Federal Aviation Administration

Design Team Technical

Report **Las Vegas Metroplex**

November 8, 2019

Contents

1.0 The Metroplex Initiative

In September 2009, the Federal Aviation Administration (FAA) received the RTCA Task Force 5 Final Report on Mid-Term NextGen Implementation. The report contains recommendations concerning the top priorities for the implementation of NextGen initiatives. A key component of the FAA response to the RTCA recommendations was the formation of teams leveraging FAA and industry Performance Based Navigation (PBN) expertise and experience to expedite implementation of optimized airspace and procedures.

The Metroplex[1] initiative (Metroplex) is a systematic, integrated, and expedited approach to implementing PBN procedures and associated airspace changes developed in direct response to the Task Force 5 recommendations on the quality, timeliness, and scope of solutions.

Metroplex focuses on a geographic area, rather than a single airport. This approach considers multiple airports and the airspace within a metropolitan area, including all types of operations, as well as connectivity with other Metroplex regions. The Metroplex initiative is intended to enable accelerated development and implementation of beneficial PBN procedures.

The Metroplex process consists of five phases: Study, Design, Evaluation, Implementation, and Post-Implementation. This Executive Summary describes the Design Phase, while Attachment 2, Proposed Design Packages and Change Control Sheets, provides the detailed designs that are proposed moving forward with the project.

2.0 Overview of the Las Vegas Metroplex Design and Implementation (D&I) Team

The Las Vegas Metroplex Operational Study Team (OST) was charged with evaluating current procedures to identify operational issues affecting the efficiency of the Las Vegas Metroplex airspace. Their principal objective was to recommend conceptual Performance Based Navigation (PBN) procedures and/or airspace changes that resulted in both quantitative and qualitative efficiency gains. The qualitative benefits expected by the OST include reduced air traffic control (ATC) and pilot task complexity, reduced pilot/controller communications, and repeatable and predictable flight paths. The OST issued its final report on November 20, 2015.

The Las Vegas Metroplex Design and Implementation (D&I) Team began work in January 2017. The D&I Team utilized recommendations from the Las Vegas OST Report along with years of operational experience with Performance Based Navigation procedures as the foundation for further optimization of PBN procedures.

The D&I Team reviewed the OST Final Report to identify all conceptual proposals. They followed this with a review of the existing PBN procedures. These procedures and the OST Report provided the framework for the D&I Team's activities. However, the D&I Team had the flexibility to modify or adjust the OST proposals and existing procedures if the changes were operationally necessary or beneficial, provided they did not significantly reduce the OST's expected benefits, increase the expected costs, or extend the project timeline.

The Las Vegas D&I Team's ultimate goal was to create designs that address identified operational and efficiency issues by refining PBN procedures and associated airspace changes in the Las Vegas Metroplex while supporting FAA and industry needs. The designs proposed by the Las Vegas D&I Team refined the OST recommendations and improve the PBN

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

procedures currently in place. These efficiencies include maximizing the use of existing aircraft technologies and aircrew capabilities as well as optimizing vertical profiles to eliminate or reduce level flight segments. The D&I Team was able to develop procedural changes to improve both lateral and vertical paths for STARs and SIDs which segregate arrival and departure procedures, provide for repeatable/predictable flight paths, reduce ATC/pilot work load, and enhance safety.

3.0 Scope and Process

The Las Vegas Metroplex consists of airspace delegated to the Las Vegas Air Traffic Control Tower (LAS ATCT), Las Vegas Terminal Radar Approach Control (L30), Nellis Air Traffic Control Facility (NATCF) and the Los Angeles Air Route Traffic Control Center (ZLA ARTCC). Airports within the lateral confines of L30 and ZLA airspace were considered within scope of the Metroplex based on their proximity to and interaction with McCarran International Airport (KLAS) and the number of annual IFR operations. See Table 1 for the list of airports within the scope of the Las Vegas Metroplex.

Table 1: Las Vegas Metroplex Airports with new/revised PBN procedures

Airport ID	Airport Name
KLAS	McCarran International Airport
KHND	Henderson Executive Airport
KVGT	North Las Vegas Airport

4.0 Proposed Solutions

Procedure Summary

Table 2 lists the number of new and amended Las Vegas Metroplex procedures. If a Finding of No Significant Impact (FONSI) is determined, publication and implementation will occur on May 21, 2020.

Table 2: New and Amended Las Vegas Metroplex Procedures

Procedure Type	Created	Up-numbered/Amended	Cancelled
RNAV STARs	9	0	6
RNAV SIDs	10	0	9
Conventional STARs	4	0	5
Conventional SIDs	0	2	1
RNPs	5	0	0
RNAV GPS	0	4	0
ILS Approach	0	3	0
Q Routes	1	2	0
T Routes	5	0	0

Airspace

The Las Vegas D&I Team adopted the OST proposal to extend L30 airspace. The OST determined that L30's current lateral airspace boundary was insufficient to accommodate runway transitions for KLAS arrivals. During periods of moderate and heavy traffic, sequencing to Runways 26 L/R localizers extends back to ZLA airspace. Arrivals from the southwest, landing Runway 01L/R have difficulty meeting speed and altitude assignments. The existing ZLA/L30 Transfer of Control Points (TCP) did not allow for the timely issuance of runway assignments.

Airspace lateral/vertical boundaries were changed in ZLA and L30 airspace.

Currently, ZLA airspace changes when runway configurations at KLAS change. When Metroplex procedures are implemented, this will no longer be the case, with ZLA airspace boundaries remaining static regardless of L30 runway configuration.

L30 airspace lateral/vertical boundaries responsibilities were changed to reflect changed arrival and departure flows based on Metroplex procedures.

Standard Terminal Arrival Routes (STARs)

The Design Team considered each of the conceptual solutions developed by the OST and refined those concepts into comprehensive designs. These designs are captured in the STAR Proposed Final Design (PFD) packages, which are included as Attachment 2 to this document. Procedures were also developed for issues that were not identified by the OST, but considered operationally necessary.

The D&I Team considered numerous alternatives in the development of the PFDs. For each individual OST concept, the D&I Team went through an iterative design process, considering alternative lateral and vertical paths, various speed and altitude restrictions, alternative leg types, different segregation options and various charting considerations.

Some existing conventional procedures will be cancelled.

The D&I Team deviated from the OST recommendations for the southeast corner STARs and the reversal of arrival/departure flows in the northwest corner for operational necessity.

The MST proposed two separate STARs from the southeast to serve KLAS. After careful consideration and numerous design attempts, the D&I Team decided to create one STAR with three en route transitions for the following reasons:

- Safety
- Increased complexity in Albuquerque ARTCC (ZAB) airspace
- No segregation between arrivals from the south and departures to the southeast
- Increased complexity when descending KLAS arrivals
- Sequencing complexities
- Increased mileages
- Restricts use of Optimized Profile Descents (OPDs)
- Negative impact on departure traffic from Phoenix Sky Harbor International Airport (KPHX) to KLAS
- During Severe Weather Avoidance Program (SWAP) events, current northeast departures would have to fly greater distances to get to destination airports

The MST also recommended a reversal of the arrival and departure traffic flows from/to the northwest. The D&I Team utilized HITLS using I-SIM to test the conceptual designs submitted by the MST. After analysis of the simulations and discussion with Industry partners, the D&I Team determined an alternative solution without reversing the flows for the following reasons:

- Terrain
- Excessive climb gradient
- Reduced controller options for vectoring due to terrain and Special Use Airspace
- Weather deviations
- Conflict with Department of Energy Flights
- KHND Departure Routes

- Conflicts with Nellis Air Force Base airspace
- Interactions between arrival and departure traffic

The Design Team developed ten RNAV STARs (three for KHND, five for KLAS and two for KVGT).

The basic operational standards for the KHND, KLAS and KVGT STARs are:

- Human-in-the-loop scenarios were developed to mitigate any concerns with respect to arrival feeds from ZLA to L30
- Traffic Management Implementation plans are being developed which may include Adjacent Center Metering (ACM).
- Segregation of procedures as much as practicable
- Utilization of OPDs when available

Standard Instrument Departures (SIDs)

The Design Team considered each of the conceptual solutions developed by the OST and refined those concepts into comprehensive designs. These designs are captured in the SID PFD packages, which are included as Attachment 2 to this document. Procedures were also developed for issues that were not identified by the OST, but considered operationally necessary.

The D&I Team considered numerous alternatives in the development of the PFDs. For each individual OST concept, the D&I Team went through an iterative design process, considering alternative lateral and vertical paths, various speed and altitude restrictions, alternative leg types, different segregation options and various charting considerations.

The Design Team developed nine RNAV SIDs (two for KHND and seven for KLAS).

Some existing conventional procedures will be amended to provide continuity with new PBN procedures. Other conventional procedures will be cancelled. The D&I Team deviated from the OST recommendations for the reversal of arrival/departure flows in the northwest corner for operational necessity (see STARS section).

The basic operational standards for the KHND, KLAS and KVGT SIDs are:

- Human-in-the-loop scenarios were developed to mitigate any concerns with respect to arrival feeds from ZLA to L30
- Segregation of procedures as much as practicable
- Provision for unrestricted climbs as much as practicable

Approaches

The Design Team developed five Required Navigation Performance (RNP) Approaches to KLAS that will provide continuity of PBN procedures for KLAS arrivals:

- RNAV (RNP) Runway 08R
- RNAV (RNP) Runway 19L
- RNAV (RNP) Runway 19R
- RNAV (RNP) Runway 26L
- RNAV (RNP) Runway 26R

The RNAV (RNP) approaches were designed to remain within historical tracks.

Three existing KLAS ILS approaches were amended in order to provide continuity with PBN procedures:

- ILS Runway 01L
- ILS Runway 26L
- ILS Runway 26R

The lateral track for amended ILS approaches remains within historical tracks.

Two RNAV/GPS approaches were amended in order to provide continuity with PBN procedures and to reduce complexity:

- KVGT RNAV/GPS Runway 12
- KLAS RNAV/GPS Runway 01R

The lateral tracks for the RNAV/GPS approaches remain within historical tracks.

Q Routes/T Routes

The Design Team developed or amended Q and T Routes in an effort to reduce complexity and increase efficiency, allowing integration of arrivals, departures and transitioning aircraft with new Metroplex STARs and SIDs.

The Las Vegas Metroplex Design Team identified a need to amend current Q-Routes in order to increase the efficiency throughout ZLA airspace and to help segregate overflight traffic from McCarran International Airport (KLAS) arrival/departure traffic.

T Routes were developed to provide repeatable and predictable routes, reducing complexity in the airspace utilized by arrivals and departures for the Las Vegas Valley.

Conventional Procedures

All conventional procedures were reviewed to determine whether they could be removed from the National Airspace System (NAS). Due to GPS jamming by the Department of Defense (DoD), most conventional procedures will still be required in the Metroplex.

Cancelled Procedures

RNAV and conventional procedures were reviewed to determine suitability based on new Metroplex designs. Cancelled Procedures are shown in Table 3 below.

Table 3: Cancelled Procedures

Procedure	Airport
ACSIN 6 RNAV SID	KHND
ADDEL1 RNAV STAR	KHND
BOACH 8 RNAV SID	KLAS
CLARR 3 CONVENTIONAL STAR	KLAS, KHND, KVGT
COWBY 8 RNAV SID	KLAS
FLAMZ 6 RNAV SID	KHND
FUZZY 8 CONVENTIONAL STAR	KLAS, KVGT
JOMIX 1 RNAV STAR	KHND
KADDY 3 CONVENTIONAL STAR	KLAS, KVGT
KEPEC 6 RNAV STAR	KLAS
KNGMN 2 RNAV STAR	KHND
LAS VEGAS 5 CONVENTIONAL SID	KLAS

LUXOR 2 CONVENTIONAL STAR	KLAS, KVGT
NOOTN 2 RNAV STAR	KHND
PALLY 6 RNAV SID	KHND
PRFUM 4 RNAV SID	KLAS
SHEAD 1 RNAV SID	KLAS
SITEE 4 RNAV STAR	KLAS
STAAV 8 RNAV SID	KLAS
SUNST 4 RNAV STAR	KLAS
TRALR 9 RNAV SID	KLAS
TYSSN 5 RNAV STAR	KLAS

5.0 Procedure Refinement

The D&I Team utilized several workgroups, which included industry representatives, National Air Traffic Control Association (NATCA) Subject Matter Experts and FAA Management. The workgroups systematically developed and refined PBN procedures and airspace designs that met the intent of the OST. For each individual proposed concept, the Las Vegas D&I Team went through a design process considering alternative lateral and vertical paths, various speed and altitude restrictions, alternative leg types, different segregation options, aircraft performance, terrain and various charting considerations. Numerous tools were utilized to support the refinement including industry flight simulations, Integrated Simulation (I-SIM), human-in-the-loop and other simulations, flyability, and criteria checks.

The receipt of 156 comments after public workshops in April 2019 resulted in a review of designs/procedures affecting surrounding communities. The Design Team reviewed the following to determine whether design changes could be safely accomplished:

- KLAS RATPK SID (Runway 08 Transition)
  - Design not changed due to safety and efficiency concerns
    - L30 and LAS plan to use the Runway 08 Transition only when aircraft are landing on Runway 19 as a result of community input
- KLAS Runway 26 L/R Downwind
  - Design not changed due to design criteria issues (maximum bank angle)
- KLAS JOHKR, NIITZ, RADYR and RASLR SIDs (Runway 26 transitions)
  - Design not change due to safety and efficiency concerns
- KLAS Approach Procedures to Runways 01 L/R
  - The Metroplex Project has proposed no lateral or vertical changes to KLAS Runway 01 arrivals
- KLAS JOHKR, NIITZ, RADYR, RASLR SIDS (Runway 19 transitions)
  - Design not change due to safety and efficiency concerns
- KLAS GIDGT and RATPK SIDs (Runway 26 transitions)
  - Design not change due to safety and efficiency concerns

Design proposals were documented and signed by affected FAA and NATCA stakeholders. The remainder of the Design Phase focused on the refinement of the Proposed Designs, ensuring that requirements of applicable guidance documents were met. Documents including, but not limited to Airspace Management Handbooks:

- FAA JO 7100.41: Performance Based Navigation Implementation Process
- FAA Order 8260.3: United States Standard for Terminal Instrument Procedures (TERPS)
- FAA Order 8260.46: Departure Procedure Program

- FAA Order 8260.58: United States Standard for Performance Based Navigation
- (PBN) Instrument Procedure Design

6.0 Key Deliverables and Recommendations

The Las Vegas Metroplex Team's systematic approach has allowed the Las Vegas D&I Team to create procedures that optimize and segregate competing routes for the entire Las Vegas metro area. Implementation of proposed procedures will include modification and cancellation of some existing SID's and STAR's. Proposed procedural actions for implementation of the Las Vegas Metroplex proposed procedures are contained in Attachment 1.

Each Design Package in Attachment 2 describes the issues and conceptual solutions identified by the OST as well as design elements and benefits, dependencies among various proposals, and graphical depictions.

The Las Vegas D&I Team proposals will:

- Modify RNAV SIDs and STARs
- Increase usage of OPDs
- Reduce departure flight path deviations
- Reduce dependence on ground based navigational aids
- Increase repeatable and predictable flight planning
- Reduce controller and pilot task complexity
- Reduce radio transmissions

The deliverables for the Las Vegas Design Phase include the Design Team Technical Report and the attached Proposed Design Packages and Change Control Sheets (CCS).

Bradley R. Mayhugh	Date	Chris Thomas	Date

Attachment 1: D&I Proposed Procedural Actions

Procedure Name	Procedure Type	Airport (s)	Action
GIDGT	RNAV SID	KLAS	Create
JOHKR	RNAV SID	KLAS	Create
LOHLA	RNAV SID	KLAS	Create
NIITZ	RNAV SID	KLAS	Create
RADYR	RNAV SID	KLAS	Create
RASLR	RNAV SID	KLAS	Create
RATPK	RNAV SID	KLAS	Create
CHOWW	RNAV STAR	KLAS	Create
COKTL	RNAV STAR	KLAS	Create
JAYSN	RNAV STAR	KLAS	Create
RKSTR	RNAV STAR	KLAS	Create
RNDRZ	RNAV STAR	KLAS	Create
OYODA	RNAV SID	KHND	Create
SCAMR	RNAV SID	KHND	Create
BOEGY	RNAV STAR	KHND	Create
GAMES	RNAV STAR	KHND	Create
NTNDO	RNAV STAR	KHND	Create
FLCHR	RNAV STAR	KVGT	Create
WYLND	RNAV STAR	KVGT	Create
BLAID	CONVENTIONAL STAR	KLAS	Create
GRMMA	CONVENTIONAL STAR	KLAS	Create
HOOVER	CONVENTIONAL SID	KLAS	Up-number
ISHEE	CONVENTIONAL STAR	KLAS	Create
MCCARRAN	CONVENTIONAL SID	KLAS	Up-number
PUMLE	CONVENTIONAL STAR	KLAS	Create
RNP 08R	RNP approach	KLAS	Create
RNP 19L	RNP approach	KLAS	Create
RNP 19R	RNP approach	KLAS	Create
RNP 26L	RNP approach	KLAS	Create
RNP 26R	RNP approach	KLAS	Create
ILS 26L	ILS Approach	KLAS	Amend
ILS 26R	ILS Approach	KLAS	Amend
ILS 01L	ILS Approach	KLAS	Amend
RNAV GPS 01R	RNAV/GPS approach	KLAS	Amend
RNAV GPS 12	RNAV/GPS approach	KVGT	Amend
T338	T Route	N/A	Create
T357	T Route	N/A	Create
T359	T Route	N/A	Create
T361	T Route	N/A	Create
T363	T Route	N/A	Create
Q13	Q Route	N/A	Amend
Q15	Q Route	N/A	Amend
Q174	Q Route	N/A	Create

Attachment 2: Proposed Design Packages and Change Control Sheets

KLAS CHOWW STAR CHANGE SHEET

METROPLEX CHOWW Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
8/28/2019	In order to meet design criteria and to increase efficiency, the Team removed the speed (210 knots) at NNEON. FOOOF (AOA 070) was moved 2.5 miles to the southwest and a speed of 220 knots was added.	Mater TARGETS File	

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.

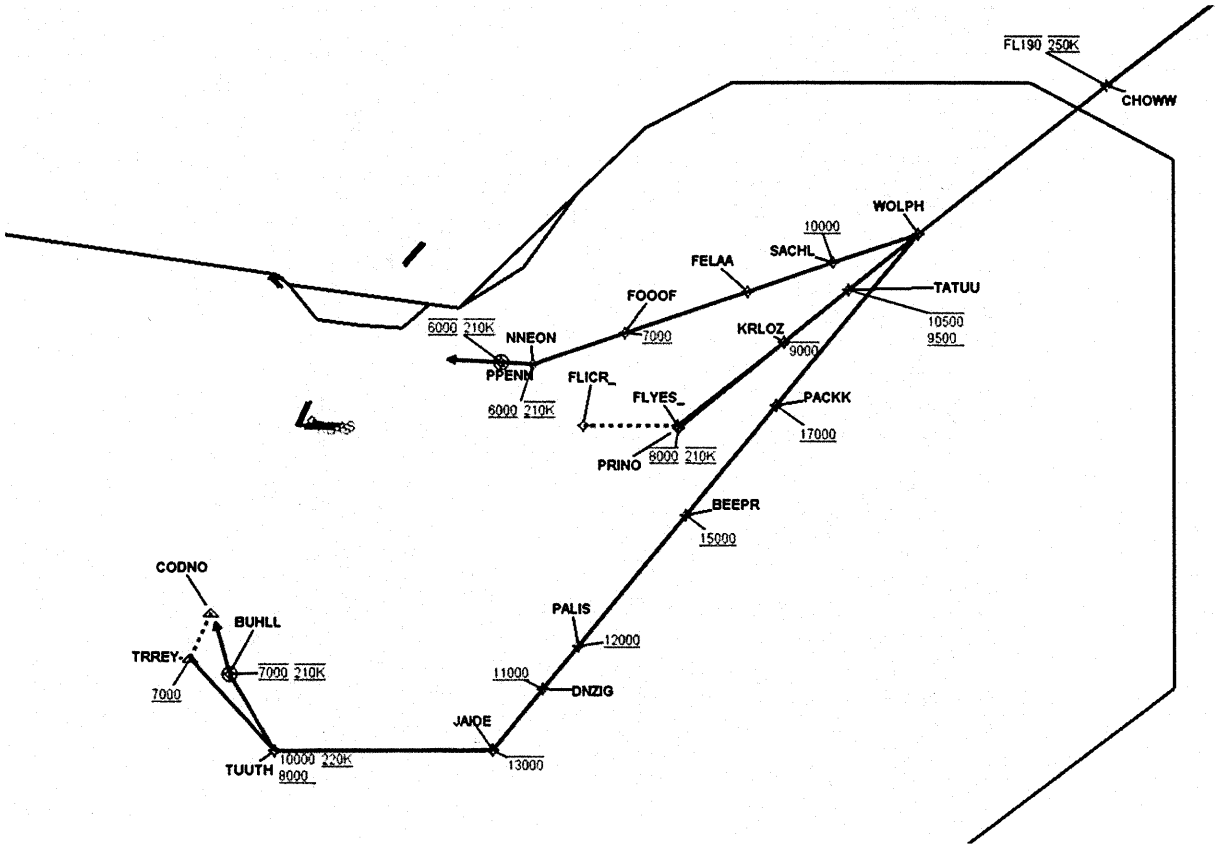


Figure 1. Original Proposed Final Design Procedure/Route/Airspace

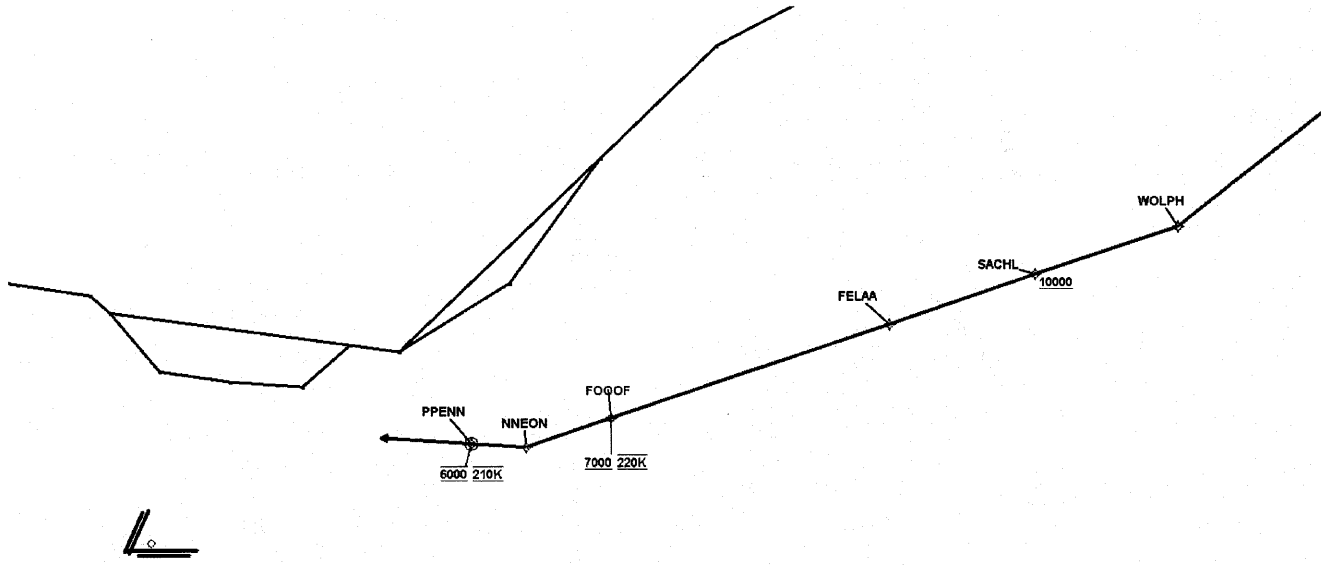


Figure 2. Revised Proposed Final Design Procedure/Route/Airspace

All Change Control Sheets and Final Design Packages under the Metroplex Project have been completed.

Bradley R. Mayhugh
FAA Metroplex Co-Lead

11/5/19
Date

Chris Thomas
NATCA Metroplex Co-Lead

11/6/19
Date

KLAS CHOWW STAR CHANGE SHEET

METROPLEX CHOWW Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
8/28/2019	In order to meet design criteria and to increase efficiency, the Team removed the speed (210 knots) at NNEON. FOOOF (AOA 070) was moved 2.5 miles to the southwest and a speed of 220 knots was added.	Mater TARGETS File	
Post Design Package Submission	FLYES was moved marginally to a location abeam of PRINO at Industry request in order to reduce complexity (Shown in Figure 1)	Master TARGETS Files	

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.

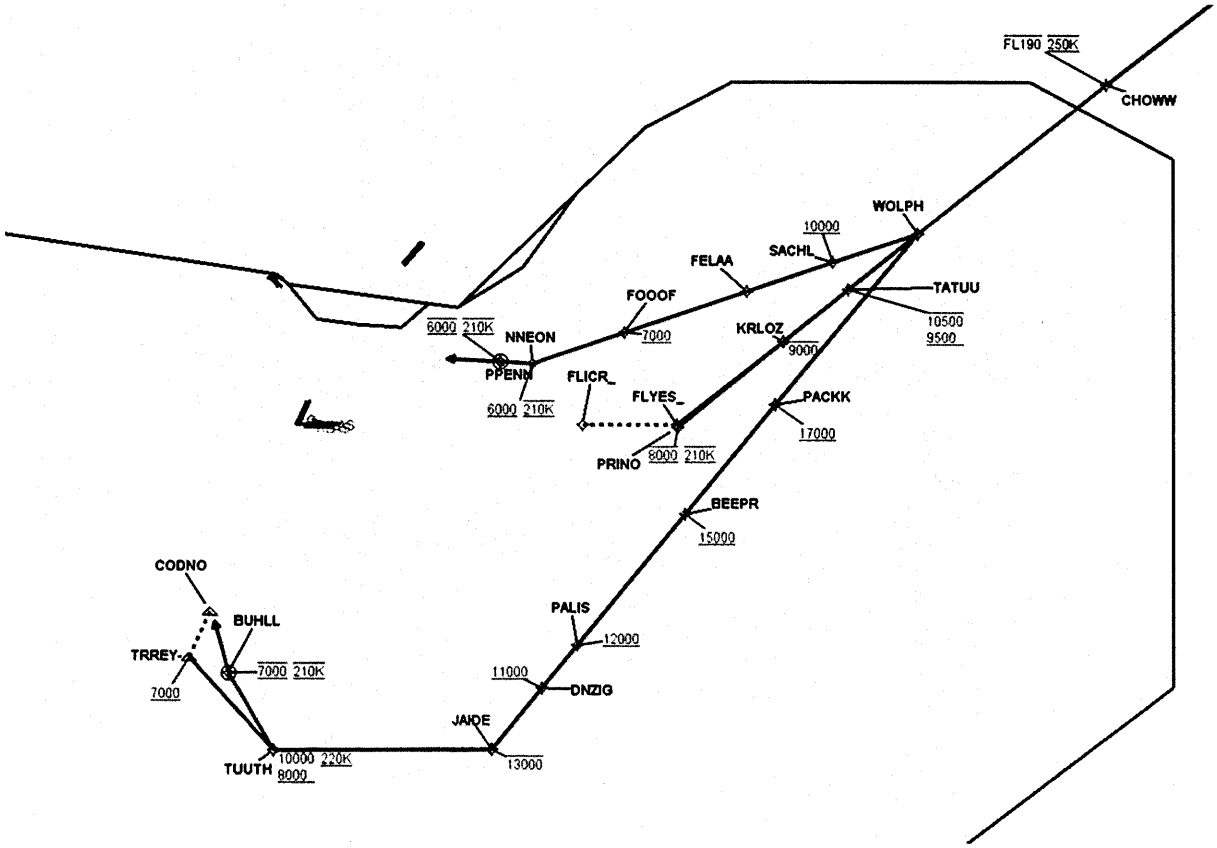


Figure 1. Original Proposed Final Design Procedure/Route/Airspace

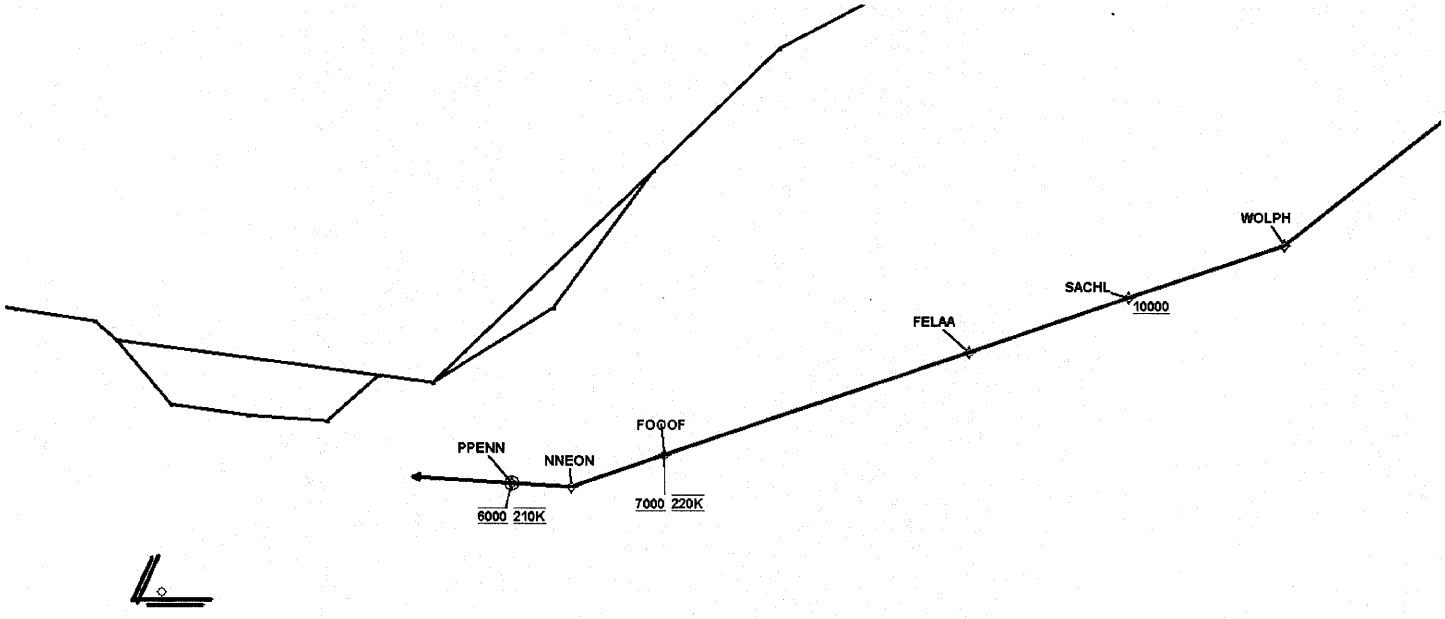


Figure 2. Revised Proposed Final Design Procedure/Route/Airspace

All Change Control Sheets and Final Design Packages under the Metroplex Project have been completed.

Bradley R. Mayhugh
FAA Metroplex Co-Lead

11/5/19
Date

Chris Thomas
NATCA Metroplex Co-Lead

11/6/19
Date

Las Vegas OAPM Design Package

KLAS CHOWW STAR

An Area Navigation (RNAV) Standard Terminal Arrival Route (STAR) is a procedure that serves as a lateral path for aircraft landing at an airport. RNAV STARs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

McCarran International Airport (KLAS) arrivals from northeastern origins will use a new flight path procedure called the CHOWW (pronounced "Chow") RNAV STAR. The CHOWW STAR will replace the current SITEE (pronounced "City") RNAV STAR.

The Las Vegas Metroplex Study Team (MST) noted that the current SITEE STAR causes aircraft to level off for extended periods and requires close interactions with other arrival and departure flight paths into and out of the Las Vegas Valley, increasing complexity of operations.

In order to segregate KLAS arrivals from the northeast from other aircraft traffic flows, the CHOWW STAR includes altitude restrictions. These restrictions will allow descents that are more continuous at reduced power. In air traffic control terms, this is called an Optimized Profile Descent (OPD).

This procedure is not anticipated to change runway usage.

The new CHOWW RNAV STAR will provide connectivity to all KLAS runways except KLAS Runways 08L/R. A transition to Runways 08L/R was not feasible.

The new CHOWW STAR addresses KLAS. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the area.

Las Vegas OAPM Design Package

KLAS CHOWW STAR

Name of Change and Airport(s)	Change Classification
Las Vegas McCarran International Airport (KLAS) CHOWW Area Navigation (RNAV) Standard Terminal Arrival Route (STAR)	**Terminal Procedure; STAR**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.3.1.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 7, 54, 55 **Salt Lake City ARTCC (ZLC) Sectors: 33, 34, 44, 46** **Denver ARTCC (ZDV) Sectors: 23, 24, 68** **Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: LAK, SAT, FNL** **KLAS**	**KLAS RATPK and GIDGT Standard Instrument Departures (SIDs)** **Henderson Executive Airport (KHND) BOEGY STAR** **KHND SCAMR SID** **North Las Vegas Airport (KVGT) WYLND STAR**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results** **Human in the Loop Simulation (HITLS) results**	

Purpose

The purpose of the proposed KLAS CHOWW RNAV STAR is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

MST Issues and Recommendation

Issues

Stakeholders agree that the GRNPA/SITEE STAR[1] has numerous inefficiencies in its design. GRNPA/SITEE arrivals incur an approximate ten nautical mile (NM) level-off at 12,000 feet and an approximate ten to twenty NM level-off at 8,000 feet to comply with other inefficient procedures.

[1] The SITEE STAR replaced the GRNPA STAR in 2017 outside of the LAS Metroplex Project but after the MST report was published.

The GRNPA/SITEE STAR does not provide repeatable and predictable course guidance to runways other than Runways 19L/R. The lack of runway transitions requires controllers to vector aircraft to other runways increasing pilot/controller task complexity.

The sharp left turn at LUXOR creates excessive compression at the L30/ZLA boundary. L30 controllers vector arrivals off the procedure to maintain in trail spacing. Sequencing three flows at KSINO by multiple ZLA sectors is complex and inefficient.

Recommendation

The MST created an RNAV Optimized Profile Descent (OPD) STAR (NE STAR) usable for all configurations, which reduces flight track miles and level segments and connects to current and proposed Standard Instrument Approach Procedures (SIAP). The KLAS NE STAR incorporates altitude windows and speed constraints to reduce pilot/controller task complexity.

During the second Outreach, ZLA provided input as to the location of the en route transitions sequencing point. This new location is east of the current KSINO merge point.

The MST recommendation is depicted in Figures 1 and 2.

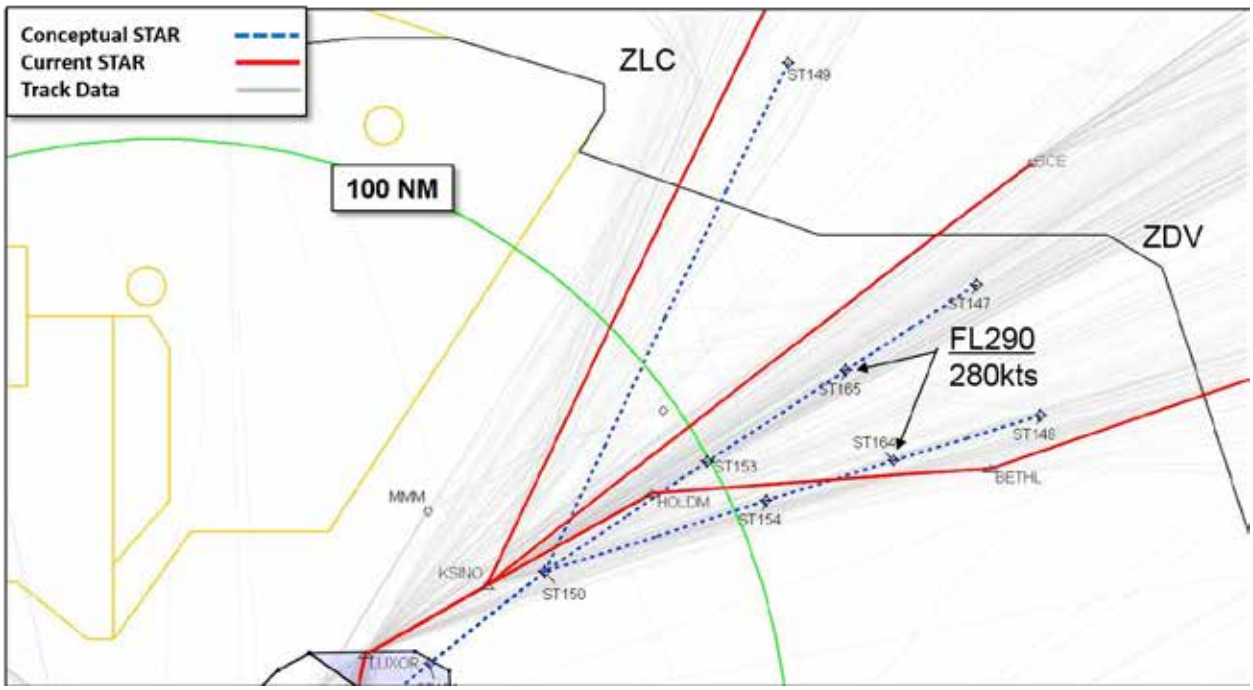


Figure 1: Current KLAS GRNPA/SITEE STAR and MST's Conceptual KLAS NE STAR - En Route View

Las Vegas OAPM Design Package

KLAS CHOWW STAR

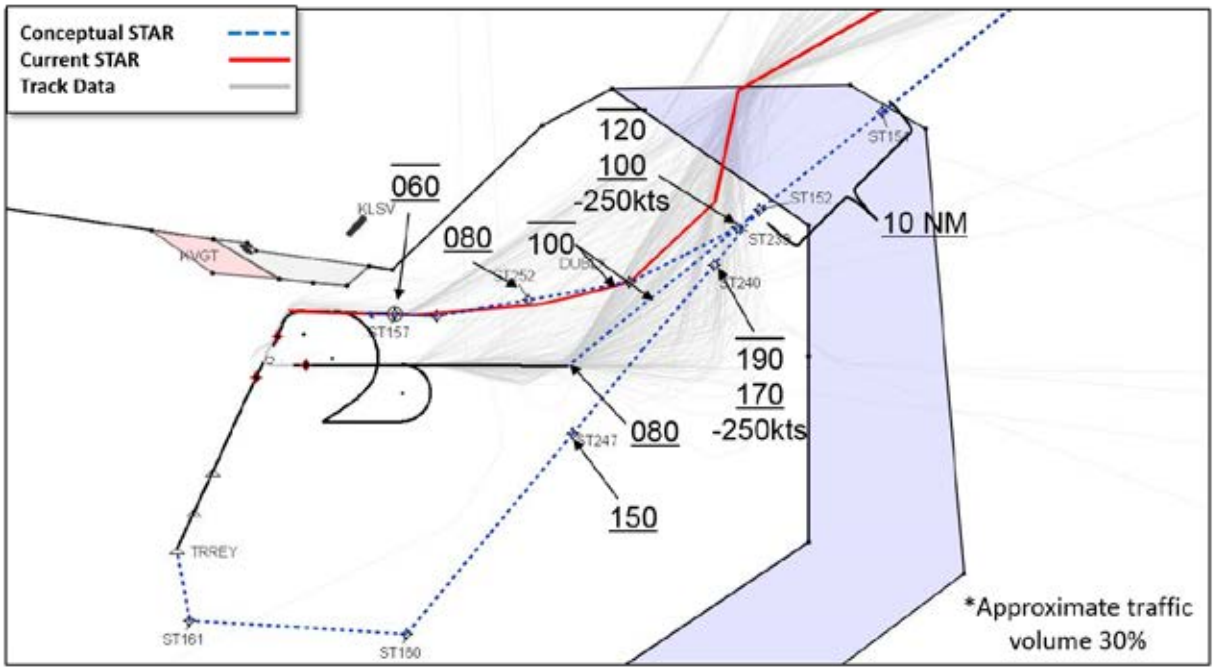


Figure 2: Current KLAS GRNPA/SITEE STAR and MST's Conceptual KLAS NE STAR – Terminal View

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal, considering both the issues and recommendation. The CHOWW RNAV STAR was designed as an OPD STAR with enhanced repeatability and predictability. It will increase efficiency and reduce complexity by reducing controller and flight crew workloads and task complexity. In en route airspace, the procedure closely follows the MST recommendation.

The KLAS CHOWW STAR was designed with three en route transitions, a common route and runway transitions to six of the eight KLAS runways.

The KLAS CHOWW STAR's PFD is depicted in Figures 3 and 4.

En Route Transitions

GGAPP Transition (for flights that depart within or overfly ZLC airspace)

- GGAPP (coordination waypoint with ZLC)
- PHHIL (At or above FL 240/provides airspace integrity/published standard holding pattern)
- AALAN (altitude window of 170 to FL230/reduces complexity in ZLA Sector 54/ published standard holding pattern)
- CHOWW (at or below FL190/250 knots/ ensures aircraft enter L30 airspace prior to boundary/reduces compression)

STEWW Transition (accommodates flights from the north from ZLC)

- STEWW (coordination waypoint with ZLC)
- RIGLL (at or above FL 240/provides airspace integrity)
- AALAN (altitude window of 170 to FL230/reduces complexity in ZLA Sector 54/published standard holding pattern)
- CHOWW (at or below FL190/250 knots/ ensures aircraft enter L30 airspace prior to boundary/reduces compression)

TYEGR Transition (for flights that depart within or overfly ZDV airspace)

- TYEGR (coordination waypoint with ZDV)
- WARKA (used for sequencing flexibility/provides segregation from J11)
- DUUGG (published standard holding pattern)
- HAANG (at or above FL 240/provides airspace integrity)
- AALAN (altitude window of 170 to FL230/reduces complexity in ZLA Sector 54/published standard holding pattern)
- CHOWW (at or below FL190/250 knots/ ensures aircraft enter L30 airspace prior to boundary /reduces compression)

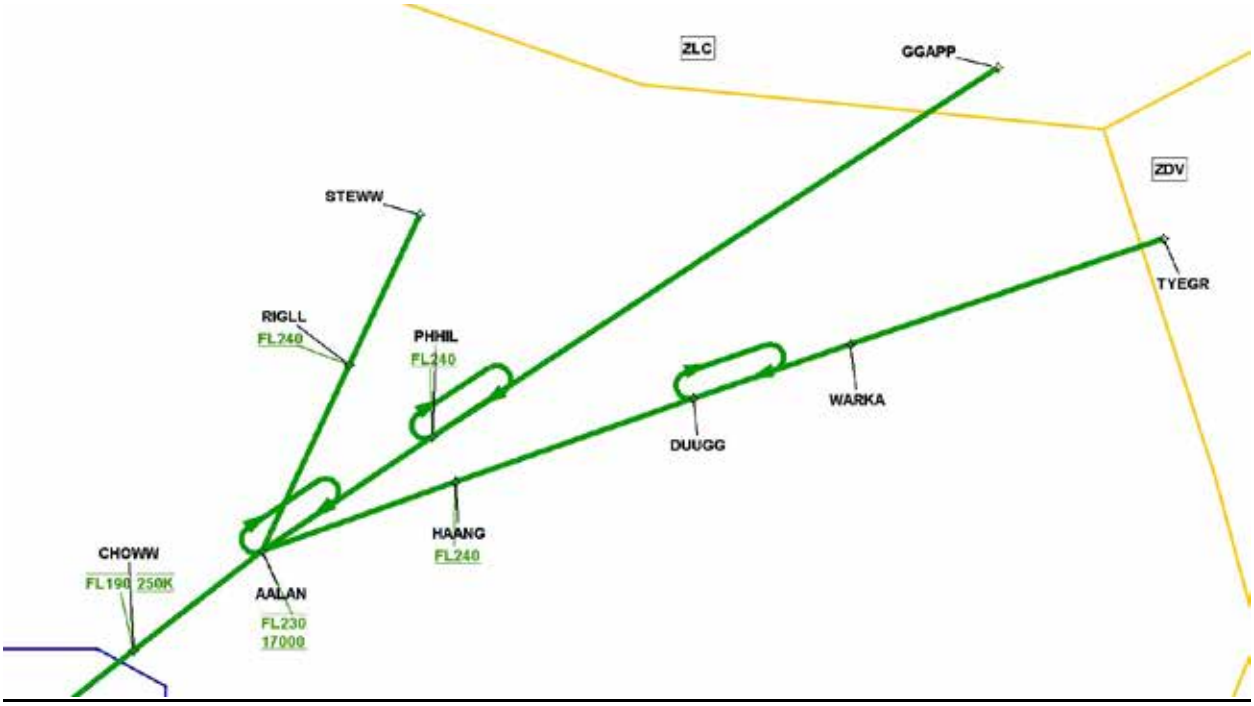


Figure 3: KLAS CHOWW STAR – En Route View

Las Vegas OAPM Design Package

KLAS CHOWW STAR

Common Route

- CHOWW (at or below FL190/250 knots/ensures aircraft enter L30 airspace prior to boundary reduces compression)
- WOLPH (accommodates runway transitions)

The terminal portion of the CHOWW STAR provides course guidance to serve all KLAS runways except Runways 08L/R. A transition to Runways 08L/R was not feasible.

Runway Transitions

Runways 01L/RTransition

- WOLPH (accommodates runway transitions)
- PACKK (at or above 170/provides continuity of descent/reduces compression)
- BEEPR (at or above 150/provides segregation from KLAS GIDGT, RASLR and NIITZ SIDs)
- PALIS (at or above 120/provides segregation from KHND SCAMR SID)
- DNZIG (at or above 110/provides segregation from KHND SCAMR SID/provides airspace integrity)
- JAIDE (at or below 130/tie-in to KLAS RKSTR STAR)
- TUUTH (altitude window of 080 to 100/220 knots/provides segregation from KHND SCAMR and OYODA SIDs/required for design criteria)
- BUHLL (at 7,000 feet/210 knots/ensures Class B containment/ required for design criteria/ provides Runway 01R approach connectivity)

  Or
- TRREY (at or above 7,000 feet/ensures Class B containment/provides Runway 01L approach connectivity)

Runways 19L/R Transition

- WOLPH (accommodates runway transitions)
- SACHL (at or above 100/resolves Minimum Obstruction Clearance Altitude (MOCA) criteria)
- FELAA (tie-in to the KLAS RKSTR STAR)
- FOOOF (at or above 070/resolves MOCA criteria)
- NNEON (at or above 060/210 knots/required for design criteria)
- PPENN (at 060/210 knots/required for design criteria/provides approach connectivity)

Runways 26L/R Transition

- WOLPH (accommodates runway transitions)
- TATUU (altitude window of 094 to 105/required for design criteria/provides segregation from KLAS GIDGT SID/resolves MOCA criteria)
- KRLOZ (at or below 090//provides segregation from KLAS NIITZ and RASLR SIDs)
- PRINO (at 080/210 knots/provides Runway 26L approach connectivity)

Or

- FLYES was moved approximately 1.6 miles east for approach criteria (at or above 080/210 knots/provides Runway 26R approach connectivity)

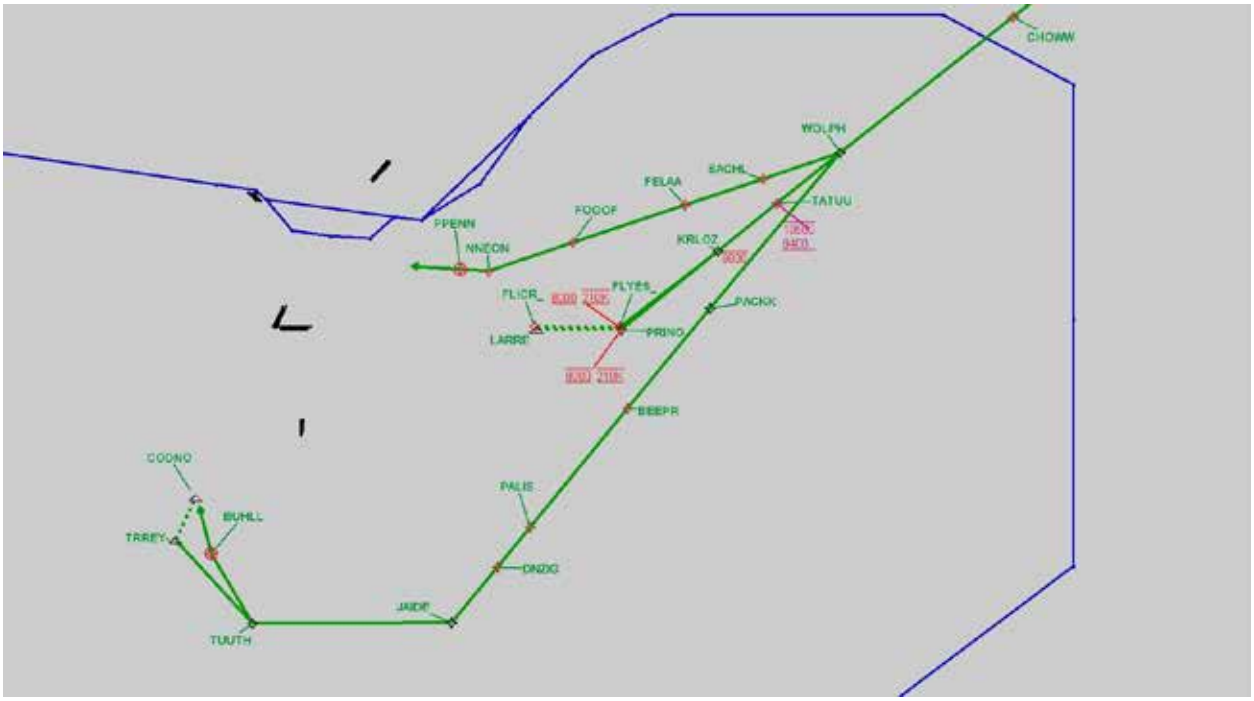


Figure 3: KLAS CHOWW STAR – Terminal View

Additional Design Considerations

- The KLAS CHOWW STAR concept was validated by the D&I Team via HITLS
- Spectrum analysis will be required for any proposed airspace changes associated with the proposed STAR
- This procedure will be used by RNAV-equipped turbojet aircraft only and is not anticipated to change runway usage
    - The following chart notes will be included with this procedure:
        - For turbojet aircraft only

The LAS CHOWW STAR affects the following facility area(s) as indicated:

- ZLA Sectors: 7, 54, 55
- ZLC Sectors: 33, 34, 44, 46
- ZDV Sectors: 23, 24, 68
- L30 Sectors: LAK, SAT, FNL
- KLAS

Las Vegas OAPM Design Package
KLAS CHOWW STAR

Implementation Dependencies

The procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND and KVGT airports.

Document changes/modifications include:

- STAR filings with airline dispatchers
- ZLA Facility Operations and Administration Order 7210.3
- ZDV Facility Operations and Administration Order 7210.3
- ZLC Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZLC LOA
- ZLA/ZDV LOA
- ZLA Standard Operating Procedures (SOP)
- ZLC SOP
- ZDV SOP
- L30 SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- SIAPs
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Terminal Procedures:
    - TARGETS distribution package
    - Flight Simulator worksheet
    - RNAV Pro analysis results
    - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	P/Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23APR19 Date

KLAS COKTL STAR CHANGE SHEET

METROPLEX COKTL Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
8/28/2019	The Team determined that removal of the AOA 090 altitude restriction at BAUMM would allow the procedure to pass criteria from BAUMM to ROAMN and BAUMM to YAGGR.	Mater TARGETS File	

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.

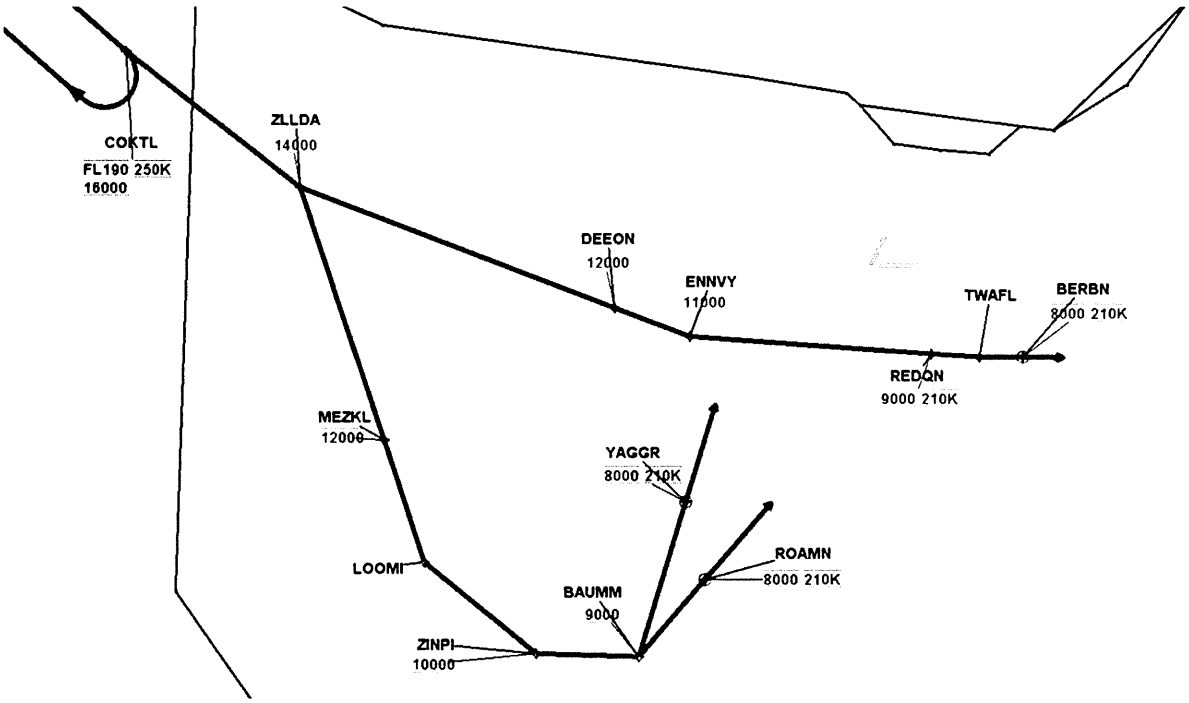


Figure 1. Original Proposed Final Design Procedure/Route/Airspace

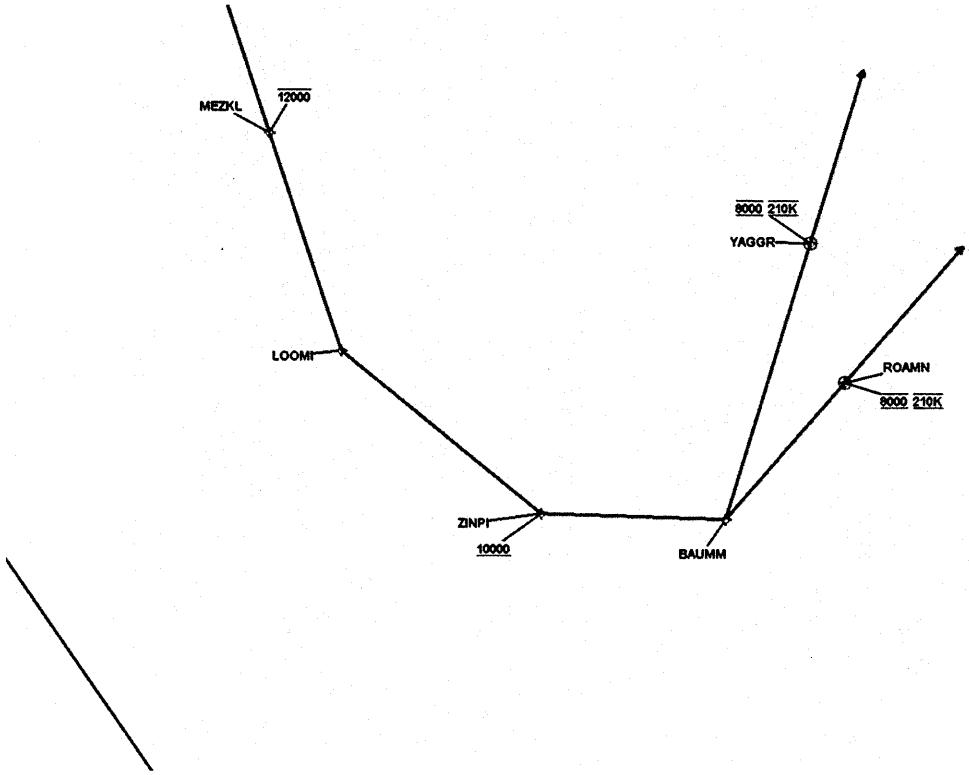


Figure 2. Revised Proposed Final Design Procedure/Route/Airspace

All Change Control Sheets and Final Design Packages under the Metroplex Project have been completed.

Bradley R. Mayhugh
FAA Metroplex Co-Lead

11/5/19
Date

Chris Thomas
NATCA Metroplex Co-Lead

11/6/19
Date

Las Vegas OAPM Design Package

KLAS COKTL STAR

An Area Navigation (RNAV) Standard Terminal Arrival Route (STAR) is a procedure that serves as a lateral path for aircraft landing at an airport. RNAV STARs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

McCarran International Airport (KLAS) arrivals from northwestern origins will use a new flight path procedure called the COKTL (pronounced "Cock-tail") RNAV STAR. The COKTL STAR will replace the current SUNST (pronounced "Sun-set") RNAV STAR.

The Las Vegas Metroplex Study Team (MST) noted that the current SUNST STAR causes aircraft to level off for extended periods and requires close interactions with other arrival and departure flight paths into and out of the Las Vegas Valley, increasing complexity of operations.

Las Vegas Valley arrivals from and departures to the northwest require routing through a nineteen mile wide corridor formed by military restricted airspace. The narrow airspace corridor supports one KLAS departure procedure and three KLAS and satellite airport departure/arrival routes. The design is further complicated by interactions closer to the airport with aircraft assigned the KLAS JOHKR Standard Instrument Departure (SID). In an area where terrain is a factor, KLAS JOHKR departure aircraft are accomplishing climbs to altitude while COKTL STAR aircraft are descending.

In order to segregate KLAS arrivals from the northwest and from other aircraft traffic flows, the new procedure includes altitude restrictions. These restrictions will allow more continuous descents at reduced power. In air traffic control terms this is called an Optimized Profile Descent (OPD).

This procedure is not anticipated to change runway usage.

The new COKTL RNAV STAR will provide connectivity to all KLAS runways.

The new COKTL STAR addresses KLAS. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the area.

Las Vegas OAPM Design Package

KLAS COKTL STAR

Name of Change and Airport(s)	Change Classification
Las Vegas McCarran International Airport (KLAS) COKTL Area Navigation (RNAV) Standard Terminal Arrival Route (STAR)	**Terminal Procedure; STAR**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.3.1.5	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 16 **Oakland ARTCC (ZOA) Sectors: 15, 33, 46** **Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: GNT, FNL, SAT** **Nellis Air Traffic Control Facility (NATCF)** **KLAS**	**North Las Vegas Airport (KVGT) FLCHR STAR**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results** **Human in the Loop Simulation (HITLS) results**	

Purpose

The purpose of the proposed KLAS COKTL RNAV STAR is to provide a repeatable and predictable path for KLAS arrivals from the northwest that address the issues identified by the Las Vegas Metroplex Study Team (MST).

MST Issues and Recommendation

Issues

Stakeholder input indicates that the SUNST STAR has numerous inefficiencies in its current design. SUNST arrivals incur an approximately 15 to 20 nautical mile (NM) level-off at 16,000 feet and a 5 to 10 NM level-off at 11,000 feet to comply with other inefficient procedures.

The SUNST STAR does not provide repeatable and predictable course guidance to runways other than Runways 26L/R. The lack of runway transitions requires controllers to vector aircraft to other runways increasing pilot/controller task complexity.

The SUNST STAR requires aircraft to cross MYCAL at or above FL210, making it difficult for arrival aircraft to meet speed and altitude restrictions at FUZZY.

The current Q-Route structure in ZLA's Sector 16 does not provide necessary connectivity when considering the arrival, departure and overflight route structure.

MST Recommendation

The MST originally proposed an alternative design for the northwest arrival/departure corridor showing a conceptual Standard Instrument Departure (SID) and STAR that reversed the arrival/departure flows in the northwest corridor. Initial designs of the SID in this quadrant had climb gradient concerns and needed further exploration. During the second Outreach, ZLA and L30 provided feedback indicating they would prefer this alternative design as the primary proposal, if feasible.

The MST was able to address these concerns by making the reverse flow alternative the primary recommendation. The RNAV Optimized Profile Descent (OPD) STAR (KLAS NW STAR) is usable for all configurations, reduces level segments, and connects to current and proposed Standard Instrument Approach Procedures (SIAP).

The KLAS NW STAR provides connectivity to the current Q-Route structure and incorporates altitude windows and speed assignments to reduce pilot/controller task complexity.

Reversing the arrival and departure flow in the northwest corridor provides aircraft on the KLAS NW STAR additional track miles for an optimal descent. The reversal of flows has also removed interaction with the KLAS NW SID (LAS Study Team Final Report Section 4.3.2.6).

The MST recommendation is depicted in Figures 1 and 2.

Las Vegas OAPM Design Package

KLAS COKTL STAR

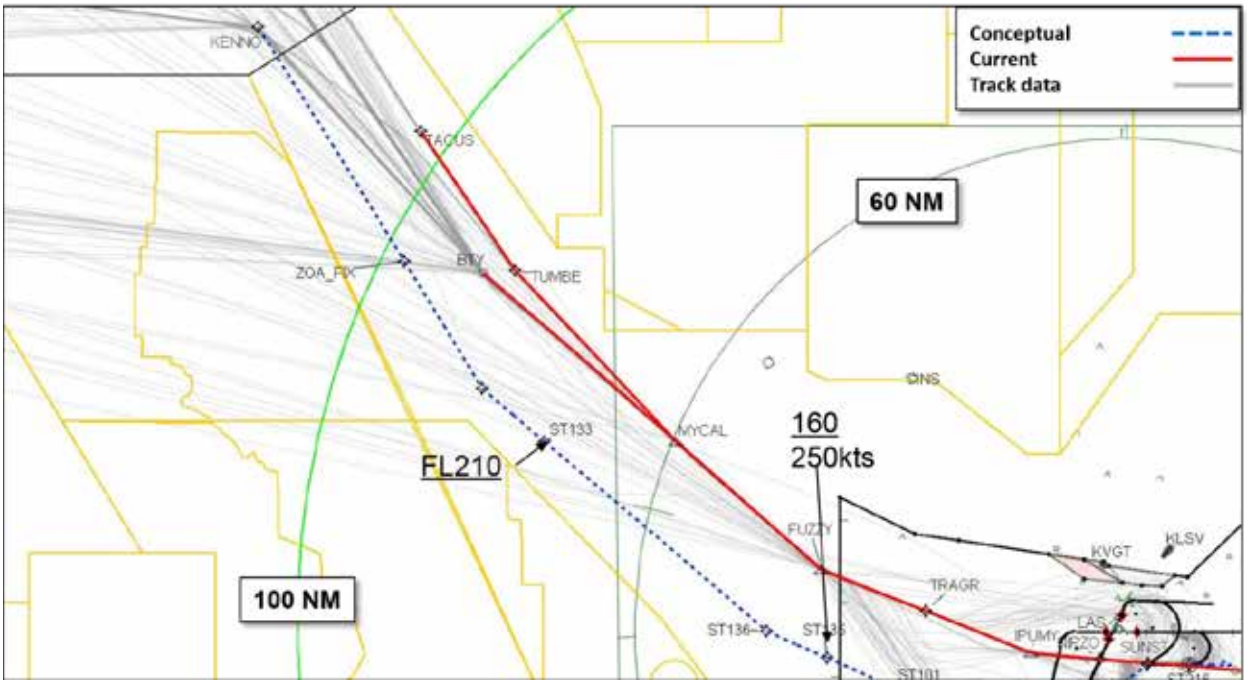


Figure 1: Current KLAS SUNST STAR and MST's Conceptual KLAS NW STAR – En Route View

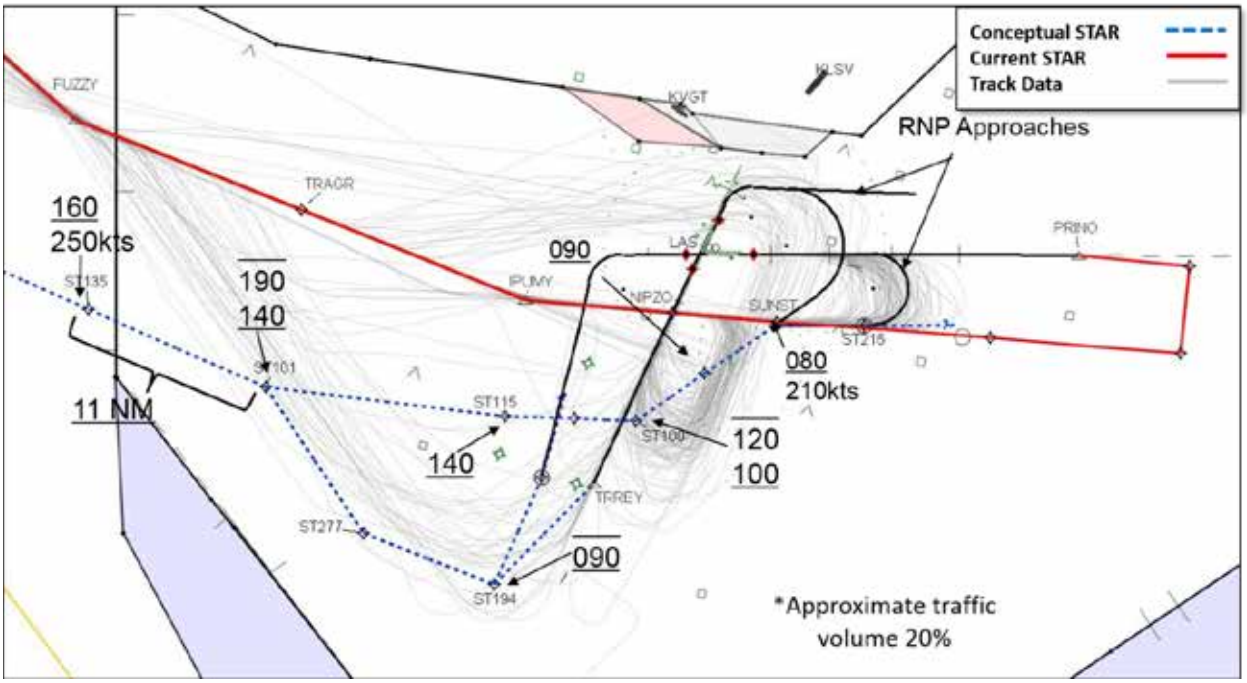


Figure 2: Current KLAS SUNST STAR and MST's Conceptual KLAS NW STAR – Terminal View

Las Vegas OAPM Design Package

KLAS COKTL STAR

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal, considering both the issues and recommendation.

The MST recommendation was for a reversal of the arrival and departure traffic flows out to the northwest. The D&I Team utilized HITLS using I-SIM to test the conceptual designs submitted by the MST. After analysis of the simulations and discussion with Industry partners, the D&I Team decided to disregard the MST proposal and redesign the SUNST STAR without reversing the arrival and departure flows. Reasoning for this decision is provided in the next section.

The COKTL STAR serves KLAS arrivals from the northwest. Las Vegas Valley arrivals from and departures to the northwest require routing through a nineteen mile wide corridor formed by military restricted airspace to the northeast and southwest. The narrow corridor supports one KLAS departure procedure and three KLAS and satellite airport departure/arrival routes. The design is further complicated by interactions closer to the airport with aircraft assigned the KLAS JOHKR SID. In an area where terrain is a factor, KLAS JOHKR departure aircraft are accomplishing climbs to altitude while COKTL STAR aircraft are descending.

The COKTL RNAV STAR (Figures 3 and 4) was designed as an OPD STAR with enhanced repeatability and predictability. It will increase efficiency and reduce complexity by reducing controller and flight crew workloads and task complexity.

To provide maximum flexibility for ATC, two en route transitions along the STAR were created, one common route and runway transitions to all KLAS runways.

En Route Transitions

BASIC Transition

- BASIC (coordination waypoint with ZOA/provides segregation from Q13/15, restricted airspace, Henderson Executive Airport (KHND) GAMES STAR and OYODA SID, and KLAS JOHKR SID)
- FLCHR (provides connectivity with Q174/provides segregation from Q13/15, restricted airspace, KHND GAMES STAR and OYODA SID)
- TBRAN (provides segregation from Q13/15, restricted airspace, KHND GAMES STAR and OYODA SID)
- ARYEL (at or above FL210/provides NATCF airspace integrity/standard published holding pattern)
- COKTL (altitude window of 160 to FL190/250 knots/ensures aircraft enter L30 airspace/reduces compression issues/standard published holding pattern

Las Vegas OAPM Design Package

KLAS COKTL STAR

GIINN Transition (ATC assigned only for times when military airspace is inactive)

- GIINN (coordination point with ZOA and Joshua Control Facility [JCF])
- TBRAN (provides segregation from Q13/15, restricted airspace, KHND GAMES STAR and OYODA SID)
- ARYEL (at or above FL210/provides NATCF airspace integrity/standard published holding pattern)
- COKTL (altitude window of 160 to FL190/250 knots/ensures aircraft enter L30 airspace/reduces compression issues/standard published holding pattern

FLCHR Transition

- FLCHR (provides connectivity with Q174/provides segregation from Q13/15, restricted airspace, KHND GAMES STAR and OYODA SID)
- TBRAN (provides segregation from Q13/15, restricted airspace, KHND GAMES STAR and OYODA SID)
- ARYEL (at or above FL210/providesNATCF airspace integrity/standard published holding pattern)
- COKTL (altitude window of 160 to FL190/250 knots/ensures aircraft enter L30 airspace/reduces compression issues/standard published holding pattern

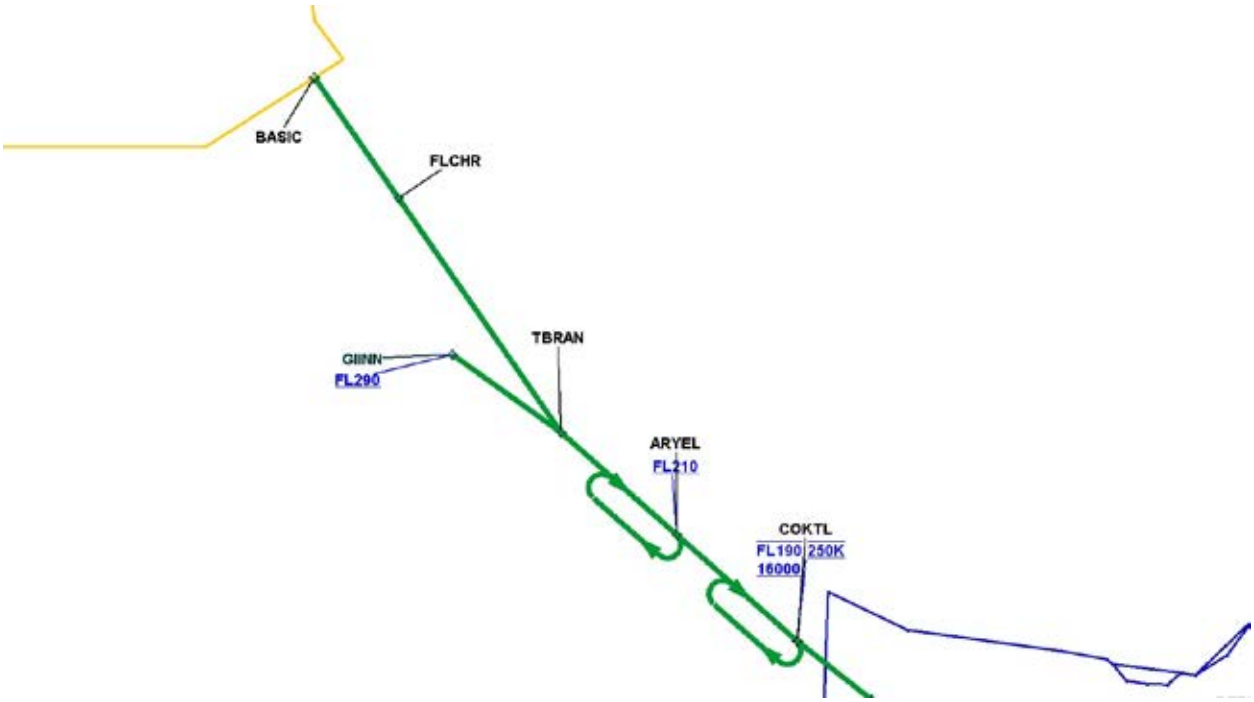


Figure 3: KLAS COKTL RNAV STAR – En Route View

Common Route (all transitions)

KLAS COKTL (SUNST) STAR

Las Vegas OAPM Design Package

KLAS COKTL STAR

- COKTL (altitude window of 160 to FL190/250 knots/ensures aircraft enter L30 airspace/reduces compression issues/standard published holding pattern
- ZLLDA (at or above 140/provides terrain avoidance/provides runway connectivity)

Runways 01L/R Transition

- MEZKL (provides segregation from KLAS JOHKR SID)
- LOOMI (provides segregation from KLAS JOHKR SID)
- ZINPI (at or above 100/provides terrain avoidance)
- BAUMM (at or above 090/required for design criteria)
- ROAMN (at 080/210 knots/provides approach connectivity)

Runways 08L/R Transition

- MEZKL (provides segregation from KLAS JOHKR SID)
- LOOMI (provides segregation from KLAS JOHKR SID)
- ZINPI (at or above 100/provides terrain avoidance)
- BAUMM (at or above 090/ required for design criteria)
- YAGGR (at 080/210 knots/provides approach connectivity)

Runways 19L/R and 26L/R Transitions

- DEEON (at or above 120/provides terrain avoidance)
- ENNVY (at or above 110/provides terrain avoidance/provides segregation from KLAS JOHKR SID)
- REDQN (at or above 090/210 knots/required for design criteria/provides segregation from KLAS JOHKR, RAYDR, NIITZ and RASLR SIDs)
- TWAFL (creates a straight segment required for design criteria)
- BERBN (at 080/210 knots/provides segregation from KHND Runway 35 departures/required to match approach restrictions/initial approach waypoint)

KLAS COKTL (SUNST) STAR

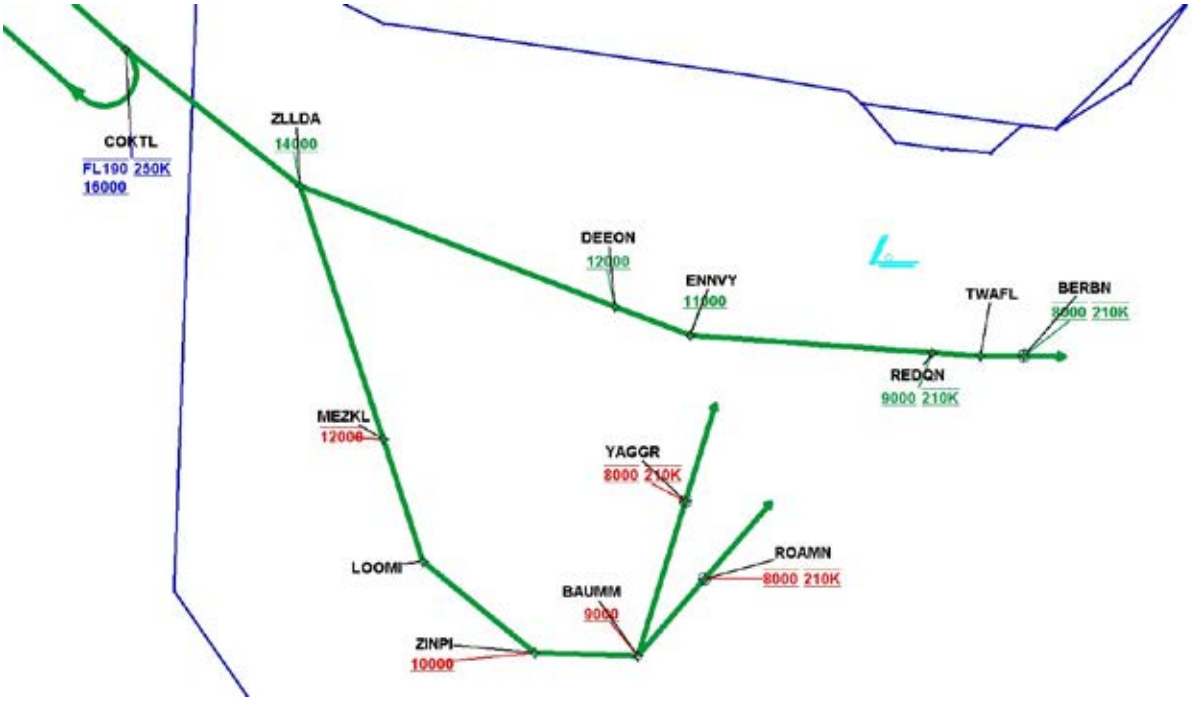


Figure 4: LAS COKTL RNAV STAR Terminal View

MST Recommendation Design Differences

The MST recommended a reversal of the arrival and departure traffic flows from/to the northwest. The D&I Team utilized HITLS using I-SIM to test the conceptual designs submitted by the MST. After analysis of the simulations and discussion with Industry partners, the D&I Team decided to disregard the MST proposal and redesign the SUNST STAR without reversing the flows.

The following are the reasons the team decided against the reversal of traffic flows:

- Terrain to the west of the airport rises faster than aircraft are able to climb
  - Departure aircraft would have difficulty meeting an excessive climb gradient to 10,000 feet, especially on Configuration 3. If an aircraft was unable to meet the altitude restrictions and was below the Minimum Vectoring Altitude (MVA), L30 would have no options to mitigate the situation
  - Eliminates L30's ability to turn departures for sequencing due to departures remaining below the MVA longer
  - L30 would have reduced ability to allow aircraft to deviate if weather were to impact the area
- Department of Energy flights (JANET Flights) are in conflict with proposed northwest departures

- KHND departure routes are excessively long, especially in Configurations 2 and 4, and in conflict with traffic in L30 Sectors FNL, LAK and GNT
- ZLA's Sector 16 would have no room to maneuver aircraft for sequencing. Departures would be lower and could not be vectored to the west to climb, as they would be in conflict with arrival traffic descending nor could they be vectored to the east due to Special Use Airspace (SUA)
- Fewer track miles on departures would not allow aircraft to climb above NATCF's LEE Sector (A7 shelf)
- Inability to provide direct routings due to interactions with arrival traffic

Additional Design Considerations

- The KLAS COKTL STAR concept was validated by the D&I Team via HITLS
- Spectrum analysis will be required for any proposed airspace changes associated with the proposed STAR
- This procedure will be used by RNAV-equipped turbojet aircraft only and is not anticipated to change runway usage
    - The following chart notes will be included with this procedure:
        - For turbojet aircraft only

The COKTL STAR affects the following facility area(s) as indicated:

- ZLA Sector: 16
- ZOA Sectors: 15, 33, 46
- L30 Sectors: GNT, FNL, SAT
- NATCF
- KLAS

Implementation Dependencies

The procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND and KVGT airports.

Document changes/modifications include:

- STAR filings with airline dispatchers
- ZLA Facility Operations and Administration Order 7210.3
- ZOA Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZOA LOA
- L30/LAS LOA

Las Vegas OAPM Design Package
KLAS COKTL STAR

- ZLA Standard Operating Procedures (SOP)
- ZOA SOP
- L30 SOP
- LAS SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- SIAPs
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Terminal Procedures:
    - TARGETS distribution package
    - Flight Simulator worksheet
    - RNAV Pro analysis results
    - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	P/Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23APR19 Date

KLAS JAYSN STAR CHANGE SHEET

METROPLEX JAYSN Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
8/28/2019	The Team determined that removal of the AOA 090 altitude restriction at BAUMM would allow the procedure to pass criteria from BAUMM to ROAMN and BAUMM to YAGGR.	Mater TARGETS File	

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.

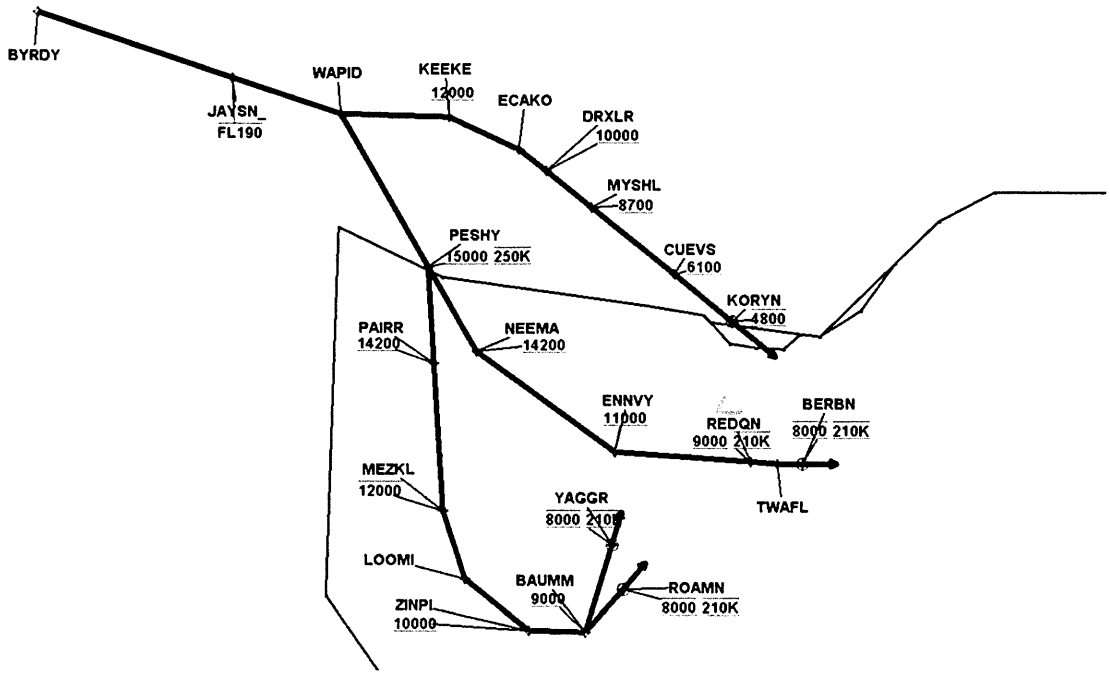


Figure 1. Original Proposed Final Design Procedure/Route/Airspace

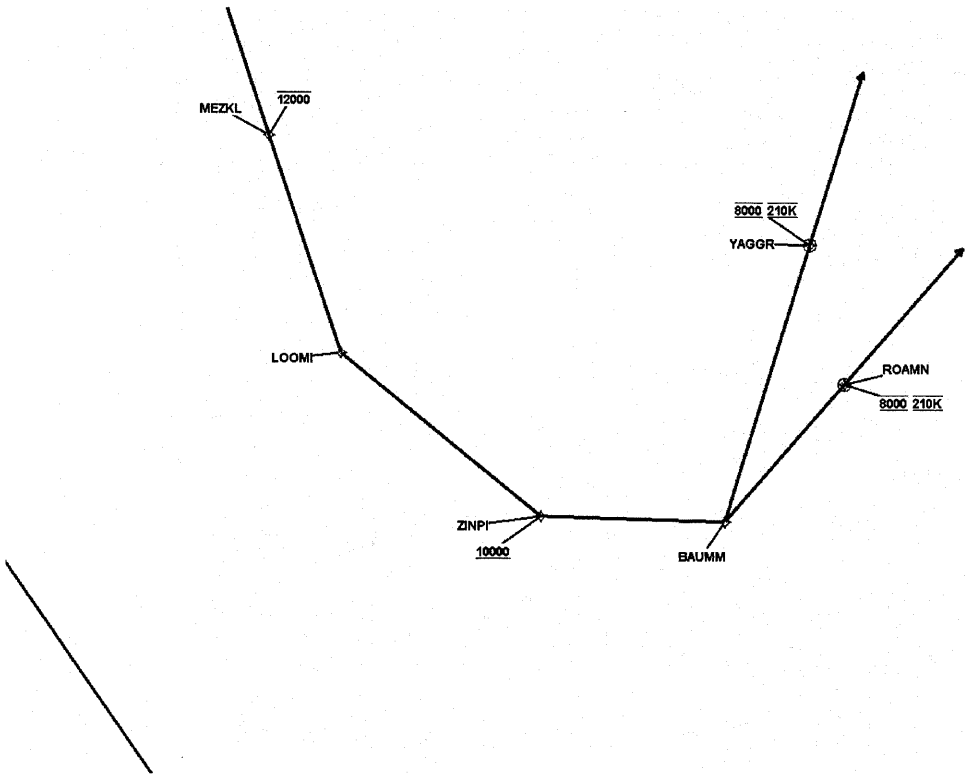


Figure 2. Revised Proposed Final Design Procedure/Route/Airspace

All Change Control Sheets and Final Design Packages under the Metroplex Project have been completed.

Bradley R. Mayhugh
FAA Metroplex Co-Lead

11/5/19
Date

Chris Thomas
NATCA Metroplex Co-Lead

11/6/19
Date

Las Vegas OAPM Design Package

KLAS JAYSN STAR

An Area Navigation (RNAV) Standard Terminal Arrival Route (STAR) is a procedure that serves as a lateral path for aircraft landing at an airport. RNAV STARs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

McCarran International Airport (KLAS) arrivals from the Tonopah Test Range Airport (KTNX) will use a new flight path procedure called the JAYSN (pronounced "Jay-son") RNAV STAR. The JAYSN STAR will replace a historically developed preferential routing.

The Las Vegas Metroplex Design and Implementation Team (D&I Team) determined that the current routing interferes with other traffic flows, reducing efficiency and increasing complexity.

The JAYSN STAR will allow continuous descents at reduced power. In air traffic control terms this is called an Optimized Profile Descent (OPD).

The JAYSN STAR will provide connectivity to all KLAS runways.

This procedure is not anticipated to change runway usage. The JAYSN STAR will increase flight path predictability and will decrease controller/pilot workload and task complexity, which will enhance safety.

The new JAYSN STAR addresses KLAS. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the area.

Las Vegas OAPM Design Package

KLAS JAYSN STAR

Name of Change and Airport(s)	Change Classification
Las Vegas McCarran International Airport (KLAS) JAYSN Area Navigation (RNAV) Standard Terminal Arrival Route (STAR)	**Terminal Procedure; STAR**
OAPM Study Team Reference(s)	**Current Phase of Design**
N/A	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: GNT, FNL, SAT Nellis Air Traffic Control Facility (NATCF) KLAS	**KLAS LOHLA Standard Instrument Departure (SID) KLAS BASIC, COKTL, and RKSTR STARs North Las Vegas Airport (KVGT) FLCHR STAR**
Associated Data Files	
TARGETS output packages Flight Simulator worksheet RNAV Pro analysis results Human in the Loop Simulation (HITLS) results	

Purpose

The Las Vegas Metroplex Design and Implementation Team (D&I Team) identified a need for efficient departure and arrival procedures for Tonopah Test Range Airport (KTNX) that account for up to 4% of the daily flights to/from KLAS.

Las Vegas Metroplex Study Team (MST) Recommendation

There was no specific recommendation from the MST for developing a STAR for aircraft departing from KTNX to KLAS.

Proposed Final Design

The JAYSN STAR (Figure 1) was designed to provide course guidance from KTNX to all KLAS runways. The D&I Team worked closely with NATCF in the design of the JAYSN STAR.

The KLAS JAYSN STAR's PFD is depicted in Figure 1.

En Route Transition

Las Vegas OAPM Design Package

KLAS JAYSN STAR

BYRDY Transition

- BYRDY (provides segregation from military Special Use Airspace [SUA])
- JAYSN_ (at or below FL190/provides segregation from Nellis Air Force Base (KLSV) westbound departures)

Common Route

- JAYSN_ (at or below FL190/provides segregation from KLSV westbound departures)
- WAPID (provides terrain avoidance/functions as a split point for runway transitions)

Runway Transitions

Runways 01L/R Transition

- WAPID (functions as a split point for runway transitions)
- PESHY (at or above 150/250 knots/coordination waypoint/provides terrain avoidance/functions as a split point for runway transitions)
- PAIRR (at or above 142/required for Minimum Obstruction Clearance Altitude [MOCA] requirements)
- MEZKL (at or below 120/provides segregation from the KLAS JOHKR SID/joins same lateral track as the KLAS COKTL STAR)
- LOOMI (joins same lateral track as the KLAS COKTL STAR)
- GIINN (at or above 100/provides terrain avoidance)
- BAUMM (at or above 090/required for design criteria)
- ROAMN (at 080/210 knots/provides approach connectivity)

Runways 08L/R Transition

- WAPID (functions as a split point for runway transitions)
- PESHY (at or above 150/250 knots/coordination waypoint/provides terrain avoidance/functions as a split point for runway transitions)
- PAIRR (at or above 142/required for MOCA requirements)
- MEZKL (at or below 120/provides segregation from the KLAS JOHKR SID/joins same lateral track as the KLAS COKTL STAR)
- LOOMI (joins same lateral track as the KLAS COKTL STAR)
- GIINN (at or above 100/provides terrain avoidance)
- BAUMM (at or above 090/required for design criteria)
- YAGGR (at 080/210 knots/initial approach waypoint)

Runways 19L/R Transition

- WAPID (functions as a split point for runway transitions)
- KEEKE (at or above 120/provides terrain avoidance)
- ECAKO (provides terrain avoidance/provides segregation from SUA)
- DRXLR (at or above 100/provides terrain avoidance)
- MYSHL (at or above 087/provides terrain avoidance)

- CUEVS (at or above 061/provides terrain avoidance)
- KORYN (at 048/coordination waypoint for L30 and NATCF)

Runways 26L/R Transition

- WAPID (functions as a split point for runway transitions)
- PESHY (at or above 150/250 knots/coordination waypoint/provides terrain avoidance/functions as a split point for runway transitions)
- NEEMA (at or above 142/required for MOCA requirements)
- ENNVY (at or above 110/provides terrain avoidance/required for design criteria/joins same lateral track as the KLAS COKTL STAR)
- REDQN (at or above 090/210 knots/provides segregation from the KLAS RASLR, NIITZ, JOHKR and RAYDR SIDs/provides terrain avoidance/required for design criteria)
- TWAFL (adds straight segment prior to approach for design criteria)
- BEBRN (at 080/210 knots/initial approach waypoint)

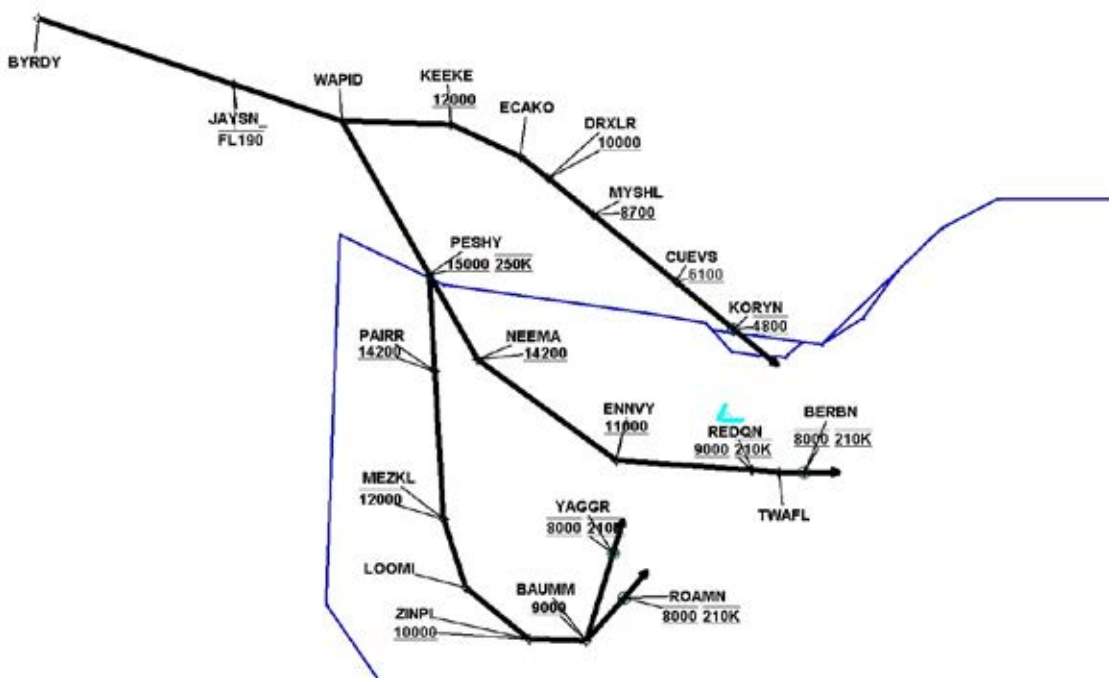


Figure 1: Proposed LAS JAYSN STAR

Additional Design Considerations

- The KLAS JAYSN STAR concept was validated by the D&I Team via HITLS
- Spectrum analysis will be required for any proposed airspace changes associated with the proposed STAR
- This procedure will be used by RNAV-equipped turbojet aircraft only and is not anticipated to change runway usage

- The following chart notes will be included with this procedure:
  - For turbojet aircraft only
  - ATC assigned only

The JAYSN STAR affects the following facility area(s) as indicated:

- L30 Sectors: GNT, FNL, SAT
- NATCF
- KLAS

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS and KVGT.

Document changes/modifications include:

- STAR filings with airline dispatchers
- L30 Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- L30 sector boundary maps and video maps
- LSV/L30 Letter of Agreement (LOA)
- L30/LAS LOA
- L30 Standard Operating Procedures (SOP)
- STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Terminal Procedures:
  - TARGETS distribution package
  - Flight Simulator worksheet
  - RNAV Pro analysis results
  - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date

Available via electronic signature

_____ Date

Nellis Air Traffic Control Facility

KLAS RKSTR CHANGE SHEET

METROPLEX RKSTR Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
5/23/2019	A new waypoint (WP1263/AOA FL240) was added 23.59 miles north of ELLDA on the ELLDA transition of the KLAS RKSTR STAR. This fix does not change the lateral track of the transition, but will serve as a holding fix (left turns/10 mile legs) if necessary. ZAYNE was removed from the procedure.	Mater TARGETS File	
5/23/2019	JJEAN waypoint name was changed to FEREL on the Runways 19L/R Transitions of the RKSTR STAR.	Mater TARGETS File	

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.

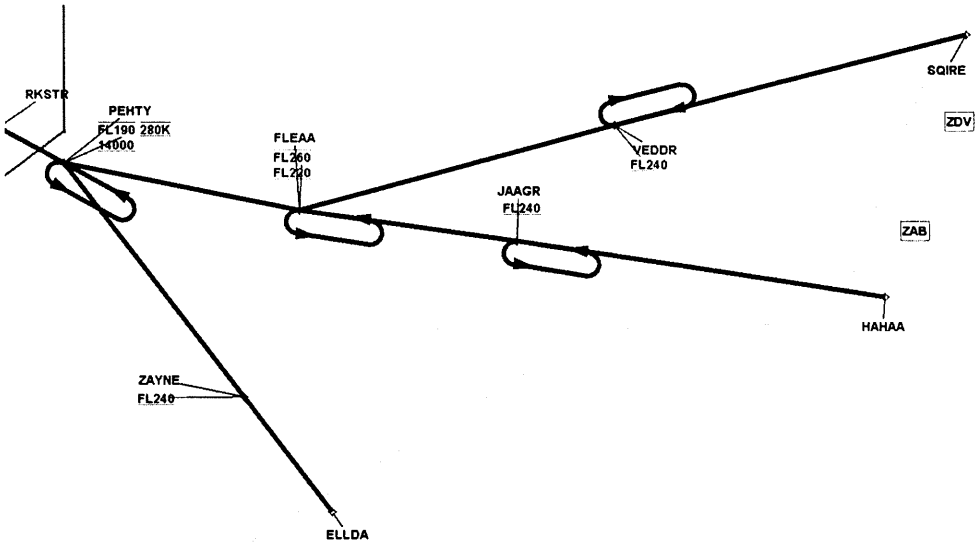


Figure 1. Original Proposed Final Design Procedure/Route/Airspace

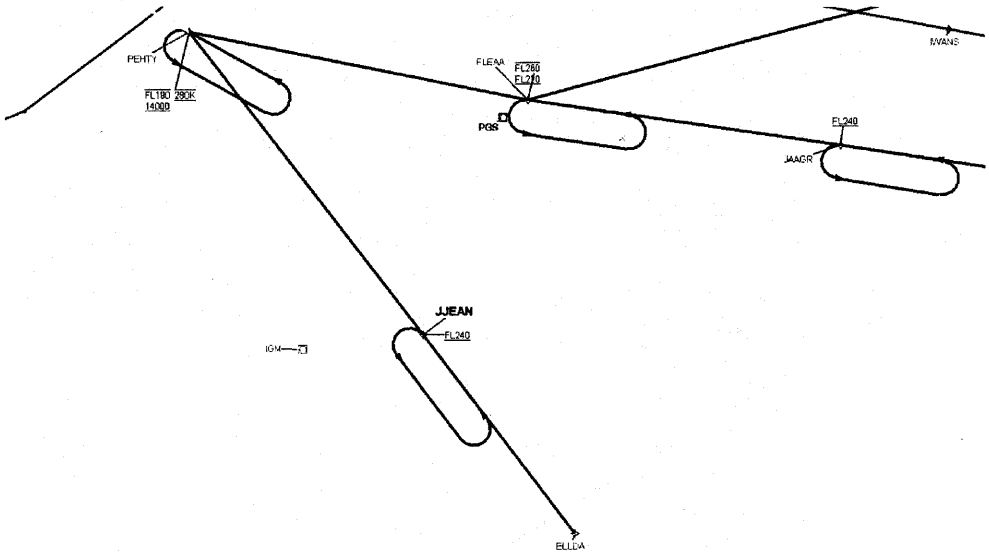


Figure 2. Revised Proposed Final Design Procedure/Route/Airspace

All Change Control Sheets and Final Design Packages under the Metroplex Project have been completed.

