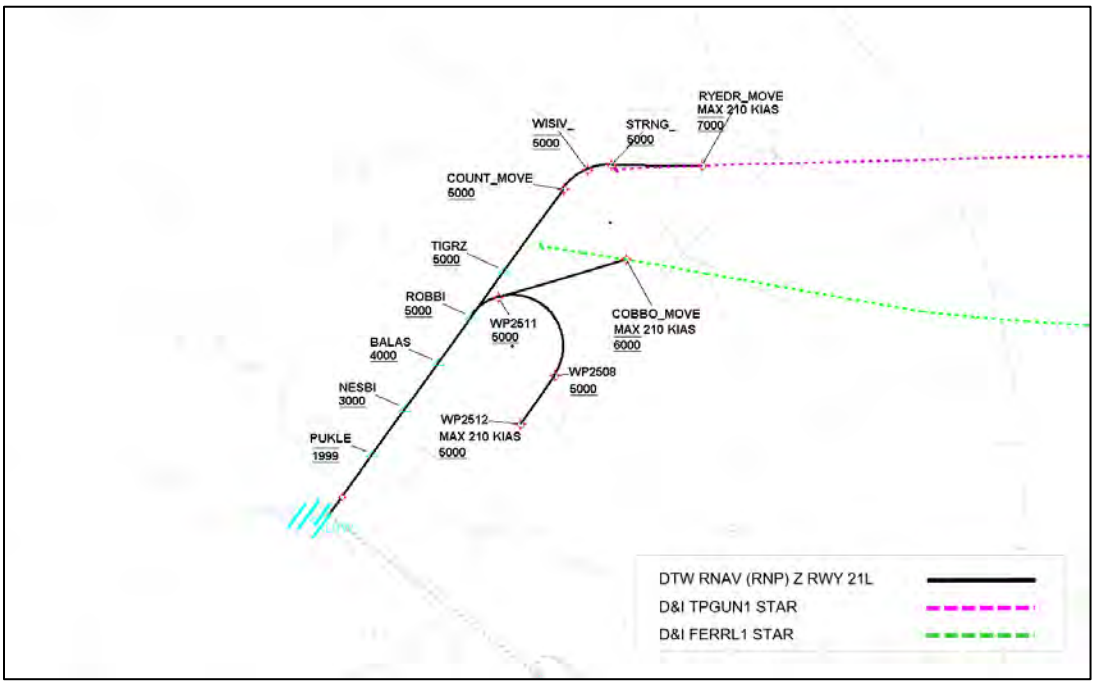

Figure 8. Final Design of the RNAV (RNP) Z approach to DTW Runway 21L (long)

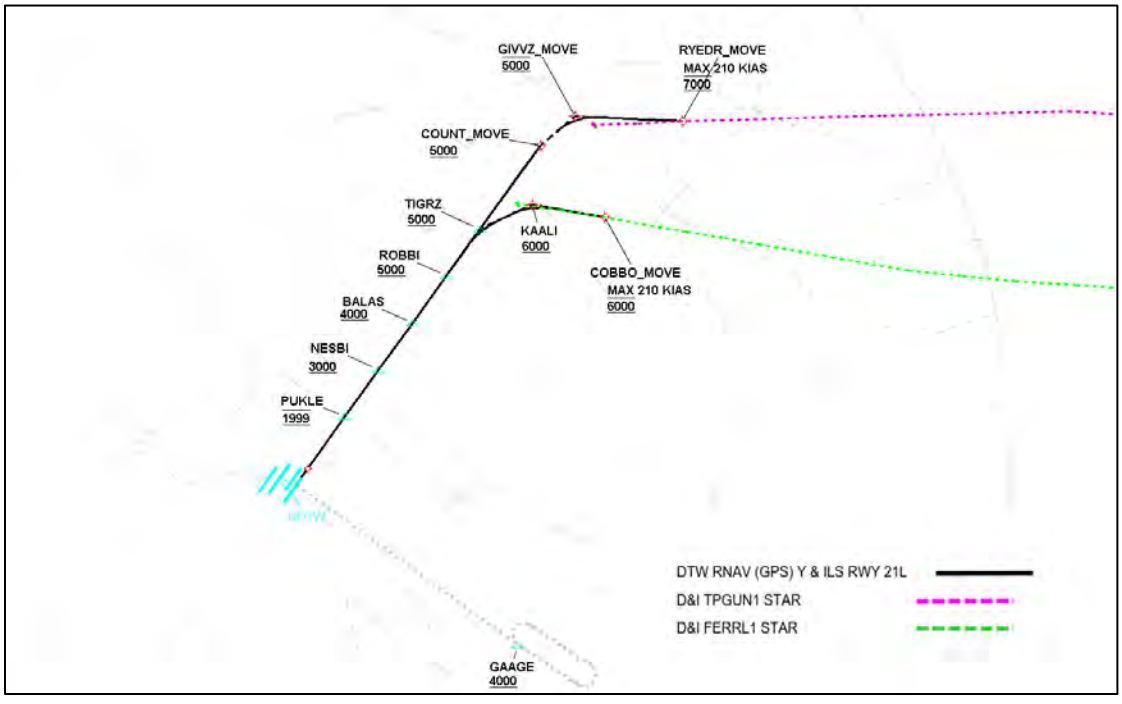

Figure 9. Final Design of the ILS and RNAV (GPS) Y approaches to DTW Runway 21L

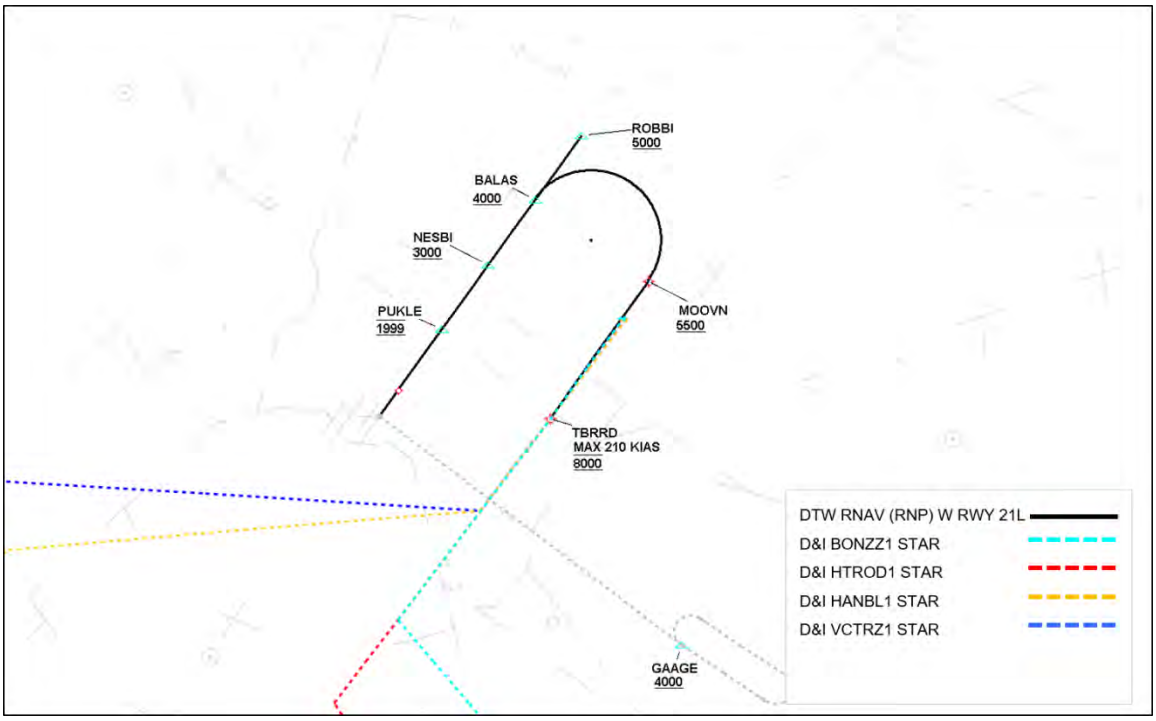

Figure 10. Final Design of the RNAV (RNP) W approach to DTW Runway 21L (short)