Bradley R Mayhugh

FAA Metroplex Co-Lead

NATCA Metroplex Co-Lead

11/5/19

Date

11/6/19

Date

Las Vegas OAPM Design Package

KLAS RKSTR STAR

An Area Navigation (RNAV) Standard Terminal Arrival Route (STAR) is a procedure that serves as a lateral path for aircraft landing at an airport. RNAV STARs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

McCarran International Airport (KLAS) arrivals from eastern/southeastern origins will use a new flight path procedure called the KLAS RKSTR (pronounced "Rock-star") RNAV STAR. The RKSTR STAR will replace the current TYSSN (pronounced "Tie-sun") RNAV STAR.

The Las Vegas Metroplex Study Team (MST) noted that the current TYSSN STAR causes aircraft to level off for extended periods and requires close interactions with other arrival and departure flight paths into and out of the Las Vegas Valley, increasing complexity of operations.

In order to segregate KLAS arrivals from the east/southeast from other aircraft traffic flows, the new procedure includes altitude restrictions. These restrictions will allow descents that are more continuous at reduced power. In air traffic control terms this is called an Optimized Profile Descent (OPD).

This procedure is not anticipated to change runway usage.

The new RKSTR RNAV STAR will provide connectivity to all KLAS runways.

The new RKSTR STAR addresses KLAS. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the area.

Las Vegas OAPM Design Package

KLAS RKSTR STAR

Name of Change and Airport(s)	Change Classification
Las Vegas McCarran International Airport (KLAS) **RKSTR Area Navigation (RNAV)** **Standard Terminal Arrival Route (STAR)**	**Terminal Procedure; STAR**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.3.1.2 **4.3.1.3**	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 8, 35 **Albuquerque ARTCC (ZAB) Sectors: 43, 45, 67, 92** **Denver ARTCC (ZDV) Sectors: 23, 24, 36** **Las Vegas Terminal Radar Approach Control (L30 TRACON) Positions: LAK, GNT, SAT, FNL** **KLAS**	**KLAS NIITZ and RASLR Standard Instrument Departures (SIDs)** **Henderson Executive Airport (KHND) SCAMR SID** **KHND NTNDO STAR**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results** **Human in the Loop Simulation (HITLS) results**	

Purpose

The purpose of the proposed KLAS RKSTR RNAV STAR is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

MST Issues and Recommendation

Issues

Stakeholders agree that the TYSSN STAR has numerous inefficiencies in its design. TYSSN arrivals incur approximately 15 to 20 nautical mile (NM) level-offs at 12,000 feet and at 8,000 feet to comply with other inefficient procedures.

The TYSSN STAR does not provide repeatable and predictable course guidance to runways other than Runways 26L/R. The lack of runway transitions requires controllers to vector aircraft to other runways increasing pilot/controller task complexity.

A sharp right turn at KADDY creates overtake situations at the L30/ZLA boundary. Currently, L30 controllers vector arrivals off the procedure to maintain in-trail spacing. Two arrival transitions and the PRFUM SID all fly over KADDY requiring ZLA sectors to descend arrivals early to maintain vertical separation.

The TYSSN STAR does not align with the proposed Phoenix Metroplex procedures.

Recommendation

The MST created two RNAV Optimized Profile Descent (OPD) STARs (KLAS SE1 STAR and KLAS SE2 STAR) usable for all configurations, which reduce overall flight track miles, minimize level segments and connect to current and proposed Standard Instrument Approach Procedures (SIAPs). The dual STARs in the southeast quadrant may require the use of (Time-Based Flow Management (TBFM) and an update to the TBFM adaptation. The STARs incorporate altitude windows and speed constraints to reduce pilot/controller task complexity and readback/hearback errors.

The KLAS SE2 STAR was designed to be used for traffic flying from western Mexico, Phoenix and Tucson area airports. The MST met with the Phoenix Metroplex leads and discussed connectivity to the Phoenix Metroplex proposals. The Phoenix Metroplex leads provided input that the LLUCK waypoint could be slightly moved without impacting their designs. To address the dual arrival concerns the MST created an ATC assigned cross over transition that will allow for a single arrival flow when warranted (i.e., weather impacts or reduced arrival rates).

Figures 1 and 2 depict the MST recommendation.

Las Vegas OAPM Design Package

KLAS RKSTR STAR

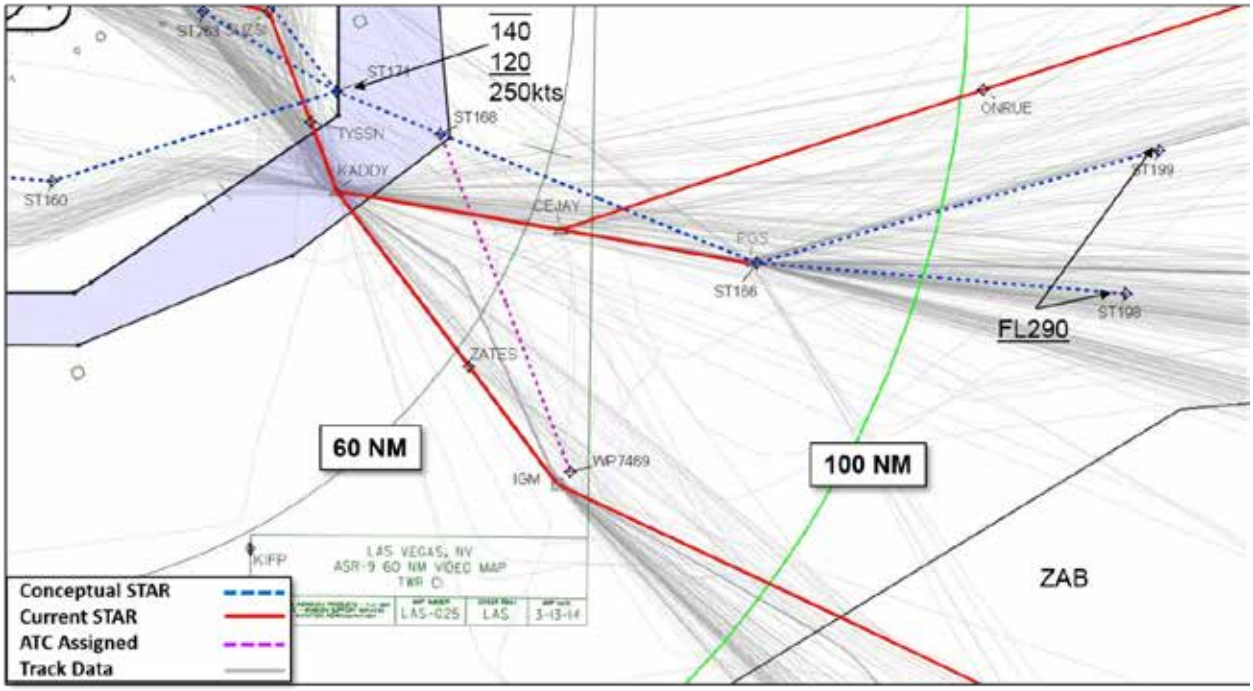


Figure 1: Current KLAS TYSSN STAR and MST's Conceptual KLAS SE1 STAR – En Route View

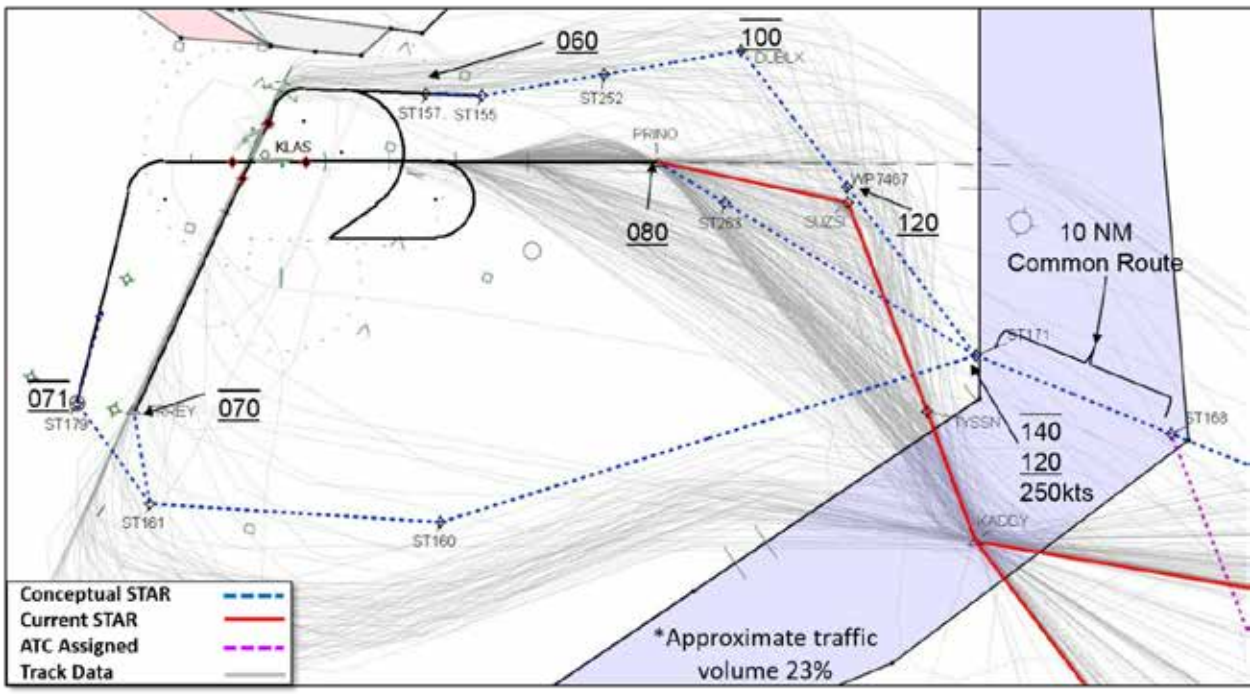


Figure 2: Current KLAS TYSSN STAR and MST's Conceptual KLAS SE1 STAR – Terminal View

Las Vegas OAPM Design Package

KLAS RKSTR STAR

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal, considering both the issues and recommendation. The MST proposed two separate STARs from the southeast to serve KLAS. After careful consideration and numerous design attempts, the D&I Team decided to create one STAR, which provides course guidance to all KLAS runways with three en route transitions.

The RKSTR RNAV STAR was designed as an OPD STAR with enhanced repeatability and predictability. It will increase efficiency and reduce complexity by reducing controller and flight crew workloads and task complexity. In en route airspace, the procedure closely follows the MST recommendation.

The RKSTR RNAV STAR's PFD is depicted in Figures 3 and 4.

En Route Transitions

ELLDA Transition (for flights that originate in and/or fly through ZAB airspace)

- ELLDA (provides a point in ZAB airspace for a crossing restriction, if needed)
- ZAYNE (at or above FL240/provides airspace integrity)
- PEHTY (altitude window of 140 to FL190/280 knots/ensures aircraft enter L30 airspace/prevents compression with successive arrivals/standard published holding pattern)

HAHAA Transition (for flights that originate in and/or fly through ZDV airspace)

- HAHAA (coordination waypoint with ZAB)
- JAAGR (at or above FL240/provides airspace integrity/published holding pattern with left turns/provides segregation from the KLAS RKSTR STAR and the KLAS NIITZ SID)
- FLEAA (altitude window of FL220 to FL260/ facilitates sequencing with competing transitions/published holding pattern with left turns/provides segregation from the KLAS NIITZ SID)
- PEHTY (altitude window of 140 to FL190/280 knots/ensures aircraft enter L30 airspace/prevents compression with successive arrivals/standard published holding pattern)

SQIRE Transition (for flights that originate in and/or fly through ZDV airspace)

- SQIRE (coordination waypoint with ZDV)
- VEDDR (at or above FL240/provides airspace integrity/standard published holding pattern/provides segregation from KLAS RKSTR STAR)
- FLEAA (altitude window of FL220 to FL260/facilitates sequencing with competing transitions/published holding pattern with left turns/provides segregation from the KLAS NIITZ SID)

- PEHTY (altitude window of 140 to FL190/280 knots/ensures aircraft enter L30 airspace/prevents compression with successive arrivals/standard published holding pattern)

Common Route

- PEHTY (altitude window of 140 to FL190/280 knots/ensures aircraft enter L30 airspace/prevents compression with successive arrivals/standard published holding pattern)
- RKSTR

Runways 01L/R Transition

- LEEEW (at or above 140/250 knots/provides segregation from the KLAS RASLR SID)
- JAIDE (at or below 130/provides segregation from the KLAS RADYR SID/tie-in to KLAS CHOWW STAR)
- TUUTH (altitude window of 080 to 100/220 knots/required for design criteria/provides segregation from KHND SCAMR and OYODA SIDs)
- BUHLL (at 070/210 knots/ensures Class B containment/ensures aircraft flyability/ joins the approach to Runway 01R)

  Or
- TRREY (at 070/210 knots/ensures Class B containment/joins the approach to Runway 01L)

Runways 08L/R Transition

- LEEEW (at or above 140/250 knots/provides segregation from the KLAS RASLR SID)
- JAIDE (at or below 130/provides segregation from the KLAS RADYR SID)
- TUUTH (altitude window of 080 to 100/220 knots/required for design criteria/provides segregation from the KHND SCAMR and OYODA SIDs)
- YAGGR (at 080/210 knots/joins the approach)

Runways 19L/R Transition

- GROLL (at or below 110/provides segregation from the KLAS NIITZ SID)
- JJEAN (at or above 100/250 knots/provides turn towards airport/provides segregation from the KLAS GIDGT SID/prevents early slowing providing consistency between aircraft)
- JOVII (at 100/required for Minimum Vectoring Altitude [MVA] criteria/provides segregation from the KLAS GIDGT SID)
- FELAA (tie-in to the KLAS CHOWW STAR)
- FOOOF (at or above 070/required for Minimum Obstruction Clearance Altitude [MOCA] criteria)
- NNEON (at or above 060/210 knots/required for design criteria)
- PPENN (at 060/210 knots/provides approach connectivity)

Runways 26L/R Transition

KLAS RKSTR (TYSSN) STAR

- HUXLY (at or above 100/250 knots/prevents early slowing providing consistency between aircraft)
- PRINO (at 080/210 knots/provides Runway 26L connectivity)

  Or

  FLYES was moved approximately 1.6 miles east for approach criteria (at or above 080/210 knots/provides Runway 26R connectivity)

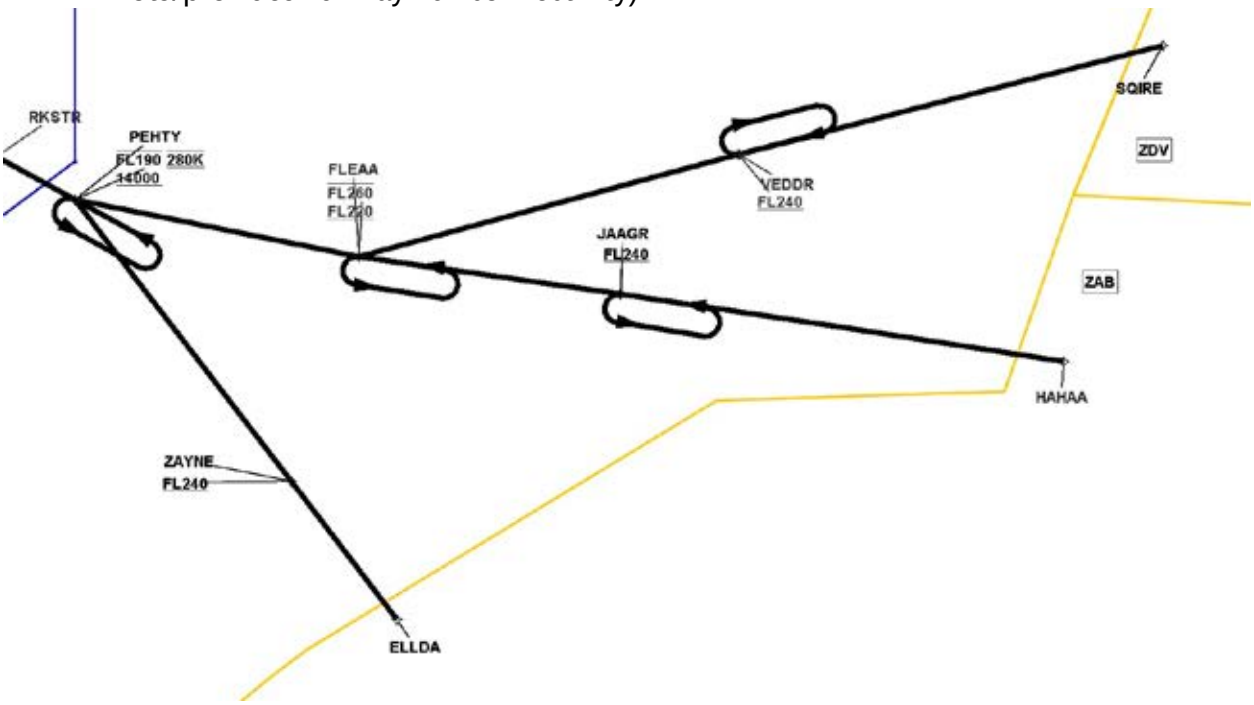


Figure 3: KLAS RKSTR RNAV STAR – En Route View

Las Vegas OAPM Design Package

KLAS RKSTR STAR

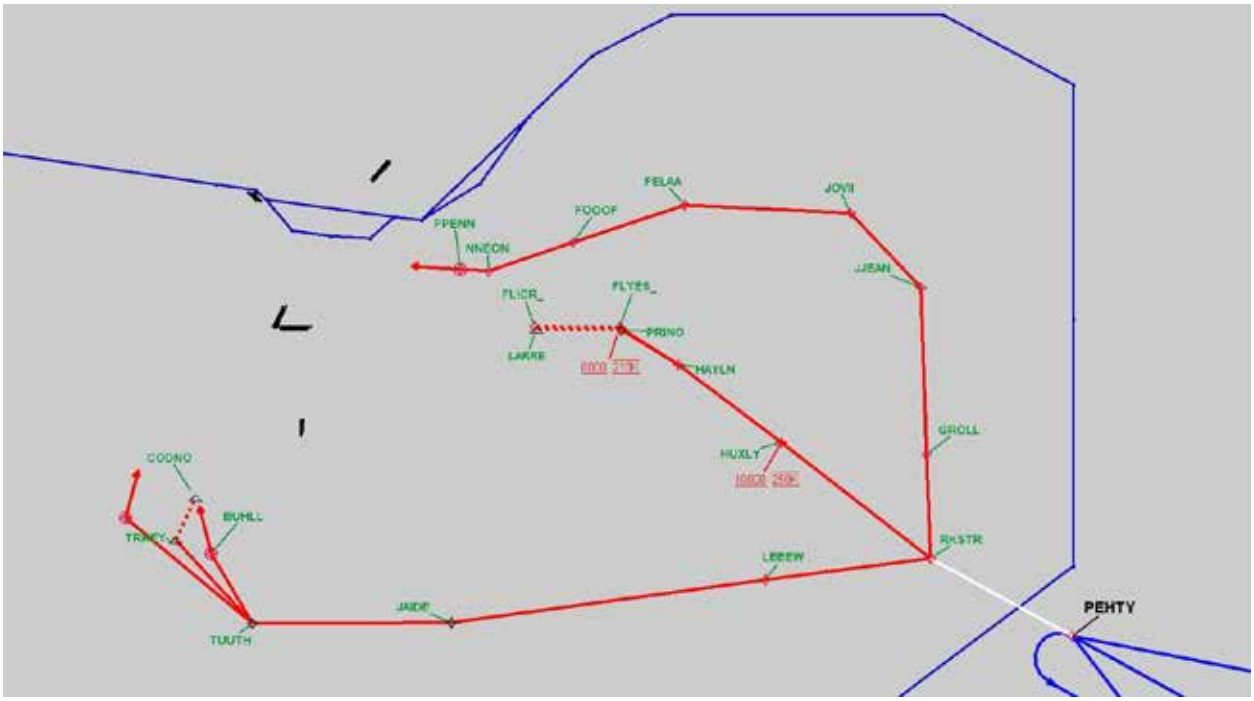


Figure 4: KLAS RKSTR RNAV STAR – Terminal View

MST Recommendation Design Differences

The MST proposed two separate STARs from the southeast to serve KLAS. After careful consideration and numerous design attempts, the D&I Team decided to create one STAR with three en route transitions.

Rationale for One STAR

Two STARs would have the following issues:

- Negative Impact to Safety
  - Multiple confliction points on the south/southwest transitions
  - False conflict alerts caused by arrival routes converging at 90 degree angles
  - Increased complexity and workload adversely impacting operation and safety
- ZAB Issue
  - KLAS departing traffic would be moved into an already complex area in ZAB
- ZLA Issues
  - No way to efficiently segregate southern arrival transition from the southeast departure procedure – procedural segregation would be overly restrictive
  - Arrivals from south/southwest would be difficult to descend into KLAS
  - Departures from KLAS would be held down due to descending arrival traffic
  - Sequencing arrival traffic between the two transitions would be limited because of the route structure (angles of headings, winds, etc.)
- System Efficiency Impacts

- Over restrictive procedural segregation would cause loss of efficiency
- Additional track mileage would be added to flights
  - To Runways 26L/R - would add 17 nm to each flight
  - To Runways 01L/R - would add 31 nm to each flight
- Unable to design OPDs on the south/southwest transitions
- Negative impact on departure traffic from Phoenix Sky Harbor International Airport (KPHX) to KLAS
- KLAS departures are constrained because two current KLAS SIDs are combined into one
- During Severe Weather Avoidance Program (SWAP) events, current northeast departures would have to fly greater distances to get to destination airports

Additional Design Considerations

Careful consideration was given to the National Parks and Tribal Nation Lands when designing the en route portion of the KLAS RKSTR STAR. Review of current traffic destined for Las Vegas Valley airports indicates arrival aircraft at lower cruise altitudes and higher descent power settings overflying the park areas and Tribal Nation Lands than on the new optimized procedures.

PEHTY was moved five nautical miles (NM) southwest. This was done to accommodate moving the KLAS NIITZ SID departure traffic south in order to avoid the Grand Canyon National Park overlook areas. The KLAS RKSTR STAR design accommodated the KLAS NIITZ SID design since departing aircraft would have a more negative impact to these areas.

- The KLAS RKSTR STAR concept was validated by the D&I Team via HITLS
- Spectrum analysis will be required for any proposed airspace changes associated with the proposed STAR
- This procedure will be used by RNAV-equipped turbojet aircraft only and is not expected to change runway usage
  - The following chart notes will be included with this procedure:
    - For turbojet aircraft only

The RKSTR STAR affects the following facility area(s) as indicated:

- ZLA Sectors: 8, 35
- ZAB Sectors: 43, 45, 67, 92
- ZDV Sectors: 23, 24, 36
- L30 Positions: LAK, GNT, SAT, FNL
- KLAS

Implementation Dependencies

The procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS and KHND airports.

KLAS RKSTR (TYSSN) STAR

- STAR filings with airline dispatchers
- ZLA Facility Operations and Administration Order 7210.3
- ZDV Facility Operations and Administration Order 7210.3
- ZAB Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZAB LOA
- ZLA/ZDV LOA
- ZLA Standard Operating Procedures (SOP)
- ZDV SOP
- ZAB SOP
- L30 SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- SIAPs
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

<u>Attachments</u>

- Terminal Procedures:
    - TARGETS distribution package
    - Flight Simulator worksheet
    - RNAV Pro analysis results
    - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	P/Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23APR19 Date

Las Vegas OAPM Design Package

KLAS RNDRZ STAR

An Area Navigation (RNAV) Standard Terminal Arrival Route (STAR) is a procedure that serves as a lateral path for aircraft landing at an airport. RNAV STARs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

McCarran International Airport (KLAS) arrivals from southern and southwestern origins will use a new flight path procedure called the RNDRZ (pronounced “Round-ers”) RNAV STAR. The RNDRZ STAR will replace the current KEPEC (pronounced “Kay-peck”) RNAV STAR.

The Las Vegas Metroplex Study Team (MST) noted that the current KEPEC STAR causes aircraft to level off for extended periods and requires close interactions with other arrival and departure flight paths into and out of the Las Vegas Valley, increasing complexity of operations.

In order to segregate KLAS arrivals from the south/southwest from other aircraft traffic flows, the new procedure includes altitude restrictions. These restrictions will allow descents that are more continuous at reduced power. In air traffic control terms this is called an Optimized Profile Descent (OPD).

This procedure is not anticipated to change runway usage.

The RNDRZ RNAV STAR will provide connectivity to all KLAS runways.

The new RNDRZ STAR addresses KLAS. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the area.

Las Vegas OAPM Design Package

KLAS RNDRZ STAR

Name of Change and Airport(s)	Change Classification
Las Vegas McCarran International Airport (KLAS) RNDRZ Area Navigation (RNAV) Standard Terminal Arrival Route (STAR)	**Terminal Procedure; STAR**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.3.1.4	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 6, 10, 17, 37, 38, 39 Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: GNT, FNL KLAS	**KLAS JOHKR and RAYDR Standard Instrument Departures (SIDs) Henderson Executive Airport (KHND) OYODA SID KHND NTNDO STAR**
Associated Data Files	
TARGETS output packages Flight Simulator worksheet RNAV Pro analysis results Human in the Loop Simulation (HITLS) results	

Purpose

The purpose of the proposed KLAS RNDRZ RNAV STAR is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

MST Issues and Recommendation

Issues

Stakeholder input indicates that the KEPEC STAR has numerous inefficiencies in its current design. KEPEC arrivals incur approximately 20 to 30 nautical mile (NM) level-offs at FL240 and at 13,000 feet to comply with other inefficient procedures.

Aircraft landing on Runways 01L/R have difficulty complying with speed and altitude restrictions.

The KEPEC STAR does not provide repeatable and predictable course guidance to runways other than Runways 26L/R. The lack of runway transitions requires controllers to vector aircraft to other runways increasing pilot/controller task complexity.

Las Vegas OAPM Design Package

KLAS RNDRZ STAR

Recommendation

The MST created an RNAV Optimized Profile Descent (OPD) STAR (KLAS SW STAR) that is usable for all configurations which reduces overall flight track miles, minimizes level offs and connects to current and proposed Standard Instrument Approach Procedures (SIAPs).

The KLAS SW STAR utilizes altitude windows and speed restraints providing predictable and repeatable flight paths as well as reducing pilot/controller task complexity.

The MST recommendation is depicted in Figures 1 and 2.

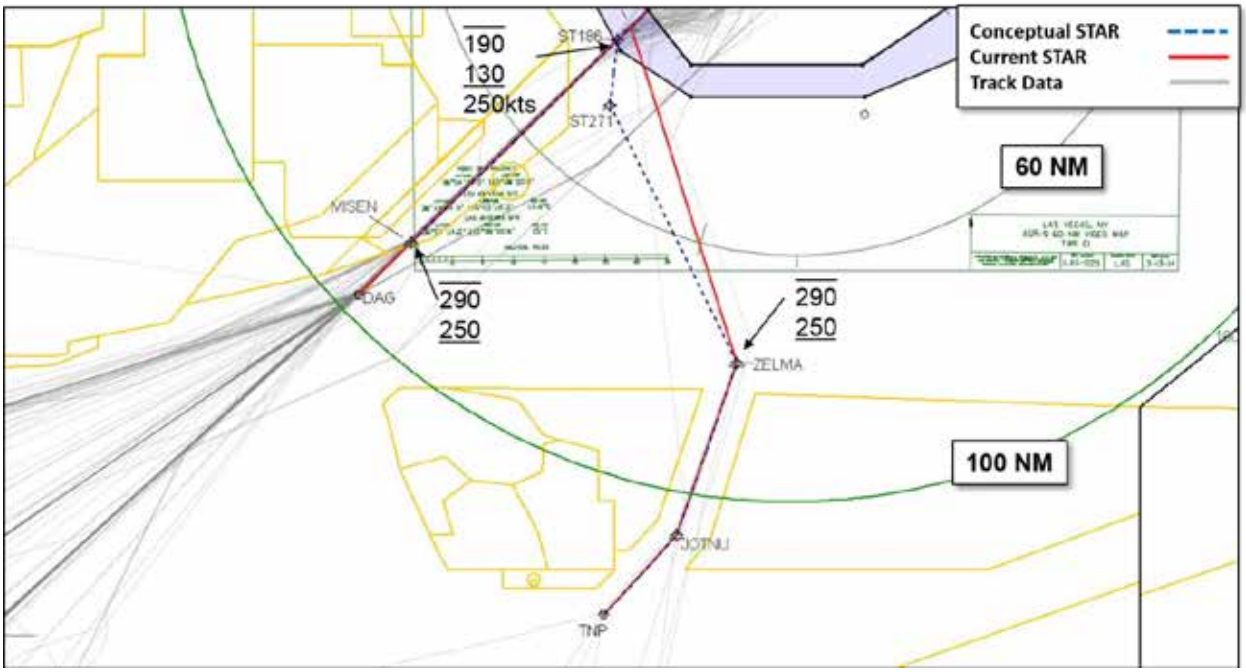


Figure 1: Current KLAS KEPEC STAR and MST's Conceptual KLAS SW STAR – En Route View

Las Vegas OAPM Design Package

KLAS RNDRZ STAR

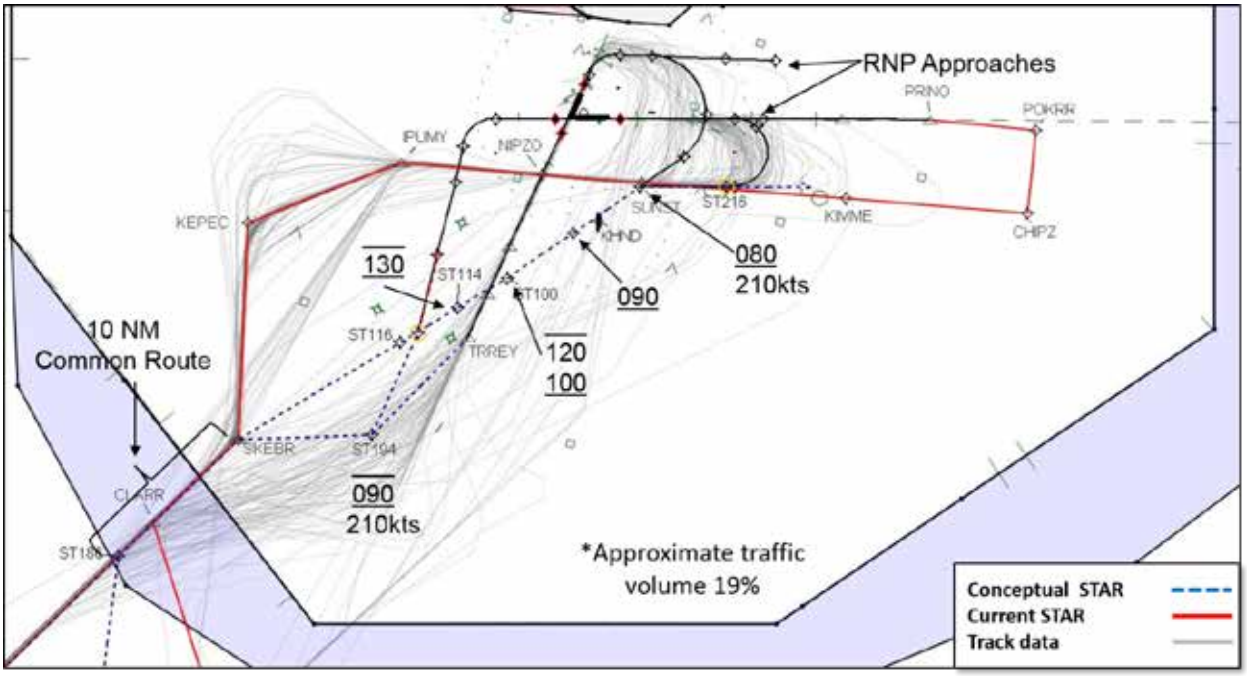


Figure 2: Current KLAS KEPEC STAR and MST's Conceptual KLAS SW STAR – Terminal View

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal, considering both the issues and recommendation.

The KLAS RNDRZ STAR was designed as an OPD STAR. It will increase flight path predictability and decrease controller/pilot task complexity. In en route airspace, the procedure closely follows the MST recommendation.

The en route transition of the KLAS RNDRZ STAR has three transitions.

The KLAS RNDRZ STAR provides connectivity to all KLAS runways and is not anticipated to change runway usage.

The D&I team deviated from the MST recommendation to segregate from the KLAS RASLR, NIITZ and RADYR SIDs. These departure aircraft would be held at lower altitudes longer than necessary if arrivals were allowed to fly direct to the base leg. By segregating these departure streams from the KLAS RNDRZ STAR, complexity and workload are reduced and departures can be assigned higher altitudes sooner.

The KLAS RNDRZ STAR's PFD is depicted in Figures 3 and 4.

En Route Transitions

KLAS RNDRZ (KEPEC) STAR

Las Vegas OAPM Design Package

KLAS RNDRZ STAR

MISEN Transition

- MISEN (at or above FL240/reduces complexity in ZLA allowing for OPD)
- TEDDE
- WATEV (provides a waypoint for sequencing aircraft/standard published holding pattern/allows for holding at higher altitudes)
- TOETS (provides a waypoint for sequencing aircraft/standard published holding pattern)
- RNDRZ (altitude window of 130 to FL190/250 knots/ensures aircraft enter L30 airspace/protects ZLA Sector 16 airspace)

Needles VOR (EED) Transition – ATC assigned only for weather situations

- EED (commonly used navaid between ZAB and ZLA north of Special Use Areas [SUAs])
- ZELMA (at or below FL230/reduces complexity in ZLA/avoids restricted area airspace/provides segregation from Los Angeles Basin arrival traffic)
- MIYKE (provides ability for ATC to issue a crossing restriction, if needed, to segregate from departing traffic)
- RNDRZ (altitude window of 130 to FL190/250 knots/ ensures aircraft enter L30 airspace/protects ZLA Sector 16 airspace)

Twenty-nine Palms VOR (TNP) Transition

- TNP (avoids Restricted Area 2501 [R2501])
- JOTNU (avoids R2501 and BRISTOL Military Operations Area [MOA])
- ZELMA (at or below FL230/reduces complexity in ZLA/avoids restricted area airspace/provides segregation from Los Angeles Basin arrival traffic)
- MIYKE (provides ability for ATC to issue a crossing restriction, if needed, to segregate from departing traffic)
- RNDRZ (altitude window of 130 to FL190/250 knots/ensures aircraft enter L30 airspace/protects ZLA Sector 16 airspace)

Runway Transitions

Runways 01L/R Transition

- RUMLY (at or above 100/provides terrain avoidance)
- BAUMM (at or above 090/required for design criteria)
- ROAMN (at 080/210 knots/initial approach waypoint/required to match approach restrictions)

Runways 08L/R Transition:

- BAUMM (at or above 090/required for design criteria)
- YAGGR (at 080/210 knots/initial approach waypoint/required to match approach restrictions)

Las Vegas OAPM Design Package

KLAS RNDRZ STAR

Runways 19L/R and 26L/R Transitions

- GRMMA (provides segregation from the KLAS JOHKR SID)
- BUETY (at or above 125/provides segregation from the KLAS JOHKR SID)
- ENNVY (at or above 110/provides terrain avoidance/provides segregation from the KLAS JOHKR SID)
- REDQN (at or above 090/210 knots/required for design criteria/provides segregation from the KLAS JOHKR, RAYDR, NIITZ and RASLR SIDs)
- TWAFL (creates straight segment required for design criteria)
- BERBN (at 080/210 knots/provides segregation from KHND Runway 35 departures/initial approach waypoint/required to match approach restrictions)

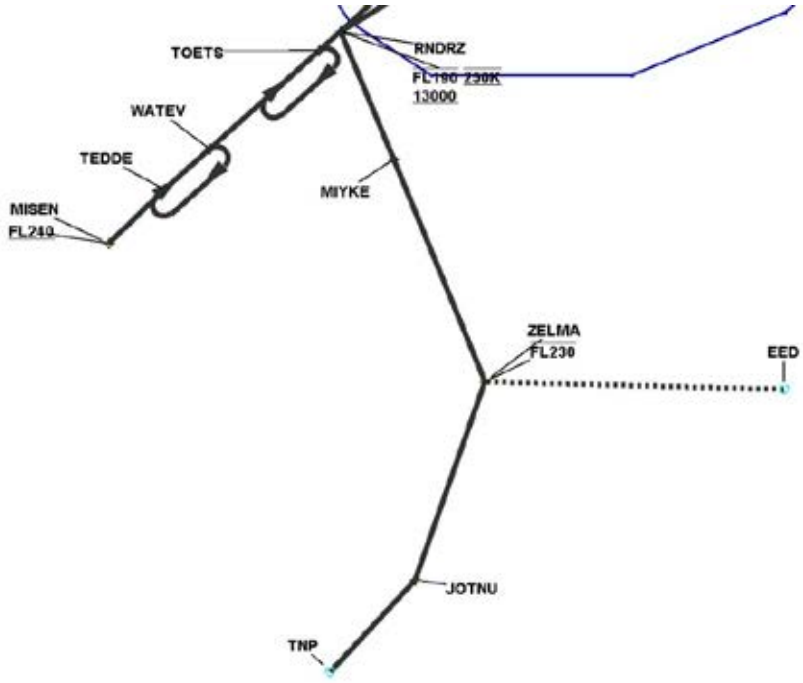


Figure 3: KLAS RNDRZ RNAV STAR's PFD – En Route View

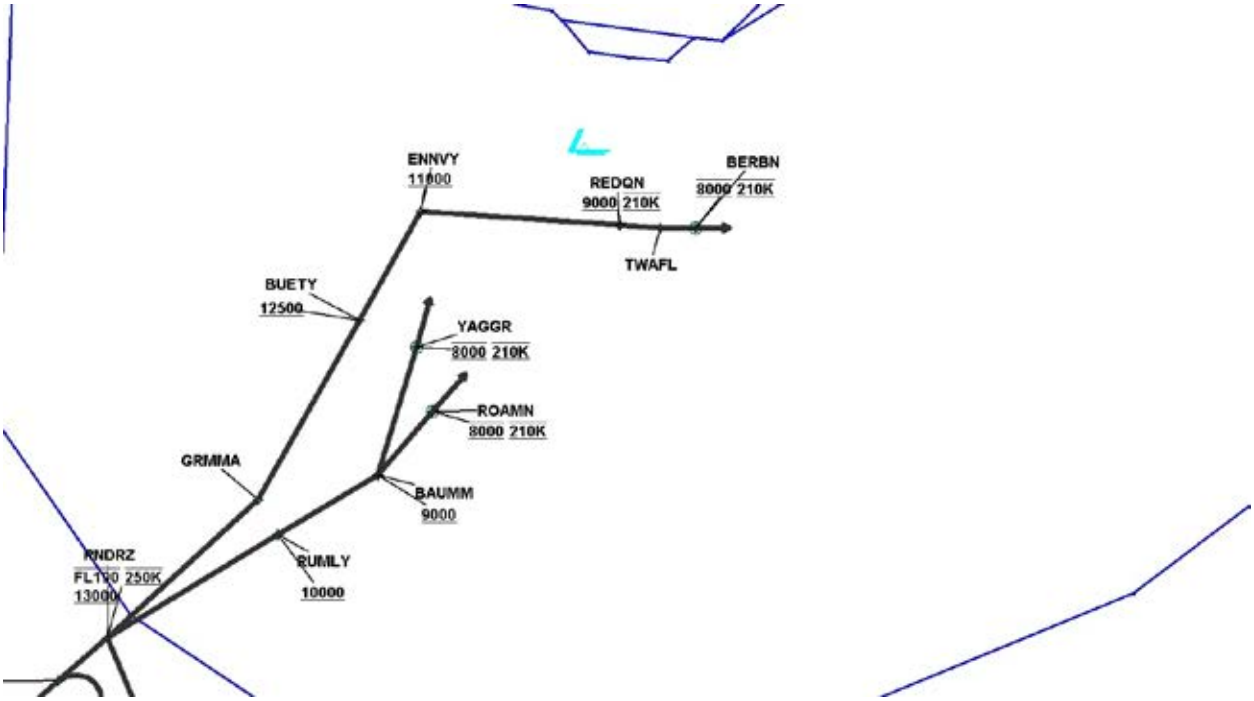


Figure 4: KLAS RNDRZ RNAV STAR's PFD – Terminal View terminal view

Additional Design Considerations

- The KLAS RNDRZ STAR concept was validated by the D&I Team via HITLS
- Spectrum analysis will be required for any proposed airspace changes associated with the proposed STAR
- This procedure will be used by RNAV-equipped turbojet aircraft only and is not anticipated to change runway usage.
    - The following chart notes will be included with this procedure:
        - For turbojet aircraft only

The KLAS RNDRZ STAR affects the following facility area(s) as indicated:

- ZLA Sectors: 6, 10, 17, 37, 38, 39
- L30 Sectors: GNT, FNL
- KLAS

Implementation Dependencies

The procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS and KHND airports.

Document changes/modifications include:

- STAR filings with airline dispatchers

Las Vegas OAPM Design Package

KLAS RNDRZ STAR

- ZLA Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA Standard Operating Procedures (SOP)
- L30 SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- SIAPs
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Terminal Procedures:
    - TARGETS distribution package
    - Flight Simulator worksheet
    - RNAV Pro analysis results
    - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	P/Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23APR19 Date

LAS Metroplex KHND BOEGY ~~SID~~ STAR Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
6/5/2019	The Proposed Final Design description of the KHND BOEGY STAR was reviewed. References to segregation from the KLAS BOEGY STAR were removed. No map depicted. Editorial change only	Master TARGETS File	

All Change Control Sheets and Final Design Packages under the Metroplex Project have been completed.

Bradley R Maybrugh

FAA Metroplex Co-Lead

11/5/19

Date

NATCA Metroplex Co-Lead

11/6/19

Date

Las Vegas OAPM Design Package

KHND BOEGY STAR

An Area Navigation (RNAV) Standard Terminal Arrival Route (STAR) is a procedure that serves as a lateral path for aircraft landing at an airport. RNAV STARs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

Henderson Executive Airport (KHND) arrivals from eastern/northeastern origins will use a new flight path procedure called the BOEGY (pronounced “Bow-gey”) RNAV STAR. The BOEGY STAR will replace the current NOOTN (pronounced “New-ton”) RNAV STAR.

The Las Vegas Metroplex Study Team (MST) noted that the current KHND arrival procedures cause aircraft to level off for extended periods and require close interactions with other arrival and departure flight paths into and out of the Las Vegas Valley, increasing the complexity of operations.

The BOEGY STAR will allow descents that are more continuous at reduced power. In air traffic control terms, this is called an Optimized Profile Descent (OPD).

This procedure is not anticipated to change runway usage. The BOEGY STAR will increase flight path predictability and will decrease controller/pilot workload and task complexity, which will enhance safety.

The new BOEGY STAR addresses KHND. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the Las Vegas Valley.

Las Vegas OAPM Design Package

KHND BOEGY STAR

[NL1]

Name of Change and Airport(s)	Change Classification
Henderson Executive Airport (KHND) **BOEGY Area Navigation (RNAV) Standard Terminal Arrival Route (STAR)**	**Terminal Procedure; STAR**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.5.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 7, 8, 35, 36, 54, 55 **Denver ARTCC (ZDV) Sectors: 23, 24, 36, 68** **Salt Lake City ARTCC (ZLC) Sectors: 33, 34, 44, 46** **Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: LAK, MED, CYN, DAG** **KHND** **North Las Vegas Airport (KVGT)**	**KVGT WYLND STAR**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results** **Human in the Loop Simulation (HITLS) results**	

Purpose

The purpose of the proposed procedure is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

MST Issues and Recommendation

Issues

KHND arrivals from the east and northeast interact with the busiest arrival streams into McCarran International Airport (KLAS). Current arrival procedures are inefficient and create task complexity for L30 and ZLA. The entry point into L30's airspace for the current KHND northeast STAR requires coordination between ZLA Sectors 7 and 8.

Las Vegas OAPM Design Package

KHND BOEGY STAR

Recommendation

The MST worked extensively with the National Business Aviation Association (NBAA) to design efficient arrival procedures for KHND. The MST created three conceptual RNAV STARs (KHND NE STAR, KHND NW STAR, and KHND S STAR).

The KHND NE STAR has two en route transitions that merge prior to terminal airspace and enter L30 south of KLAS Runways 26L/R extended centerline. The procedure continues to HAKID, the initial waypoint on the RNAV (GPS) B approach. This conceptual STAR is procedurally de-conflicted from KLAS arrivals. The waypoints and restrictions are depicted in Figure 1.

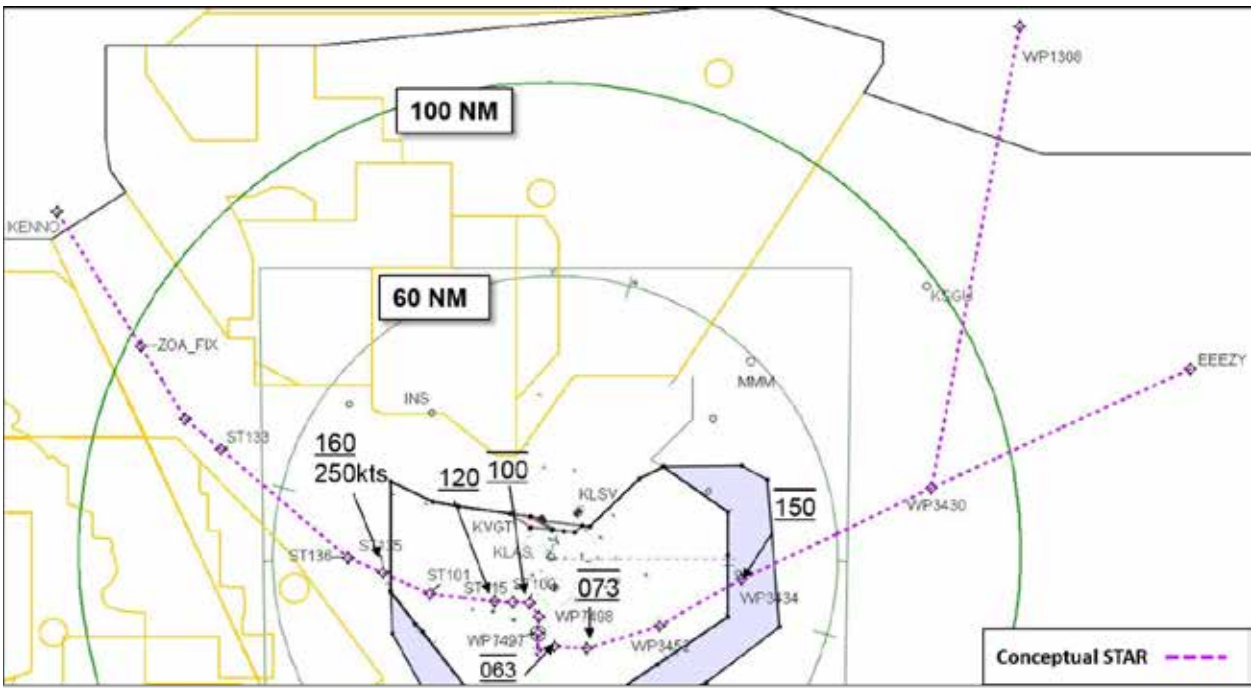


Figure 1: KHND NE and NW MST Conceptual STAR Designs

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST concept as the basis for the initial design proposal, considering both the issues and the recommendation. The D&I Team developed three en route transitions for KHND arrivals from the east/northeast. The KHND BOEGY STAR's PFD is depicted in Figure 2.

En Route Transitions

EEEZY Transition (from ZDV)

- EEEZY (existing waypoint/used for aircraft arriving from the northeast)
- PAHRR (provides a sequencing point with SHAYM transition)

- BOEGY (at 150/250 knots/provides segregation from KLAS arrival and departure traffic/serves as a coordination waypoint/provides continuity with new T-routes/allows sequencing with TOADD transition)

<u>SHAYM Transition (from ZLC)</u>

- SHAYM (for aircraft arriving from northern airports)
- PAHRR (provides a sequencing point with EEEZY transition)
- BOEGY (at 150/250 knots/provides segregation from KLAS arrival and departure traffic/serves as a coordination waypoint/provides continuity with new T-routes/allows sequencing with TOADD transition)

<u>TOADD Transition (from ZDV)</u>

- TOADD (existing waypoint in ZDV airspace/coordination waypoint)
- BOEGY (at 150/250 knots/provides segregation from KLAS arrival and departure traffic/serves as a coordination waypoint/provides continuity with new T-routes/allows sequencing with EEEZY and SHAYM transitions)

<u>Common Route (after BOEGY, regardless of active runway)</u>

- PUTTT (at 070/provides terrain avoidance/provides segregation from KLAS arrival and departure traffic)
- KGRDN (at 060/provides terrain avoidance/allows for approach vectors to appropriate runway)

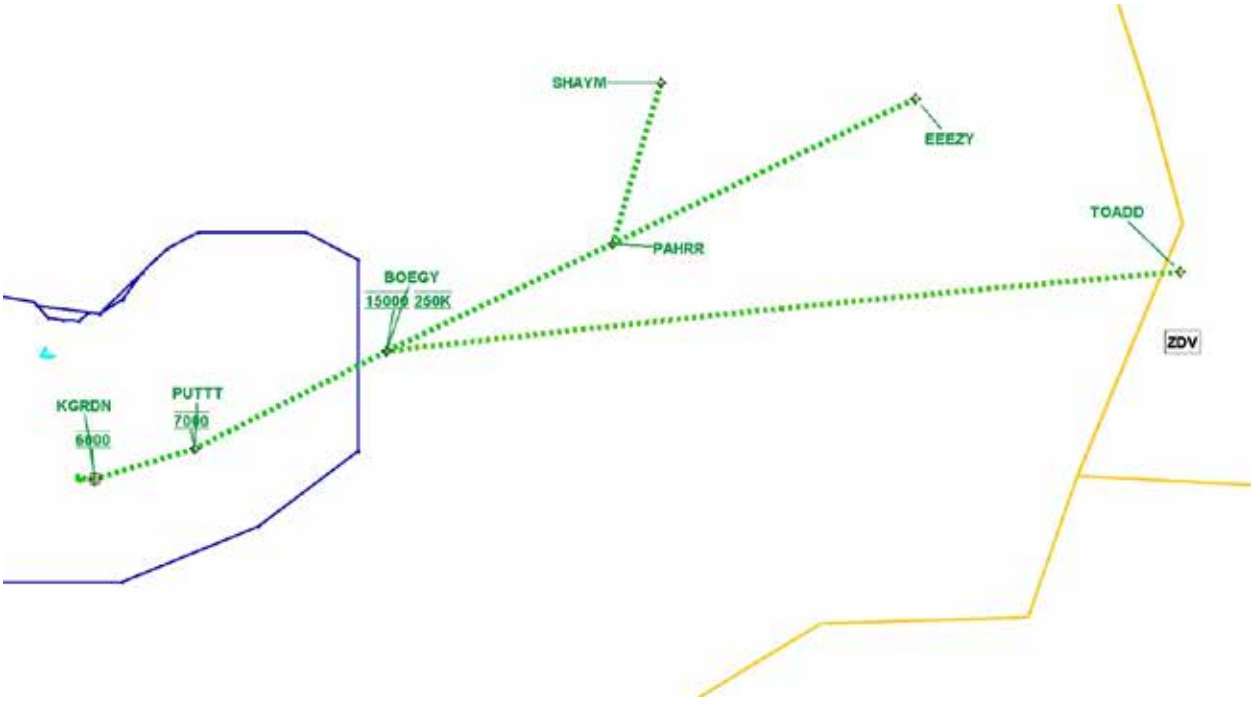


Figure 2: KHND BOEGY STAR – PFD

Additional Design Considerations

- The KHND BOEGY STAR concept was validated by the D&I Team via HITLS
- Spectrum analysis will be required for any proposed airspace changes associated with the proposed STAR
- This procedure will be used by RNAV-equipped turbojet aircraft only and is not anticipated to change runway usage
    - No chart notes will be included with this procedure

The BOEGY STAR affects the following facility area(s) as indicated:

- ZLA Sectors: 7, 8, 35, 36, 54, 55
- ZDV Sectors: 23, 24, 36, 68
- ZLC Sectors: 33, 34, 44, 46
- L30 Sectors: LAK, MED, CYN, DAG
- KHND

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KHND and KVGT.

Document changes/modifications include:

- STAR filings with airline dispatchers
- ZLA Facility Operations and Administration Order 7210.3
- ZDV Facility Operations and Administration Order 7210.3
- ZLC Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- VGT Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZDV LOA
- ZLA/ZLC LOA
- ZLA Standard Operating Procedures (SOP)
- ZDV SOP
- ZLC SOP
- L30 SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

<u>Attachments</u>

- Terminal Procedures:
    - TARGETS distribution package
    - Flight Simulator worksheet
    - RNAV Pro analysis results
    - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	P/Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23APR19 Date

Las Vegas OAPM Design Package

KHND GAMES STAR

An Area Navigation (RNAV) Standard Terminal Arrival Route (STAR) is a procedure that serves as a lateral path for aircraft landing at an airport. RNAV STARs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

Henderson Executive Airport (KHND) arrivals from northwestern origins will use a new flight path procedure called the GAMES (pronounced "Games") RNAV STAR. The GAMES STAR will replace the current ADDEL (pronounced "Aa-dell") RNAV STAR serving both turbojet and turboprop aircraft. The GAMES STAR will also serve McCarran International Airport (KLAS) turboprop arrivals from the northwest that currently utilize the KLAS FUZZY STAR.

The Las Vegas Metroplex Study Team (MST) noted that the current KHND arrival procedures cause aircraft to level off for extended periods and require close interactions with other arrival and departure flight paths into and out of the Las Vegas Valley, increasing the complexity of operations.

The GAMES STAR serves KHND arrivals from the northwest. Las Vegas Valley arrivals from and departures to the northwest require routing through a nineteen mile wide corridor formed by military restricted airspace to the northeast and southwest. The narrow corridor supports one KLAS departure procedure and three KLAS and satellite airport departure/arrival routes. The design is further complicated by interactions closer to the airport with aircraft assigned the KLAS JOHKR Standard Instrument Departure (SID). In an area where terrain is a factor, JOHKR departure aircraft are accomplishing climbs to altitude while GAMES arrival aircraft are descending.

The GAMES STAR will allow descents that are more continuous at reduced power. In air traffic control terms this is called an Optimized Profile Descent (OPD).

This procedure is not anticipated to change runway usage. The GAMES STAR will increase flight path predictability and will decrease controller/pilot workload and task complexity, which will enhance safety.

The new GAMES STAR addresses KHND and KLAS. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the Las Vegas Valley.

Las Vegas OAPM Design Package

KHND GAMES STAR

Name of Change and Airport(s)	Change Classification
Henderson Executive Airport (KHND) **McCarran international Airport (KLAS)** **GAMES Area Navigation (RNAV) Standard Terminal Arrival Route (STAR)**	**Terminal Procedure; STAR**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.5.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 16 **Oakland ARTCC (ZOA) Sectors: 33, 46** **Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: DAG, GNT, CYN** **Nellis Air Traffic Control Facility (NATCF) Sectors: LEE (A7 Shelf)** **KHND** **KLAS**	**KHND OYODA Standard Instrument Departure (SID)** **Q13 Amendment** **Q15 Amendment**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results** **Human in the Loop Simulation (HITLS) results**	

Purpose

The purpose of the proposed procedure is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

MST Issues and Recommendation

Issues

Stakeholders reported that due to the close proximity of KHND and KLAS, current procedures for arrivals into KLAS create delays for KHND departures.

Recommendation

Las Vegas OAPM Design Package

KHND GAMES STAR

The MST worked extensively with the National Business Aviation Association (NBAA) to design efficient arrival procedures for KHND. The MST created three conceptual RNAV STARs (KHND NE STAR, KHND NW STAR, and KHND S STAR).

The KHND NW STAR follows the KLAS NW STAR through the northwest corridor and diverges at ST100. The waypoints and restrictions are depicted in Figure 1.

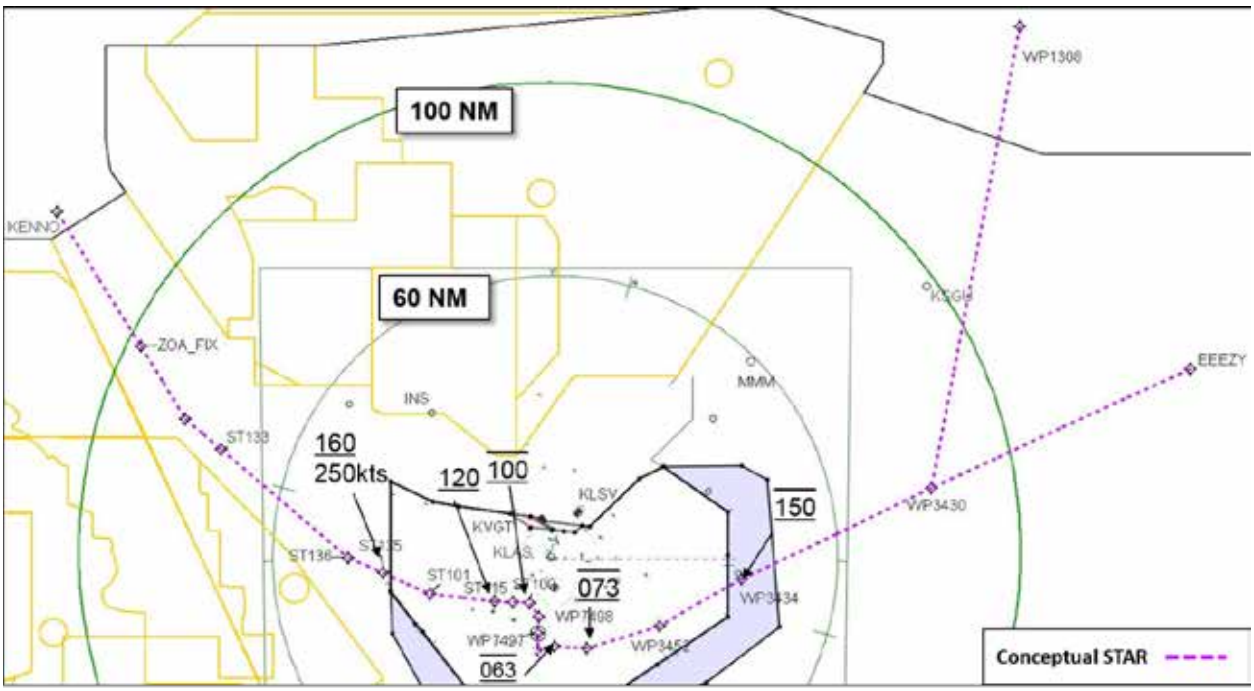


Figure 1: KHND NW and NE MST Conceptual STAR Designs

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST concept as the basis for the initial design proposal, considering both the issues and the recommendation.

The GAMES STAR serves KHND arrivals from the northwest. Las Vegas Valley arrivals from and departures to the northwest require routing through a nineteen mile wide corridor formed by military restricted airspace to the northeast and southwest. The narrow corridor supports one KLAS departure procedure and three KLAS and satellite airport departure/arrival routes. The design is further complicated by interactions closer to the airport with aircraft assigned the KLAS JOHKR Standard Instrument Departure (SID). In an area where terrain is also a factor, JOHKR departure aircraft are accomplishing climbs to altitude while GAMES arrival aircraft are descending.

The GAMES STAR will serve turbojet and turboprop aircraft landing at KHND and turboprop aircraft landing at KLAS.

Las Vegas OAPM Design Package
KHND GAMES STAR

The KHND GAMES STAR's PFD is depicted in Figure 2.

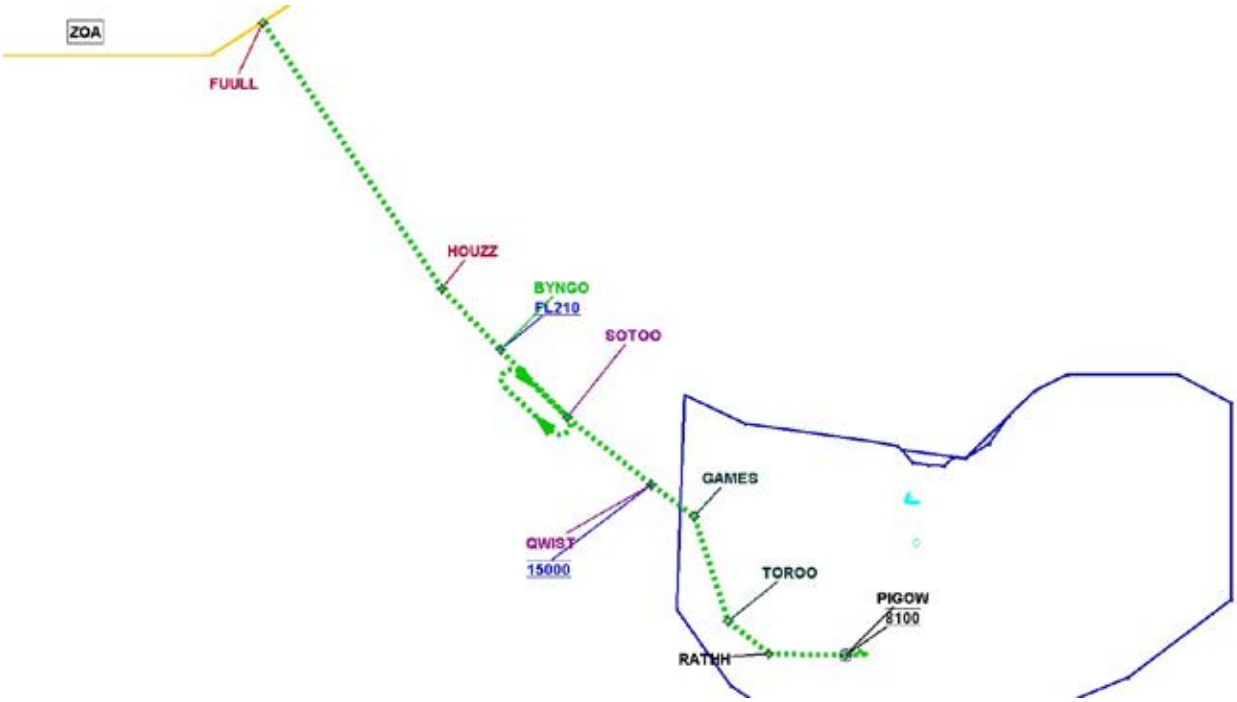
<u>En Route Transition</u>

<u>FUULL Transition</u>

- FUULL (coordination waypoint with ZOA/provides segregation from KLAS JOHKR SID and KLAS COKTL STAR)
- HOUZZ (provides segregation from KLAS JOHKR SID and KLAS COKTL STAR)
- BYNGO (at or above FL210/provides airspace integrity from NATCF's A7 shelf/provides segregation from KLAS JOHKR SID and KLAS COKTL STAR)
- SOTOO (provides alignment with the new Q13 and/or Q15 routes/provides segregation from KLAS JOHKR SID and KLAS COKTL STAR/provides a published standard holding pattern)
- QWIST (at 150/ensures KHND arrival traffic is below KLAS arrival/departure traffic)
- GAMES (provides segregation from KLAS JOHKR SID and KLAS COKTL STAR)

<u>Common Route (allows radar vectors to all runways)</u>

- GAMES (provides segregation from KLAS JOHKR SID and KLAS COKTL STAR)
- TOROO (parallels KLAS COKTL STAR)
- RATHH (provides lateral distance from KLAS COKTL STAR)
- PIGOW (at 081/FM leg towards KHND)



KHND GAMES (ADDEL) STAR

Figure 2: KHND GAMES STAR - PFD

Additional Design Considerations

- The KHND GAMES STAR concept was validated by the D&I Team via HITLS
- Spectrum analysis will be required for any proposed airspace changes associated with the proposed STAR
- This procedure will be used by RNAV-equipped turbojet aircraft landing KHND and turboprop aircraft landing KLAS, and is not anticipated to change runway usage

The GAMES STAR affects the following facility area(s) as indicated:

- ZLA Sectors: 16
- ZOA) Sectors: 33, 46
- L30 Sectors: DAG, GNT, CYN
- NATCF
- KHND
- KLAS

Implementation Dependencies

The procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS and KHND.

Document changes/modifications include:

- STAR filings with airline dispatchers
- ZLA Facility Operations and Administration Order 7210.3
- ZOA Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZOA LOA
- L30/HND LOA
- ZLA Standard Operating Procedures (SOP)
- ZOA SOP
- L30 SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- Standard Instrument Approach Procedures (SIAP)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Terminal Procedures:
  - TARGETS distribution package
  - Flight Simulator worksheet
  - RNAV Pro analysis results
  - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	P/Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23APR19 Date

Las Vegas OAPM Design Package

KHND NTNDO STAR

An Area Navigation (RNAV) Standard Terminal Arrival Route (STAR) is a procedure that serves as a lateral path for aircraft landing at an airport. RNAV STARs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

Henderson Executive Airport (KHND) arrivals from southwestern, southern and southeastern origins will use a new flight path procedure called the NTNDO (pronounced "Nin-ten-doe") RNAV STAR. The NTNDO STAR will replace the current JOMIX (pronounced "Joe-mix") RNAV STAR. The NTNDO STAR will also serve KHND arrivals that currently utilize a conventional arrival routing from the Kingman (IGM) VORTAC (ground-based navigational aid).

The Las Vegas Metroplex Study Team (MST) noted that the current KHND arrival procedures cause aircraft to level off for extended periods and require close interactions with other arrival and departure flight paths into and out of the Las Vegas Valley, increasing the complexity of operations.

The NTNDO STAR will allow descents that are more continuous at reduced power. In air traffic control terms this is called an Optimized Profile Descent (OPD).

This procedure is not anticipated to change runway usage. The NTNDO STAR will increase flight path predictability and will decrease controller/pilot workload and task complexity, which will enhance safety.

The new NTNDO STAR addresses KHND. Due to additional traffic routes into and out of the area, the Las Vegas Metroplex Design and Implementation Team (D&I Team) decided to include North Las Vegas Airport (KVGT) to the proposed STAR. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the area.

Las Vegas OAPM Design Package

KHND NTNDO STAR

Name of Change and Airport(s)	Change Classification
Henderson Executive Airport (KHND) **North Las Vegas Airport (KVGT)** **NTNDO Area Navigation (RNAV) Standard Terminal Arrival Route (STAR)**	**Terminal Procedure; STAR**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.5.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 6, 10, 17, 35, 37, 38, 39, 68 **Albuquerque ARTCC (ZAB) Sectors: 43, 92** **Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: CYN** **KHND** **KVGT**	**N/A**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results** **Human in the Loop Simulation (HITLS) results**	

Purpose

The purpose of the proposed procedure is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

MST Issues and Recommendation

Issues

Stakeholders reported that due to the close proximity of KHND and KLAS, current procedures for arrivals into KLAS create delays for KHND departures.

Multiple entry points for aircraft landing at KHND from the southwest, south, and southeast directions require coordination between ZLA Sectors 6 and 8, and increases task complexity for L30.

Recommendation

The MST worked extensively with the National Business Aviation Association (NBAA) to design efficient arrival procedures for KHND. The MST created three conceptual RNAV STARS (KHND NE STAR, KHND NW STAR, and KHND S STAR).

The KHND S STAR has three en route transitions and a common route into L30 airspace from the south. The procedure continues to HAKID, the initial waypoint for the RNAV (GPS) B approach. The waypoints and restrictions are depicted in Figure 1.

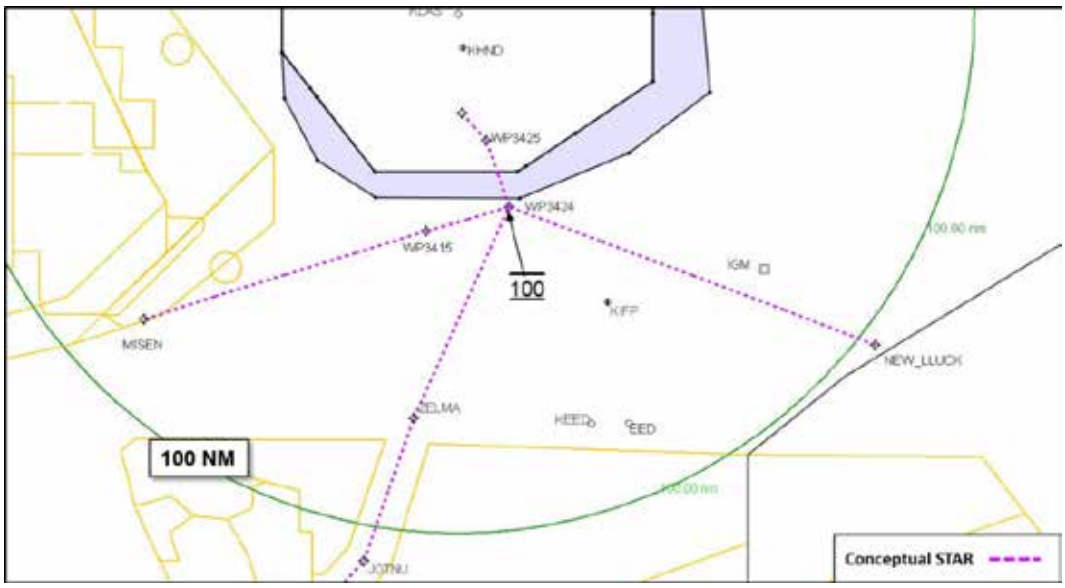


Figure 1: KHND S MST Conceptual STAR Design

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal. Considering both the issues and recommendation, the D&I Team decided to include KVGT to the proposed STAR. The D&I Team developed three en route transitions for KHND/KVGT arrivals from the south. The KHND NTNDO STAR is depicted in Figure 2.

En Route Transitions

GUILE Transition

- GUILE (located near current arrival point used by ZAB)
- BYSEN (at or above FL240/reduces complexity in ZLA Sector 8)
- KONNG (at 110/250 knots/provides segregation from the KLAS RADYR Standard Instrument Departure [SID])

MISEN Transition

- MISEN (utilized for Los Angeles basin departures as a tie in point for KHND and KVGT arrivals/provides segregation from the KLAS RADYR SID)
- LINCK (provides segregation from the KLAS RADYR SID)
- TETRS (at or above 130 to protect for the MEA/serves as a sequencing point with the TNP transition)
- KONNG (at 110/250 knots/provides segregation from the KLAS RADYR SID)

Twenty-nine Palms (TNP VORTAC) Transition

- TNP (existing waypoint/avoids Military Operations Areas [MOAs])
- JOTNU (existing waypoint/avoids MOAs)
- ZELMA (existing waypoint/avoids MOAs)
- TETRS (at or above 130 to protect for the MEA/serves as a sequencing point with the MISEN transition)
- KONNG (at 110/250 knots/provides segregation from the KLAS RADYR SID)

All the en route transitions join a common route regardless of the active runway(s) at KHND or KVGT.

Common Route

- KEEKO (AOA 072/provides terrain avoidance)
- NTNDO (at 070/provides segregation from the KLAS CHOWW and RKSTR STARs and the KLAS OYODA SID)

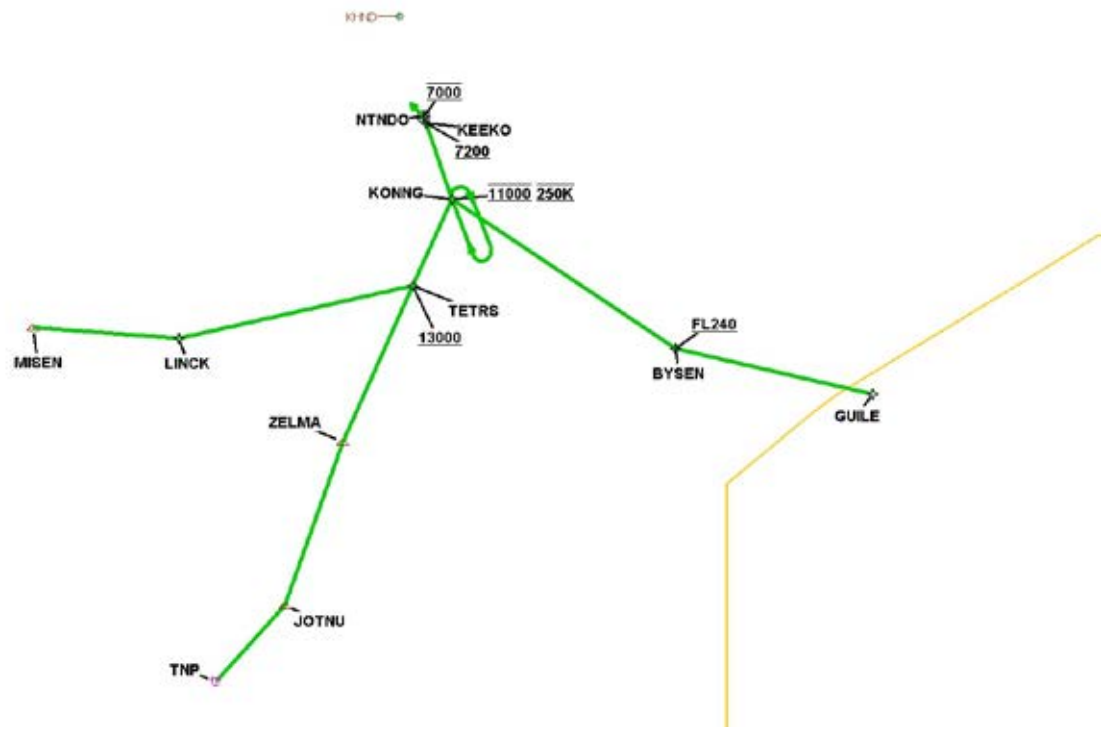


Figure 2: KHND NTNDO STAR - PFD

Additional Design Considerations

- The KHND NTNDO STAR concept was validated by the D&I Team via HITLS
- Spectrum analysis will be required for any proposed airspace changes associated with the proposed STAR
- This procedure will be used by RNAV-equipped turbojet aircraft only and is not anticipated to change runway usage
    - The following chart notes will be included with this procedure:
        - For turbojet aircraft only

The NTNDO STAR affects the following facility area(s) as indicated:

- ZLA Sectors: 6, 8, 10, 17, 35, 37, 38, 39, 68
- ZAB Sectors: 43, 92
- L30 Sectors: CYN
- KHND
- KVGT

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KHND and KVGT.

Document changes/modifications include:

- STAR filings with airline dispatchers
- ZLA Facility Operations and Administration Order 7210.3
- ZAB Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- VGT Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZAB LOA
- L30/HND LOA
- L30/VGT LOA
- ZLA Standard Operating Procedures (SOP)
- ZAB SOP
- L30 SOP
- VGT SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

<u>Attachments</u>

- Terminal Procedures:
    - TARGETS distribution package
    - Flight Simulator worksheet
    - RNAV Pro analysis results
    - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	P/Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23APR19 Date

Las Vegas OAPM Design Package

KVGT FLCHR STAR

An Area Navigation (RNAV) Standard Terminal Arrival Route (STAR) is a procedure that serves as a lateral path for aircraft landing at an airport. RNAV STARs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

North Las Vegas Airport (KVGT) arrivals from northwestern origins will use a new flight path procedure called the FLCHR (pronounced "Flet-cher"), RNAV STAR. There is no current procedure for aircraft arriving from the northwest.

Stakeholders requested that the current conventional procedures be replaced with more efficient Performance Based Navigation (PBN) procedures.

Current operations cause aircraft to level off for extended periods and require close interactions with other arrival and departure flight paths into and out of the Las Vegas Valley, increasing complexity of operations.

In order to segregate from KLAS arrivals from the northwest and other aircraft traffic flows, the new FLCHR STAR includes altitude restrictions. These restrictions will allow descents that are more continuous at reduced power. In air traffic control terms this is called an Optimized Profile Descent (OPD).

The new FLCHR STAR address KVGT. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the area.

Las Vegas OAPM Design Package

KVGT FLCHR STAR

Name of Change and Airport(s)	Change Classification
North Las Vegas Airport (KVGT) **FLCHR Area Navigation (RNAV)** **Standard Terminal Arrival Route (STAR)**	**Terminal Procedure; STAR**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.5.2	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 16 **Oakland ARTCC (ZOA) Sectors: 15, 33, 46** **Nellis Air Traffic Control Facility (NATCF)** **KVGT**	**McCarran International Airport (KLAS) COKTL and JAYSN STARs;** **KLAS LOHLA Standard Instrument Departure (SID)** **Q174 Route**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results** **Human in the Loop Simulation (HITLS) results**	

Purpose

The purpose of the proposed procedure is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

MST Issues and Recommendation

Issues

Stakeholders requested that the current conventional procedures be replaced with more efficient Performance Based Navigation (PBN) procedures.

Recommendation

The MST worked extensively with the National Business Aviation Association (NBAA) to design four conceptual RNAV STARs (KVGT NE STAR, KVGT NW STAR, KVGT SE STAR, and KVGT SW STAR).

The KVGT NW and NE STARs transition from the en route structure through NATCF airspace bypassing L30.

Figure 1 depicts the MST recommendation.

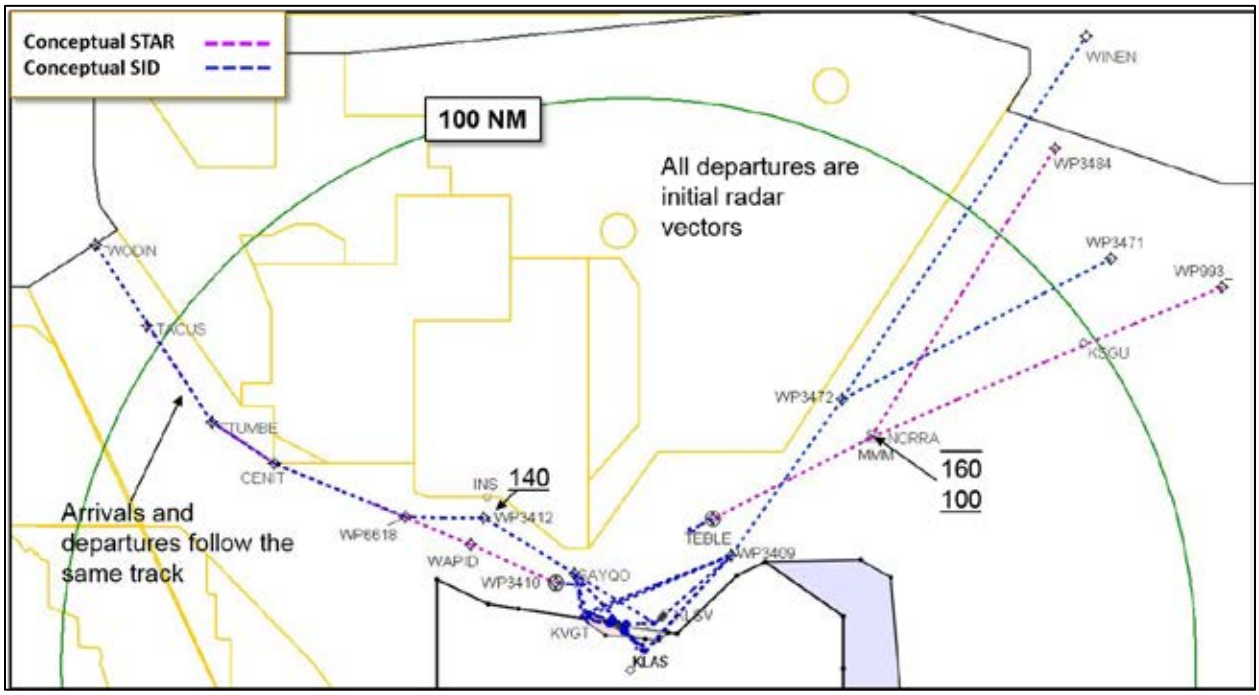


Figure 1: KVGT MST STAR/SID Designs

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal, considering both the issues and recommendation. For arrivals from the northwest, the team designed the KVGT FLCHR STAR to closely align with the newly designed KLAS JAYSN STAR, in an effort to maximize use of constrained airspace. There are a limited number of flights that will utilize the FLCHR STAR to KVGT and the KLAS JAYSN STAR will be utilized only by Department of Energy flights (JANET Flights). Due to the low number of flights, the D&I Team felt that the best use of the airspace would be to overlap the routes.

Aircraft join the arrival at the FLCHR waypoint, which is shared by the KLAS COKTL STAR and Q174. By mutual agreement between ZLA's Sector 16 and NATCF, aircraft will be descended to FL210 (the bottom of Sector 16's airspace which lies over NATCF's LEE Sector), then, traffic permitting, handed off to NATCF and descended out of Sector 16's airspace.

The KVGT FLCHR STAR Proposed Final Design is depicted in Figure 2.

En Route Transitions

FLCHR Transition

- FLCHR (provides connectivity with Q174/provides segregation from Q13/15, restricted airspace, and from Henderson Executive Airport (KHND) GAMES and OYODA RNAV SIDs)
- OPNOW (coordination waypoint/provides NATCF airspace integrity/avoids Restricted Area 4806 [R4806])
- GEOOF (provides terrain avoidance/provides segregation from westbound KLSV departures/avoids restricted airspace)
- KEEKE (at or above 105/no greater than 250 knots/provides terrain avoidance/for design criteria)
- ECAKO (at 090/no greater than 230 knots/joins an RNAV GPS approach to KVGT Runway 12R)

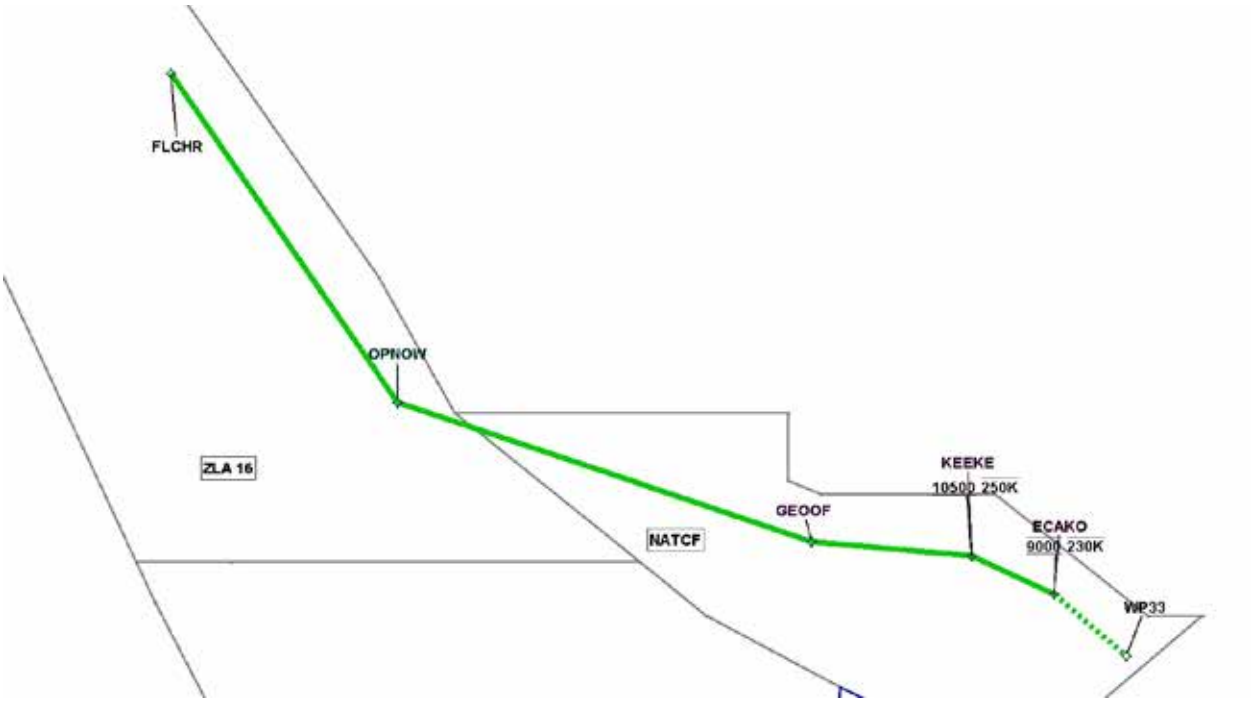


Figure 2: KVGT FLCHR STAR

Additional Design Considerations

- Spectrum analysis will be required for any proposed airspace changes associated with the proposed STAR
- This procedure will be used by RNAV-equipped turbojet aircraft only and is not anticipated to change runway usage.
    - The following chart notes will be included with this procedure:
        - For turbojet and turboprop aircraft only
        - GPS Required

The FLCHR STAR affects the following facility area(s) as indicated:

- ZLA ARTCC Sectors: 16
- ZOA Sectors: 15, 33, 46
- NATCF
- KVGT

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND, KLSV, and KVGT.

Document changes/modifications include:

- ZLA Facility Operations and Administration Order 7210.3
- ZOA Facility Operations and Administration Order 7210.3
- VGT Facility Operations and Administration Order 7210.3
- ZLA/NATCF sector boundary maps and video maps
- ZLA/ZOA Letter of Agreement (LOA)
- ZLA/NATCF LOA
- ZLA Standard Operating Procedures (SOP)
- NATCF SOP
- VGT SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- TARGETS distribution package
- Flight Simulator worksheet
- RNAV Pro analysis results
- HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R Mayhugh 4/23/19 4/23/19

Bradley R Mayhugh Date Chris Thomas Date
LAS FAA Lead LAS NATCA Lead

4/23/19 5/2/19

Sarah Fletcher Date Martin Ramirez Date
ZLA Facility POC ZLA NATCA POC

Available via electronic signature

Date

Nellis Air Traffic Control Facility

Las Vegas OAPM Design Package

KVGT WYLND STAR

An Area Navigation (RNAV) Standard Terminal Arrival Route (STAR) is a procedure that serves as a lateral path for aircraft landing at an airport. RNAV STARs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

North Las Vegas Airport (KVGT) arrivals from eastern/southeastern origins will use a new flight path procedure called the WYLND (pronounced “Why-land”), RNAV STAR. There is no current procedure for aircraft from the east or southeast.

Stakeholders requested that the current conventional procedures be replaced with more efficient Performance Based Navigation (PBN) procedures.

Current operations cause aircraft to level off for extended periods and require close interactions with other arrival and departure flight paths into and out of the Las Vegas Valley, increasing complexity of operations.

In order to segregate from KLAS arrivals from the east and southeast, and from other aircraft traffic flows, the new WYLND STAR includes altitude restrictions. These restrictions will allow descents that are more continuous at reduced power. In air traffic control terms this is called an Optimized Profile Descent (OPD).

The new WYLND STAR address KVGT. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the area.

Las Vegas OAPM Design Package

KVGT WYLND STAR

Name of Change and Airport(s)	Change Classification
North Las Vegas Airport (KVGT) WYLND Area Navigation (RNAV) Standard Terminal Arrival Route (STAR)	**Terminal Procedure; STAR**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.5.2	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 8, 35, 36 Denver ARTCC (ZDV) Sectors: 23, 24, 36, 68 Albuquerque ARTCC (ZAB) Sectors: 45, 67 Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: LAK, MED, DAG Nellis Air Traffic Control Facility (NATCF) KVGT	**Henderson Executive Airport (KHND) BOEGY STAR**
Associated Data Files	
TARGETS output packages Flight Simulator worksheet RNAV Pro analysis results Human in the Loop Simulation (HITLS) results	

Purpose

The purpose of the proposed procedure is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

MST Issues and Recommendation

Issues

Stakeholders requested that the current conventional procedures be replaced with more efficient PBN procedures.

Recommendation

The MST worked extensively with the National Business Aviation Association (NBAA) to design four conceptual RNAV STARs (KVGT NE STAR, KVGT NW STAR, KVGT SE STAR, and KVGT SW STAR).

The KVGT SE and SW STARs are designed to traverse L30 airspace and will exit L30 northwest of McCarran International Airport (KLAS), with connectivity to the GPS RWY12R approach.

Figure 1 depicts the MST recommendation.

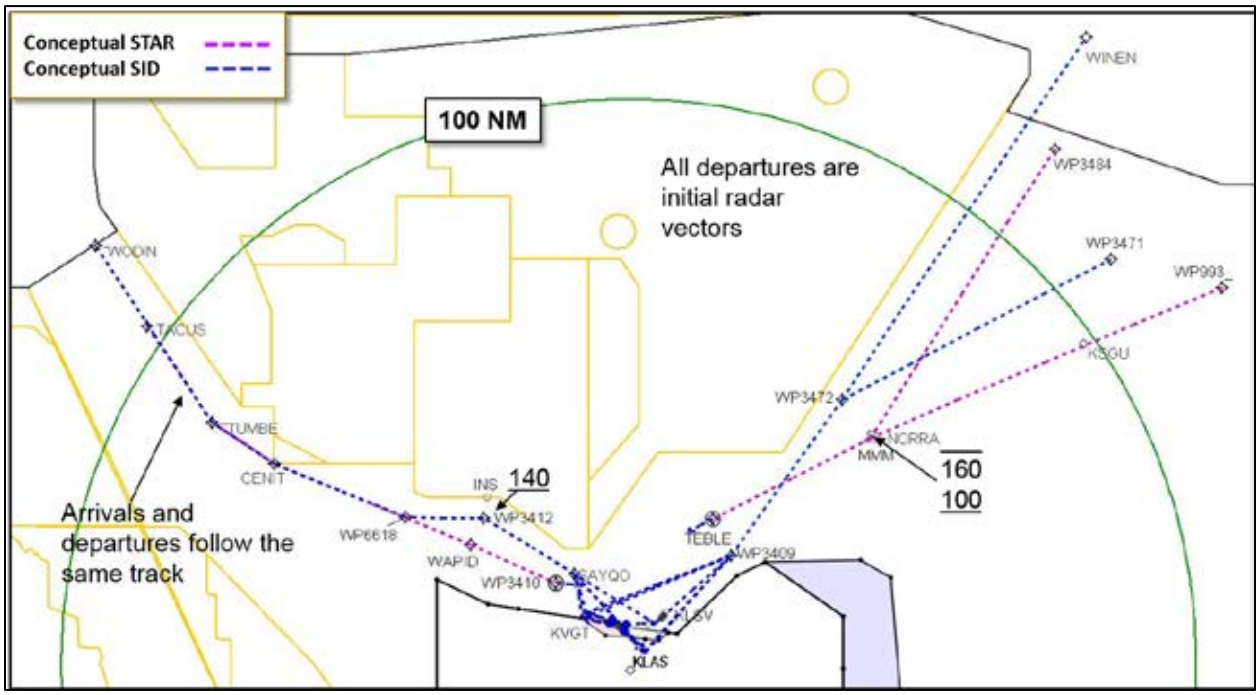


Figure 1: KVGT MST STAR/SID Designs

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal, considering both the issues and recommendation. For arrivals from the east and southeast, the team decided to share the BOEGY waypoint for both KVGT and KHND arrivals.

The D&I Team differed from the MST with respect to the north arrivals, because there is a current arrival route from the north over Mormon Mesa VOR (MMM) which will still be utilized per NATCF request.

The KVGT WYLAND STAR Proposed Final Design is depicted in Figure 2.

En Route Transitions

SSKEE Transition (from ZAB):

- SSKEE (coordination waypoint with ZAB)

- BOEGY (at 150/250 knots/provides segregation from KLAS arrival and departure traffic/coordination waypoint with L30/provides continuity with new T-routes)
- WYLND (provides segregation from KLAS arrival and departure traffic)
- LNDIN (at 090/coordination waypoint with NATCF)

TOADD Transition (from ZDV):

- TOADD (existing waypoint/coordination waypoint with ZDV)
- BOEGY (at 150/250 knots/provides segregation from KLAS arrival and departure traffic/coordination waypoint with L30/provides continuity with new T-routes)
- WYLND (provides segregation from KLAS arrival and departure traffic)
- LNDIN (at 090/coordination waypoint with NATCF)

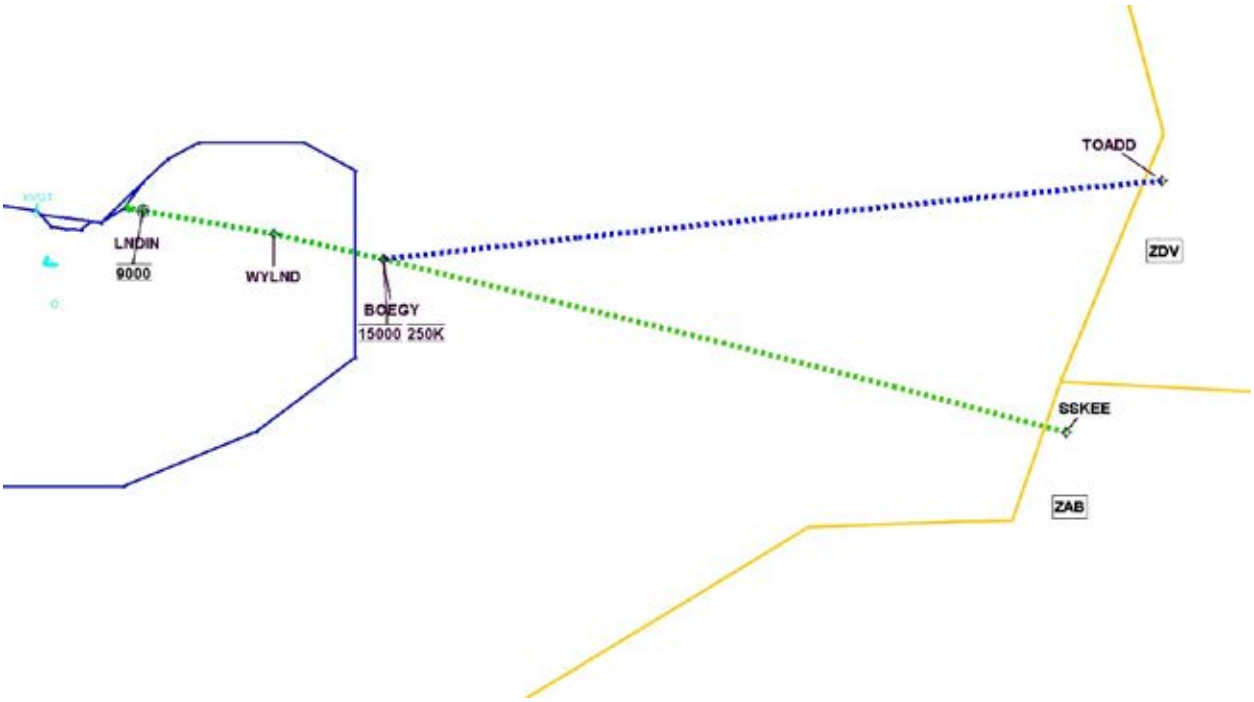


Figure 2 KVGT WYLND STAR - PFD

Additional Design Considerations

- The KVGT WYLND STAR concept was validated by the D&I Team via HITLS
- Spectrum analysis will be required for any proposed airspace changes associated with the proposed STAR
- This procedure will be used by RNAV-equipped turbojet aircraft only and is not anticipated to change runway usage
    - The following chart notes will be included with this procedure:

- For turbojet aircraft only

The WYLND STAR affects the following facility area(s) as indicated:

- ZLA Sectors: 8, 35, 36
- ZDV Sectors: 23, 24, 36, 68
- ZAB Sectors: 45, 67
- L30 Sectors: LAK, MED, DAG
- NATCF
- KVGT

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND and KVGT.