CLE-DTW Metroplex Design Package

DTW Standard Instrument Approach Procedures (SIAPs)

Figures 11 and 12 depict the final designs of the runway 04L Z (straight-in) procedures:

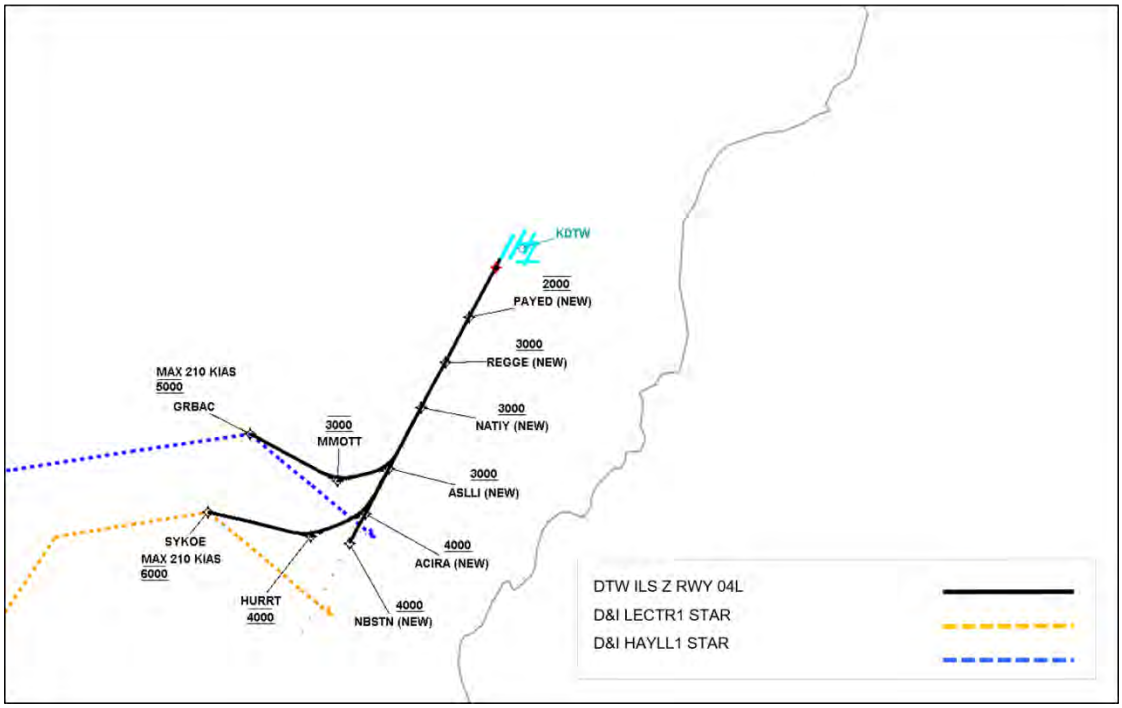

Figure 11. CURRENT DTW ILS Z Runway 04L approach (straight-in), published 11/10/16

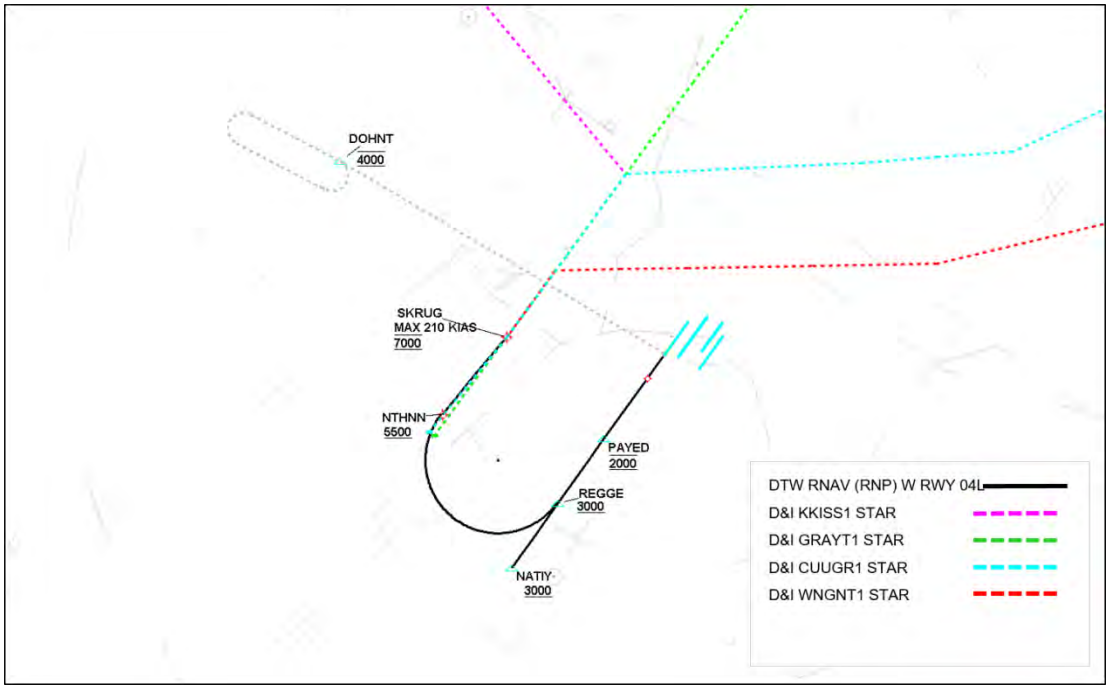

Figure 12. Final Design of the DTW RNAV (RNP) W Runway 04L approach (straight-in)

CLE-DTW Metroplex Design Package

DTW Standard Instrument Approach Procedures (SIAPs)

Figures 13, 14, and 15 depict the final designs of the runway 04L Y, X, and W (offset) procedures:

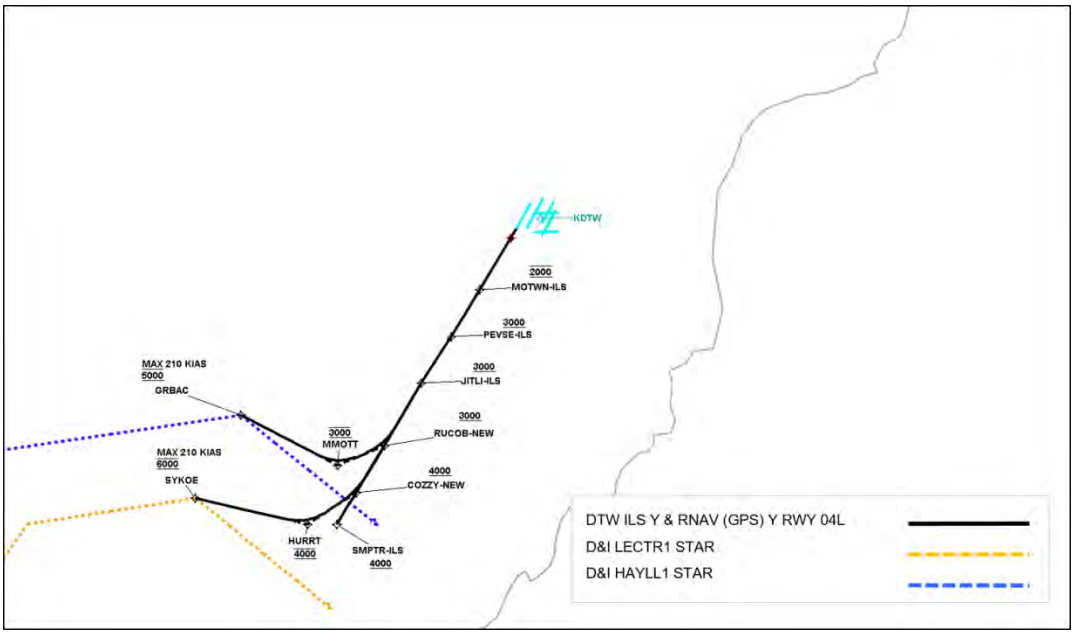

Figure 13. CURRENT ILS Y & RNAV(GPS) Y approaches to DTW Runway 04L(Offset), published 11/10/16

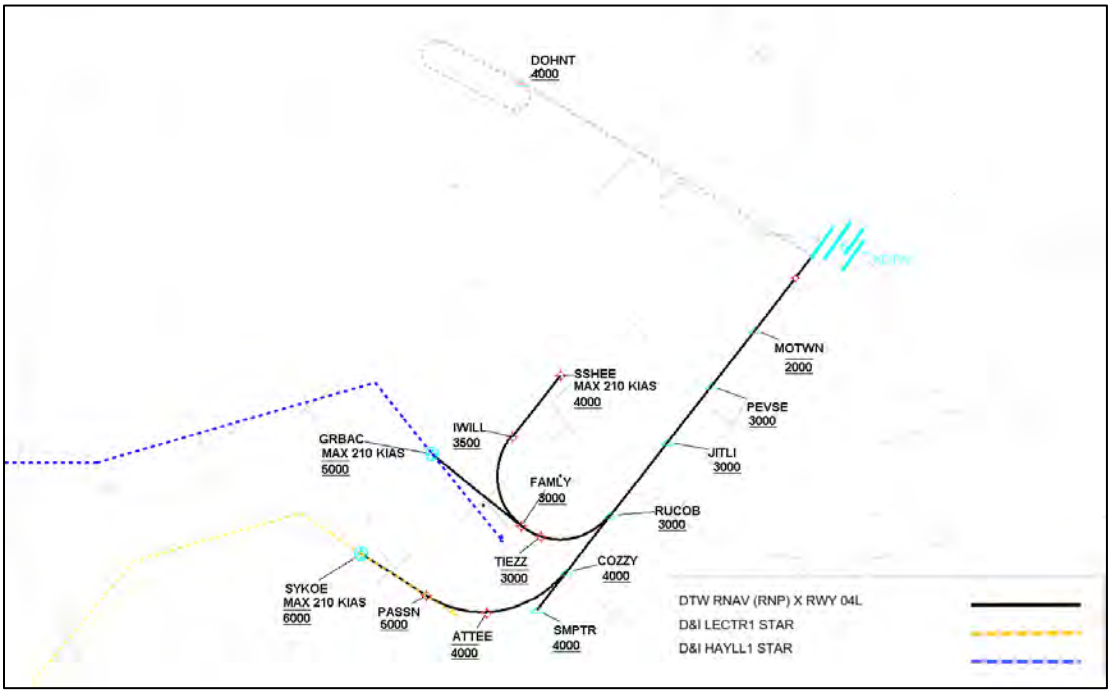

Figure 14. Final Design of the DTW RNAV (RNP) X Runway 04L approach (Offset/Long)

CLE-DTW Metroplex Design Package

DTW Standard Instrument Approach Procedures (SIAPs)

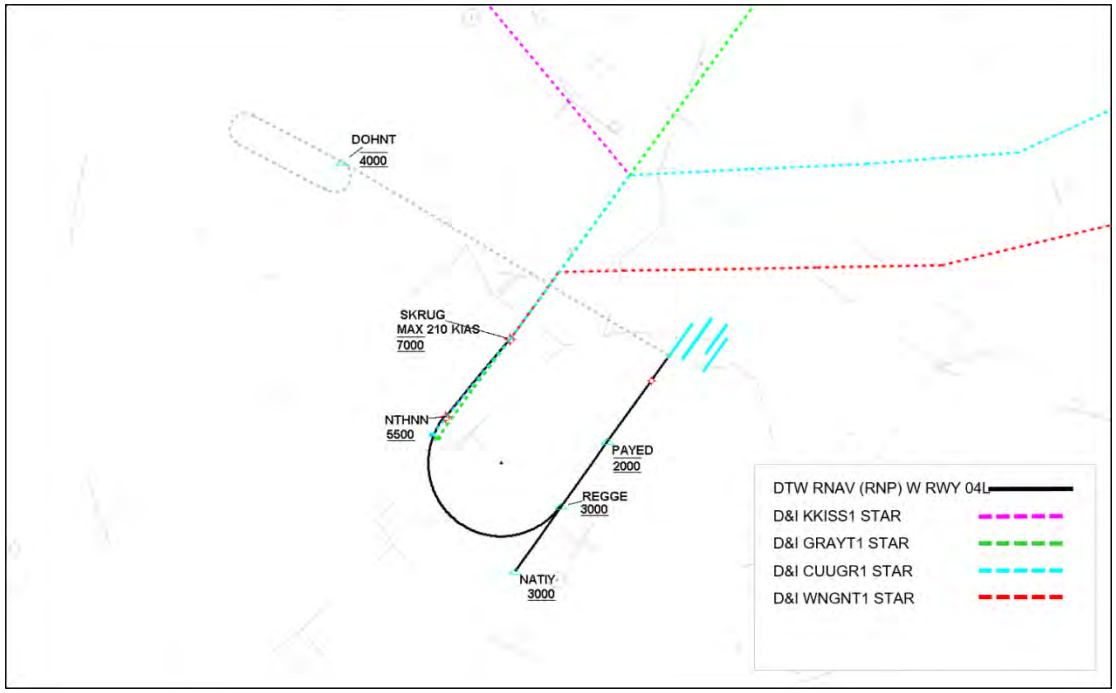

Figure 15. Final Design of the DTW RNAV (RNP) W Runway 04L approach (Offset/Short)