Document changes/modifications include:

- ZLA Facility Operations and Administration Order 7210.3
- ZDV Facility Operations and Administration Order 7210.3
- ZAB Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- VGT Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZDV LOA
- ZLA/ZAB LOA
- ZLA Standard Operating Procedures (SOP)
- ZDV SOP
- ZAB SOP
- L30 SOP
- VGT SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

Las Vegas OAPM Design Package

KVGT WYLND STAR

- TARGETS distribution package
- Flight Simulator worksheet
- RNAV Pro analysis results
- HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date

Available via electronic signature

_____ Date

Nellis Air Traffic Control Facility

LAS Metroplex KLAS GIDGT SID Community Engagement Review Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
6/4/2019	On April 9, 10 and 11, 2019, the LAS Metroplex Project conducted public outreach efforts to present Proposed Final Designs for developed RNAV procedures. The Team solicited comments, in person during the events and for 30 days after via web based comment forms. At the conclusion of the comment period, the Team reviewed all submissions and re-examined the procedures to determine if any changes could be made based on public input. The KLAS GIDGT SID was reviewed as part of this process. **KLAS GIDGT SID Runways 26 L/R transitions** The southern edge of Summerlin is approximately 6 miles northwest of KLAS. Comments from the Summerlin, NV community focused on existing aircraft noise for departures, with no remarks concerning new procedures. The existing STAAV SID serving KLAS Runway 26 departures will be replaced by the Metroplex proposed KLAS GIDGT and KLAS RATPK SIDs, routed over or near Summerlin. The D&I Team reviewed the two procedures to determine whether changes could be made. Aircraft are expected to remain within historical tracks for KLAS Runway 26 departures routed to destinations east and northeast of Las Vegas. Several comments suggested routing aircraft further west before beginning a turn to the north and then east, allowing a higher altitude as departures crossed over the Summerlin area. The Team examined changing the lateral path by moving the LEELN waypoint three miles west. Several issues were identified with this change: • Routes too close to rapidly rising terrain for aircraft to safely climb above • Routes through an existing VFR corridor, utilized by aircraft not always in contact with FAA controllers. • Departing LAS aircraft would often exit and then re-enter Class Bravo service area The preliminary designs for the KLAS GIDGT and RATPK SIDs (Runways 26 L/R transitions) were not changed due to decreases in safety and efficiency. This document will be part of the Administrative Record indicating review of the procedure based on public comments submitted prior to release of the Draft Environmental Assessment.	Master TARGETS File	

LAS Metroplex KLAS JOHKR SID Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
6/4/2019	On April 9, 10 and 11, 2019, the LAS Metroplex Project conducted public outreach efforts to present Proposed Final Designs for developed RNAV procedures. The Team solicited comments, in person during the events and for 30 days after via web based comment forms. At the conclusion of the comment period, the Team reviewed all submissions and re-examined the procedures to determine if any changes could be made based on public input. The KLAS JOHKR SID was reviewed as part of this process. The lateral routes for the JOHKR SID was designed to provide increased controller separation options for aircraft departing in the Runways 19 and 26 configuration. Existing procedures route aircraft from two separate runways to the same location (ROPPR waypoint) approximately eight miles southwest of the airport after departure. This convergence of departures from separate runways creates higher workloads for flight crews and controllers, resulting in increased control instructions and radio communications. The new procedure will delay or in some cases eliminate convergence and is intended to reduce complexity in the National Airspace System (NAS). Additionally, the new procedure approximates current actions taken by controllers to maintain separation. The lateral route of the KLAS JOHKR SID remains within historical tracks for Runway 19 departures. The LAS Metroplex Project does not expect the KLAS JOHKR SID to affect KLAS runway usage. Any changes to the Proposed Final Design could have a negative impact on safety, efficiency or task complexity. After review, the LAS Metroplex Team elected to make no changes to the Proposed Final Design. This document will be part of the Administrative Record indicating review of the procedure based on public comments submitted prior to release of the Draft Environmental Assessment.	Master TARGETS File	

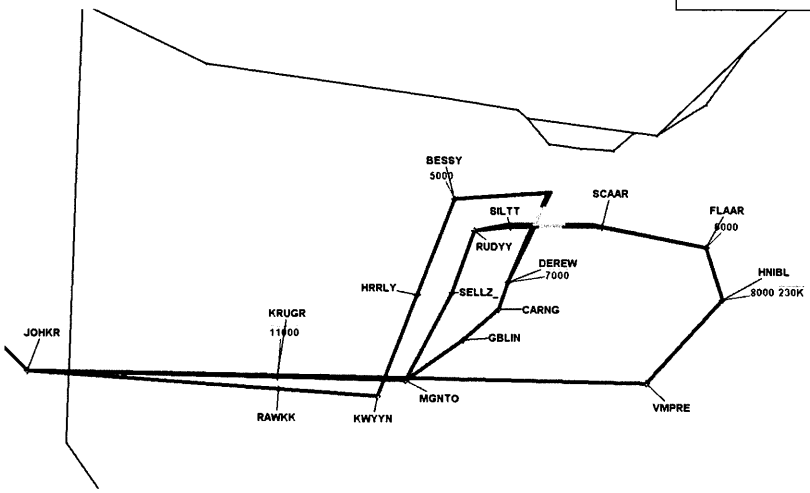


Figure 1: KLAS JOHKR SID Original Proposed Final Design (Terminal View)

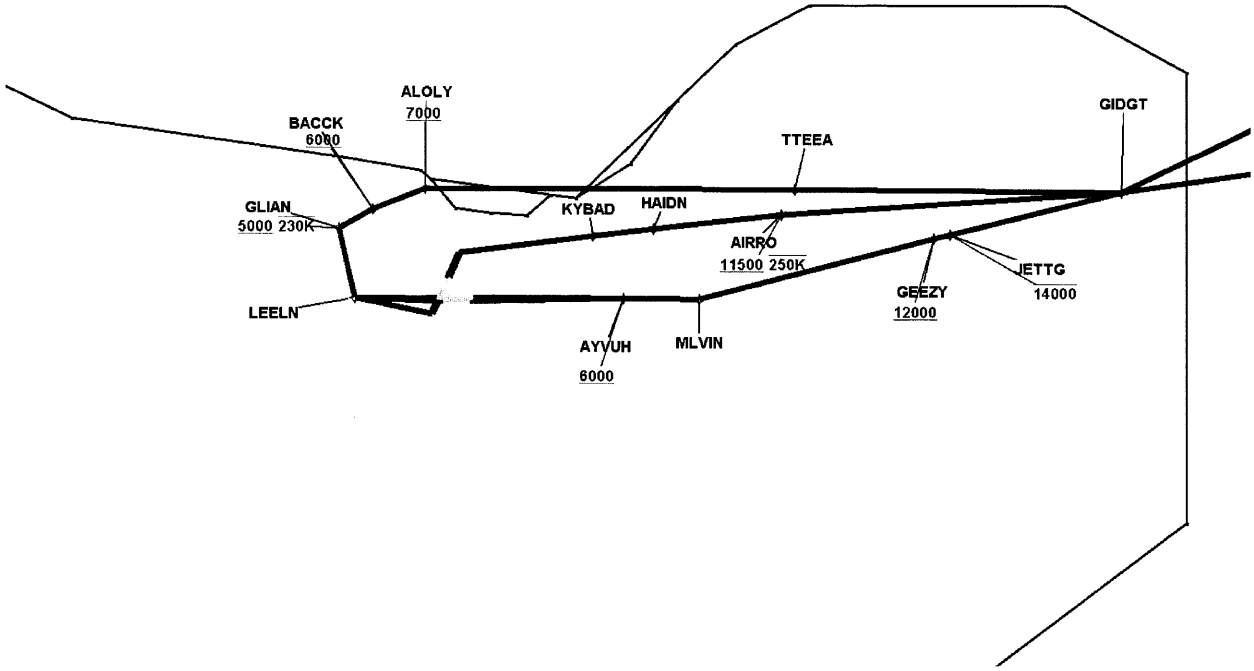


Figure 1: KLAS GIDGT SID Original Proposed Final Design (Terminal View)

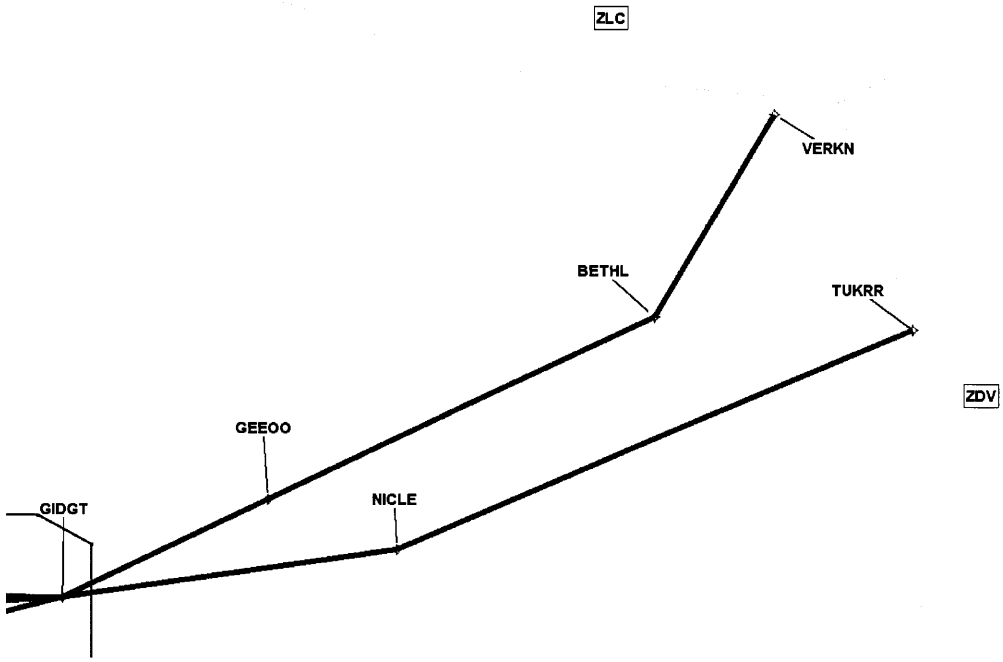


Figure 2: KLAS GIDGT SID Original Proposed Final Design (Enroute View)

All Change Control Sheets and Final Design Packages under the Metroplex Project have been completed.

Bradley R Maybrugh
FAA Metroplex Co-Lead

11/5/19
Date

NATCA Metroplex Co-Lead

11/6/19
Date

Las Vegas OAPM Design Package

KLAS GIDGT SID

An Area Navigation (RNAV) Standard Instrument Departure (SID) is a procedure that serves as a lateral path for aircraft departing from an airport. RNAV SIDs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

Las Vegas McCarran International Airport (KLAS) departures to east/northeast destinations will use a new flight path procedure called the GIDGT (pronounced "GID-jet") RNAV SID. The GIDGT SID will replace the current STAAV (pronounced "Stahv") and TRALR (pronounced "Tray-ler") RNAV SIDs.

The Las Vegas Metroplex Study Team (MST) identified the need for an efficient departure procedure that utilizes modern technologies. The GIDGT SID is developed around advanced navigation concepts, which will provide climbs that are more continuous.

The Las Vegas Design and Implementation (D&I) Team reviewed potential safety issues associated with the existing TRALR (Runways 19/26) and STAAV (Runway 26) SIDs that converge at the TRALR waypoint. These two SIDs depart the airport in separate directions and then join at the same point northeast of the airport. The convergence of these two SIDs at TRALR creates sequencing and separation issues for controllers, resulting in increased complexity and implementation of flow control management for departures. Flow management requires extensive ground movements in order to reroute Runway 19 departures over to Runway 26. The redirection of aircraft from one runway to another requires the crossing of two active runways and movement over several taxiways. The reassignment of takeoff runway enforces a more orderly and controllable flow after departure.

The GIDGT SID includes a right turn immediately after departure from Runway 19, allowing earlier and more efficient sequencing with Runway 26 departures. Safety will increase with the elimination of active runway and taxiway crossings. The intended use of the GIDGT SID departing Runway 19 is for general aviation aircraft parked on the west side of the airport.

The GIDGT SID will increase flight path predictability and will decrease controller/pilot workload and task complexity, which will enhance safety.

The new GIDGT SID addresses KLAS. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the Las Vegas Valley.

Las Vegas OAPM Design Package

KLAS GIDGT SID

Name of Change and Airport(s)	Change Classification
McCarran International Airport (KLAS) GIDGT Area Navigation (RNAV) Standard Instrument Departure (SID)	**Terminal Procedure; SID**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.3.2.2	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 7, 54, 55 **Salt Lake City ARTCC (ZLC) Sectors: 34, 46** **Denver ARTCC (ZDV) Sectors: 23, 24, 68** **Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: MED** **LAS Positions: LC1, LC2, LC3, GCE, GCW, CD** **KLAS**	**KLAS NIITZ and RATPK SIDs** **KLAS CHOWW Standard Terminal Arrival Route (STAR)** **Henderson Executive Airport (KHND) SCAMR SID** **KHND BOEGY STAR** **North Las Vegas Airport (KVGT) WYLND STAR**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results** **Human in the Loop Simulation (HITLS) results**	

Purpose

The purpose of the proposed procedure is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

Study Team Issues and Solutions

Issues

Currently, the TRALR SID is available for all configurations with Runways 26L/R and 19L/R traffic merging close to the airport over ROPPR, increasing ATC task complexity. Stakeholders identified an issue with confusion between filed routes and assigned routes, and requested a new SID that mimics the right turn on the STAAV SID. ZLA identified that the TRALR SID's MLF transition conflicts with the LAS GRNPA STAR. The TRALR SID has inefficient initial departure routes and altitudes. ZLA requested that all conceptual designs merge with Southern California Metroplex designs and have Q-Route connectivity.

Las Vegas OAPM Design Package

KLAS GIDGT SID

MST Recommendation

- The MST reduced lateral track miles by reviewing historical flight track data and designing more direct routes, and created an RNAV SID (KLAS NE2 SID) usable for all configurations that connects to the proposed Southern California Metroplex procedures.
- The KLAS NE2 SID was designed with runway transitions for all configurations and simplifies departure flows with two en route transitions, one ending at the proposed Southern California Metroplex waypoint VERKN (BCE area) and the other at WP7458 (replaces DVC transition). Both transitions join Southern California Metroplex proposed Q-Routes.
- The KLAS NE2 SID segregates Runways 19L/R departure routes from ROPPR and optimizes lateral paths and vertical profiles. To eliminate the confusion between filed routes and assigned routes, the conceptual procedure mimics the initial path of the Runways 25L/R transition of the KLAS NE1 SID. The KLAS NE2 SID en route transitions minimize the conflictions with the conceptual KLAS NE STAR.
- During procedure design, the MST looked at multiple options to replace the current TRALR SID. The options included various altitude constraints, realignment of runway transitions, and simplifying en route transitions. The KLAS NE2 SID has two en route transitions over the BCE and DVC areas. During the Second Outreach, ZLA requested that the two en route transitions be moved to points more in line with proposed Southern California Metroplex designed routes.
- The KLAS NE2 SID was designed to be available for all configurations and is not reliant on ground-based navigation. The KLAS NE2 SID provides transitions for runways and simplifies departure flows with two en route transitions, one over VERKN (BCE) and a transition over WP7458 (DVC). The proposed SID utilizes lower altitudes with reduced climb gradients.

The current TRALR SID and MST-proposed KLAS NE2 SID are depicted in Figures 1 and 2.

Las Vegas OAPM Design Package
KLAS GIDGT SID

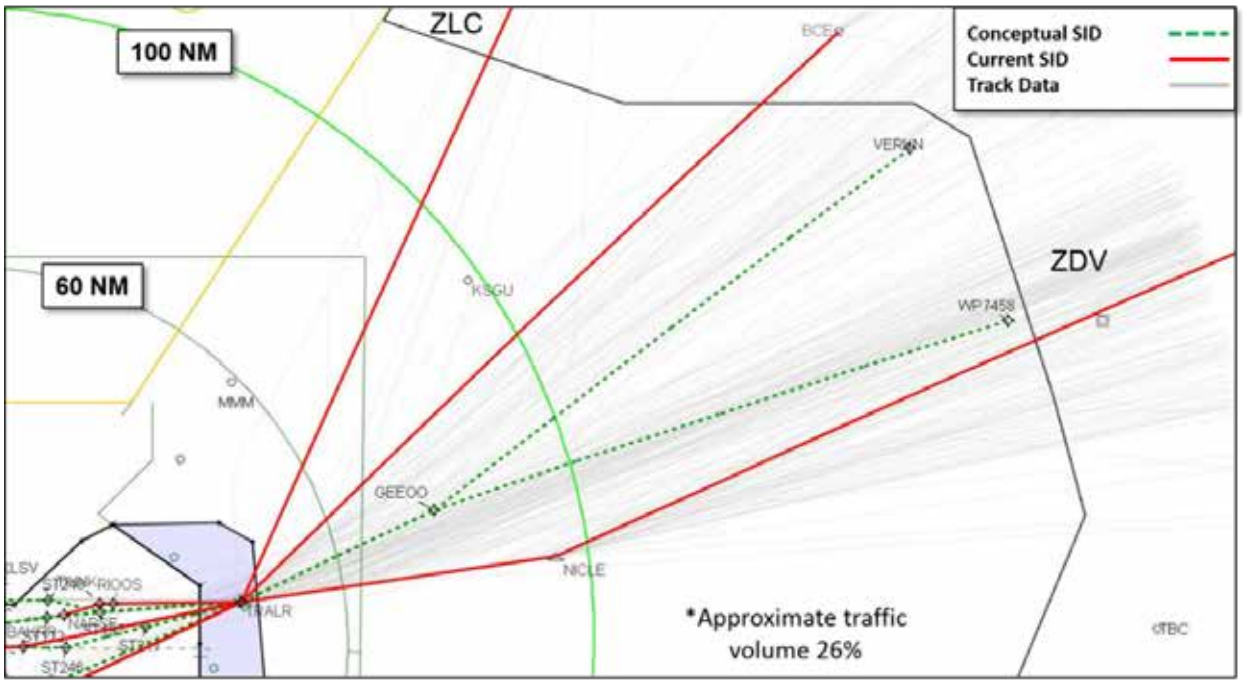


Figure 1: TRALR SID and KLAS NE2 SID – En Route View

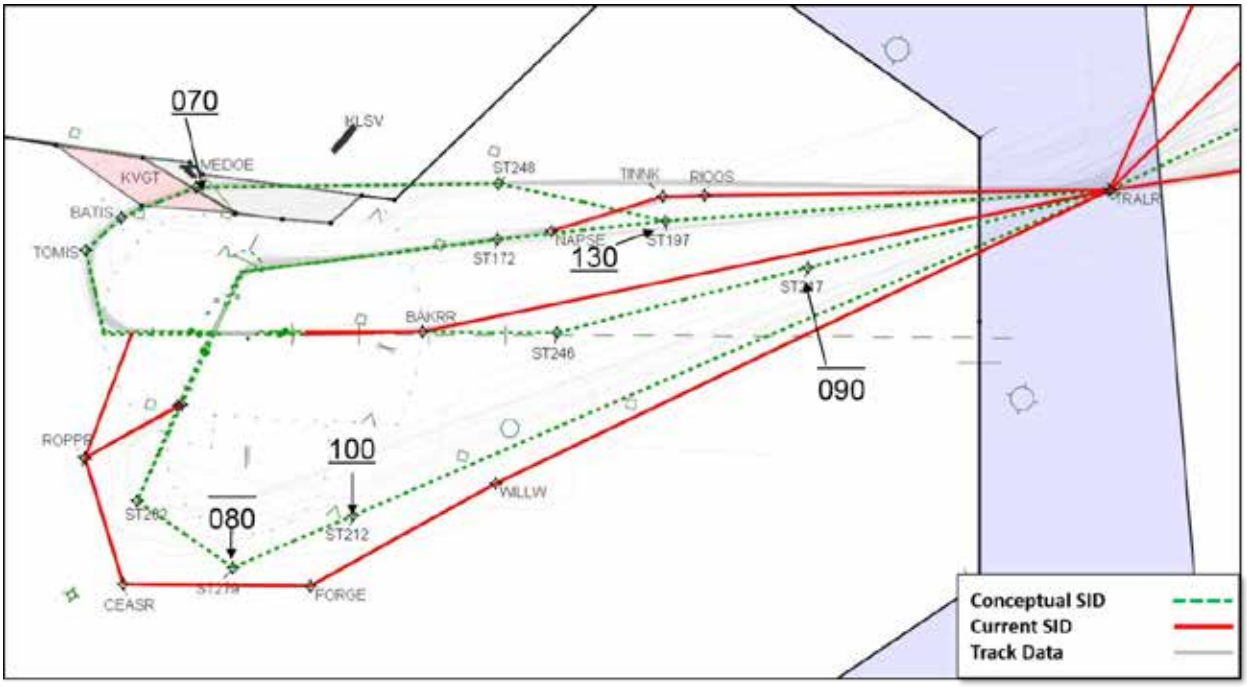


Figure 2: TRALR SID and KLAS NE2 SID - Terminal View

Las Vegas OAPM Design Package

KLAS GIDGT SID

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal, considering both the issues and recommendations.

The D&I Team reviewed potential safety issues associated with the existing TRALR (Runways 19/26) and STAAV (Runway 26) SIDs that converge at the TRALR waypoint. These two SIDs depart the airport in separate directions, and then join at the same point northeast of the airport. The convergence of these two SIDs at TRALR creates sequencing and separation issues for controllers, resulting in increased complexity and implementation of flow control management for departures. Flow management requires extensive ground movements in order to reroute Runway 19 departures over to Runway 26. The redirection of aircraft from one runway to another requires the crossing of two active runways and movement over several taxiways. The reassignment of takeoff runway enforces a more orderly and controllable flow after departure.

The GIDGT SID includes a right turn immediately after departure from Runway 19, allowing earlier and more efficient sequencing with Runway 26 departures. Safety will increase with the elimination of active runway and taxiway crossings. The intended use of the GIDGT SID departing Runway 19 is for general aviation aircraft parked on the west side of the airport.

The D&I Team amended the MST proposal, providing departure guidance from all runways at KLAS.

The KLAS GIDGT SID's Proposed Final Design (PFD) is depicted in Figures 3 and 4.

Runway Transitions

Runways 01L/R Transitions (VICF legs)

- KYBAD (common waypoint for eastbound departures)
- HAIDN (placement provides segregation from KLAS Runway 26 final)
- AIRRO (at or above 115/less than 250 knots/ facilitates the climb gradient and provides segregation from the KLAS CHOWW STAR)
- GIDGT (coordination waypoint)

Runways 08L/R Transitions (VADF legs)

- AYVUH (at or above 060/provides terrain avoidance)
- MLVIN (placement provides segregation from the KLAS Runway 19 arrival route)
- GEEZY (at or above 120/provides segregation from the KLAS RKSTR STAR)
- JETTG (at or below 140/provides segregation from the KLAS CHOWW STAR)
- GIDGT (coordination waypoint)

Las Vegas OAPM Design Package

KLAS GIDGT SID

Runways 19L/R Transitions (VICF legs)

- LEELN (existing waypoint on the current Runway 26 procedure/added to Runway 19 L/R transitions)
- GLIAN (at or above 050/less than 230 knots/ ensures climb gradient for Nellis Air Traffic Control Facility [NATCF] airspace and KVGT)
- BACCK (at or above 060/ensures climb gradient for NATCF airspace and KVGT)
- ALOLY (at or above 070/provides NATCF airspace integrity)
- TTEEA (placement provides possible restriction waypoint for segregation from the KLAS CHOWW STAR)
- GIDGT (coordination waypoint)

Runways 26L/R Transitions (VICF legs)

- LEELN (existing waypoint)
- GLIAN (at or above 050/less than 230 knots/ensures climb gradient for NATCF airspace and KVGT)
- BACCK (at or above 060/ensures climb gradient for NATCF airspace and KVGT)
- ALOLY (at or above 070/provides NATCF airspace integrity)
- TTEEA (placement provides possible restriction waypoint for segregation from the KLAS CHOWW STAR)
- GIDGT (coordination waypoint)

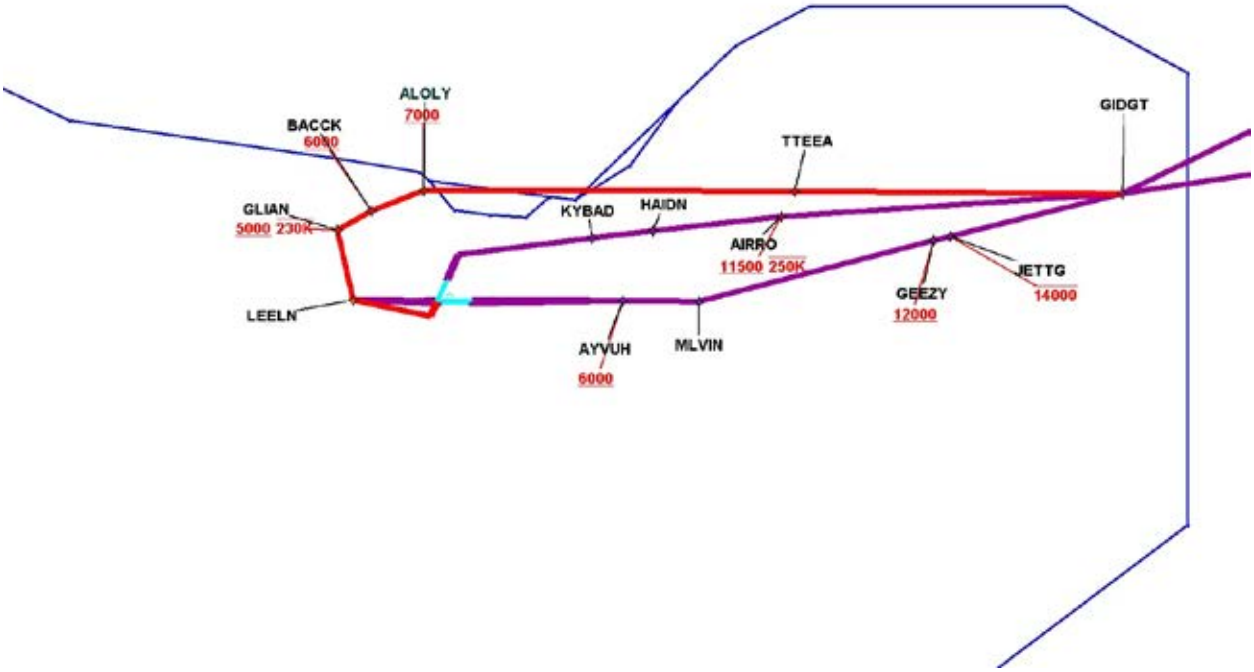


Figure 3: KLAS GIDGT SID's PFD - Terminal View

Las Vegas OAPM Design Package
KLAS GIDGT SID

En Route Transitions

The D&I Team considered the MST recommendation of one SID with three en route transitions however chose to design two separate SIDs (KLAS GIDGT and RATPK) to facilitate segregation from the KLAS CHOWW STAR.

TUKRR Transition (to ZLC)

- GIDGT (coordination waypoint)
- NICLE (existing waypoint/provides segregation from the KLAS GIDGT SID's VERKN Transition)
- TUKRR (located in ZDV airspace/used as a coordination and termination waypoint)

VERKN Transition (to ZLC)

- GIDGT (coordination waypoint)
- GEEOO (provides segregation from the KLAS CHOWW STAR)
- BETHL (provides segregation from the KLAS CHOWW STAR)
- VERKN (placement provides a coordination waypoint clear of CHOWW to return on course/provides connectivity with Q Route structure)

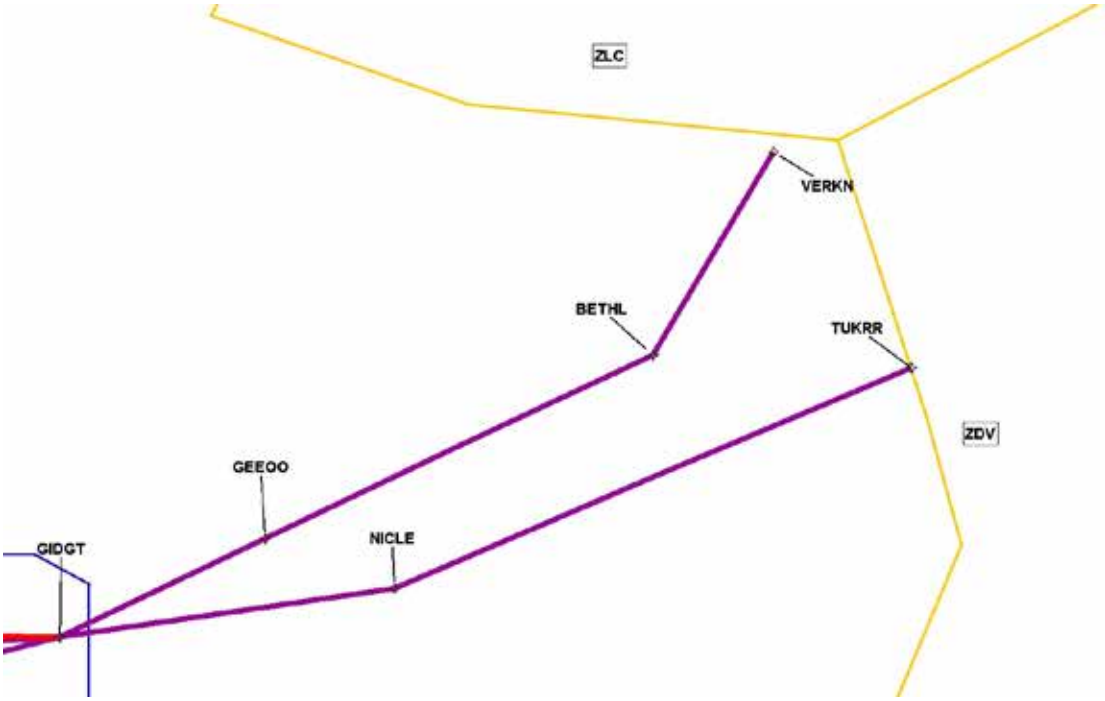


Figure 4: KLAS GIDGT SID's PFD - En Route View

Las Vegas OAPM Design Package
KLAS GIDGT SID

Additional Design Considerations

- The KLAS GIDGT SID concept was validated by the D&I Team via Human in the Loop Simulation (HITLS)
- Spectrum analysis will be required for the proposed airspace changes associated with the proposed SID
- This procedure will be used by RNAV-equipped turbojet aircraft only
    - The following chart notes will be included with this procedure:
        - For turbojet aircraft only

The GIDGT SID affects the following facility area(s) as indicated:

- ZLA Sectors: 7, 54, 55
- ZLC Sectors: 34, 46
- ZDV Sectors: 23, 24, 68
- L30 Sectors: MED
- LAS Positions: LC1, LC2, LC3, GCE, GCW, CD
- KLAS

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND and KVGT.

Document changes/modifications include:

- Departure SID filings with airline dispatchers
- ZLA Facility Operations and Administration Order 7210.3
- ZLC Facility Operations and Administration Order 7210.3
- ZDV Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- VGT Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZLC LOA
- ZLA/ZDV LOA
- L30/LAS LOA
- ZLA Standard Operating Procedures (SOP)
- ZLC SOP
- ZDV SOP
- L30 SOP
- LAS SOP
- VGT SOP

- ERAM and STARs automation changes (ADAR, ADRS, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- NAS Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Terminal Procedures:
    - TARGETS distribution package
    - Flight Simulator worksheet
    - RNAV Pro analysis results (may be completed during Evaluation Phase)
    - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R Mayhugh 4/23/19 — 4/23/19

Bradley R. Mayhugh — Date — Chris Thomas — Date
LAS FAA Lead — LAS NATCA Lead

4/23/19 — 5/2/19

Sarah Fletcher — Date — Martin Ramirez — Date
ZLA Facility POC — ZLA NATCA POC

Anita Engelmann 4/25/19 — 23 APR 19

Anita Engelmann — Date — Dan Hauptman — Date
TWAB Representative — L30 NATCA POC

Available via electronic signature

_____ Date

Nellis Air Traffic Control Facility

LAS Metroplex KLAS JOHKR SID Community Engagement Review Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
6/4/2019	On April 9, 10 and 11, 2019, the LAS Metroplex Project conducted public outreach efforts to present Proposed Final Designs for developed RNAV procedures. The Team solicited comments, in person during the events and for 30 days after via web based comment forms. At the conclusion of the comment period, the Team reviewed all submissions and re-examined the procedures to determine if any changes could be made based on public input. The KLAS JOHKR SID was reviewed as part of this process. **Southern Highlands, NV** is located approximately 6 miles southwest of KLAS. The area lies under an extended centerline with Runways 01 L/R (arrivals) and 19 L/R (departures). Comments focused on existing aircraft noise for both arrivals and departures, with few remarks concerning specific new procedures. The existing BOACH, COWBY, PRFUM and SHEAD SIDs, which serve KLAS Runway 19 departures, will be replaced by the Metroplex proposed KLAS JOHKR, NIITZ, RADYR and RASLR SIDs. The D&I Team reviewed these procedures to determine whether changes could be made. **KLAS JOHKR, NIITZ, RADYR, RASLR SIDS (Runway 19 L/R transitions)** The lateral routes for these new procedures were designed to increase controller separation options for aircraft departing in the Runways 19 and 26 configuration. Existing procedures route aircraft from two separate runways to the same location (ROPPR waypoint), approximately eight miles southwest of the airport after departure. This convergence of departures from separate runways creates higher workloads for flight crews and controllers, resulting in increased control instructions and radio communications. Currently, the common solutions to this situation are for the tower controller to delay aircraft on the ground or for the departure controller to route Runway 19 departures straight out instead of allowing them to fly the procedure to ROPPR. By designing the procedures to reflect those actions currently taken by controllers, the new procedures will delay or in some cases eliminate convergence, reducing complexity and increasing safety in the National Airspace System (NAS). The Team also examined moving the procedure laterally to the east, along the I-15 corridor, but this would place departing aircraft too close to KHND operations. The lateral route of the KLAS JOHKR, NIITZ, RASLR and RADYR SIDS remain within historical tracks for Runway 19 departures.	Master TARGETS File	

	The preliminary designs for the KLAS JOHKR, NIITZ, RADYR, and RASLR SIDs were not changed due to decreases in safety and efficiency. The eastern edge of **Rhodes Ranch, NV** is approximately 6 miles west of KLAS on an extended centerline of Runway 26. Comments from the Rhodes Ranch community focused on existing aircraft noise for departures, with no remarks concerning new procedures. The existing KLAS SHEAD, COWBY, BOACH and PRFUM SIDs serving KLAS Runway 26 departures will be replaced, respectively, by the Metroplex proposed KLAS JOHKR, NIITZ, RADYR and RASLR SIDs. The D&I Team reviewed these procedures to determine whether changes could be made. **KLAS JOHKR, NIITZ, RADYR and RASLR SIDs (Runway 26 L/R transitions)** Aircraft are expected to remain within historical tracks for KLAS Runway 26 departures to the southwest. The Team examined changing the lateral path by moving the RUDDY waypoint four miles west. Several issues were identified with this change: • Routes too close to rapidly rising terrain for aircraft to safely climb above • Routes through an existing VFR corridor, utilized by aircraft not always in contact with FAA controllers. • Departing LAS aircraft would often exit and then re-enter Class Bravo service area The Team also examined lesser distances west of the RUDDY waypoint, but determined that the action would concentrate more traffic directly over Rhodes Ranch than the preliminary design. The preliminary designs for the KLAS JOHKR, NIITZ, RADYR and RASLR SIDs were not changed due to decreases in safety.		

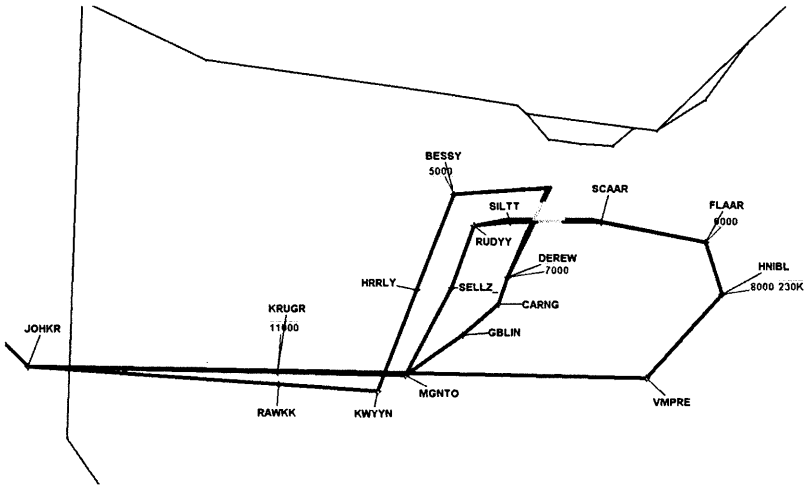


Figure 1: KLAS JOHKR SID Original Proposed Final Design (Terminal View)

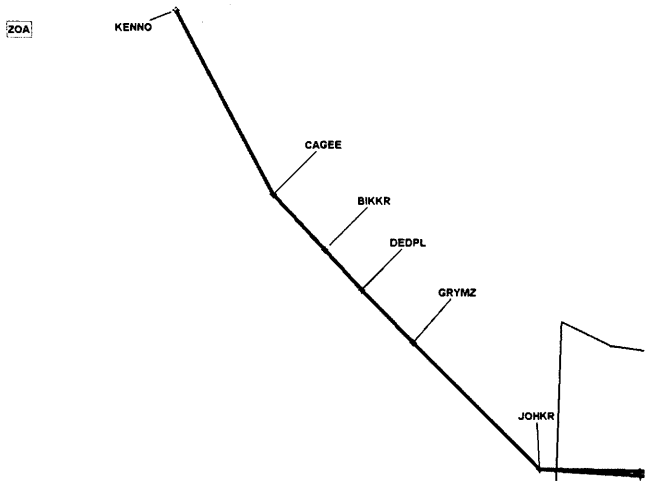


Figure 2: KLAS JOHKR SID Original Proposed Final Design (Enroute View)

All Change Control Sheets and Final Design Packages under the Metroplex Project have been completed.

Bradley R Mayhugh
FAA Metroplex Co-Lead

NATCA Metroplex Co-Lead

11/5/19
Date

11/6/19
Date

Las Vegas OAPM Design Package

KLAS JOHKR SID

An Area Navigation (RNAV) Standard Instrument Departure (SID) is a procedure that serves as a lateral path for aircraft departing from an airport. RNAV SIDs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

Las Vegas McCarran International Airport (KLAS) departures to northwestern destinations will use a new flight path called the JOHKR (pronounced "JOKE-her") RNAV SID. The JOKHR SID will replace the current SHEAD (pronounced "SH-head") RNAV SID.

The Las Vegas Metroplex Study Team (MST) identified the need for an efficient departure procedure that utilizes modern technologies. The JOHKR SID is developed around advanced navigation concepts, which will provide climbs that are more continuous.

The JOHKR SID was designed to take advantage of reduced separation requirements between successive Runway 08 or Runway 26 departures. The use of ten-degree divergent headings between successive departures will improve efficiency and reduce complexity.

This procedure is not anticipated to change runway usage. The JOHKR SID will increase flight path predictability and will decrease controller/pilot workload and task complexity, which will enhance safety.

The JOHKR SID addresses KLAS. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the Las Vegas Valley.

Las Vegas OAPM Design Package

KLAS JOHKR SID

Name of Change and Airport(s)	Change Classification
McCarran International Airport (KLAS) JOHKR Area Navigation (RNAV) Standard Instrument Departure (SID)	**Terminal Procedure; SID**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.3.2.6	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 16 Oakland ARTCC (ZOA) Sectors: 33, 46 Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: DAG, MED LAS Positions: LC1, LC2, LC3, GCE, GCW, CD KLAS	**Henderson Executive Airport (KHND) GAMES Standard Terminal Arrival Route (STAR) KLAS RADYR SID KLAS RNDRZ and COKTL STARs KHND OYODA SID KHND NTNDO STAR**
Associated Data Files	
TARGETS output packages Flight Simulator worksheet RNAV Pro analysis results Human in the Loop Simulation (HITLS) results	

Purpose

The purpose of the proposed procedure is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

MST Issues and Recommendations

Issues

Currently, the SHEAD SID is available for all configurations with Runways 26L/R and 19L/R traffic merging close to the airport over ROPPR increasing ATC task complexity. Stakeholders agree that there are inefficiencies in the design of the SHEAD SID. There are numerous interactions between arrival and departure flows to the northwest within terminal airspace creating level segments. Traffic on the SHEAD SID typically experiences approximately five NM of level flight at 7,000 and 9,000 feet and five to ten NM at 11,000 feet. In the en route environment, the current Q-Route structure in ZLA Sector 16 does not provide necessary connectivity. ZLA Sector 16 is a very narrow volume of airspace confined on the east and west by several Special Use Airspace areas (SUAs).

The SHEAD SID requires a sharp turn at the SHEAD waypoint. The route is minimally segregated from the SHOSHONE SUA at this turn and some aircraft have difficulty with course guidance and possible incursion into the SUA. These deviations require ATC to coordinate with the Department of Defense (DoD) thus increasing controller task complexity and workload.

MST Recommendations

Based on feedback from the facilities the MST reversed flows in the northwest corridor. The MST created an RNAV SID (KLAS NW SID) usable for all configurations. The KLAS NW SID provides connectivity to the current Q-Route structure (Q162/Q13 at TUMBE) and incorporates altitude and speed restrictions to reduce pilot/controller task complexity.

Reversing the arrival and departure flows in the northwest corridor provides aircraft on the KLAS NW SID an unrestricted climb by removing all interaction with the northwest arrival traffic. By moving the departure route to the north and east, the sharp turn at SHEAD has been removed.

The MST recommendation is depicted in Figures 1 and 2.

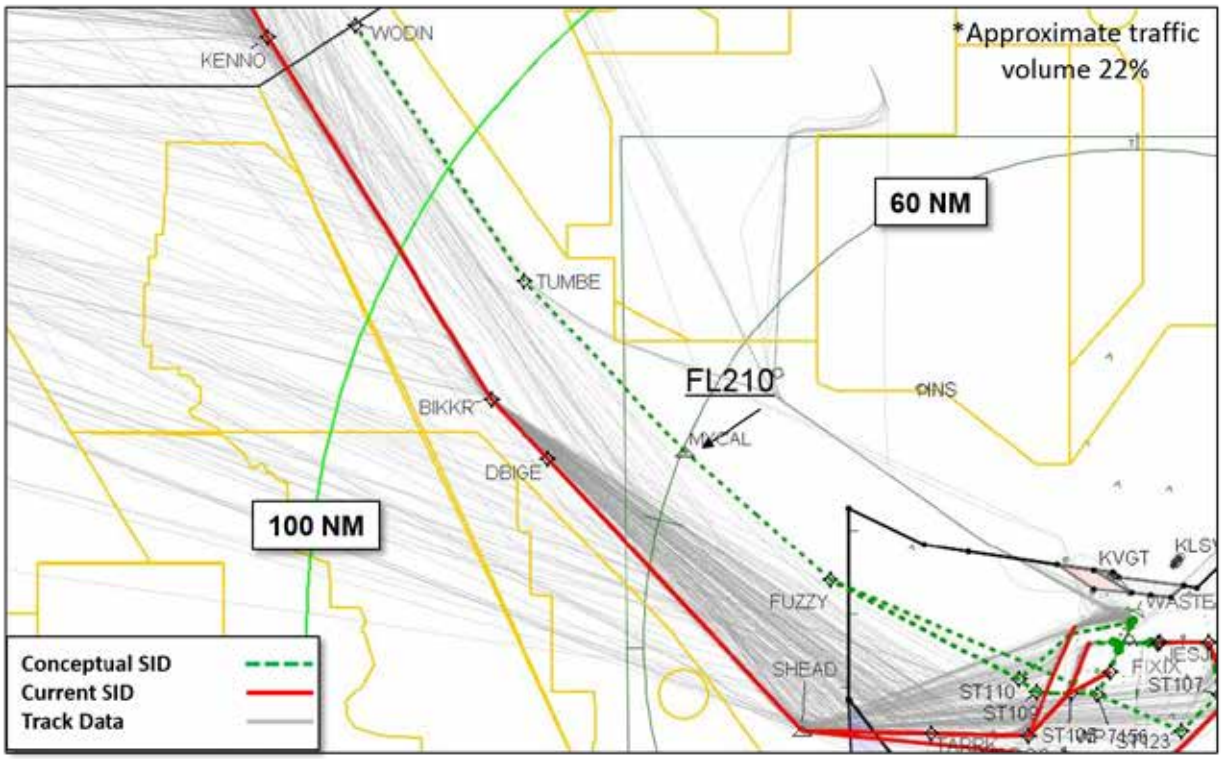


Figure 1: SHEAD SID and KLAS NW SID - En Route View

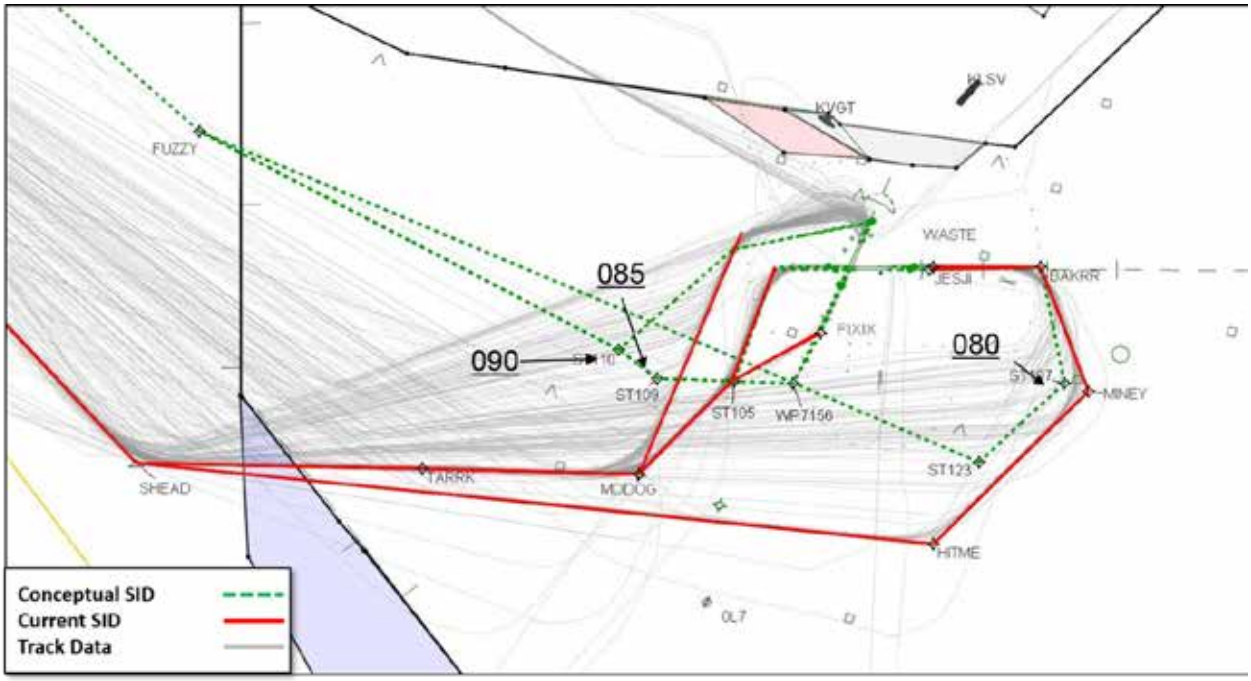


Figure 2: SHEAD SID and KLAS NW SID - Terminal View

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal, considering both the issues and recommendations. The MST recommended a reversal of the arrival and departure traffic flows to the northwest.

The D&I Team utilized human in the loop simulations using I-SIM to test the conceptual designs of the MST. After analysis of the simulations and discussion with Industry partners, the D&I Team decided to omit the MST proposal and redesign the SHEAD SID without reversing the arrival and departure flows. Rationale for this decision is provided in the next section.

The JOHKR SID was designed to take advantage of reduced separation requirements between successive Runway 08 or Runway 26 departures. The use of ten-degree divergent headings between successive departures will improve efficiency and reduce complexity.

The KLAS JOHKR SID's PFD is depicted in Figures 3 and 4.

Runway Transitions

Runways 01L/R Transitions (VADF legs)

- BESSY (at or above 050/for criteria)
- HRRLY (placement provides segregation from off load arrivals to Runway 26L/R)

- KWYYN (provides segregation from the KLAS COKTL STAR)
- RAWKK (at or above 130/provides segregation from the KLAS COKTL STAR)
- JOHKR (placement provides a coordination waypoint with ZLA and segregation from the KHND GAMES STAR)

Runway 08L Transition (VICF leg utilized for 10-degree divergence with successive departures)

- FLAAR (at or above 060/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR)
- HNIBL (at or above 080/less than 230 knots/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/speed restriction is for design criteria)
- VMPRE (provides segregation from the KLAS CHOWW and RKSTR STARs)
- JOHKR (placement provides a coordination waypoint with ZLA and segregation from the KHND GAMES STAR)

Runway 08R Transition (VADF leg)

- SCAAR (placed to mirror VICF leg utilized on the Runway 08L transition)
- FLAAR (at or above 060/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR)
- HNIBL (at or above 080/less than 230 knots/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/speed restriction is for design criteria)
- VMPRE (provides segregation from the KLAS CHOWW and RKSTR STARs)
- JOHKR (placement provides a coordination waypoint with ZLA and segregation from the KHND GAMES STAR)

Runways 19L/R Transitions (VADF legs)

- DEREW (at or below 070/provides segregation from the KLAS COKTL and RNDRZ STARs)
- CARNG (provides consistency with KLAS RASLR and NIITZ SIDs)
- GBLIN (required for design criteria)
- MGNTO (provides segregation from KLAS RNDRZ STAR)
- KRUGR (at or below 110/provides segregation from the KLAS RNDRZ STAR)
- JOHKR (placement provides a coordination waypoint with ZLA and segregation from the KHND GAMES STAR)

Runway 26L Transition (VADF leg)

- SILTT (placed to mirror VICF leg utilized on the Runway 26R transition)
- RUDDY (at or above 040/required for design criteria and provides terrain avoidance)
- SELLZ (at or below 080/provides segregation from the KLAS COKTL and RNDRZ STARs)
- MGNTO (provides segregation from the KLAS RNDRZ STAR)
- KRUGR (at or below 110/provides segregation from the KLAS RNDRZ STAR)
- JOHKR (placement provides a coordination waypoint with ZLA and segregation from the KHND GAMES STAR)

KLAS JOHKR (SHEAD) SID

Las Vegas OAPM Design Package

KLAS JOHKR SID

Runway 26R Transition (VICF leg)

- RUDDY (at or above 040/required for design criteria and provides terrain avoidance)
- SELLZ (at or below 080/provides segregation from the KLAS COKTL and RNDRZ STARs)
- MGNTO (provides segregation from the KLAS RNDRZ STAR)
- KRUGR (at or below 110/provides segregation from the KLAS RNDRZ STAR)
- JOHKR (placement provides a coordination waypoint with ZLA and segregation from the KHND GAMES STAR)

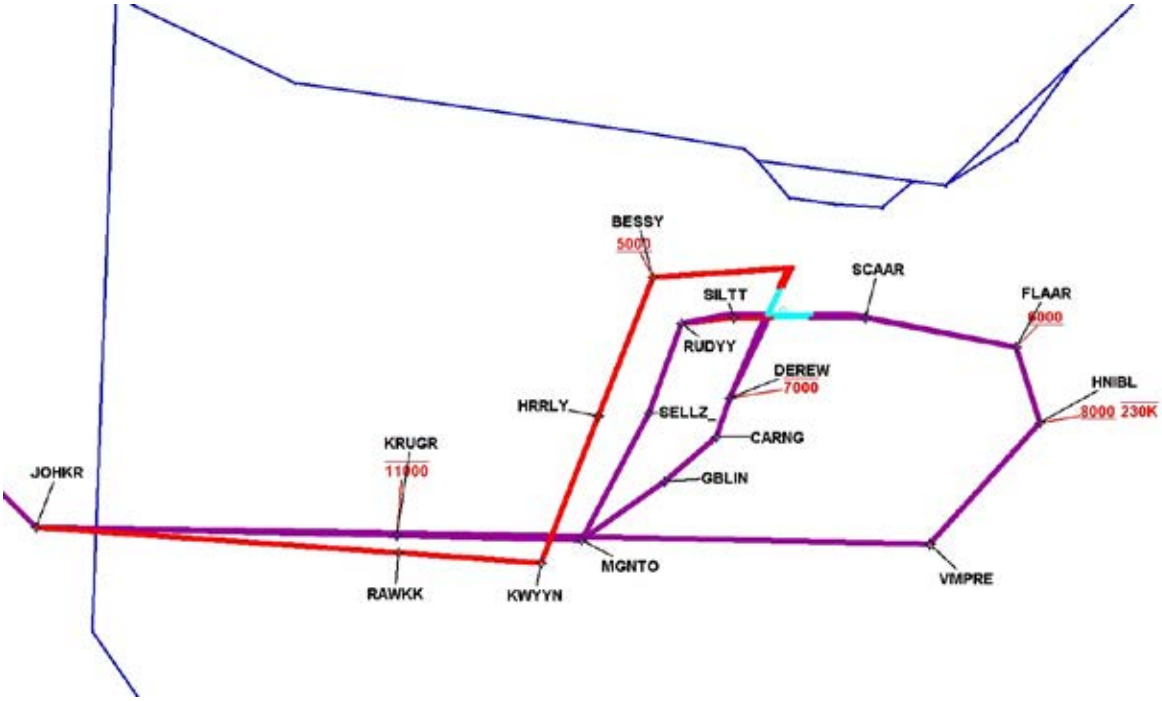


Figure 3: KLAS JOHKR SID's PFD - Terminal View

En Route Transitions

KEENO Transition

- JOHKR (placement provides a coordination waypoint with ZLA and segregation from the KHND GAMES STAR)
- GRYMZ (provides segregation from SUA, Q13/15 and the KHND GAMES STAR)
- DEDPL (placement provides ability to issue altitude restriction(s), if necessary to segregate from the Nellis Air Traffic Control Facility's [NATCF] LEE Sector (A7 shelf) and/or to segregate from SUA, Q13/15, and the KHND GAMES STAR)
- BIKKR (provides Q Route connectivity and can be used when Joshua Control Facility [JCF] airspace is not active)
- CAGEE (provides segregation from SUA, Q13/15 and the KHND GAMES STAR)

- KENNO (SID termination waypoint/placement provides segregation from SUA, Q13/15 and the KHND GAMES STAR)

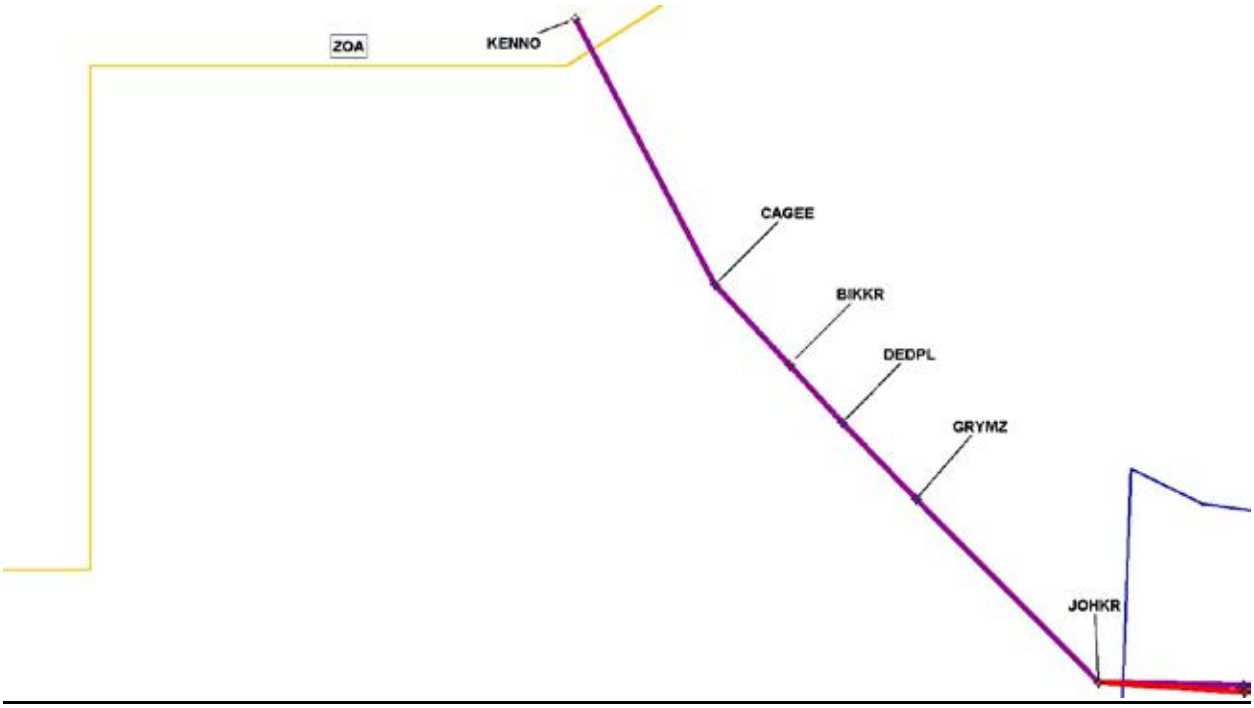


Figure 4: KLAS JOHKR SID's PFD - En Route View

MST Recommendation and D&I Team Design Differences

The MST recommended a reversal of the arrival and departure traffic flows to the northwest. The D&I Team utilized human in the loop simulations using I-SIM to test the conceptual designs of the MST. After analysis of the simulations and discussion with Industry partners, the D&I Team decided to omit the MST proposal and redesign the SHEAD SID without reversing the arrival and departure flows. The following are the reasons the team decided against the reversal of traffic flows:

- Terrain to the west of the airport rises faster than aircraft are able to climb
  - Aircraft would have difficulty meeting an excessive climb gradient to 10,000 feet, especially on Configuration 3. If an aircraft was unable to meet the altitude restrictions and was below the Minimum Vectoring Altitude (MVA), L30 would have no options to mitigate the situation
  - Eliminates L30's ability to turn departures for sequencing due to departures remaining below the MVA longer
  - L30 would have reduced ability to allow aircraft to deviate if weather were to impact the area
- Department of Energy (DoE) flights (JANET Flights) are in conflict with proposed northwest departures

- KHND departure routes are excessively long, especially in configurations 2 and 4, and in conflict with traffic in L30 Sectors FNL, LAK and GNT
- ZLA Sector 16 would have no room to maneuver aircraft for sequencing. Departures in proposal would be lower and could not be vectored to the west to climb (conflicted with descending arrival traffic) nor could they be vectored to the east (SUA)
- Fewer track miles on departures would not allow aircraft to climb above NATCF A7 shelf
- Inability to provide direct routings due to interactions with arrival traffic

Additional Design Considerations

- The KLAS JOHKR SID concept was validated by the D&I Team via HITLS
- Spectrum analysis will be required for the proposed airspace changes associated with the proposed SID

The JOHKR SID affects the following facility area(s) as indicated:

- ZLA Sectors: 16
- ZOA Sectors: 33, 46
- L30 Sectors: DAG, MED
- LAS Positions: LC1, LC2, LC3, GCE, GCW, CD
- KLAS

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND and KVGT.

Document changes/modifications include:

- Departure SID filings with airline dispatchers
- ZLA Facility Operations and Administration Order 7210.3
- ZOA Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- ZLA/ L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZOA LOA
- L30/LAS LOA
- ZLA Standard Operating Procedures (SOP)
- ZOA SOP
- L30 SOP
- LAS SOP
- ERAM and STARS automation changes (ADAR, ADRS, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)

Las Vegas OAPM Design Package

KLAS JOHKR SID

- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- NAS Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Terminal Procedures:
    - TARGETS distribution package
    - Flight Simulator worksheet
    - RNAV Pro analysis results
    - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R Mayhugh 4/23/19 — 4/23/19

Bradley R. Mayhugh — Date — Chris Thomas — Date
LAS FAA Lead — LAS NATCA Lead

4/23/19 — 5/2/19

Sarah Fletcher — Date — Martin Ramirez — Date
ZLA Facility POC — ZLA NATCA POC

Anita Engelmann 4/25/19 — 23 APR 19

Anita Engelmann — Date — Dan Hauptman — Date
TWAB Representative — L30 NATCA POC

Available via electronic signature

_____ Date

Nellis Air Traffic Control Facility

Las Vegas OAPM Design Package

KLAS LOHLA SID

An Area Navigation (RNAV) Standard Instrument Departure (SID) is a procedure that serves as a lateral path for aircraft departing from an airport. RNAV SIDs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

The Las Vegas Metroplex Study Team (MST) identified the need for an efficient departure procedure to serve the Tonopah Nevada Airport (KTNX) which account for up to four percent of the daily flights to/from McCarran International Airport (KLAS) utilizing modern technologies.

Aircraft departing to the northwest from KLAS to KTNX are currently directed via a historically developed routing that interferes with other traffic flows. These aircraft will use a new flight path called the LOHLA (pronounced “Low-lah”) RNAV SID. The LOHLA SID is developed around advanced navigation concepts, which will provide climbs that are more continuous.

This procedure is not anticipated to change runway usage. The LOHLA SID will increase flight path predictability and will decrease controller/pilot workload and task complexity, which will enhance safety.

The new LOHLA SID addresses KLAS. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the Las Vegas Valley.

Las Vegas OAPM Design Package

KLAS LOHLA SID

Name of Change and Airport(s)	Change Classification
McCarran International Airport (KLAS) LOHLA Area Navigation (RNAV) Standard Instrument Departure (SID)	**Terminal Procedure; SID**
OAPM Study Team Reference(s)	**Current Phase of Design**
N/A	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: DAG, MED LAS Positions: CD, LC1, LC2, LC3, GCE, GCW KLAS KTNX Nellis Air Traffic Control Facility (NATCF)	**KLAS RASLR, NIITZ, JOHKR, RATPK, RADYR and GIDGT SIDs**
Associated Data Files	
TARGETS output packages Flight Simulator worksheet RNAV Pro analysis results Human in the Loop Simulation (HITLS) results	

Purpose

The Las Vegas Metroplex Study Team (MST) did not address KLAS departures destined for Tonopah, NV (KTNX). The Las Vegas Design and Implementation Team (D&I Team) identified a need for efficient departure and arrival procedures to serve this airport which account for up to 4% of the daily flights to/from KLAS.

To protect from other traffic patterns and to address inefficiencies, the new procedure includes altitude restrictions reducing interactions with other traffic flows and allowing for less interrupted and more continuous climbs.

Study Team Recommendation

There was no specific recommendation from the MST for the development of a SID for aircraft departing KLAS to KTNX.

Proposed Final Design

Las Vegas OAPM Design Package

KLAS LOHLA SID

The LOHLA SID was designed to allow connectivity from all KLAS runways. Lateral and vertical paths were designed to provide repeatable and predictable routing, reducing interactions with other traffic flows wherever possible.

The D&I Team worked closely with the NATCF to design a KLAS departure procedure that would not interfere with Nellis Air Force Base (KLSV) departures to the west and still meet the objectives of the project.

The KLAS LOHLA SID's Proposed Final Design (PFD) is depicted in Figure 1.

Runways 01L/R Transitions (VICF legs)

- PENSK (mitigates conflictions with KLSV westbound departures/allows NATCF Controllers more time to resolve conflicts/provides segregation from North Las Vegas Airport (KVGT) departures)
- BEGLY (coordination waypoint with NATCF)
- LOHLA (at or above 133/provides terrain clearance/begins common route)

Runway 08L Transition (VICF leg utilized for 10-degree divergence with successive departures)

- FLAAR (at or above 060/provides segregation from the Henderson Executive Airport (KHND) OYODA and SCAMR SIDs and the KLAS CHOWW STAR)
- HNIBL (at or above 080/less than 230 knots/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/speed restriction is for design criteria)
- KNGPN (provides segregation from the KLAS CHOWW STAR)
- LOHLA (at or above 133/provides terrain clearance/begins common route)

Runway 08R Transition (VADF leg)

- SCAAR (placed to mirror VICF leg utilized on the Runway 08L transition)
- FLAAR (at or above 060/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR)
- HNIBL (at or above 080/less than 230 knots/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/speed restriction is for design criteria)
- KNGPN (provides segregation from the KLAS CHOWW STAR)
- LOHLA (at or above 133/provides terrain clearance/begins common route)

Runways 19L/R Transitions (VICF departure legs)

- LEELN (existing waypoint/ allows aircraft to depart northwest under Instrument Flight Rules [IFR] as opposed to Visual Flight Rules [VFR] over the mountainous terrain)
- GLIAN (provides continuity with other Metroplex KLAS SIDs)
- BEGLY (coordination waypoint with NATCF)
- LOHLA (at or above 133/provides terrain clearance/begins common route)

Runways 26L/R Transitions (VADF departure leg)

- LEELN (existing waypoint/allows aircraft to depart northwest under IFR as opposed to VFR over the mountainous terrain)
- GLIAN (provides continuity with other Metroplex KLAS SIDs)
- BEGLY (coordination waypoint with NATCF)
- LOHLA (at or above 133/provides terrain clearance/begins common route)

En Route Transitions

JAYSN_ Transition

- LOHLA (at or above 133/provides terrain clearance/begins common route)
- JAYSN_ (SID termination point)

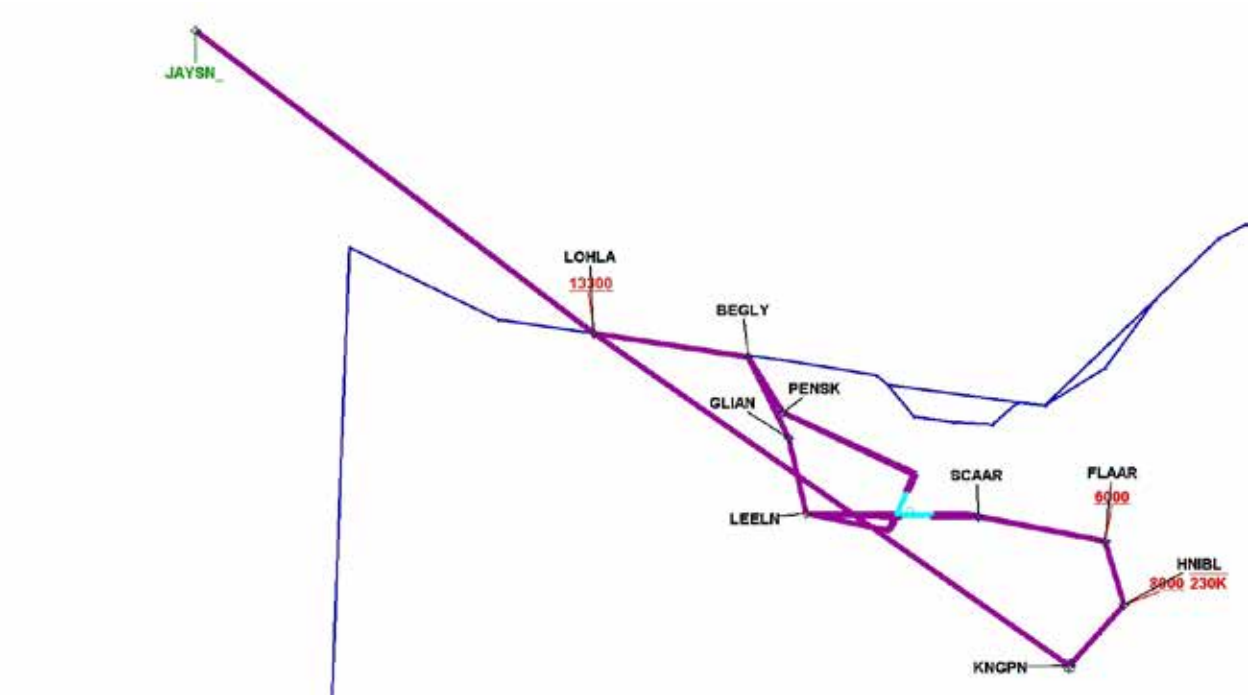


Figure 1: Proposed KLAS LOHLA SID

Additional Design Considerations

A VADF departure leg was examined by the D&I Team for the Runways 01L and 01R transitions, but due to conflictions with KLSV westbound departures, the route was adjusted further to the west to allow NATCF controllers more time to resolve any conflicts that may exist.

- The KLAS LOHLA SID concept was validated by the D&I Team via HITLS
- Spectrum analysis will be required for the proposed airspace changes associated with the proposed SID
- This procedure will be used by RNAV-equipped turbojet aircraft only and is not anticipated to change runway usage

- The following chart notes will be included with this procedure:
  - For turbojet aircraft only
  - ATC assigned only

The LOHLA SID affects the following facility area(s) as indicated:

-
- L30 TRACON Sectors: DAG, MED
- LAS Positions: CD, LC1, LC2, LC3, GCE, GCW
- KLAS
- KTNX
- NATCF

Implementation Dependencies

This procedure will be implemented in conjunction with other SIDs and STARs designed to serve KLAS, KHND and KVGT.

Document changes/modifications include:

- Departure SID filings with airline dispatchers
- L30 Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- L30 sector boundary maps and video maps
- L30/LAS Letter of Agreement LOA
- LAS/NATCF LOA
- L30 Standard Operation Procedures (SOP)
- LAS SOP
- STARS automation changes (ADRS, ADAR, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- NAS Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Terminal Procedures:
  - TARGETS distribution package
  - Flight Simulator worksheet
  - RNAV Pro analysis results (may be completed during Evaluation Phase)
  - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R Mayhugh	4/23/19		4/23/19
Bradley R Mayhugh	Date	Chris Thomas	Date
LAS FAA Lead		LAS NATCA Lead	

	4/25/19		23 Apr 19
Anita Engelmann	Date	Dan Hauptman	Date
TWAB Representative		L30 NATCA POC	

	4-23-19	Available via electronic signature	
Chris Iwanski	Date		Date
LAS NATCA POC		Nellis Air Traffic Control Facility	

LAS Metroplex KLAS NIITZ SID Community Engagement Review Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
6/4/2019	On April 9, 10 and 11, 2019, the LAS Metroplex Project conducted public outreach efforts to present Proposed Final Designs for developed RNAV procedures. The Team solicited comments, in person during the events and for 30 days after via web based comment forms. At the conclusion of the comment period, the Team reviewed all submissions and re-examined the procedures to determine if any changes could be made based on public input. The KLAS NIITZ SID was reviewed as part of this process. **Southern Highlands, NV** is located approximately 6 miles southwest of KLAS. The area lies under an extended centerline with Runways 01 L/R (arrivals) and 19 L/R (departures). Comments focused on existing aircraft noise for both arrivals and departures, with few remarks concerning specific new procedures. The existing BOACH, COWBY, PRFUM and SHEAD SIDs, which serve KLAS Runway 19 departures, will be replaced by the Metroplex proposed KLAS JOHKR, NIITZ, RADYR and RASLR SIDs. The D&I Team reviewed these procedures to determine whether changes could be made. **<u>KLAS JOHKR, NIITZ, RADYR, RASLR SIDS (Runway 19 L/R transitions)</u>** The lateral routes for these new procedures were designed to increase controller separation options for aircraft departing in the Runways 19 and 26 configuration. Existing procedures route aircraft from two separate runways to the same location (ROPPR waypoint), approximately eight miles southwest of the airport after departure. This convergence of departures from separate runways creates higher workloads for flight crews and controllers, resulting in increased control instructions and radio communications. Currently, the common solutions to this situation are for the tower controller to delay aircraft on the ground or for the departure controller to route Runway 19 departures straight out instead of allowing them to fly the procedure to ROPPR. By designing the procedures to reflect those actions currently taken by controllers, the new procedures will delay or in some cases eliminate convergence, reducing complexity and increasing safety in the National Airspace System (NAS). The Team also examined moving the procedure laterally to the east, along the I-15 corridor, but this would place departing aircraft too close to KHND operations. The lateral route of the KLAS JOHKR, NIITZ, RASLR and RADYR SIDS remain within historical tracks for Runway 19 departures.	Master TARGETS File	

	The preliminary designs for the KLAS JOHKR, NIITZ, RADYR, and RASLR SIDs were not changed due to decreases in safety and efficiency. The eastern edge of **Rhodes Ranch, NV** is approximately 6 miles west of KLAS on an extended centerline of Runway 26. Comments from the Rhodes Ranch community focused on existing aircraft noise for departures, with no remarks concerning new procedures. The existing KLAS SHEAD, COWBY, BOACH and PRFUM SIDs serving KLAS Runway 26 departures will be replaced, respectively, by the Metroplex proposed KLAS JOHKR, NIITZ, RADYR and RASLR SIDs. The D&I Team reviewed these procedures to determine whether changes could be made. **<u>KLAS JOHKR, NIITZ, RADYR and RASLR SIDs (Runway 26 L/R transitions)</u>** Aircraft are expected to remain within historical tracks for KLAS Runway 26 departures to the southwest. The Team examined changing the lateral path by moving the RUDDY waypoint four miles west. Several issues were identified with this change: • Routes too close to rapidly rising terrain for aircraft to safely climb above • Routes through an existing VFR corridor, utilized by aircraft not always in contact with FAA controllers. • Departing LAS aircraft would often exit and then re-enter Class Bravo service area The Team also examined lesser distances west of the RUDDY waypoint, but determined that the action would concentrate more traffic directly over Rhodes Ranch than the preliminary design. The preliminary designs for the KLAS JOHKR, NIITZ, RADYR and RASLR SIDs were not changed due to decreases in safety.		

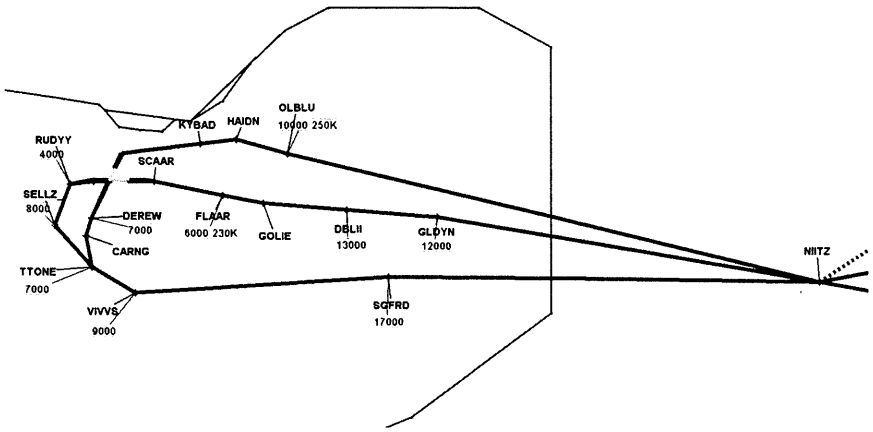


Figure 1: KLAS NIITZ SID Original Proposed Final Design (Terminal View)

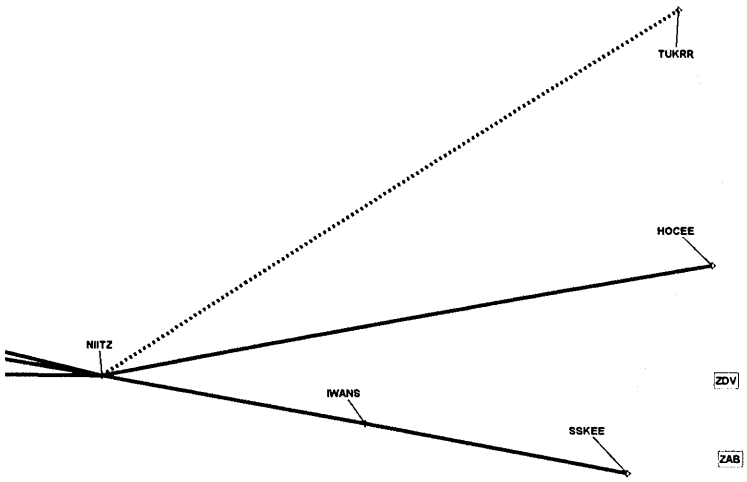


Figure 2: KLAS NIITZ SID Original Proposed Final Design (Enroute View)

All Change Control Sheets and Final Design Packages under the Metroplex Project have been completed.

Bradley R Mayhugh
FAA Metroplex Co-Lead

NATCA Metroplex Co-Lead

11/5/19
Date

11/6/19
Date

Las Vegas OAPM Design Package

KLAS NIITZ SID

An Area Navigation (RNAV) Standard Instrument Departure (SID) is a procedure that serves as a lateral path for aircraft departing from an airport. RNAV SIDs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

Las Vegas McCarran International Airport (KLAS) departures to eastern destinations will use a new flight path called the NIITZ (pronounced "Nights") RNAV SID. The NIITZ SID will replace the current COWBY (pronounced "COW-boy") RNAV SID.

The Las Vegas Metroplex Study Team (MST) identified the need for an efficient departure procedure that utilizes modern technologies. The NIITZ SID was developed around advanced navigation concepts, which will provide climbs that are more continuous.

The NIITZ SID was designed to take advantage of reduced separation requirements between successive Runway 08 or Runway 26 departures. The use of 10-degree divergent headings between successive departures will improve efficiency and reduce complexity.

This procedure is not anticipated to change runway usage. The NIITZ SID will increase flight path predictability and will decrease controller/pilot workload and task complexity, which will enhance safety.

The NIITZ SID addresses KLAS. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the Las Vegas Valley.

Las Vegas OAPM Design Package

KLAS NIITZ SID

Name of Change and Airport(s)	Change Classification
McCarran International Airport (KLAS) NIITZ Area Navigation (RNAV) Standard Instrument Departure (SID)	**Terminal Procedure; SID**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.3.2.3	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 7, 8, 35, 36, 54, 55 Albuquerque ARTCC (ZAB) Sectors: 45, 67 Denver ARTCC (ZDV) Sectors: 23, 24, 36 Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: DAG, MED Las Vegas Air Traffic Control Tower (LAS ATCT) Positions: LC1, LC2, LC3, GCE, GCW, CD KLAS	**KLAS RASLR and GIDGT SIDs KLAS RKSTR Standard Terminal Arrival Route (STAR) Henderson Executive Airport (KHND) SCAMR SID**
Associated Data Files	
TARGETS output packages Flight Simulator worksheet RNAV Pro analysis results Human in the Loop Simulations (HITLS) results	

Purpose

The purpose of the proposed procedure is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

MST Issues and Recommendations

Issues

Currently the COWBY SID is available for all configurations; however, aircraft departing Runways 19L/R and Runways 26L/R have an inefficient initial altitude constraint and merge close to the airport over ROPPR, increasing ATC task complexity.

KLAS NIITZ SID

The COWBY SID is not segregated from the TYSSN STAR. The COWBY SID lacks connectivity with the proposed Phoenix Metroplex procedures. L30 and ZLA requested that a weather mitigation route be developed for aircraft departing LAS to the northeast when the TRALR SID is not usable.

<u>Study Team Recommendations</u>

The MST developed an RNAV SID (KLAS SE1 SID) usable in all configurations, which optimizes lateral paths and connects to the proposed Phoenix Metroplex procedures. The KLAS SE1 SID incorporates altitude and speed restrictions to reduce pilot/controller task complexity and increase efficiencies. The KLAS SE1 SID was segregated from conceptual STARs. The MST created an ATC assigned transition to the northeast to be used whenever the KLAS NE2 SID is unavailable.

The MST recommendation is depicted in Figures 1 and 2.

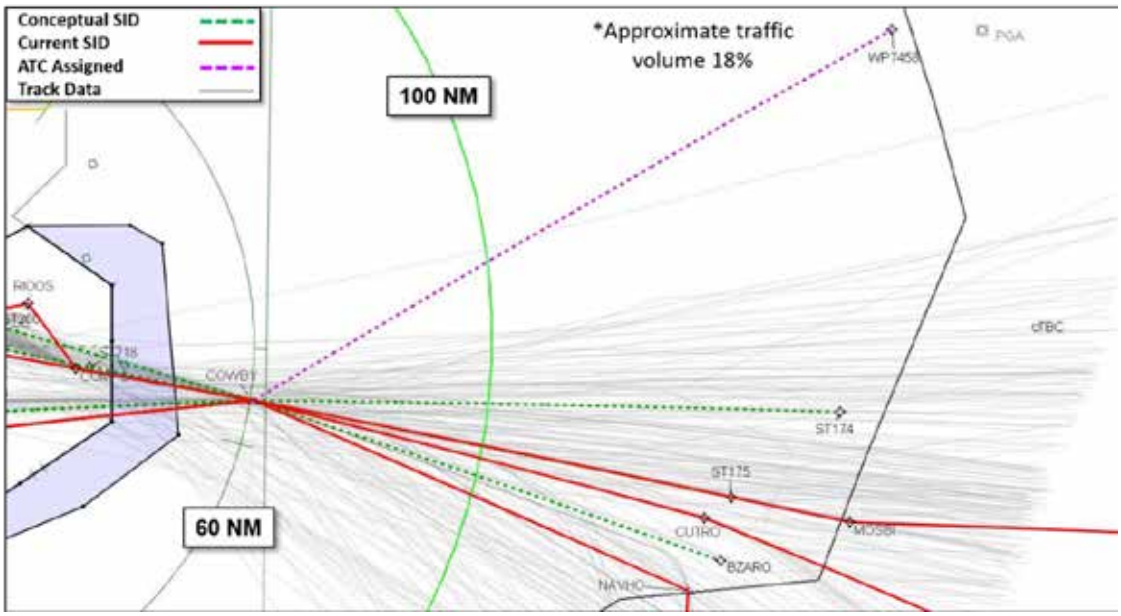


Figure 1: COWBY SID and KLAS SE1 SID - En Route View

Las Vegas OAPM Design Package

KLAS NIITZ SID

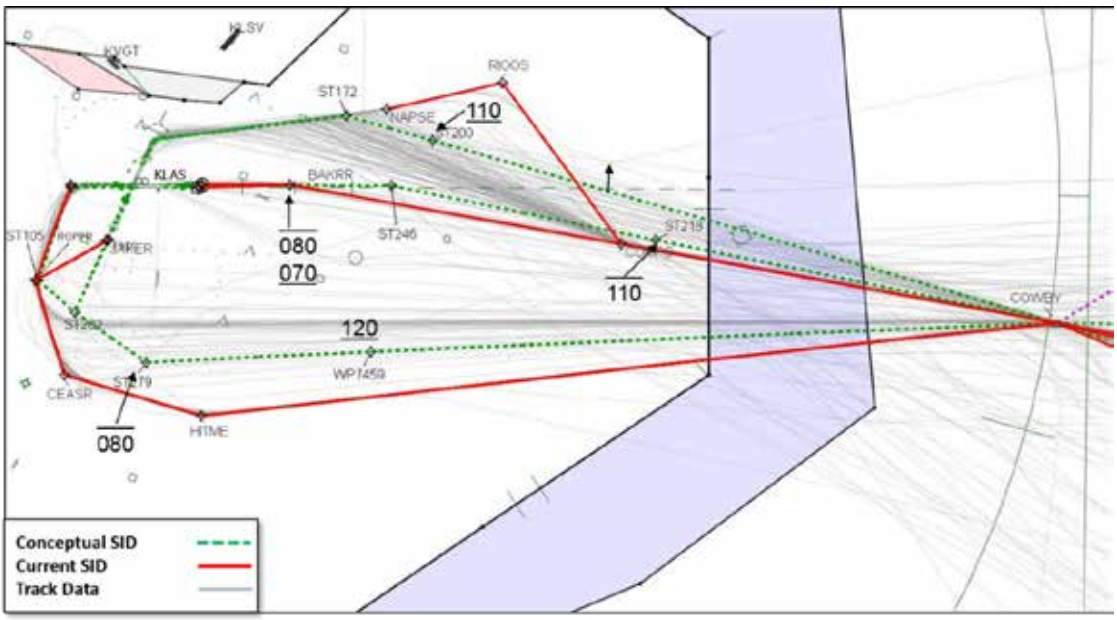


Figure 2: COWBY SID and KLAS SE1 SID - Terminal View

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal, considering both the issues and recommendations. The D&I Team amended the MST proposal to provide connectivity from all runways at KLAS.

The NIITZ SID was designed to take advantage of reduced separation requirements between successive Runway 08 departures. The use of ten-degree divergent headings between successive departures will improve efficiency and reduce complexity.

The KLAS NIITZ SID's PFD is depicted in Figures 3 and 4.

Runway Transitions

Runways 01L/R Transitions (VICF legs)

- KYBAD (provides connectivity and continuity of east departures)
- HAIDN (provides segregation from KLAS Runway 26 final)
- OLBLU (at or above 100/less than 250 knots/ facilitates the climb gradient and provides segregation from the KLAS CHOWW STAR)
- NIITZ (coordination waypoint/beginning point for four en route transitions)

Runway 08L Transition (VICF leg utilized for 10-degree divergence with successive departures)

- FLAAR (at or above 060/less than 230 knots/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/speed restriction for aircraft flyability)

Las Vegas OAPM Design Package

KLAS NIITZ SID

- GOLIE (provides segregation from the KLAS GIDGT SID)
- DBLII (at or below 130/provides segregation from the KLAS CHOWW STAR)
- GLDYN (at or above 120/provides segregation from the KLAS RKSTR STAR)
- NIITZ (coordination waypoint/beginning point for four en route transitions)

Runway 08R Transition (VADF departure leg)

- SCAAR (located to mirror VICF leg utilized on the Runway 08L transition)
- FLAAR (at or above 060/less than 230 knots/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/speed restriction for aircraft flyability)
- GOLIE (provides segregation from the KLAS GIDGT SID)
- DBLII (at or below 130/provides segregation from the KLAS CHOWW STAR)
- GLDYN (at or above 120/provides segregation from the KLAS RKSTR STAR))
- NIITZ (coordination waypoint/beginning point for four en route transitions)

Runways 19L/R Transitions (VADF legs)

- DEREW (at or below 070/provides segregation from the KLAS COKTL and BASIC STARs)
- CARNG (for design criteria/consolidates KLAS JOHKR, NIITZ, and RASLR SIDs)
- TTONE (at or above 070/provides segregation from KHND traffic)
- VIVVS (at or above 090/provides segregation from KHND traffic)
- SGFRD (at or above 170/provides segregation from the KLAS RKSTR STAR)
- NIITZ (coordination waypoint/beginning point for four en route transitions)

Runway 26L Transition (VADF leg)

- SILTT (placed to mirror VICF leg utilized on the Runway 26R transition)
- RUDDY (at or above 040/provides terrain avoidance/for design criteria and aircraft flyability)
- SELLZ (at or below 080/provides segregation from the KLAS COKTL and RNDRZ STARs)
- TTONE (at or above 070/provides segregation from KHND traffic)
- VIVVS (at or above 090/provides segregation from KHND traffic)
- SGFRD (at or above 170/provides segregation from the KLAS RKSTR STAR)
- NIITZ (coordination waypoint/beginning point for four en route transitions)

Runway 26R Transition (VICF leg)

- RUDDY (at or above 040/provides terrain avoidance/for design criteria and aircraft flyability)
- SELLZ (at or below 080/provides segregation from the KLAS COKTL and RNDRZ STARs)
- TTONE (at or above 070/provides segregation from KHND traffic)
- VIVVS (at or above 090/provides segregation from KHND traffic)
- SGFRD (at or above 170/provides segregation from the KLAS RKSTR STAR)
- NIITZ (coordination waypoint/beginning point for four en route transitions)

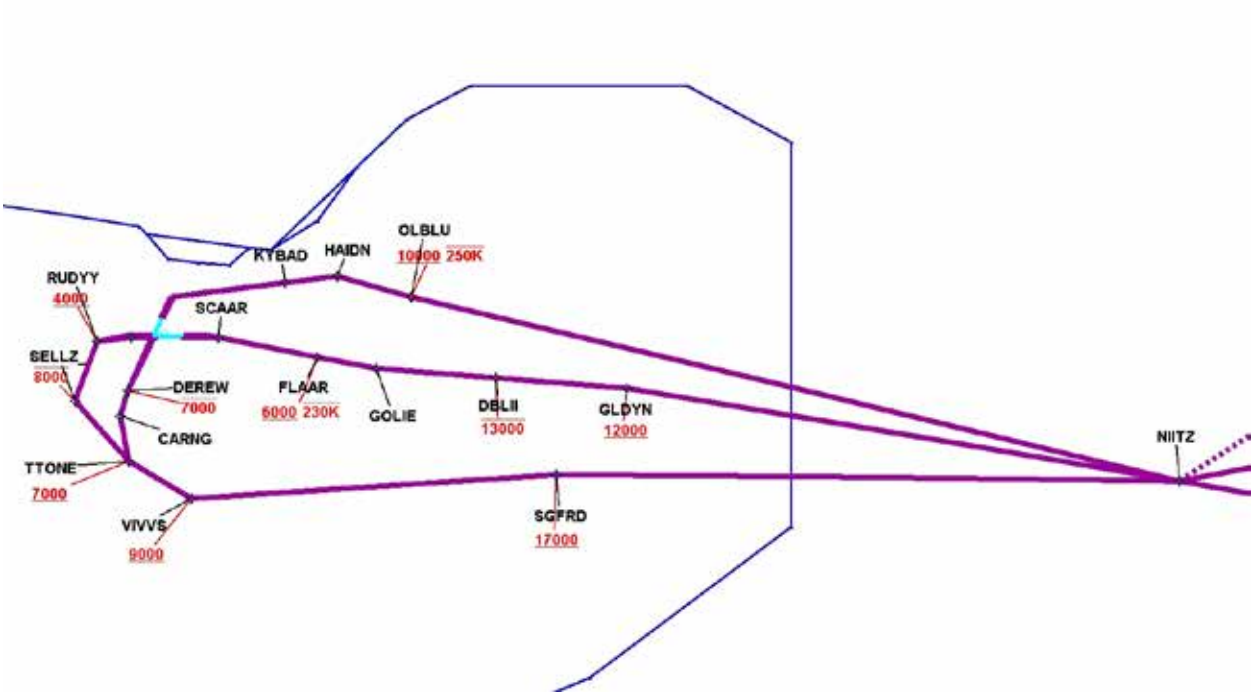


Figure 3: KLAS NIITZ SID's PFD - Terminal View

En Route Transitions

HOCEE Transition (to ZDV)

- NIITZ (placement provides avoidance of points of interest identified by the National Parks Service [NPS]/D&I Team examined several options and placed waypoint as far south as possible without interfering with the KLAS RKSTR STAR)
- HOCEE (coordination waypoint in ZDV airspace/SID termination point/ NPS had concerns with the waypoint location, but few options existed to change this location due to KLAS and Phoenix Sky Harbor International Airport [KPHX] arrival traffic)

IWANS Transition (to ZAB)

- NIITZ (placement provides avoidance of points of interest identified by the NPS/D&I Team examined several options and placed waypoint as far south as possible without interfering with the KLAS RKSTR STAR)
- IWANS (transition waypoint for the Phoenix Terminal area)

SSKEE Transition (to ZAB)

- NIITZ (placement provides avoidance of points of interest identified by the NPS/D&I Team examined several options and placed waypoint as far south as possible without interfering with the KLAS RKSTR STAR)
- IWANS (transition waypoint for Phoenix Terminal area)

KLAS NIITZ SID

- SSKEE (coordination waypoint in ZAB airspace/SID termination point)

TUKRR Transition (ATC assigned only for weather avoidance to ZDV)

- NIITZ (placement provides avoidance of points of interest identified by the NPS/D&I Team examined several options and placed waypoint as far south as possible without interfering with the KLAS RKSTR STAR)
- TUKRR (coordination waypoint in ZDV airspace/SID termination point /NPS had concerns of the waypoint location- mitigated by the route being used only during KLAS severe weather events, with minimal traffic)

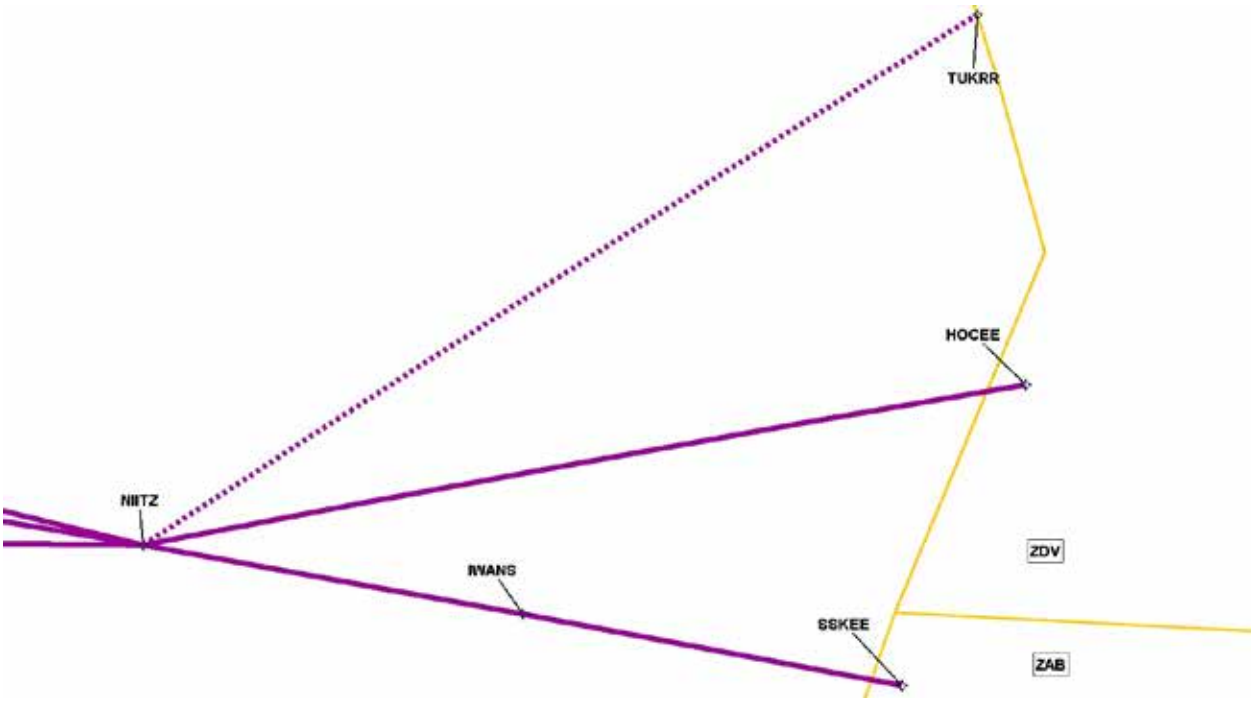


Figure 4 KLAS NIITZ SID's PFD - En Route View

Additional Design Considerations

- The KLAS NIITZ SID concept was validated by the D&I Team via HITLS
- Spectrum analysis will be required for any proposed airspace changes associated with the proposed SID
- This procedure will be used by RNAV-equipped turbojet aircraft only and is not anticipated to change runway usage
    - The following chart notes will be included with this procedure:
        - For turbojet aircraft only
        - TUKKR transition ATC assigned only

The NIITZ SID affects the following facility area(s) as indicated:

Las Vegas OAPM Design Package

KLAS NIITZ SID

- ZLA Sectors: 7, 8, 35, 36, 54, 55
- ZAB Sectors: 45, 67
- ZDV Sectors: 23, 24, 36
- L30 Sectors: DAG, MED
- LAS Positions: LC1, LC2, LC3, GCE, GCW, CD
- KLAS

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND and North Las Vegas Airport (KVGT).

Document changes/modifications include:

- Departure SID filings with airline dispatchers
- ZLA Facility Operations and Administration Order 7210.3
- ZAB Facility Operations and Administration Order 7210.3
- ZDV Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZAB LOA
- ZLA/ZDV LOA
- L30/LAS LOA
- ZLA Standard Operating Procedures (SOP)
- ZAB SOP
- ZDV SOP
- L30 SOP
- LAS SOP
- ERAM and STARS automation changes (ADAR, ADRS, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- NAS Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Terminal Procedures:
    - TARGETS distribution package

Las Vegas OAPM Design Package

KLAS NIITZ SID

- Flight Simulator worksheet
- RNAV Pro analysis results
- HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R Mayhugh 4/23/19 — 4/23/19

Bradley R. Mayhugh — Date — Chris Thomas — Date
LAS FAA Lead — LAS NATCA Lead

4/23/19 — 5/2/19

Sarah Fletcher — Date — Martin Ramirez — Date
ZLA Facility POC — ZLA NATCA POC

Anita Engelmann 4/25/19 — 23 APR 19

Anita Engelmann — Date — Dan Hauptman — Date
TWAB Representative — L30 NATCA POC

Available via electronic signature

_____ Date

Nellis Air Traffic Control Facility

LAS Metroplex KLAS RAYDR SID Community Engagement Review Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
6/4/2019	On April 9, 10 and 11, 2019, the LAS Metroplex Project conducted public outreach efforts to present Proposed Final Designs for developed RNAV procedures. The Team solicited comments, in person during the events and for 30 days after via web based comment forms. At the conclusion of the comment period, the Team reviewed all submissions and re-examined the procedures to determine if any changes could be made based on public input. The KLAS RADYR SID was reviewed as part of this process. **Southern Highlands, NV** is located approximately 6 miles southwest of KLAS. The area lies under an extended centerline with Runways 01 L/R (arrivals) and 19 L/R (departures). Comments focused on existing aircraft noise for both arrivals and departures, with few remarks concerning specific new procedures. The existing BOACH, COWBY, PRFUM and SHEAD SIDs, which serve KLAS Runway 19 departures, will be replaced by the Metroplex proposed KLAS JOHKR, NIITZ, RADYR and RASLR SIDs. The D&I Team reviewed these procedures to determine whether changes could be made. **KLAS JOHKR, NIITZ, RADYR, RASLR SIDS (Runway 19 L/R transitions)** The lateral routes for these new procedures were designed to increase controller separation options for aircraft departing in the Runways 19 and 26 configuration. Existing procedures route aircraft from two separate runways to the same location (ROPPR waypoint), approximately eight miles southwest of the airport after departure. This convergence of departures from separate runways creates higher workloads for flight crews and controllers, resulting in increased control instructions and radio communications. Currently, the common solutions to this situation are for the tower controller to delay aircraft on the ground or for the departure controller to route Runway 19 departures straight out instead of allowing them to fly the procedure to ROPPR. By designing the procedures to reflect those actions currently taken by controllers, the new procedures will delay or in some cases eliminate convergence, reducing complexity and increasing safety in the National Airspace System (NAS). The Team also examined moving the procedure laterally to the east, along the I-15 corridor, but this would place departing aircraft too close to KHND operations. The lateral route of the KLAS JOHKR, NIITZ, RASLR and RADYR SIDS remain within historical tracks for Runway 19 departures.	Master TARGETS File	

The preliminary designs for the KLAS JOHKR, NIITZ, RADYR, and RASLR SIDs were not changed due to decreases in safety and efficiency.

The eastern edge of **Rhodes Ranch, NV** is approximately 6 miles west of KLAS on an extended centerline of Runway 26. Comments from the Rhodes Ranch community focused on existing aircraft noise for departures, with no remarks concerning new procedures.

The existing KLAS SHEAD, COWBY, BOACH and PRFUM SIDs serving KLAS Runway 26 departures will be replaced, respectively, by the Metroplex proposed KLAS JOHKR, NIITZ, RADYR and RASLR SIDs. The D&I Team reviewed these procedures to determine whether changes could be made.

KLAS JOHKR, NIITZ, RADYR and RASLR SIDs (Runway 26 L/R transitions)

Aircraft are expected to remain within historical tracks for KLAS Runway 26 departures to the southwest.

The Team examined changing the lateral path by moving the RUDDY waypoint four miles west. Several issues were identified with this change:

- Routes too close to rapidly rising terrain for aircraft to safely climb above
- Routes through an existing VFR corridor, utilized by aircraft not always in contact with FAA controllers.
- Departing LAS aircraft would often exit and then re-enter Class Bravo service area

The Team also examined lesser distances west of the RUDDY waypoint, but determined that the action would concentrate more traffic directly over Rhodes Ranch than the preliminary design.

The preliminary designs for the KLAS JOHKR, NIITZ, RADYR and RASLR SIDs were not changed due to decreases in safety.

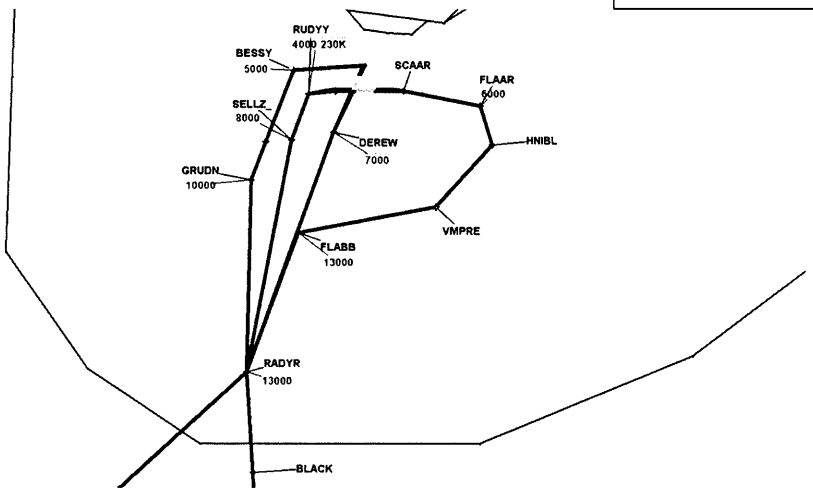


Figure 1: KLAS RAYDR SID Original Proposed Final Design (Terminal View)

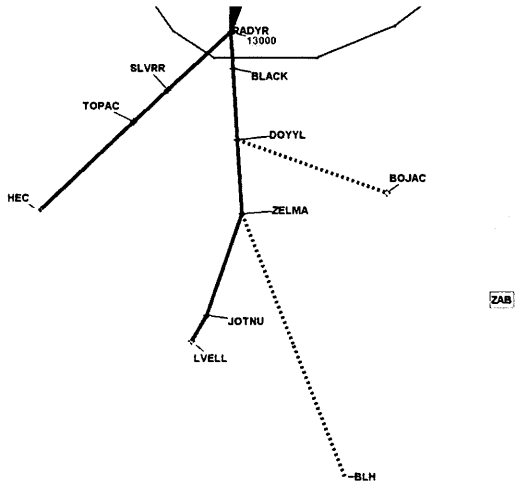


Figure 2: KLAS RAYDR SID Original Proposed Final Design (Enroute View)

All Change Control Sheets and Final Design Packages under the Metroplex Project have been completed.

Bradley R Mayhugh

FAA Metroplex Co-Lead

NATCA Metroplex Co-Lead

11/5/19

Date

11/6/19

Date

Las Vegas OAPM Design Package

KLAS RADYR SID

An Area Navigation (RNAV) Standard Instrument Departure (SID) is a procedure that serves as a lateral path for aircraft departing from an airport. RNAV SIDs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

Las Vegas McCarran International Airport (KLAS) departures to south/southwest destinations will use a new flight path procedure called the KLAS RADYR (pronounced "ray-der") RNAV SID. The RADYR SID will replace the current BOACH (pronounced "bōCH") RNAV SID.

The Las Vegas Metroplex Study Team (MST) identified the need for an efficient departure procedure that utilizes modern technologies. The RADYR SID is developed around advanced navigation concepts, which will provide more climbs that are continuous.

In a review of existing procedures by the Las Vegas Metroplex Design and Implementation Team (D&I Team), the merging of aircraft from KLAS Runways 19 and 26 on the BOACH SID shortly after departure was of particular concern. The opportunity for conflict occurring between aircraft while still below altitudes that allow controllers to stop their climb or turn aircraft was a safety issue. The BOACH SID, Runway 19 transition, routes aircraft via an unnecessary turn west, directly into the path of Runway 26 departures. While providing no operational benefit, the routing causes increased complexity and can add additional radio instructions during a critical phase of flight. The D&I Team elected to reduce this complexity by integrating two runway transitions further south.

The RADYR SID was designed to take advantage of reduced separation requirements between successive Runway 08 or Runway 26 departures. The use of 10-degree divergent headings between successive departures will improve efficiency and reduce complexity.

This procedure is not anticipated to change runway usage. The RADYR SID will increase flight path predictability and will decrease controller/pilot workload and task complexity, which will enhance safety.

The RADYR SID addresses KLAS; however, other procedures are being proposed that will serve additional nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the Las Vegas Valley.

Las Vegas OAPM Design Package

KLAS RADYR SID

Name of Change and Airport(s)	Change Classification
McCarran International Airport (KLAS) RADYR Area Navigation (RNAV) Standard Instrument Departure (SID)	**Terminal Procedure; SID**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.3.2.5	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 6, 10, 17, 35, 36, 37, 39, 53, 60 **Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: DAG, MED** **Las Vegas Air Traffic Control Tower (LAS ATCT) Positions: LC1, LC2, LC3, GCE, GCW, CD**	**KLAS RASLR and JOHKR SIDs** **KLAS BASIC Standard Terminal Arrival Route (STAR)** **Henderson Executive Airport (KHND)** **NTNDO STAR**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results** **Human in the Loop Simulation (HITLS) results**	

Purpose

The purpose of the proposed procedure is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

MST Issues and Recommendations

Issues

Stakeholders agree that there are inefficiencies in the current design of the BOACH SID. Runways 19L/R and 26L/R departure traffic merge close to the airport over ROPPR with inefficient vertical profiles increasing ATC task complexity.

Facilities requested the MST to ensure that the conceptual design merges with Southern California Metroplex designs, have Q-Route connectivity, and provide a weather mitigation route.

Study Team Recommendations

The MST created an RNAV SID (KLAS SW SID) usable for all configurations which reduces flight track miles and connects to the proposed Southern California Metroplex procedures. The KLAS SW SID was designed with transitions for all runways and simplifies departure flows with connectivity to the proposed Southern California Metroplex.

The KLAS SW SID segregates Runways 19L/R departure routes from ROPPR and optimizes lateral paths and vertical profiles. A southeast bound weather mitigation transition was designed as an ATC assigned route.
The MST recommendation is depicted in Figures 1 and 2.

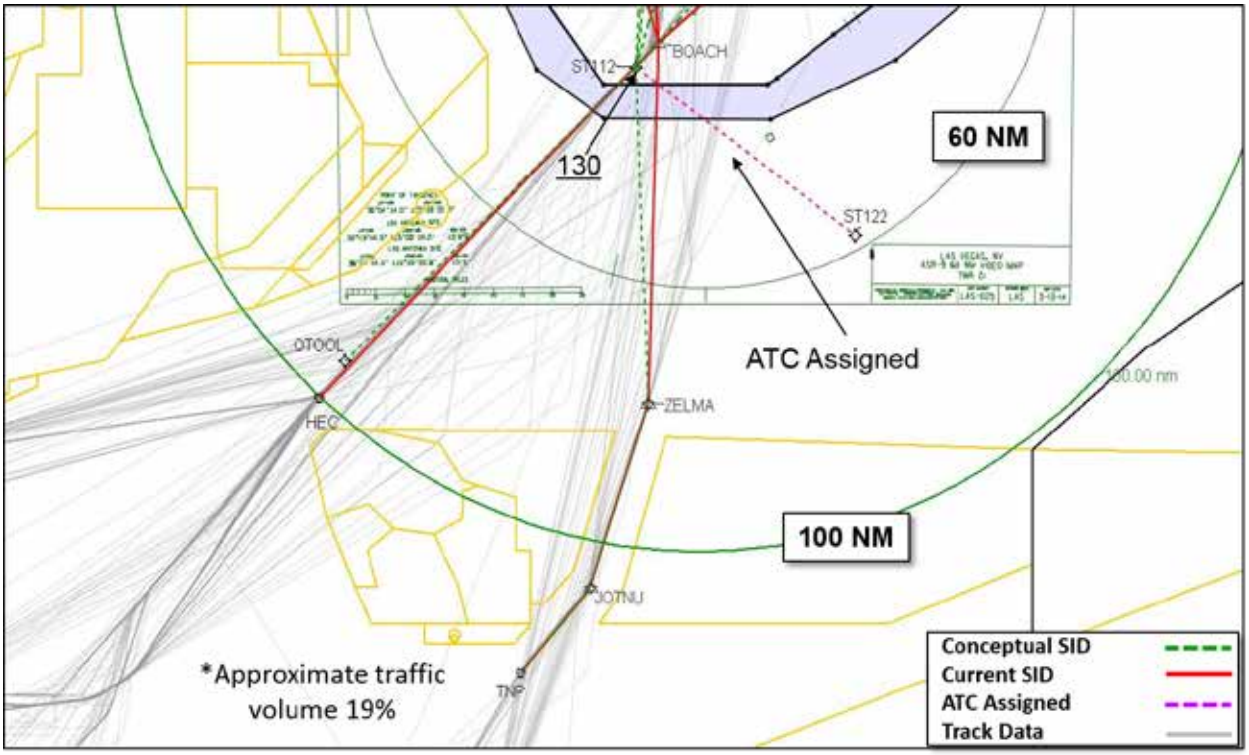


Figure 1: BOACH SID and KLAS SW SID - En Route View

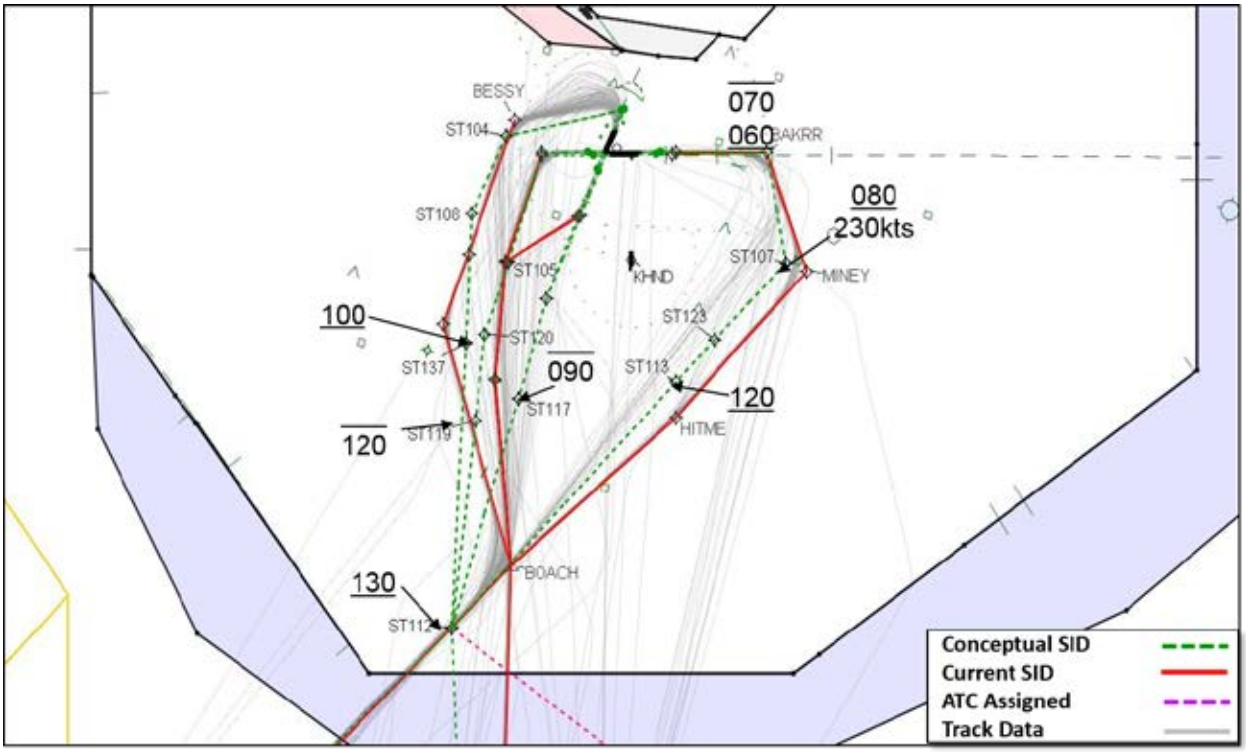


Figure 2: BOACH SID and KLAS SW SID - Terminal View

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal, considering both the issues and recommendations.

In a review of existing procedures by the D&I Team, the merging of aircraft from KLAS Runways 19 and 26 on the BOACH SID shortly after departure was of particular concern. The opportunity for conflict occurring between aircraft while still below altitudes that allow controllers to stop their climb or turn aircraft was a safety issue. The BOACH SID's Runway 19 transition routes aircraft via an unnecessary turn west, directly into the path of Runway 26 departures. While providing no operational benefit, the routing causes increased complexity and can add additional radio instructions during a critical phase of flight. The D&I Team elected to reduce this complexity by integrating two runway transitions further south.

The RADYR SID was designed to take advantage of reduced separation requirements between successive Runway 08 or Runway 26 departures. The use of 10-degree divergent headings between successive departures will improve efficiency and reduce complexity.

The D&I Team made an additional amendment to the MST proposal, providing departure guidance from all runways at KLAS.

Las Vegas OAPM Design Package
KLAS RADYR SID

The KLAS RADYR SID's PFD is depicted in Figures 3 and 4.

Runway Transitions

Runways 01LR Transitions (VADF legs)

- BESSY (at or above 050/no greater than 230 knots/for design criteria)
- HRRLY (provides segregation from off load arrivals to runway 26)
- GRUDN (at or above 100/provides segregation from the KLAS RNDRZ and COKTL STARs)
- RADYR (at or above 130/provides segregation from prop arrivals over WHIGG)

Runway 08L Transition (VICF leg utilized for 10-degree divergence with successive departures)

- FLAAR (at or above 060/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR)
- HNIBL (at or above 080/less than 230 knots/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/speed restriction is for aircraft flyability)
- VMPRE (/provides segregation from the KLAS CHOWW STAR)
- FLABB (at or above 130/provides segregation from the KLAS RKSTR and CHOWW STARs/ for airspace integrity)
- RADYR (at or above 130/provides segregation from prop arrivals over WHIGG)

Runway 08R Transition (VADF leg)

- SCAAR (placed to mirror the VICF leg utilized on the Runway 08L transition)
- FLAAR (at or above 060/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/speed restriction is for aircraft flyability)
- HNIBL (at or above 080/less than 230 knots/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/speed restriction is for aircraft flyability)
- VMPRE (provides segregation from the KLAS CHOWW STAR)
- FLABB (at or above 130/provides segregation from the KLAS RKSTR and CHOWW STARs/ for airspace integrity)
- RADYR (at or above 130/provides segregation from prop arrivals over WHIGG)

Runways 19L/R Transition (VADF legs)

- DEREW (at or below 070/provides segregation from the KLAS COKTL and RNDRZ STARs)
- RADYR (at or above 130/provides segregation from prop arrivals over WHIGG)

Runway 26L Transition (VADF leg)

- SILTT (placed to mirror the VICF leg utilized on the Runway 26R transition)
- RUDDY (at or above 040/for design criteria)
- SELLZ (at or below 080/provides segregation from the KLAS COKTL and RNDRZ STARs)
- RADYR (at or above 130/provides segregation from prop arrivals over WHIGG)

Las Vegas OAPM Design Package

KLAS RADYR SID

Runway 26R Transition (VICF leg utilized for 10-degree divergence with successive departures)

- RUDDY (at or above 040/for design criteria)
- SELLZ (at or below 080/provides segregation from the KLAS COKTL and RNDRZ STARs)
- RADYR (at or above 130/provides segregation from prop arrivals over WHIGG)

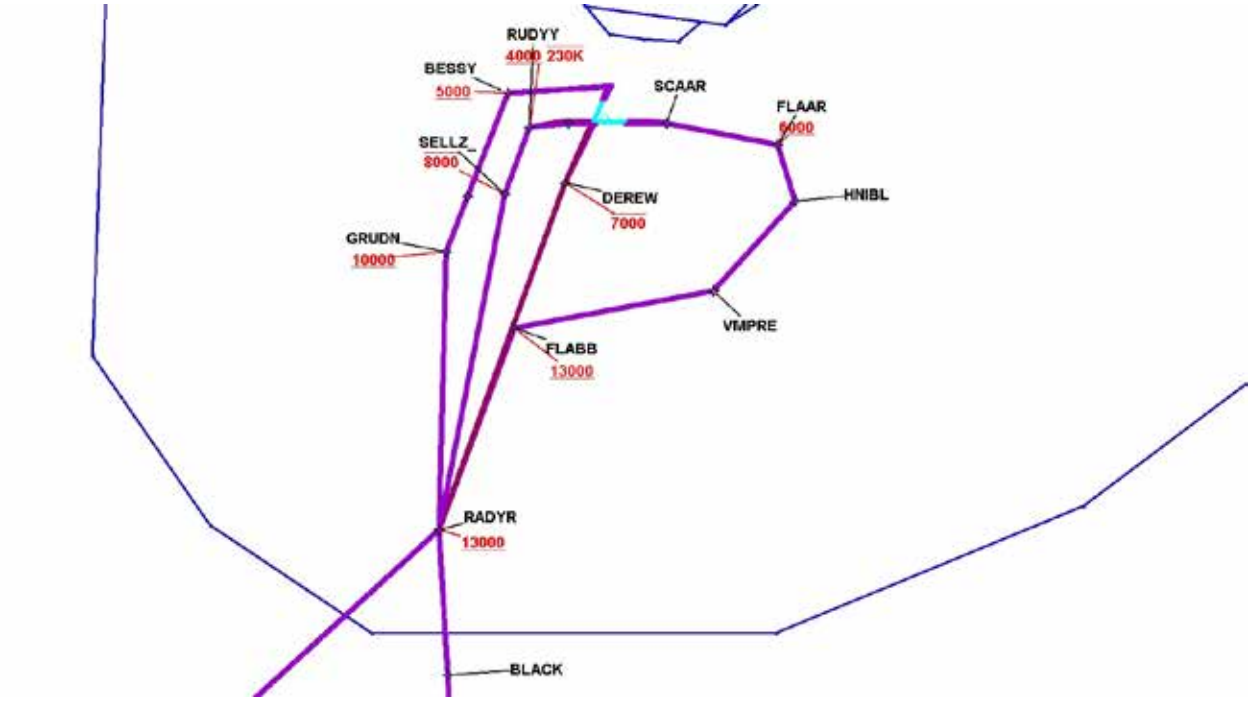


Figure 3: KLAS RADYR SID's PFD - Terminal View

En Route Transitions

BLACK Transition

- RADYR (at or above 130/provides segregation from prop arrivals over WHIGG))
- BLACK (provides segregation from KLAS arrivals over WHIGG/ tie-in point for Los Angeles International Airport [KLAX] arrivals)

Blythe (BLH) Transition (ATC assigned only transition for weather avoidance)

- RADYR (at or above 130/provides segregation from prop arrivals over WHIGG)
- BLACK (provides segregation from KLAS arrivals over WHIGG)
- DOYYL (provides continuity with BOJAC transition)
- ZELMA (existing waypoint/provides avoidance of Military Operation Areas [MOAs])
- BLH (existing ground-based navigational aid [VORTAC]/used as a tie-in point for weather reroutes to southeastern destinations)

BOJAC Transition (ATC assigned only transition for weather avoidance)

Las Vegas OAPM Design Package

KLAS RADYR SID

- RADYR (at or above 130/provides segregation from prop arrivals over WHIGG)
- DOYYL (provides ATC flexibility for sequencing)
- BOJAC (used as a tie-in point for weather reroutes for southeastern destinations)

Hector (HEC) Transition

- RADYR (at or above 130/provides segregation from prop arrivals over WHIGG)
- SLVRR (provides continuity with SLVRR transition)
- TOPAC (waypoint placement for crossing restriction to segregate from KHND NTNDO STAR)
- HEC (existing VORTAC/used for aircraft destined to the west of Los Angeles and to avoid restricted airspace)

LVELL Transition

- RADYR (at or above 130/provides segregation from prop arrivals over WHIGG)
- BLACK (provides segregation from KLAS arrivals over WHIGG)
- DOYYL (provides continuity with BOJAC transition)
- ZELMA (existing waypoint/provides avoidance of MOAs)
- JOTNU (existing waypoint/provides avoidance of MOAs))
- LVELL (existing waypoint/used to join San Diego area, Los Angeles area, Mexico and other western/southwestern destinations)

SLVRR Transition

- RADYR (at or above 130/provides segregation from prop arrivals over WHIGG)
- SLVRR (transition point for Los Angeles area airports, excluding KLAX)

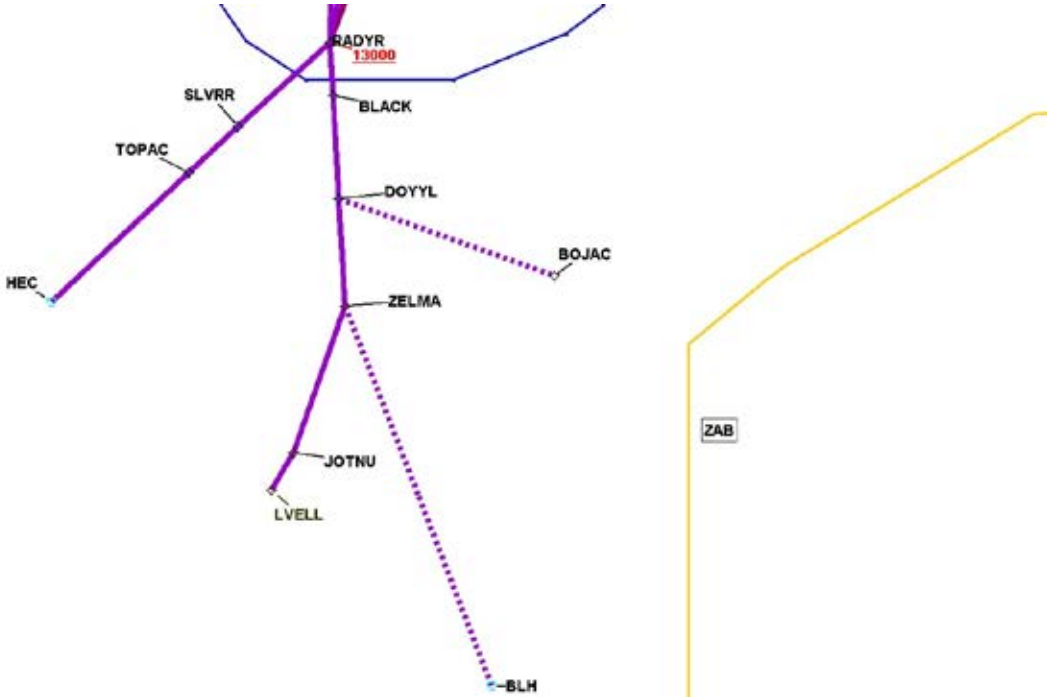


Figure 4: KLAS RADYR SID's PFD - En Route View

Additional Design Considerations

- The KLAS RADYR SID concept was validated via HITLS
- Spectrum analysis will be required for any proposed airspace changes associated with the proposed SID
- This procedure will be used by RNAV-equipped turbojet aircraft only and is not anticipated to change runway usage
    - The following chart notes will be included with this procedure:
        - For turbojet aircraft only

The RADYR SID affects the following facility area(s) as indicated:

- ZLA Sectors: 6, 10, 17, 35, 36, 37, 39, 53, 60
- L30 Sectors: DAG, MED
- LAS Positions: LC1, LC2, LC3, GCE, GCW, CD
- KLAS

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND, KVGT and KLSV.

Las Vegas OAPM Design Package
KLAS RADYR SID

Document changes/modifications include:

- Departure SID filings with airline dispatchers
- ZLA Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- L30/LAS LOA
- ZLA Standard Operating Procedures (SOP)
- L30 SOP
- LAS SOP
- ERAM and STARS automation changes (ADRS, ADAR, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- NAS Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

<u>Attachments</u>

- Terminal Procedures
    - TARGETS distribution package
    - Flight Simulator worksheet
    - RNAV Pro analysis results (may be completed during Evaluation Phase)
    - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R Mayhugh 4/23/19 — 4/23/19

Bradley R. Mayhugh — Date — Chris Thomas — Date
LAS FAA Lead — LAS NATCA Lead

4/23/19 — 5/2/19

Sarah Fletcher — Date — Martin Ramirez — Date
ZLA Facility POC — ZLA NATCA POC

Anita Engelmann 4/25/19 — 23 APR 19

Anita Engelmann — Date — Dan Hauptman — Date
TWAB Representative — L30 NATCA POC

Available via electronic signature

_____ Date

Nellis Air Traffic Control Facility

LAS Metroplex KLAS RASLR SID Community Engagement Review Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
6/4/2019	On April 9, 10 and 11, 2019, the LAS Metroplex Project conducted public outreach efforts to present Proposed Final Designs for developed RNAV procedures. The Team solicited comments, in person during the events and for 30 days after via web based comment forms. At the conclusion of the comment period, the Team reviewed all submissions and re-examined the procedures to determine if any changes could be made based on public input. The KLAS RASLR SID was reviewed as part of this process. **Southern Highlands, NV** is located approximately 6 miles southwest of KLAS. The area lies under an extended centerline with Runways 01 L/R (arrivals) and 19 L/R (departures). Comments focused on existing aircraft noise for both arrivals and departures, with few remarks concerning specific new procedures. The existing BOACH, COWBY, PRFUM and SHEAD SIDs, which serve KLAS Runway 19 departures, will be replaced by the Metroplex proposed KLAS JOHKR, NIITZ, RADYR and RASLR SIDs. The D&I Team reviewed these procedures to determine whether changes could be made. **<u>KLAS JOHKR, NIITZ, RADYR, RASLR SIDS (Runway 19 L/R transitions)</u>** The lateral routes for these new procedures were designed to increase controller separation options for aircraft departing in the Runways 19 and 26 configuration. Existing procedures route aircraft from two separate runways to the same location (ROPPR waypoint), approximately eight miles southwest of the airport after departure. This convergence of departures from separate runways creates higher workloads for flight crews and controllers, resulting in increased control instructions and radio communications. Currently, the common solutions to this situation are for the tower controller to delay aircraft on the ground or for the departure controller to route Runway 19 departures straight out instead of allowing them to fly the procedure to ROPPR. By designing the procedures to reflect those actions currently taken by controllers, the new procedures will delay or in some cases eliminate convergence, reducing complexity and increasing safety in the National Airspace System (NAS). The Team also examined moving the procedure laterally to the east, along the I-15 corridor, but this would place departing aircraft too close to KHND operations. The lateral route of the KLAS JOHKR, NIITZ, RASLR and RADYR SIDS remain within historical tracks for Runway 19 departures.	Master TARGETS File	

The preliminary designs for the KLAS JOHKR, NIITZ, RADYR, and RASLR SIDs were not changed due to decreases in safety and efficiency.

The eastern edge of **Rhodes Ranch, NV** is approximately 6 miles west of KLAS on an extended centerline of Runway 26. Comments from the Rhodes Ranch community focused on existing aircraft noise for departures, with no remarks concerning new procedures.

The existing KLAS SHEAD, COWBY, BOACH and PRFUM SIDs serving KLAS Runway 26 departures will be replaced, respectively, by the Metroplex proposed KLAS JOHKR, NIITZ, RADYR and RASLR SIDs. The D&I Team reviewed these procedures to determine whether changes could be made.

<u>KLAS JOHKR, NIITZ, RADYR and RASLR SIDs (Runway 26 L/R transitions)</u>

Aircraft are expected to remain within historical tracks for KLAS Runway 26 departures to the southwest.

The Team examined changing the lateral path by moving the RUDDY waypoint four miles west. Several issues were identified with this change:

- Routes too close to rapidly rising terrain for aircraft to safely climb above
- Routes through an existing VFR corridor, utilized by aircraft not always in contact with FAA controllers.
- Departing LAS aircraft would often exit and then re-enter Class Bravo service area

The Team also examined lesser distances west of the RUDDY waypoint, but determined that the action would concentrate more traffic directly over Rhodes Ranch than the preliminary design.

The preliminary designs for the KLAS JOHKR, NIITZ, RADYR and RASLR SIDs were not changed due to decreases in safety.

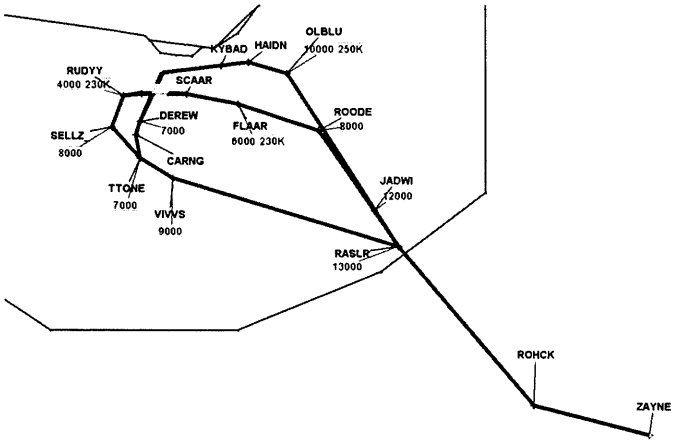


Figure 1: KLAS RASLR SID Original Proposed Final Design

All Change Control Sheets and Final Design Packages under the Metroplex Project have been completed.

Bradley R Mayhugh	
FAA Metroplex Co-Lead	NATCA Metroplex Co-Lead
11/5/19	11/6/19
Date	Date

Las Vegas OAPM Design Package

KLAS RASLR SID

An Area Navigation (RNAV) Standard Instrument Departure (SID) is a procedure that serves as a lateral path for aircraft departing from an airport. RNAV SIDs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

Las Vegas McCarran International Airport (KLAS) departures to southeastern destinations will use a new flight path procedure called the RASLR (pronounced "RAS-ler") RNAV SID. The RASLR SID will replace the current PRFUM (pronounced "PER-fume") RNAV SID. Additionally, current procedures do not provide routing from all the runways utilized at KLAS.

The Las Vegas Metroplex Study Team (MST) identified the need for an efficient departure procedure that utilizes modern technologies. The RASLR SID was developed around advanced navigation concepts, which will provide climbs that are more continuous. The new RASLR RNAV SID will also provide connectivity from all KLAS runways.

The RASLR SID was designed to take advantage of reduced separation requirements between successive Runway 08 or Runway 26 departures. The use of 10-degree divergent headings between successive departures will improve efficiency and reduce complexity.

This procedure is not anticipated to change runway usage. The RASLR SID will increase flight path predictability and will decrease controller/pilot workload and task complexity, which will enhance safety.

The RASLR SID addresses KLAS. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the Las Vegas Valley.

Las Vegas OAPM Design Package

KLAS RASLR SID

Name of Change and Airport(s)	Change Classification
McCarran International Airport (KLAS) RASLR Area Navigation (RNAV) Standard Instrument Departure (SID)	**Terminal Procedure; SID**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.3.2.4	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 8, 35, 36, 53 Albuquerque ARTCC (ZAB) Sectors: 37, 43, 92 Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: DAG, MED Las Vegas Air Traffic Control Tower (LAS ATCT) Positions: LC1, LC2, LC3, GCE, GCW, CD KLAS	**KLAS RADYR and NIITZ SIDs KLAS RKSTR STAR Henderson Executive Airport (KHND) NTNDO Standard Terminal Arrival Route (STAR)**
Associated Data Files	
TARGETS output packages Flight Simulator worksheet RNAV Pro analysis results Human in the Loop Simulations (HITLS) results	

Purpose

The purpose of the proposed procedure is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

MST Issues and Recommendations

Issues

Currently, the PRFUM SID is available in Configuration 1 only. Stakeholders requested availability of the PRFUM SID for all configurations. Aircraft departing Runways 19L/R and Runways 26L/R have an inefficient initial altitude constraint and merge close to the airport over ROPPR, increasing ATC task complexity.

Las Vegas OAPM Design Package

KLAS RASLR SID

The PRFUM SID conflicts with the KLAS TYSSN STAR at KADDY and does not align with the proposed Phoenix Metroplex procedures.

Study Team Recommendations

The MST created the KLAS SE2 SID, which is usable for all configurations and connects to the proposed Phoenix Metroplex procedures. The KLAS SE2 SID incorporates altitude and speed constraints to reduce pilot/controller task complexity and increases efficiencies. The KLAS SE2 SID was designed to be deconflicted from conceptual STARs.

The MST recommendation is depicted in Figures 1 and 2.

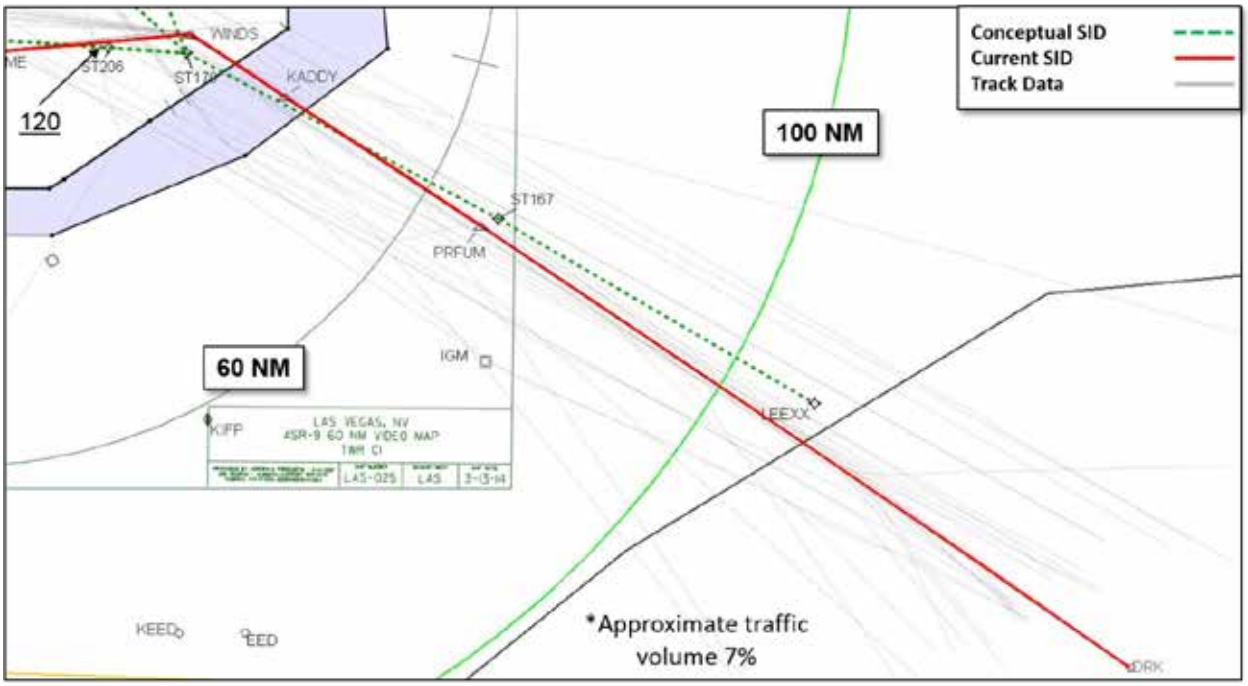


Figure 1: PRFUM SID and KLAS SE2 SID - En Route View

Las Vegas OAPM Design Package

KLAS RASLR SID

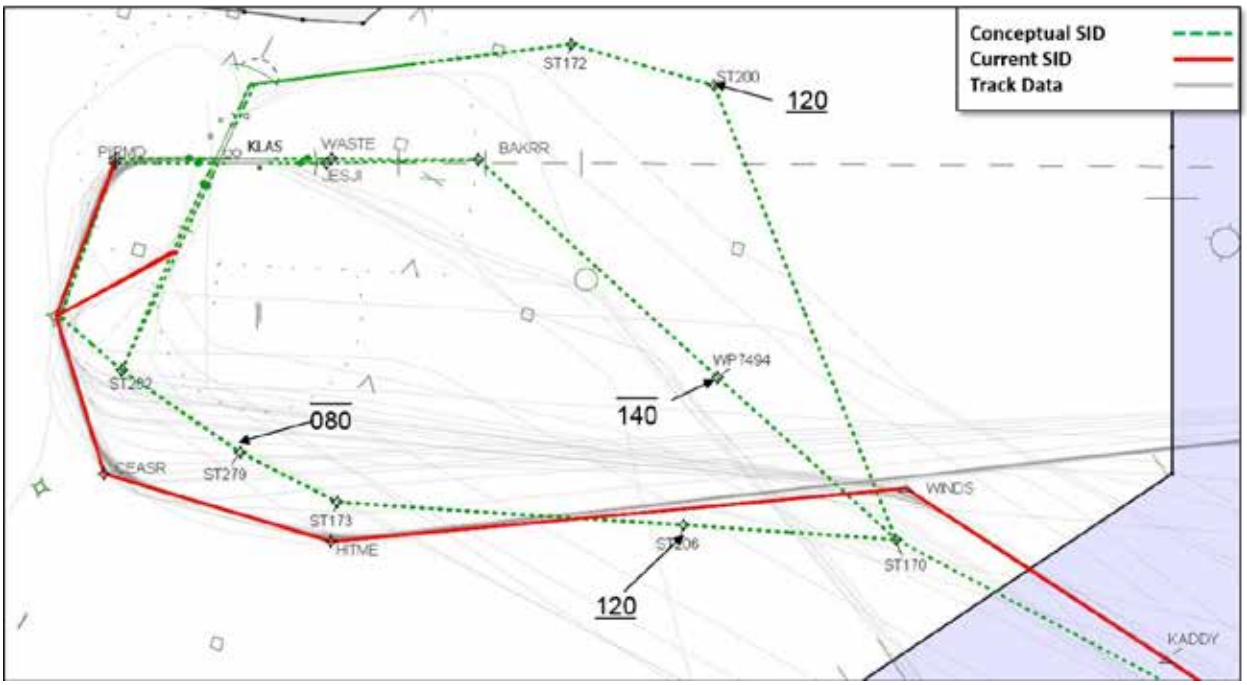


Figure 2: PRFUM SID and KLAS SE2 SID - Terminal View

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal, considering both the issues and recommendations. The D&I Team amended the MST proposal to the following design, providing departure guidance from all runways at KLAS.

The RASLR SID was designed to take advantage of reduced separation requirements between successive Runway 08 or Runway 26 departures. The use of t10-degree divergent headings between successive departures will improve efficiency and reduce complexity.

The KLAS RASLR SID's PFD is depicted in Figure 3.

Runway Transitions

Runways 01L/R Transitions (VICF legs)

- KYBAD (common waypoint for eastbound departures)
- HAIDN (provides segregation from KLAS Runway 26 final)
- OLBLU (at or above 100/less than 250 knots/facilitates the climb gradient/provides segregation from the KLAS CHOWW STAR)
- RASLR (at or above 130/provides segregation from the KLAS RKSTR STAR)

Runway 08L Transition (VICF leg utilized for 10-degree divergence with successive departures)

Las Vegas OAPM Design Package

KLAS RASLR SID

- FLAAR (at or above 060/less than 230 knots/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/speed restriction for aircraft flyability)
- ROODE (at or above 080/provides segregation from KHND traffic)
- JADWI (at or below 120/provides segregation from the KLAS RKSTR STAR)
- RASLR (at or above 130/provides segregation from the KLAS RKSTR STAR)

Runway 08R Transition (VADF leg)

- SCAAR (placed to mirror VICF leg utilized on the Runway 08L transition)
- FLAAR (at or above 060/less than 230 knots/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/speed restriction for aircraft flyability)
- ROODE (at or above 080/provides segregation from KHND traffic)
- JADWI (at or below 120/provides segregation from the KLAS RKSTR STAR)
- RASLR (at or above 130/provides segregation from the KLAS RKSTR STAR)

Runways 19L/R Transitions (VADF legs)

- DEREW (at or below 070/provides segregation from the KLAS COKTL and RNDRZ STARs)
- CARNG (for design criteria/consolidates KLAS JOHKR, NIITZ, and RASLR SIDs)
- TTONE (at or above 070/provides segregation from KHND traffic)
- VIVVS (at or above 090/provides segregation from KHND traffic)
- RASLR (at or above 130/provides segregation from the KLAS RKSTR STAR)

Runway 26L Transition (VADF leg)

- SILTT (placed to mirror VICF leg utilized on the Runway 26R transition)
- RUDDY (at or above 040/no greater than 230 knots/provides terrain avoidance/for design criteria and aircraft flyability)
- SELLZ (at or below 080/provides segregation from the KLAS COKTL and RNDRZ STARs)
- TTONE (at or above 070/provides segregation from KHND traffic)
- VIVVS (at or above 090/provides segregation from KHND traffic)
- RASLR (at or above 130/provides segregation from the KLAS RKSTR STAR)

Runway 26R Transition (VICF leg)

- RUDDY (at or above 040/no greater than 230 knots/provides terrain avoidance/for design criteria and aircraft flyability)
- SELLZ (at or below 080/provides segregation from the KLAS COKTL and RNDRZ STARs)
- TTONE (at or above 070/provides from KHND traffic)
- VIVVS (at or above 090/provides from KHND traffic)
- RASLR (at or above 130/provides segregation from the KLAS RKSTR STAR)

En Route Transitions

ZAYNE Transition

KLAS RASLR (PRFUM) SID

Las Vegas OAPM Design Package

KLAS RASLR SID

- RASLR (at or above 130/provides segregation from the KLAS RKSTR STAR)
- ROHCK (provides segregation from the KLAS RKSTR STAR's ELLDA transition)
- ZAYNE (allows ZLA to issue routing "direct WOTRO" for Phoenix Sky Harbor International Airport [KPHX] arrivals, "direct KIDDR" for Phoenix area satellite airports, and "direct DRK" for aircraft filed over DRK)

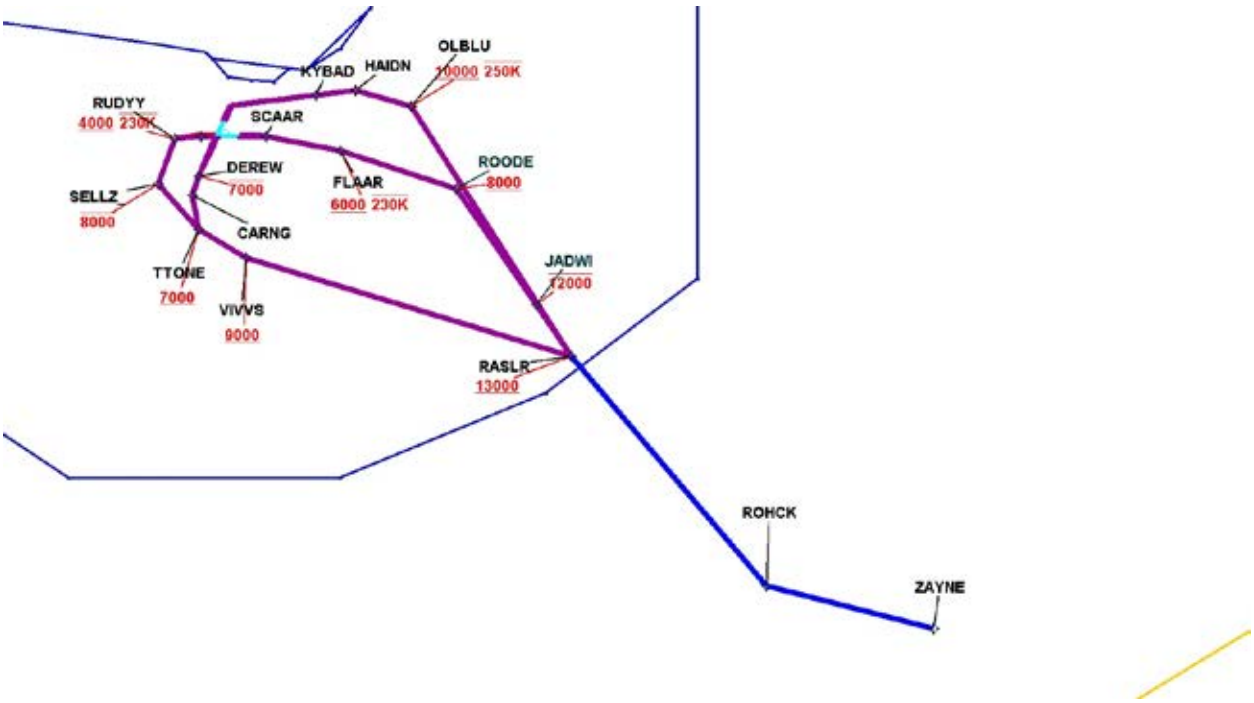


Figure 33: KLAS RASLR SID's PFD -

Additional Design Considerations

- The KLAS RASLR SID concept was validated by the D&I Team via HITLS
- Spectrum analysis will be required for any proposed airspace changes associated with the proposed SID
- This procedure will be used by RNAV-equipped turbojet aircraft only and is not anticipated to change runway usage
    - The following chart notes will be included with this procedure:
        - For turbojet aircraft only

The RASLR SID affects the following facility area(s) as indicated:

-
- ZLA Sectors: 8, 35, 36, 53
- ZAB Sectors: 37, 43, 92
- L30 Sectors: DAG, MED

Las Vegas OAPM Design Package
KLAS RASLR SID

- LAS Positions: LC1, LC2, LC3, GCE, GCW, CD
- KLAS

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND and North Las Vegas Airport (KVGT).

Document changes/modifications include:

- Departure SID filings with airline dispatchers
- ZLA Facility Operations and Administration Order 7210.3
- ZAB Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZAB LOA
- L30/LAS LOA
- ZLA Standard Operating Procedures (SOP)
- ZAB SOP
- L30 SOP
- LAS SOP
- ERAM and STARS automation changes (ADRS, ADAR, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- NAS Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Terminal Procedures
    - TARGETS distribution package
    - Flight Simulator worksheet
    - RNAV Pro analysis results (may be completed during Evaluation Phase)
    - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R Mayhugh 4/23/19 — 4/23/19

Bradley R. Mayhugh — Date — Chris Thomas — Date
LAS FAA Lead — LAS NATCA Lead

4/23/19 — 5/2/19

Sarah Fletcher — Date — Martin Ramirez — Date
ZLA Facility POC — ZLA NATCA POC

Anita Engelmann 4/25/19 — 23 APR 19

Anita Engelmann — Date — Dan Hauptman — Date
TWAB Representative — L30 NATCA POC

Available via electronic signature

_____ Date

Nellis Air Traffic Control Facility

Las Vegas Metroplex KLAS RATPK SID Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
4/30/2019	After a review of the Proposed Final Design for the KLAS RATPK SID with Nellis Air Traffic Control Facility (NATCF), it was determined that the waypoint JENFR needed to move .55 miles to the southwest in order to remain within a designated airspace shelf controlled by the Las Vegas TRACON (L30). This move will reduce potential coordination between L30 and NATCF.	LAS Master TARGETs File	

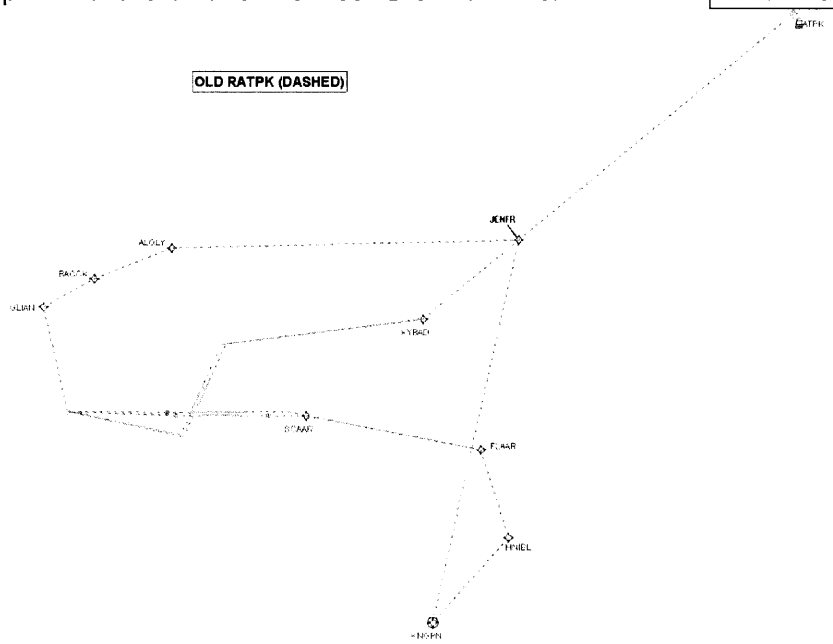


Figure 1. Original Proposed Final Design Procedure/Route/Airspace

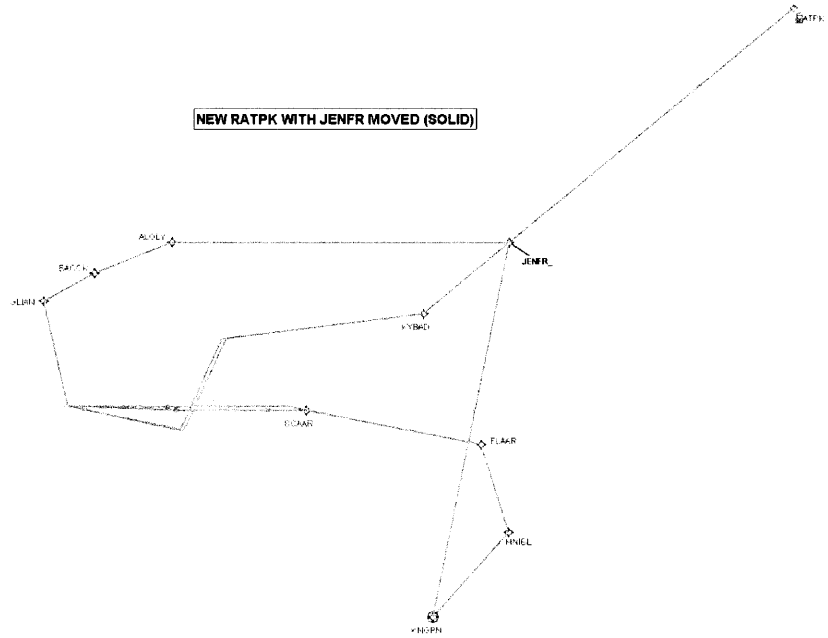


Figure 2. Revised Proposed Final Design Procedure/Route/Airspace

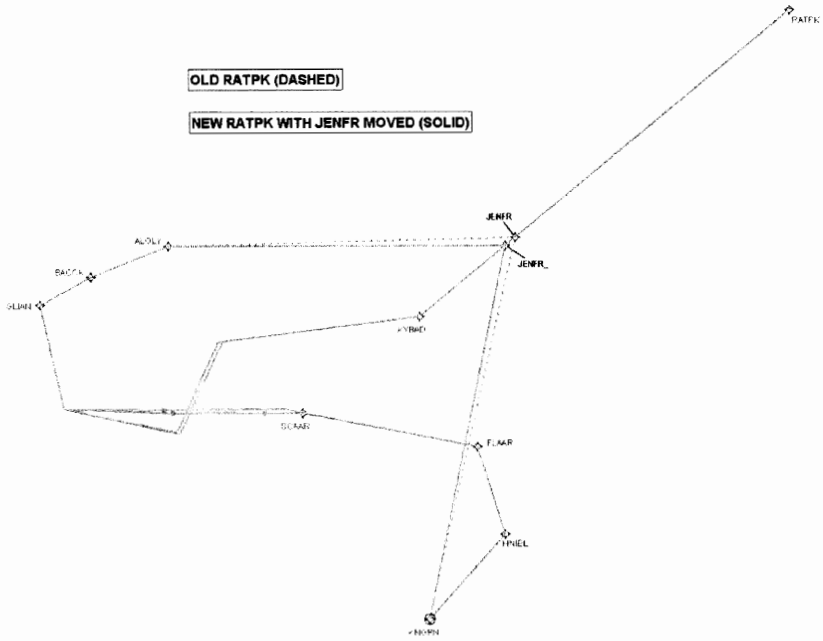


Figure 3. Original and Revised Overlaid

All Change Control Sheets and Final Design Packages under the Metroplex Project have been completed.

Bradley R Mayhugh

FAA Metroplex Co-Lead

NATCA Metroplex Co-Lead

11/5/19

Date

11/6/19

Date

LAS Metroplex KLAS RATPK SID Design Package Community Engagement Review Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
6/4/2019	On April 9, 10 and 11, 2019, the LAS Metroplex Project conducted public outreach efforts to present Proposed Final Designs for developed RNAV procedures. The Team solicited comments, in person during the events and for 30 days after via web based comment forms. At the conclusion of the comment period, the Team reviewed all submissions and re-examined the procedures to determine if any changes could be made based on public input. The KLAS RATPK SID Runway 08 was reviewed as part of this process. **<u>KLAS RATPK SID Runways 08 L/R transitions</u>** The KLAS RATPK SID (Runway 08 transition) was mentioned in several comments from residents of Henderson, NV. The D&I Team reviewed the procedure to determine whether changes could be made. The Runway 08 departure configuration at KLAS is typically used on extremely hot days. The KLAS RATPK SID (Runway 08 Transition) was developed to allow climbs that are more expeditious and to segregate from the KLAS CHOWW STAR and North Las Vegas Airport (KVGT) WYLND STAR. The RATPK SID routes aircraft departing Runway 08 via a climbing right turn (loop). The alternative without a "loop" procedure on the departure was to leave aircraft at low altitudes for extended periods. The continued traffic interactions, attempting to climb KLAS RATPK departures above aircraft landing at KLAS and KVGT, would create higher workloads for flight crews and controllers, resulting in increased control instructions and radio communications. Additionally, during high temperature conditions, aircraft could be subject to extended periods of substantial convective turbulence when forced to postpone climbs. The delay in climbing to higher, smoother flight conditions has the potential to cause extreme passenger discomfort or, in severe cases, injury. The preliminary design for the KLAS RATPK SID (Runway 08 L/R Transitions) was not changed due to decreases in safety and efficiency. **<u>KLAS RATPK SID Runways 26 L/R transitions</u>** The southern edge of Summerlin is approximately 6 miles northwest of KLAS. Comments from the Summerlin, NV community focused on existing aircraft noise for departures, with no remarks concerning new procedures. The existing STAAV SID serving KLAS Runway 26 departures will be replaced by the Metroplex proposed KLAS GIDGT and KLAS RATPK SIDs, routed over or near Summerlin. The D&I Team reviewed the two procedures to determine whether changes could be made.	Master TARGETS File	

	Aircraft are expected to remain within historical tracks for KLAS Runway 26 departures routed to destinations east and northeast of Las Vegas. Several comments suggested routing aircraft further west before beginning a turn to the north and then east, allowing a higher altitude as departures crossed over the Summerlin area. The Team examined changing the lateral path by moving the LEELN waypoint three miles west. Several issues were identified with this change: • Routes too close to rapidly rising terrain for aircraft to safely climb above • Routes through an existing VFR corridor, utilized by aircraft not always in contact with FAA controllers. • Departing LAS aircraft would often exit and then re-enter Class Bravo service area The preliminary designs for the KLAS GIDGT and RATPK SIDs (Runways 26 L/R transitions) were not changed due to decreases in safety and efficiency. This document will be part of the Administrative Record indicating review of the procedure based on public comments submitted prior to release of the Draft Environmental Assessment.		

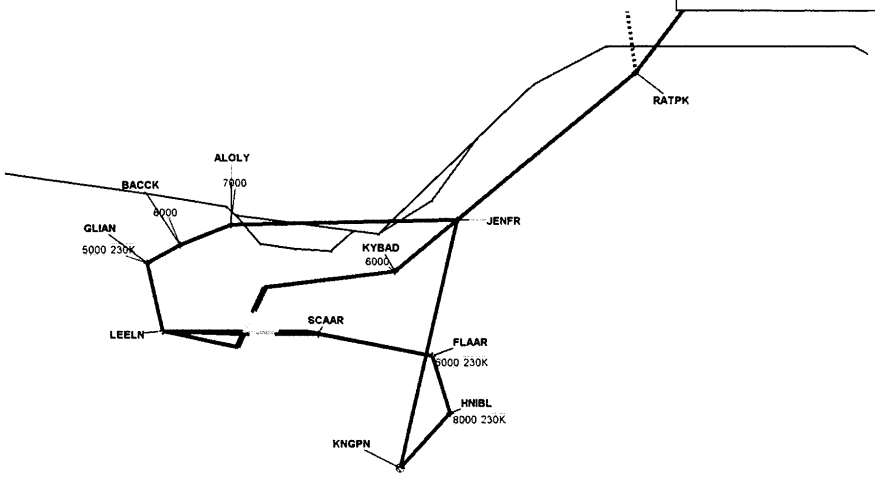


Figure 1: KLAS RATPK SID Original Proposed Final Design (Terminal View)

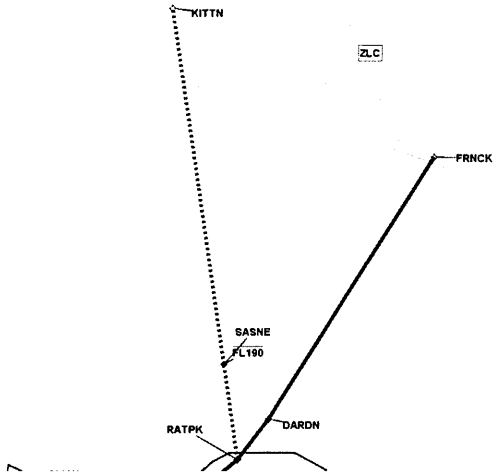


Figure 2: KLAS RATPK SID Original Proposed Final Design (Enroute View)

All Change Control Sheets and Final Design Packages ~~under the Metroplex Project have~~ been completed.

Bradley R Maybugh
FAA Metroplex Co-Lead

NATCA Metroplex Co-Lead

11/5/19
Date

11/6/19
Date

Las Vegas OAPM Design Package

KLAS RATPK SID

An Area Navigation (RNAV) Standard Instrument Departure (SID) is a procedure that serves as a lateral path for aircraft departing from an airport. RNAV SIDs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

Las Vegas McCarran International Airport (KLAS) departures to north/northeast destinations will use a new flight path procedure called the RATPK (pronounced "RAT-pack") RNAV SID. The RATPK SID will replace the current STAAV (pronounced "Stahv") and TRALR (pronounced "Tray-ler") SIDs.

The Las Vegas Metroplex Study Team (MST) identified the need for an efficient departure procedure that utilizes modern technologies. The RATPK SID is developed around advanced navigation concepts which will provide more continuous climbs.

The Las Vegas Design and Implementation Team (D&I Team) reviewed potential safety issues with the existing TRALR (Runways 19/26) and STAAV (Runway 26) SIDs that converge at the TRALR waypoint. These two SIDs depart the airport in separate directions, then join at the same point northeast of the airport. The convergence of these two SIDs at TRALR creates sequencing and separation issues for controllers, resulting in increased complexity and implementation of flow control management for departures. Flow management requires extensive ground movements in order to reroute Runway 19 departures over to Runway 26. The redirection of aircraft from one runway to another requires the crossing of two active runways and movement over several taxiways. The reassignment of takeoff runway enforces a more orderly and controllable flow after departure.

The RATPK SID includes a right turn immediately after departure from Runway 19, allowing earlier and more efficient sequencing with Runway 26 departures. Safety will increase with the elimination of active runway and taxiway crossings. The intended use of the RATPK SID departing Runway 19 is for general aviation aircraft parked on the west side of the airport.

The RATPK SID was designed to take advantage of reduced separation requirements between successive Runway 08 departures. The use of 10-degree divergent headings between successive departures will improve efficiency and reduce complexity.

The RATPK SID will increase flight path predictability and will decrease controller/pilot workload and task complexity which will enhance safety.

The new RATPK SID addresses KLAS; however, other procedures are being proposed that will serve additional nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the Las Vegas valley.

KLAS RATPK (STAAV) SID

Las Vegas OAPM Design Package

KLAS RATPK SID

Name of Change and Airport(s)	Change Classification
McCarran International Airport (KLAS) RATPK Area Navigation (RNAV) Standard Instrument Departure (SID)	**Terminal Procedure; SID**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.3.2.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 7, 54, 55 **Salt Lake City ARTCC (ZLC) Sectors: 33, 44, 45, 47** **Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: MED, DAG** **Las Vegas Air Traffic Control Tower (LAS ATCT) Positions: LC1, LC2, LC3, GCE, GCW, CD** **KLAS** **Nellis Air Traffic Control Facility (NATCF)**	**KLAS GIDGT SID** **KLAS CHOWW Standard Terminal Arrival Route (STAR)** **Henderson Executive Airport (KHND) BOEGY STAR** **North Las Vegas Airport (KVGT) WYLND STAR**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results** **Human in the Loop (HITLS)results**	

Purpose

The purpose of the proposed procedure is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

MST Issues and Recommendations

Issues

The STAAV SID is available in configuration 1 for Runways 26L/R only. Stakeholders request that the STAAV SID be available for all configurations. Departures assigned the TRALR SID's MLF transition turn into the path of arrivals. Facilities requested that the MST merge conceptual designs with Southern California Metroplex procedures and provide Q-Route connectivity.

KLAS RATPK (STAAV) SID

Stakeholders reported the current procedure has high climb gradients and several aircraft types have trouble meeting the restrictions at the STAAV and FOLDD waypoints. The NATCF identified a lack of a northbound transition through the Nellis Special Use Airspace (SUA), when the airspace is available for joint use.

Study Team Recommendations

The MST created an RNAV SID (KLAS NE1 SID) usable for all configurations, which reduces flight track miles, and connects to the proposed Southern California Metroplex procedures. The KLAS NE1 SID was designed to add transitions off all runways and simplify departure flows with two en route transitions. One transition ends at the proposed Southern California Metroplex waypoint WINEN. The MST designed an ATC assigned transition over CRITO that traverses the Nellis SUA when the airspace is open for joint use.

The KLAS NE1 SID incorporates lower altitude restrictions which reduce climb gradients. This procedure allows jet aircraft to meet conceptual altitudes, reducing pilot/controller task complexity and increase efficiencies. The MST designed the KLAS NE1 SID to be deconflicted from conceptual STARs.

The MST recommendation is depicted in Figures 1 and 2.

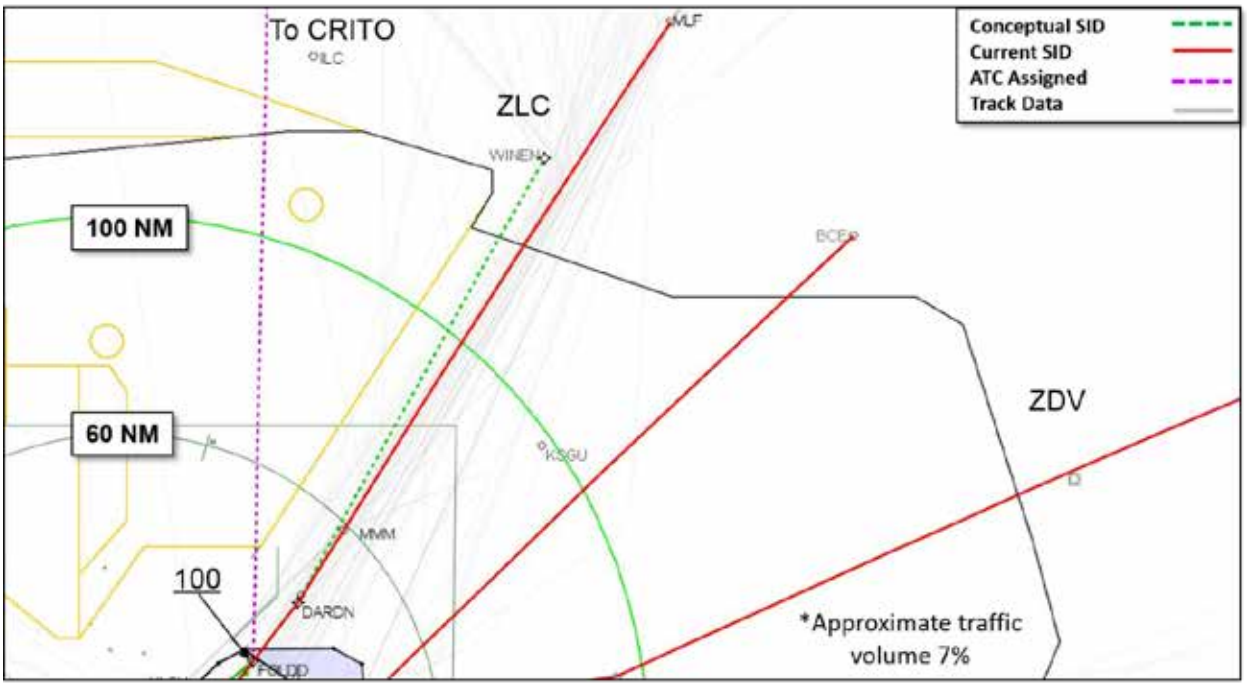


Figure 1: STAAV SID and KLAS NE1 SID - En Route View

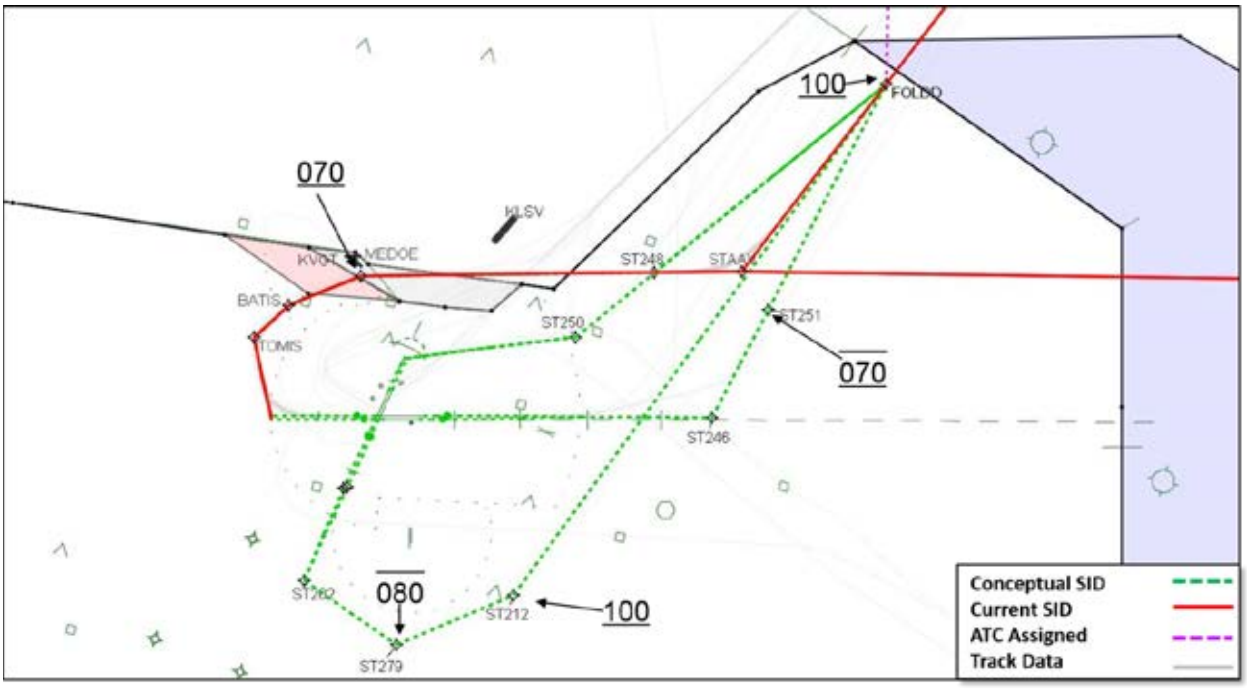


Figure 2: STAAV SID and KLAS NE1 SID - Terminal View

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal, considering both the issues and recommendations.

The D&I Team reviewed potential safety issues with existing TRALR (Runways 19/26) and STAAV (Runway 26) SIDs that converge at the TRALR waypoint. These two SIDs depart the airport in separate directions, and then join at the same point northeast of the airport. The convergence of these two SIDs at TRALR creates sequencing and separation issues for controllers, resulting in increased complexity and implementation of flow control management for departures. Flow management requires extensive ground movements in order to reroute Runway 19 departures over to Runway 26. The redirection of aircraft from one runway to another requires the crossing of two active runways and movement over several taxiways. The reassignment of takeoff runway enforces a more orderly and controllable flow after departure.

The RATPK SID includes a right turn immediately after departure from Runway 19, allowing earlier and more efficient sequencing with Runway 26 departures. Safety will increase with the elimination of active runway and taxiway crossings. The intended use of the RATPK SID departing Runway 19 is for general aviation aircraft parked on the west side of the airport.

Las Vegas OAPM Design Package

KLAS RATPK SID

The D&I Team additionally amended the MST proposal with a right turn "loop" that was created for the Runway 08 departure transitions to allow for aircraft to climb and to segregate from the KLAS CHOWW STAR, KHND BOEGY STAR and KVGT WYLND STAR. The alternative without a "loop" procedure on the departure was to leave aircraft at low altitudes for extended periods.

The KLAS RATPK SID's PFD is depicted in Figures 3 and 4.

Runway Transitions

Runways 01L/R Transitions (VICF legs)

- KYBAD (at or above 060/allow aircraft to get above the minimum vectoring altitude [MVA]/protects from VFR aircraft eastbound from NATCF)
- JNFER (placed to rejoin RATPK routing to northeast/common point for other runway transitions)
- RATPK (coordination waypoint with ZLA)

Runway 08L Transition (VICF leg utilized for 10-degree divergence with successive departures)

- FLAAR (at or above 060/less than 230 knots/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/speed restriction for design criteria)
- HNIBL (at or above 080/less than 230 knots/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/ speed restriction for design criteria)
- KNGPN (provides segregation from the KLAS CHOWW and RKSTR STARs)
- JENFR (placed to rejoin RATPK routing to northeast/common point for other runway transitions)
- RATPK (coordination waypoint with ZLA)

Runway 08R Transitions (VADF leg)

- SCAAR (placed to mirror VICF leg utilized on the Runway 08L transition)
- FLAAR (at or above 060/less than 230 knots/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/speed restriction for design criteria)
- HNIBL (at or above 080/less than 230 knots/provides segregation from the KHND OYODA and SCAMR SIDs and the KLAS CHOWW STAR/ speed restriction for design criteria)
- KNGPN (provides segregation from the KLAS CHOWW and RKSTR STARs)
- JENFR (placed to rejoin RATPK routing to northeast/common point for other runway transitions)
- RATPK (coordination waypoint with ZLA)

Runways 19L/R Transitions (VICF legs)

- LEELN (existing waypoint on the current Runway 26 procedure/added to Runways 19 L/R transitions)

- GLIAN (at or above 050/ensures climb gradient for NATCF airspace and VGT)
- BACCK (at or above 060/less than 230 knots/ensures climb gradient for NATCF airspace and VGT /speed restriction for design criteria)
- ALOLY (at or above 070/provides NATCF airspace integrity)
- JENFR (placed to rejoin RATPK routing to northeast/common point for other runway transitions)
- RATPK (coordination waypoint with ZLA)

Runways 26L/R Transitions (VADF legs)

- LEELN (existing waypoint)
- GLIAN (at or above 050/ensures climb gradient for NATCF airspace and VGT)
- BACCK (at or above 060/less than 230 knots/ensures climb gradient for NATCF airspace and VGT /speed restriction for design criteria)
- ALOLY (at or above 070/provides NATCF airspace integrity)
- JENFR (placed to rejoin RATPK routing to northeast/common point for other runway transitions)
- RATPK (coordination waypoint with ZLA)

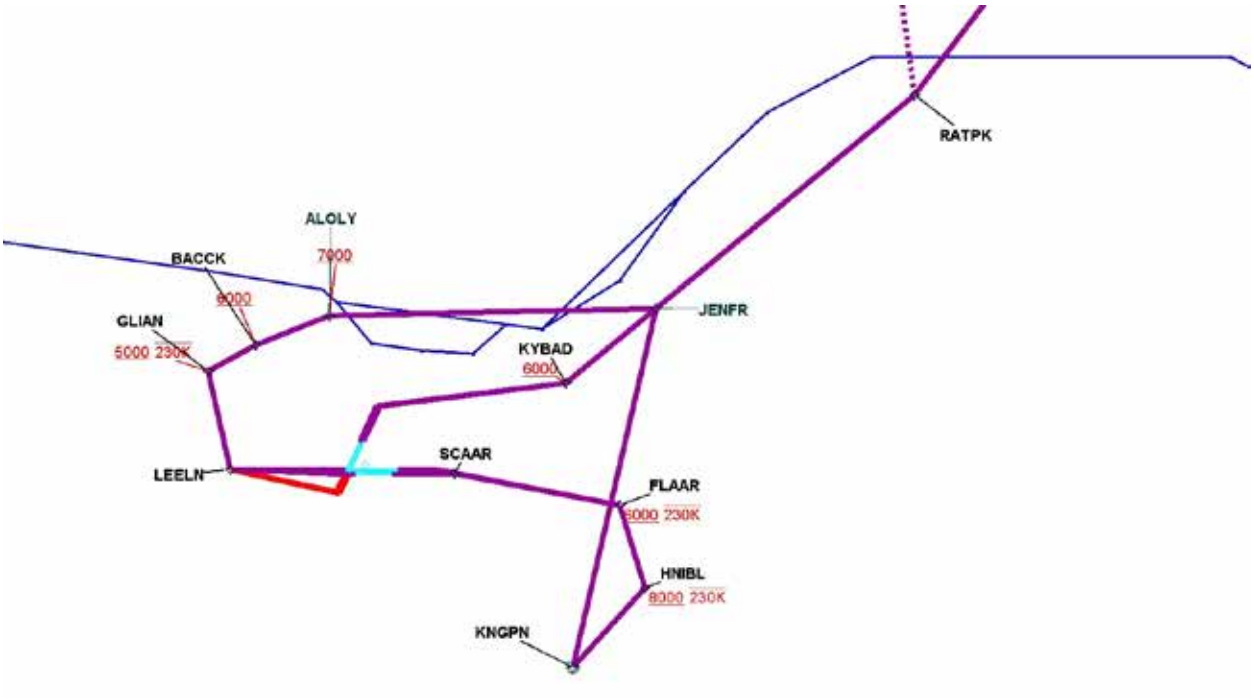


Figure 3: KLAS RATPK SID's PFD - Terminal View

En route Transitions

Las Vegas OAPM Design Package

KLAS RATPK SID

The MST proposed four transitions for this SID, but the D&I team chose to design two northern transitions for this SID and added the other 2 transitions to the newly designed KLAS GIDGT SID to facilitate the segregation from the KLAS CHOWW STAR.

FRNCK Transition (to ZLC)

- RATPK (coordination waypoint with ZLA)
- DARDN (provides segregation from NATCF airspace and the KLAS CHOWW STAR)
- FRNCK (coordination waypoint inside ZLC airspace)

KITTN Transition (ATC assigned only to reduce track miles when SUA is not in use)

- RATPK (coordination waypoint with ZLA)
- SANSE (at or below FL190/for design criteria)
- KITTN (existing waypoint on Q164 in ZOA airspace)

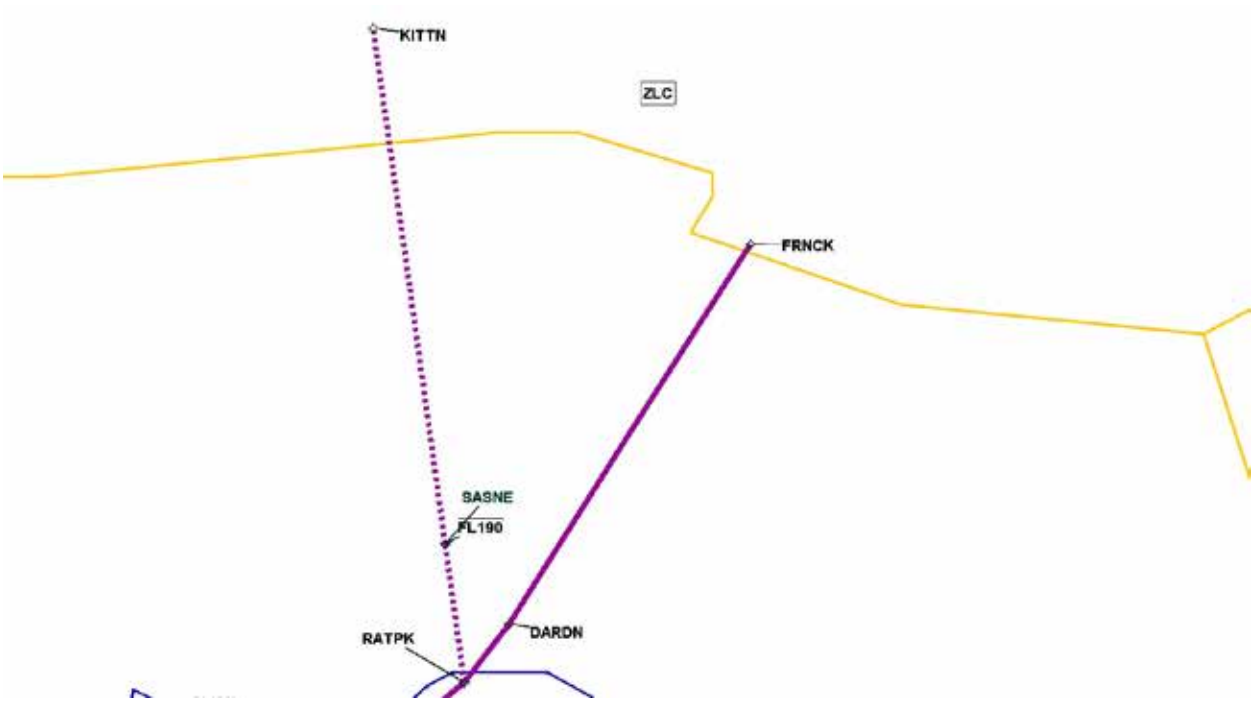


Figure 4: KLAS RATPK SID's PFD - En Route View

Additional Design Considerations

- The KLAS RATPK SID concept was validated by the D&I Team via HITLS
- Spectrum analysis will be required for any proposed airspace changes associated with the proposed SID
- This procedure will be used by RNAV-equipped turbojet aircraft only
    - The following chart notes will be included with this procedure:

KLAS RATPK (STAAV) SID

§ For turbojet aircraft only

The RATPK SID affects the following facility area(s) as indicated:

- ZLA Sectors: 7, 54, 55
- ZLC Sectors: 33, 44, 45, 47
- L30 Sectors: MED, DAG
- LAS Positions: LC1, LC2, LC3, GCE, GCW, CD
- NATCF
- KLAS

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed for KLAS, KHND and KVGT.

Document changes/modifications include:

- Departure SID filings with airline dispatchers
- ZLA Facility Operations and Administration Order 7210.3
- ZLC Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- VGT Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZLC LOA
- L30/LAS LOA
- ZLA Standard Operating Procedures (SOP)
- ZLC SOP
- L30 SOP
- LAS SOP
- VGT SOP
- ERAM and STARS automation changes (ADRS, ADAR, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- NAS Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- En Route Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

KLAS RATPK (STAAV) SID

Las Vegas OAPM Design Package

KLAS RATPK SID

- Terminal Procedures
  - TARGETS distribution package
  - Flight Simulator worksheet
  - RNAV Pro analysis results (may be completed during Evaluation Phase)
  - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R Mayhugh 4/23/19 — 4/23/19

Bradley R. Mayhugh — Date — Chris Thomas — Date
LAS FAA Lead — LAS NATCA Lead

4/23/19 — 5/2/19

Sarah Fletcher — Date — Martin Ramirez — Date
ZLA Facility POC — ZLA NATCA POC

Anita Engelmann 4/25/19 — 23 APR 19

Anita Engelmann — Date — Dan Hauptman — Date
TWAB Representative — L30 NATCA POC

Available via electronic signature

_____ Date

Nellis Air Traffic Control Facility

Las Vegas OAPM Design Package

KHND OYODA (PALLY) SID

An Area Navigation (RNAV) Standard Instrument Departure (SID) is a procedure that serves as a lateral path for aircraft departing from an airport. RNAV SIDs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

Henderson Executive Airport (KHND) departures to northwest/south/southwest destinations will use a new flight path procedure called the OYODA (pronounced “Oh-Yo-da”) SID. The OYODA SID will replace the current PALLY (pronounced “Pal-lee”) RNAV SID.

The Las Vegas Metroplex Study Team (MST) identified the need for an efficient departure procedure that utilizes modern technologies. The OYODA SID is developed around advanced navigation concepts, which will provide climbs that are more continuous.

This procedure is not anticipated to change runway usage. The OYODA SID will increase flight path predictability and will decrease controller/pilot workload and task complexity, which will enhance safety.

The new OYODA SID addresses KHND. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the Las Vegas Valley.

Las Vegas OAPM Design Package

KHND OYODA (PALLY) SID

Name of Change and Airport(s)	Change Classification
Henderson Executive Airport (KHND) **OYODA Area Navigation (RNAV) Standard Instrument Departure (SID)**	**Terminal Procedure; SID**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.5.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 6, 10, 16, 17, 35, 37, 39, 53, 60 **Oakland ARTCC (ZOA) Sectors: 33, 46** **Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: CYN, DAG, GNT, FNL, SAT, LAK** **KHND**	**McCarran International Airport (KLAS)** **RADYR SID** **Q13 Amendment** **Q15 Amendment**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results** **HITLS results**	

Purpose

The purpose of the proposed procedure is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

Study Team Issues and Solutions

Issues

Stakeholders requested procedures for the Las Vegas satellite airports, which provide predictable, repeatable course guidance and reduce dependencies between operations at neighboring airports. The MST designed conceptual Standard Terminal Arrival Routes (STARs) and SIDs for KHND and North Las Vegas Airport (KVGT).

Las Vegas OAPM Design Package

KHND OYODA (PALLY) SID

MST Recommendation

The MST worked extensively with the National Business Aviation Association (NBAA) to design efficient Runway 17R and Runway 35L departure procedures. The MST created four conceptual RNAV SIDs (KHND E SID, KHND NE SID, KHND SE SID, and KHND SW/NW SID) (See Figure 1). Mountainous terrain near the KHND airport was a primary concern in developing these procedures.

To provide common en route transitions, the KHND SIDs follow conceptual KLAS SIDs. L30 and ZLA expressed concerns about mountainous terrain for Runway 35L departure procedures and gaps in surveillance coverage on the KHND SW/NW SID.

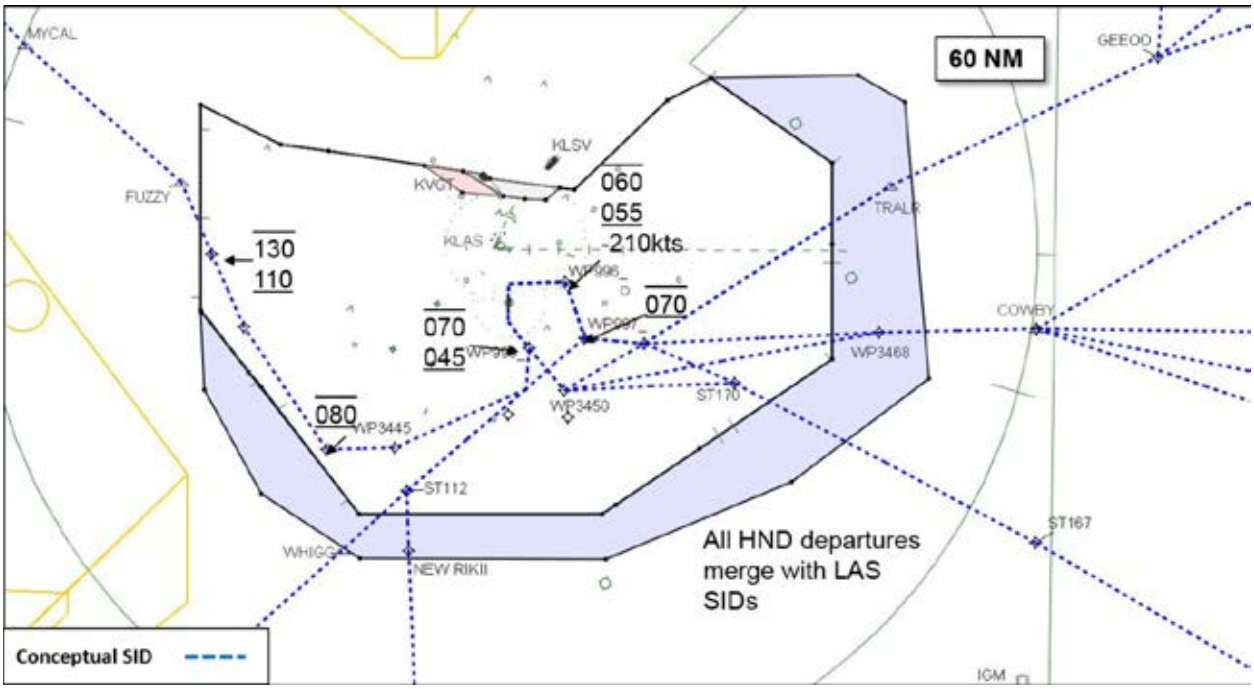


Figure 1: MST KHND Conceptual SIDs

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal, considering both the issues and recommendations.

The D&I Team decided to design two SIDs (OYODA and SCAMR) in order to reduce ATC complexity and chart clutter caused by too many transitions.

The top altitude of the OYODA SID is 060 to segregate from KLAS procedures.

The KHND OYODA SID is depicted in Figure 2.

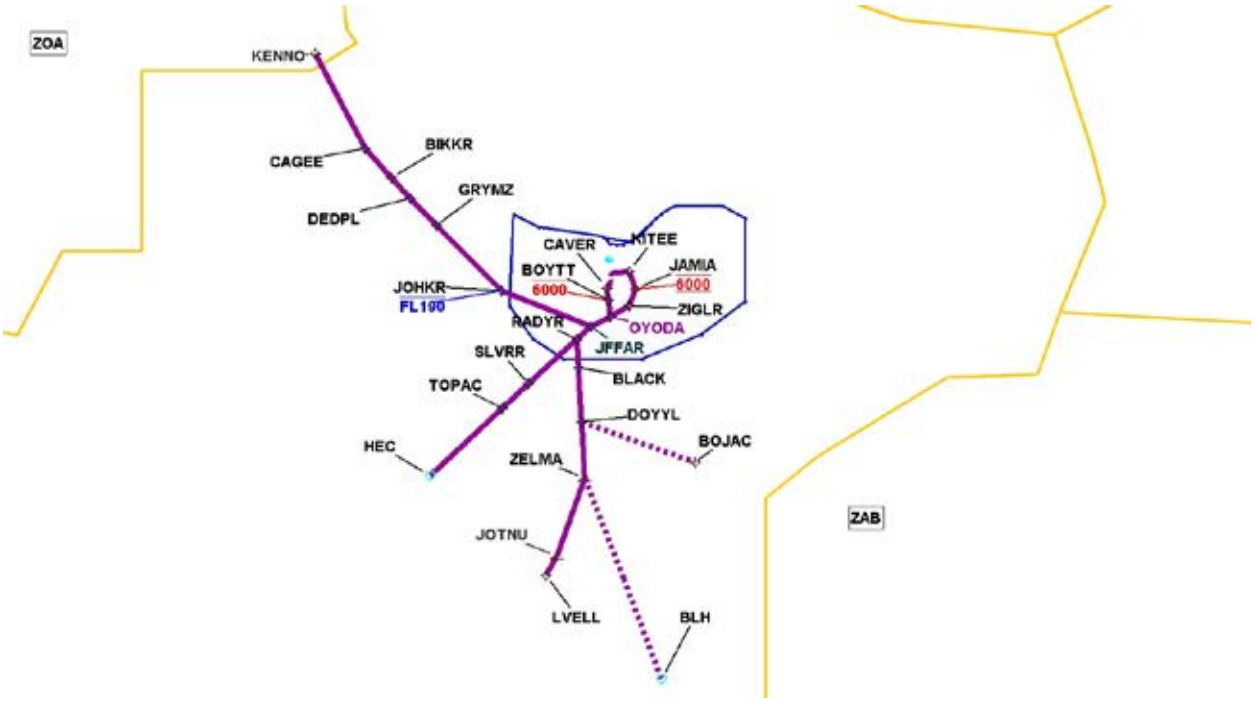


Figure 2: KHND OYODA SID - Proposed Final Design

Runway Transitions

KHND Runway 17R Transition (VICF leg for terrain avoidance)

- CAVER (existing waypoint/provides terrain avoidance)
- BOYTT (at or below 060 to segregate from KLAS RKSTR and CHOWW STARs and KLAS NIITZ and RASLR SIDs/provides terrain avoidance)
- OYODA (placement provides a common transition point for both runways and is a coordination waypoint for L30 CYN and DAG sectors)

KHND Runway 35L Transition (VICF leg to segregate from KLAS traffic)

- KITEE (existing waypoint/provides terrain avoidance and utilized for segregation from KLAS final to Runways 26L/R and departures off Runways 08L/R)
- JAMIA (at 060 to segregate from KLAS JOHKR, RATPK and RADYR SIDs, and from KLAS COKTL, RNDRZ and CHOWW STARs)
- ZIGLR (provides terrain avoidance)
- OYODA (placement provides a common transition point for both runways and is a coordination waypoint for L30 CYN and DAG sectors)

En Route Transitions

Las Vegas OAPM Design Package

KHND OYODA (PALLY) SID

BLACK Transition

- OYODA (placement provides a common transition point for both runways and is a coordination waypoint for L30 CYN and DAG sectors)
- JFFAR (placement is for design criteria/provides terrain avoidance)
- RADYR (placement is to tie in to KLAS procedure)
- BLACK (placement is to segregate from KLAS arrivals over WHIGG and to tie into Los Angeles International Airport [KLAX] arrivals)

Blythe (BLH) Transition (ATC assigned only transition for weather avoidance)

- OYODA (placement provides a common transition point for both runways and is a coordination waypoint for L30 CYN and DAG sectors)
- JFFAR (placement is for design criteria/provides terrain avoidance)
- RADYR (placement is to tie in to KLAS procedure)
- BLACK (placement is to segregate from KLAS arrivals over WHIGG)
- DOYYL (provides continuity with BOJAC transition)
- ZELMA (existing waypoint to avoid Military Operation Areas [MOAs])
- BLH (existing ground-based navigational aid [VORTAC]/used as a tie-in point for weather reroutes to southeastern destinations)

BOJAC Transition (ATC assigned only transition for weather avoidance)

- OYODA (placement provides a common transition point for both runways and is a coordination waypoint for L30 CYN and DAG sectors)
- JFFAR (placement is for design criteria/provides terrain avoidance)
- RADYR (placement is to tie in to KLAS procedure)
- DOYYL (provides ATC flexibility for sequencing)
- BOJAC (used as a tie-in point for weather reroutes to southeastern destinations)

Hector (HEC) Transition

- OYODA (placement provides a common transition point for both runways and is a coordination waypoint for L30 CYN and DAG sectors)
- JFFAR (placement is for design criteria/provides terrain avoidance)
- RADYR (placement is to tie in to KLAS procedure)
- SLVRR (provides continuity with SLVRR transition)
- TOPAC (waypoint placement for crossing restriction to segregate from KHND NTNDO STAR)
- HEC (existing VORTAC/used for aircraft destined to the west of Los Angeles and to avoid restricted airspace)

KENNO Transition:

- OYODA (placement provides a common transition point for both runways and is a coordination waypoint for L30 CYN and DAG sectors)
- JFFAR (placement is for design criteria/provides terrain avoidance)

- JOHKR (placement is to tie in to KLAS procedure)
- GRYMZ (placement is to segregate from Special Use Airspace [SUA], Q13/15 Amend, and KHND GAMES STAR)
- DEDPL (to be used, if necessary, to segregate from Nellis Air Traffic Control Facility [NATCF] LEE Sector [A7 shelf] and to segregate from SUA, Q13/15 Amend, and KHND GAMES STAR)
- BIKKR (ties in to Q Route structure and segregates from KHND GAMES STAR)
- CAGEE (at or above 100 for terrain/placement is to segregate from SUA, Q13/15 Amend, and KHND GAMES STAR)
- KENNO (SID termination waypoint/placement is to segregate from SUA, Q13/15 Amend, and KHND GAMES STAR)

LVELL Transition

- OYODA (placement provides a common transition point for both runways and is a coordination waypoint for L30 CYN and DAG sectors)
- JFFAR (placement is for design criteria/provides terrain avoidance)
- RADYR (placement is to tie in to KLAS procedure)
- BLACK (placement is to segregate from KLAS arrivals over WHIGG)
- DOYYL (provides continuity with BOJAC transition)
- ZELMA (existing waypoint to avoid MOAs)
- JOTNU (existing waypoint to avoid MOAs)
- LVELL (existing waypoint to join San Diego area, Los Angeles area, Mexico and other western/southwestern destinations)

SLVRR Transition

- OYODA (placement provides a common transition point for both runways and is a coordination waypoint for L30 CYN and DAG sectors)
- JFFAR (placement is for design criteria/provides terrain avoidance)
- RADYR (placement is to tie in to KLAS procedure)SLVRR (transition for Los Angeles area airports, excluding KLAX)

Additional Design Considerations

- The KHND OYODA SID concept was validated by the D&I Team via Human in the Loop Simulation (HITLS)
- Spectrum analysis will be required for the proposed airspace changes associated with the proposed SID
- This procedure will be used by RNAV-equipped turbojet aircraft only and is not anticipated to change runway usage
    - The following chart notes will be included with this procedure:
        - For turbojet aircraft only

Las Vegas OAPM Design Package
KHND OYODA (PALLY) SID

The OYODA SID affects the following facility area(s) as indicated:

- ZLA Sectors: 6, 10, 16, 17, 35, 37, 39, 53, 60
- ZOA Sectors: 33, 46
- L30 Sectors: CYN, DAG, GNT, FNL, SAT, LAK
- KHND

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND and KVGT.