Figure 16 and 17 depict the final designs of the runway 04R procedures:

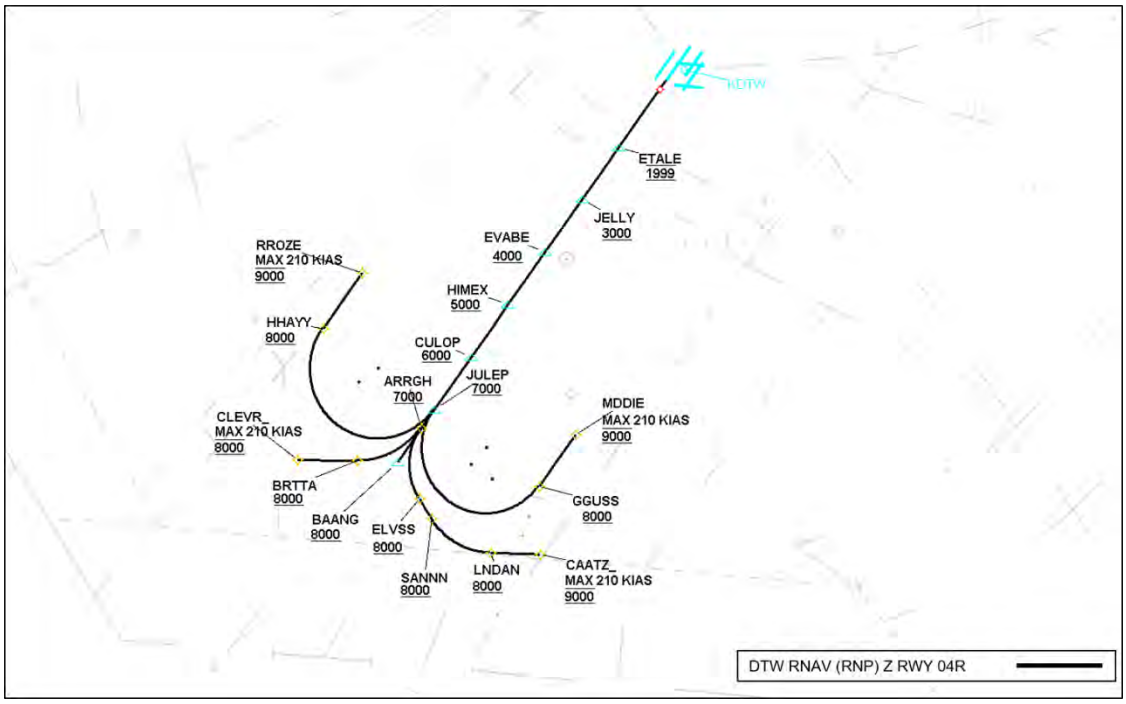

Figure 16. Final Design of the DTW RNAV (RNP) Z Runway 04R approach

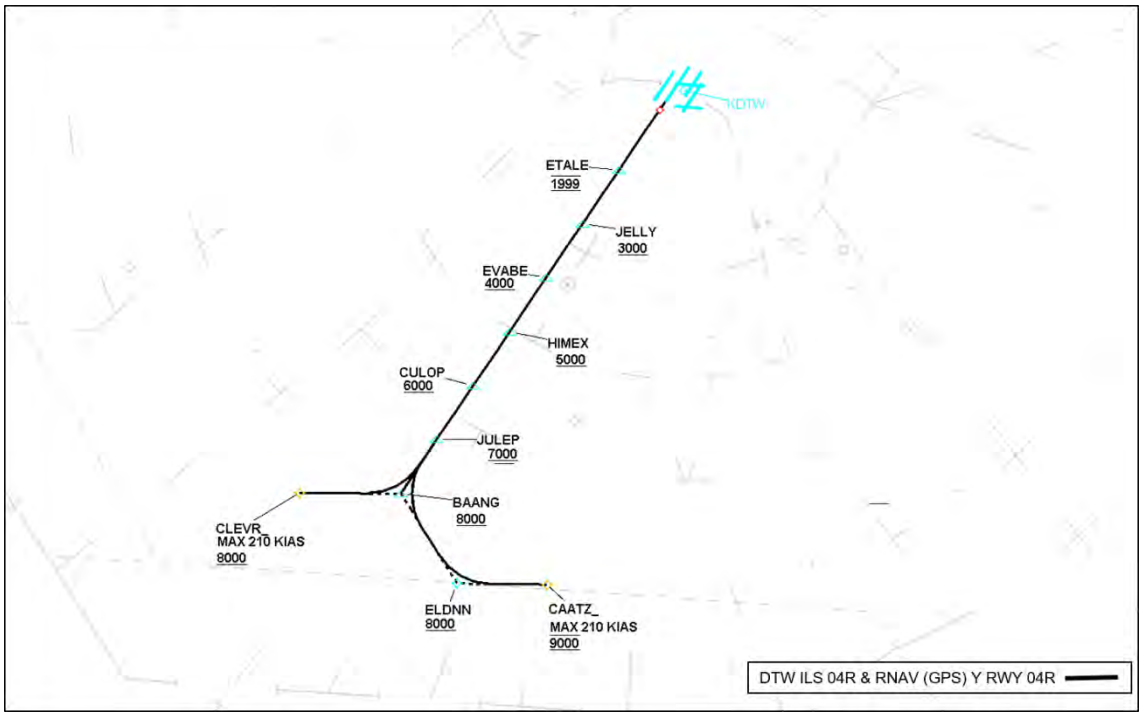

Figure 17. Final Design of the DTW ILS and RNAV (GPS) Y Runway 04R

Figures 18, 19, and 20 depict the final designs of the runway 03R procedures:

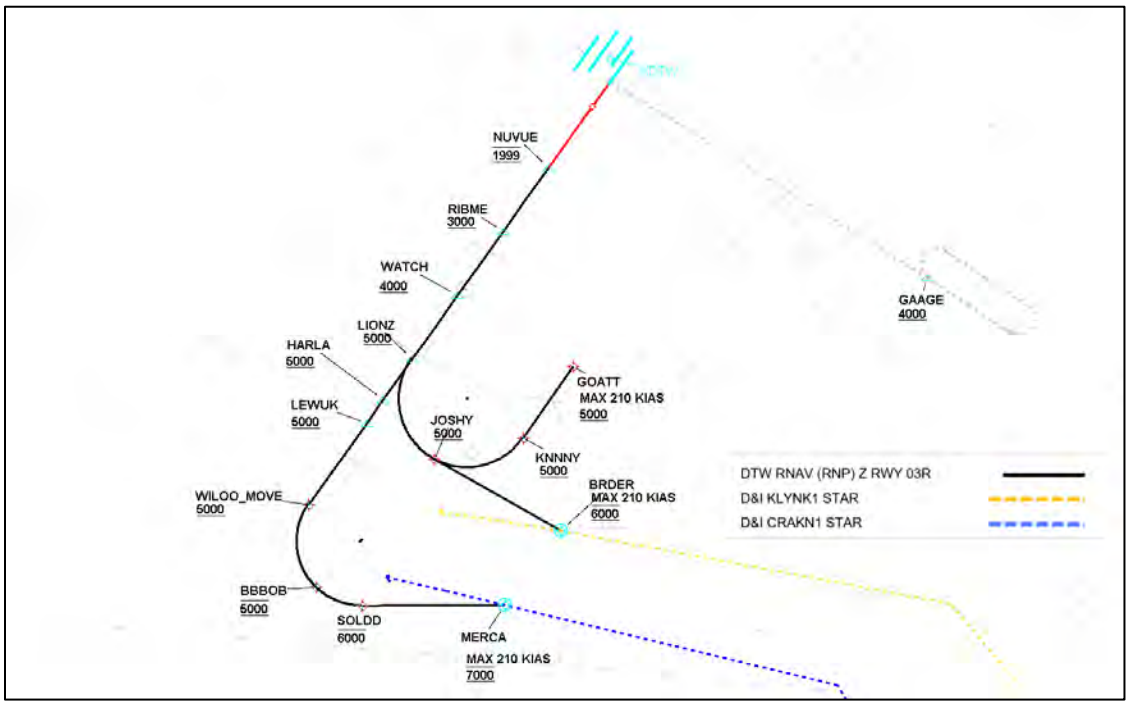

Figure 18. Final Design of the DTW RNAV (RNP) Z Runway 03R approach (Long)

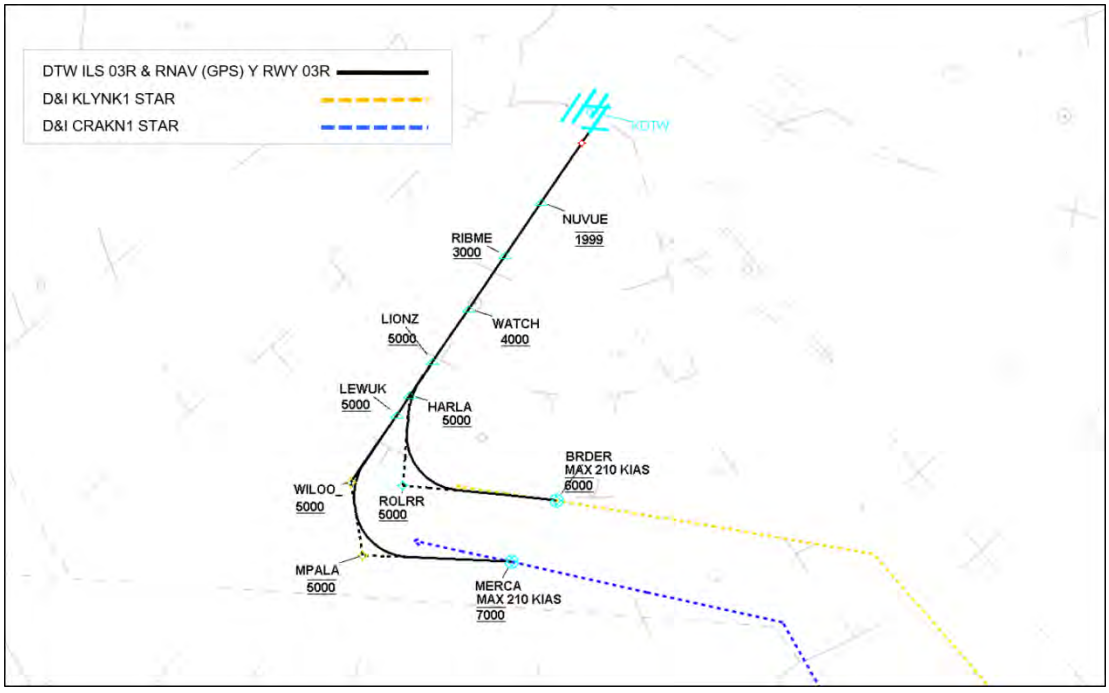

Figure 19. Final Design of the ILS and RNAV (GPS) Y Runway 03R approaches

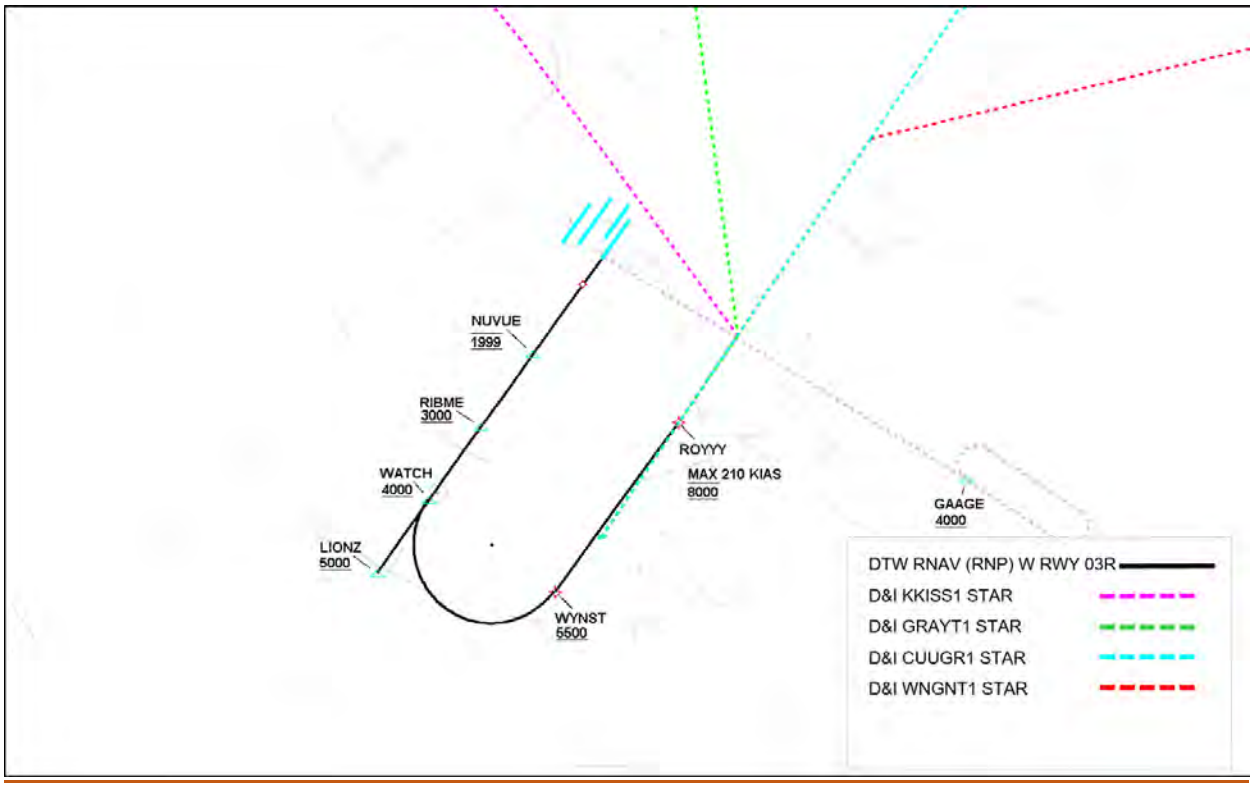

Figure 20. Final Design of the DTW RNAV (RNP) W Runway 03R approach (Short)

CLE-DTW Metroplex Design Package

DTW Standard Instrument Approach Procedures (SIAPs)

Additional Design Considerations

- A Human-in-the-Loop (HITL) simulation was conducted to validate these procedures in June 2015.
- Industry flight simulator testing was conducted through September 2015 to validate these procedures.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will be required.
- Terminal and enroute automation changes will be required.