Document changes/modifications include:

- Departure SID filings with airline dispatchers
- ZLA Facility Operations and Administration Order 7210.3
- ZOA Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- ZLA/ L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZOA LOA
- LAS/L30/HND LOA
- ZLA Standard Operating Procedures (SOP)
- ZOA SOP
- L30 SOP
- ERAM and STARS automation changes (ADRS, ADAR, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- NAS Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Terminal Procedures
    - TARGETS Distribution Package
    - Flight Simulator Worksheet
    - RNAV Pro analysis results (may be completed during Evaluation Phase)
    - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh 4/23/19 — 4/23/19

Bradley R. Mayhugh — Date — Chris Thomas — Date

LAS FAA Lead — LAS NATCA Lead

Anita Engelmann 4/25/19 — 23APR19

Anita Engelmann — Date — Dan Hauptman — Date

TWAB Representative — L30 NATCA POC

23 APR 19

Chris Iwanski — Date

LAS NATCA POC

Las Vegas OAPM Design Package

KHND SCAMR SID

An Area Navigation (RNAV) Standard Instrument Departure (SID) is a procedure that serves as a lateral path for aircraft departing from an airport. RNAV SIDs are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports.

Henderson Executive Airport (KHND) departures to eastern destinations will use a new flight path procedure called the SCAMR (pronounced "Scam-mer") RNAV SID. The SCAMR SID will replace the current ACSIN (pronounced "Ack-sin") RNAV SID.

The Las Vegas Metroplex Study Team (MST) identified the need for an efficient departure procedure that utilizes modern technologies. The SCAMR SID is developed around advanced navigation concepts, which will provide climbs that are more continuous.

This procedure is not anticipated to change runway usage. The SCAMR SID will increase flight path predictability and will decrease controller/pilot workload and task complexity, which will enhance safety.

The new SCAMR SID addresses KHND. Additionally, other procedures are being proposed that will serve nearby airports in a similar manner, providing a more safe and efficient operation for all airports in the Las Vegas Valley.

Las Vegas OAPM Design Package

KHND SCAMR SID

Name of Change and Airport(s)	Change Classification
Henderson Executive Airport (KHND) SCAMR Area Navigation (RNAV) Standard Instrument Departure (SID)	**Terminal Procedure; SID**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.5.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 7, 8, 35, 36, 53, 54, 55 **Salt Lake City ARTCC (ZLC) Sectors: 33, 34, 44, 46** **Denver ARTCC (ZDV) Sectors: 23, 24, 36, 68** **Albuquerque ARTCC (ZAB) Sectors: 37, 43, 45, 67, 92** **Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: CYN, DAG, MED, LAK** **Nellis Air Traffic Control Facility (NATCF)** **KHND**	**McCarran International Airport (KLAS) RASLR, RATPK, NIITZ and GIDGT SIDs**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results** **Human in the Loop Simulation (HITLS) results**	

Purpose

The purpose of the proposed procedure is to address the issues identified by the Las Vegas Metroplex Study Team (MST).

Study Team Issues and Solutions

Issues

Stakeholders requested procedures for the Las Vegas satellite airports, which provide predictable, repeatable course guidance and reduce dependencies between operations at neighboring airports. The MST designed conceptual Standard Terminal Arrival Routes (STARs) and SIDs for KHND and North Las Vegas Airport (KVGT).

Las Vegas OAPM Design Package

KHND SCAMR SID

MST Recommendation

The MST worked extensively with the National Business Aviation Association (NBAA) to design efficient Runway 17R and Runway 35L departure procedures. The MST created four conceptual RNAV SIDs (KHND E SID, KHND NE SID, KHND SE SID, and KHND SW/NW SID) (See Figure 1). Mountainous terrain near the KHND airport was a primary concern in developing these procedures.

To provide common en route transitions, the KHND SIDs follow conceptual KLAS SIDs. L30 and ZLA expressed concerns about mountainous terrain for Runway 35L departure procedures and gaps in surveillance coverage on the KHND SW/NW SID.

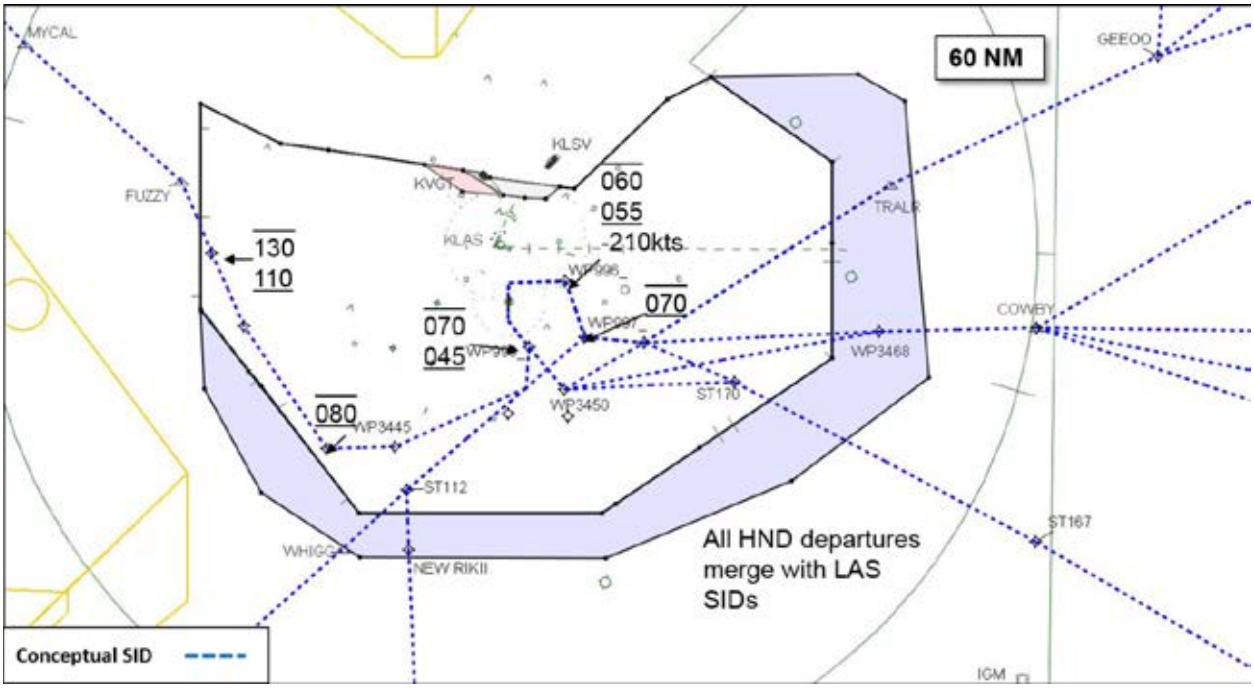


Figure 1: MST KHND Conceptual SIDs

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) used the MST recommendation as the basis for the initial design proposal, considering both the issues and recommendations.

The D&I Team decided to design two SIDs (SCAMR and OYODA) in order to reduce ATC complexity and chart clutter caused by too many transitions.

The top altitude of the SCAMR SID is 060 to segregate from KLAS procedures.

Las Vegas OAPM Design Package
KHND SCAMR SID

The KHND SCAMR SID is depicted in Figure 2.

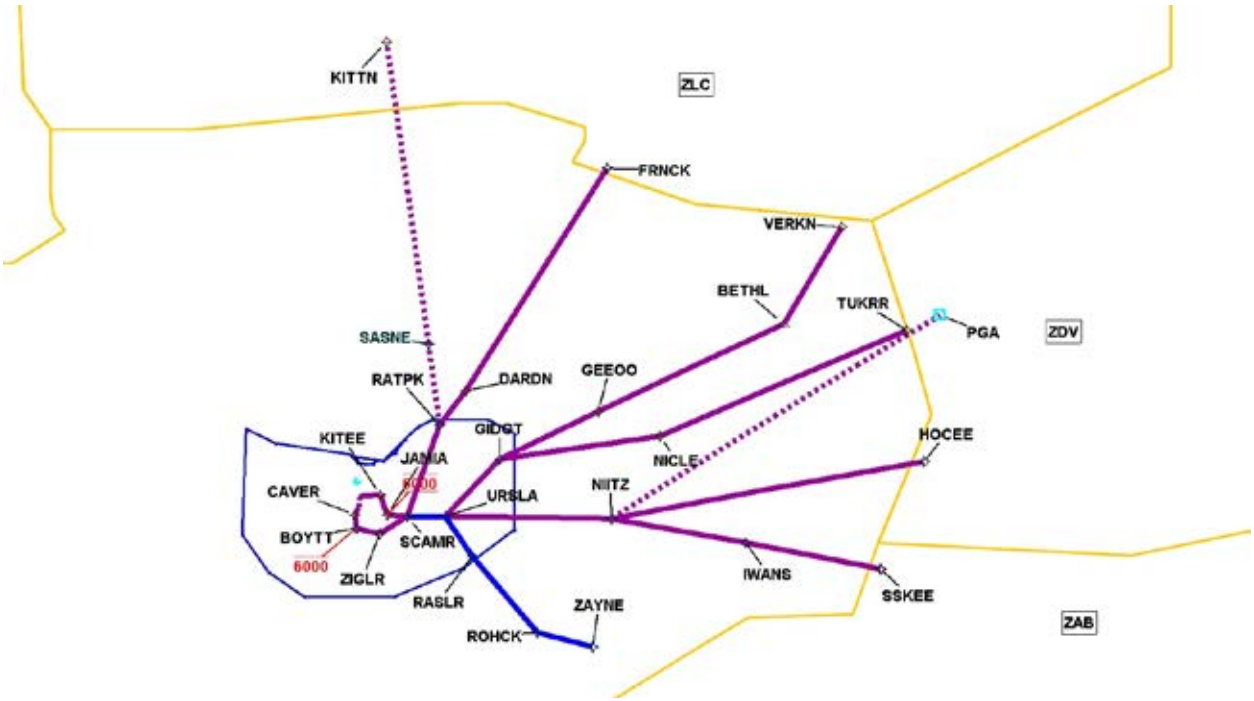


Figure 2: KHND SCAMR SID - Proposed Final Design

Runway Transitions

KHND Runway 17R Transition (VICF leg)

- CAVER (existing waypoint/provides terrain avoidance)
- BOYTT (at or below 060 to segregate from KLAS RKSTR and CHOWW STARs and KLAS NIITZ and RASLR SIDs/provides terrain avoidance)
- ZIGLR (provides terrain avoidance)
- SCAMR (placement provides a common transition point for both runways and is a coordination waypoint for L30)

KHND Runway 35L Transition (VICF leg)

- KITEE (existing waypoint/provides terrain avoidance and utilized for segregation from KLAS final to Runways 26L/R and departures off Runways 08L/R)
- JAMIA (at 060 to segregate from KLAS JOHKR, RADYR and RATPK SIDs, and from KLAS COKTL, RNDRZ and CHOWW STARs)
- SCAMR (placement provides a common transition point for both runways and is a coordination waypoint L30)

En Route Transitions

Las Vegas OAPM Design Package
KHND SCAMR SID

FRNCK Transition (for aircraft transitioning to ZLC)

- SCAMR (placement provides a common transition point for both runways and is a coordination waypoint for L30)
- RATPK (joins same lateral tracks as the KLAS RATPK SID)
- DARDN (joins same lateral tracks as the KLAS RATPK SID)
- FRNCK (joins same lateral tracks as the KLAS RATPK SID)

HOCEE Transition (for aircraft transitioning to ZDV)

- SCAMR (placement provides a common transition point for both runways and is a coordination waypoint for L30)
- URSLA (segregates from KLAS CHOWW and RKSTR STARs/serves as transition point to join same lateral tracks as the KLAS GIDGT, NIITZ and RASLR SIDs)
- NIITZ (coordination waypoint)
- HOCEE (joins same lateral tracks as the KLAS NIITZ SID)

IWANS Transition (for aircraft transitioning to Phoenix Sky Harbor Airport (KPHX) and Phoenix Terminal satellite airports):

- SCAMR (placement provides a common transition point for both runways and is a coordination waypoint for L30)
- URSLA (segregates from KLAS CHOWW and RKSTR STARs/serves as transition point to join same lateral tracks as the KLAS GIDGT, NIITZ and RASLR SIDs)
- NIITZ (coordination waypoint)
- IWANS (joins same lateral tracks as the KLAS NIITZ SID)

KITTN Transition (ATC assigned only/utilized to reduce track miles when Special Use Airspace (SUA) is not in use)

- SCAMR (placement provides a common transition point for both runways and is a coordination waypoint for L30)
- RATPK (joins same lateral tracks as the KLAS RATPK SID)
- SASNE (joins same lateral tracks as the KLAS RATPK SID)
- KITTN (joins same lateral tracks as the KLAS RATPK SID)

PGA Transition (ATC assigned only/utilized for weather avoidance for aircraft transitioning to the Northeast)

- SCAMR (placement provides a common transition point for both runways and is a coordination waypoint for L30)
- URSLA (segregates from KLAS CHOWW and RKSTR STARs/serves as transition point to join same lateral tracks as the KLAS GIDGT, NIITZ and RASLR SIDs)
- NIITZ (coordination waypoint)
- PGA (closely aligns with the KLAS NIITZ SID, TUKKR transition lateral track)

Las Vegas OAPM Design Package

KHND SCAMR SID

SSKEE Transition (for aircraft transitioning to ZAB airspace)

- SCAMR (placement provides a common transition point for both runways and is a coordination waypoint for L30)
- URSLA (segregates from KLAS CHOWW and RKSTR STARs/serves as transition point to join same lateral tracks as the KLAS GIDGT, NIITZ and RASLR SIDs)
- NIITZ (coordination waypoint)
- IWANS (joins same lateral tracks as the KLAS NIITZ SID)
- SSKEE (joins same lateral tracks as the KLAS NIITZ SID)

TUKRR Transition (for aircraft transitioning to ZDV)

- SCAMR (placement provides a common transition point for both runways and is a coordination waypoint for L30)
- GIDGT (coordination waypoint for L30)
- NICLE (joins same lateral tracks as the KLAS GIDGT SID)
- TUKRR (joins same lateral tracks as the KLAS GIDGT SID)

VERKN Transition (for aircraft transitioning to ZLC)

- SCAMR (placement provides a common transition point for both runways and is a coordination waypoint for L30)
- URSLA (segregates from KLAS CHOWW and RKSTR STARs/serves as transition point to join same lateral tracks as the KLAS GIDGT, NIITZ and RASLR SIDs)
- GIDGT (coordination waypoint for L30)
- GEEOO (joins same lateral tracks as the KLAS GIDGT SID)
- BETHL (joins same lateral tracks as the KLAS GIDGT SID)
- VERKN (joins same lateral tracks as the KLAS GIDGT SID)

ZAYNE Transition (for aircraft transitioning to KPHX

- SCAMR (placement provides a common transition point for both runways and is a coordination waypoint for L30)
- URSLA (segregates from KLAS CHOWW and RKSTR STARs/serves as transition point to join same lateral tracks as the KLAS GIDGT, NIITZ and RASLR SIDs)
- RASLR (coordination waypoint for L30)
- ROHCK (joins same lateral tracks as the KLAS RASLR SID)
- ZAYNE (joins same lateral tracks as the KLAS RASLR SID)

Additional Design Considerations

- The KHND SCAMR SID concept was validated by the D&I Team via Human in the Loop Simulation (HITLS)
- Spectrum analysis will be required for the proposed airspace changes associated with the proposed SID

- This procedure will be used by RNAV-equipped turbojet aircraft only and is not anticipated to change runway usage
    - The following chart notes will be included with this procedure:
        - For turbojet aircraft only

The SCAMR SID affects the following facility area(s) as indicated:

- ZLA Sectors: 7, 8, 35, 36, 53, 54, 55
- ZLC Sectors: 33, 34, 44, 46
- ZDV Sectors: 23, 24, 36, 68
- ZAB Sectors: 37, 43, 45, 67, 92
- L30 Sectors: CYN, DAG, MED, LAK
- NATCF
- KHND

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND and KVGT.

Document changes/modifications include:

- Departure SID filings with airline dispatchers
- ZLA Facility Operations and Administration Order 7210.3
- ZLC Facility Operations and Administration Order 7210.3
- ZDV Facility Operations and Administration Order 7210.3
- ZAB Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- VGT Facility Operations and Administration Order 7210.3
- ZLA/ L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZLC LOA
- ZLA/ZDV LOA
- ZLA/ZAB LOA
- L30/LAS/HND LOA
- ZLA Standard Operating Procedures (SOP)
- ZLC SOP
- ZDV SOP
- ZAB SOP
- L30 SOP
- HND SOP
- VGT SOP
- ERAM and STARS automation changes (ADRS, ADAR, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)

Las Vegas OAPM Design Package
KHND SCAMR SID

- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- NAS Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Terminal Procedures
    - TARGETS distribution package
    - Flight Simulator worksheet
    - RNAV Pro analysis results (may be completed during Evaluation Phase)
    - HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh 4/23/19 — 4/23/19

Bradley R. Mayhugh — Date — Chris Thomas — Date

LAS FAA Lead — LAS NATCA Lead

Anita Engelmann 4/25/19 — 23APR19

Anita Engelmann — Date — Dan Hauptman — Date

TWAB Representative — L30 NATCA POC

23 APR 19

Chris Iwanski — Date

LAS NATCA POC

Las Vegas OAPM Design Package

KLAS BLAID STAR

The Las Vegas Metroplex Project (Project) was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures into and out of Las Vegas area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures. Extensive changes were made to designated airspace in air traffic control sectors at the Las Vegas Terminal Radar Approach Control (L30 TRACON) and the Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

RNAV procedures can only be flown by properly equipped aircraft and certified aircrews. For those aircraft that are unable to take advantage of satellite navigation procedures, conventional procedures using ground-based radio signals are currently, and will continue to be, available for use. While RNAV usage continues to increase, it is necessary to provide aircraft using older technologies navigational direction that will integrate them into a system designed for the 21st Century. To maintain the benefits gained by the development of RNAV procedures, the Project made changes to existing ground-based conventional procedures that will provide similar paths for all aircraft arriving at or departing from area airports.

The Project's team reviewed the McCarran International Airport's (KLAS) CHOWW RNAV STAR and the conventional LUXOR TWO STAR. A new lateral path was developed to more closely align the conventional arrival with the newly developed RNAV STAR. The BLAID ONE STAR will replace the LUXOR TWO STAR, providing conventionally equipped aircraft a similar arrival path as RNAV capable flights from the northeast. The BLAID ONE STAR will serve KLAS.

KLAS BLAID (LUXOR) STAR

Las Vegas OAPM Design Package

KLAS BLAID STAR

Name of Change and Airport(s)	Change Classification
McCarran International Airport (KLAS) **BLAID ONE Conventional Standard Terminal Arrival Route (STAR)**	**Terminal Procedure; STAR**
OAPM Study Team Reference(s)	**Current Phase of Design**
N/A	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 7, 54, 55 **Denver ARTCC (ZDV) Sectors: 23, 24, 36, 68** **Salt Lake City ARTCC (ZLC) Sectors: 33, 34, 44, 46** **Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: LAK, FNL, SAT** **KLAS** **KVGT** **KHND** **KBLD**	**KLAS CHOWW STAR**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results** **Human in the Loop Simulation (HITLS) results**	

Purpose

The BLAID ONE STAR will provide an arrival procedure that merges KLAS, North Las Vegas Airport (KVGT), Henderson Executive Airport (KHND) and Bolder City Municipal Airport (KBLD) conventional arrivals into a similar traffic flow with RNAV aircraft utilizing the KLAS CHOWW STAR. The integration of conventional and RNAV procedures will maintain airspace integrity and reduce complexity. The BLAID ONE STAR will replace the LUXOR TWO STAR.

Study Team Recommendation

The Las Vegas Metroplex Study Team (MST) did not address amendments to conventional procedures.

Las Vegas OAPM Design Package

KLAS BLAID STAR

<u>Proposed Final Design</u>

The Las Vegas Metroplex Design and Implementation Team (D&I Team) designed the BLAID ONE STAR to serve conventional arrivals from the northeast to all runways at KLAS. The BLAID ONE STAR will replace the existing LUXOR TWO STAR.

The KLAS BLAID ONE STAR is depicted in Figure 1 and with KLAS CHOWW RNAV STAR in Figure 2.

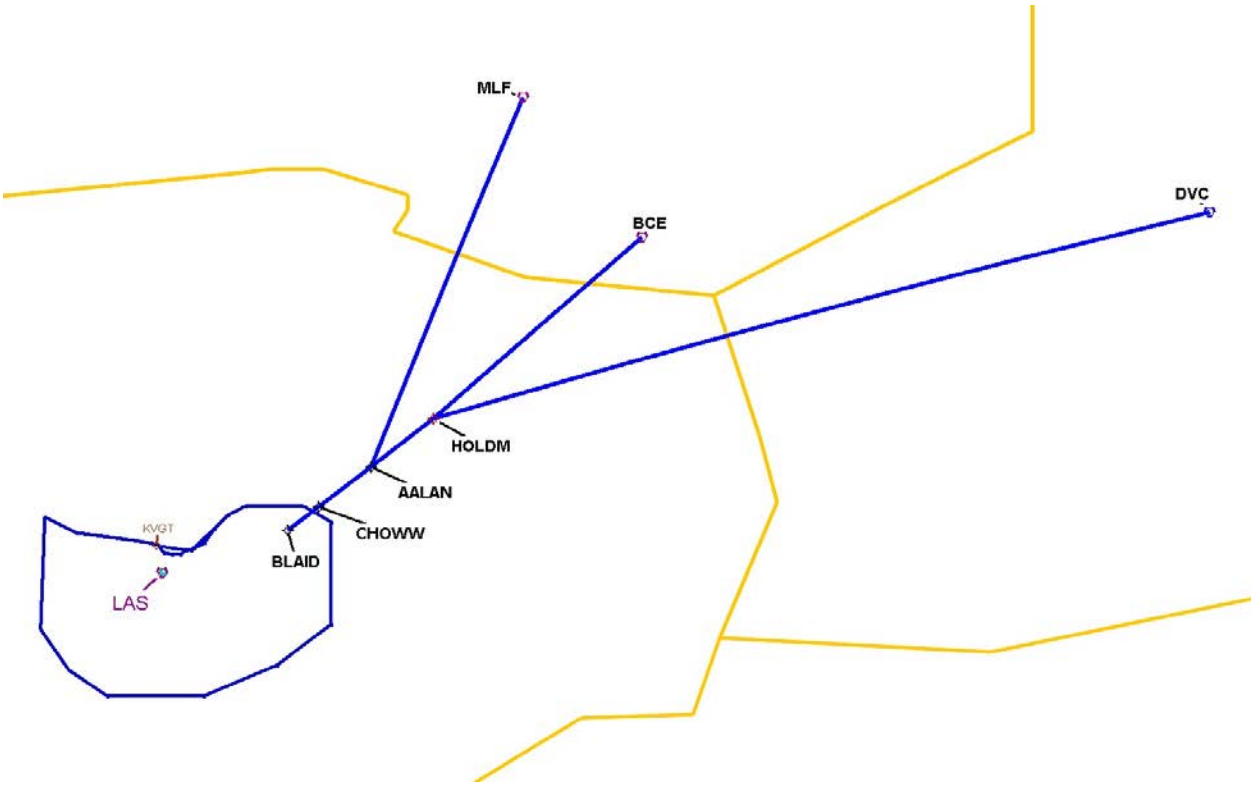


Figure 1: KLAS BLAID ONE Conventional STAR

KLAS BLAID (LUXOR) STAR

Las Vegas OAPM Design Package

KLAS BLAID STAR

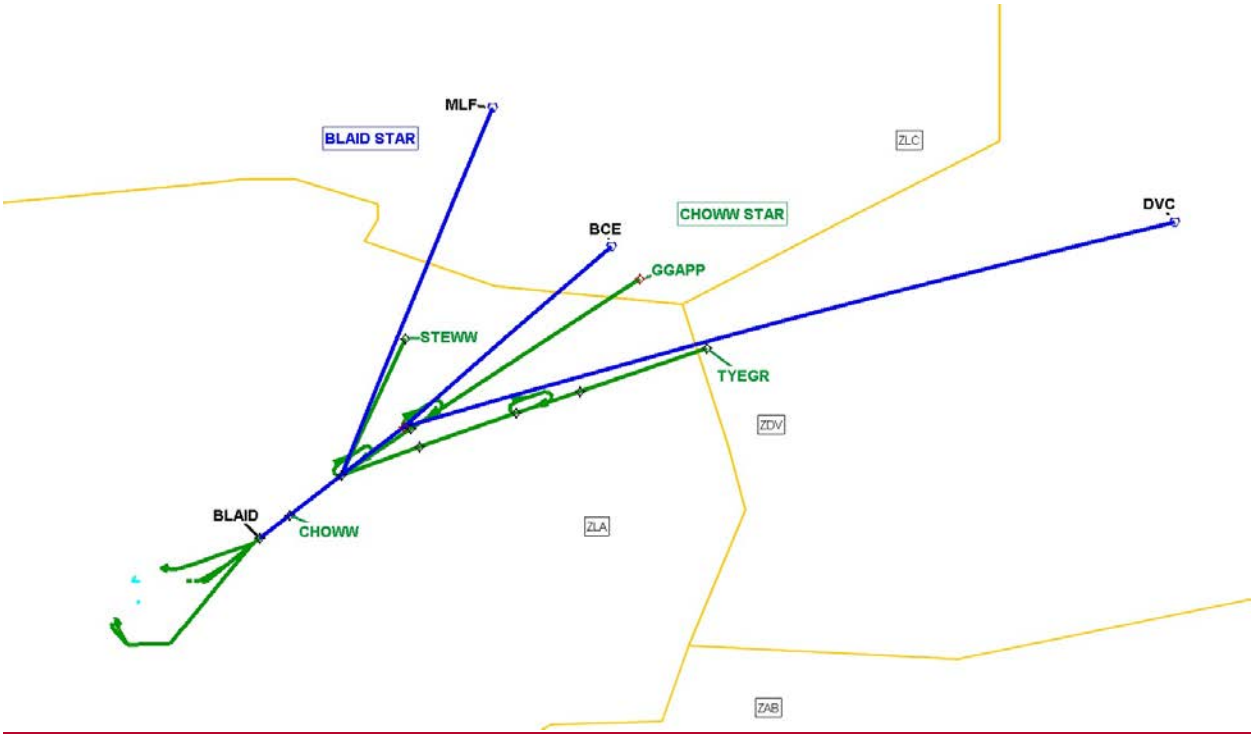


Figure 2: KLAS BLAID ONE Conventional STAR and KLAS CHOWW RNAV STAR

The BLAID ONE STAR's lateral paths are listed below:

<u>BCE Transition</u>

- BCE
- HOLDM (364907.73N-1133230.82W)
- AALANX (363516.97N-1135503.78W)
- CHOWX (362341.51N-1141344.92W)
- BLAID (361656.85N-1142432.12W)

<u>DVC Transition</u> ~~Verify Beth designing this transition~~

- DVC
- HOLDM (364907.73N-1133230.82W)
- AALANX (363516.97N-1135503.78W)
- CHOWX (362341.51N-1141344.92W)
- BLAID (361656.85N-1142432.12W)

<u>MLF Transition</u>

- MLF
- AALANX (363516.97N-1135503.78W)

KLAS BLAID (LUXOR) STAR

KLAS BLAID STAR

- CHOWX (362341.51N-1141344.92W)
- BLAID (361656.85N-1142432.12W)

After BLAID, arrivals will be assigned radar vectors to the appropriate runway.

Additional Design Considerations

- This procedure is not anticipated to change runway usage.
    - The following chart notes will be included with this procedure:
        - Turbojets only
        - DME required
        - Lost communications - Proceed to BLD and hold

The BLAID STAR affects the following facility area(s) as indicated:

- ZLA Sectors: 7, 54, 55
- ZDV Sectors: 23, 24, 36, 68
- ZLC Sectors: 33, 34, 44, 46
- L30 Sectors: LAK, FNL, SAT

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND, KVGT and KBLD.

Document changes/modifications include:

- ZLA Facility Operations and Administration Order 7210.3
- ZDV Facility Operations and Administration Order 7210.3
- ZLC Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- VGT Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZDV LOA
- ZLA/ZLC LOA
- ZLA Standard Operating Procedures (SOP)
- ZDV SOP
- ZLC SOP
- L30 SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)

KLAS BLAID (LUXOR) STAR

- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- TARGETS distribution package
- Flight Simulator worksheet
- RNAV Pro analysis results
- HITLS results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date
Chris Iwanski LAS NATCA POC	23 APR 19 Date		

Las Vegas OAPM Design Package

KLAS GRMMA STAR

The Las Vegas Metroplex Project was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures into and out of Las Vegas area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures. Extensive changes were made to designated airspace in air traffic control sectors at the Las Vegas Terminal Radar Approach Control (L30 TRACON) and the Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

RNAV procedures can only be flown by properly equipped aircraft and certified aircrews. For those aircraft that are unable to take advantage of satellite navigation procedures, conventional procedures using ground-based radio signals are currently, and will continue to be, available for use. While RNAV usage continues to increase, it is necessary to provide aircraft using older technologies navigational direction that will integrate them into a system designed for the 21st Century. To maintain the benefits gained by the development of RNAV procedures, the Project made changes to existing ground-based conventional procedures that will provide similar paths for all aircraft arriving at or departing from area airports.

The Project's team reviewed the McCarran International Airport's (KLAS) RNDRZ RNAV STAR and the conventional CLARR THREE STAR. A new lateral path was developed to more closely align the conventional arrival with the newly developed RNAV STAR. The GRMMA ONE STAR will replace the CLARR THREE STAR, providing conventionally equipped aircraft a similar arrival path as RNAV capable flights from the northeast. The GRMMA ONE STAR will serve KLAS.

Las Vegas OAPM Design Package

KLAS GRMMA STAR

Name of Change and Airport(s)	Change Classification
McCarran International Airport (KLAS) GRMMA ONE Conventional Standard Terminal Arrival Route (STAR)	Terminal Procedure; STAR
OAPM Study Team Reference(s)	**Current Phase of Design**
N/A	☐ Preliminary Operational Design (PD) ☒ Proposed Final Design (PFD)
Package Date	**Implementation Date**
5/31/2019	5/21/2020
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 6, 10, 17, 37, 38, 39 Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: GNT, FNL, SAT, DAG, MED KLAS KVGT	KLAS RNDRZ STAR
Associated Data Files	
TARGETS output packages Flight Simulator worksheet RNAV Pro analysis results Human in the Loop Simulation (HITLS)results	

Purpose

The GRMMA ONE STAR will provide an arrival procedure that merges KLAS and North Las Vegas Airport (KVGT) conventional arrivals into a similar traffic flow with RNAV aircraft utilizing the KLAS RNDRZ STAR. The integration of conventional and RNAV procedures will maintain airspace integrity and reduce complexity. The GRMMA ONE STAR will replace the CLARR THREE STAR.

Study Team Recommendation

The Las Vegas Metroplex Study Team (MST) did not address amendments to conventional procedures.

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) designed the GRMMA ONE STAR to serve conventional arrivals from the southwest to all runways at KLAS and KVGT. The GRMMA ONE STAR will replace the existing CLARR THREE STAR (Figure 1).

KLAS GRMMA (CLARR) STAR

Las Vegas OAPM Design Package

KLAS GRMMA STAR

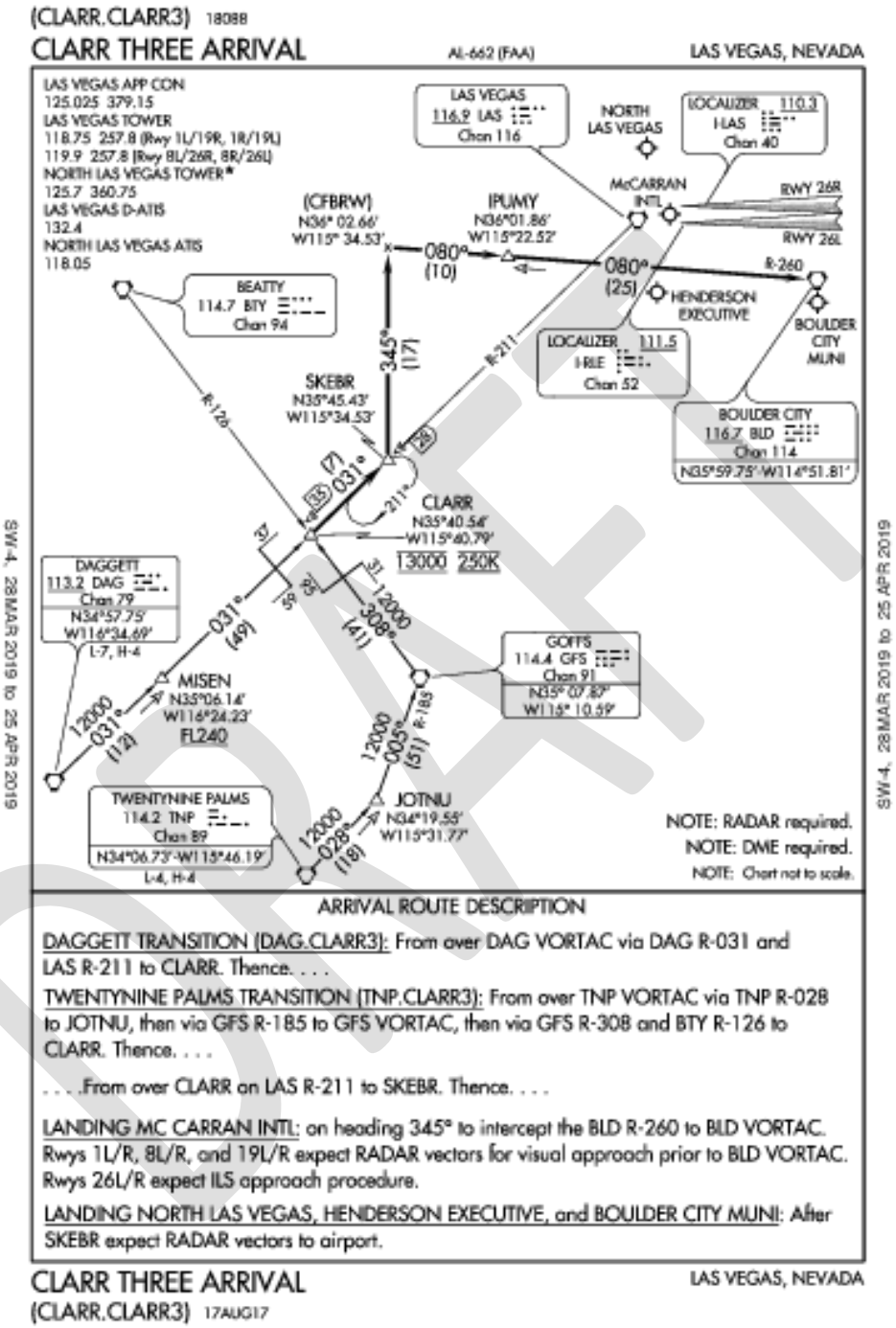


Figure 1: KLAS CLARR THREE – Current Conventional STAR

The KLAS RNDRZ STAR and the GRMMA ONE STAR are depicted in Figure 2.

KLAS GRMMA (CLARR) STAR

Las Vegas OAPM Design Package

KLAS GRMMA STAR

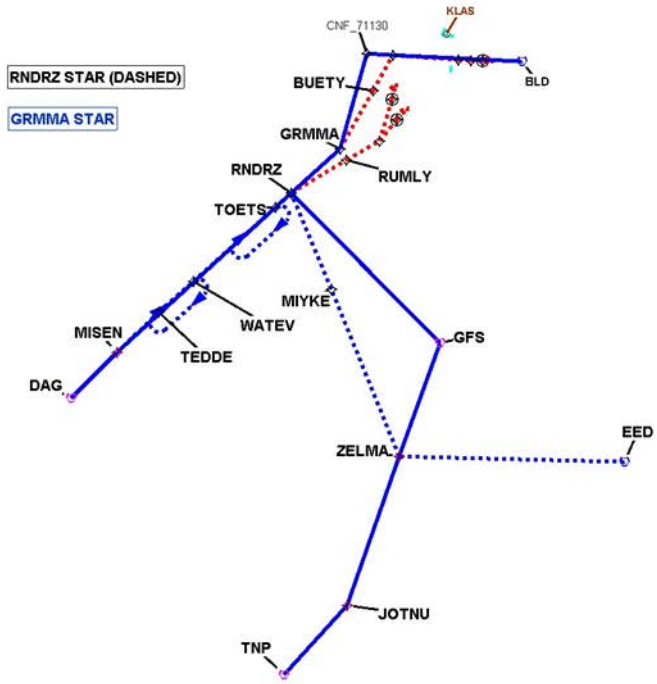


Figure 2: KLAS RNDRZ STAR and GRMMA ONE Conventional STAR

The GRMMA ONE STAR's lateral path is listed below:

<u>DAG Transition</u>

- DAG
- MISEN
- RNDRZ (353529.34N-1154426.45W)
- GRNMA (354342.10N-1153320.35W)
- DF Heading to CNF (360112.49N-1152711.16W) (Replacing CFBRW)
- CNF
- ENNVY (360058.51N-1152114.95W)
- BLD

<u>TNP Transition</u>

- TNP
- JOTNU
- ZELMA
- GFS
- RNDRZ
- GRMMA
- 005 heading to intercept BLD 258 radial at waypoint CNF_WP71130
- BLD

KLAS GRMMA (CLARR) STAR

After BLD, arrivals will be assigned radar vectors to the appropriate runway.

Additional Design Considerations

- This procedure is not anticipated to change runway usage and is not anticipated to modify flight paths below 3,000 feet Above Ground Level (AGL)
    - The following chart notes will be included with this procedure:
        - DME required
        - Lost communications - Proceed to BLD and hold

The GRMMA STAR affects the following facility area(s) as indicated:

- ZLA Sectors: 6, 10, 17, 37, 38, 39
- L30 Sectors: GNT, FNL, SAT, DAG, MED
- KLAS
- KVGT

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS and KVGT.
Document changes/modifications include:

- ZLA Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- VGT Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA Standard Operating Procedures (SOP)
- L30 SOP
- VGT SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

KLAS GRMMA (CLARR) STAR

Las Vegas OAPM Design Package

KLAS GRMMA STAR

- TARGETS distribution package
- Flight Simulator worksheet
- RNAV Pro analysis results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date
Chris Iwanski LAS NATCA POC	23 APR 19 Date		

Las Vegas OAPM Design Package

KLAS ISHEE STAR

The Las Vegas Metroplex Project (Project) was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures into and out of Las Vegas area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures. Extensive changes were made to designated airspace in air traffic control sectors at the Las Vegas Terminal Radar Approach Control (L30 TRACON) and the Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

RNAV procedures can only be flown by properly equipped aircraft and certified aircrews. For those aircraft that are unable to take advantage of satellite navigation procedures, conventional procedures using ground-based radio signals are currently, and will continue to be, available for use. While RNAV usage continues to increase, it is necessary to provide aircraft using older technologies navigational direction that will integrate them into a system designed for the 21st Century. To maintain the benefits gained by the development of RNAV procedures, the Project made changes to existing ground-based conventional procedures that will provide similar paths for all aircraft arriving at or departing from area airports.

The Project's team reviewed the McCarran International Airport's (KLAS) RKSTR RNAV STAR and the conventional KADDY TWO STAR. A new lateral path was developed to more closely align the conventional arrival with the newly developed RNAV STAR. The ISHEE ONE STAR will replace the KADDY TWO STAR, providing conventionally equipped aircraft a similar arrival path as RNAV capable flights from the northeast. The ISHEE ONE STAR will serve KLAS.

Las Vegas OAPM Design Package

KLAS ISHEE STAR

Name of Change and Airport(s)	Change Classification
McCarran International Airport (KLAS) **ISHEE ONE Standard Terminal Arrival Route (STAR)**	**Terminal Procedure; STAR**
OAPM Study Team Reference(s)	**Current Phase of Design**
N/A	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 8, 35 **Albuquerque ARTCC (ZAB) Sectors: 43, 45, 67, 92** **Denver ARTCC (ZDV) Sectors: 23, 24, 36 and 68** **Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: LAK** **KLAS**	**KLAS RKSTR STAR**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results**	

Purpose

The KLAS ISHEE ONE STAR will merge KLAS conventional arrivals into a similar traffic flow with RNAV aircraft utilizing the KLAS RKSTR STAR. The integration of conventional and RNAV procedures will maintain airspace integrity and reduce complexity. The ISHEE ONE STAR will replace the KADDY TWO STAR.

Study Team Recommendation

The Las Vegas Metroplex Study Team (MST) did not address amendments to conventional procedures.

Proposed Final Design

Las Vegas OAPM Design Package

KLAS ISHEE STAR

The Las Vegas Metroplex Design and Implementation Team (D&I Team) designed the ISHEE ONE STAR to serve conventional arrivals from the southeast to all runways at KLAS. The ISHEE ONE STAR will replace the existing KADDY TWO STAR (Figure 1).

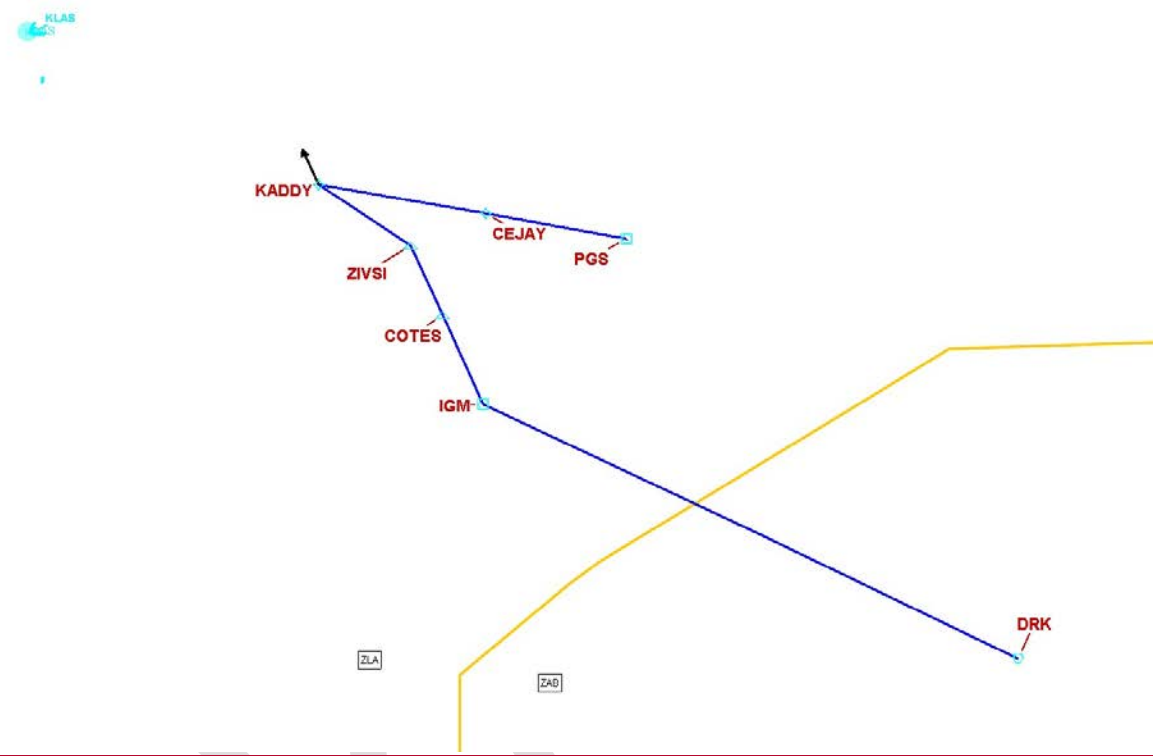


Figure 1: KLAS KADDY TWO Current Conventional STAR

The KLAS RKSTR STAR and the ISHEE ONE STAR are depicted in Figure 2.

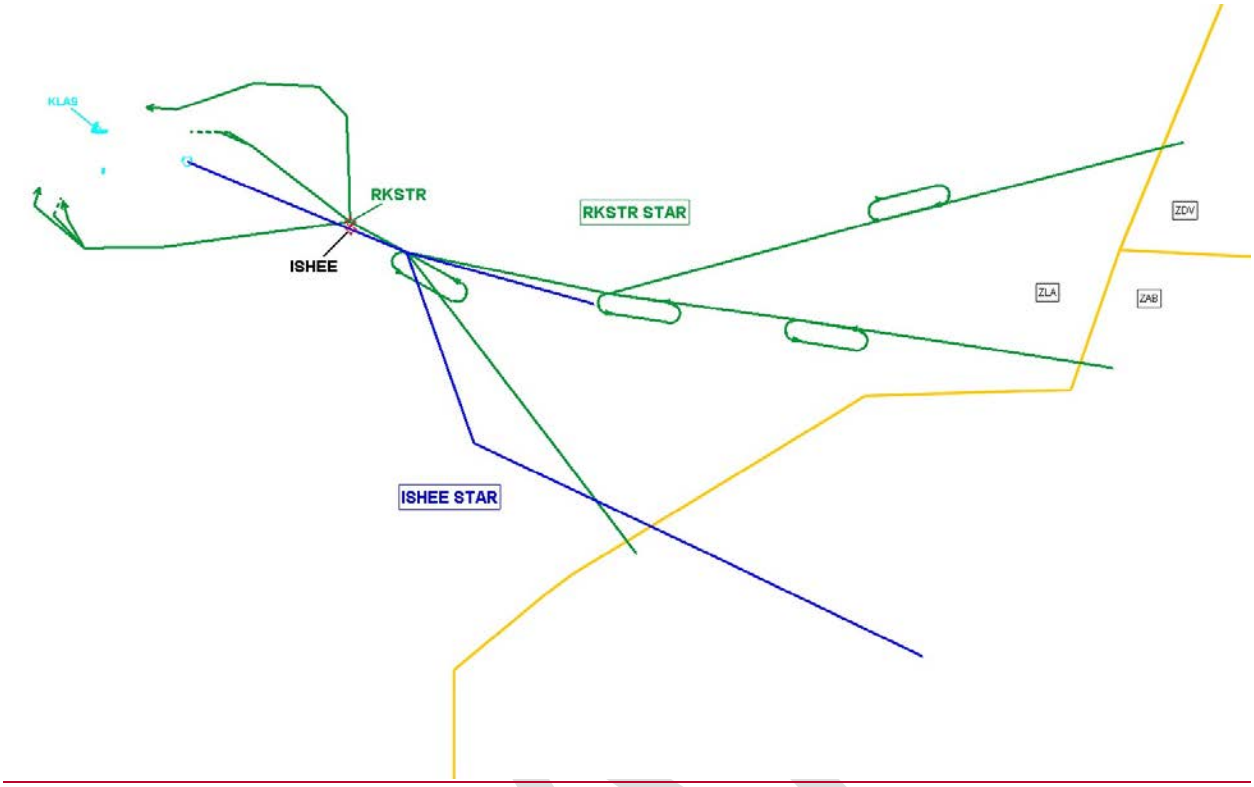


Figure 2: KLAS RKSTR STAR and ISHEE ONE Conventional STAR

The ISHEE ONE STAR's lateral path is listed below:

DRK Transition

- DRK
- IGM
- PEHTY (354530.55N-1140911.11W)
- ISHEE (354907.50N-1141954.95W)
- BLD

PGS Transition

- PGS
- PEHTY (354530.55N-1140911.11W)
- ISHEE (354907.50N-1141954.95W)
- BLD

After BLD, arrivals will be assigned radar vectors to the appropriate runway.

Additional Design Considerations

This procedure is not anticipated to change runway usage.

- The following chart notes will be included with this procedure:
  - Turbojets only
  - DME required
  - Lost communications - Proceed to BLD and hold (Hold S, RT R150, 330 Inbound)

<u>Implementation Dependencies</u>

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS.

- ZLA Sectors: 8, 35
- ZAB Sectors: 43, 45, 67, 92
- ZDV Sectors: 23, 24, 36 and 68
- L30 TRACON Sectors: LAK
- KLAS

Document changes/modifications include:

- ZLA Facility Operations and Administration Order 7210.3
- ZDV Facility Operations and Administration Order 7210.3
- ZAB Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZDV LOA
- ZLA/ZAB LOA
- ZLA Standard Operating Procedures (SOP)
- ZDV SOP
- ZAB SOP
- L30 SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- TARGETS distribution package
- Flight Simulator worksheet
- RNAV Pro analysis results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date
Chris Iwanski LAS NATCA POC	23 APR 19 Date		

Las Vegas OAPM Design Package

KLAS PUMLE STAR

The Las Vegas Metroplex Project (Project) was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures in to and out of Las Vegas area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures. Extensive changes were made to designated airspace in air traffic control sectors at the Las Vegas Terminal Radar Approach Control (L30 TRACON) and the Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

RNAV procedures can only be flown by properly equipped aircraft and certified aircrews. For those aircraft that are unable to take advantage of satellite navigation procedures, conventional procedures using ground-based radio signals are currently, and will continue to be, available for use. While RNAV usage continues to increase, it is necessary to provide aircraft using older technologies navigational direction that will integrate them into a system designed for the 21st Century. To maintain the benefits gained by the development of RNAV procedures, the Project made changes to existing ground-based conventional procedures that will provide similar paths for all aircraft arriving at or departing from area airports.

The Project's team reviewed the McCarran International Airport's (KLAS) COKTL RNAV STAR and the conventional FUZZY EIGHT STAR. A new lateral path was developed to more closely align the conventional arrival with the newly developed RNAV STAR. The PUMLE ONE STAR will replace the FUZZY EIGHT STAR, providing conventionally equipped aircraft a similar arrival path as RNAV capable flights from the northeast. The PUMLE ONE STAR will serve KLAS.[JB-j1]

Las Vegas OAPM Design Package

KLAS PUMLE STAR

Name of Change and Airport(s)	Change Classification
McCarran International Airport (KLAS) **PUMLE ONE Standard Terminal Arrival Route (STAR)**	**Terminal Procedure; STAR**
OAPM Study Team Reference(s)	**Current Phase of Design**
N/A	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 16 **Oakland ARTCC (ZOA) Sectors: 33, 46** **Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: GNT, FNL** **KLAS**	**KLAS COKTL STAR**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results**	

Purpose

The KLAS PUMLE ONE STAR i will merge KLAS conventional arrivals into a similar traffic flow with RNAV aircraft utilizing the KLAS COKTL STAR. The integration of conventional and RNAV procedures will maintain airspace integrity and reduce complexity. The PUMLE ONE STAR will replace the FUZZY EIGHT STAR.

Study Team Recommendation

The Las Vegas Metroplex Study Team (MST) did not address amendments to conventional procedures.

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) designed the PUMLE ONE STAR to serve conventional arrivals from the southeast to all runways at KLAS. The PUMLE ONE STAR will replace the existing FUZZY EIGHT STAR (Figure 1).

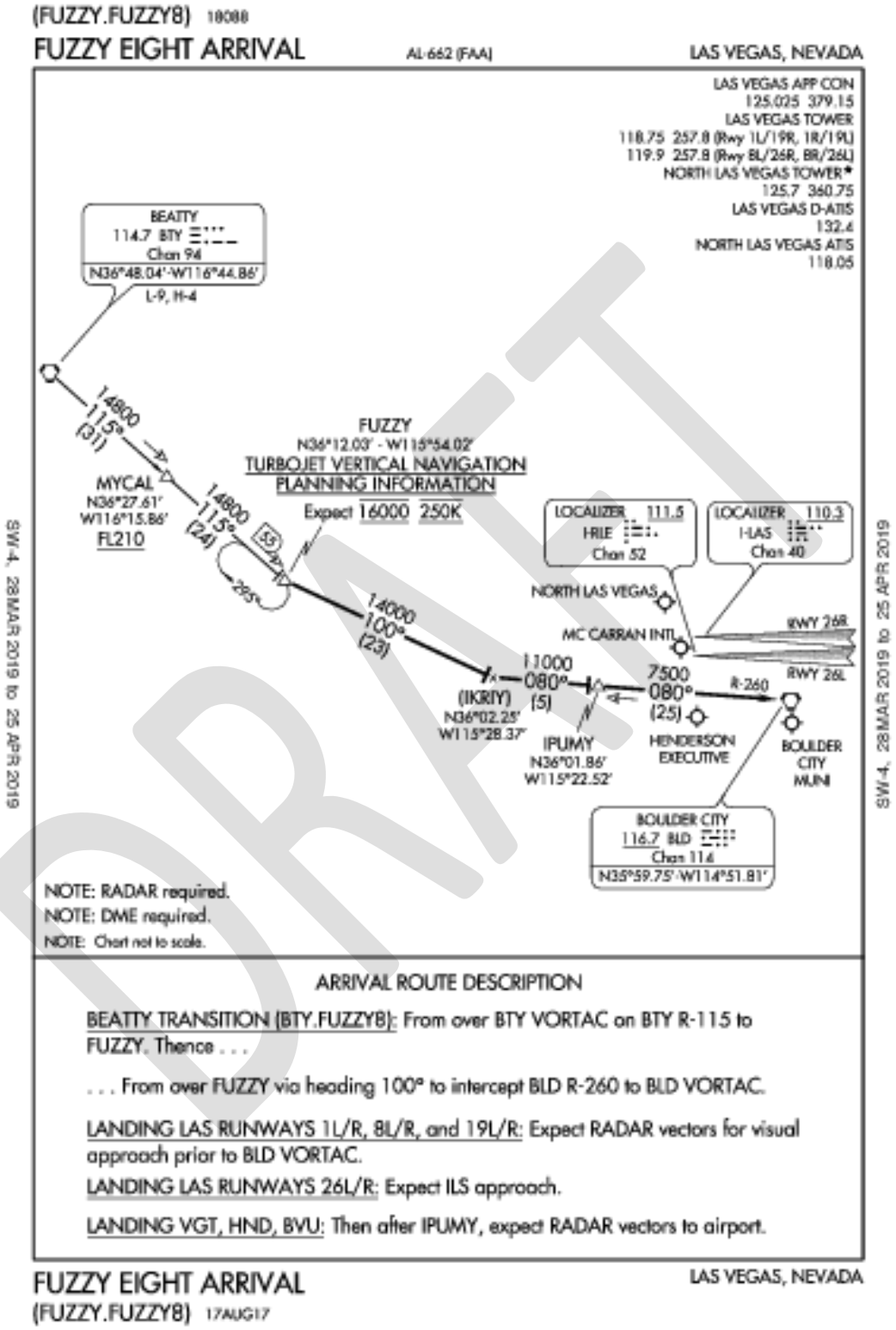


Figure 1: KLAS FUZZY EIGHT Current Conventional STAR

The KLAS COKTL STAR and the PUMLE ONE STAR are depicted in Figure 2.

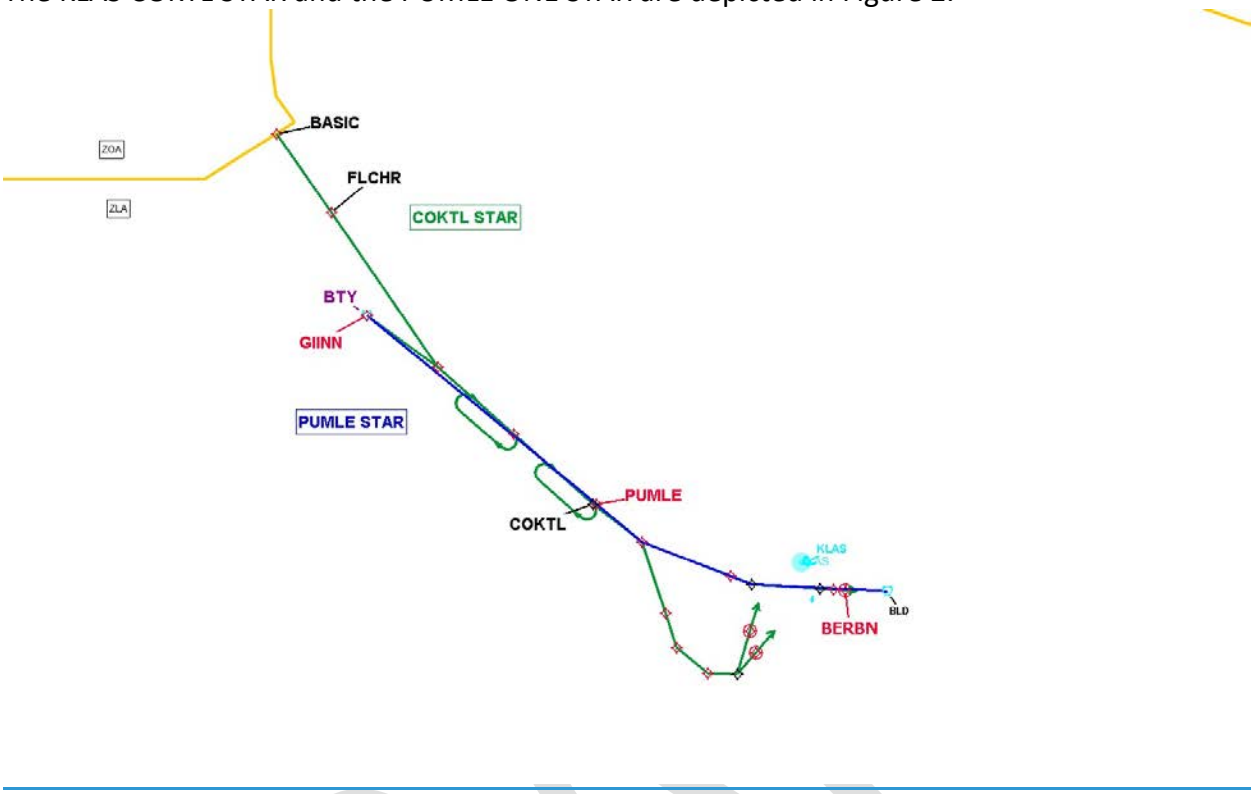


Figure 2: KLAS COKTL STAR and PUMLE ONE Conventional STAR

The PUMLE ONE STAR's lateral path is listed below:

<u>BTY Transition</u>

- BTY
- PUMLE (361500.00N-1155459.29W)
- ZLLDA (360819.66N-1154503.06W)
- CNF (360112.49N-1152711.16W)ENNVY
- BLD

After BLD, arrivals will be assigned radar vectors to the appropriate runway.

<u>Additional Design Considerations</u>

This procedure is not anticipated to change runway usage.

- The following chart notes will be included with this procedure:
  - Turbojets only
  - DME required
  - Lost communications - Proceed to BLD and hold

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS.

Document changes/modifications include:

- ZLA Facility Operations and Administration Order 7210.3
- ZOA Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZOA LOA
- ZLA Standard Operating Procedures (SOP)
- ZOA SOP
- L30 SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- TARGETS distribution package
- Flight Simulator worksheet
- RNAV Pro analysis results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date
Chris Iwanski LAS NATCA POC	23 APR 19 Date		

Las Vegas OAPM Design Package

KLAS/KHND MCCARRAN SIX SID

The Las Vegas Metroplex Project (Project) was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures into and out of Las Vegas area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures. Extensive changes were made to designated airspace in air traffic control sectors at the Las Vegas Terminal Radar Approach Control (L30 TRACON) and the Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

RNAV procedures can only be flown by properly equipped aircraft and certified aircrews. For those aircraft that are unable to take advantage of satellite navigation procedures, conventional procedures using ground-based radio signals are currently, and will continue to be, available for use. While RNAV usage continues to increase, it is necessary to provide aircraft using older technologies navigational direction that will integrate them into a system designed for the 21st Century. To maintain the benefits gained by the development of RNAV procedures, the Project made changes to existing ground-based conventional procedures that will provide similar paths for all aircraft arriving at or departing from area airports.

The Project's team reviewed the McCarran International Airport's (KLAS) JOHKR and RADYR RNAV SIDs and the conventional MCCARRAN FIVE SID. A new lateral path for the MCCARRAN SID was developed to more closely align the conventional departure with the newly developed RNAV SIDs. The MCCARRAN SIX SID will replace the MCCARRAN FIVE SID, providing conventionally equipped aircraft a similar departure path as RNAV capable flights to south and west destinations. The MCCARRAN SIX SID will serve both KLAS and Henderson Executive Airport (KHND).

Las Vegas OAPM Design Package

KLAS/KHND MCCARRAN SIX SID

Name of Change and Airport(s)	Change Classification
McCarran International Airport (KLAS) **Henderson Executive Airport (KHND)** **MCCARRAN SIX Conventional Standard Instrument Departure (SID)**	**Terminal Procedure; SID**
OAPM Study Team Reference(s)	**Current Phase of Design**
N/A	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 6, 10, 16, 37, 39 **Oakland ARTCC (ZOA) Sectors: 33, 46** **Joshua Control Facility (JCF)** **Nellis Air Traffic Control Facility (NATCF)** **Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: MED, DAG** **Las Vegas Air Traffic Control Tower (LAS ATCT) Positions: LC1, LC2, LC3, GCE, GCW, CD** **KLAS** **KHND**	**KLAS JOHKR and RADYR SIDs**
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results**	

Purpose

The KLAS/KHND MCCARRAN SIX SID will merge KLAS and KHND conventional departures into a similar traffic flow with RNAV aircraft utilizing the KLAS JOHKR and RADYR RNAV SIDs. The integration of conventional and RNAV procedures will maintain airspace integrity and reduce complexity.

Study Team Recommendation

The Las Vegas Metroplex Study Team (MST) did not address amendments to conventional procedures.

Las Vegas OAPM Design Package

KLAS/KHND MCCARRAN SIX SID

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) designed the MCCARRAN SIX SID to serve conventional departures from all runways at KLAS. The MCCARRAN SIX SID will replace the existing MCCARRAN FIVE SID (Figure 1).

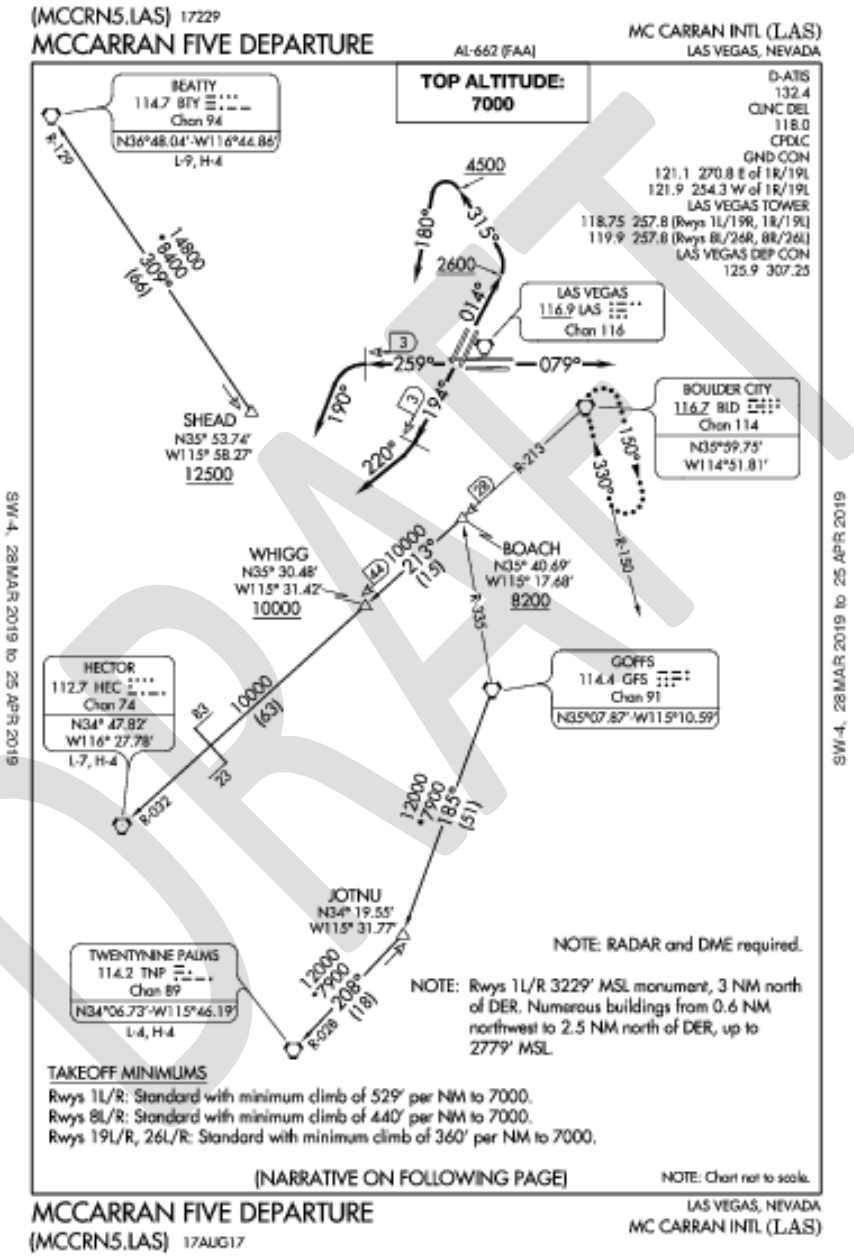


Figure 1: KLAS MCCARRAN FIVE Current Conventional SID

The KLAS JOHKR and RADYR RNAV SIDs, as well as the MCCARRAN SIX SID are depicted in Figure 2.

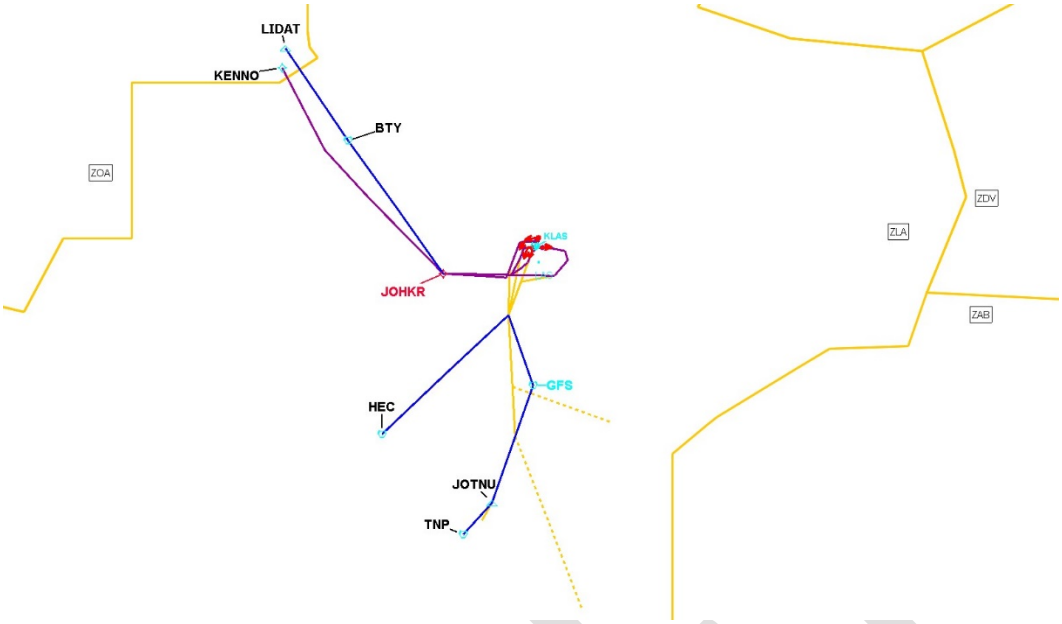


Figure 2: KLAS JOHKR and RADYR RNAV SIDs and MCCARRAN SIX Conventional SID

For conventional KLAS departures to the south and west, the MCCARRAN SIX SID's lateral paths are listed below.

Runway Transitions

KLAS Runways 01L/R

- 014 heading to at or above 026
- Left turn heading 255 to at or above 045
- Left turn heading 200
- Vectors to assigned transition

KLAS Runways 08L/R

- Heading 079
- Vectors to assigned transition

KLAS Runways 19L/R

- Heading 194
- Vectors to assigned transition

KLAS Runways 26L/R

- Heading 259 to 3 miles DME
- Heading 190
- Vectors to assigned transition

En Route Transitions

HEC Transition

- RADYR (BLD R-213/BLD/BLD R-213/HEC R-032)/HEC

TNP Transition

- RADYR (GFS R-335/GFS/GFS R-185/JOTNU/TNP R-028/TNP)

LIDAT Transition:

- JOHKR
- BTY (128 radial)/BTY
- BTY (310 radial)/LIDAT~~**BTY Transition**~~
  - ~~JOHKR/BTY (128 radial)/BTY~~

Additional Design Considerations

- This procedure is not anticipated to change runway usage.
  - The following chart notes will be included with this procedure:
    - DME required
    - Lost communications - Proceed to BLD and hold

The MCCARRAN SIX SID affects the following facility area(s) as indicated:

- ZLA Sectors: 6, 10, 16, 37, 39
- ZOA Sectors: 33, 46
- Joshua Control Facility (JCF)
- Nellis Air Traffic Control Facility (NATCF)
- L30 Sectors: MED, DAG
- LAS Positions: LC1, LC2, LC3, GCE, GCW, CD
- KLAS
- KHND

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS and KHND.

Document changes/modifications include:

- ZLA Facility Operations and Administration Order 7210.3
- ZOA Facility Operations and Administration Order 7210.3
- JCF Facility Operations and Administration Order 7210.3
- NATCF Facility Operations and Administration Order 7210.3

- L30 Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA/ZOA LOA
- ZLA/JCF LOA
- ZLA/NATCF LOA
- ZLA Standard Operating Procedures (SOP)
- ZOA SOP
- JCF SOP
- HND SOP
- LAS SOP
- L30 SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

<u>Attachments</u>

- TARGETS distribution package
- Flight Simulator worksheet
- RNAV Pro analysis results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date
Chris Iwanski LAS NATCA POC	23 APR 19 Date		

Las Vegas OAPM Design Package

KLAS/KHND HOOVER SEVEN SID

The Las Vegas Metroplex Project (Project) was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures into and out of Las Vegas area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures. Extensive changes were made to designated airspace in air traffic control sectors at the Las Vegas Terminal Radar Approach Control (L30 TRACON) and the Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

RNAV procedures can only be flown by properly equipped aircraft and certified aircrews. For those aircraft that are unable to take advantage of satellite navigation procedures, conventional procedures using ground-based radio signals are currently, and will continue to be, available for use. While RNAV usage continues to increase, it is necessary to provide aircraft using older technologies navigational direction that will integrate them into a system designed for the 21st Century. To maintain the benefits gained by the development of RNAV procedures, the Project made changes to existing ground-based conventional procedures that will provide similar paths for all aircraft arriving at or departing from area airports.

The Project's team reviewed the McCarran International Airport's (KLAS) GIDGT, RATPK, and NIITZ RNAV SIDs and the conventional HOOVER SIX SID. A new lateral path for the HOOVER SID was developed to more closely align the conventional departure with the newly developed RNAV SIDs. The HOOVER SEVEN SID will replace the HOOVER SIX SID, providing conventionally equipped aircraft a similar departure path as RNAV capable flights to northeast, east and southeast destinations. The HOOVER SEVEN SID will serve both KLAS and Henderson Executive Airport (KHND).

Las Vegas OAPM Design Package

KLAS/KHND HOOVER SEVEN SID

Name of Change and Airport(s)	Change Classification
McCarran International Airport (KLAS) Henderson Executive Airport (KHND) HOOVER SEVEN Conventional Standard Instrument Departure (SID)	Terminal Procedure; SID
OAPM Study Team Reference(s)	**Current Phase of Design**
N/A	☐ Preliminary Operational Design (PD) ☒ Proposed Final Design (PFD)
Package Date	**Implementation Date**
5/31/2019	5/21/2020
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 7, 8, 35, 36, 54, 55 Albuquerque ARTCC (ZAB) Sectors: 43, 45, 67, 92 Denver ARTCC (ZDV) Sectors: 23, 24, 36, 37, 38 Salt Lake ARTCC (ZLC) Sectors: 33, 44 Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: DAG, MED Las Vegas Air Traffic Control Tower (LAS ATCT) Positions: LC1, LC2, LC3, GCE, GCW, CD KLAS KHND	KLAS GIDGT, RATPK, and NIITZ SIDs
Associated Data Files	
TARGETS output packages Flight Simulator worksheet RNAV Pro analysis results Human in the Loop Simulation (HITLS) results	

Purpose

The KLAS/KHND HOOVER SEVEN SID will merge KLAS and KHND conventional departures into a similar traffic flow with RNAV aircraft utilizing the KLAS GIDGT, RATPK, and NIITZ RNAV SIDs. The integration of conventional and RNAV procedures will maintain airspace integrity and reduce complexity.

Study Team Recommendation

Las Vegas OAPM Design Package

KLAS/KHND HOOVER SEVEN SID

The Las Vegas Metroplex Study Team (MST) did not address amendments to conventional procedures.

Proposed Final Design

The Las Vegas Metroplex Design and Implementation Team (D&I Team) designed the KLAS HOOVER SEVEN SID to serve conventional departures from all runways at KLAS. The HOOVER SEVEN SID will replace the existing HOOVER SIX SID (Figure 1).

The HOOVER SEVEN SID will serve conventional KLAS and KHND departures to the northeast and east.

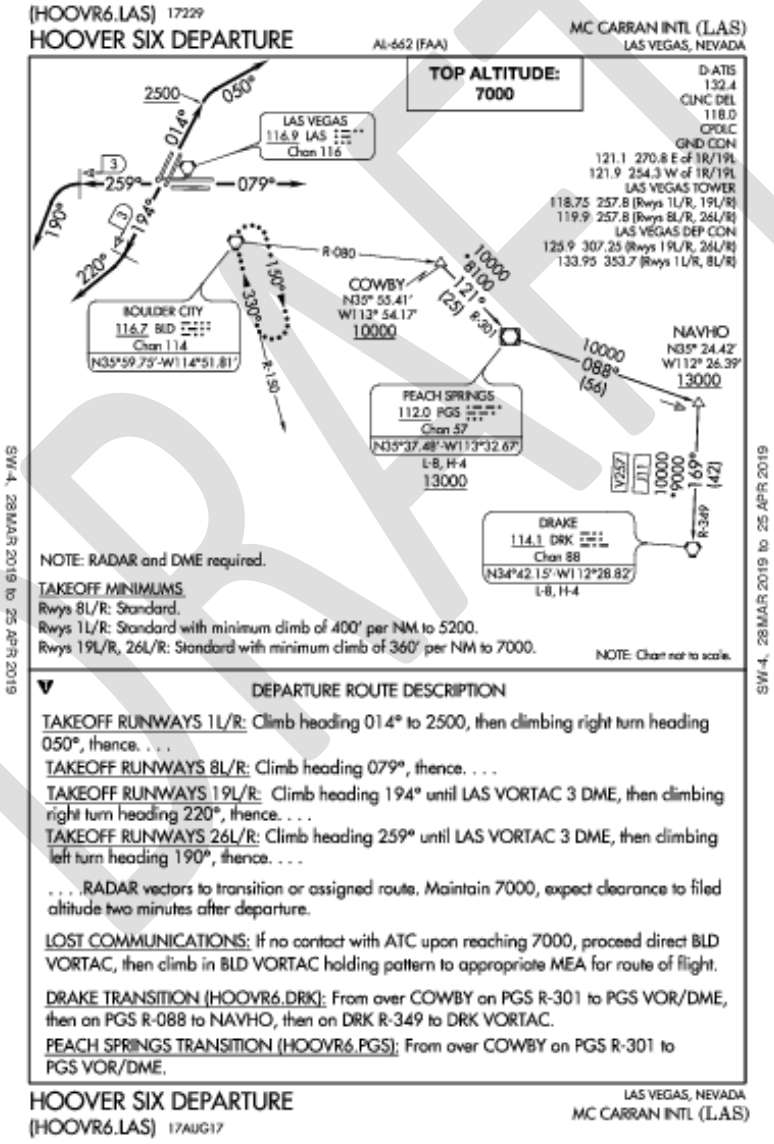


Figure 1: KLAS HOOVER SIX Current Conventional SID

The HOOVER SEVEN SID's lateral paths are listed below.

Runway Transitions

KLAS Runways 01L/R
- Heading 014 to at or above 025
- Right turn heading 060
- Vectors to assigned transition

KLAS Runways 08L/R
- Heading 079
- Vectors to assigned transition

KLAS Runways 19L/R
- Heading 194
- Vectors to assigned transition

KLAS Runways 26L/R
- Heading 259 to 3 miles DME
- Left turn heading 190
- Vectors to assigned transition

En Route Transitions

DRK Transition
- NIITZ (355319.52N-1133200.85W)
- MAFLO (353649.51N-1124953.54W, FLG 282.54 Magnetic, PGS 76.87 Magnetic)
- ROSYY (352722.06N-1122609.33W, FLG 282.54 Magnetic, DRK 348.76 Magnetic)
- Right turn on DRK R-349 to KIDDR
- DRK

DVC Transition
- GIDGT (361136.43N-11425.32W/at or above 100)
- LAS R-066 to NICLE
- PGS R-234 to PGS
- PGA R-053 and DVC R-233 to DVC

MLF Transition
- RATPK (362204.14N-1143721.47W, LAS R-041, 31.3 DME)
- MMM R-199 to MMM
- MMM R-016 and MLF R-198 to MLF

MOSBI Transition

- NIITZ
- MAYFLO
- Left turn on PGS R-076 (J72-86) to MOSBI

The KLAS GIDGT, RATPK, and NIITZ RNAV SIDs, as well as the HOOVER SEVEN SID are depicted in Figure 2.

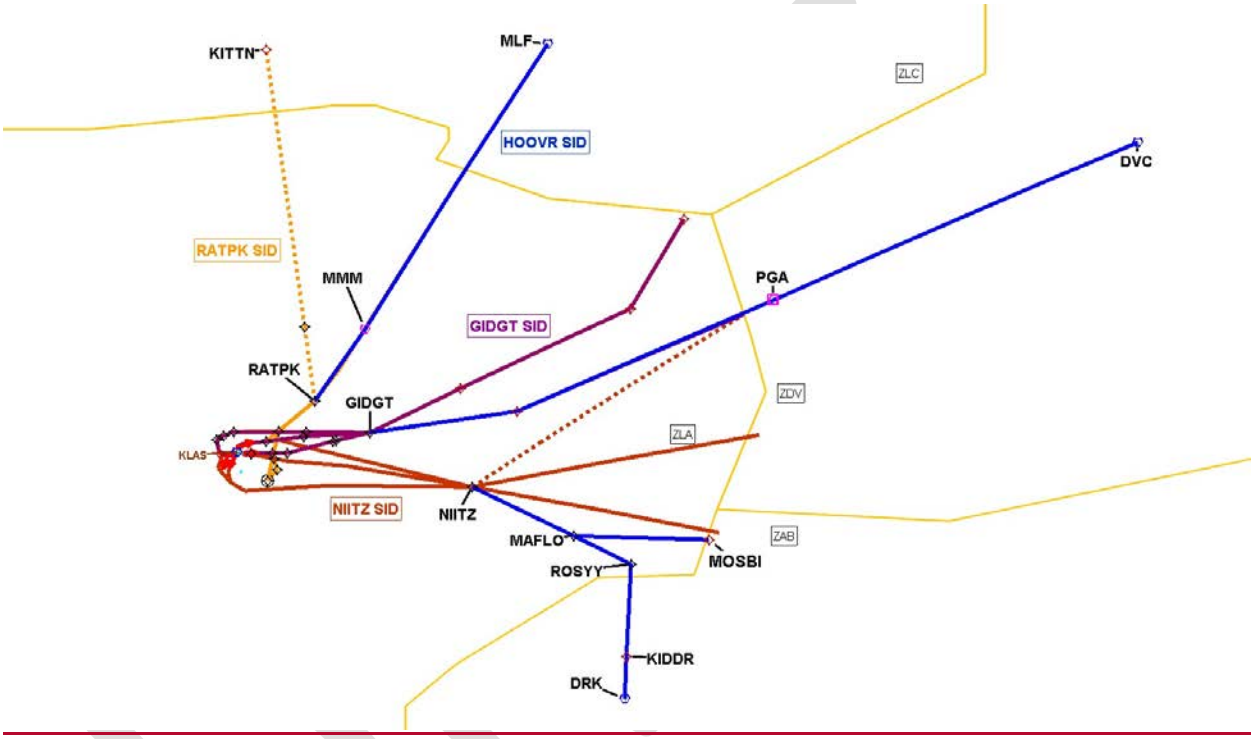


Figure 2: KLAS GIDGT, RATPK, and NIITZ RNAV SIDs and HOOVER SEVEN Conventional SID

Additional Design Considerations

- This procedure is not anticipated to change runway usage.
  - The following chart notes will be included with this procedure:
    - DME required
    - Lost communications - Proceed to BLD and hold

The HOOVER SEVEN SID affects the following facility area(s) as indicated:

- ZLA Sectors: 7, 8, 35, 36, 54, 55
- ZAB Sectors: 43, 45, 67, 92
- ZDV Sectors: 23, 24, 36, 37, 38
- ZLC Sectors: 33, 44
- L30 Sectors: DAG, MED

- LAS Positions: LC1, LC2, LC3, GCE, GCW, CD
- KLAS
- KHND

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve airports for KLAS and KHND.

Document changes/modifications include:

- ZLA Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- ZLA/L30 sector boundary maps and video maps
- ZLA/L30 Letter of Agreement (LOA)
- ZLA Standard Operating Procedures (SOP)
- L30 SOP
- LAS SOP
- HND SOP
- ERAM and STARS automation changes (ADAR, AARS, Waypoint Pairs, etc.)
- National Route Program (NRP) Database including Coded Departure Routes (CDRs)
- Airport Facility Directory (AFD) Preferential Routings (Green Book)
- National Airspace System (NAS) Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- TARGETS distribution package
- Flight Simulator worksheet
- RNAV Pro analysis results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date
Chris Iwanski LAS NATCA POC	23 APR 19 Date		

Las Vegas OAPM Design Package

Las Vegas Runway 01L ILS Approach

Approach procedures to the Las Vegas McCarran International Airport (KLAS) are currently limited to Instrument Landing System (ILS), Global Positioning System (GPS) or visual procedures. The ILS and GPS approaches both involve intercepting an extended runway line in preparation for landing (straight in approach). Visual approaches require sighting of the airport and hand flying to touchdown.

As part of the Las Vegas Metroplex Project, Area Navigation (RNAV) procedures were developed for arrivals and departures serving the Las Vegas Valley. These procedures include Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARs) and Required Navigation Procedure (RNP) approaches. RNAV procedures are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces task complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports. Implementation of PBN will assist in the Federal Aviation Administration's (FAA) Trajectory Based Operations (TBO) Infrastructure 2025 Plan[1].

The Las Vegas Metroplex Design and Implementation (D&I) Team elected to provide continuity between PBN and conventional procedures by amending existing conventional (ground based radio navigation) ILS approaches.

This procedure is not anticipated to change runway usage.

---

[1] *Trajectory Based Operations (TBO) is an Air Traffic Management (ATM) method for strategically planning, managing, and optimizing flights throughout the NAS by using time-based management, information exchange between air and ground systems, and the aircraft's ability to fly precise paths in time and space.* *https://www.faa.gov/about/office_org/headquarters_offices/ang/offices/tc/library/Storyboard/tbo.html#intro1*

Las Vegas OAPM Design Package

Las Vegas Runway 01L ILS Approach

Name of Change and Airport/s	Change Classification
Las Vegas McCarran (KLAS) Runway 01L ILS Approach	**Terminal Procedure**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
May 31, 2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
L30 Sectors: FNL, SAT	**KLAS RNDRZ Standard Terminal Arrival Route (STAR), KLAS CHOWW STAR, KLAS COKTL STAR, KLAS RKSTR STAR, KLAS JAYSN STAR**
Associated Data Files	
TARGETS Output Packages **RNAV Pro analysis results**	

Purpose

There are currently no Required Navigation (RNP) procedures for KLAS. Industry and L30 requested RNP approaches for all configurations, which mimic historical flight track data. Stakeholders requested RNP approaches which utilize Radius to Fix (RF) turns to the final approach course. The Las Vegas Metroplex Design and Implementation (D&I) Team developed RNP Authorization Required (AR) approaches to KLAS runways 08R, 19 L/R and 26 L/R. For a number of reasons, RNP approaches to Runways 01 L/R and 08 L were not feasible.

The Las Vegas Metroplex Design and Implementation (D&I) Team elected to provide continuity between PBN and conventional procedures by amending existing (ground based radio navigation) ILS approaches.

Figure 1 depicts the current KLAS Runway 01L ILS Approach.

Study Team Recommendation

There was no Metroplex Study Team (MST) recommendation for ILS approaches.

Las Vegas OAPM Design Package

Las Vegas Runway 01L ILS Approach

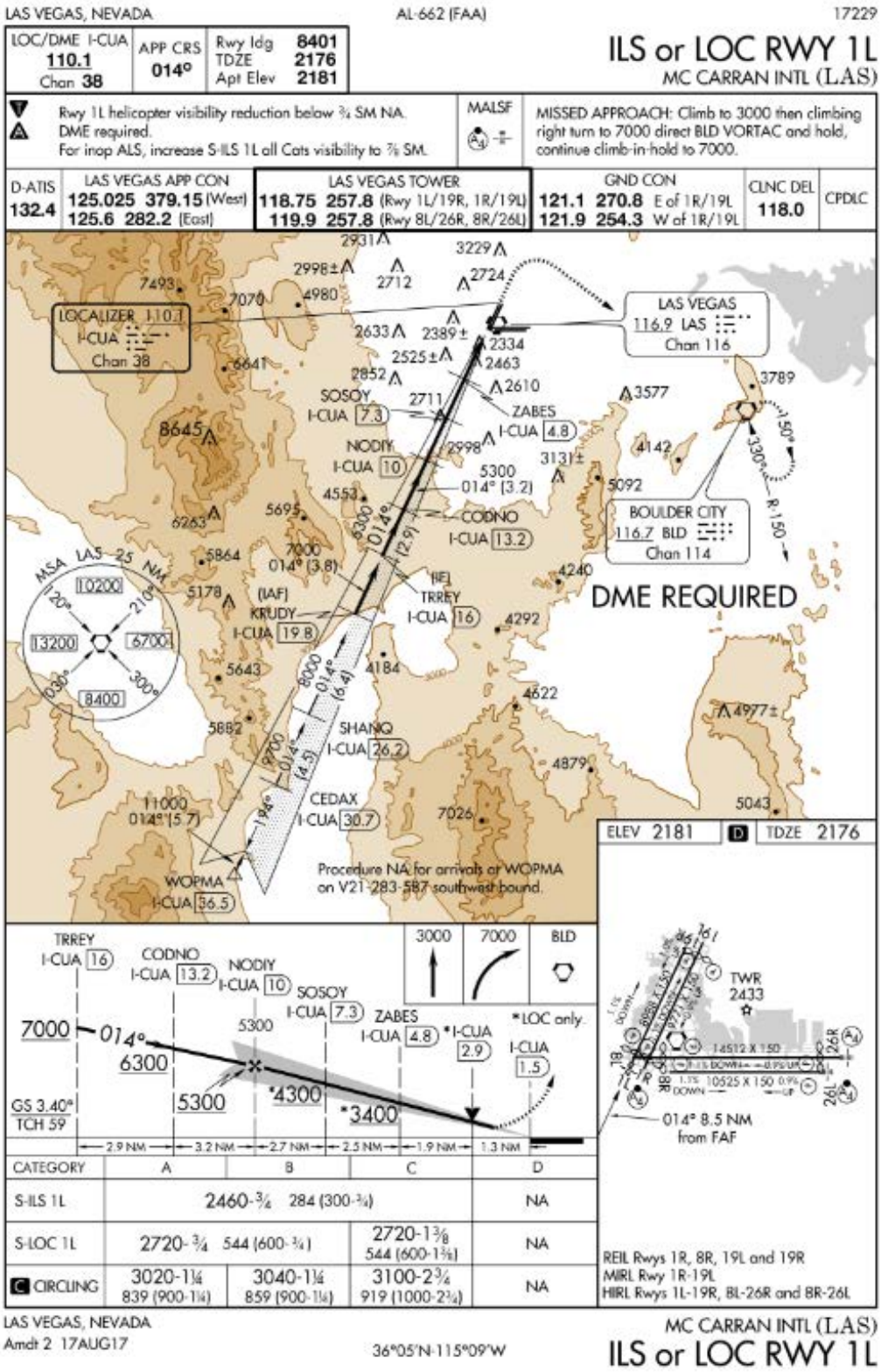


Figure 1: Current KLAS Runway 01L ILS Approach

Las Vegas OAPM Design Package

Las Vegas Runway 01L ILS Approach

Proposed Final Design

Waypoint changes were made to the KLAS 01L ILS Approach. Two transitions allow greater flexibility.

Figure 2 depicts the KLAS Runway 01L ILS Approach Proposed Final Design.

KLAS Runway 01L ILS Approach from WOPMA

- WOPMA (at or above 110)
- CEDAX (at or above 110)
- SHANQ (at or above 097)
- KRUDY (at or above 080)
- TRREY (at or above 070 for terrain/Class B containment)
- CODNO (at or above 063 for terrain/Class B containment)
- PFAF3 (at or above 053 for terrain/Class B containment)
- SOSOY (at or above 043 for Class B containment)
- ZABES (at or above 034 for criteria)

KLAS Runway 01L ILS Approach from ROAMN

- ROAMN (at 080 for terrain/Class B containment and no greater than 210 knots for criteria)
- TRREY (at or above 070 for terrain/Class B containment)
- CODNO (at or above 063 for terrain/Class B containment)
- PFAF3 (at or above 053 for terrain/Class B containment)
- SOSOY (at or above 043 for Class B containment)
- ZABES (at or above 034 for criteria)

Las Vegas OAPM Design Package

Las Vegas Runway 01L ILS Approach

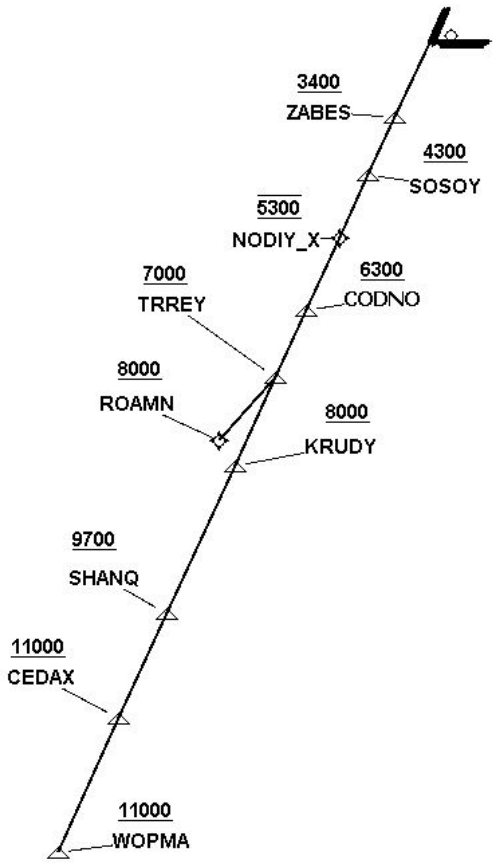


Figure 2: KLAS Runway 01L ILS Approach Proposed Final Design

Attachments

- TARGETS Distribution Package
- RNAV Pro analysis results (may be completed during Evaluation Phase

Las Vegas OAPM Design Package

Las Vegas Runway 01L ILS Approach

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date
Chris Iwanski LAS NATCA POC	23 APR 19 Date		

Las Vegas OAPM Design Package

Las Vegas Runway 26L ILS Approach

Approach procedures to the Las Vegas McCarran International Airport (KLAS) are currently limited to Instrument Landing System (ILS), Global Positioning System (GPS) or visual procedures. The ILS and GPS approaches both involve intercepting an extended runway line in preparation for landing (straight in approach). Visual approaches require sighting of the airport and hand flying to touchdown.

As part of the Las Vegas Metroplex Project, Area Navigation (RNAV) procedures were developed for arrivals and departures serving the Las Vegas Valley. These procedures include Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARs) and Required Navigation Procedure (RNP) approaches. RNAV procedures are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces task complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports. Implementation of PBN will assist in the Federal Aviation Administration's (FAA) Trajectory Based Operations (TBO) Infrastructure 2025 Plan[1].

The Las Vegas Metroplex Design and Implementation (D&I) Team elected to provide continuity between PBN and conventional procedures by amending existing conventional (ground based radio navigation) ILS approaches. The KLAS Runway 26L ILS Approach was changed to provide a similar path to RNP approaches.

This procedure is not anticipated to change runway usage.

---

[1] *Trajectory Based Operations (TBO) is an Air Traffic Management (ATM) method for strategically planning, managing, and optimizing flights throughout the NAS by using time-based management, information exchange between air and ground systems, and the aircraft's ability to fly precise paths in time and space.* *https://www.faa.gov/about/office_org/headquarters_offices/ang/offices/tc/library/Storyboard/tbo.html#intro1*

Las Vegas OAPM Design Package

Las Vegas Runway 26L ILS Approach

Name of Change and Airport/s	Change Classification
Las Vegas McCarran (KLAS) Runway 26L ILS Approach/RNAV Entry to Runway 26L ILS	**Terminal Procedure**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
May 31, 2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
L30 Sectors: FNL	**KLAS RNDRZ Standard Terminal Arrival Route (STAR), KLAS CHOWW STAR, KLAS COKTL STAR, KLAS RKSTR STAR, KLAS JAYSN STAR**
Associated Data Files	
TARGETS Output Packages **Flight Simulator Worksheet** **RNAV Pro analysis results** **HITL simulation results**	

Purpose

There are currently no Required Navigation (RNP) procedures for KLAS. Industry and L30 requested RNP approaches for all configurations, which mimic historical flight track data. Stakeholders requested RNP approaches which utilize Radius to Fix (RF) turns to the final approach course. The Las Vegas Metroplex Design and Implementation (D&I) Team developed RNP Authorization Required (AR) approaches to KLAS runways 08R, 19 L/R and 26 L/R. For a number of reasons, RNP approaches to Runways 01 L/R and 08 L were not feasible.

The Las Vegas Metroplex Design and Implementation (D&I) Team elected to provide continuity between PBN and conventional procedures by amending existing (ground based radio navigation) ILS approaches. The KLAS Runway 26L ILS Approach was changed to provide a similar path to RNP approaches.

Figure 1 depicts the current KLAS Runway 26L ILS Approach.

Study Team Recommendation

There was no Metroplex Study Team (MST) recommendation for ILS approaches.

Las Vegas OAPM Design Package

Las Vegas Runway 26L ILS Approach

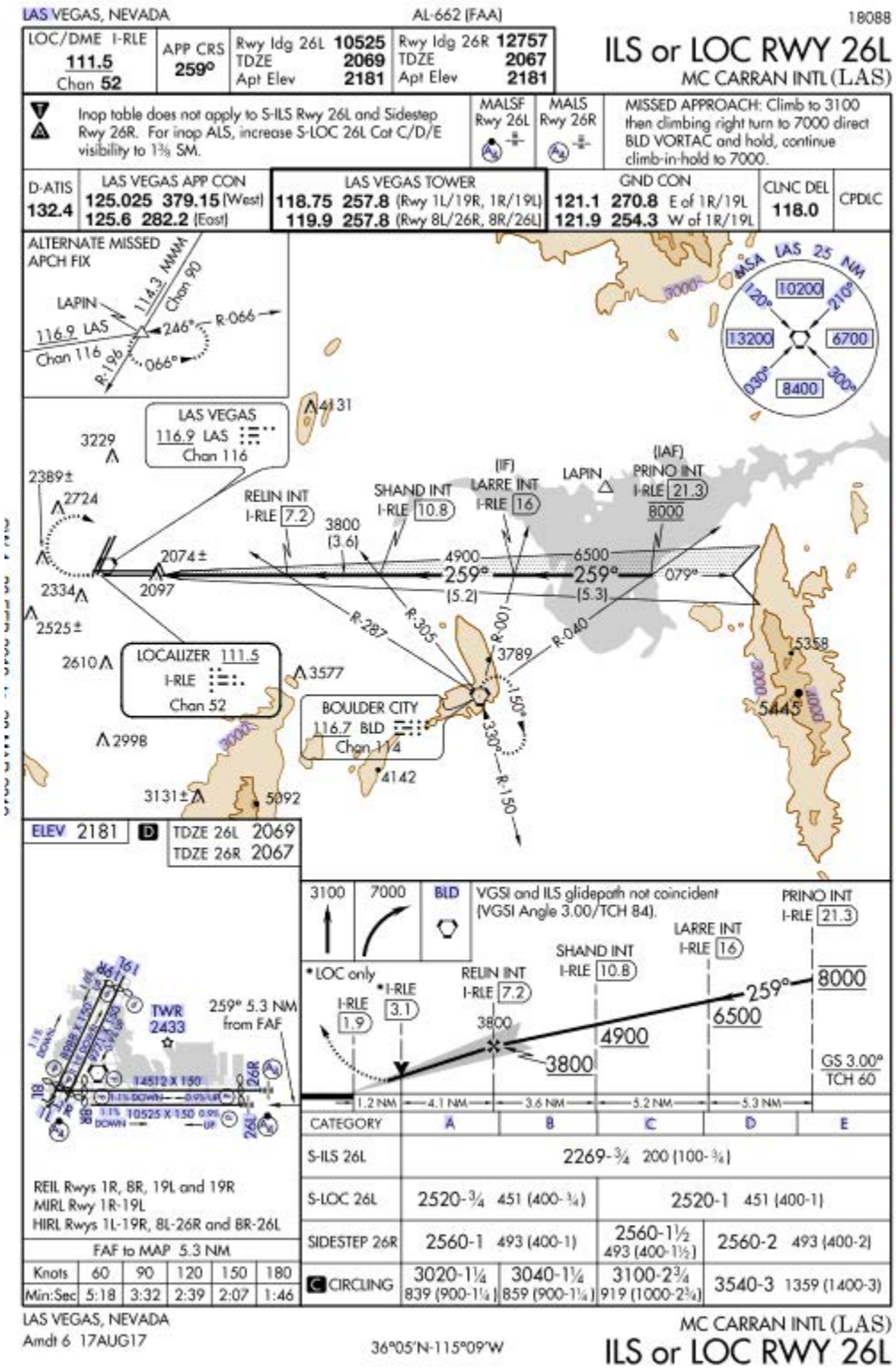


Figure 1: Current KLAS Runway 26L ILS Approach

Las Vegas OAPM Design Package

Las Vegas Runway 26L ILS Approach

Proposed Final Design

A point-to-point route was developed for RNAV equipped aircraft arriving from the west. This RNAV entry to KLAS Runway 26L ILS Approach will mimic the KLAS Runway 26L RNP AR Downwind Approach. Aircraft from the west that are not RNAV equipped will receive radar vectors to join the straight-in ILS approach.

The straight-in ILS approach was also amended to comply with design criteria.

Figure 2 depicts the RNAV entry to KLAS Runway 26L ILS Approach and the KLAS Runway 26L ILS Approach Proposed Final Design.

RNAV entry to KLAS Runway 26L ILS Approach

- BERBN (at 080 for Class B containment and no greater than 210 knots for criteria)
- BISHP (at or above 070 for criteria/segregates from KHND departures and no greater than 200 knots)
- WP68 (at or above 066 for criteria)
- WP70 (at or above 058 for criteria)
- WP67 (at or above 052 for criteria and ties in to ILS Approach)
- SHAND (at or above 048 for Class B containment)
- PFAF9 (at 038)

KLAS Runway 26L ILS Approach

- PRINO (at 080 for Class B containment)
- LARRE (at or above 065 for Class B containment)
- WP67 (at or above 052 for criteria)
- SHAND (at or above 048 for Class B containment)
- PFAF9 (at 038)

Las Vegas OAPM Design Package

Las Vegas Runway 26L ILS Approach

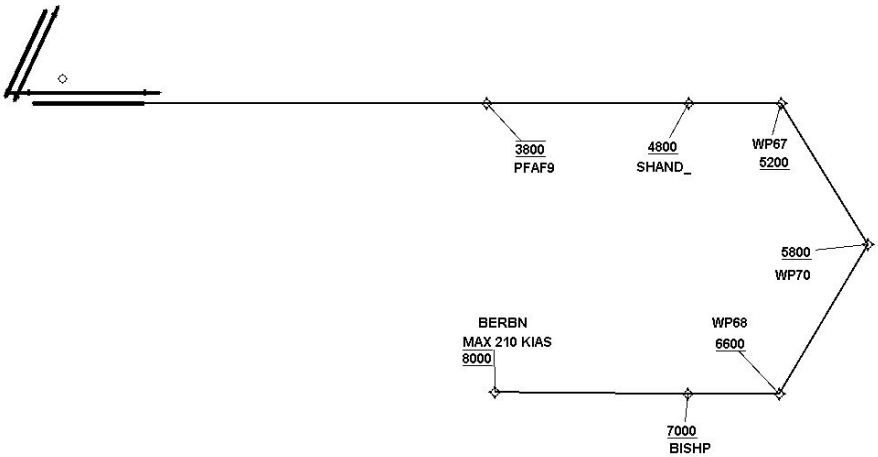


Figure 2: RNAV entry to KLAS Runway 26L ILS Approach and the KLAS Runway 26L ILS Approach Proposed Final Design

Attachments

- TARGETS Distribution Package
- RNAV Pro analysis results (may be completed during Evaluation Phase)

Las Vegas OAPM Design Package

Las Vegas Runway 26L ILS Approach

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date
Chris Iwanski LAS NATCA POC	23 APR 19 Date		

Las Vegas OAPM Design Package

Las Vegas Runway 26R ILS Approach

Approach procedures to the Las Vegas McCarran International Airport (KLAS) are currently limited to Instrument Landing System (ILS), Global Positioning System (GPS) or visual procedures. The ILS and GPS approaches both involve intercepting an extended runway line in preparation for landing (straight in approach). Visual approaches require sighting of the airport and hand flying to touchdown.

As part of the Las Vegas Metroplex Project, Area Navigation (RNAV) procedures were developed for arrivals and departures serving the Las Vegas Valley. These procedures include Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARs) and Required Navigation Procedure (RNP) approaches. RNAV procedures are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces task complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports. Implementation of PBN will assist in the Federal Aviation Administration's (FAA) Trajectory Based Operations (TBO) Infrastructure 2025 Plan[1].

The Las Vegas Metroplex Design and Implementation (D&I) Team elected to provide continuity between PBN and conventional procedures by amending existing conventional (ground based radio navigation) ILS approaches. The KLAS Runway 26R ILS Approach was changed to provide a similar path to RNP approaches.

This procedure is not anticipated to change runway usage.

---

[1] *Trajectory Based Operations (TBO) is an Air Traffic Management (ATM) method for strategically planning, managing, and optimizing flights throughout the NAS by using time-based management, information exchange between air and ground systems, and the aircraft's ability to fly precise paths in time and space.* *https://www.faa.gov/about/office_org/headquarters_offices/ang/offices/tc/library/Storyboard/tbo.html#intro1*

Las Vegas OAPM Design Package

Las Vegas Runway 26R ILS Approach

Name of Change and Airport/s	Change Classification
Las Vegas McCarran (KLAS) Runway 26R ILS Approach/RNAV Entry to ILS Runway 26R	**Terminal Procedure**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
May 31, 2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
L30 Sectors: FNL	**KLAS RNDRZ Standard Terminal Arrival Route (STAR), KLAS CHOWW STAR, KLAS COKTL STAR, KLAS RKSTR STAR, KLAS JAYSN STAR**
Associated Data Files	
TARGETS Output Packages **RNAV Pro analysis results**	

Purpose

There are currently no Required Navigation (RNP) procedures for KLAS. Industry and L30 requested RNP approaches for all configurations, which mimic historical flight track data. Stakeholders requested RNP approaches which utilize Radius to Fix (RF) turns to the final approach course. The Las Vegas Metroplex Design and Implementation (D&I) Team developed RNP Authorization Required (AR) approaches to KLAS runways 08R, 19 L/R and 26 L/R. For a number of reasons, RNP approaches to Runways 01 L/R and 08 L were not feasible.

The Las Vegas Metroplex Design and Implementation (D&I) Team elected to provide continuity between PBN and conventional procedures by amending existing (ground based radio navigation) ILS approaches. The KLAS Runway 26R ILS Approach was changed to provide a similar path to RNP approaches.

Figure 1 depicts the current KLAS Runway 26R ILS Approach.

Study Team Recommendation

There was no Metroplex Study Team (MST) recommendation for ILS approaches.

Las Vegas OAPM Design Package

Las Vegas Runway 26R ILS Approach

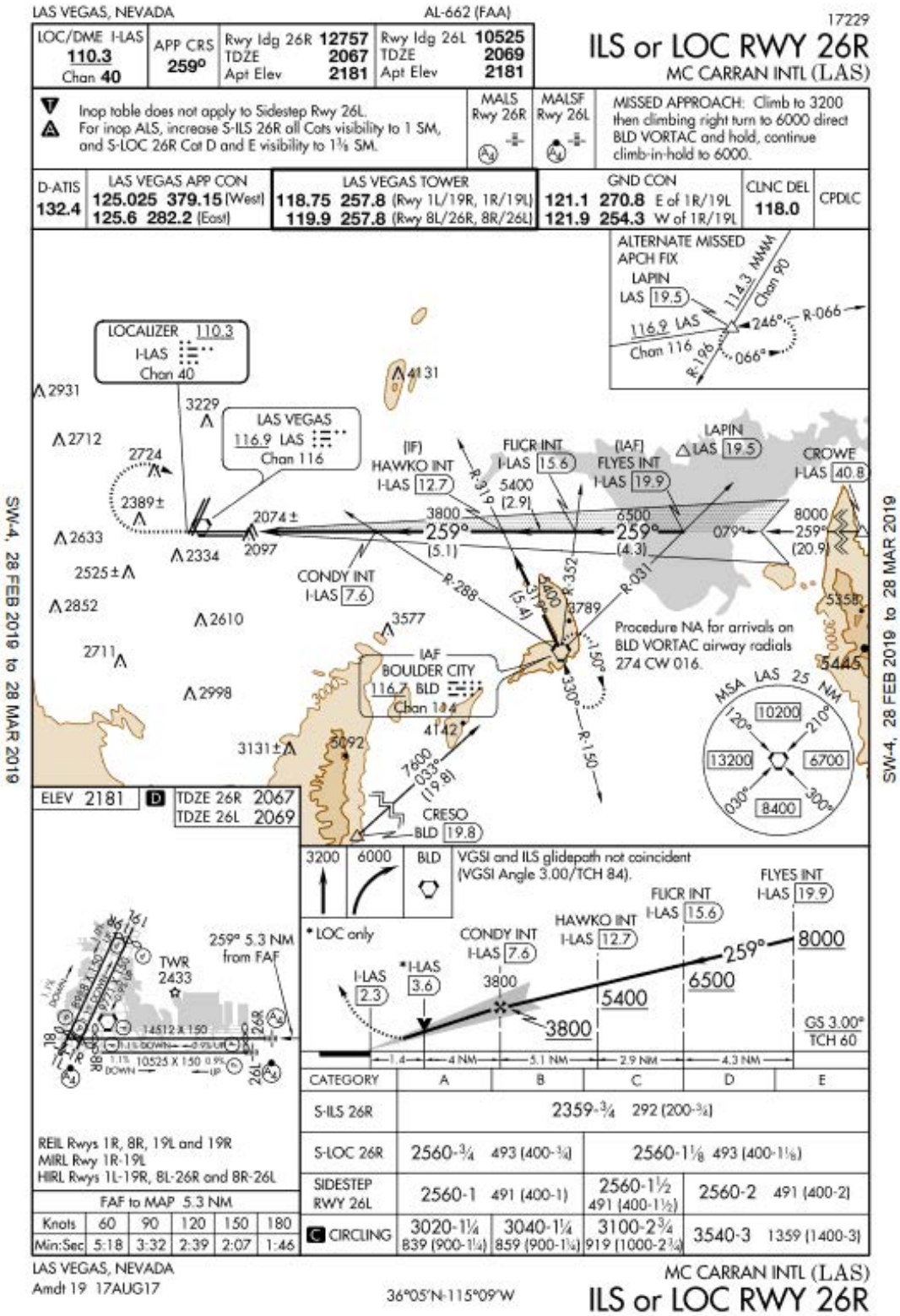


Figure 1: Current KLAS Runway 26R ILS Approach

Las Vegas OAPM Design Package

Las Vegas Runway 26R ILS Approach

Proposed Final Design

A point-to-point route was developed for RNAV equipped aircraft arriving from the west. This RNAV entry to KLAS Runway 26R ILS Approach will mimic the KLAS Runway 26R RNP AR Downwind Approach. Aircraft from the west that are not RNAV equipped will receive radar vectors to join the straight-in ILS approach.

The straight-in ILS approach was also amended to comply with design criteria.

Figure 2 depicts the RNAV entry to KLAS Runway 26R ILS Approach and the KLAS Runway 26R ILS Approach Proposed Final Design.

RNAV entry to KLAS Runway 26R ILS Approach

- BERBN (at 080 for Class B and no greater than 210 knots for criteria)
- LUISA (at or above 070 to segregate from KHND departures and no greater than 210 knots for criteria)
- WP65 (at or above 066 for criteria)
- WP62 (at or above 059 for criteria)
- HAWKO_ (at or above 052 for Class B containment and joins RWY26R ILS)
- BJORG (at or above 047 for Class B containment and criteria)
- PFAF7 (at 038)

KLAS Runway 26R ILS Approach

- FLYES (at or above 080 for Class B containment)
- FLICR (at or above 065 for Class B containment)
- HAWKO_ (at or above 052 for Class B containment)
- BJORG (at or above 047 for Class B containment and criteria)
- PFAF7 (at 038)

Las Vegas OAPM Design Package

Las Vegas Runway 26R ILS Approach

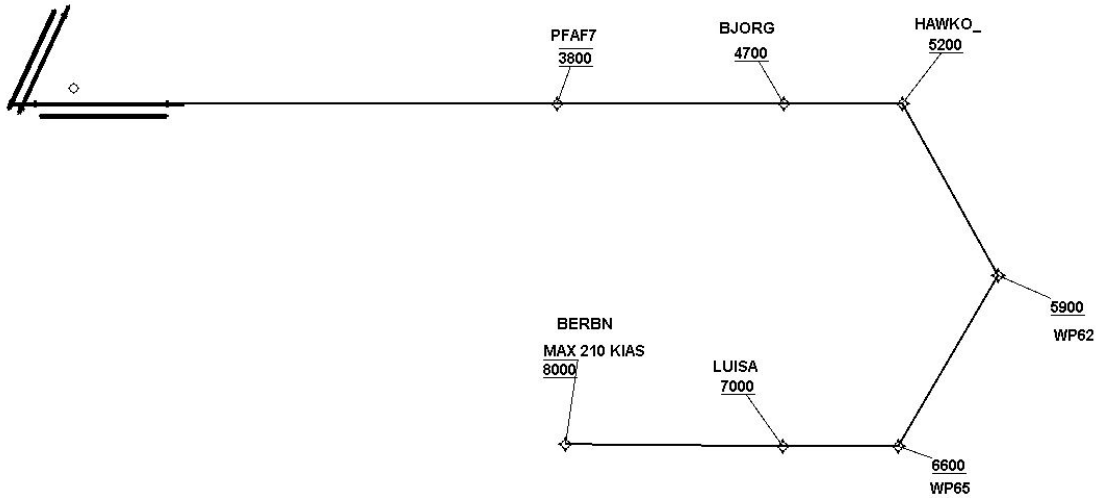


Figure 2: RNAV entry to KLAS Runway 26R ILS Approach and the KLAS Runway 26R ILS Approach Proposed Final Design

Attachments

- TARGETS Distribution Package
- RNAV Pro analysis results (may be completed during Evaluation Phase)

Las Vegas OAPM Design Package

Las Vegas Runway 26R ILS Approach

<u>Review Signatures</u>

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date
Chris Iwanski LAS NATCA POC	23 APR 19 Date		

Las Vegas OAPM Design Package

Las Vegas RNP Runway 19L Approach

Approach procedures to the Las Vegas McCarran International Airport (KLAS) are currently limited to Instrument Landing System (ILS), Global Positioning System (GPS) or visual procedures. The ILS and GPS approaches both involve intercepting an extended runway line in preparation for landing (straight in approach). Visual approaches require sighting of the airport and hand flying to touchdown.

As part of the Las Vegas Metroplex Project, Area Navigation (RNAV) procedures were developed for arrivals and departures serving the Las Vegas Valley. These procedures include Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARs) and Required Navigation Procedure (RNP) approaches. RNAV procedures are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports. Implementation of PBN will assist in the Federal Aviation Administration's (FAA) Trajectory Based Operations (TBO) Infrastructure 2025 Plan[1]

The RNP Runway 19L Approach was designed in conjunction with the KLAS RKSTR, CHOWW, RNDRZ, COKTL and JAYSN STARs, allowing access to Runway 19L from multiple directions. The use of satellite navigation will allow joining of the approach via either a curved of straight in path.

This procedure is not anticipated to change runway usage. The KLAS RNP Runway 19L approach will increase flight path predictability and decrease controller/pilot workload and task complexity, which will enhance safety.

---

[1] *Trajectory Based Operations (TBO) is an Air Traffic Management (ATM) method for strategically planning, managing, and optimizing flights throughout the NAS by using time-based management, information exchange between air and ground systems, and the aircraft's ability to fly precise paths in time and space.* *https://www.faa.gov/about/office_org/headquarters_offices/ang/offices/tc/library/Storyboard/tbo.html#intro1*

Las Vegas OAPM Design Package

Las Vegas RNP Runway 19L Approach

Name of Change and Airport/s	Change Classification
Las Vegas McCarran (KLAS) Required Navigation (RNP) Runway 19L Approach	**Terminal Procedure**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
May 31, 2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Las Vegas Terminal Radar Approach Control (L30) Sectors: Satellites (SAT) **KLAS**	**KLAS RNDRZ Standard Terminal Arrival Route (STAR), KLAS CHOWW STAR, KLAS COKTL STAR, KLAS RKSTR STAR, KLAS JAYSN STAR**
Associated Data Files	
TARGETS Output Packages **Flight Simulator Worksheet** **RNAV Pro analysis results** **HITL simulation results**	

Purpose

There are currently no Required Navigation Procedures (RNP) approach procedures for KLAS. Industry and L30 requested RNP approaches for all configurations, using historical track data as a baseline. Stakeholders requested RNP approaches which utilize Radius to Fix (RF) turns to the final approach course.

Study Team Recommendation

As depicted in Figure 1, KLAS RNP procedures to the final approach course were designed for all configurations (25L/R, 19L/R, 07R and 01L/R)[2]. The Las Vegas Metroplex Study Team (MST) recommends that conceptual RNP Standard Instrument Approach Procedures (SIAPs) at KLAS be reviewed during the Design and Implementation (D&I) phase for optimized downwind alignment and reduction in arc length.

Initial conceptual approaches were designed for all runways. During the Study Team Second Outreach L30 requested the Runway 07L RNP approach be deleted.

The MST recommendation is depicted in Figure 1.

[2] In August 2017 Las Vegas runways had a magnetic variance adjustment. Runways 07 L/R and 25 L/R became 08 L/R and 26 L/R.

Las Vegas OAPM Design Package

Las Vegas RNP Runway 19L Approach

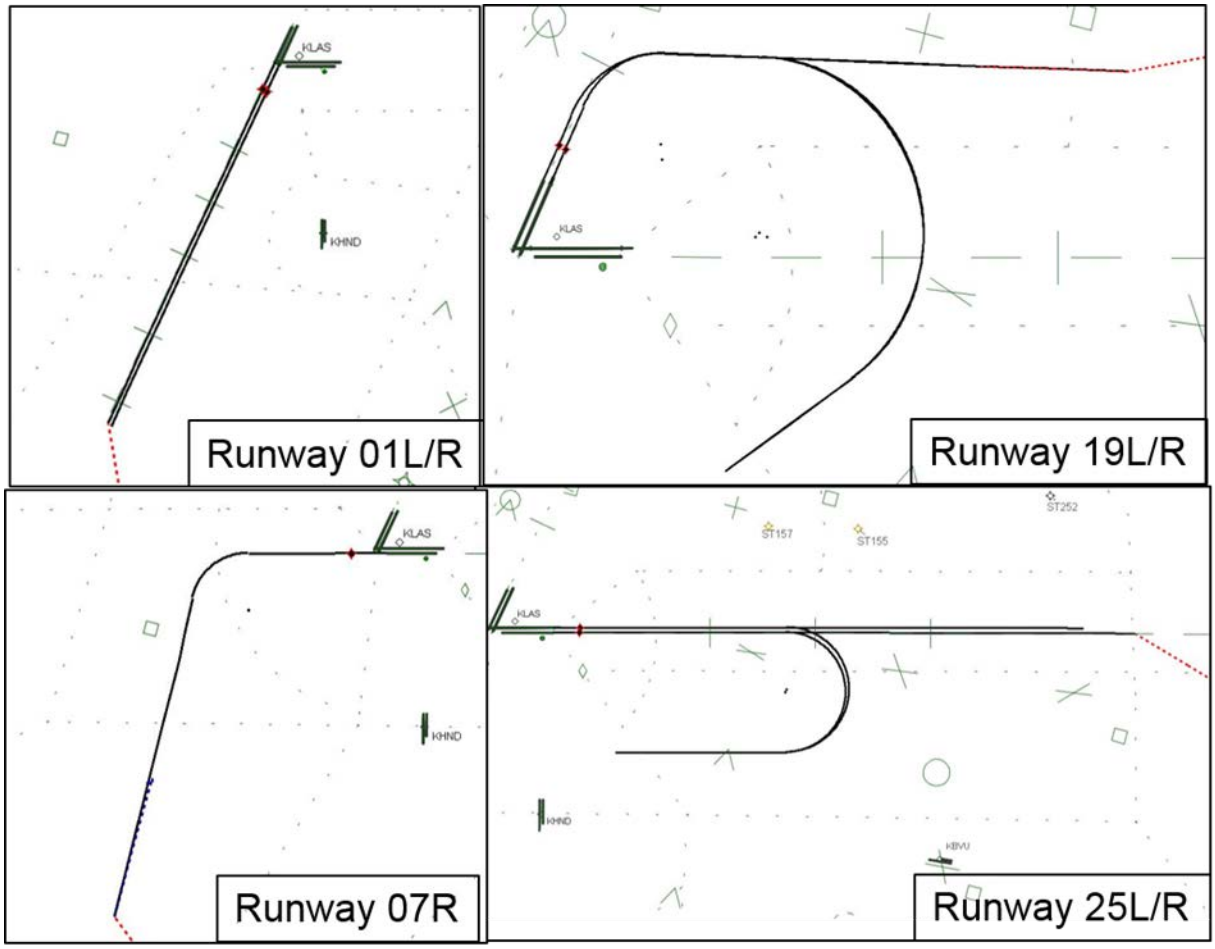


Figure 1: KLAS RNP Approaches-Study Team Recommendations

<u>Proposed Final Design</u>

The D&I Team reviewed the MST proposal to refine and provide optimization to the greatest extent possible. The RNP Runway 19L Approach was designed for connectivity from all Metroplex KLAS RNAV STAR designs. The KLAS RKSTR and CHOWW Standard Terminal Arrival Routes (STARs) share a waypoint (PPENN) with the approach, while the KLAS RNDRZ, COKTL and JAYSN STARs will allow connection via radar vectors.

The KLAS Runway 19L RNP Approach begins at PPENN. Waypoints with restrictions (altitudes/speeds) were added to meet design criteria and to assist in aircraft flyability.

The D&I Team proposed final design is depicted in Figure 2.

<u>KLAS Runway 19L RNP Authorization Required (AR) Approach</u>

- PPENN (at 080/no greater than 210 knots)
- KIVEY (at or above 052/terrain avoidance)
- CSARO (at or above 040/no greater than 180 knots)

- KOOPA (at 035/segregates from tour helicopter routes)
- DLARG
- WP568 (Expected to be changed to WILSE)

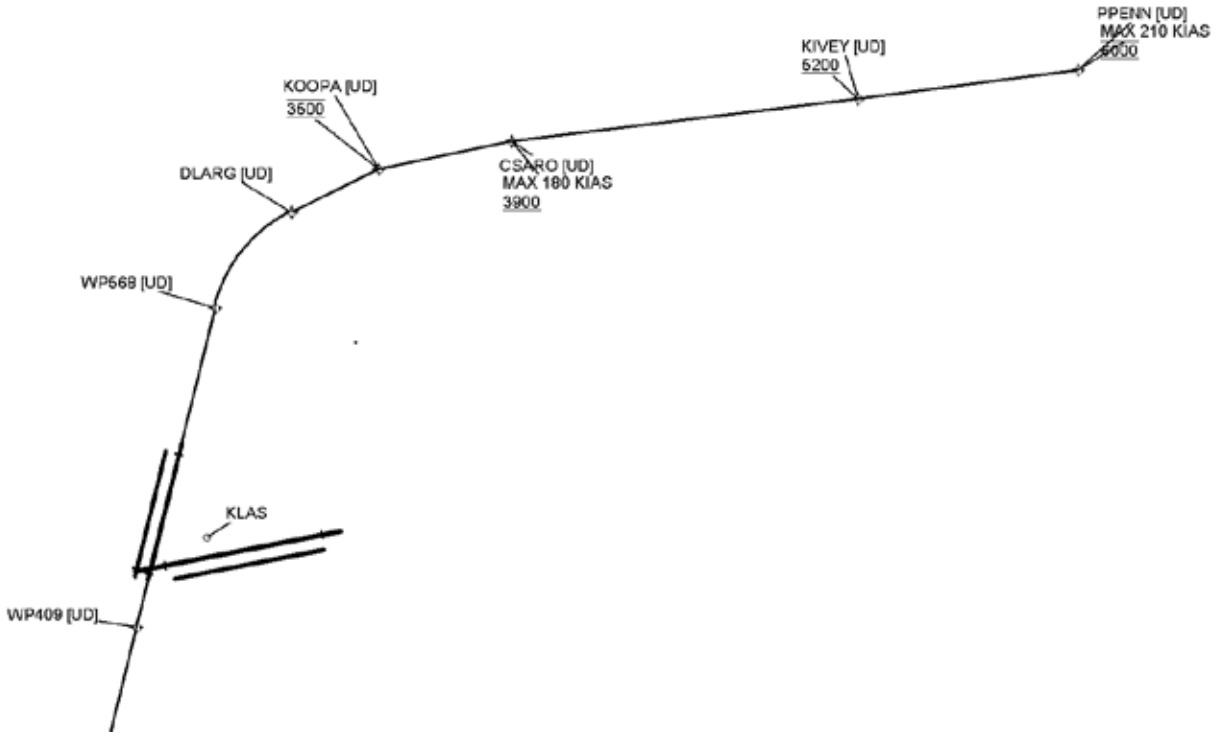


Figure 2: Proposed KLAS RNP Runway 19L Approach

Study Team Recommendation Design Differences

The Study Team proposed a transition from the southeast side of the airport. This was not feasible due to conflicting traffic departing the KLAS Runway 08 complex.

Implementation Dependencies

Attachments

- TARGETS Distribution Package
- Flight Simulator Worksheet
- RNAV Pro analysis results (may be completed during Evaluation Phase
- HITL simulation results (when applicable - may be completed during Evaluation Phase)

Las Vegas OAPM Design Package

Las Vegas RNP Runway 19L Approach

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date
Chris Iwanski LAS NATCA POC	23 APR 19 Date		

Las Vegas OAPM Design Package

Las Vegas RNP Runway 19R Approach

Approach procedures to the Las Vegas McCarran International Airport (KLAS) are currently limited to Instrument Landing System (ILS), Global Positioning System (GPS) or visual procedures. The ILS and GPS approaches both involve intercepting an extended runway line in preparation for landing (straight in approach). Visual approaches require sighting of the airport and hand flying to touchdown.

As part of the Las Vegas Metroplex Project, Area Navigation (RNAV) procedures were developed for arrivals and departures serving the Las Vegas Valley. These procedures include Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARs) and Required Navigation Procedure (RNP) approaches. RNAV procedures are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports. Implementation of PBN will assist in the Federal Aviation Administration's (FAA) Trajectory Based Operations (TBO) Infrastructure 2025 Plan[1]

The RNP Runway 19R Approach was designed in conjunction with the KLAS RKSTR, CHOWW, RNDRZ, COKTL and JAYSN STARs, allowing access to Runway 19R from multiple directions. The use of satellite navigation will allow joining of the approach via either a curved of straight in path.

This procedure is not anticipated to change runway usage. The KLAS RNP Runway 19R approach will increase flight path predictability and decrease controller/pilot workload and task complexity, which will enhance safety.

---

[1] *Trajectory Based Operations (TBO) is an Air Traffic Management (ATM) method for strategically planning, managing, and optimizing flights throughout the NAS by using time-based management, information exchange between air and ground systems, and the aircraft's ability to fly precise paths in time and space.* *https://www.faa.gov/about/office_org/headquarters_offices/ang/offices/tc/library/Storyboard/tbo.html#intro1*

Las Vegas OAPM Design Package

Las Vegas RNP Runway 19R Approach

Name of Change and Airport/s	Change Classification
Las Vegas McCarran (KLAS) Required Navigation (RNP) Runway 19R Approach	**Terminal Procedure**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
May 31, 2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Las Vegas Terminal Radar Approach Control (L30) Sectors: Satellites (SAT) **KLAS**	**KLAS RNDRZ Standard Terminal Arrival Route (STAR), KLAS CHOWW STAR, KLAS COKTL STAR, KLAS RKSTR STAR, KLAS JAYSN STAR**
Associated Data Files	
TARGETS Output Packages **Flight Simulator Worksheet** **RNAV Pro analysis results** **HITL simulation results**	

Purpose

There are currently no Required Navigation Procedures (RNP) approach procedures for KLAS. Industry and L30 requested RNP approaches for all configurations, using historical track data as a baseline. Stakeholders requested RNP approaches which utilize Radius to Fix (RF) turns to the final approach course.

Study Team Recommendation

As depicted in Figure 1, KLAS RNP procedures to the final approach course were designed for all configurations (25L/R, 19L/R, 07R and 01L/R)[2]. The Las Vegas Metroplex Study Team (MST) recommends that conceptual RNP Standard Instrument Approach Procedures (SIAPs) at KLAS be reviewed during the Design and Implementation (D&I) phase for optimized downwind alignment and reduction in arc length.

Initial conceptual approaches were designed for all runways. During the Second Outreach L30 requested the Runway 07L RNP approach be deleted.

The MST recommendation is depicted in Figure 1.

[2] In August 2017 Las Vegas runways had a magnetic variance adjustment. Runways 07 L/R and 25 L/R became 08 L/R and 26 L/R.

Las Vegas OAPM Design Package

Las Vegas RNP Runway 19R Approach

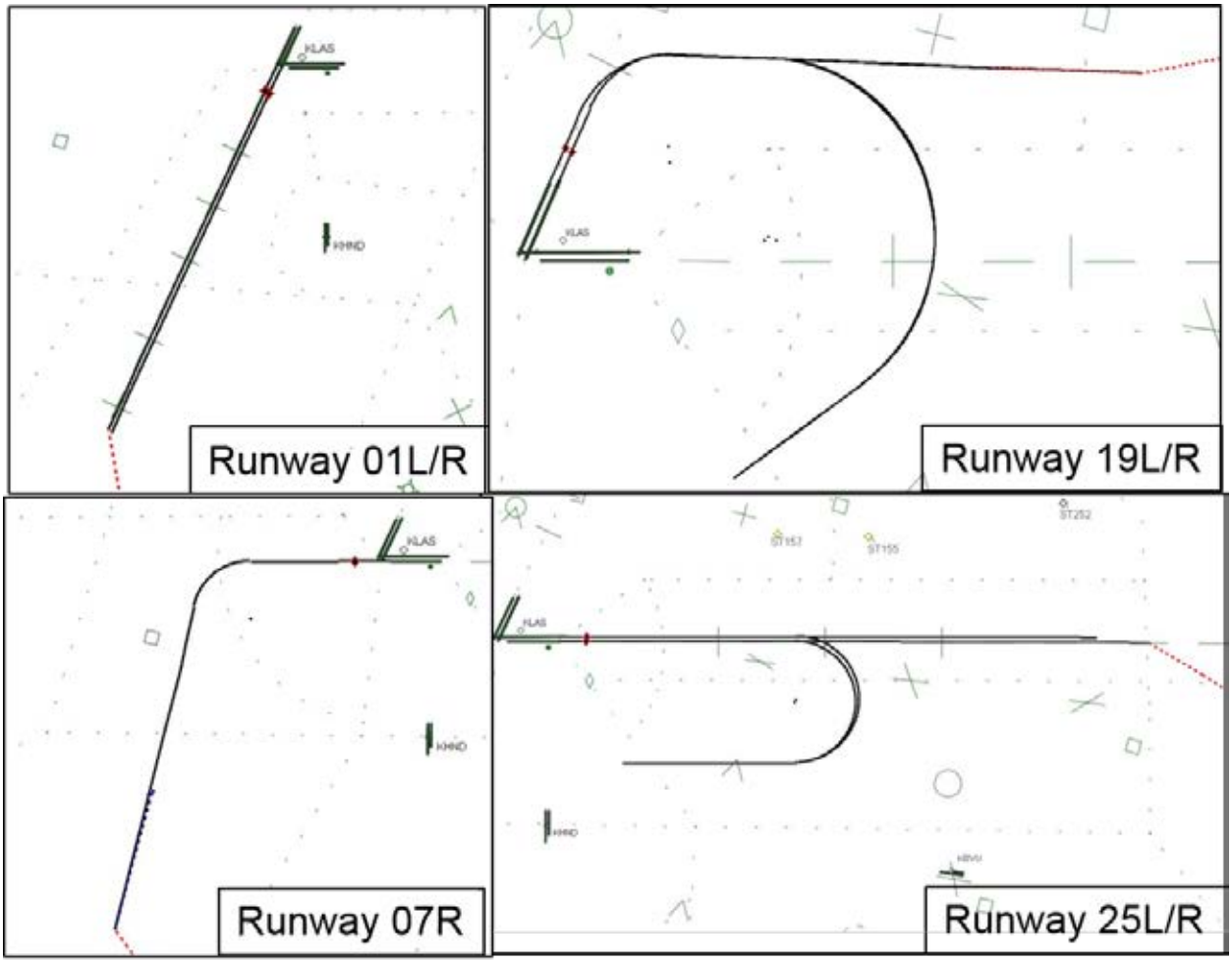


Figure 1: KLAS RNP Approaches-Study Team Recommendations

<u>Proposed Final Design</u>

The D&I Team reviewed the MST proposal to refine and provide optimization to the greatest extent possible. The RNP Runway 19R Approach was designed for connectivity from all Metroplex KLAS RNAV STAR designs. The KLAS RKSTR and CHOWW Standard Terminal Arrival Routes (STARs) share a waypoint (PPENN) with the approach, while the KLAS RNDRZ, COKTL and JAYSN STARs will allow connection via radar vectors.

.

The KLAS Runway 19R RNP Approach begins at PPENN. Waypoints with restrictions (altitudes/speeds) were added to meet design criteria and to assist in aircraft flyability.

The D&I Team proposed final design is depicted in Figure 2

<u>KLAS Runway 19R RNP Authorization Required (AR) Approach</u>

- PPENN (at 060/no greater than 210 knots)
- KIVEY (at or above 052/no greater than 180 knots)

- MOBBB (at or above 040)
- GMBIL (at 035/segregate from tour helicopter routes)
- HIRLR
- CEGIL

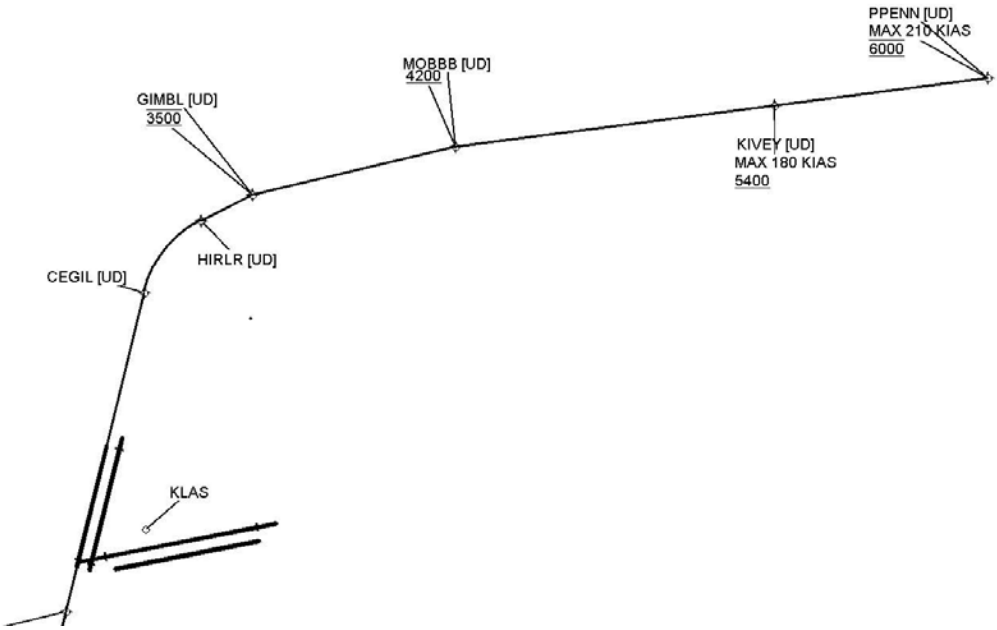


Figure 2: KLAS Runway 19R RNP AR Approach Proposed Final Design

Study Team Recommendation Design Differences

The Study Team proposed a transition from the southeast side of the airport. This was not feasible due to conflicting traffic departing the KLAS Runway 08 complex.

Implementation Dependencies

Attachments

- TARGETS Distribution Package
- Flight Simulator Worksheet
- RNAV Pro analysis results
- HITL simulation results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh 4/23/19 — 4/23/19

Bradley R. Mayhugh — Date — Chris Thomas — Date

LAS FAA Lead — LAS NATCA Lead

Anita Engelmann 4/25/19 — 23APR19

Anita Engelmann — Date — Dan Hauptman — Date

TWAB Representative — L30 NATCA POC

23 APR 19

Chris Iwanski — Date

LAS NATCA POC

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date
Chris Iwanski LAS NATCA POC	23 APR 19 Date		

Las Vegas OAPM Design Package

Las Vegas Runway 01R GPS Approach

Approach procedures to the Las Vegas McCarran International Airport (KLAS) are currently limited to Instrument Landing System (ILS), Global Positioning System (GPS) or visual procedures. The ILS and GPS approaches both involve intercepting an extended runway line in preparation for landing (straight in approach). Visual approaches require sighting of the airport and hand flying to touchdown.

As part of the Las Vegas Metroplex Project, Area Navigation (RNAV) procedures were developed for arrivals and departures serving the Las Vegas Valley. These procedures include Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARs) and Required Navigation Procedure (RNP) approaches. RNAV procedures are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces task complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports. Implementation of PBN will assist in the Federal Aviation Administration's (FAA) Trajectory Based Operations (TBO) Infrastructure 2025 Plan[1].

The Las Vegas Metroplex Design and Implementation (D&I) Team elected to provide continuity between PBN and conventional procedures by amending existing conventional (ground based radio navigation) ILS approaches. The KLAS Runway 01R GPS Approach was changed to provide a similar path to RNP approaches.

This procedure is not anticipated to change runway usage.

---

[1] *Trajectory Based Operations (TBO) is an Air Traffic Management (ATM) method for strategically planning, managing, and optimizing flights throughout the NAS by using time-based management, information exchange between air and ground systems, and the aircraft's ability to fly precise paths in time and space.* *https://www.faa.gov/about/office_org/headquarters_offices/ang/offices/tc/library/Storyboard/tbo.html#intro1*

Las Vegas OAPM Design Package

Las Vegas Runway 01R GPS Approach

Name of Change and Airport/s	Change Classification
Las Vegas McCarran (KLAS) Runway 01R GPS Approach	**Terminal Procedure**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
May 31, 2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
L30 Sectors: SAT, FNL	**KLAS RNDRZ Standard Terminal Arrival Route (STAR), KLAS CHOWW STAR, KLAS COKTL STAR, KLAS RKSTR STAR, KLAS JAYSN STAR**
Associated Data Files	
TARGETS Output Packages **RNAV Pro analysis results**	

Purpose

There are currently no Required Navigation (RNP) procedures for KLAS. Industry and L30 requested RNP approaches for all configurations, which mimic historical flight track data. Stakeholders requested RNP approaches which utilize Radius to Fix (RF) turns to the final approach course. The Las Vegas Metroplex Design and Implementation (D&I) Team developed RNP Authorization Required (AR) approaches to KLAS runways 08R, 19 L/R and 26 L/R. For a number of reasons, RNP approaches to Runways 01 L/R and 08 L were not feasible.

The Las Vegas Metroplex Design and Implementation (D&I) Team elected to provide continuity between PBN and conventional procedures by amending the existing GPS approach.

Figure 1 depicts the current KLAS Runway 01R GPS Approach.

Study Team Recommendation

There was no Metroplex Study Team (MST) recommendation for GPS approaches.

Las Vegas OAPM Design Package

Las Vegas Runway 01R GPS Approach

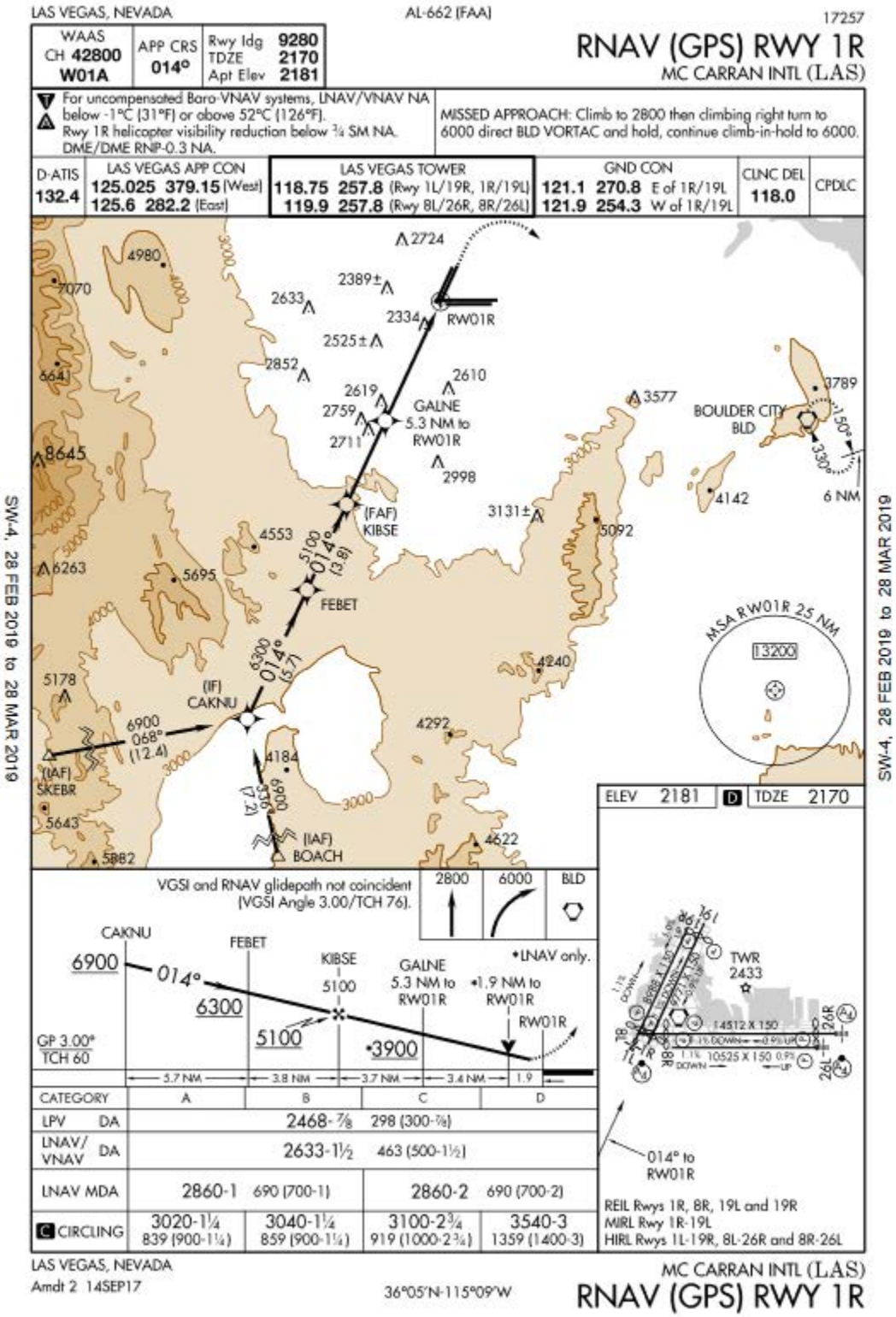


Figure 1: Current KLAS Runway 01R GPS Approach

Las Vegas OAPM Design Package

Las Vegas Runway 01R GPS Approach

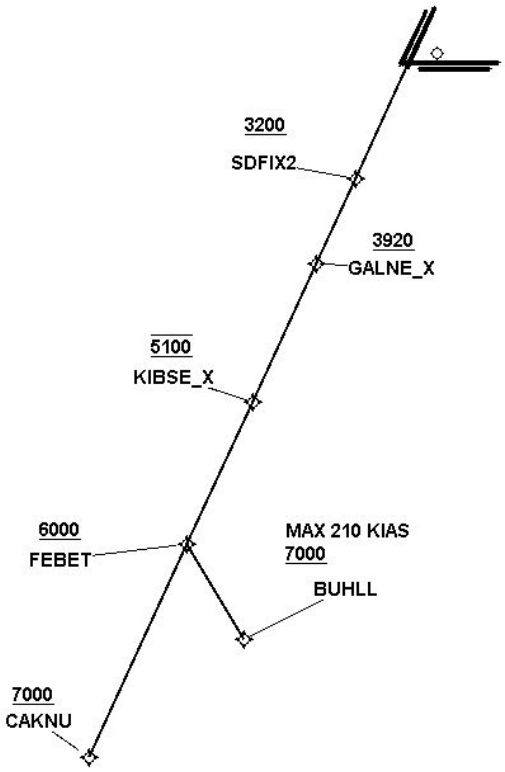
<u>Proposed Final Design</u>

Waypoint changes were made to the KLAS 01R GPS Approach. Two transitions allow greater flexibility.

Figure 2 depicts the KLAS Runway 01R GPS Approach Proposed Final Design.

<u>KLAS Runway 01R GPS Approach</u>

- CAKNU (at or above 070 for terrain/Class B containment) or BUHLL (at 070 for terrain/Class B containment and no greater than 210 knots for criteria) as an entry point
- FEBET (at or above 060 FOR Class B containment)
- KIBSE_X (at 051 for criteria)
- GALNE_X (at or above 3,920 feet for criteria)
- SDFIX2 (at or above 032 for criteria)



Las Vegas OAPM Design Package

Las Vegas Runway 01R GPS Approach

Figure 2: KLAS Runway 01R ILS Approach Proposed Final Design

<u>Attachments</u>

- TARGETS Distribution Package
- RNAV Pro analysis results (may be completed during Evaluation Phase

Las Vegas OAPM Design Package

Las Vegas Runway 01R GPS Approach

<u>Review Signatures</u>

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date
Chris Iwanski LAS NATCA POC	23 APR 19 Date		

Las Vegas OAPM Design Package

Las Vegas RNP Runway 08R Approach

Approach procedures to the Las Vegas McCarran International Airport (KLAS) are currently limited to Instrument Landing System (ILS), Global Positioning System (GPS) or visual procedures. The ILS and GPS approaches both involve intercepting an extended runway line in preparation for landing (straight in approach). Visual approaches require sighting of the airport and hand flying to touchdown.

As part of the Las Vegas Metroplex Project, Area Navigation (RNAV) procedures were developed for arrivals and departures serving the Las Vegas Valley. These procedures include Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARs) and Required Navigation Procedure (RNP) approaches. RNAV procedures are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces task complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports. Implementation of PBN will assist in the Federal Aviation Administration's (FAA) Trajectory Based Operations (TBO) Infrastructure 2025 Plan[1].

The RNP Runway 08R Approach was designed in conjunction with the KLAS RKSTR, CHOWW, RNDRZ, COKTL and JAYSN STARs, allowing access to Runway 08R from multiple directions. The use of satellite navigation will provide connectivity to the approach via either a curved of straight in path.

This procedure is not anticipated to change runway usage. The KLAS RNP Runway approach will increase flight path predictability and decrease controller/pilot workload and task complexity, which will enhance safety.

---

[1] *Trajectory Based Operations (TBO) is an Air Traffic Management (ATM) method for strategically planning, managing, and optimizing flights throughout the NAS by using time-based management, information exchange between air and ground systems, and the aircraft's ability to fly precise paths in time and space.* *https://www.faa.gov/about/office_org/headquarters_offices/ang/offices/tc/library/Storyboard/tbo.html#intro1*

Las Vegas OAPM Design Package

Las Vegas RNP Runway 08R Approach

Name of Change and Airport/s	Change Classification
Las Vegas McCarran (KLAS) RNP Runway 08R Approach	**Terminal Procedure**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
May 31, 2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Las Vegas Terminal Radar Approach Control (L30) Sectors: FINAL (FNL) **KLAS**	**KLAS RNDRZ Standard Terminal Arrival Route (STAR), KLAS CHOWW STAR, KLAS COKTL STAR, KLAS RKSTR STAR, KLAS JAYSN STAR**
Associated Data Files	
TARGETS Output Packages **Flight Simulator Worksheet** **RNAV Pro analysis results** **HITL simulation results**	

Purpose

There are currently no Required Navigation Procedures (RNP) approach procedures for KLAS. Industry and L30 requested RNP approaches for all configurations, using historical track data as a baseline. Stakeholders requested RNP approaches which utilize Radius to Fix (RF) turns to the final approach course.

Study Team Recommendation

As depicted in Figure 1, KLAS RNP procedures to the final approach course were designed for all configurations (25L/R, 19L/R, 07R and 01L/R)[2]. The Las Vegas Metroplex Study Team (MST) recommends that conceptual RNP Standard Instrument Approach Procedures (SIAPs) at KLAS be reviewed during the Design and Implementation (D&I) phase for optimized downwind alignment and reduction in arc length.

Initial conceptual approaches were designed for all runways. During the Second Outreach, L30 requested the Runway 07L RNP approach be deleted.

The MST recommendation is depicted in Figure 1.

[2] In August 2017 Las Vegas runways had a magnetic variance adjustment. Runways 07 L/R and 25 L/R were adjusted to 08L/R and 26 L/R.

Las Vegas OAPM Design Package

Las Vegas RNP Runway 08R Approach

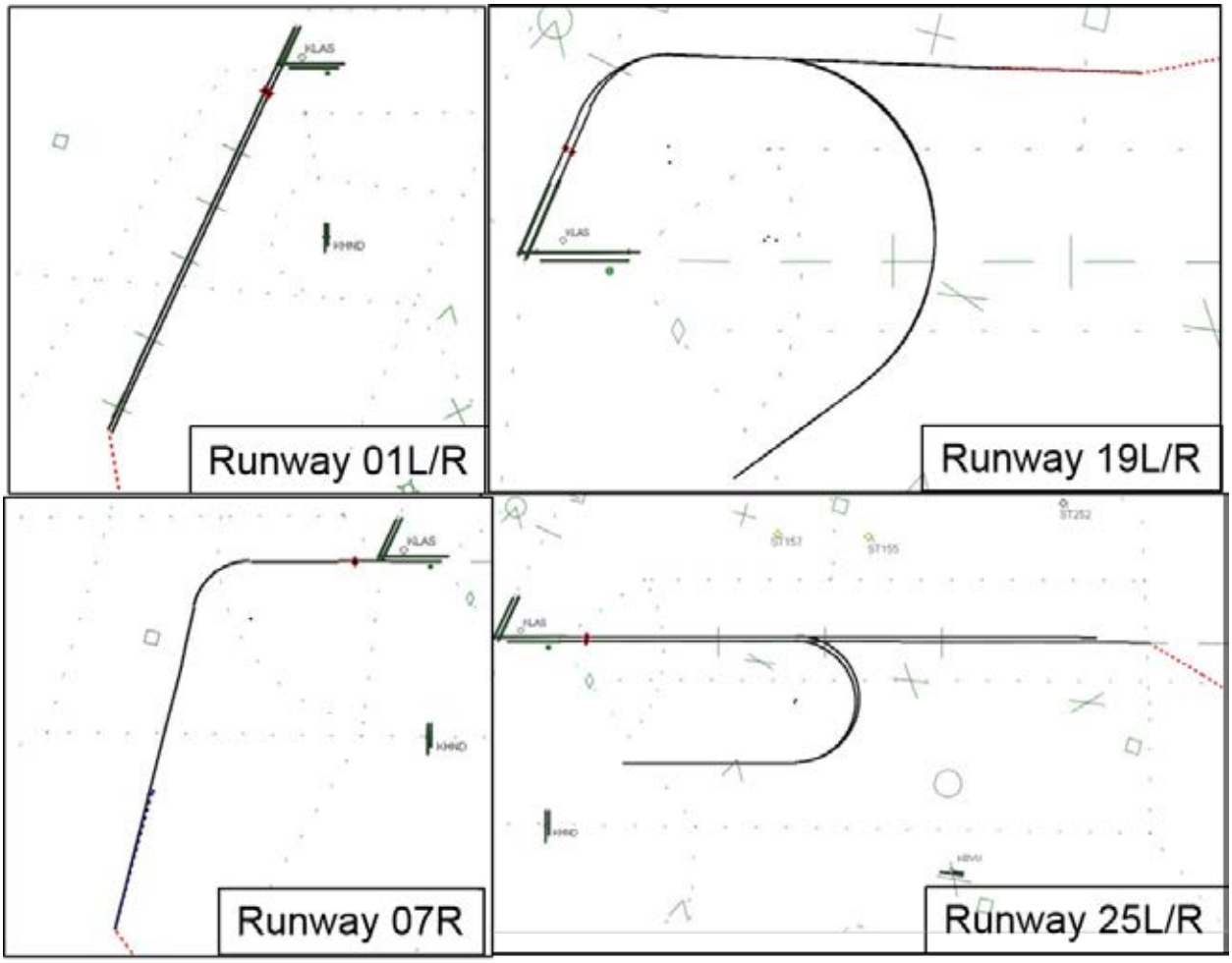


Figure 1: KLAS RNP Approaches-Study Team Recommendations

<u>Proposed Final Design</u>

The Las Vegas Design and Implementation (D&I) Team reviewed the MST proposal to refine and provide optimization to the greatest extent possible. The RNP Runway 08R Approach was designed for connectivity from all Metroplex KLAS RNAV STAR designs. The KLAS COKTL, JAYSN, RKSTR and RNDRZ STARs all share a waypoint (YAGGR) with the approach, while the KLAS CHOWW will allow connection via radar vectors.

The KLAS Runway 08R RNP Approach begins at YAGGR. Waypoints with restrictions (altitudes/speeds) were added to meet design criteria and to assist in aircraft flyability.

The D&I Team proposed final design is depicted in Figure 2.

<u>KLAS Runway 08R RNP Authorization Required (AR) Approach</u>

- YAGGR (at 080/no greater than 210 knots)
- CEENA (at or above 070)
- MNDRN (at or above 060/terrain avoidance)

- SAMOA (at or above 050/Class B containment)
- EYUNG (at or above 045/terrain avoidance)
- BHARP (at 038)

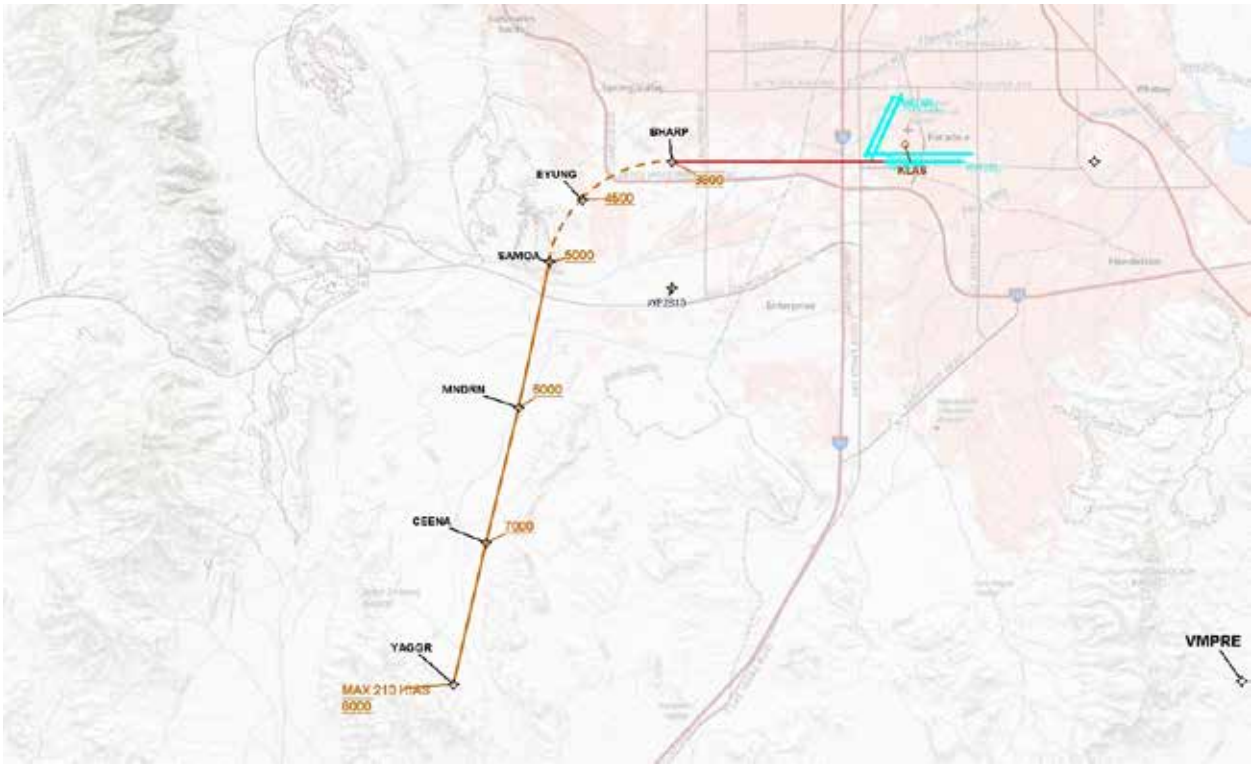


Figure 2: KLAS Runway 08R RNP AR Approach Proposed Final Design

Study Team Recommendation Design Differences

The proposed KLAS RNP Runway 08R Approach is in line with the Study Team recommendation.

Implementation Dependencies

Attachments

- TARGETS Distribution Package
- Flight Simulator Worksheet
- RNAV Pro analysis results
- HITL simulation results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh 4/23/19 — 4/23/19

Bradley R. Mayhugh — Date — Chris Thomas — Date

LAS FAA Lead — LAS NATCA Lead

Anita Engelmann 4/25/19 — 23APR19

Anita Engelmann — Date — Dan Hauptman — Date

TWAB Representative — L30 NATCA POC

23 APR 19

Chris Iwanski — Date

LAS NATCA POC

LAS Metroplex KLAS RNP RUNWAY 26L Community Engagement Review Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
6/4/2019	On April 9, 10 and 11, 2019, the LAS Metroplex Project conducted public outreach efforts to present Proposed Final Designs for developed RNAV procedures. The Team solicited comments, in person during the events and for 30 days after via web based comment forms. At the conclusion of the comment period, the Team reviewed all submissions and re-examined the procedures to determine if any changes could be made based on public input. The KLAS RNP RUNWAY 26L was reviewed as part of this process. The KLAS RNP Runways 26 L/R Approaches (downwind segments) were mentioned in several comments from residents of Henderson, NV. The D&I Team reviewed the procedures to determine whether changes could be made. The development of RNAV RNP approaches requires adherence to precise design criteria, which ensure different aircraft types, with varying capabilities and flight characteristics, are able to fly the procedure safely. The mandated criteria limits aircraft bank angles, assigned speeds, altitudes and segment leg lengths. The downwind segment meets existing criteria for design, utilizing the maximum allowable bank angle. The proposed procedure routes aircraft between ¾ and ½ mile south of the existing arrival procedures tracks from the west. Any movement north for the downwind portion of the approach would exceed maximum approved bank angle for the procedure. Industry representatives indicate that any movement north for the downwind segment could result in unmanageable situations for aircrews attempting to land. Aircraft assigned the KLAS RNAV RNP Runways 26 L/R Approaches will be 4,800 feet or higher above airport elevation at the point where they begin a northbound turn towards KLAS. The preliminary designs for the Runway 26 L/R downwind were not changed due to design criteria issues. This document will be part of the Administrative Record indicating review of the procedure based on public comments submitted prior to release of the Draft Environmental Assessment.	Master TARGETS File	

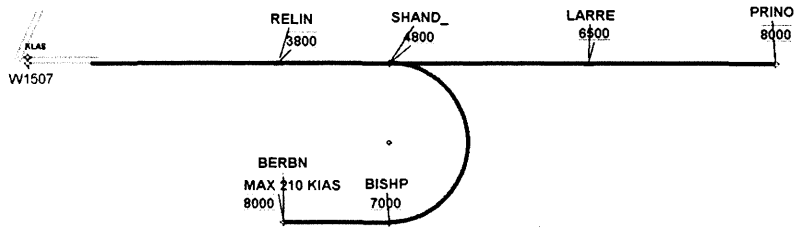


Figure 1: KLAS RNP RUNWAY 26L Original Proposed Final Design

All Change Control Sheets and Final Design Packages under the Metroplex Project have been completed.

Bradley R Mayhugh
FAA Metroplex Co-Lead

NATCA Metroplex Co-Lead

11/5/19
Date

11/6/19
Date

Las Vegas OAPM Design Package

Las Vegas RNP Runway 26L Approach

Approach procedures to the Las Vegas McCarran International Airport (KLAS) are currently limited to Instrument Landing System (ILS), Global Positioning System (GPS) or visual procedures. The ILS and GPS approaches both involve intercepting an extended runway line in preparation for landing (straight in approach). Visual approaches require sighting of the airport and hand flying to touchdown.

As part of the Las Vegas Metroplex Project, Area Navigation (RNAV) procedures were developed for arrivals and departures serving the Las Vegas Valley. These procedures include Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARs) and Required Navigation Procedure (RNP) approaches. RNAV procedures are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports. Implementation of PBN will assist in the Federal Aviation Administration's (FAA) Trajectory Based Operations (TBO) Infrastructure 2025 Plan[1].

The RNP Runway 26L Approach was designed in conjunction with the KLAS RKSTR, CHOWW, RNDRZ, COKTL and JAYSN STARs, allowing access to Runway 26L from multiple directions. The use of satellite navigation will allow joining of the approach via either a curved of straight in path.

This procedure is not anticipated to change runway usage. The KLAS RNP Runway 26L approach will increase flight path predictability and decrease controller/pilot workload and task complexity, which will enhance safety.

---

[1] *Trajectory Based Operations (TBO) is an Air Traffic Management (ATM) method for strategically planning, managing, and optimizing flights throughout the NAS by using time-based management, information exchange between air and ground systems, and the aircraft's ability to fly precise paths in time and space.* *https://www.faa.gov/about/office_org/headquarters_offices/ang/offices/tc/library/Storyboard/tbo.html#intro1*

Las Vegas OAPM Design Package

Las Vegas RNP Runway 26L Approach

Name of Change and Airport/s	Change Classification
Las Vegas McCarran (KLAS) Required Navigation (RNP) Runway 26L Approach	**Terminal Procedure**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
May 31, 2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Las Vegas Terminal Radar Approach Control (L30) Sectors: FINAL (FNL) **KLAS**	**KLAS RNDRZ Standard Terminal Arrival Route (STAR), KLAS CHOWW STAR, KLAS COKTL STAR, KLAS RKSTR STAR, KLAS JAYSN STAR**
Associated Data Files	
TARGETS Output Packages **Flight Simulator Worksheet** **RNAV Pro analysis results** **HITL simulation results**	

Purpose

There are currently no Required Navigation Procedures (RNP) approach procedures for KLAS. Industry and L30 requested RNP approaches for all configurations, using historical track data as a baseline. Stakeholders requested RNP approaches which utilize Radius to Fix (RF) turns to the final approach course.

Study Team Recommendation

As depicted in Figure 1, KLAS RNP procedures to the final approach course were designed for all configurations (25L/R, 19L/R, 07R and 01L/R)[2]. The Las Vegas Metroplex Study Team (MST) recommends that conceptual RNP Standard Instrument Approach Procedures (SIAPs) at KLAS be reviewed during the Design and Implementation (D&I) phase for optimized downwind alignment and reduction in arc length.

Initial conceptual approaches were designed for all runways. During the Study Team Second Outreach L30 requested the Runway 07L RNP approach be deleted.

The MST recommendation is depicted in Figure 1.

[2] In August 2017 Las Vegas runways had a magnetic variance adjustment. Runways 07 L/R and 25 L/R became 08 L/R and 26 L/R.

Las Vegas OAPM Design Package

Las Vegas RNP Runway 26L Approach

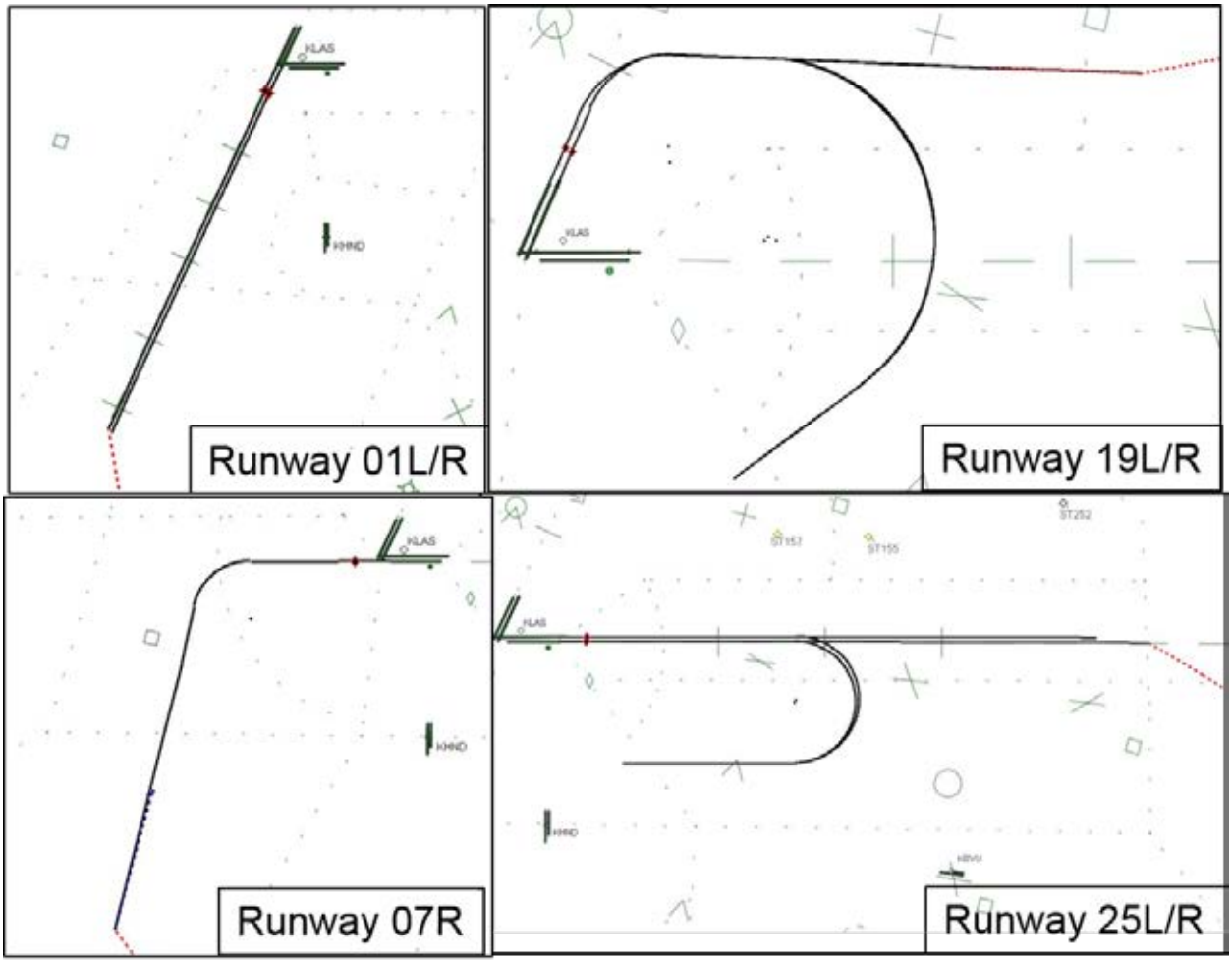


Figure 1: LAS RNP Approaches-Study Team Recommendations

<u>Proposed Final Design</u>

The Las Vegas Design and Implementation (D&I) Team reviewed the MST proposal to refine and provide optimization to the greatest extent possible. The Runway 26L RNP Approach was designed for connectivity from all Metroplex KLAS RNAV STAR designs. The KLAS RKSTR and CHOWW Standard Terminal Arrival Routes (STARs) share a waypoint (PRINO) with the straight in approach segment. The KLAS RNDRZ, COKTL and JAYSN STARs share a waypoint (BERBN) with the downwind approach segment.

The KLAS Runway 26L RNP Approach straight in segment begins at PRINO. The KLAS Runway 26L RNP Approach downwind segment begins at BERBN. Waypoints with restrictions (altitudes/speeds) were added for design criteria and to assist in aircraft flyability.

The D&I Team proposed final design is depicted in Figure 2.

<u>KLAS Runway 26L RNP Authorization Required (AR) Approach</u>

<u>Straight In Segment:</u>

- PRINO (at 080)

- LARRE (at or above 065 for Class B)
- SHAND (at or above 048)
- RELIN (at 038)

Downwind Segment:

- BERBN (at 080/no greater than 210 knots)
- BISHP (at or above 070)
- SHAND (at or above 048)
- RELIN (at 038)

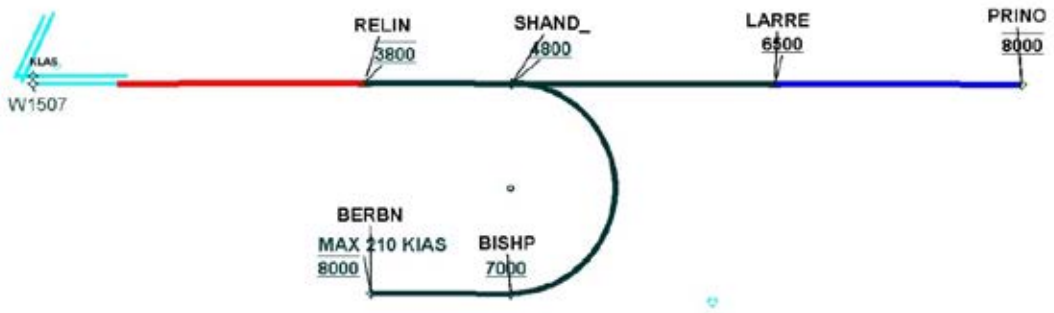


Figure 2: Proposed KLAS RNP Runway 26L Approach

Study Team Recommendation Design Differences

The proposed LAS RNP Runway 26L Approach is in line with the Study Team recommendation.

Implementation Dependencies

Attachments

- TARGETS Distribution Package
- Flight Simulator Worksheet
- RNAV Pro analysis results
- HITL simulation results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh 4/23/19 — 4/23/19

Bradley R. Mayhugh — Date — Chris Thomas — Date

LAS FAA Lead — LAS NATCA Lead

Anita Engelmann 4/25/19 — 23APR19

Anita Engelmann — Date — Dan Hauptman — Date

TWAB Representative — L30 NATCA POC

23 APR 19

Chris Iwanski — Date

LAS NATCA POC

LAS Metroplex KLAS RNP RUNWAY 26R Community Engagement Review Design Package Change Control Sheet			
Date	Description	TARGETS File Reference	FAA/NATCA Co-Lead Initials
6/4/2019	On April 9, 10 and 11, 2019, the LAS Metroplex Project conducted public outreach efforts to present Proposed Final Designs for developed RNAV procedures. The Team solicited comments, in person during the events and for 30 days after via web based comment forms. At the conclusion of the comment period, the Team reviewed all submissions and re-examined the procedures to determine if any changes could be made based on public input. The KLAS RNP RUNWAY 26R Approach was reviewed as part of this process. The KLAS RNP Runways 26 L/R Approaches (downwind segments) were mentioned in several comments from residents of Henderson, NV. The D&I Team reviewed the procedures to determine whether changes could be made. The development of RNAV RNP approaches requires adherence to precise design criteria, which ensure different aircraft types, with varying capabilities and flight characteristics, are able to fly the procedure safely. The mandated criteria limits aircraft bank angles, assigned speeds, altitudes and segment leg lengths. The downwind segment meets existing criteria for design, utilizing the maximum allowable bank angle. The proposed procedure routes aircraft between ¾ and ½ mile south of the existing arrival procedures tracks from the west. Any movement north for the downwind portion of the approach would exceed maximum approved bank angle for the procedure. Industry representatives indicate that any movement north for the downwind segment could result in unmanageable situations for aircrews attempting to land. Aircraft assigned the KLAS RNAV RNP Runways 26 L/R Approaches will be 4,800 feet or higher above airport elevation at the point where they begin a northbound turn towards KLAS. The preliminary designs for the Runway 26 L/R downwind were not changed due to design criteria issues. This document will be part of the Administrative Record indicating review of the procedure based on public comments submitted prior to release of the Draft Environmental Assessment. This document will be part of the Administrative Record indicating review of the procedure based on public comments submitted prior to release of the Draft Environmental Assessment.	Master TARGETS File	

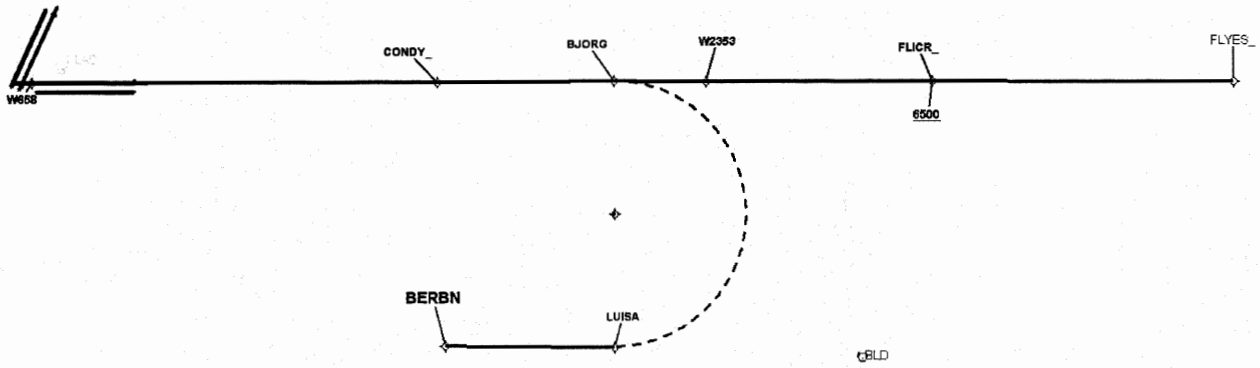


Figure 1: KLAS RNP RUNWAY 26R Original Proposed Final Design

All Change Control Sheets and Final Design Packages under the Metroplex Project have been completed.

Bradley R Mayhugh

FAA Metroplex Co-Lead

NATCA Metroplex Co-Lead

11/5/19

Date

11/6/19

Date

Las Vegas OAPM Design Package

Las Vegas RNP Runway 26R Approach

Approach procedures to the Las Vegas McCarran International Airport (KLAS) are currently limited to Instrument Landing System (ILS), Global Positioning System (GPS) or visual procedures. The ILS and GPS approaches both involve intercepting an extended runway line in preparation for landing (straight in approach). Visual approaches require sighting of the airport and hand flying to touchdown.

As part of the Las Vegas Metroplex Project, Area Navigation (RNAV) procedures were developed for arrivals and departures serving the Las Vegas Valley. These procedures include Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARs) and Required Navigation Procedure (RNP) approaches. RNAV procedures are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports. Implementation of PBN will assist in the Federal Aviation Administration's (FAA) Trajectory Based Operations (TBO) Infrastructure 2025 Plan[1]

The RNP Runway 19L Approach was designed in conjunction with the KLAS RKSTR, CHOWW, RNDRZ, COKTL and JAYSN STARs, allowing access to Runway 19L from multiple directions. The use of satellite navigation will allow joining of the approach via either a curved of straight in path.

This procedure is not anticipated to change runway usage. The KLAS RNP Runway 19L approach will increase flight path predictability and decrease controller/pilot workload and task complexity, which will enhance safety.

---

[1] *Trajectory Based Operations (TBO) is an Air Traffic Management (ATM) method for strategically planning, managing, and optimizing flights throughout the NAS by using time-based management, information exchange between air and ground systems, and the aircraft's ability to fly precise paths in time and space.* *https://www.faa.gov/about/office_org/headquarters_offices/ang/offices/tc/library/Storyboard/tbo.html#intro1*

Las Vegas OAPM Design Package

Las Vegas RNP Runway 26R Approach

Name of Change and Airport/s	Change Classification
Las Vegas McCarran (KLAS) Required Navigation (RNP) Runway 26R Approach	**Terminal Procedure**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
May 31, 2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Las Vegas Terminal Radar Approach Control (L30) Sectors: FINAL (FNL) **KLAS**	**KLAS RNDRZ Standard Terminal Arrival Route (STAR), KLAS CHOWW STAR, KLAS COKTL STAR, KLAS RKSTR STAR, KLAS JAYSN STAR**
Associated Data Files	
TARGETS Output Packages **Flight Simulator Worksheet** **RNAV Pro analysis results** **HITL simulation results**	

Purpose

There are currently no Required Navigation Procedure (RNP) approaches for KLAS. Industry and L30 requested RNP approaches for all configurations which mimic historical flight track data. Stakeholders requested RNP approaches which utilize Radius to Fix (RF) turns to the final approach course.

Study Team Recommendation

As depicted in Figure 1, KLAS RNP procedures to the final approach course were designed for all configurations (25L/R, 19L/R, 07R and 01L/R)[2]. The Las Vegas Metroplex Study Team (MST) recommends that conceptual RNP Standard Instrument Approach Procedures (SIAPs) at KLAS be reviewed during the Design and Implementation (D&I) phase for optimized downwind alignment and reduction in arc length.

Initial conceptual approaches were designed for all runways. During the Study Team Second Outreach L30 requested the Runway 07L RNP approach be deleted.

The MST recommendation is depicted in Figure 1:

[2] In August 2017 Las Vegas runways had a magnetic variance adjustment. Runways 07 L/R and 25 L/R became 08 L/R and 26 L/R.

Las Vegas OAPM Design Package

Las Vegas RNP Runway 26R Approach

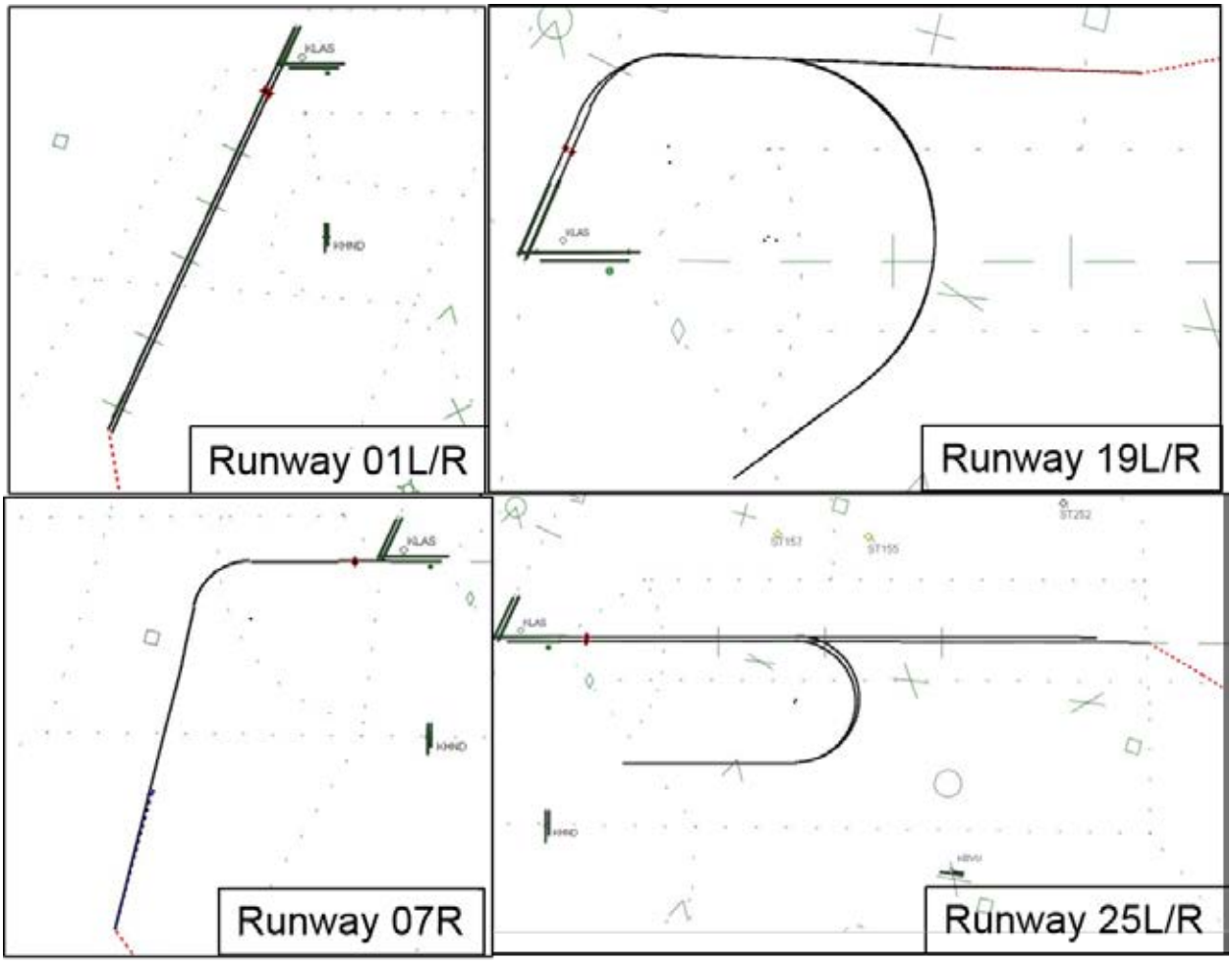


Figure 1: KLAS RNP Approaches-Study Team Recommendations

<u>Proposed Final Design</u>

The D&I Team reviewed the MST proposal to refine and provide optimization to the greatest extent possible. The Runway 26L RNP Approach was designed for connectivity from all Metroplex KLAS RNAV STAR designs. The KLAS RKSTR and CHOWW Standard Terminal Arrival Routes (STARs) share a waypoint (FLIKR) with the straight in approach segment. The KLAS RNDRZ, COKTL and JAYSN STARs share a waypoint (BERBN) with the downwind approach segment.

The KLAS Runway 26L RNP Approach straight in segment begins at PRINO. The KLAS Runway 26L RNP Approach downwind segment begins at BERBN. Waypoints with restrictions (altitudes/speeds) were added to meet design criteria and to assist in aircraft flyability.

The D&I Team proposed final design is depicted in Figure 2.

<u>KLAS Runway 26R RNP Authorization Required (AR) Approach</u>

<u>Straight In Segment:</u>

- FLYES (at 080/no greater than 210 knots)

- FLICR (at or above 065 for Class B)
- W2353 (at or above 053)
- BJORG (at or above 047)
- CONDY (at 038)

Downwind Segment:

- BERBN (at 080/no greater than 210 knots)
- LUISA (at or above 070)
- BJORG (at or above 047)
- CONDY (at 038)

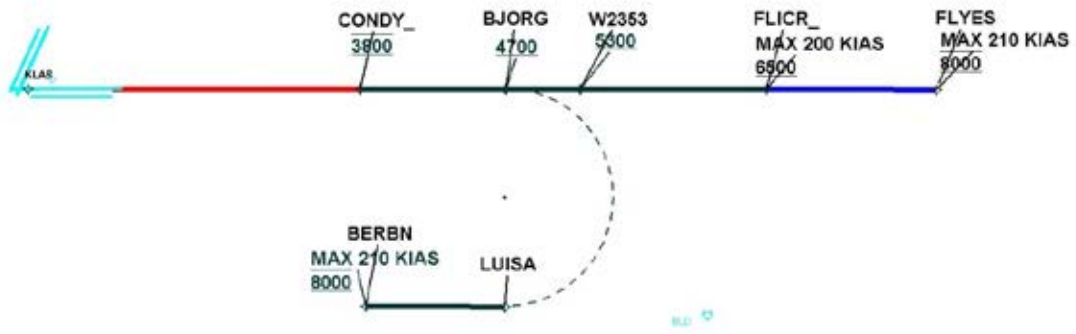


Figure 2: Proposed KLAS RNP Runway 26R Approach

Study Team Recommendation Design Differences

The proposed LAS RNP Runway 26R Approach is in line with the Study Team recommendation.

Implementation Dependencies

Attachments

- TARGETS Distribution Package
- Flight Simulator Worksheet
- RNAV Pro analysis results
- HITL simulation results

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh 4/23/19 — 4/23/19

Bradley R. Mayhugh — Date — Chris Thomas — Date

LAS FAA Lead — LAS NATCA Lead

Anita Engelmann 4/25/19 — 23APR19

Anita Engelmann — Date — Dan Hauptman — Date

TWAB Representative — L30 NATCA POC

23 APR 19

Chris Iwanski — Date

LAS NATCA POC

Las Vegas OAPM Design Package

KVGT Runway 12R GPS Approach

Approach procedures to the McCarran International Airport (KLAS) and North Las Vegas Airport (KVGT) are currently limited to Instrument Landing System (ILS), Global Positioning System (GPS) or visual procedures. The ILS and GPS approaches both involve intercepting an extended runway line in preparation for landing (straight-in approach). Visual approaches require sighting of the airport and hand flying to touchdown.

As part of the Las Vegas Metroplex Project, Area Navigation (RNAV) procedures were developed for arrivals and departures serving the Las Vegas Valley. These procedures include Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARs) and Required Navigation Procedure (RNP) approaches. RNAV procedures are designed to take advantage of Performance Based Navigation (PBN) capabilities in modern aircraft and may also provide vertical guidance and/or speed restrictions. Utilization of PBN provides repeatable and predictable paths, reduces task complexity and increases efficiency in the National Airspace System (NAS). PBN procedures assist in the segregation of aircraft utilizing different routes or landing at/departing from different airports. Implementation of PBN will assist in the Federal Aviation Administration's (FAA) Trajectory Based Operations (TBO) Infrastructure 2025 Plan[1].

The Las Vegas Metroplex Design and Implementation Team (D&I Team) elected to provide continuity between PBN and conventional procedures by amending three existing conventional (ground-based radio navigation) ILS approaches and one GPS approach for KLAS.

The Las Vegas Metroplex Project received a request from the North Las Vegas Air Traffic Control Tower (VGT ATCT) to help improve the GPS approach for KVGT. The current procedures prevent the use of simultaneous approaches to parallel Runways 12L/R.

The KVGT Runway 12R GPS Approach was amended to provide a more efficient operation that would allow parallel instrument/GPS approaches to Runways 12L/R.

---

[1] *Trajectory Based Operations (TBO) is an Air Traffic Management (ATM) method for strategically planning, managing, and optimizing flights throughout the NAS by using time-based management, information exchange between air and ground systems, and the aircraft's ability to fly precise paths in time and space.*
https://www.faa.gov/about/office_org/headquarters_offices/ang/offices/tc/library/Storyboard/tbo.html#intro1

Las Vegas OAPM Design Package

KVGT Runway 12R GPS Approach

Name of Change and Airport(s)	Change Classification
North Las Vegas (KVGT) **Runway 12R Global Positioning System (GPS) Approach**	**Terminal Procedure; GPS Approach**[NL1]
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.1	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**5/21/2020**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Nellis Air Traffic Control Facility (NATCF) **North Las Vegas Air Traffic Control Tower (VGT ATCT)** **KVGT**	**KLAS RNDRZ, CHOWW, COKTL, RKSTR, and JAYSN Standard Terminal Arrival Routes (STARs)**[NL2]
Associated Data Files	
TARGETS output packages **Flight Simulator worksheet** **RNAV Pro analysis results** **HITL**[NL3]**S results**	

Purpose

The Las Vegas Metroplex Project received a request from VGT ATCT to help improve the GPS approach for KVGT. The current procedures prevent the use of simultaneous approaches to parallel Runways 12L/R.

Figure 1 depicts the current KVGT Runway 12R GPS Approach.

Study Team Recommendation

There was no Las Vegas Metroplex Study Team (MST) recommendation for GPS approaches.

Las Vegas OAPM Design Package

KVGT Runway 12R GPS Approach

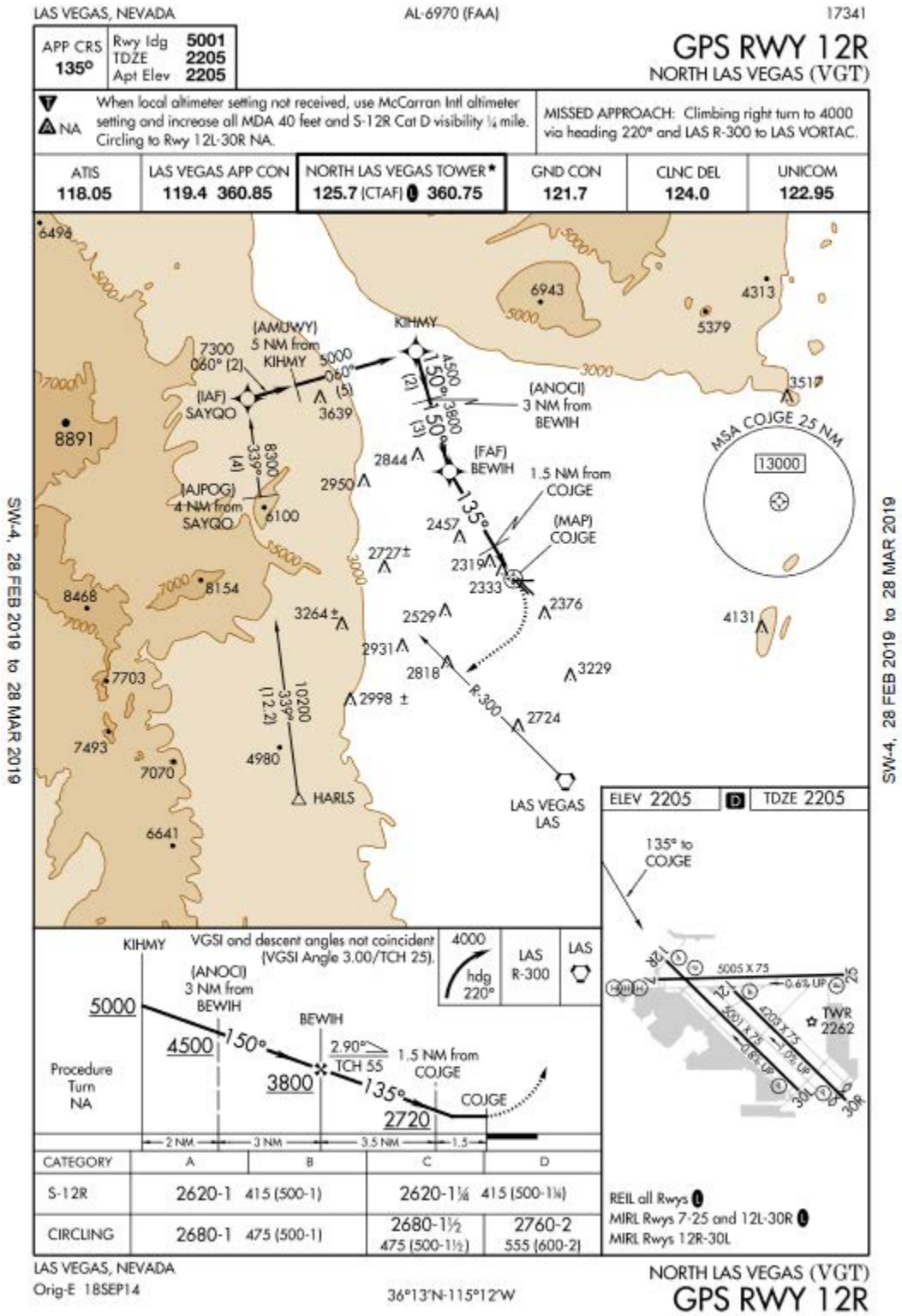


Figure 1: Current KVGT Runway 12R GPS Approach

Las Vegas OAPM Design Package

KVGT Runway 12R GPS Approach

Proposed Final Design

The KVGT Runway 12R GPS Approach was amended to provide a more efficient operation that would allow parallel instrument/GPS approaches to Runways 12L/R.

Lateral and vertical changes were made to the KVGT Runway 12R GPS Approach.

Figure 2 depicts the KVGT Runway 12R GPS Approach PFD.

KVGT Runway 12R GPS Approach

- ECAKO (at or above 090/no greater than 230 knots/for terrain[NL4])
- WP33 (at or above 067/ no greater than 230 knots/for terrain)
- WP02 (at or above 060/for terrain)
- PFAF (at 052/for design criteria)
- WP05 (at or above 038/for terrain)
- WP06 (at or above 3,080 feet/for terrain)

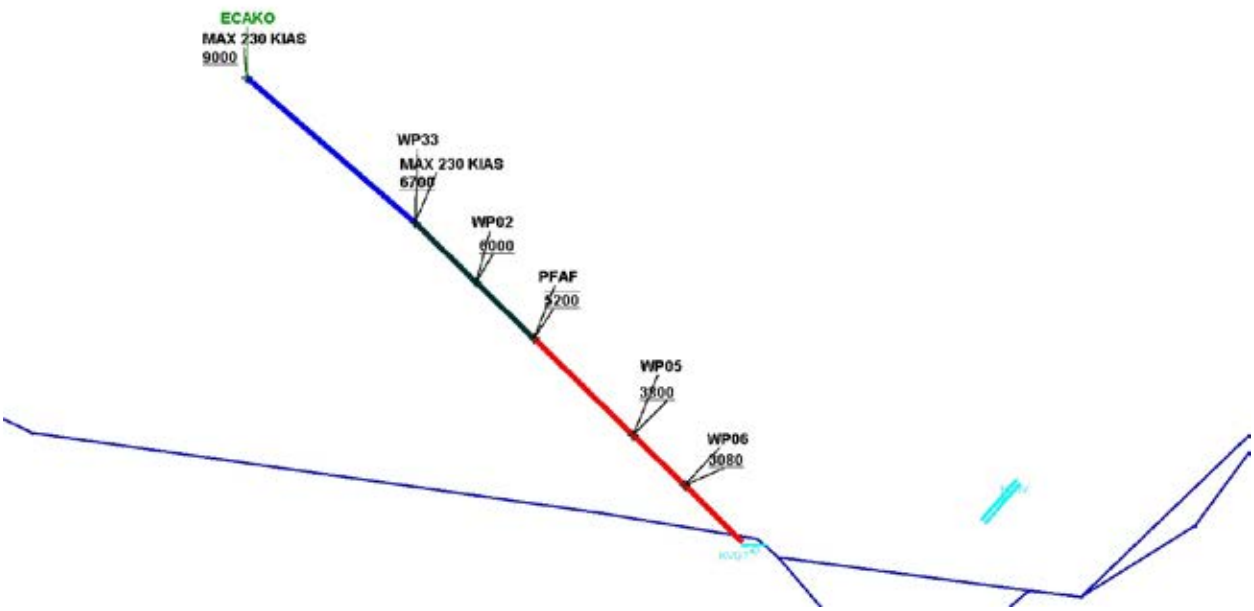


Figure 2: KVGT Runway 12R GPS Approach PFD

Attachments

- TARGETS distribution package
- Flight Simulator worksheet
- RNAV Pro analysis results (may be completed during Evaluation Phase)
- HITLS results (when applicable - may be completed during Evaluation Phase)

Las Vegas OAPM Design Package

KVGT Runway 12R GPS Approach

Review Signatures[NL5]

The D&I Team has reached agreement through consensus on this procedure using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh	4/23/19	Chris Thomas	4/23/19
Bradley R. Mayhugh	Date	Chris Thomas	Date
LAS FAA Lead		LAS NATCA Lead	
	30 Apr 19	Ashley L. Magee	4/30/19
Tom Black	Date	Ashley Magee	Date
VGT Facility POC		VGT NATCA POC	
Anita Engelmann	4/23/19		23 Apr 19
Anita Engelmann	Date	Dan Hauptman	Date
TWAB Representative		L30 NATCA POC	
	4-23-19	Available via electronic signature	
Chris Iwanski	Date		Date
LAS NATCA POC		Nellis Air Traffic Control Facility	

Las Vegas OAPM Design Package

T338 Route

A T-route is an airway that serves as a lateral path for aircraft at or below 17,999 feet, which allows flights to traverse airspace. A T-route can also serve as a defined path connecting other procedures or routes. It is based on satellite navigation and provides repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS).

T338 is a proposed Area Navigation (RNAV) route that will provide a lateral path for arrivals and departures to the North Las Vegas Airport (KVGT), Boulder City Municipal Airport (KBVU) and McCarran International Airport (KLAS). It will serve prop aircraft that are arriving at KVGT and KLAS from points east or that are departing from KVGT and KLAS to points east. The routing duplicates a new proposed KVGT WYLAND Standard Terminal Arrival Route (STAR) serving jet aircraft arriving to KVGT from the east. The T-route will serve prop KVGT arrivals. This defined routing will reduce complexity and workload for both controller and flight crews along with increasing efficiency in the NAS.