Attachments

1. TARGETS Distribution Package DTW RNAV (RNP) Z Runway 22R
2. TARGETS Distribution Package DTW RNAV (RNP) X Runway 22R
3. TARGETS Distribution Package DTW RNAV (RNP) W Runway 22R
4. TARGETS Distribution Package DTW RNAV (RNP) Z Runway 22L
5. TARGETS Distribution Package DTW RNAV (GPS) Y Runway 22L (amend current RNAV(GPS) 22L)
6. TARGETS Distribution Package DTW ILS Runway 22L (amendment)
7. TARGETS Distribution Package DTW RNAV (RNP) **Z** Runway 21L
8. TARGETS Distribution Package DTW RNAV (GPS) Y Runway 21L (amend current RNAV(GPS) 21L)
9. TARGETS Distribution Package DTW ILS Runway 21L (amendment)
10. TARGETS Distribution Package DTW RNP AR W Runway 21L

11. TARGETS Distribution Package DTW RNAV (RNP) Z Runway 04L
12. TARGETS Distribution Package DTW RNAV (RNP) X Runway 04L
13. TARGETS Distribution Package DTW RNAV (RNP) W Runway 04L
14. TARGETS Distribution Package DTW RNAV (RNP) Z Runway 04R
15. TARGETS Distribution Package DTW RNAV (GPS) Y RWY 04R (amend current RNAV(GPS) 04R)
16. TARGETS Distribution Package DTW ILS Runway 04R (amendment)
17. TARGETS Distribution Package DTW RNAV (RNP) **Z** Runway 03R
18. TARGETS Distribution Package DTW RNAV (GPS) Y RWY 03R (amend current RNAV(GPS) 04R)
19. TARGETS Distribution Package DTW ILS Runway 03R (amendment)
20. TARGETS Distribution Package DTW RNP AR W Runway 03R

CLE-DTW Metroplex Design Package

Detroit Satellite RNAV Standard Terminal Arrivals (STARs)

OAPM Design Package Change Control Sheet			
Date	**Description**	**TARGETS File Reference**	**FAA/NATCA Co-Lead Initials**
20170505	**PTK OKLND STAR**) Removed MTC and PHN from the AXXIS/OKLND STAR. Purpose: MTC ATCT does not need MTC on the procedure.	20171107_CLE_DTW_ MASTER_FINAL.tgs	RW / MT
20170512	**PTK OKLND STAR**) Renamed the AXXIS STAR to the OKLND STAR.) Renamed WP2263 to PICUP.) Procedure to serve PTK, YIP, ARB, OZW, and VLL only Purpose: Procedure redesigned and renamed.	See above.	RW / MT
20170505	**PTK OKLND STAR**) Changed altitude at OKLND to AOA40. Purpose: The lowest MEA is 40 with no critical DMEs (PSI to be decommissioned).	See above.	RW / MT
20170724	**PTK OKLND STAR**) Make PICUP a transition fix.) Change altitude at OKLND to AOA40 if possible. Purpose: Requested by NavCanada.	See above.	RW / MT
20170724	**PTK OKLND STAR**) Make PICUP a transition fix. Purpose: Requested by NavCanada.	See above.	RW / MT
20170505	**DET GIGGY STAR**) New satellite STAR, mirrors OKLND STAR from COLTS to AXXIS then diverges to the southwest to AUTTO and GIGGY.) Procedure to serve DET, YQG, ONZ, and TTF only. Purpose: New procedure (subject airports removed from the AXXIS/OKLND STAR.	See above.	RW / MT
20170724	**DET GIGGY STAR**) Make PICUP a transition fix. Purpose: Requested by NavCanada.	See above.	RW / MT

Note: FAA and NATCA Metroplex Lead initials indicate that all required coordination (e.g. Environmental, Safety Management, Affected Facility POC, etc.) has been accomplished and all relevant data (e.g. TARGETS files) and attachments have been appropriately updated.

CLE-DTW Metroplex Design Package

DTW Satellite RNAV Standard Terminal Arrivals (STARs)

Name of Change	Date
AXXIS ONE STAR – RNAV (SATELLITE NE) **FOREY ONE STAR – RNAV (SATELLITE SE)** **PETTE ONE STAR – RNAV (SATELLITE SW)** **RRALF ONE STAR – RNAV (SATELLITE NW)**	**03 February 2017**
Change Classification	**Current Phase of Design**
Terminal Procedure **RNAV STARs**	☐ **Preliminary Design (PD)** ☐ **Operational Design (OD)** ☐ **Operational Design Complete (ODC)** ☒ **Proposed Final Design (PFD)** ☐ **Final Design (FD)**
OAPM Study Team Reference(s)	**Implementation Date**
4.3.1.9 DTW SAT Arrival Issues	**May 24, 2018**
Affected Facilities and Positions, Areas, and/or Sectors	**Facility Points of Contact**
D21 Positions: Y, P, D, K, W, E **ZOB 1, 2, 8** **ZAU** **ZID** **ZMP**	**Detroit TRACON (D21): Steve Mack, Alex Huttenga** **Cleveland ARTCC (ZOB): Mike Ferrell, Rick Norris** **Chicago ARTCC (ZAU): Joseph Bocik, Sam Passialis** **Indianapolis ARTCC (ZID): Steven Balkevicius, Noble Brown** **Minneapolis ARTCC (ZMP): Todd Amerman, Daniel Albing**
Related/Dependent Submissions	**Associated Data Files**
Dependent: Airspace Design Packages	**20170203_CLE_DTW_MASTER_FINAL.tgs**

Purpose

These proposed satellite STARs were designed to remain segregated and deconflicted from the DTW RNAV STARs. These procedures do not utilize Optimized Profile Descents (OPDs) to help reduce track miles.

CLE-DTW Metroplex Design Package

DTW Satellite RNAV Standard Terminal Arrivals (STARs)

Study Team Issues and Solutions

The Cleveland/Detroit Study Team identified a number of issues related to DTW satellite arrivals. Satellite Airports account for approximately 23% of all D21 TRACON arrival traffic.

- Issues
    - Lack of RNAV STAR for SAT airports
    - PTK arrivals over LLEEO descended over 40 miles from airport
    - CRUXX STAR contains a large turn at CRUXX
- Solution
    - RNAV STAR for satellite airports at each of the four corner posts

CLE-DTW Metroplex Design Package

DTW Satellite RNAV Standard Terminal Arrivals (STARs)

Proposed Final Design

All four DTW Satellite STARs:

- Are intended for use by all aircraft; turbojets, turboprops, and props
- Are not designed with optimized profile descents (OPDs)
- Serve the following satellite airports only:
  1. KVLL Oakland/Troy Airport
  2. CYQG Windsor Airport
  3. KPTK Oakland County International Airport
  4. KYIP Willow Run Airport
  5. KARB Ann Arbor Municipal Airport
  6. KDET Coleman A Young Municipal Airport
  7. KOZW Livingston County Spencer J. Hardy Airport
  8. KONZ Grosse Ile Municipal Airport
  9. KTTF Custer Airport
  10. KFNT Bishop International Airport (Flint) - FOREY (SE) and PETTE (SW) STARs only
  11. KMTC Selfridge Air National Guard Base

CLE-DTW Metroplex Design Package

DTW Satellite RNAV Standard Terminal Arrivals (STARs)

Figures 1 through 4 below depict proposed final design for DTW Satellite STARs.

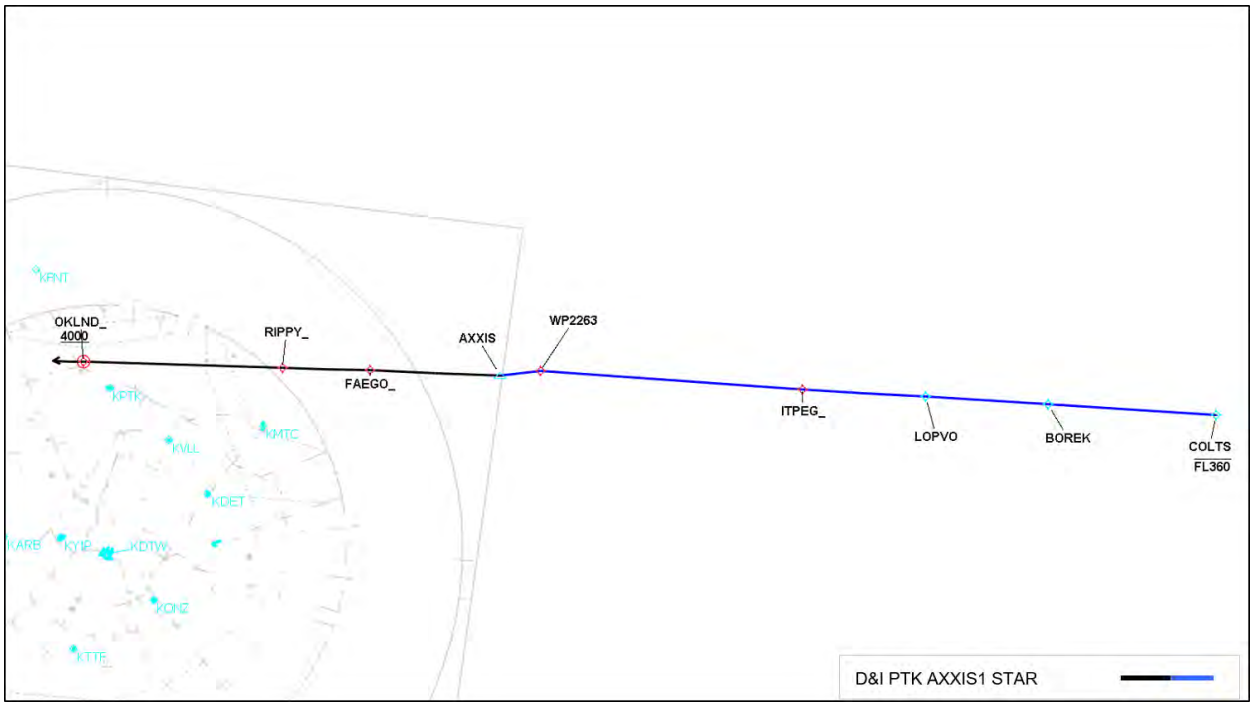

Figure 1. Proposed Final Design of the AXXIS ONE STAR

CLE-DTW Metroplex Design Package

DTW Satellite RNAV Standard Terminal Arrivals (STARs)

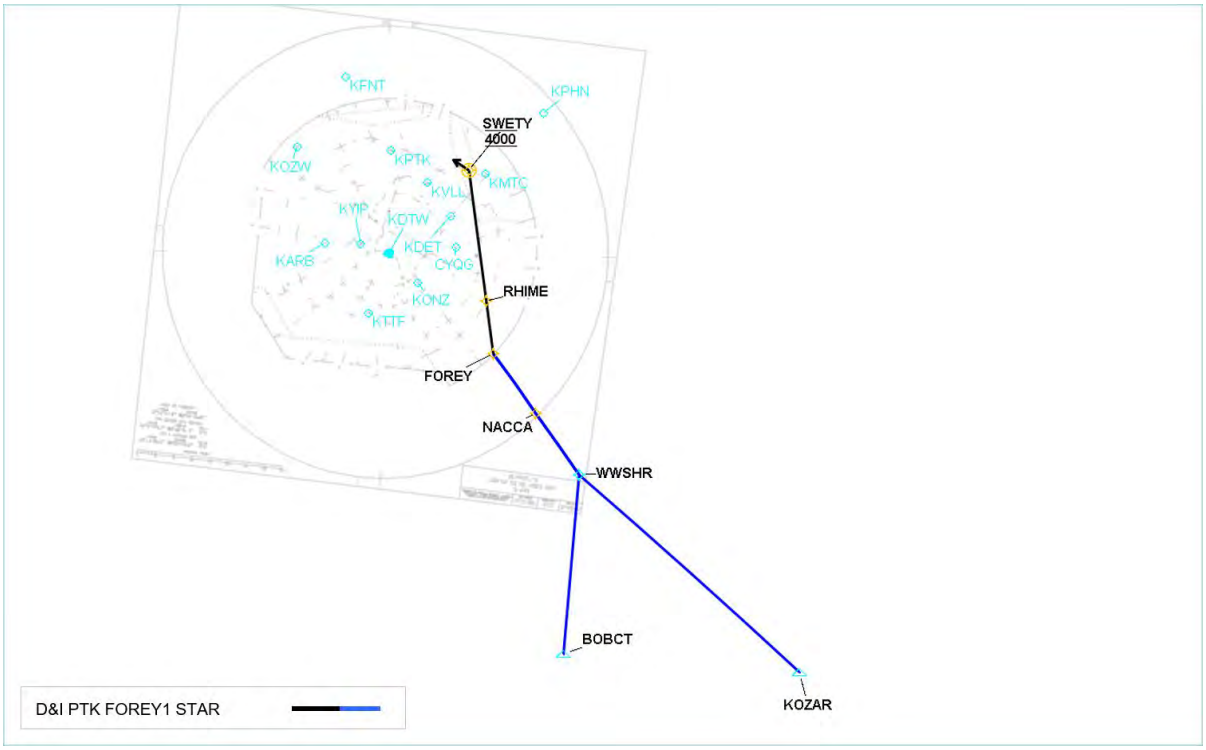

Figure 2. Proposed Final Design of the FOREY ONE STAR

CLE-DTW Metroplex Design Package

DTW Satellite RNAV Standard Terminal Arrivals (STARs)