Las Vegas OAPM Design Package

T338 Route

Name of Change and Airport/s	Change Classification
T338 Route	**Terminal Route**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.3	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
2/22/2019	**TBD**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Las Vegas Terminal Radar Approach Control (L30 TRACON): LAK, SAT, KNO, MED **McCarran International Airport Tower (LAS): CD, LC1, LC2** **Los Angeles Air Route Traffic Control Center (ZLA ARTCC): Sector 7 and 8** **North Las Vegas Airport (VGT):** **Nellis Air Traffic Control Facility (NATCF)**	**N/A**
Associated Data Files	
xxxxxxxx_LAS_tgs	

Purpose

The purpose of T338 is to provide a repeatable and predictable east/west route for prop traffic arriving to and departing from North Las Vegas Airport (KVGT), Boulder City Municipal Airport (KBVU) and McCarran International Airport (KLAS).

Study Team Recommendation

There was no specific recommendation from the Las Vegas Metroplex Study Team (MST) for the development of T338.

Issues

The Las Vegas Terminal Radar Approach Control Facility (L30 TRACON) issues radar vectors to aircraft in the absence of published routes to traverse Class B airspace. Stakeholders requested

low altitude Area Navigation (RNAV) routes through Class B airspace which will provide predictable, repeatable paths.

Solutions

The Las Vegas Metroplex Design and Implementation (D&I) Team identified an opportunity to proceduralize routes below FL180 by utilizing low altitude RNAV routes (T-Routes) in the terminal and en route airspaces.

Proposed Final Design

The D&I Team determined that a repeatable and predictable east/west route was needed for prop traffic arriving to and departing from KVGT, KBVU and KLAS.

T338 route:

- BOEGY (located as a coordination fix for L30 and ZLA)
- WYLND (located for use as a crossing point if needed to segregate from KLAS arrivals/departures)
- LNDIN (located as a coordination point for L30 and NATCF and as a fix to tie-in to other T-routes)
- DSIRE (located as a fix to join the approach to KVGT, for use by NATCF to route aircraft through their airspace and as a fix to tie-in to other T-routes)

This routing allows KVGT prop arrivals to follow the same arrival path as jet traffic landing at KVGT assigned the proposed KVGT WYLND STAR.

Figure 1 depicts T338.

Las Vegas OAPM Design Package

T338 Route

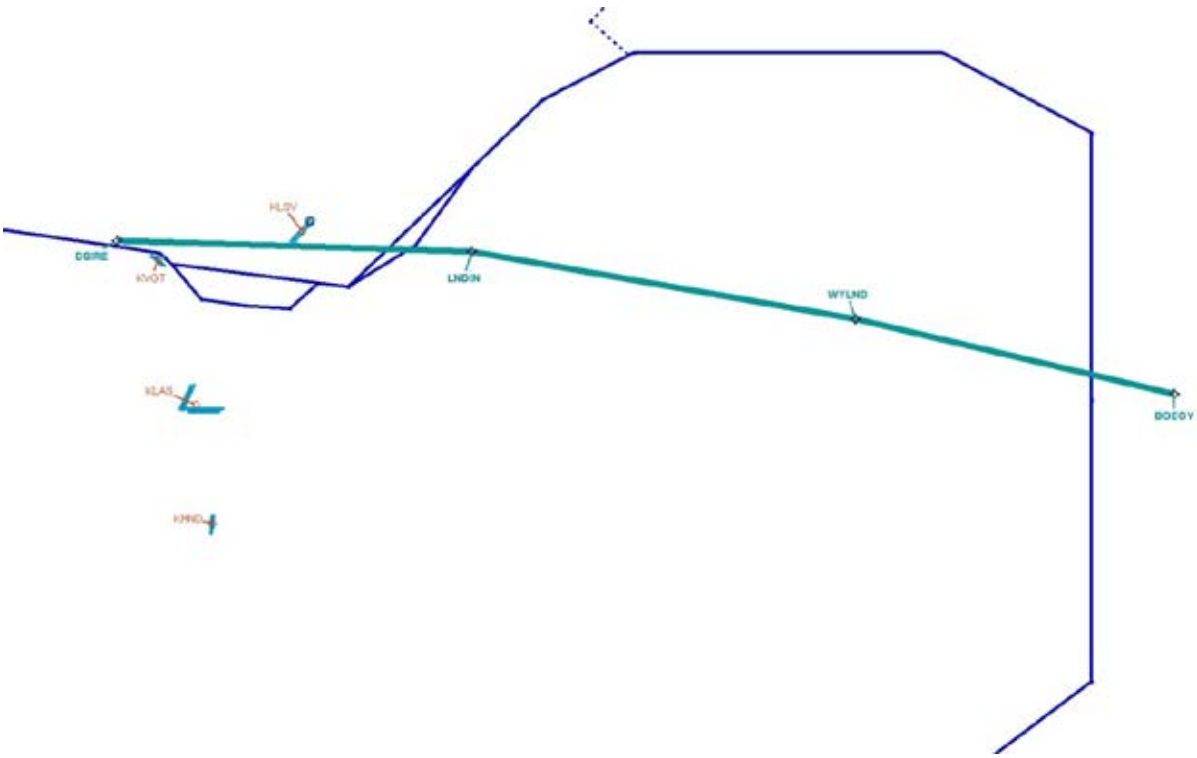


Figure 1: T338 Route

Additional Design Considerations

Implementation Dependencies

- Requires modifications to VGT, LAS, ZLA and L30 Letters of Agreement (LOA) and Standard Operating Procedures (SOP)
- Requires modification to L30/LSV LOA
- Requires no airspace modifications
- Requires controller training
- Requires automation changes

Attachments

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R Mayhugh 4/23/19		4/23/19	
Bradley R Mayhugh	Date	Chris Thomas	Date
LAS FAA Lead		LAS NATCA Lead	
	30 Apr 19	Ashley C. Magee 4/30/19	
Tom Black	Date	Ashley Magee	Date
VGT Facility POC		VGT NATCA POC	
Anita Engelmann 4/25/19		23APR19	
Anita Engelmann	Date	Dan Hauptman	Date
TWAB Representative		L30 NATCA POC	
4/23/19		5/2/19	
Sarah Fletcher	Date	for Martin Ramirez	Date
ZLA Facility POC		ZLA NATCA POC	
4-23-19		Available via electronic signature	
Chris Iwanski	Date		Date
LAS NATCA POC		Nellis Air Traffic Control Facility	

Las Vegas OAPM Design Package

T361 Route

A T-route is an airway that serves as a lateral path for aircraft at or below 17,999 feet, which allows flights to traverse airspace. A T-route can also serve as a defined path connecting other procedures or routes. It is based on satellite navigation and provides repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS).

T361 was developed to provide a predictable and repeatable flight path for aircraft flying through the Las Vegas Terminal Radar Approach Control Facility (L30 TRACON) airspace and to serve as an arrival/departure airway for McCarran International Airport (KLAS), North Las Vegas Airport (KVGT), Boulder City Municipal Airport (KBVU) and Henderson Executive Airport (KHND). T361 will reduce the current requirement for air traffic control facilities to issue radar vectors or itinerant routing for KLAS and KHND. This defined routing will reduce complexity and workload for both controller and flight crews along with increasing efficiency in the NAS.

Las Vegas OAPM Design Package

T361 Route

Name of Change and Airport/s	Change Classification
T361 Route	**Terminal Route**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.3	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
2/22/2019	**TBD**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Las Vegas Terminal Radar Approach Control (L30 TRACON): CYN, DAG, GNT, FNL, MED, SAT, LAK, KNO **McCarran International Airport Tower (LAS): CD, LC1, LC2** **Los Angeles Air Route Traffic Control Center (ZLA ARTCC): Sectors 7 and 8** **Henderson Executive Airport (HND)** **North Las Vegas Airport Tower (VGT)**	**Not dependent on any other procedures**
Associated Data Files	
xxxxxxxx_LAS_tgs	

Purpose

The purpose of T361 is to provide a repeatable and predicable route for overflights through L30 airspace and to serve as an arrival/departure airway for North Las Vegas Airport (KVGT), McCarran International Airport (KLAS), Boulder City Municipal Airport (KBVU) and Henderson Executive Airport (KHND). It will serve aircraft transitioning to/from the east and northeast.

Study Team Recommendation

There was no specific recommendation from the Las Vegas Metroplex Study Team (MST) for the development of T361.

Issues

Las Vegas OAPM Design Package

T361 Route

The Las Vegas Terminal Radar Approach Control Facility (L30 TRACON) issues radar vectors to aircraft in the absence of published routes to traverse Class B airspace. Stakeholders requested low altitude Area Navigation (RNAV) routes through Class B airspace which will provide predictable, repeatable paths.

Solutions

The Las Vegas Metroplex Design and Implementation (D&I) Team identified an opportunity to proceduralize routes below FL180 by utilizing low altitude RNAV routes (T-Routes) in the terminal and en route airspaces. This T-Route will be utilized by arrivals and departures to/from KVGT and KHND and by prop aircraft into and out of KLAS. T361 will provide connectivity to other T-Route designs, allowing aircraft to transition the airspace. This design will reduce phraseology and complexity, and increase efficiency for aircraft landing in, departing from or transitioning the airspace.

Proposed Final Design

The D&I Team developed a route for prop aircraft from the north and east to KBVU, KVGT, KLAS and KHND airports. This route also ties in to the other T-routes developed for L30 in order to provide transition through the airspace for prop aircraft.

From the north:

- Mormon Mesa Vortac (MMM) (existing navaid utilized as an initial fix)
- SHIEK (coordination fix between ZLA/L30 that segregates from KLAS arrival and departure routes and as a fix to tie-in to other T-routes)
- LNDIN (located as a coordination point for L30 and Nellis Air Traffic Control Facility (NATCF) and as a fix to tie-in to other T-routes)
- WANDR (located to segregate from KLAS arrivals/departures)
- DICSA (provides routing to and from KHND and as a fix to tie-in to other T-routes)
- PUTTT (located to be used to tie in to other T-routes)
- BOEGY (coordination fix for ZLA/L30)

The route can be flown in either direction and aircraft can transition to another T-route or to the KVGT, KHND, KBVU or KLAS airports.

Figure 1 depicts T361.

Las Vegas OAPM Design Package

T361 Route

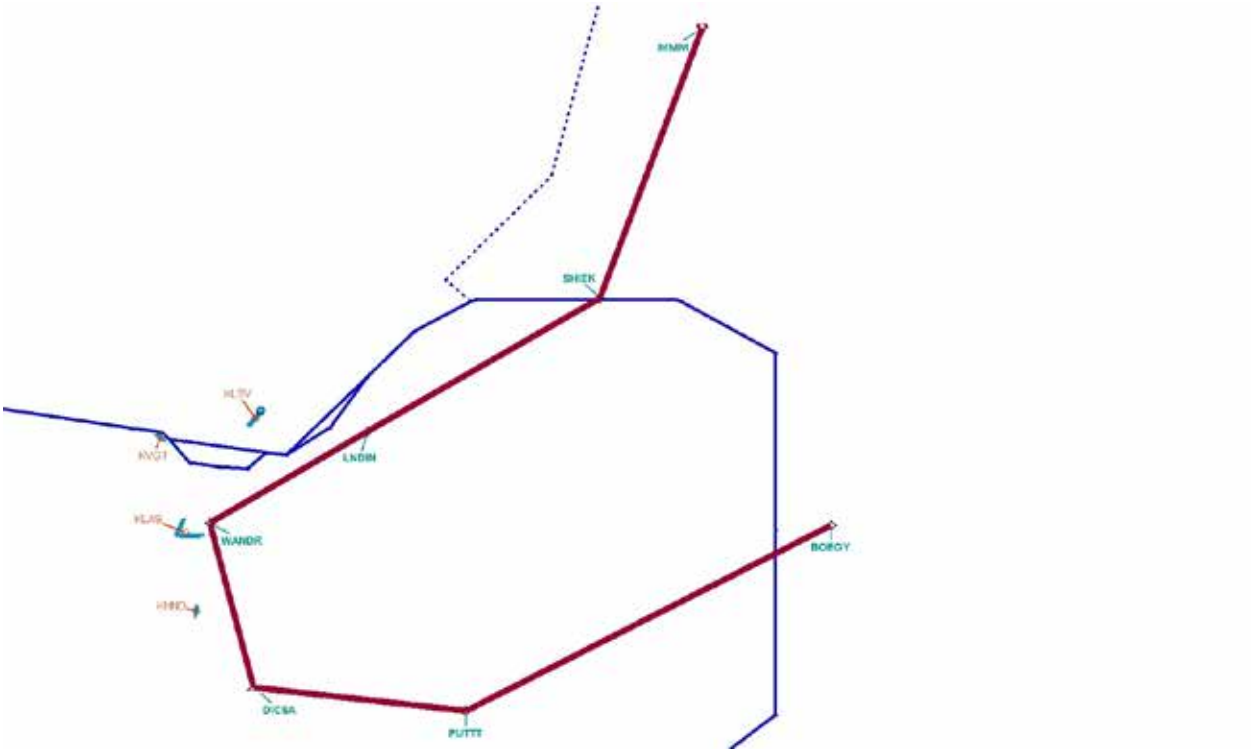


Figure 1: T361 Route

Additional Design Considerations

Implementation Dependencies

- Requires modifications to VGT, LAS, ZLA and L30 Standard Operating Procedures (SOP) and Letter of Agreements (LOA)
- Requires modification to L30/HND LOA
- Requires no airspace modifications
- Requires controller training
- Requires automation changes

Attachments

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date
Chris Iwanski LAS NATCA POC	23 APR 19 Date		

Las Vegas OAPM Design Package

T363 Route

A T-route is an airway that serves as a lateral path for aircraft at or below 17,999 feet, which allows flights to traverse airspace. A T-route can also serve as a defined path connecting other procedures or routes. It is based on satellite navigation and provides repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS).

T363 is a proposed Area Navigation (RNAV) route that will provide a predictable and repeatable path for arrivals and departures to and from Henderson Executive Airport (KHND) and Boulder Municipal City Airport (KBVU) to and from points north. This defined routing will reduce complexity and workload for both controller and flight crews along with increasing efficiency in the National Airspace System (NAS).

Las Vegas OAPM Design Package

T363 Route

Name of Change and Airport/s	Change Classification
T363 Route	**Terminal Route**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.3	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
2/22/2019	**TBD**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Las Vegas Terminal Radar Approach Control (L30 TRACON): CYN, DAG, FNL, MED, SAT, KNO, LAK **McCarran International Airport Tower (LAS): CD, LC1, LC2** **Henderson Executive Airport Tower (HND)** **Los Angeles Air Route Traffic Control Center (ZLA ARTCC): Sector 7**	**Not dependent on any other procedures**
Associated Data Files	
XXXXXXXX_LAS_tgs	

Purpose

The purpose of T363 is to provide a repeatable and predictable routing for prop aircraft arriving to and departing from Henderson Executive Airport (KHND) and Boulder City Municipal Airport (KBVU) routed to and from points north and northeast as well as prop aircraft arriving KLAS.

Study Team Recommendation

There was no specific recommendation from the Las Vegas Metroplex Study Team (MST) for the development of T363.

Issues

The L30 TRACON uses radar vectors in the absence of published routes to traverse Class B airspace. Stakeholders requested low altitude RNAV routes through Class B airspace which provide predictable, repeatable paths.

Las Vegas OAPM Design Package

T363 Route

Solutions

The Las Vegas Design and Implementation (D&I) Team identified an opportunity to proceduralize routes below FL180 by utilizing low altitude RNAV routes (T-routes) in the terminal and en route airspaces. This conceptual T-route can be used to enter and exit the L30 airspace and will serve KLAS and KHND arrivals and departures to and from the north and northeast.

Proposed Final Design

The D&I Team developed a lateral RNAV path that serves as an arrival/departure route to/from KLAS/KHND for prop aircraft. The route begins at the Mormon Mesa Vortac (MMM) and proceeds to waypoints:

- SHIEK (coordination fix that segregates from KLAS arrival and departure routes and as a fix to tie-in to other T-routes)
- PUTTT (located to be used to tie in to other T-routes)
- DICSA (provides routing to and from KHND and as a fix to tie-in to other T-routes)

Figure 1 depicts T363.

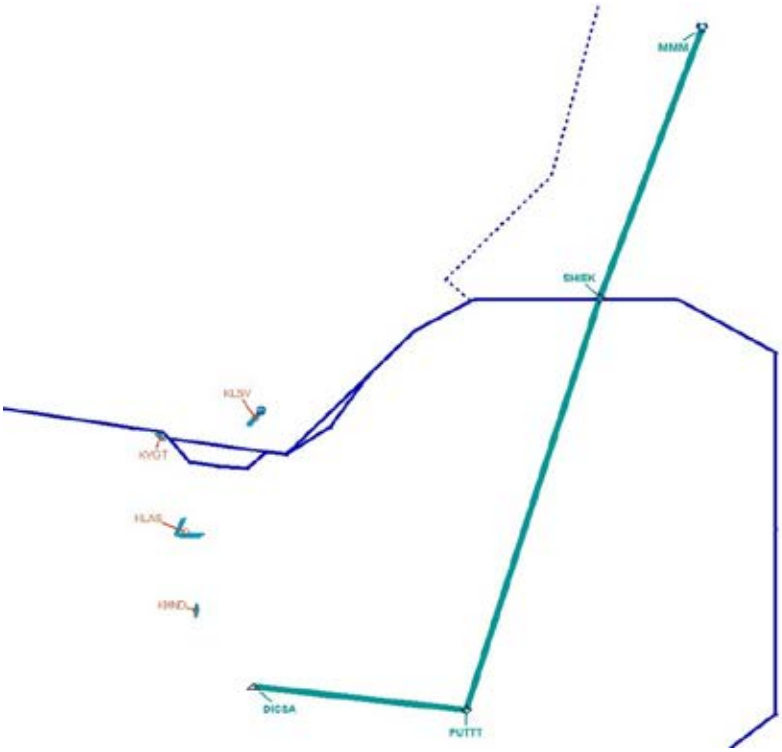


Figure 1 T363 Route

Additional Design Considerations

Implementation Dependencies

- Not dependent upon any other procedure implementation
- Requires modifications to ZLA and L30 Standard Operating Procedures (SOP) and Letters of Agreement (LOA)
- Requires modification to L30/HND LOA
- Requires no airspace modifications
- Requires controller training
- Requires automation changes

Attachments

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 APR 19 Date
Chris Iwanski LAS NATCA POC	23 APR 19 Date		

Las Vegas OAPM Design Package

T357 Route

A T-route is an airway that serves as a lateral path for aircraft at or below 17,999 feet, which allows flights to traverse airspace. A T-route can also serve as a defined path connecting other procedures or routes. It is based on satellite navigation and provides repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS).

T357 is a proposed Area Navigation (RNAV) route that will provide a predictable and repeatable path for overflights through the Las Vegas Terminal Radar Approach Control Facility (L30 TRACON) airspace and serve as an arrival/departure airway for North Las Vegas Airport (KVGT), Henderson Executive Airport (KHND), Boulder City Municipal Airport (KBVU) and McCarran International Airport (KLAS) aircraft. T357 will reduce the current requirement for air traffic control facilities to issue radar vectors or itinerant routing for North Las Vegas Airport (KVGT) arrivals/departures or overflights.

Las Vegas OAPM Design Package

T357 Route

Name of Change and Airport/s	Change Classification
T357 Route	**Terminal Route**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.3	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
2/22/2019	**TBD**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Las Vegas Terminal Radar Approach Control (L30 TRACON): CYN, DAG, GNT, FNL, MED, SAT, LAK **Los Angeles Air Route Traffic Control Center (ZLA ARTCC): Sector 6** **McCarran International Airport Tower (LAS): LC1, LC2, LC3** **Nellis Air Traffic Control Facility (NATCF)**	**Not dependent on any other procedures**
Associated Data Files	
xxxxxxxxx_LAS_MASTER.tgs	

Purpose

The purpose of T357 is to provide a repeatable and predicable north/south route for overflights through L30 airspace and to serve as an arrival/departure airway for North Las Vegas Airport (KVGT), Henderson Executive Airport (KHND), Boulder City Municipal Airport (KBVU) and McCarran International Airport (KLAS) aircraft.

Study Team Recommendation

Issues

The Las Vegas Terminal Radar Approach Control Facility (L30 TRACON) issues radar vectors to aircraft in the absence of published routes to traverse Class B airspace. Stakeholders requested low altitude Area Navigation (RNAV) routes through Class B airspace which will provide predictable, repeatable paths. The Los Angeles Air Route Traffic Control Facility (ZLA) identified multiple Victor airways that were being filed by small prop aircraft exiting L30 airspace to the southwest.

Las Vegas OAPM Design Package

T357 Route

Solutions

The Las Vegas Metroplex Study Team (MST) identified an opportunity to proceduralize routes below FL180 by utilizing low altitude RNAV routes (T-Routes) in the terminal and en route airspaces. L30 assisted the Las Vegas MST in the design of two T-Routes (T357 and T359) to be used east or west of McCarran International Airport (LAS) based on LAS runway configuration, terminating in the vicinity of KVGT. ZLA requested a T-Route for departure traffic destined for Southern California airports. This conceptual T-Route can be used to traverse the L30 airspace. Figure 1 shows the MST T-route recommendation

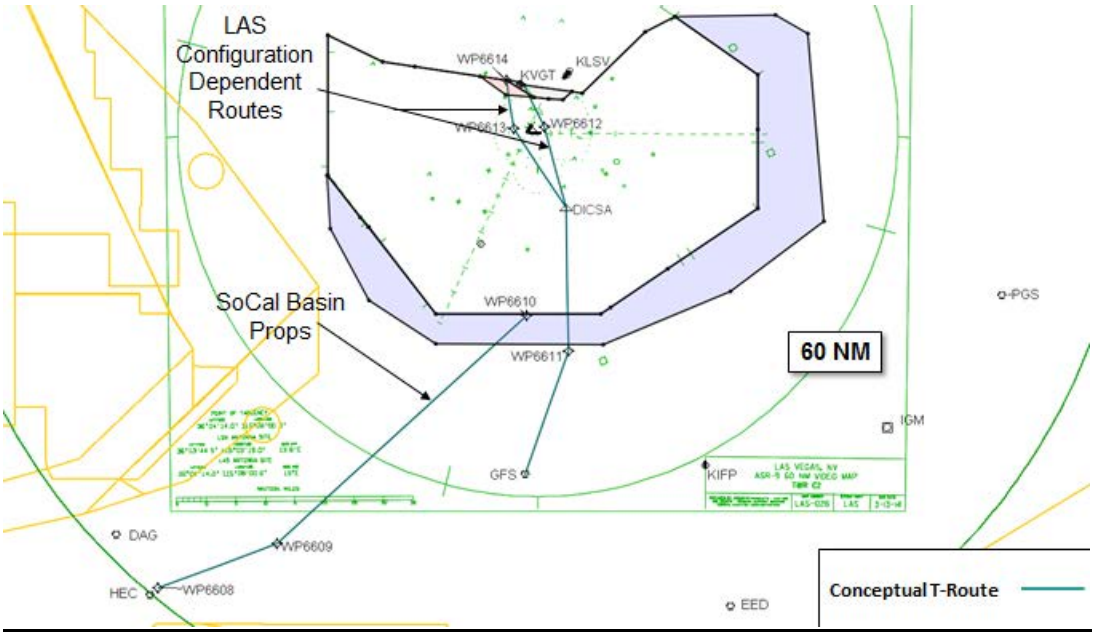


Figure 1: MST Recommendation for T-route

Proposed Final Design

The D&I Team developed a north/south route through L30 airspace that could be used to transition the area and also as an arrival and departure route for aircraft to/from KHND, KVGT and prop aircraft to/from KLAS.

T357 route:

- KONNG (used as a coordination fix between ZLA/L30)
- DICSA (provides routing to and from KHND and flexibility for ATC to send aircraft east [T357] or west [T359] of LAS)
- WANDR (located to segregate from KLAS arrivals/departures)

T357

- DSIRE (located as a fix to join the approach to KVGT and use by NATCF for aircraft entering and exiting their airspace)

Figure 1 depicts proposed T357.

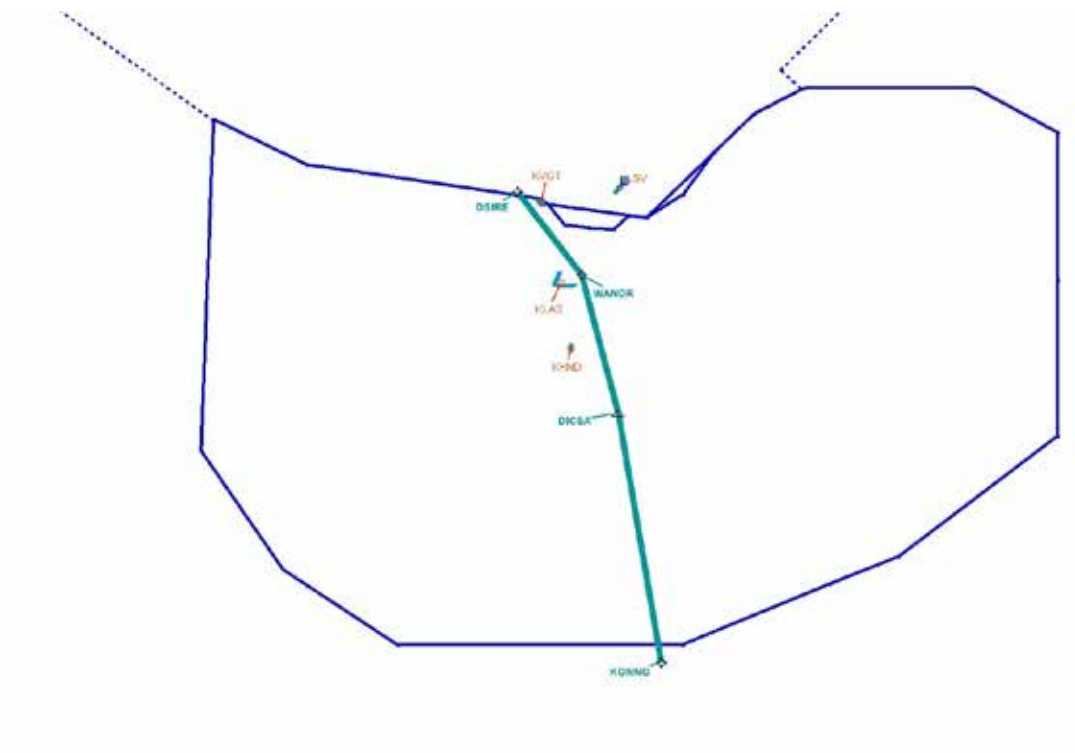


Figure 2: T357 Route

Additional Design Considerations

Implementation Dependencies

- Not dependent upon any other procedure implementation
- Requires modifications to VGT, HND, LAS, ZLA and L30 Standard Operating Procedures (SOP) and Letter of Agreement (LOA)
- Requires no airspace modifications
- Requires controller training
- Requires automation changes

Attachments

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R Mayhugh 4/23/19		4/23/19	
Bradley R Mayhugh	Date	Chris Thomas	Date
LAS FAA Lead		LAS NATCA Lead	
	30 Apr 19	Ashley C. Magee 4/30/19	
Tom Black	Date	Ashley Magee	Date
VGT Facility POC		VGT NATCA POC	
Anita Engelmann 4/25/19		23APR19	
Anita Engelmann	Date	Dan Hauptman	Date
TWAB Representative		L30 NATCA POC	
4/23/19		5/2/19	
Sarah Fletcher	Date	for Martin Ramirez	Date
ZLA Facility POC		ZLA NATCA POC	
4-23-19		Available via electronic signature	
Chris Iwanski	Date		Date
LAS NATCA POC		Nellis Air Traffic Control Facility	

Las Vegas OAPM Design Package

T359 Route

A T-route is an airway that serves as a lateral path for aircraft at or below 17,999 feet, which allows flights to traverse airspace. A T-route can also serve as a defined path connecting other procedures or routes. It is based on satellite navigation and provides repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS).

T359 is a proposed Area Navigation (RNAV) route that will provide a predictable and repeatable path for overflights through the Las Vegas Terminal Radar Approach Control Facility (L30 TRACON) airspace and to serve as an arrival/departure airway for North Las Vegas Airport (KVGT), Henderson Executive Airport (KHND), Boulder City Municipal Airport (KBVU) and McCarran International Airport (KLAS) aircraft. T359 will reduce the current requirement for air traffic control facilities to issue radar vectors or itinerant routing for North Las Vegas Airport (KVGT) arrivals/departures or overflights.

Las Vegas OAPM Design Package

T359 Route

Name of Change and Airport/s	Change Classification
T359 Route	**Terminal Route**
OAPM Study Team Reference(s)	**Current Phase of Design**
4.4.3	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
2/22/2019	**TBD**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Las Vegas Terminal Radar Approach Control (L30 TRACON): CYN, DAG, GNT, FNL, MED, SAT, LAK **Los Angeles Air Route Traffic Control Center (ZLA): Sector 6** **McCarran International Airport Tower (LAS): LC1, LC2, LC3** **Henderson Executive Airport Tower (HND)** **North Las Vegas Airport Tower (VGT)** **Nellis Air Traffic Control Facility (NATCF)**	**Not dependent on any other procedures**
Associated Data Files	
xxxxxxxxx_LAS_MASTER.tgs	

Purpose

The purpose of T359 is to provide a repeatable and predicable north/south route for overflights through Las Vegas Terminal Radar Control Facility (L30 TRACON) airspace and to serve as an arrival/departure airway for North Las Vegas Airport (KVGT), Henderson Executive Airport (KHND), Boulder City Municipal Airport (KBVU) and prop aircraft to/from McCarran International Airport (KLAS).

Study Team Recommendation

Issues

The Las Vegas Terminal Radar Approach Control Facility (L30 TRACON) issues radar vectors to aircraft in the absence of published routes to traverse Class B airspace. Stakeholders requested low altitude Area Navigation (RNAV) routes through Class B airspace which will provide

predictable, repeatable paths. The Los Angeles Air Route Traffic Control Facility (ZLA) identified multiple Victor airways that were being filed by small prop aircraft exiting L30 airspace to the southwest.

Solutions

The Las Vegas Metroplex Study Team (MST) identified an opportunity to proceduralize routes below FL180 by utilizing low altitude RNAV routes (T-Routes) in the terminal and en route airspaces. L30 assisted the Las Vegas MST in the design of two T-Routes (T357 and T359) to be used east or west of McCarran International Airport (LAS) based on LAS runway configuration, terminating in the vicinity of KVGT. ZLA requested a T-Route for departure traffic destined for Southern California airports. This conceptual T-Route can be used to traverse the L30 airspace. Figure 1 shows the MST T-route recommendation.

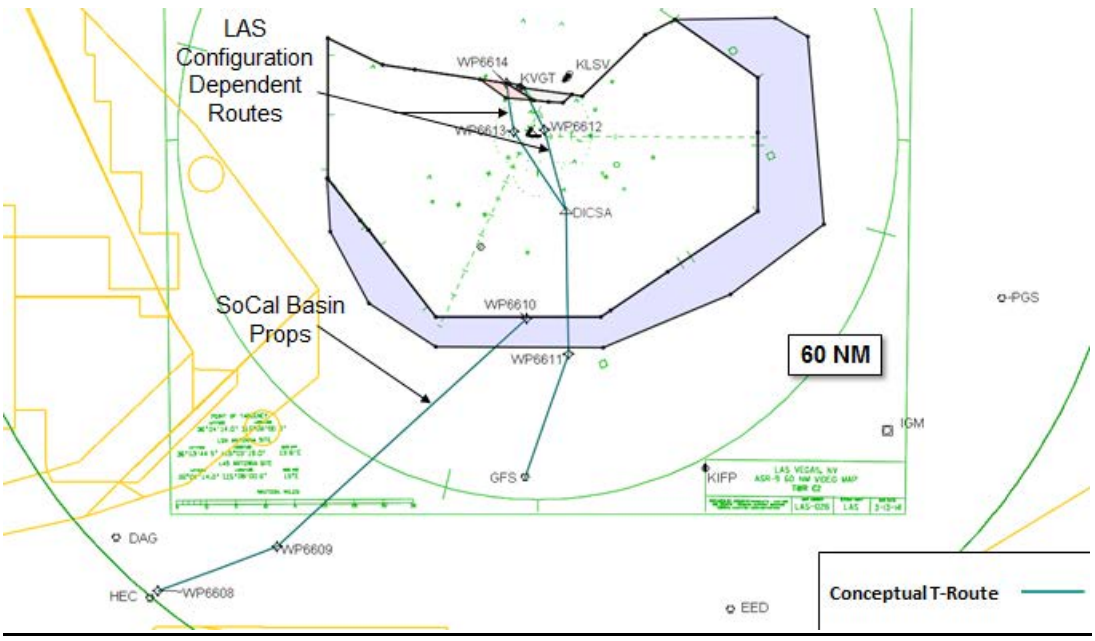


Figure 1: MST Recommendation for T-route

Proposed Final Design

The Las Vegas Metroplex Design and Implementation (D&I) Team developed a north/south route through L30 airspace that could be used to transition L30 airspace and also as an arrival and departure route for aircraft to/from KBVU, KHND, KVGT and prop aircraft to/from KLAS. T359 was developed beginning in ZLA sector 6 airspace at:

- DANBY (existing waypoint that segregates from KLAS BASIC STAR)

- BOOOO (located as an entry waypoint into L30)
- DICSA (provides routing to and from KHND and flexibility for ATC to send aircraft east [T357] or west [T359] of LAS)
- RAATT (to provide separation from the KLAS arrival/departure corridor)
- DSIRE (located as a fix to join the approach to KVGT and use by NATCF for aircraft entering and exiting their airspace)

Figure 1 depicts proposed T359.

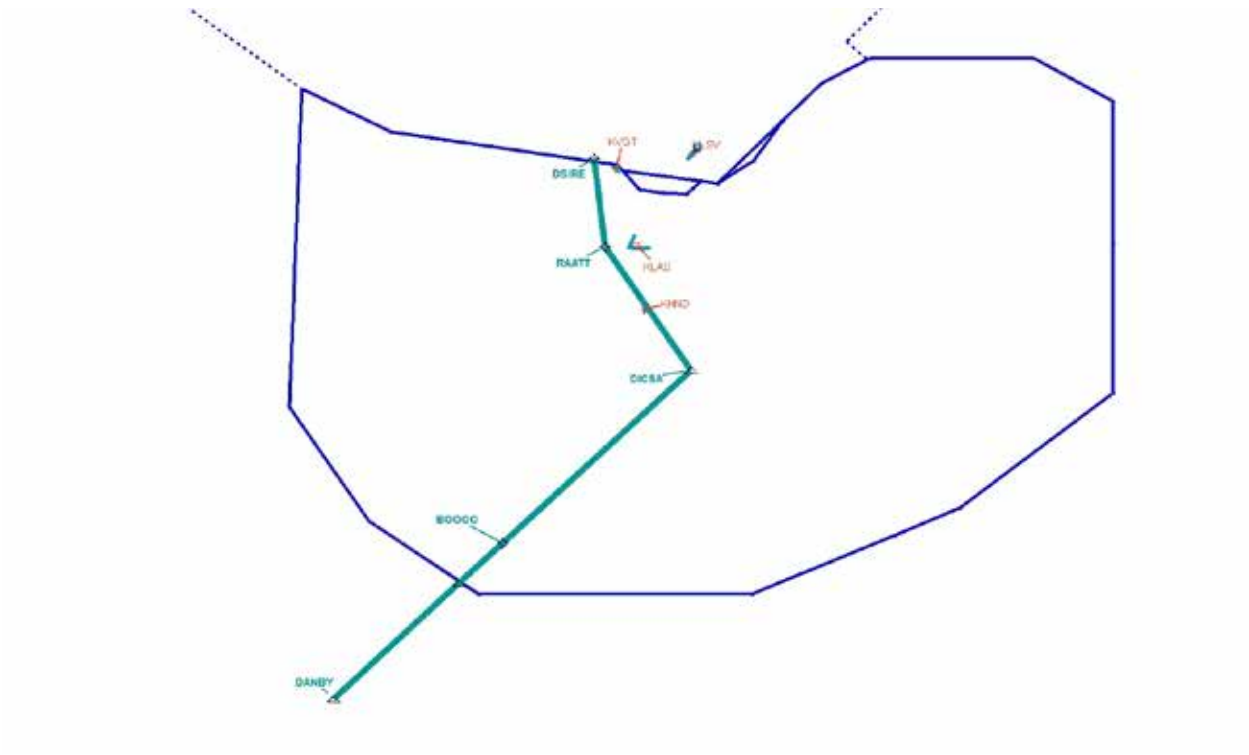


Figure 2: T359 Route

Additional Design Considerations

Implementation Dependencies

- Not dependent upon any other procedure implementation
- Requires modifications to VGT, LAS, ZLA and L30 Standard Operating Procedures (SOP) and Letter of Agreement (LOA)
- Requires no airspace modifications
- Requires controller training

- Requires automation changes

Attachments

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R Mayhugh 4/23/19		4/23/19	
Bradley R Mayhugh	Date	Chris Thomas	Date
LAS FAA Lead		LAS NATCA Lead	
	30 Apr 19	Ashley C. Magee 4/30/19	
Tom Black	Date	Ashley Magee	Date
VGT Facility POC		VGT NATCA POC	
Anita Engelmann 4/25/19		23APR19	
Anita Engelmann	Date	Dan Hauptman	Date
TWAB Representative		L30 NATCA POC	
4/23/19		5/2/19	
Sarah Fletcher	Date	for Martin Ramirez	Date
ZLA Facility POC		ZLA NATCA POC	
4-23-19		Available via electronic signature	
Chris Iwanski	Date		Date
LAS NATCA POC		Nellis Air Traffic Control Facility	

Las Vegas Metroplex Design Package

Q13 AMEND

A Q-Route is an airway that serves as a lateral path for aircraft at or above 18,000 feet that allows flights to traverse airspace or serves as a defined path that allows connectivity to other procedures or other routes to or from airports. Q-Routes are based on satellite navigation and provide repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS).

The Las Vegas Metroplex Design and Implementation (D&I) Team has developed new procedures to serve airports located in the Las Vegas Valley. To provide connectivity to and from these new designs and to add lateral distance between aircraft, the D&I Team proposes an amendment to the lateral path of the existing Q13. To reduce complexity and increase flexibility, the team moved Q13 to the west and created the waypoint SOTOO where Q13 will join Q15. The purpose of this routing is to segregate overflight traffic on Q13 from McCarran International Airport (KLAS) arrival and departure traffic on the new RNAV Metroplex Area navigation (RNAV) Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs).

This change to the lateral path will also allow the Oakland Air Route Traffic Control Center (ZOA ARTCC) to deliver KLAS arrival traffic to the Los Angeles (ZLA) ARTCC at higher altitudes than current state and will provide the opportunity for Optimized Profile Descents (OPD's) into KLAS. The lateral changes that were part of this procedure will cause marginally greater flight miles for arrivals. Industry was involved in the design of this amendment and advised the Team that they would prefer the benefits of an OPD versus a slight increase in track miles.

The Las Vegas Metroplex D&I Team coordinated design plans with the Albuquerque ARTCC (ZAB). ZAB requested that the Q-Route be extended to allow additional routes to southwest Texas.

This amended routing will reduce complexity and workload for both controller and flight crews along with increasing efficiency in the NAS.

Las Vegas Metroplex Design Package

Q13 AMEND

Name of Change and Airport/s	Change Classification
Q13 AMENDMENT	**ATS Route**
OAPM Study Team Reference(s)	**Current Phase of Design**
N/A	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**TBD**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) **Sector 16, 34, 35, 36** **Oakland (ZOA) ARTCC** · **Sector 33, 46**	**Proposed Q-Routes** · **Q15 Amendment, Q174**
Associated Data Files	
xxxxxxxxx_LAS_MASTER.tgs	

Purpose

The purpose of the proposed procedure is to address issues identified by the Las Vegas Metroplex Design and Implementation (D&I) Team. This issue was not identified by the Metroplex Study Team (MST):

The Las Vegas Metroplex Design Team identified a need to amend current Q-Routes in order to increase the efficiency throughout ZLA airspace and to help segregate overflight traffic from McCarran International Airport (KLAS) arrival/departure traffic.

Design Team Recommendation

To reduce complexity and increase flexibility, the team amended Q13, moving the route to the west to segregate overflight traffic on Q13 from McCarran International Airport (KLAS) arrival and departure traffic on the new KLAS COKTL Standard Terminal Arrival Route (STAR) and KLAS JOHKR Standard Instrument Departure (SID). By segregating the Q-Route from inbound and outbound traffic, KLAS departures can be assigned requested altitudes sooner. This will also allow ZOA to deliver KLAS arrival traffic to ZLA at higher altitudes than current state and will provide the opportunity for Optimized Profile Descents (OPD's) into KLAS. The lateral changes that were part of this procedure will cause marginally greater flight miles for arrivals. Industry was involved in the design of this amendment and advised the Team that they would prefer the benefits of an OPD versus a slight increase in track miles.

The D&I Team coordinated design plans with the Albuquerque ARTCC (ZAB). ZAB requested that the Q-Route be extended to allow additional routes to southwest Texas.

Las Vegas Metroplex Design Package
Q13 AMEND

<u>Q13 waypoints:</u>

- ELP VORTAC
- VERNO
- NABOB
- DRK VORTAC
- WOTRO
- PRFUM (existing waypoint currently on Q13)
- SOTOO (new waypoint placed to segregate from the KLAS COKTL STAR and KLAS JOHKR SID)
- HOUZZ (new waypoint placed to segregate from the KLAS COKTL STAR and KLAS JOHKR SID)
- FUULL (new waypoint placed to segregate from the KLAS COKTL STAR and KLAS JOHKR SID)
- SKANN (existing waypoint on Q15)
- LOMIA (existing waypoint currently on Q13 in ZOA airspace)

Figure 1 depicts current Q13 and Q13 Amend.

Figure 2 depicts Q13 Amend and Q15 Amend with the KLAS JOHKR SID and KLAS COKTL STAR.

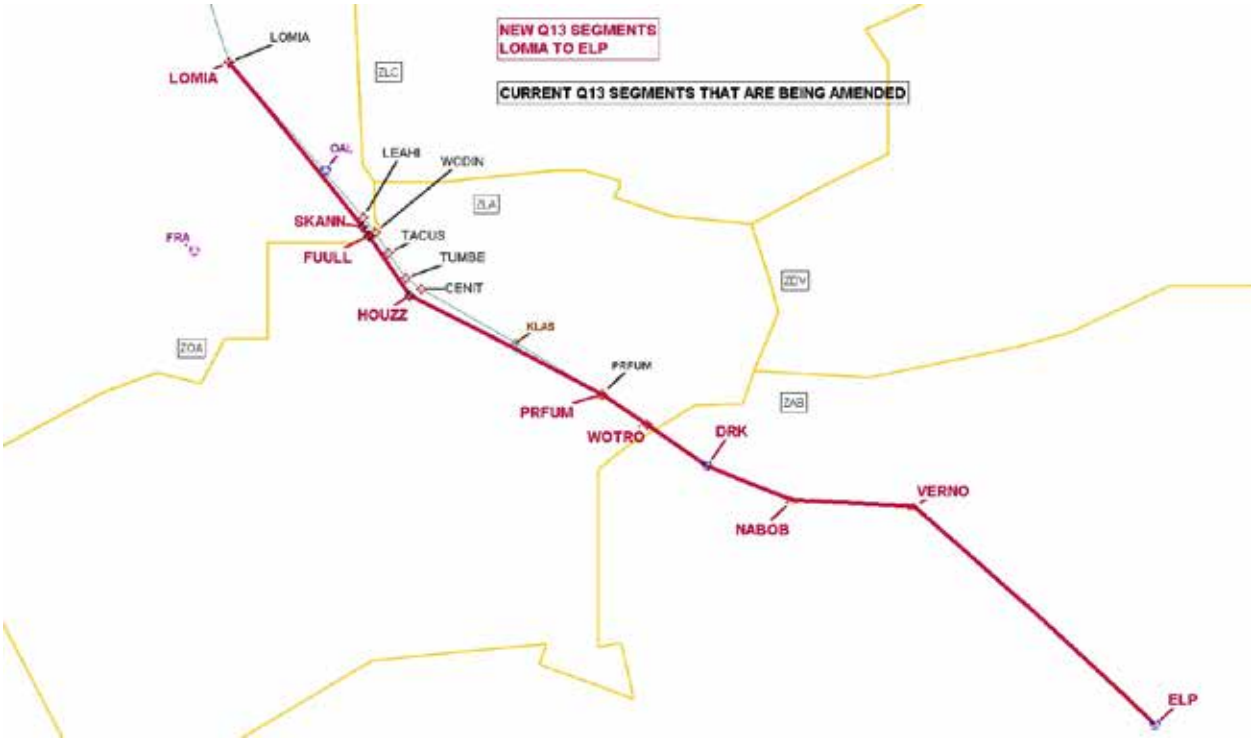


Figure 1: Current Q13 and Q13 Amend

Q13 Amend

Las Vegas Metroplex Design Package
Q13 AMEND

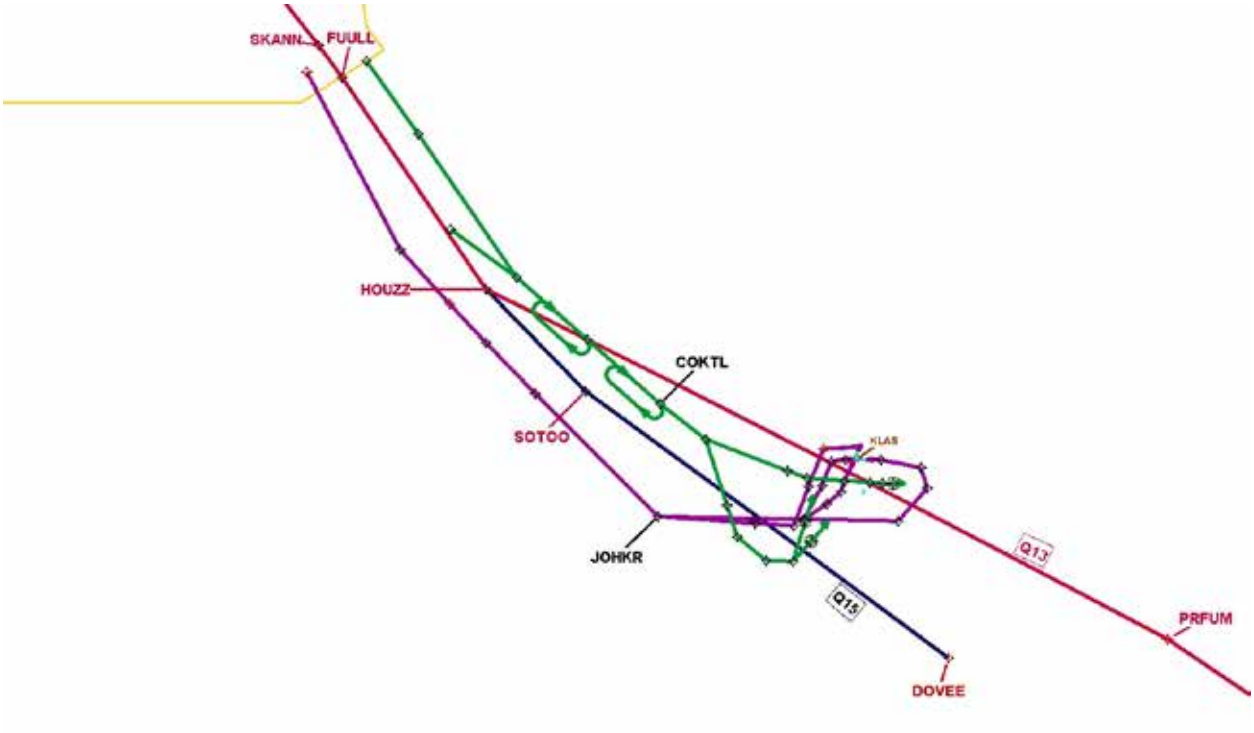


Figure 2: Q13 and Q15 with LAS JOHKR SID and LAS COKTL STAR/need new graphic

Implementation Dependencies

- Requires modifications to ZOA, ZLA and Las Vegas Terminal Radar Approach Control Facility (L30 TRACON) Standard Operating Procedures (SOP) and Letter of Agreement (LOA)
- Requires no airspace modifications
- Requires controller training
- Requires automation changes

Attachments

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23 Apr 19 Date
Brett Stewart ZAB Facility Lead	5/2/19 Date	Paul Chavez ZAB NATCA Lead	5/2/19 Date

Las Vegas Metroplex Design Package

Q15 AMENDMENT

A Q-Route is an airway that serves as a lateral path for aircraft at or above 18,000 feet that allows flights to traverse airspace or serves as a defined path that allows connectivity to other procedures or other routes to or from airports. Q-Routes are based on satellite navigation and provides repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS).

The Las Vegas Metroplex Design and Implementation (D&I) Team has developed new procedures to serve airports located in the Las Vegas Valley. To provide connectivity to and from these new designs and to add lateral distance between aircraft, the D&I Team proposes an amendment to the lateral path of the existing Q15. To reduce complexity and increase flexibility, the team created the waypoint SOTOO where Q15 will join Q13. The purpose of this routing is to segregate overflight traffic on Q15 from McCarran International Airport (KLAS) arrival and departure traffic on the new RNAV Metroplex Area navigation (RNAV) Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs).

This amended routing will reduce complexity and workload for both controller and flight crews along with increasing efficiency in the NAS.

Las Vegas Metroplex Design Package

Q15 AMENDMENT

Name of Change and Airport/s	Change Classification
Q15 AMENDMENT	**ATS Route**
OAPM Study Team Reference(s)	**Current Phase of Design**
N/A	☐ **Preliminary Operational Design (PD)** ☒ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
5/31/2019	**TBD**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) **Sector 16, 34, 35, 36** **Oakland (ZOA) ARTCC** · **Sector 33, 46**	**Proposed Q-Routes** · **Q13 AMENDMENT, Q174**
Associated Data Files	
xxxxxxxxx_LAS_MASTER.tgs	

Purpose

The purpose of the proposed procedure is to address issues identified by the Las Vegas Metroplex Design and Implementation (D&I) Team. This issue was not identified by the Metroplex Study Team (MST):

- The Las Vegas Metroplex Design Team identified a need to amend current Q-Routes in order to increase efficiency throughout ZLA airspace and to help segregate overflight traffic from McCarran International Airport (KLAS) arrival/departure traffic.
- The Q-Route will have limited dependence on ground based navigational aids and will provide a more seamless route structure for aircraft utilizing Area navigation (RNAV) when transitioning from a Standard Instrument Departure (SID)/Standard Terminal Arrival Route (STAR) or for aircraft overflying the airspace or from other Q-Routes.

Design Team Recommendation

The Las Vegas Metroplex D&I Team proposes an amendment to Q15. To reduce complexity and increase flexibility, the team created the waypoint SOTOO where Q15 will join Q13. The purpose of this routing is to segregate overflight traffic on Q15 from KLAS arrival and departure traffic on the new RNAV Metroplex RNAV SIDs and STARs.

Q15 waypoints:

- DOVEE (existing waypoint on Q15)
- SOTOO (placed to segregate from KLAS JOHKR SID and KLAS COKTL STAR)
- HOUZZ (placed to segregate from KLAS JOHKR SID and KLAS COKTL STAR)
- FUULL (placed to segregate from KLAS JOHKR SID and KLAS COKTL STAR)
- SKANN (existing waypoint)

Las Vegas Metroplex Design Package

Q15 AMENDMENT

Figure 1 depicts the current Q13 and Q15 merging in ZOA airspace at the LOMIA waypoint. The current Q15 overlies the new KLAS JOHKR SID, which could result in delays for aircraft departing KLAS receiving higher requested altitudes.

Figure 2 depicts Q13 AMEND and Q15 AMEND merging in ZLA airspace at the new SOTOO waypoint.

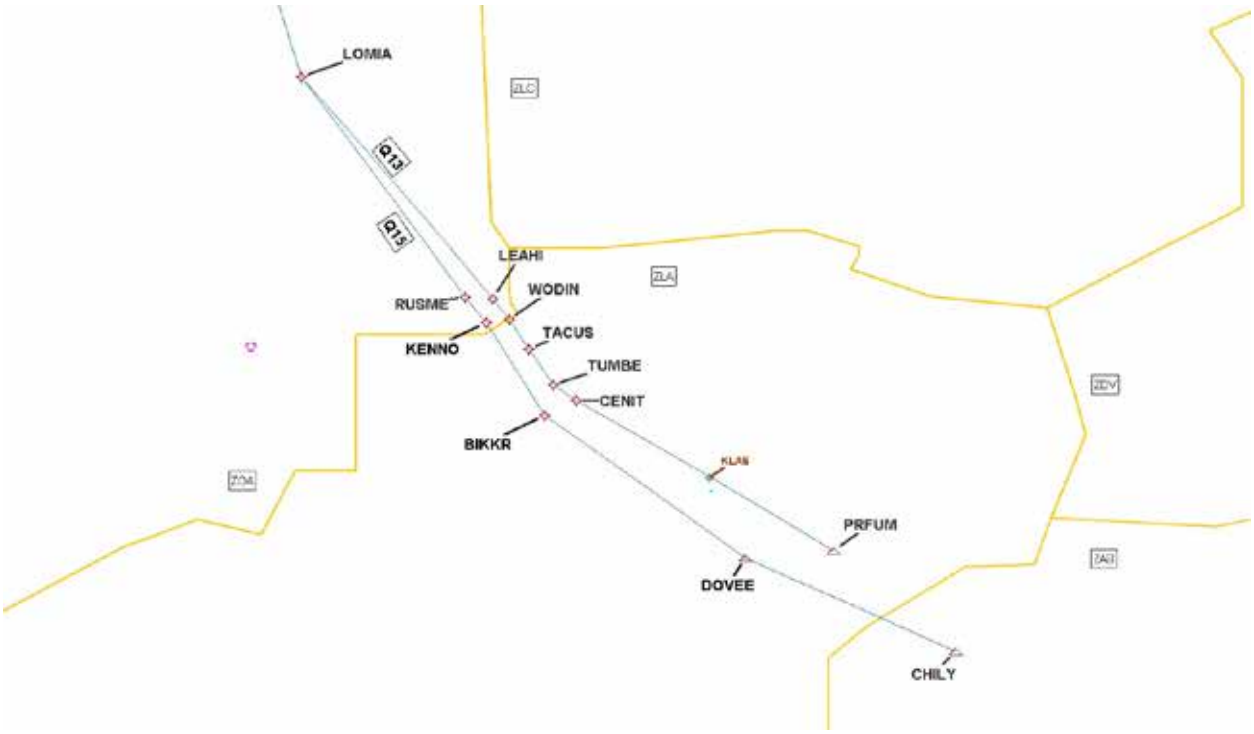


Figure 1: Current Q13 and Q15

Las Vegas Metroplex Design Package
Q15 AMENDMENT

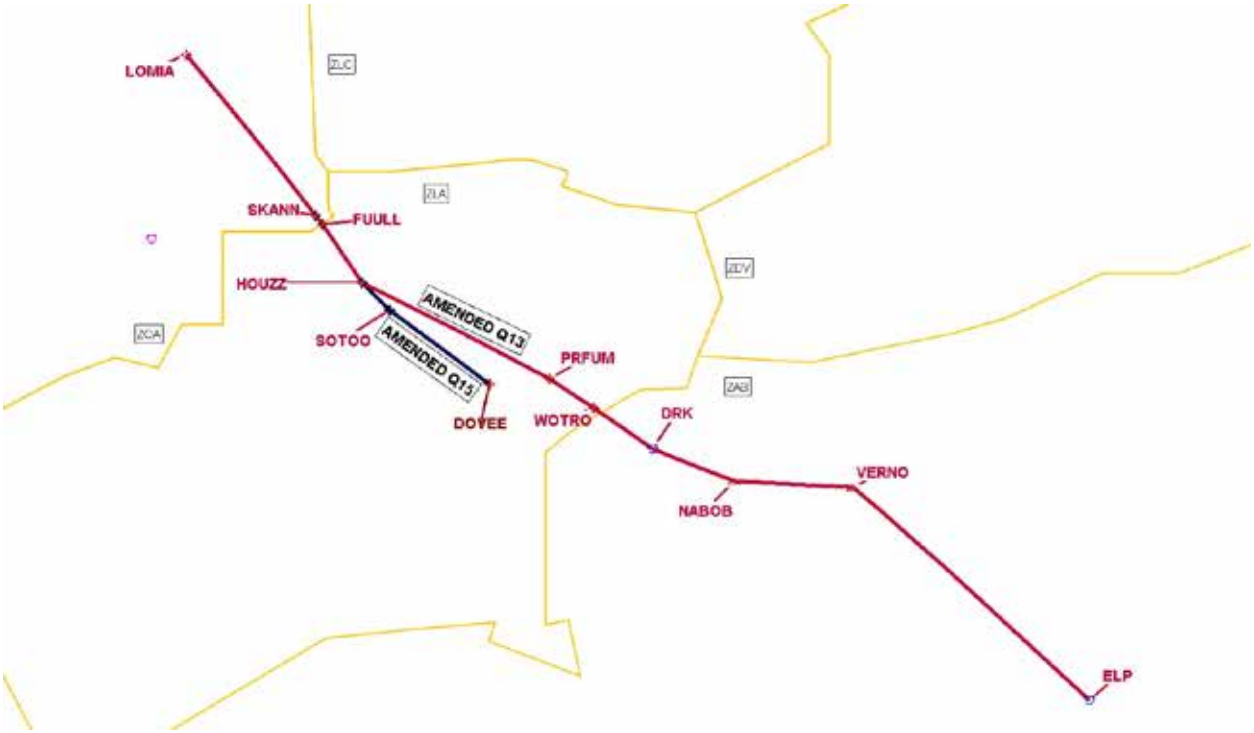


Figure 2: Q13 AMEND and Q15 AMEND

Implementation Dependencies

- There are no procedures dependent on this route.
- Requires modifications to ZLA and ZOA internal Standard Operating Procedures
- Requires modifications to Letter of Agreement between ZLA and ZOA
- Requires no airspace modifications
- Requires controller training
- No automation changes needed

Attachments

- **xxxxxxxxx_LAS_MASTER.tgs**
-

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	Martin Ramirez ZLA NATCA POC	5/14/19 Date
Tommy Thompson ZOA Facility Lead	4/30/19 Date	Jesse Randall ZOA NATCA Lead	4/30/19 Date

Las Vegas Metroplex Design Package

Q174 (Q162 Amend)

A Q-Route is an airway that serves as a lateral path for aircraft at or above 18,000 feet that allows flights to traverse airspace or serves as a defined path that allows connectivity to other procedures or other routes to or from airports. Q-Routes are based on satellite navigation and provides repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS).

The Las Vegas Metroplex Design and Implementation (D&I) Team has developed new procedures to serve airports located in the Las Vegas Valley. To provide connectivity to and from these new designs and to add lateral distance between aircraft, the D&I Team proposed an amendment to the lateral path of the existing Q162.

Because existing procedures utilize waypoints on Q162, it is impossible to amend the Q-Route without having an impact on current operations. The D&I Team elected to develop a new Q-Route that incorporates the planned changes to Q162 but allows independent implementation that will not disrupt current operations.

The new Q174 will provide connectivity to the proposed McCarran International Airport (KLAS) COKTL Standard Terminal Arrival Route (STAR) at the FLCHR waypoint.

This amended routing will reduce complexity and workload for both controller and flight crews along with increasing efficiency in the NAS.

After implementations of both Q174 and the KLAS COKTL STAR, Oakland ARTCC will evaluate whether Q162 will be removed from the National Airspace System (NAS)

Las Vegas Metroplex Design Package

Q174 (Q162 Amend)

Name of Change and Airport/s	Change Classification
Q174	**ATS Route**
OAPM Study Team Reference(s)	**Current Phase of Design**
N/A	☒ **Preliminary Operational Design (PD)** ☐ **Proposed Final Design (PFD)**
Package Date	**Implementation Date**
2/22/2019	**TBD**
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sector 16 **Oakland (ZOA) ARTCC Sectors 33, 46**	**N/A**
Associated Data Files	
xxxxxxxxx_LAS_MASTER.tgs	

Purpose

The purpose of the proposed procedure is to address issues identified by the Las Vegas Metroplex Design and Implementation (D&I) Team. This issue was not identified by the Metroplex Study Team (MST):

- The Las Vegas Metroplex Design Team identified a need to amend the current Q-routes to increase the efficiency throughout ZLA airspace and to help segregate overflight traffic from McCarran International Airport (KLAS) arrival/departure traffic.
- The Q-Route will have limited dependence on ground based navigational aids and will provide a more seamless route structure for aircraft utilizing RNAV when transitioning from a Standard Instrument Departure (SID)/Standard Terminal Arrival Route (STAR) or for aircraft transitioning the airspace or from other Q-Routes.
- Q174 will provide connectivity from California Bay Area airports to the new KLAS COKTL STAR and to/from Q13 and Q15.

Design Team Recommendation

The D&I Team originally proposed an amendment to the existing Q162 to provide connectivity with the proposed McCarran International Airport (KLAS) COKTL STAR. The Q162 amendment was expected to connect to the KLAS COKTL STAR at FLCHR.

Q162 currently shares waypoints located on existing arrival procedures and is utilized for transitioning from the en route environment to the arrival phase of flight. Because the changes required to provide connectivity to newly designed Metroplex procedures would involve waypoint changes and affect existing procedures, the D&I Team elected to develop a new Q-Route (Q174).

Las Vegas Metroplex Design Package

Q174 (Q162 Amend)

After implementations of both Q174 and the KLAS COKTL STAR, the Las Vegas Metroplex Evaluation Team, ZLA and ZOA will evaluate whether Q162 will be removed from the National Airspace System (NAS).

Figure 1 depicts the proposed Q174 and current Q162.

<u>Q174 waypoints:</u>

- NTELL (on the current Q162 and will be utilized as the initial fix on Q174)
- CABOB (existing fix used to avoid Special Use Airspace (SUA) and for leg length design criteria)
- TTMSN (placed as a holding fix for ZOA)
- SKANN (placed to provide connectivity to Q13/Q15 and for design criteria)
- FLCHR (allows connectivity to the KLAS COKTL STAR)

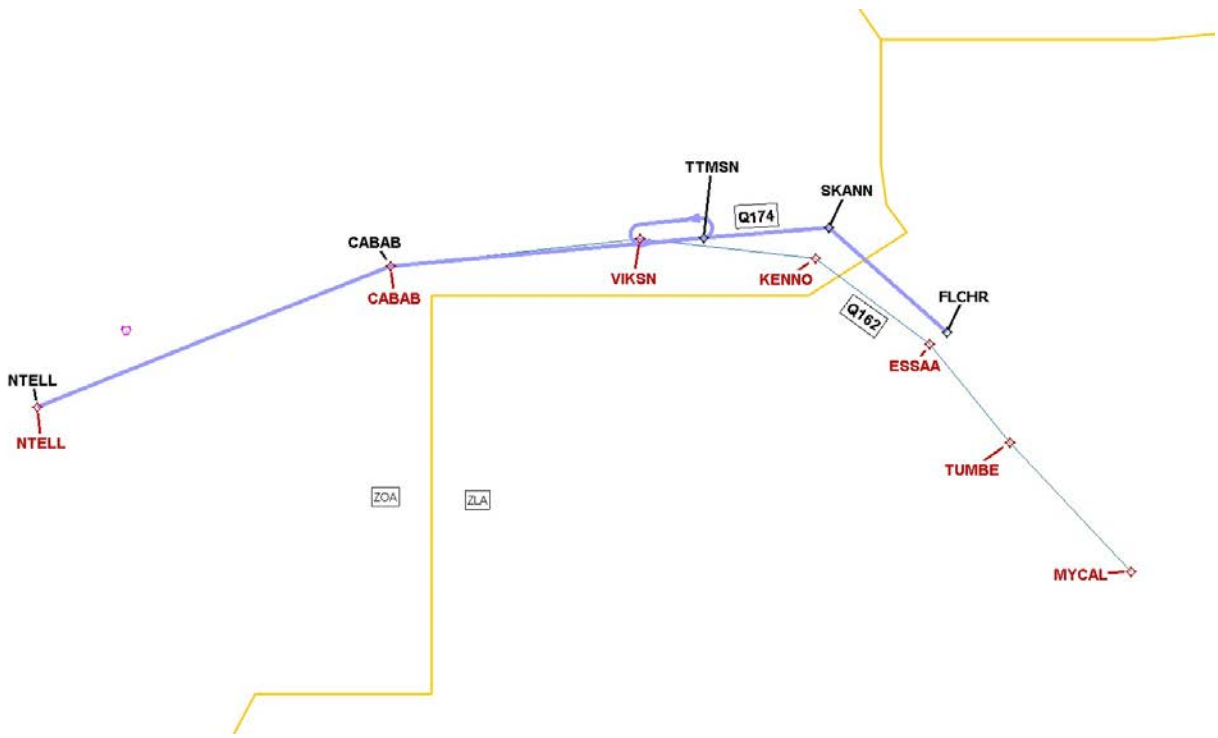


Figure 1: Proposed Q174 and Current Q162

Las Vegas Metroplex Design Package

Q174 (Q162 Amend)

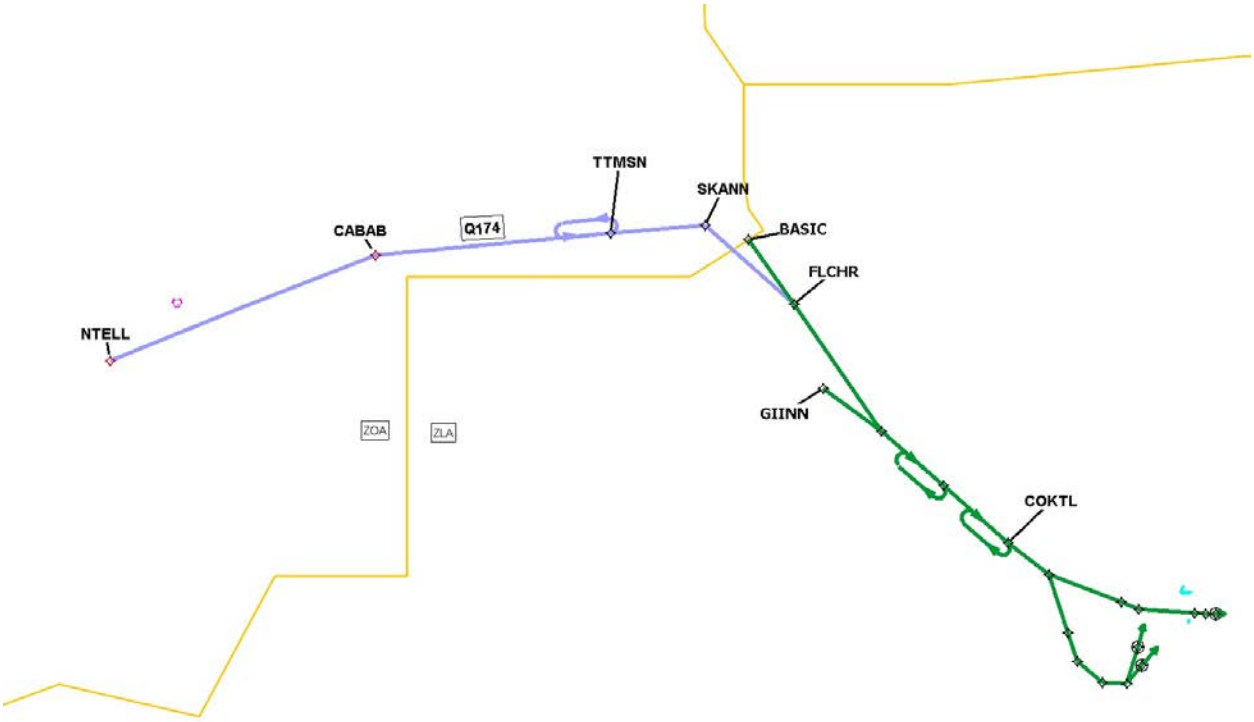


Figure 2 Q174 and Proposed KLAS COKTL STAR

Design Considerations

Q174 was designed to allow a defined path for overflights through ZOA airspace transitioning for landing at KLAS or KVGT. It allows connectivity to Q13 and Q15.

Implementation Dependencies

- There are no procedures dependent on this route.
- Requires modifications to ZLA and ZOA Standard Operating Procedures
- Requires modifications to Letter of Agreement between ZLA and ZOA
- Requires no airspace modifications
- Requires controller training
- No automation changes needed

Attachments

xxxxxxxxx_LAS_MASTER.tgs

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	Martin Ramirez ZLA NATCA POC	5/14/19 Date
Tommy Thompson ZOA Facility Lead	4/30/19 Date	Jesse Randall ZOA NATCA Lead	4/30/19 Date

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

The Las Vegas Metroplex Project was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation, providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures in to and out of area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows, allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures.

Extensive changes were made to designated airspace at air traffic control sectors in the Las Vegas Terminal Radar Control (L30 TRACON) and Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

Name of Change and Airport/s	Change Classification
Las Vegas Terminal Radar Control Facility (TRACON/L30) Airspace Changes	Delegated Airspace
OAPM Study Team Reference(s)	**Current Phase of Design**
4.2 L30 Airspace Expansion	☐ Preliminary Operational Design (PD) ☒ Proposed Final Design (PFD)
Package Date	**Implementation Date**
5/31/2019	5/21/2020
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
McCarran International Airport (KLAS), Henderson Executive Airport (KHND), North Las Vegas Airport (KVGT), Nellis Air Force Base (KLSV) Nellis Air Traffic Control Facility (NATCF) Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: CYN, DAG, FNL, GNT, KNO, LAK, MED, SAT Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 06, 07, 08, 16	KLAS JOHKR Standard Instrument Departure (SID) KLAS RADYR SID KLAS RASLR SID KLAS NIITZ SID KLAS GIDGT SID KLAS RATPK SID KLAS LOHLA SID KLAS COKTL Standard Terminal Arrival Route (STAR) KLAS RNDRZ STAR KLAS RKSTR STAR KLAS CHOWW STAR KLAS JAYSN STAR KHND OYODA SID KHND SCAMR SID KHND GAMES STAR KHND NTNDO STAR KHND BOEGY STAR KVGT FLCHR STAR KVGT WYLND STAR
Associated Data Files	
Standard Operating Procedures Airspace Illustrations Spectrum package Automation package Table of frequencies for all affected sectors/positions Spectrum analysis results HITL simulation results	

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

Purpose

The Las Vegas Metroplex Project was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation, providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures in to and out of area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows, allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures.

Extensive changes are required for designated airspace at air traffic control sectors in the Las Vegas Terminal Radar Control (L30 TRACON) and Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

Study Team Issues and Solutions

Issues

L30's current lateral airspace boundary is insufficient to accommodate runway transitions for LAS arrivals for all configurations. During periods of moderate and heavy traffic, sequencing to Runways 25L/R localizers extends back to ZLA airspace. Arrivals from the southwest, landing Runway 01L/R have difficulty meeting speed and altitude assignments. The current ZLA/L30 Transfer of Control Points (TCP) do not allow for the timely issuance of runway assignments.

The HND NOOTN STAR entry point into L30's airspace requires excessive coordination between ZLA Sectors 7 and 8.

Solutions

Expanding L30's current lateral boundary allowed the Las Vegas MST to develop Optimized Profile Descent (OPD) STARs with runway transitions for all configurations. The Las Vegas MST recommended airspace expansion would allow sequencing to Runways 25L/R to be contained within L30 airspace. Optimized procedures facilitate compliance with speed and altitude assignments thereby reducing transmissions and pilot/controller task complexity.

The Las Vegas MST recommends ZLA issues the LAS landing direction (one option per configuration per gate) and L30 issues the runway transition.

The proposed airspace modification reduces coordination and complexity, allows for timely runway assignments, and provides additional airspace for sequencing. The Las Vegas MST considered surveillance coverage when designing L30 airspace expansion. D&I should further analyze the airspace expansion to ensure adequate surveillance coverage. Figure 4-3 depicts the Las Vegas MST conceptual L30 airspace expansion.

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

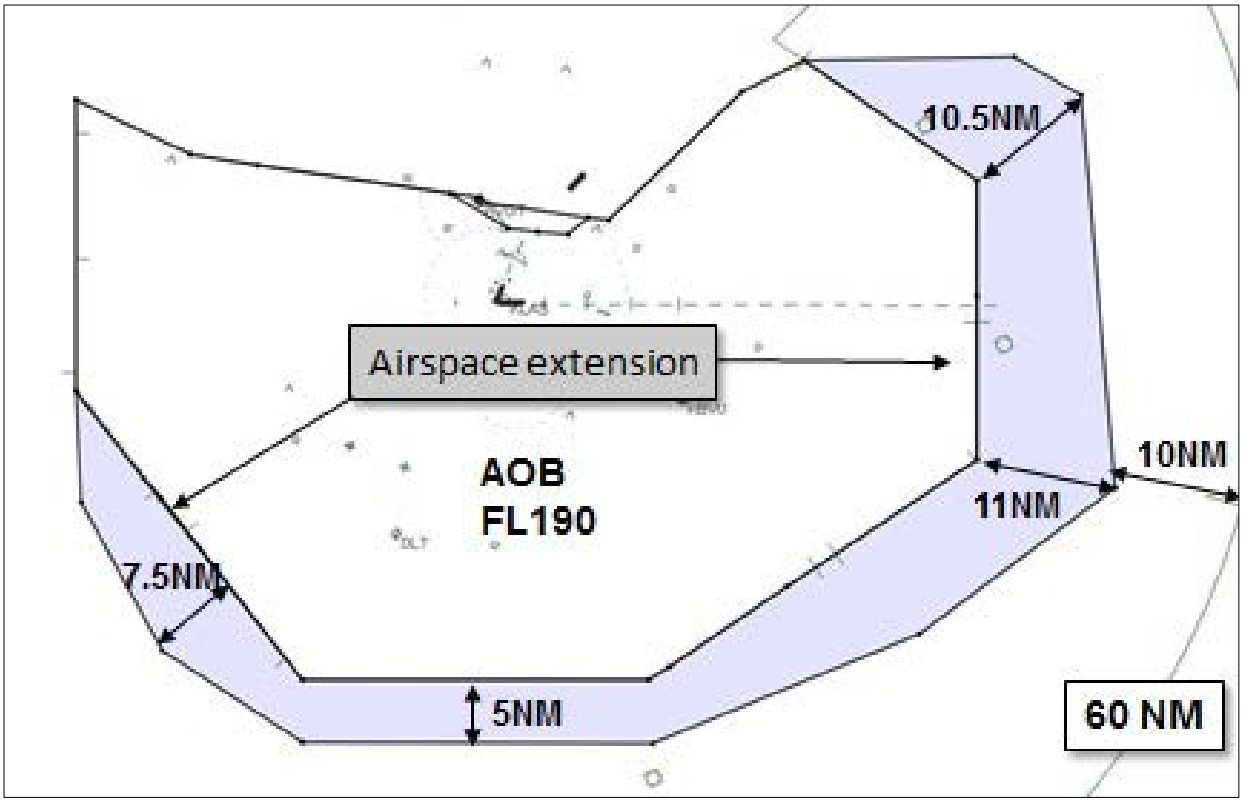


Figure 1: MST Proposed L30 Airspace

Proposed Final Design

The Design and Implementation (D&I) Team undertook an extensive review of airspace at L30 and ZLA to determine the suitability of current airspace and changes that would be necessary to accommodate new designs. The L30 delegated airspace was expanded laterally with airspace transferred from ZLA to provide flexibility and increased options for controllers as they sequence arrivals and departures for Las Vegas Valley airports. This expanded L30 airspace will also allow the issuance of alternate runway assignment for arrivals if required.

Current L30 Sector internal airspace delegation is dependent on which configuration is being utilized at KLAS. The Proposed Final Design will also provide changing lateral and vertical boundaries tailored to individual configurations.

This Proposed Final Design Package presents changes for KLAS Configuration One, which serves arrivals and departures on KLAS Runways 19L/R; and 26 L/R.

The Proposed Final Design of L30 airspace for KLAS Configuration One is as follows:

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

<u>L30 CYN Sector</u>

The current L30 CYN Sector is depicted in Figure 2.

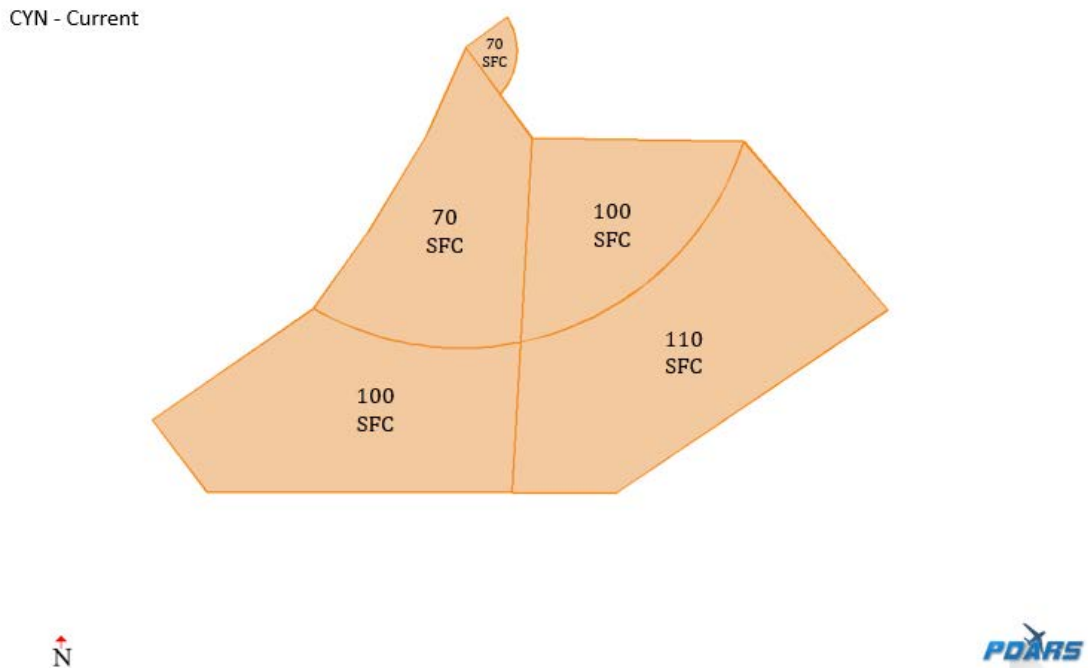


Figure 2: Current CYN Sector

The CYN Sector was expanded laterally on the southern edge of the sector with airspace acquired from ZLA Sectors 06 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between CYN and L30 Sectors DAG and LAK.

The proposed CYN Sector is depicted in Figure 3.
An overlay of the current and proposed CYN Sector is depicted in Figure 4.

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

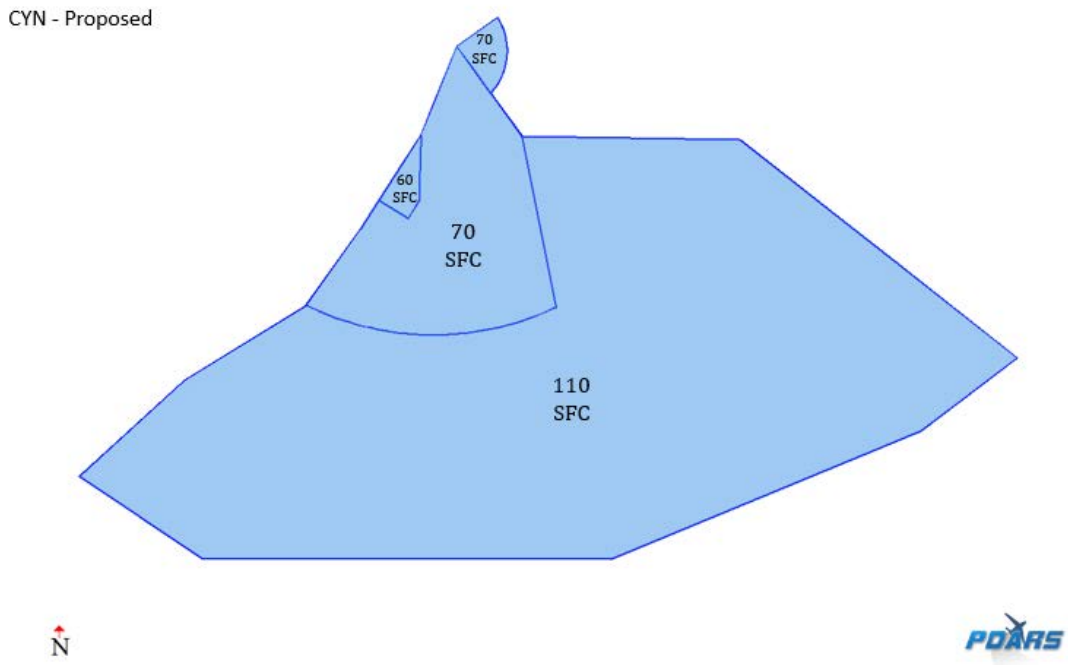


Figure 3: Proposed CYN Sector

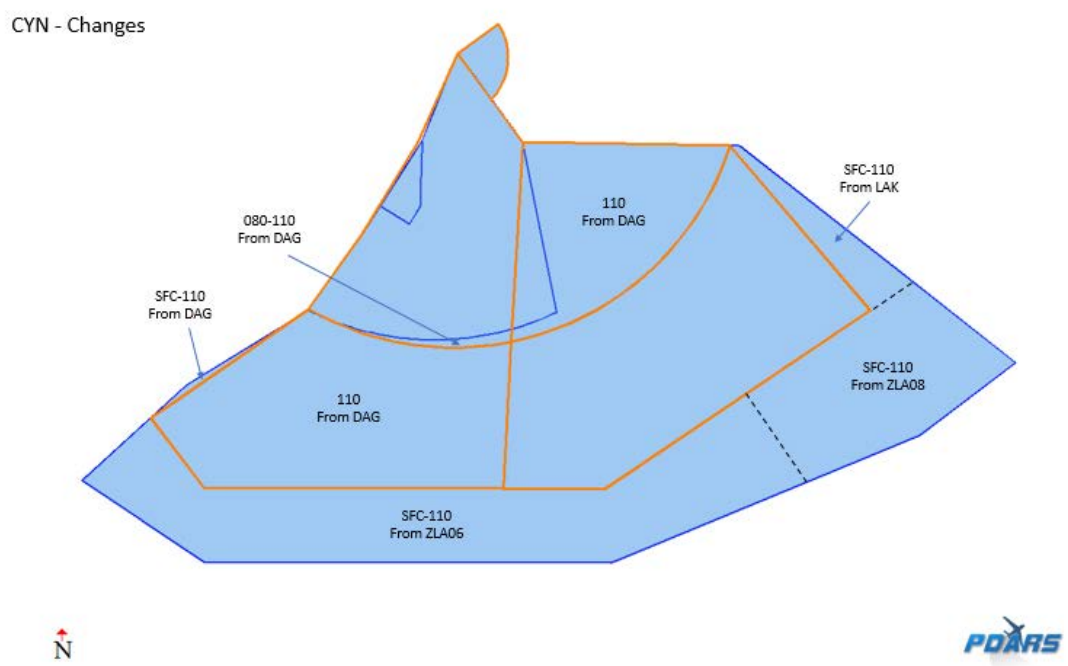


Figure 4: Overlay of Current and Proposed CYN Sector

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND BOEGY STAR
- KHND GAMES STAR
- KHND NTNDO STAR
- KHND OYODA SID
- KHND SCAMR SID
- KLAS NIITZ SID
- KLAS RADYR SID
- KLAS RASLR SID

An overlay of the proposed CYN Sector with proposed RNAV procedures is depicted in Figure 5.

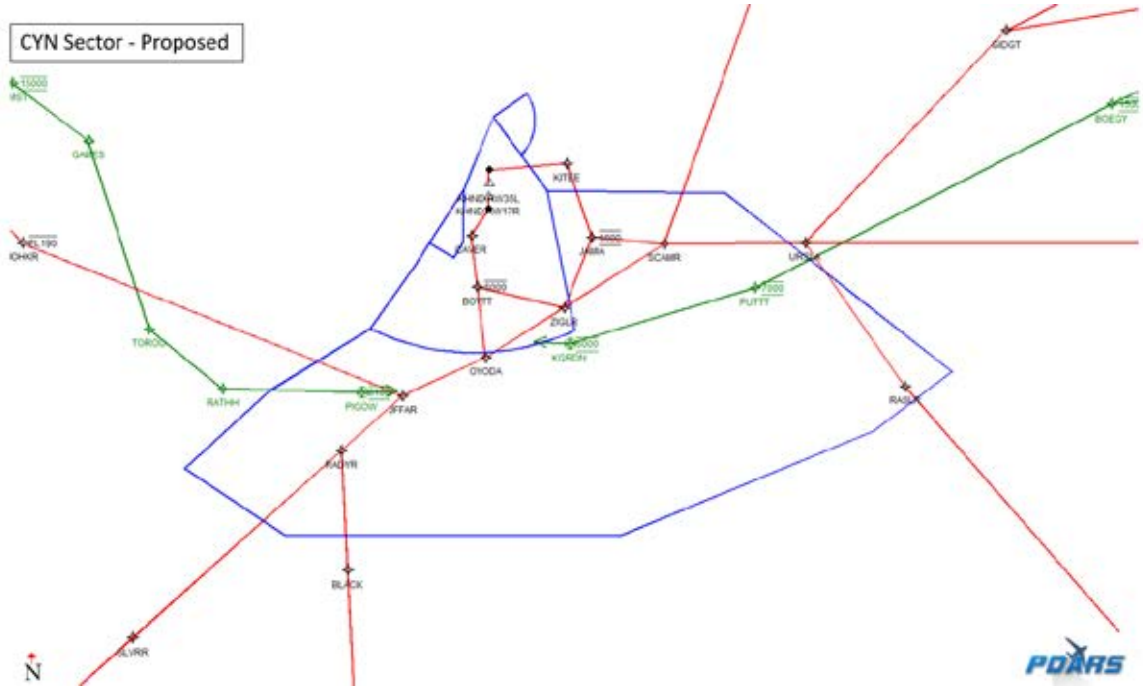


Figure 5: Overlay off Proposed CYN Sector with Proposed RNAV Procedures

L30 DAG Sector

The current DAG Sector is depicted in Figure 6.

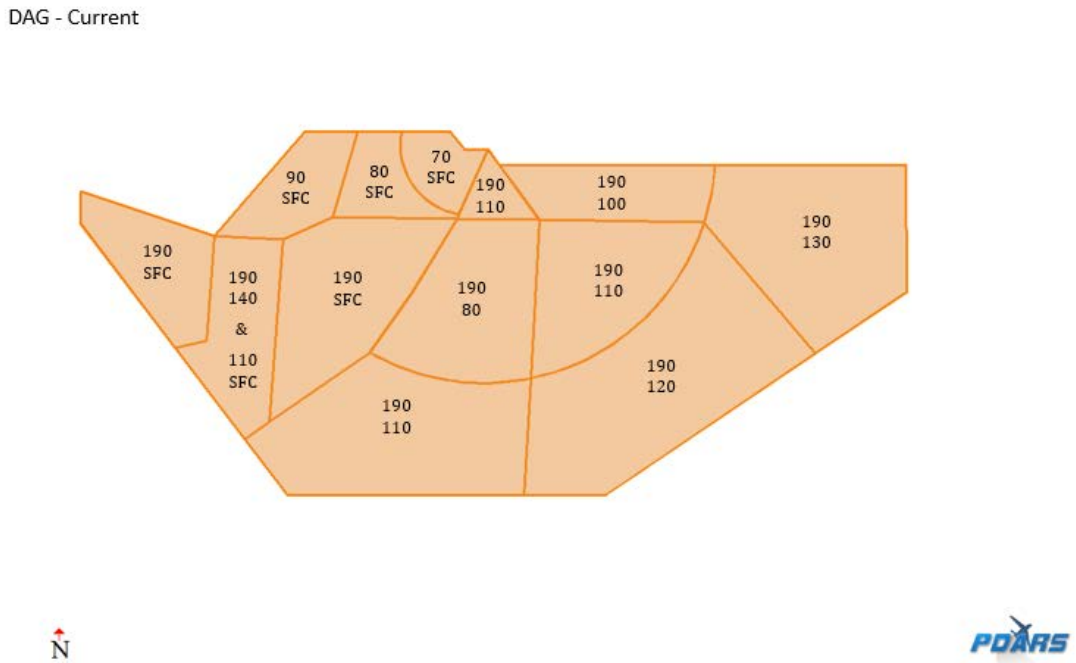


Figure 6: Current DAG Sector

The DAG Sector was expanded laterally on the western, southern and eastern edges of the sector with airspace acquired from ZLA Sectors 06, 08 and 16. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between DAG and L30 Sectors CYN, GNT, LAK and MED.

The proposed DAG Sector is depicted in Figure 7.
An overlay of the current and proposed DAG Sector is depicted in Figure 8.

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

DAG - Proposed

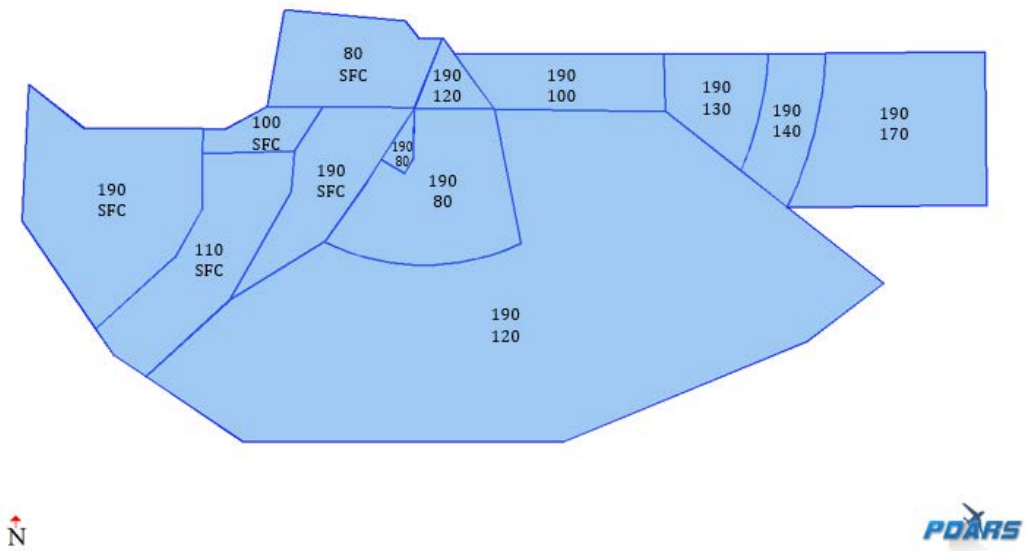


Figure 7: Proposed DAG Sector

DAG - Changes

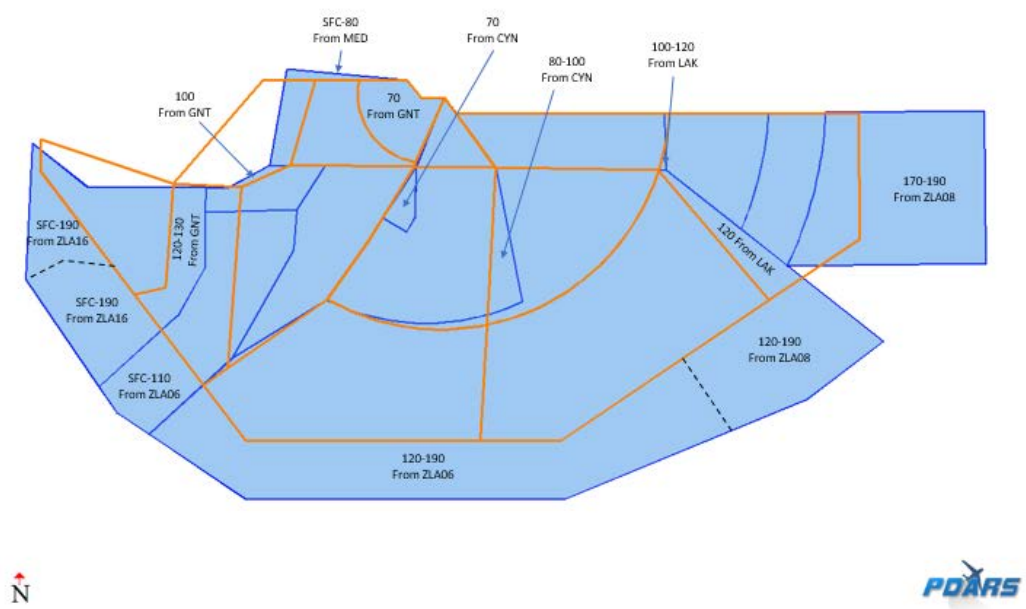


Figure 8: Overlay of Current and Proposed DAG Sector

These changes will help reduce complexity and accommodate departures on the newly designed RNAV routes:

- KHND OYODA SID
- KHND SCAMR SID
- KLAS JOHKR SID
- KLAS NIITZ SID
- KLAS RASLR SID
- KLAS RAYDR SID

An overlay of the proposed DAG Sector with proposed RNAV procedures is depicted in Figure 9.

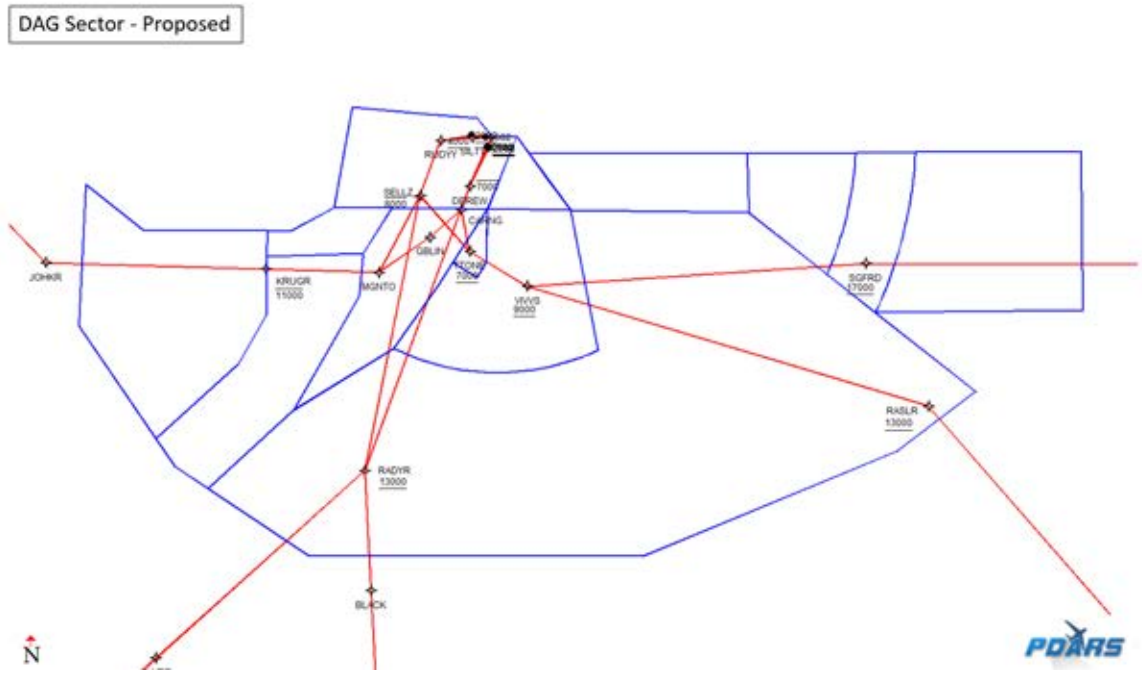


Figure 9: Overlay of Proposed DAG Sector with Proposed RNAV Procedures

<u>L30 FNL Sector</u>

The current FNL Sector is depicted in Figure 10.

FNL - Current

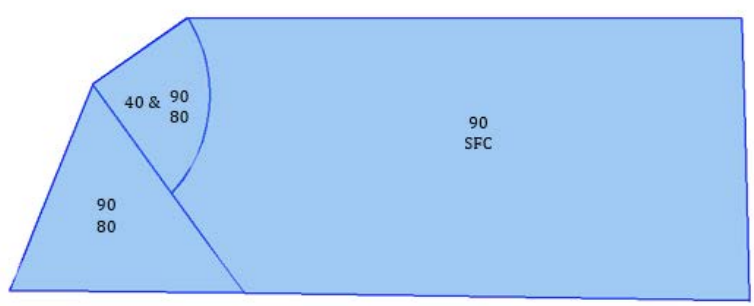
N

Figure 10: Current FNL Sector

The FNL Sector was changed with airspace transferred between FNL and L30 Sectors GNT, KNO and LAK.

The proposed FNL Sector is depicted in Figure 11.
An overlay of the current and proposed FNL Sector is depicted in Figure 12.