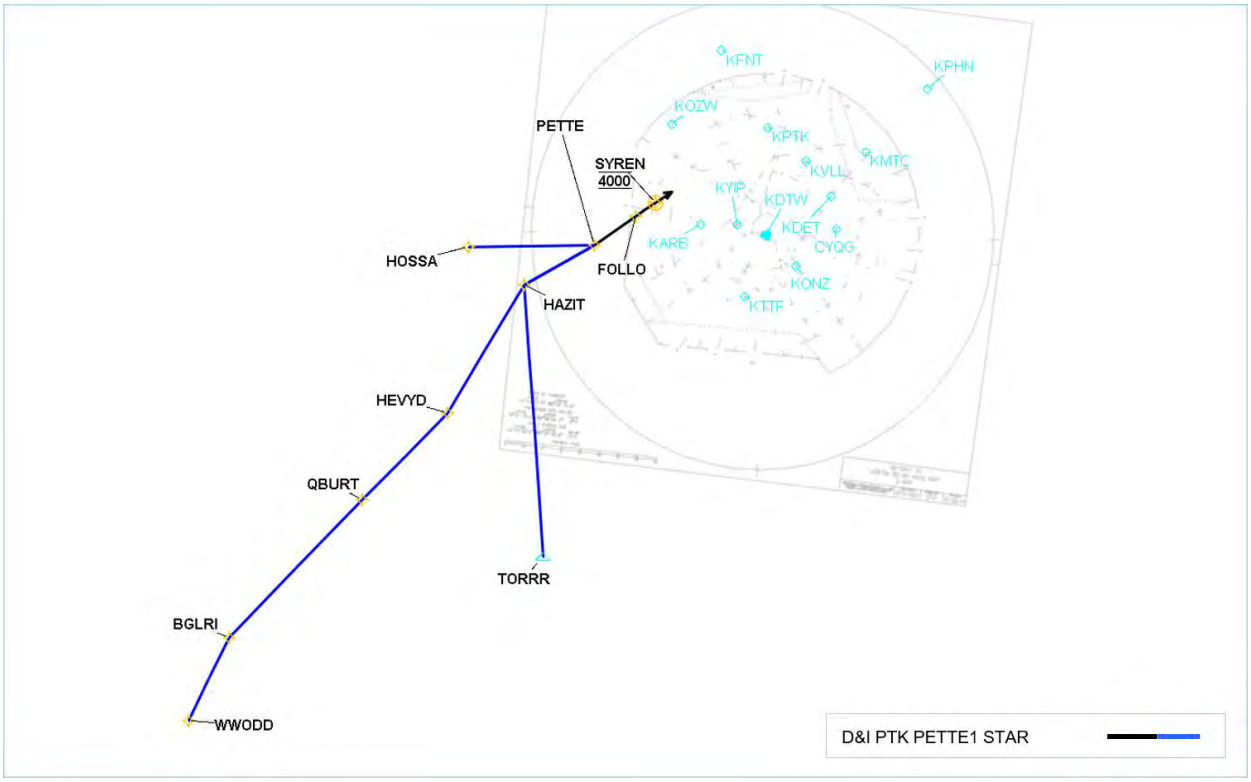

Figure 3. Proposed Final Design of the PETTE ONE STAR - enroute view

CLE-DTW Metroplex Design Package

DTW Satellite RNAV Standard Terminal Arrivals (STARs)

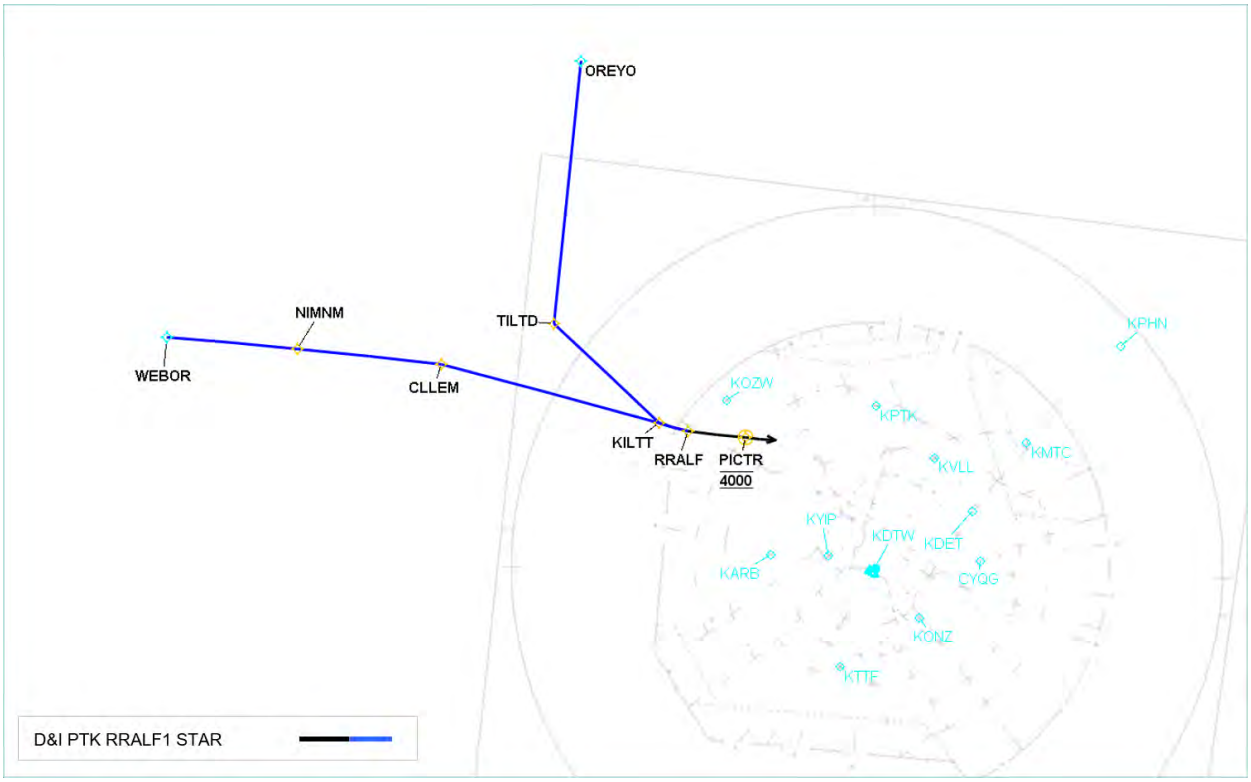

Figure 4. Proposed Final Design of the RRALF ONE STAR

CLE-DTW Metroplex Design Package

DTW Satellite RNAV Standard Terminal Arrivals (STARs)

Additional Design Considerations

- A high-level ISIM simulation was conducted to validate this procedure in May 2015.
- Industry flight simulator testing to validate this procedure was not conducted.

Implementation Dependencies

- Changes to airspace/sectorization and corresponding amendments to Letters of Agreement/s (LOAs) and Standard Operating Procedures (SOPs) will be required.
- A spectrum analysis will be required.
- Terminal and enroute automation changes will be required.

Attachments

AXXIS ONE STAR RNAV TARGETS Distribution Package
FOREY ONE STAR RNAV TARGETS Distribution Package
PETTE ONE STAR RNAV TARGETS Distribution Package
RRALF ONE STAR RNAV TARGETS Distribution Package