FNL - Proposed



N

Figure 11: Proposed FNL Sector

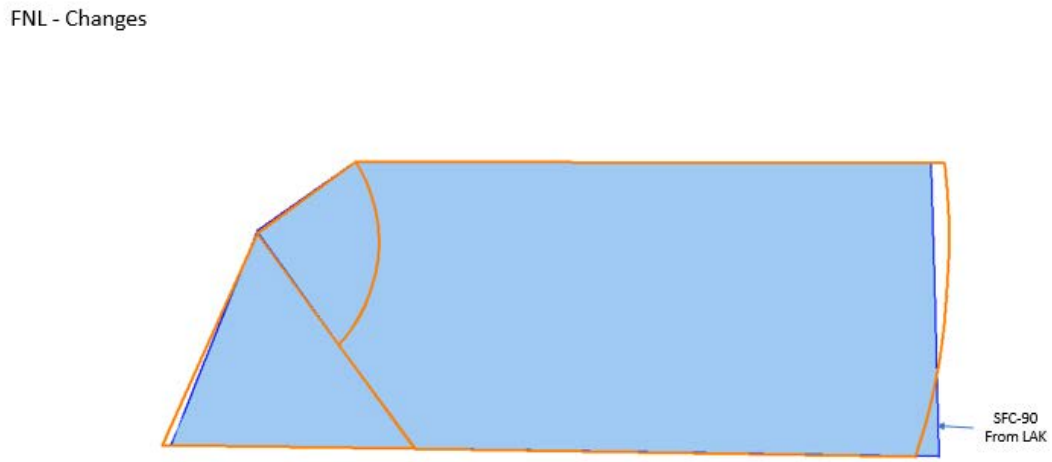


Figure 12: Overlay of Current and Proposed FNL Sector

These changes will help reduce complexity and accommodate arrivals on the newly designed RNAV routes:

- KHND OYODA SID
- KHND SCAMR SID
- KLAS CHOWW STAR
- KLAS COKTL STAR
- KLAS JAYSN STAR
- KLAS RKSTR STAR
- KLAS RNDRZ STAR

An overlay of the proposed FNL Sector with proposed RNAV procedures is depicted in Figure 13.

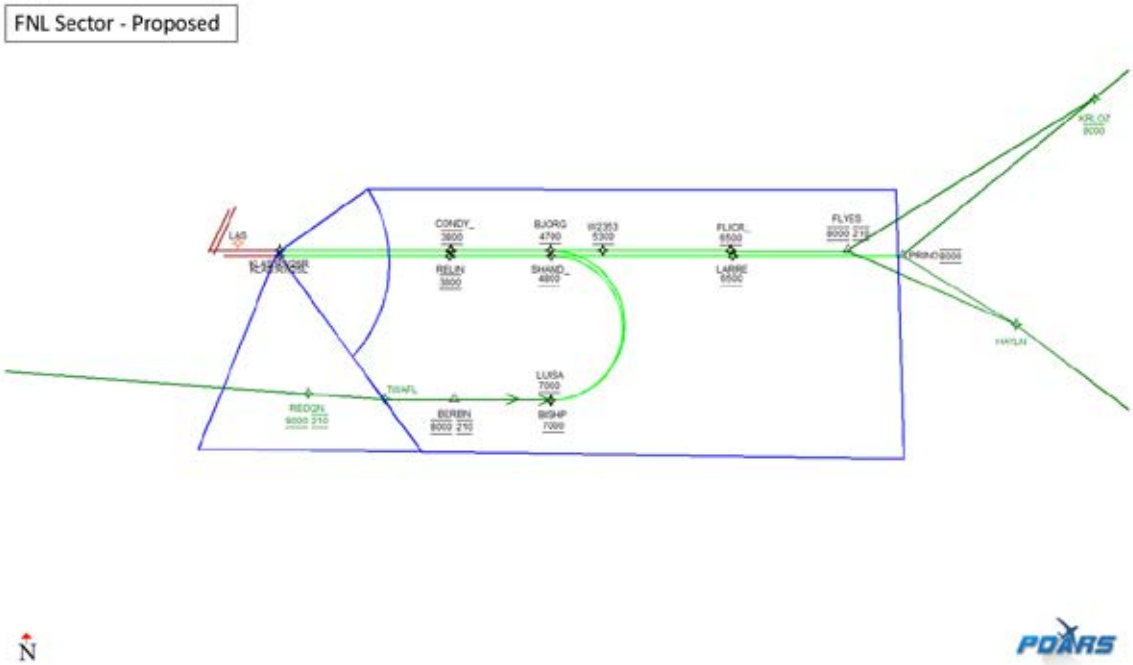


Figure 13: Overlay of Proposed FNL Sector with Proposed RNAV Procedures

L30 GNT Sector

The current GNT Sector is depicted in Figure 14.

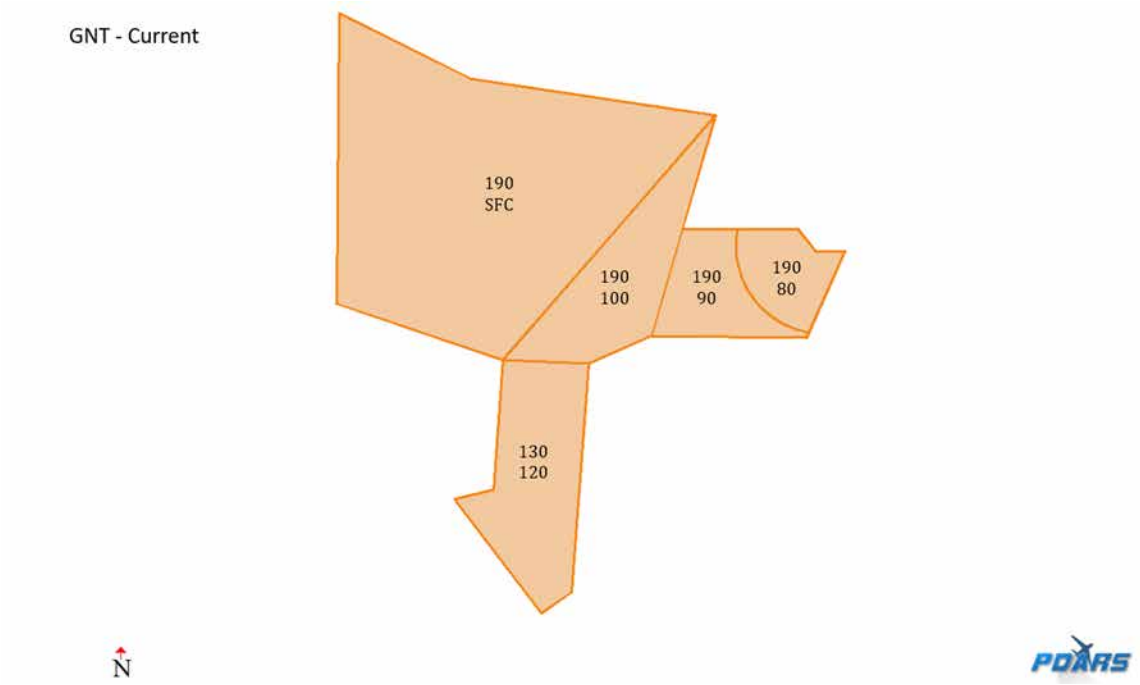


Figure 14: Current GNT Sector

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

The GNT Sector was expanded laterally on the southern and western edges of the sector with airspace acquired from ZLA Sectors 06 and 16. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between GNT and L30 Sectors DAG, FNL and MED.

The proposed GNT Sector is depicted in Figure 15.
An overlay of the current and proposed GNT Sector is depicted in Figure 16.

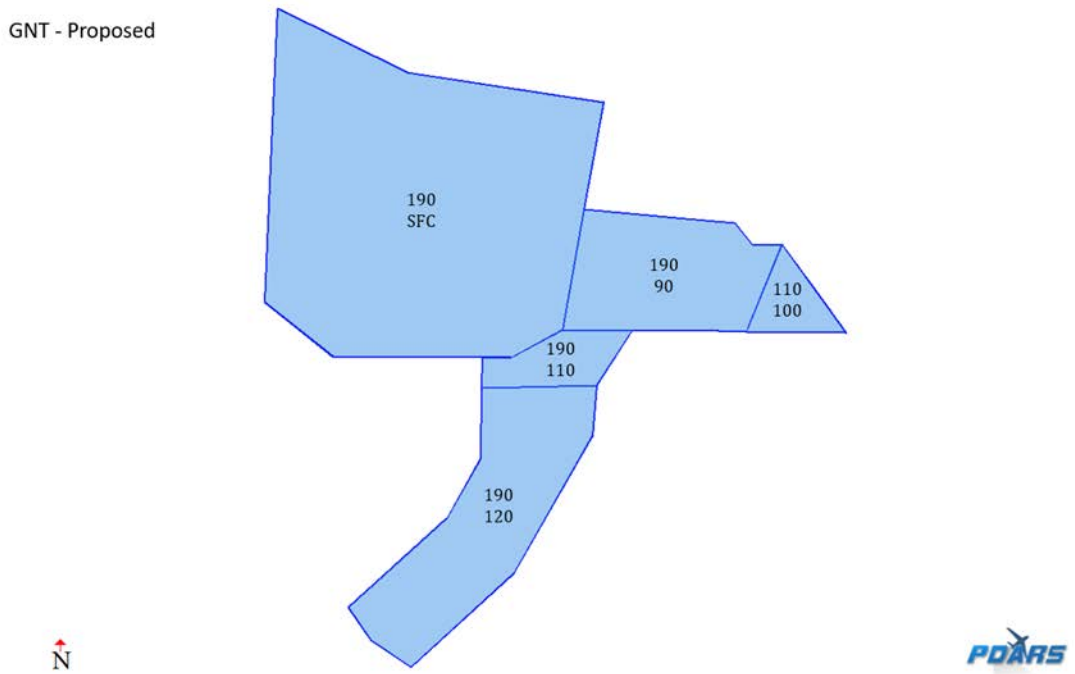


Figure 15: Proposed GNT Sector

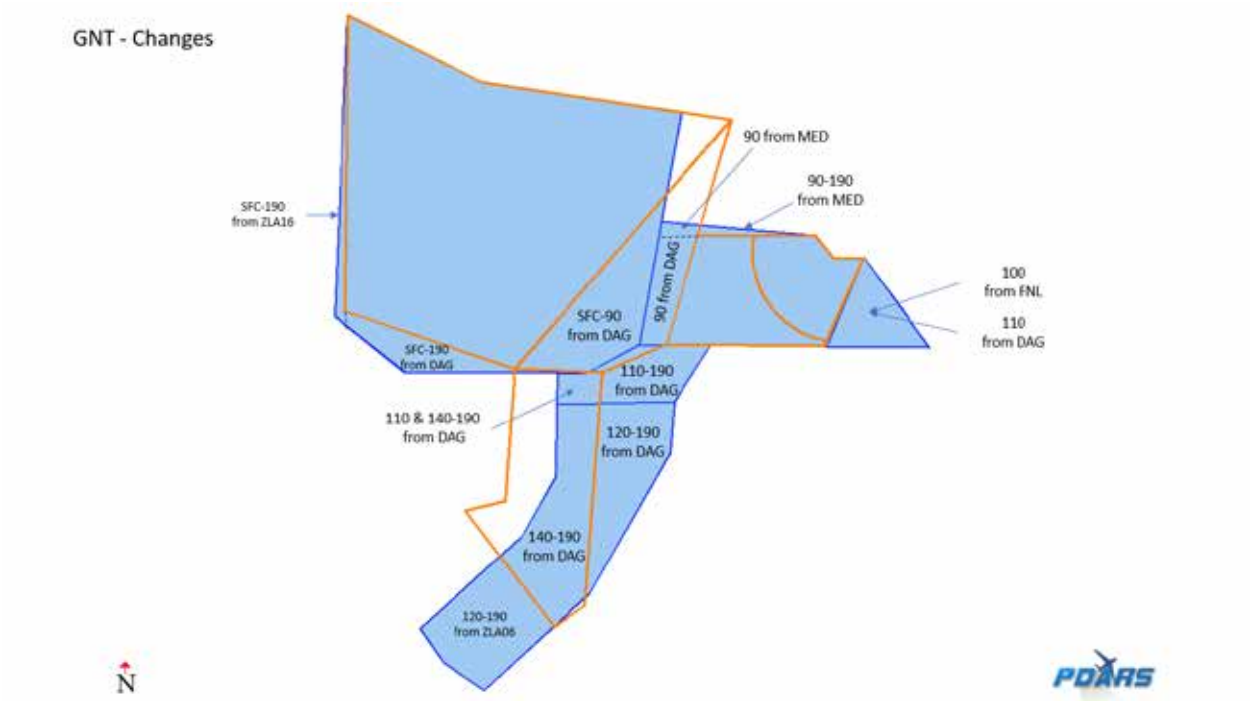


Figure 16: Overlay of Current and Proposed GNT Sector

These changes will help reduce complexity and accommodate arrivals on the newly designed RNAV routes:

- KLAS COKTL STAR
- KLAS JAYSN STAR
- KLAS RNDRZ STAR

An overlay of the proposed GNT Sector with proposed RNAV procedures is depicted in Figure 17.

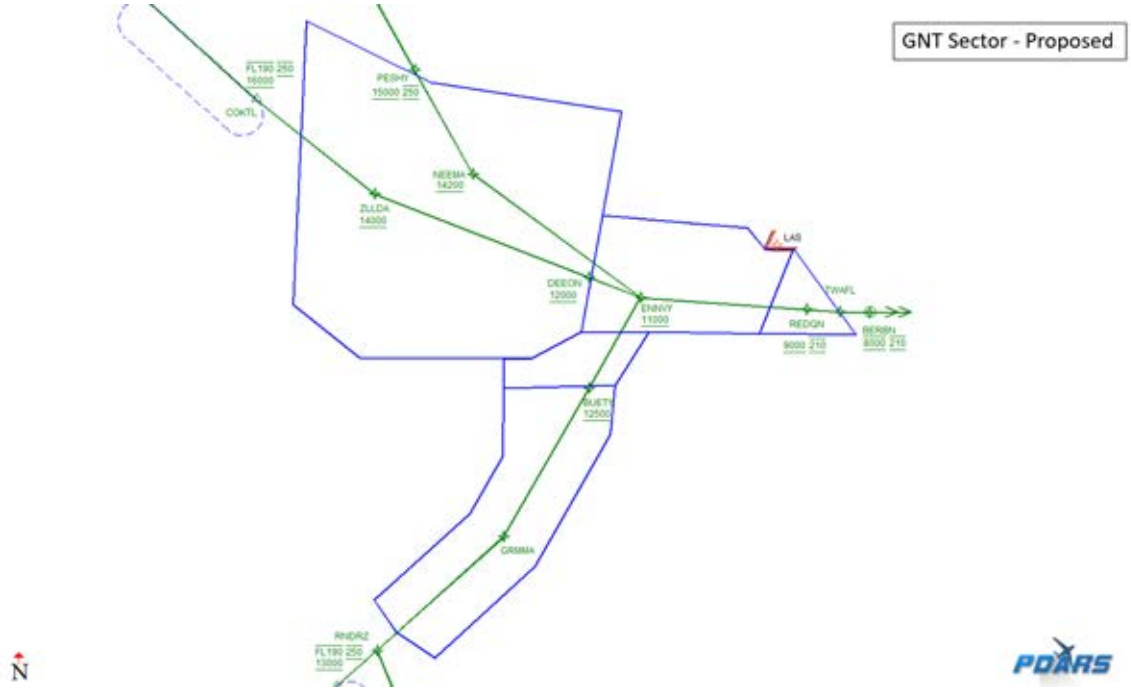


Figure 17: Overlay of Proposed GNT Sector with Proposed RNAV Procedures

L30 KNO Sector

The current KNO Sector is depicted in Figure 18.

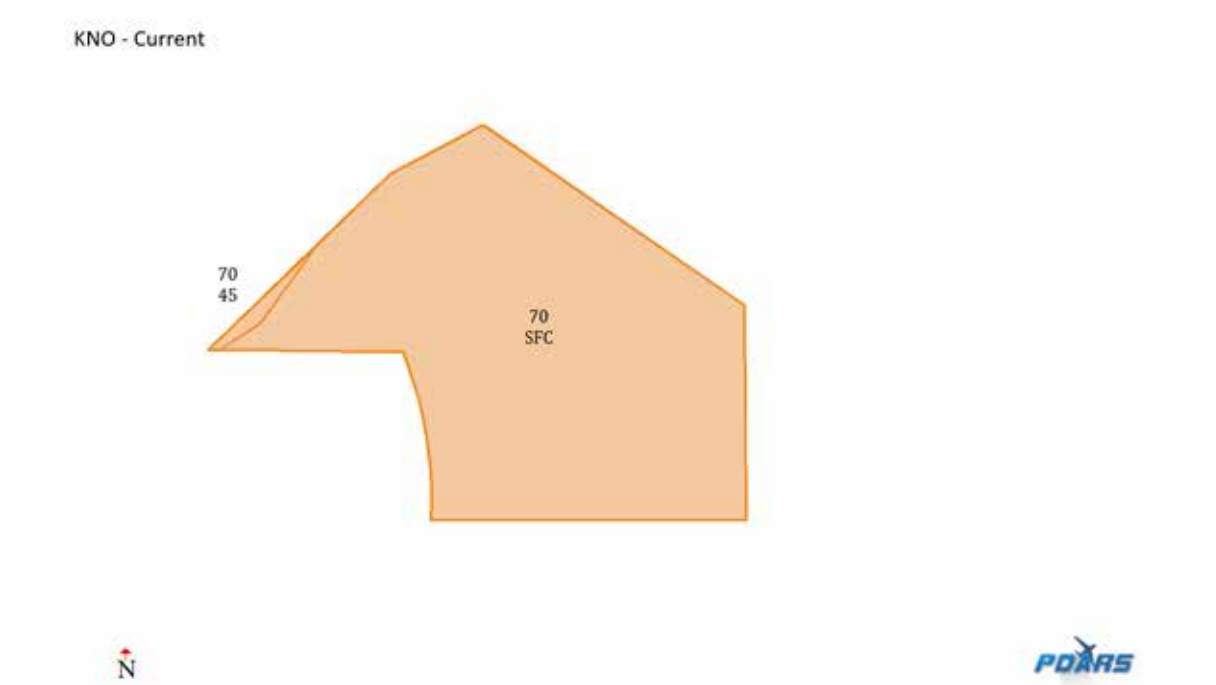


Figure 18: Current KNO Sector

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

The KNO Sector was expanded laterally on the eastern edge of the sector with airspace acquired from ZLA Sectors 07 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between KNO and L30 Sectors SAT and FNL.

The proposed KNO Sector is depicted in Figure 19.
An overlay of the current and proposed KNO Sector is depicted in Figure 20.

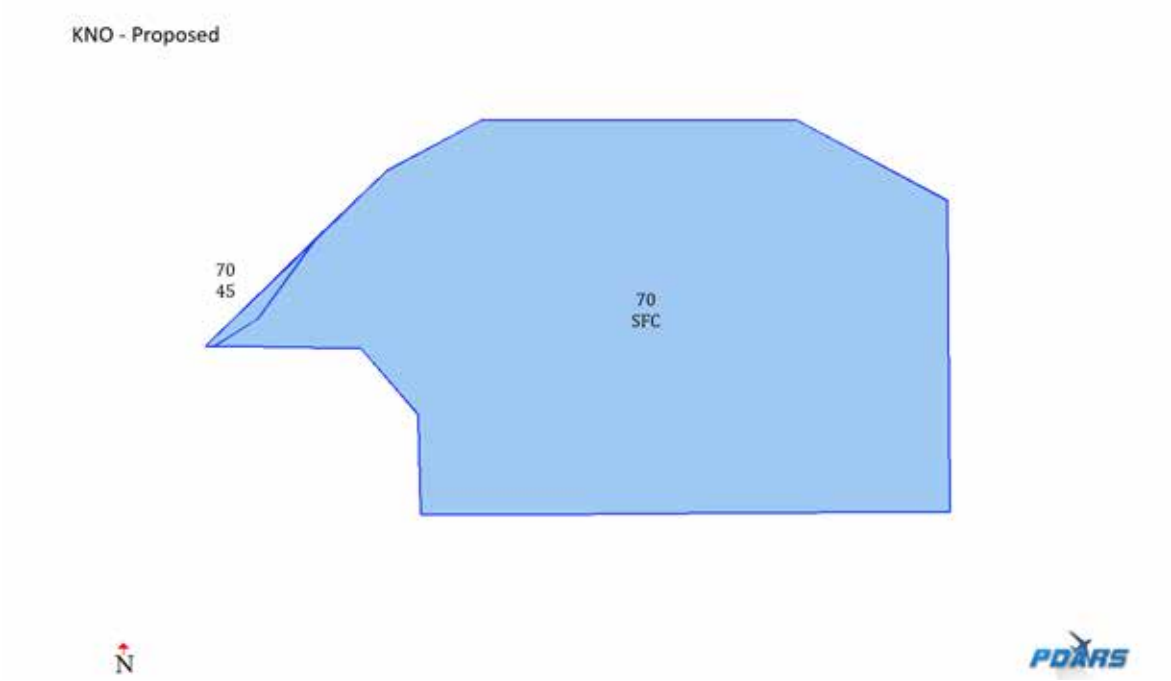


Figure 19: Proposed KNO Sector

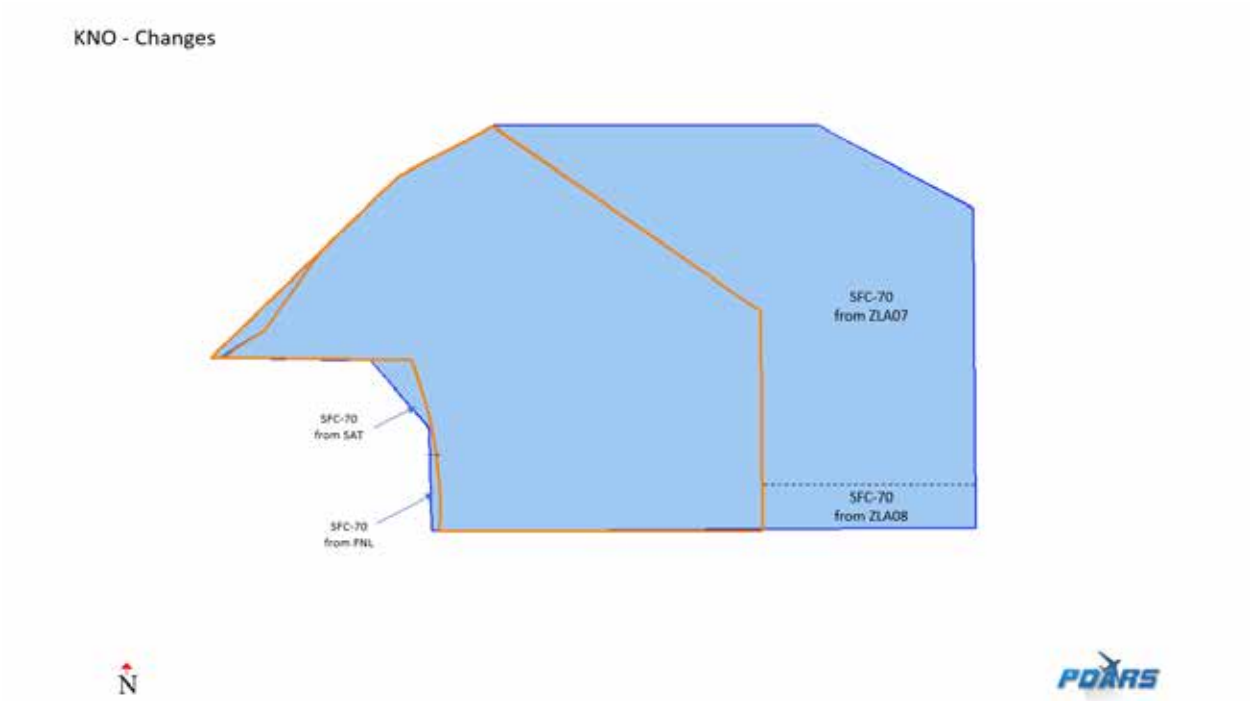


Figure 20: Overlay of Current and Proposed KNO Sector

No new RNAV procedures route through the proposed KNO Sector. These changes will help reduce complexity and accommodate airspace changes for other affected L30 Sectors.

<u>L30 LAK Sector</u>

The current LAK Sector is depicted in Figure 21.

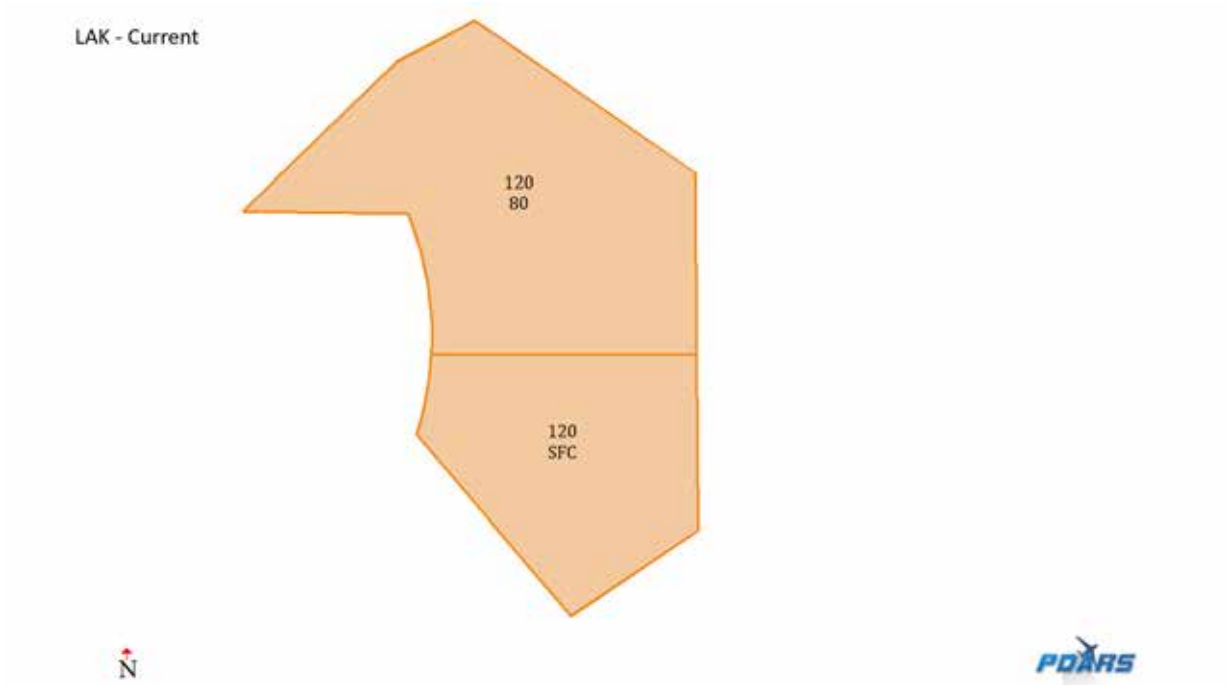


Figure 21: Current LAK Sector

The LAK Sector was expanded laterally on the eastern edge of the sector with airspace acquired from ZLA Sectors 07 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between KNO and L30 Sectors CYN, DAG, FNL and MED.

The proposed LAK Sector is depicted in Figure 22.
An overlay of the current and proposed LAK Sector is depicted in Figure 23.

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

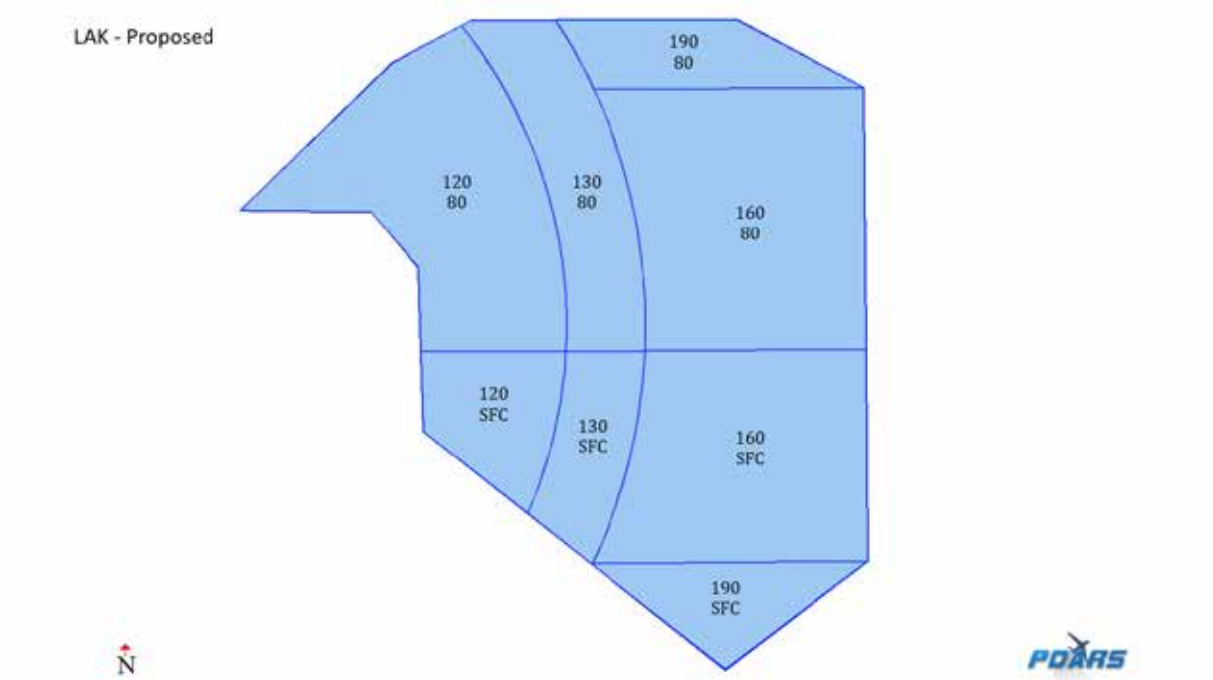


Figure 22: Proposed LAK Sector

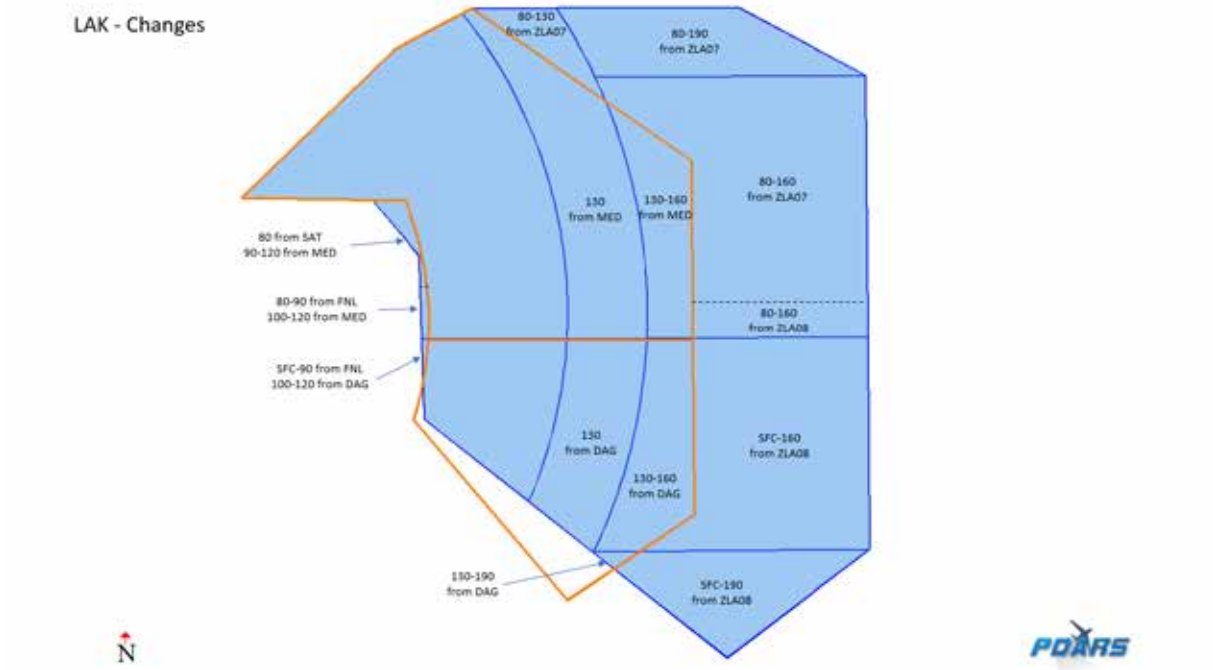


Figure 23: Overlay of Current and Proposed LAK Sector

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

These changes will help reduce complexity and accommodate arrivals on the newly designed RNAV routes:

- KHND BOEGY STAR
- KLAS CHOWW STAR
- KLAS RKSTR STAR
- KVGT WYLND STAR

An overlay of the proposed LAK Sector with proposed RNAV procedures is depicted in Figure 24.

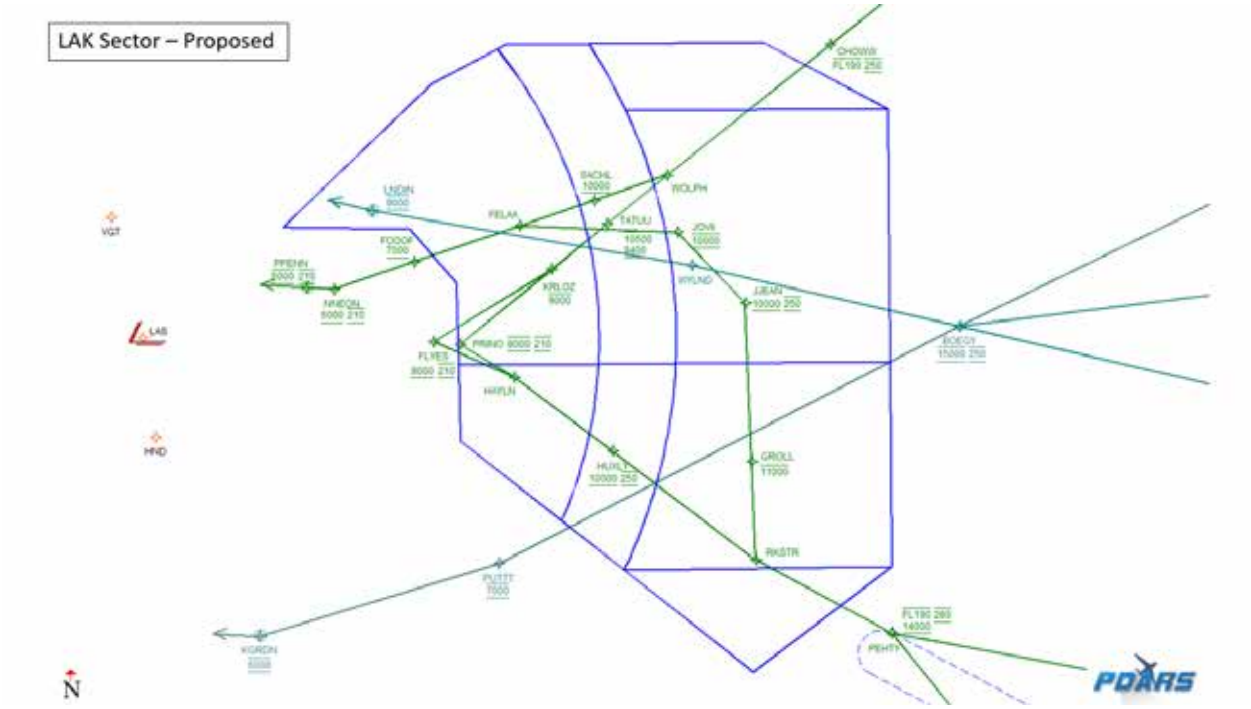


Figure 24: Overlay of Proposed LAK Sector with Proposed RNAV Procedures

L30 MED Sector

The current MED Sector is depicted in Figure 25.

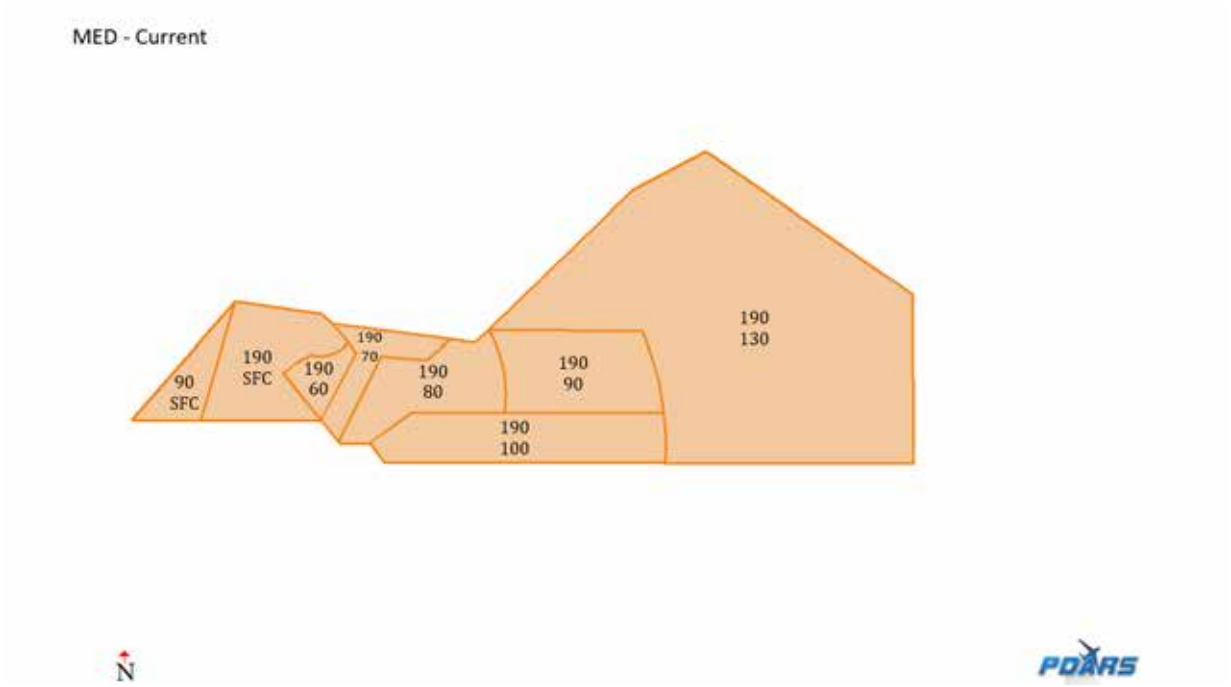


Figure 25: Current MED Sector

The MED Sector was expanded laterally on the eastern edge of the sector with airspace acquired from ZLA Sectors 07 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between MED and L30 Sectors DAG, GNT, LAK and SAT.

The proposed MED Sector is depicted in Figure 26.
An overlay of the current and proposed MED Sector is depicted in Figure 27.

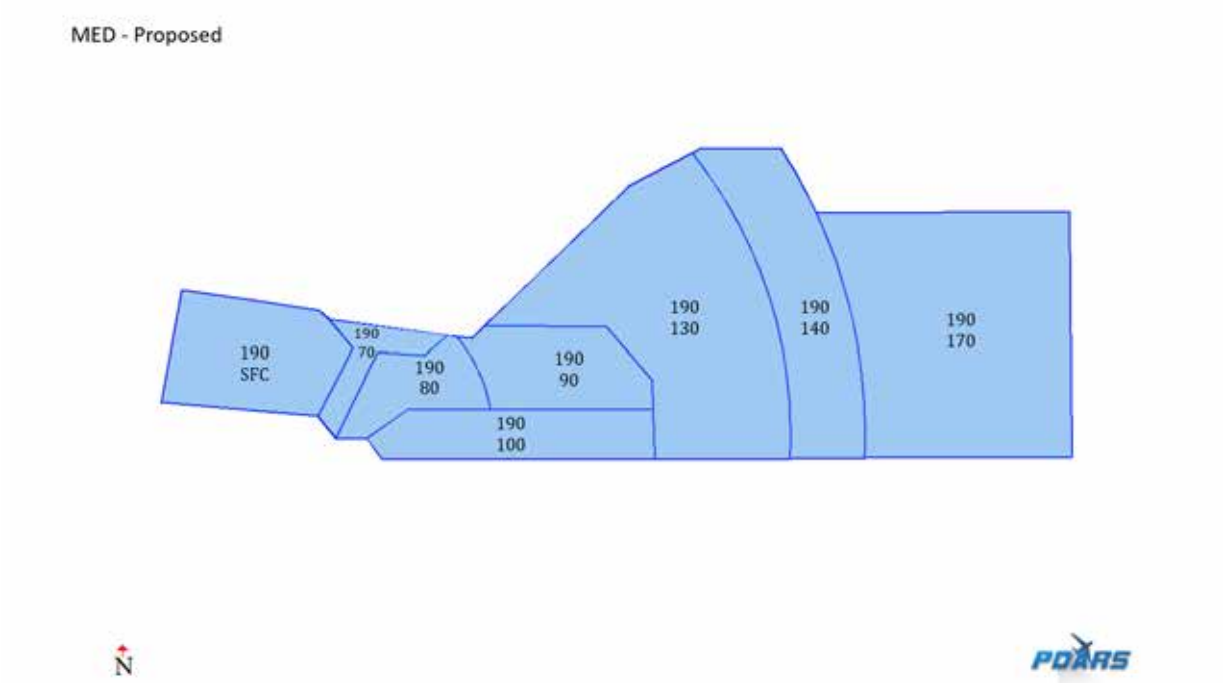


Figure 26: Proposed MED Sector

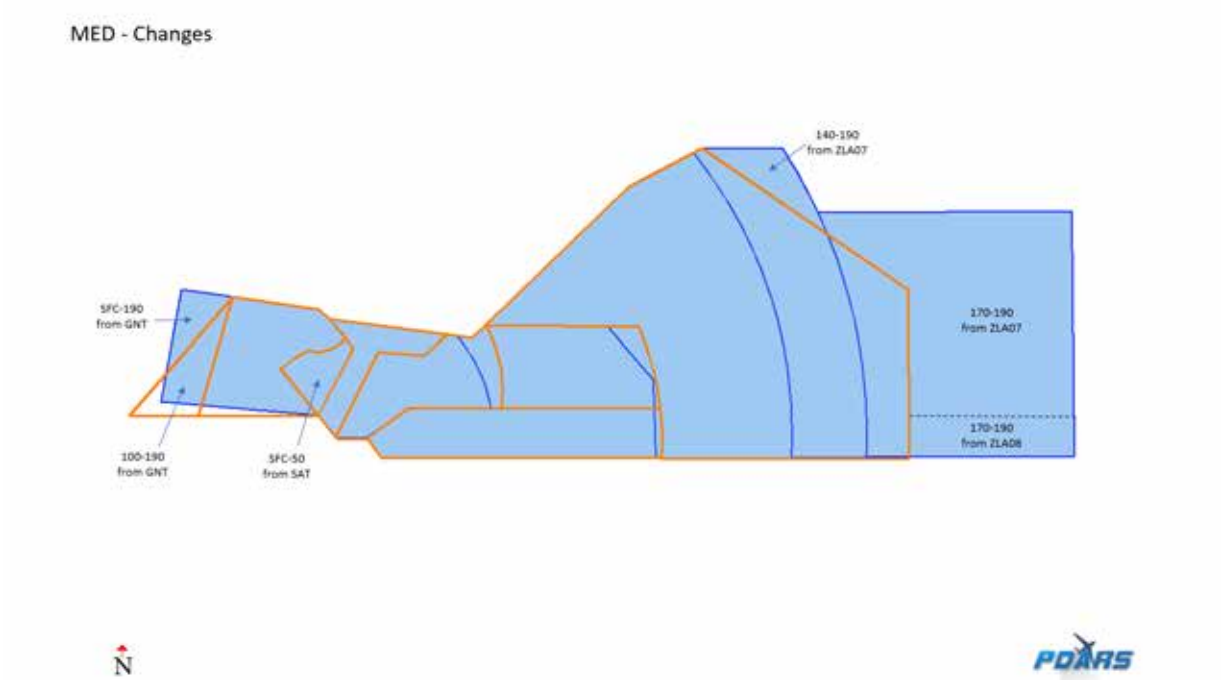


Figure 27: Overlay of Current and Proposed MED Sector

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

These changes will help reduce complexity and accommodate departures on the newly designed RNAV routes:

- KHND SCAMR SID
- KLAS GIDGT SID
- KLAS RATPK SID

An overlay of the proposed MED Sector with proposed RNAV procedures is depicted in Figure 28.

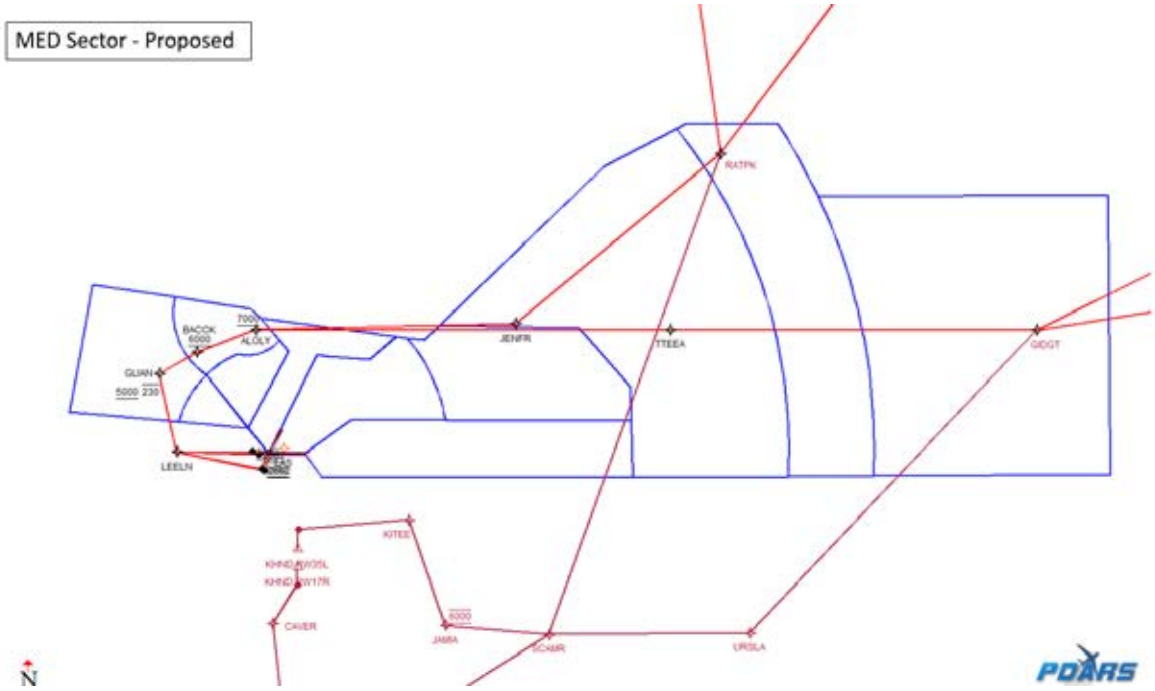


Figure 28: Overlay of Proposed MED Sector with Proposed RNAV Procedures

L30 SAT Sector

The current SAT Sector is depicted in Figure 29.

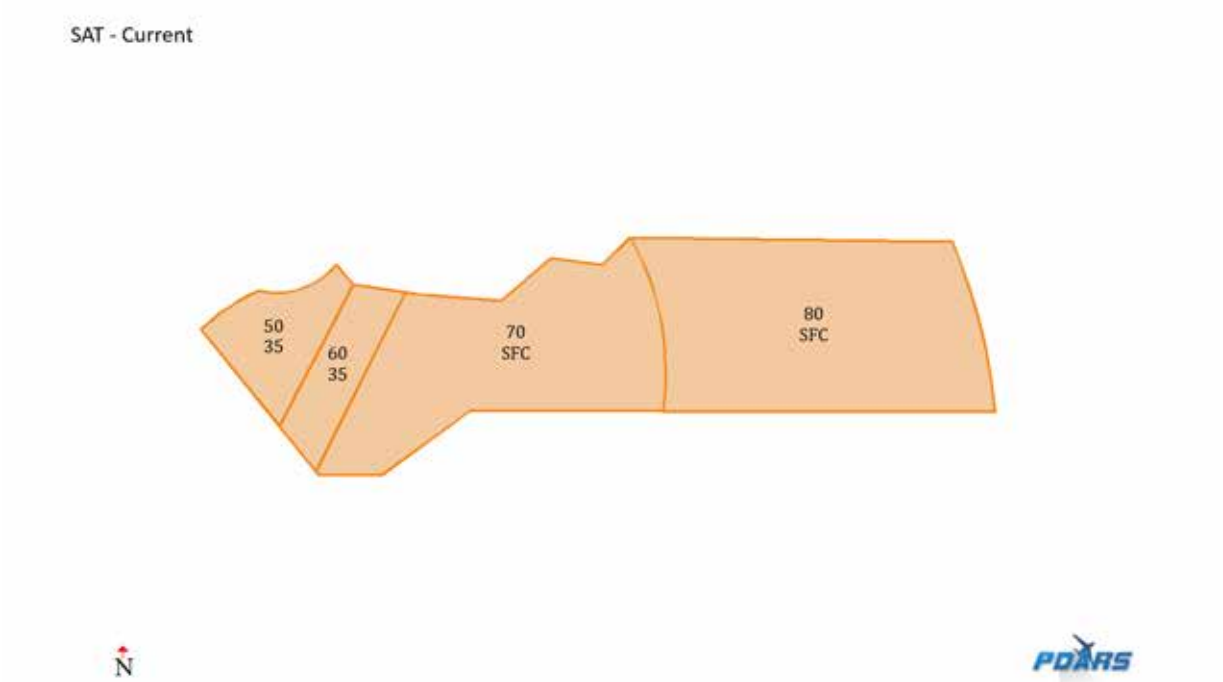


Figure 29: Current SAT Sector

The SAT Sector was changed with airspace transferred between SAT and L30 Sectors KNO, LAK and MED.

The proposed SAT Sector is depicted in Figure 30.
An overlay of the current and proposed SAT Sector is depicted in Figure 31.

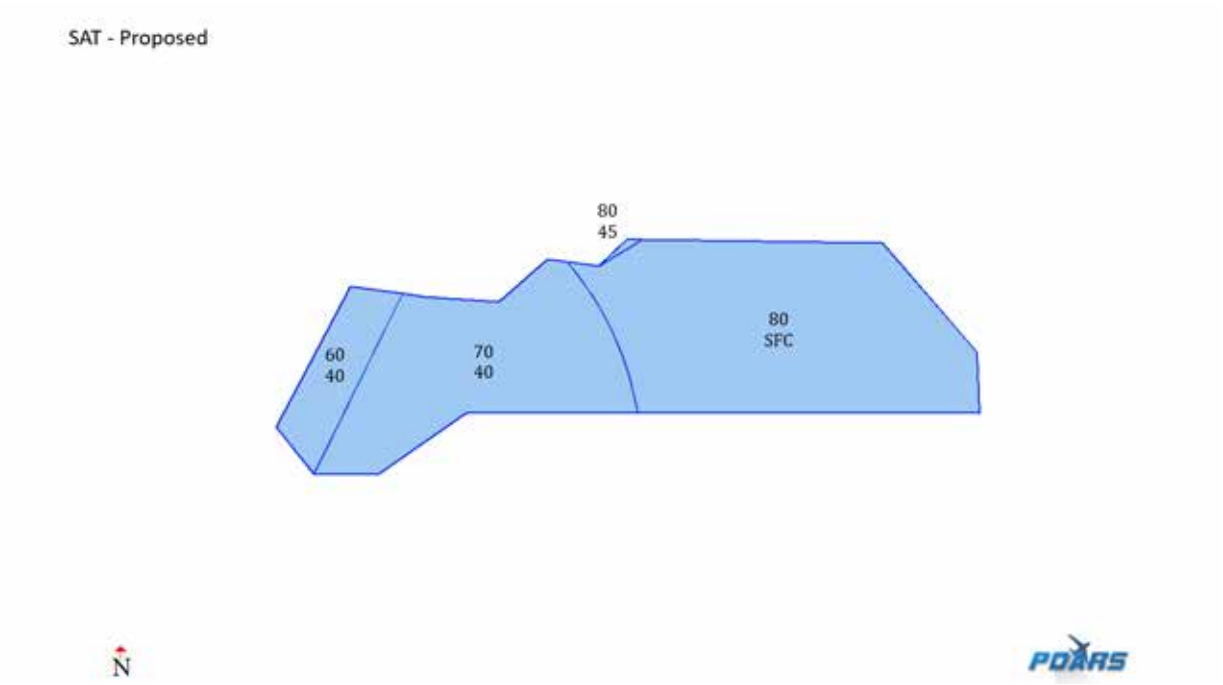


Figure 30: Proposed SAT Sector

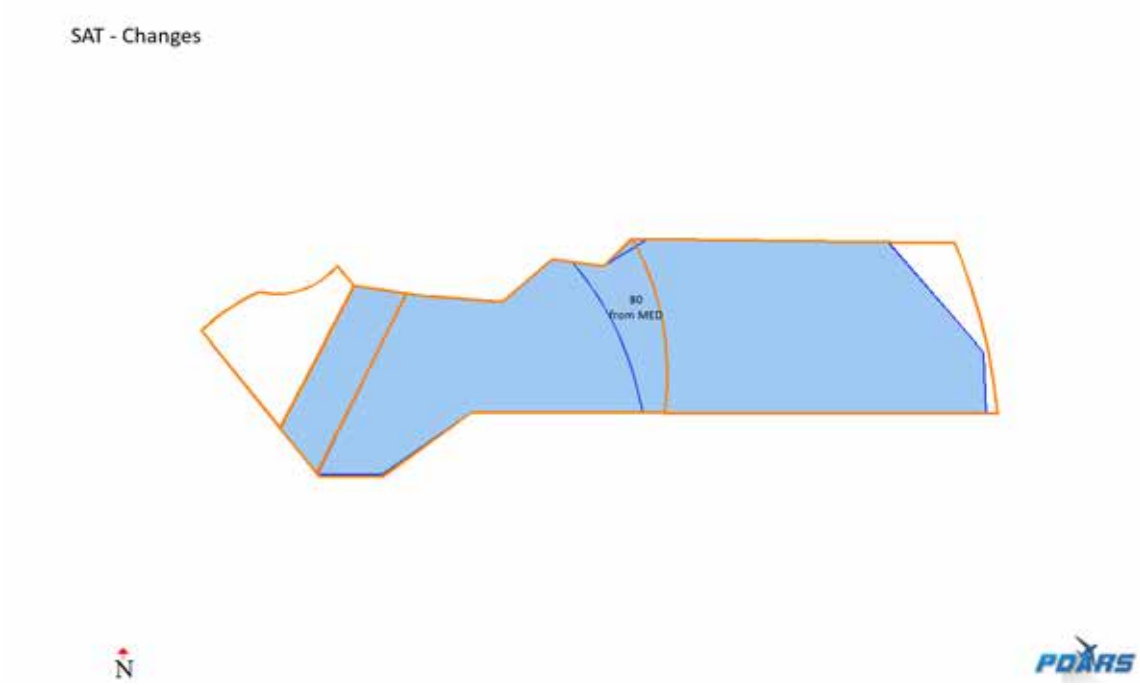


Figure 31: Overlay of Current and Proposed SAT Sector

These changes will help reduce complexity and accommodate arrivals on the newly designed RNAV routes:

- KLAS CHOWW STAR
- KLAS RKSTR STAR

An overlay of the proposed SAT Sector with proposed RNAV procedures is depicted in Figure 32.

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

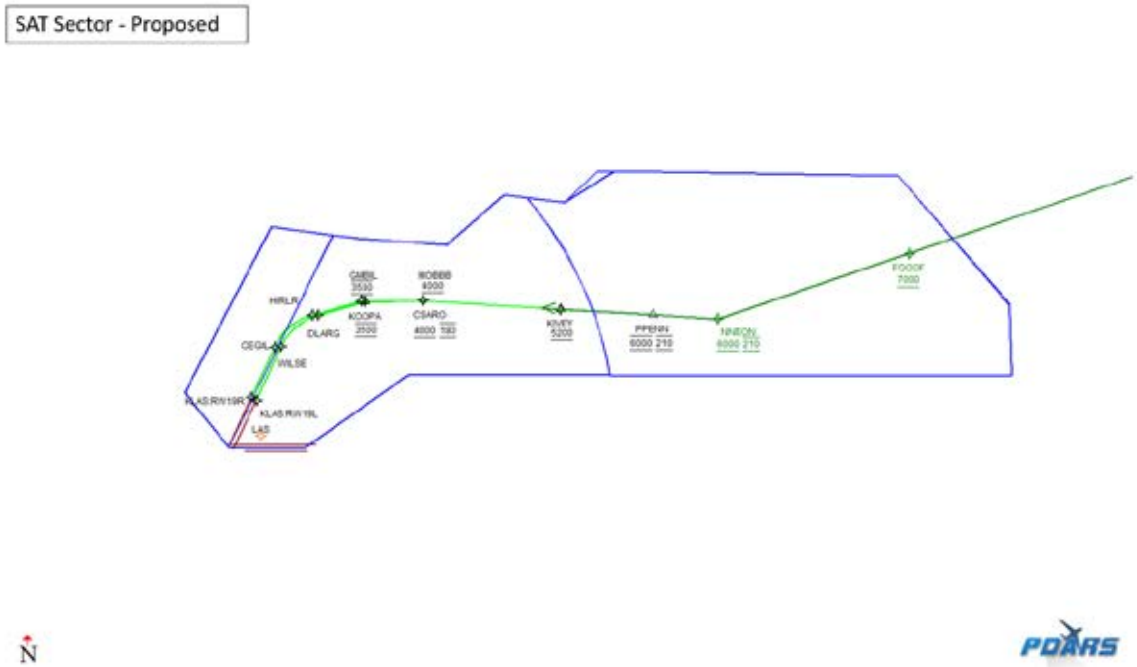


Figure 32: Overlay of Proposed SAT Sector with Proposed RNAV Procedures

Additional Design Considerations

- Spectrum analysis will be required for the proposed airspace changes associated with the proposed RNAV procedures.

The L30 airspace changes affect the following facility area(s) as indicated:

- Nellis Air Traffic Control Facility (NATCF)
- Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors:
  - CYN
  - DAG
  - FNL
  - GNT
  - KNO
  - LAK
  - MED
  - SAT
- Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors:
  - 06
  - 0
  - 08
  - 16

Implementation Dependencies

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND and KVGT.

Document changes/modifications include:

- ZLA Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- ZLA and L30 sector boundary maps
- ZLA/L30 Letter of Agreement (LOA)
- L30/LAS LOA
- LAS/L30/HND LOA
- ZLA Standard Operating Procedures (SOP)
- L30 SOP
- LAS SOP
- ERAM and STARS Automation Changes (ADRS, ADAR, Waypoint Pairs, etc.)
- NAS Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Standard Operating Procedures
- Airspace Illustrations
- Spectrum package
- Automation package
- Table of frequencies for all affected sectors/positions
- Spectrum analysis results
- HITL simulation results

Las Vegas OAPM Design Package

L30 Configuration One Airspace Changes

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	P/Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23APR19 Date

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

The Las Vegas Metroplex Project was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation, providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures in to and out of area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows, allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures.

Extensive changes were made to designated airspace at air traffic control sectors in the Las Vegas Terminal Radar Control (L30 TRACON) and Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

Name of Change and Airport/s	Change Classification
Las Vegas Terminal Radar Control Facility (TRACON/L30) Airspace Changes	Delegated Airspace
OAPM Study Team Reference(s)	**Current Phase of Design**
4.2 L30 Airspace Expansion	☐ Preliminary Operational Design (PD) ☒ Proposed Final Design (PFD)
Package Date	**Implementation Date**
5/31/2019	5/21/2020
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
McCarran International Airport (KLAS), Henderson Executive Airport (KHND), North Las Vegas Airport (KVGT), Nellis Air Force Base (KLSV) Nellis Air Traffic Control Facility (NATCF) Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: CYN, DAG, FNL, GNT, KNO, LAK, MED, SAT Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 06, 07, 08, 16	KLAS JOHKR Standard Instrument Departure (SID) KLAS RADYR SID KLAS RASLR SID KLAS NIITZ SID KLAS GIDGT SID KLAS RATPK SID KLAS LOHLA SID KLAS COKTL Standard Terminal Arrival Route (STAR) KLAS RNDRZ STAR KLAS RKSTR STAR KLAS CHOWW STAR KLAS JAYSN STAR KHND OYODA SID KHND SCAMR SID KHND GAMES STAR KHND NTNDO STAR KHND BOEGY STAR KVGT FLCHR STAR KVGT WYLND STAR
Associated Data Files	
Standard Operating Procedures Airspace Illustrations Spectrum package Automation package Table of frequencies for all affected sectors/positions Spectrum analysis results HITL simulation results	

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

Purpose

The Las Vegas Metroplex Project was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation, providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures in to and out of area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows, allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures.

Extensive changes are required for designated airspace at air traffic control sectors in the Las Vegas Terminal Radar Control (L30 TRACON) and Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

Study Team Issues and Solutions

Issues

L30's current lateral airspace boundary is insufficient to accommodate runway transitions for LAS arrivals for all configurations. During periods of moderate and heavy traffic, sequencing to Runways 25L/R localizers extends back to ZLA airspace. Arrivals from the southwest, landing Runway 01L/R have difficulty meeting speed and altitude assignments. The current ZLA/L30 Transfer of Control Points (TCP) do not allow for the timely issuance of runway assignments.

The HND NOOTN STAR entry point into L30's airspace requires excessive coordination between ZLA Sectors 7 and 8.

Solutions

Expanding L30's current lateral boundary allowed the Las Vegas MST to develop Optimized Profile Descent (OPD) STARs with runway transitions for all configurations. The Las Vegas MST recommended airspace expansion would allow sequencing to Runways 25L/R to be contained within L30 airspace. Optimized procedures facilitate compliance with speed and altitude assignments thereby reducing transmissions and pilot/controller task complexity.

The Las Vegas MST recommends ZLA issues the LAS landing direction (one option per configuration per gate) and L30 issues the runway transition.

The proposed airspace modification reduces coordination and complexity, allows for timely runway assignments, and provides additional airspace for sequencing. The Las Vegas MST considered surveillance coverage when designing L30 airspace expansion. D&I should further analyze the airspace expansion to ensure adequate surveillance coverage. Figure 4-3 depicts the Las Vegas MST conceptual L30 airspace expansion.

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

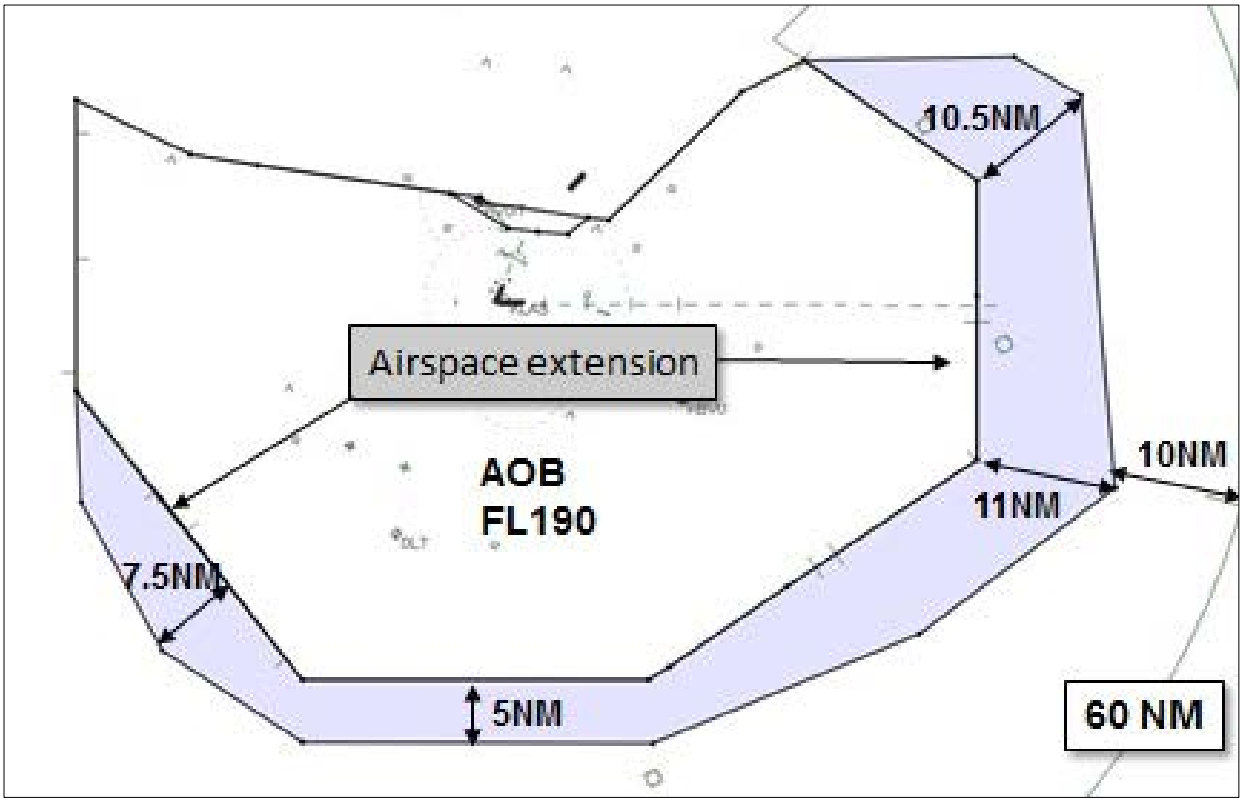


Figure 1: MST Proposed L30 Airspace

Proposed Final Design

The Design and Implementation (D&I) Team undertook an extensive review of airspace at L30 and ZLA to determine the suitability of current airspace and changes that would be necessary to accommodate new designs. The L30 delegated airspace was expanded laterally with airspace transferred from ZLA to provide flexibility and increased options for controllers as they sequence arrivals and departures to Las Vegas Valley airports. This expanded L30 airspace will also allow the issuance of alternate runway assignment for arrivals if required.

Current L30 Sector internal airspace delegation is dependent on which configuration is being utilized at KLAS. The Proposed Final Design will also provide changing lateral and vertical boundaries tailored to individual configurations.

This Proposed Final Design Package presents changes for KLAS Configuration Three, which serves arrivals and departures on KLAS Runways 01 L/R; and 26 L/R.

The Proposed Final Design of L30 airspace for KLAS Configuration Three is as follows:

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

L30 CYN Sector

The current L30 CYN Sector is depicted in Figure 2.

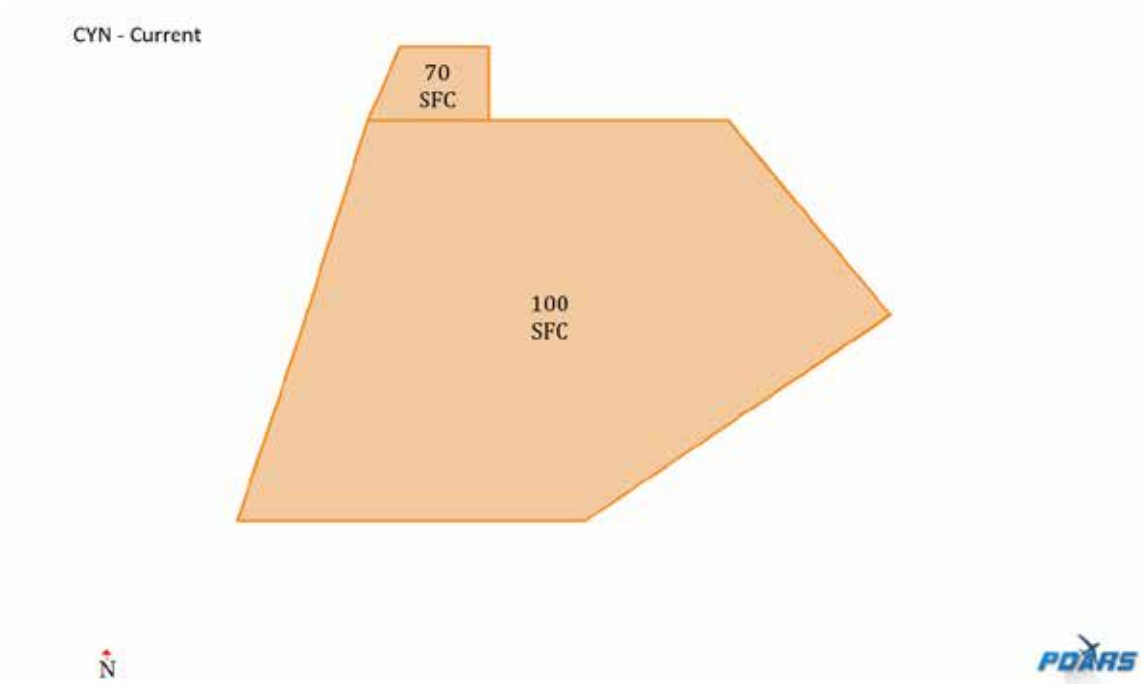


Figure 2: Current CYN Sector

The CYN Sector was expanded laterally on the southern and eastern edges of the sector with airspace acquired from ZLA Sectors 06 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between CYN and L30 Sectors DAG, GNT, FNL, LAK and SAT.

The proposed CYN Sector is depicted in Figure 3.
An overlay of the current and proposed CYN Sector is depicted in Figure 4.

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

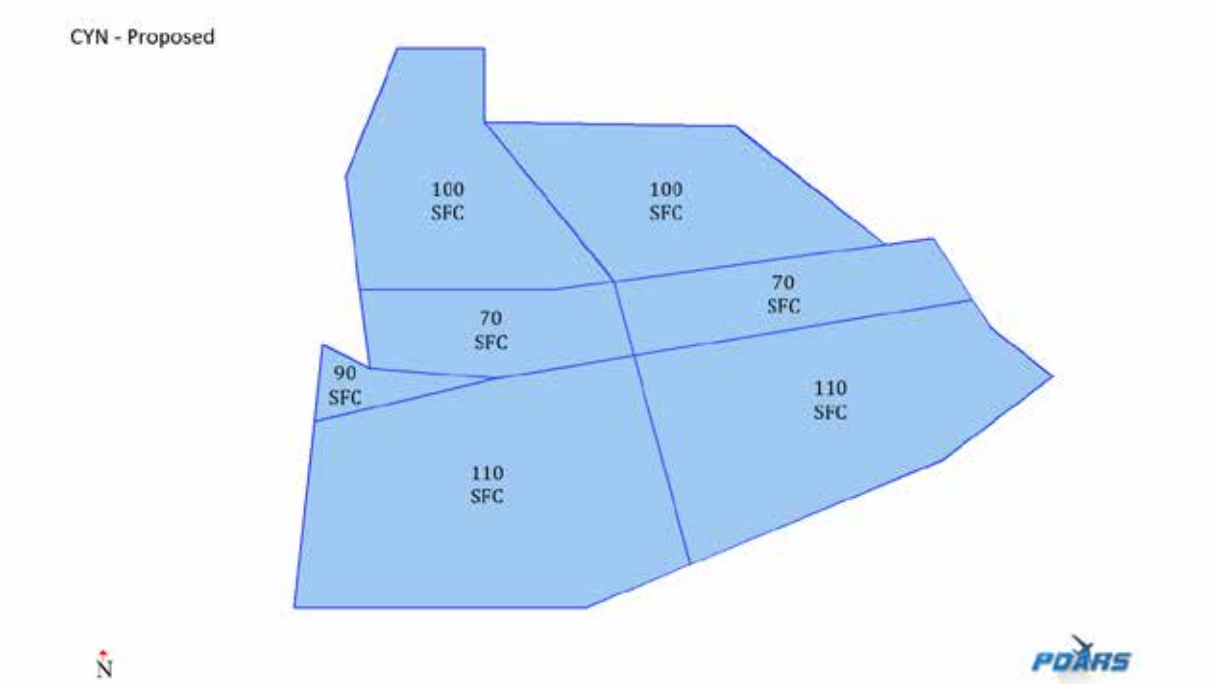


Figure 3: Proposed CYN Sector

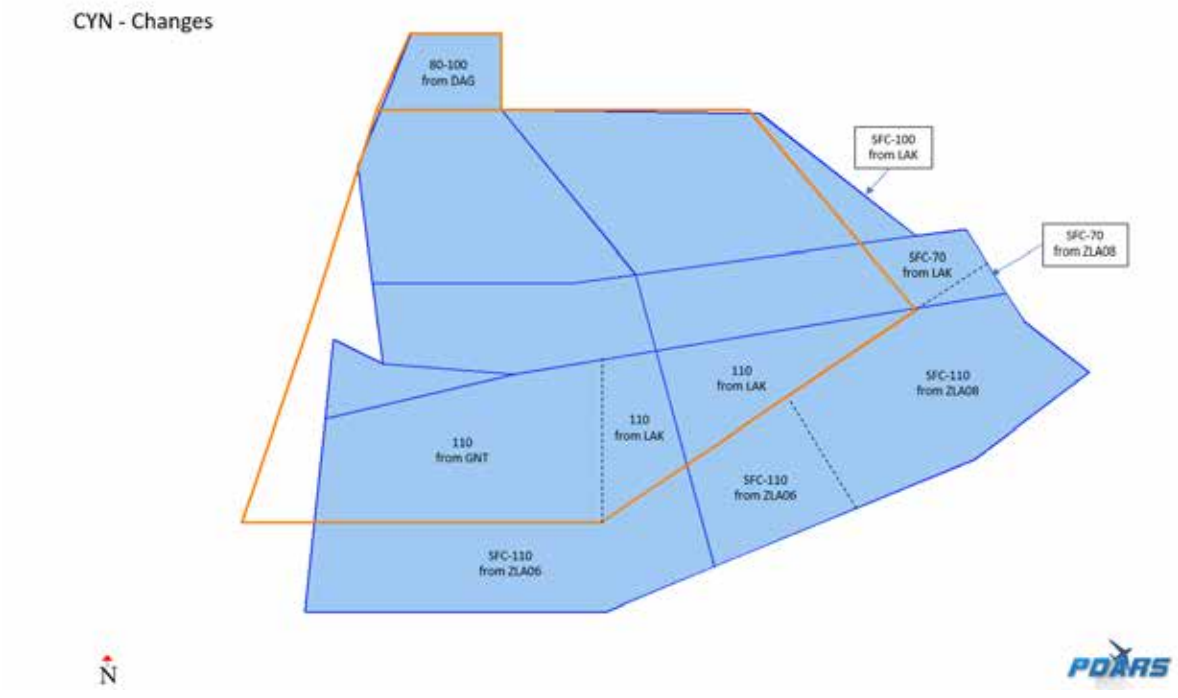


Figure 4: Overlay of Current and Proposed CYN Sector

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND BOEGY STAR
- KHND GAMES STAR
- KHND NTNDO STAR
- KHND OYODA SID
- KHND SCAMR SID

An overlay of the proposed CYN Sector with proposed RNAV procedures is depicted in Figure 5.

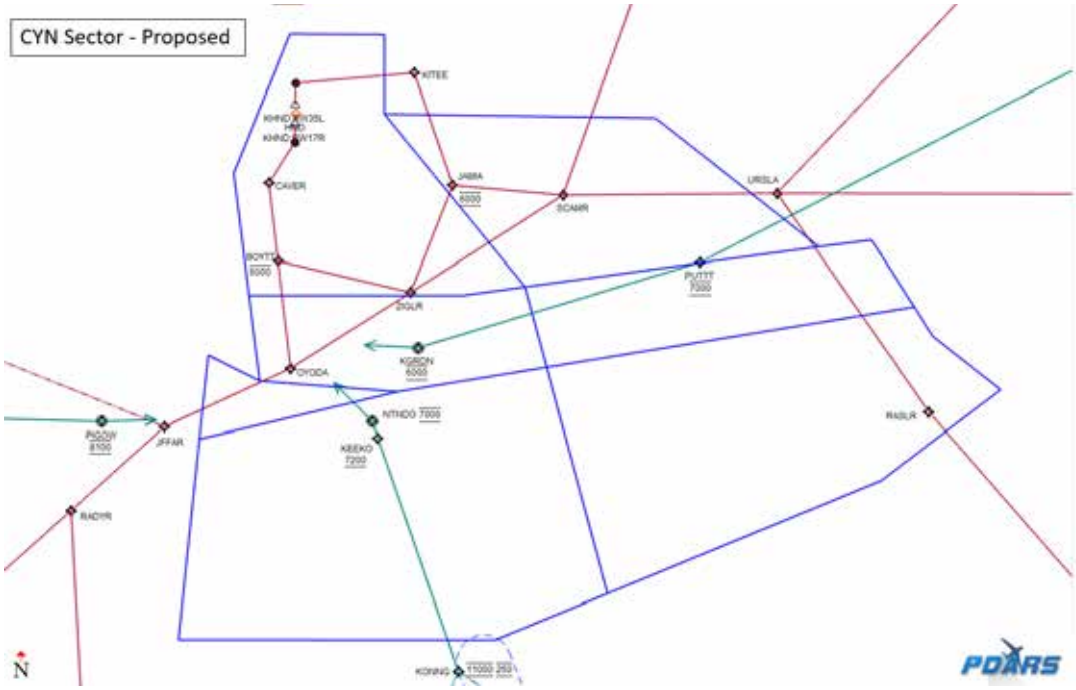


Figure 5: Overlay off Proposed CYN Sector with Proposed RNAV Procedures

L30 DAG Sector

The current DAG Sector is depicted in Figure 6.

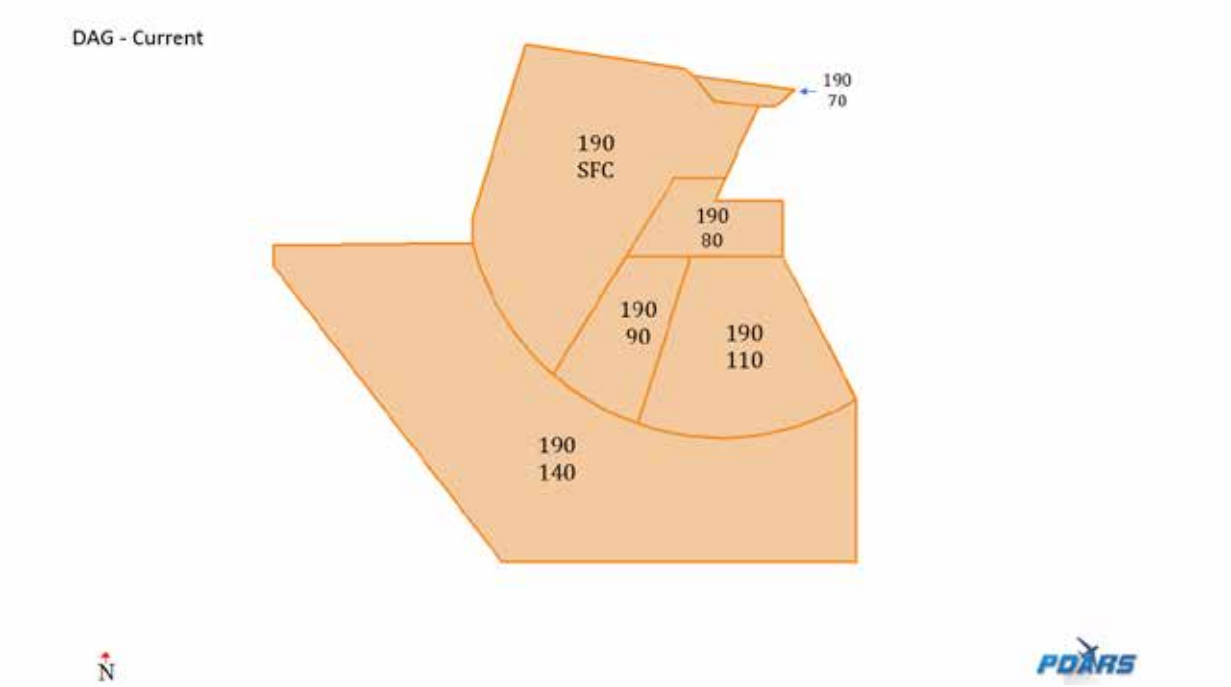


Figure 6: Current DAG Sector

The DAG Sector was expanded laterally on the western and southern edges of the sector with airspace acquired from ZLA Sectors 06 and 16. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between DAG and L30 Sectors CYN, GNT, LAK, MED and SAT.

The proposed DAG Sector is depicted in Figure 7.
An overlay of the current and proposed DAG Sector is depicted in Figure 8.

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

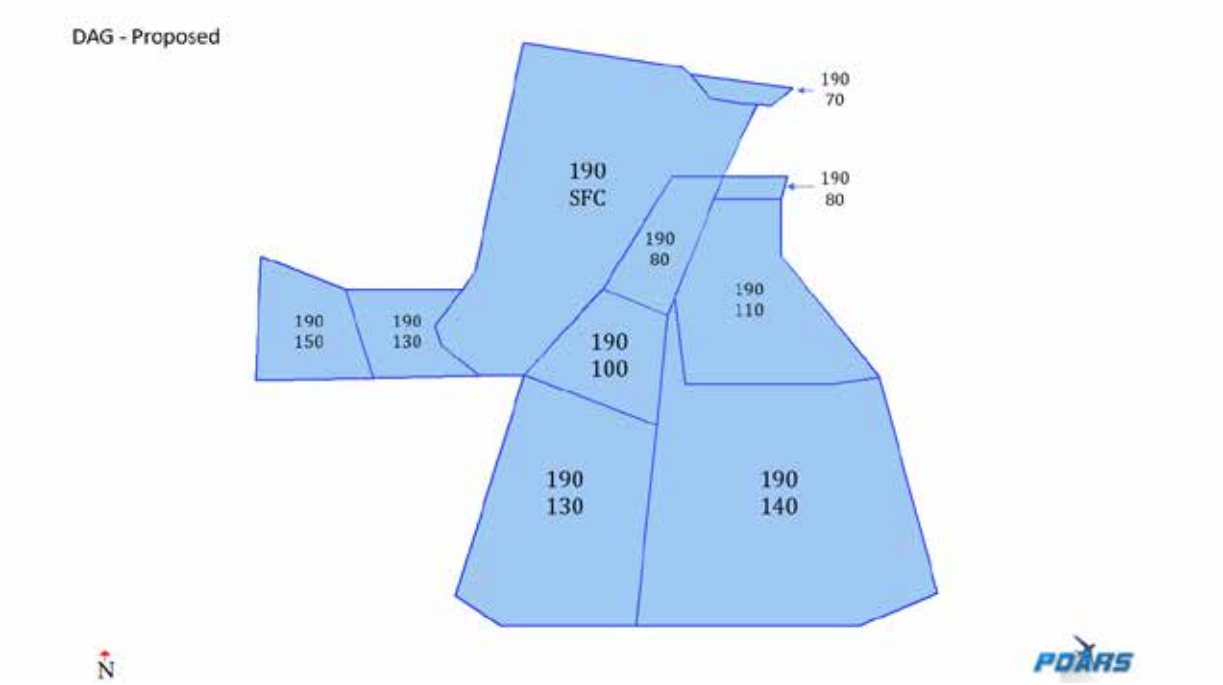


Figure 7: Proposed DAG Sector

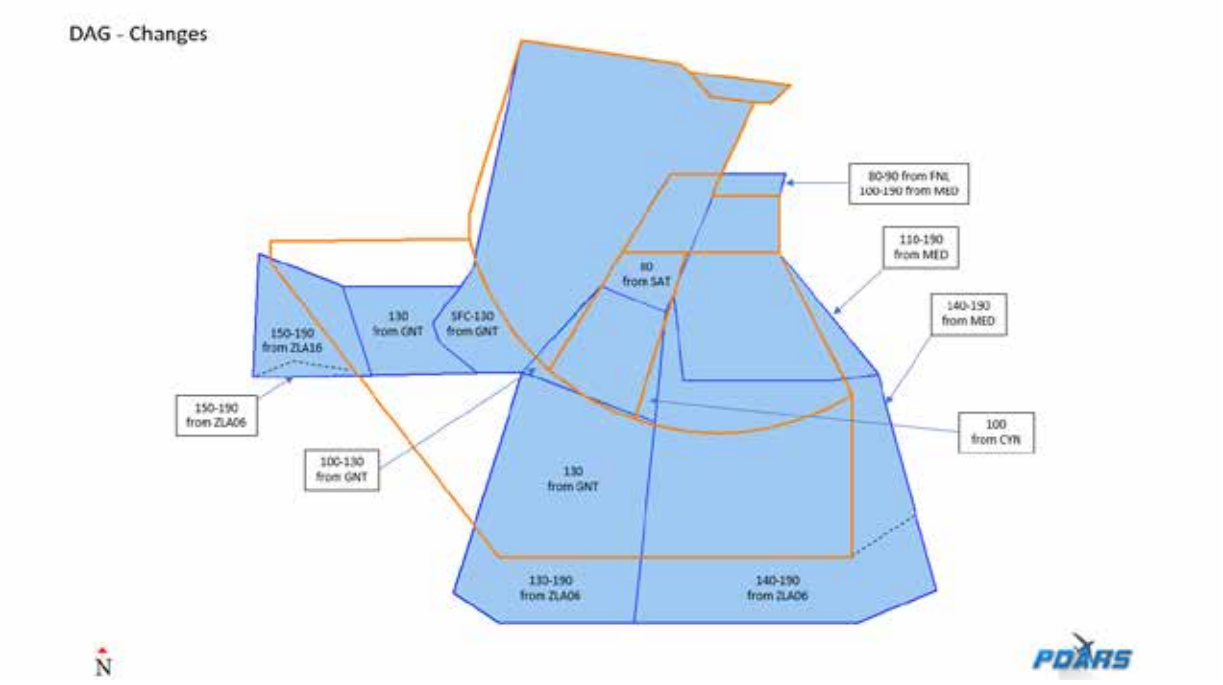


Figure 8: Overlay of Current and Proposed DAG Sector

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND OYODA SID
- KLAS GIDGT SID
- KLAS JOHKR SID
- KLAS LOHLA SID
- KLAS NIITZ SID
- KLAS RASLR SID
- KLAS RATPK SID
- KLAS RAYDR SID

An overlay of the proposed DAG Sector with proposed RNAV procedures is depicted in Figure 9.

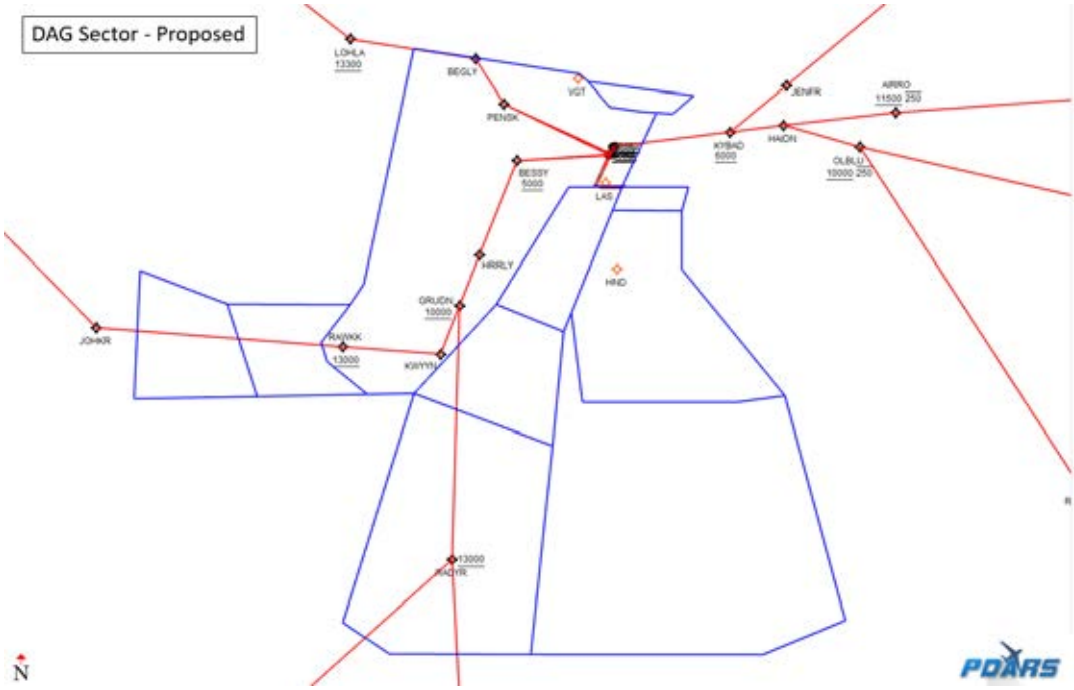


Figure 9: Overlay of Proposed DAG Sector with Proposed RNAV Procedures

L30 FNL Sector

The current FNL Sector is depicted in Figure 10.

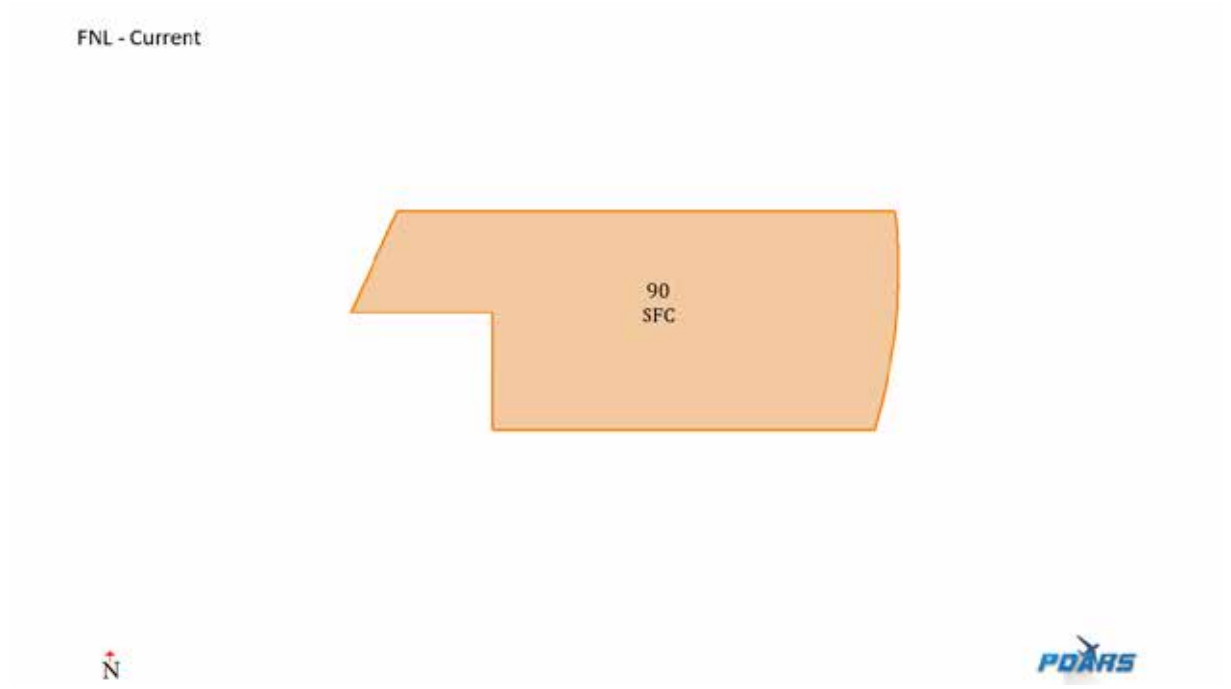


Figure 10: Current FNL Sector

The FNL Sector was changed with airspace transferred between FNL and L30 Sectors DAG, KNO, LAK and MED.

The proposed FNL Sector is depicted in Figure 11.
An overlay of the current and proposed FNL Sector is depicted in Figure 12.

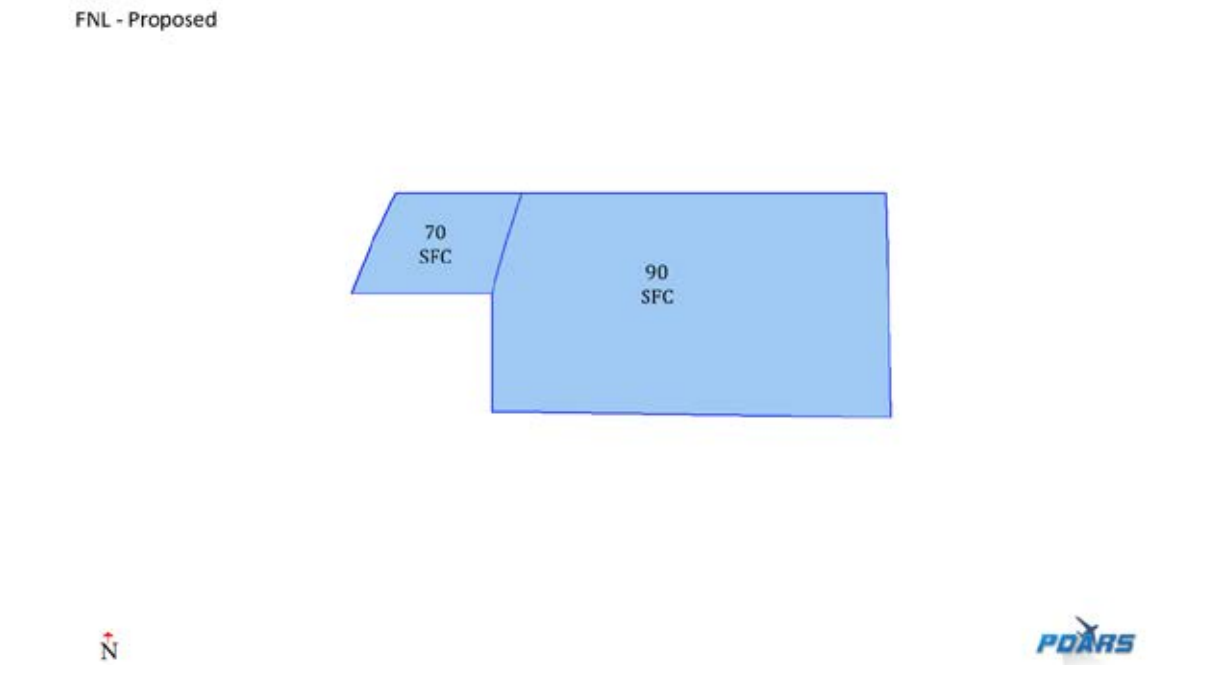


Figure 11: Proposed FNL Sector

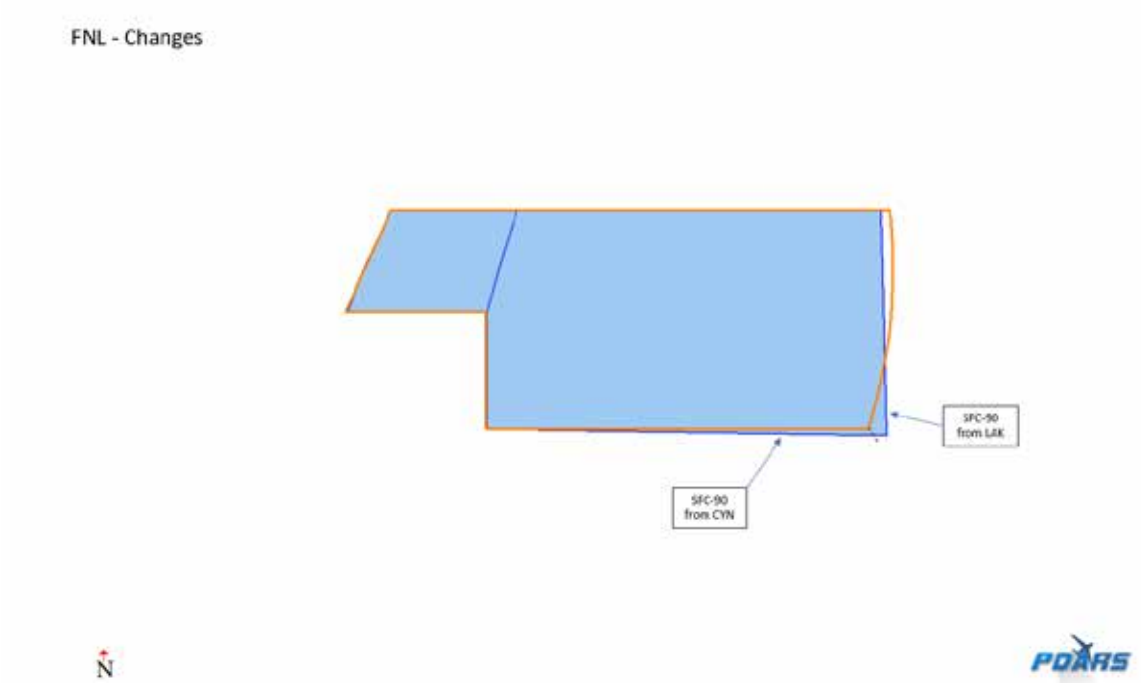


Figure 12: Overlay of Current and Proposed FNL Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND OYODA SID
- KHND SCAMR SID
- KLAS CHOWW STAR
- KLAS RKSTR STAR

An overlay of the proposed FNL Sector with proposed RNAV procedures is depicted in Figure 13.

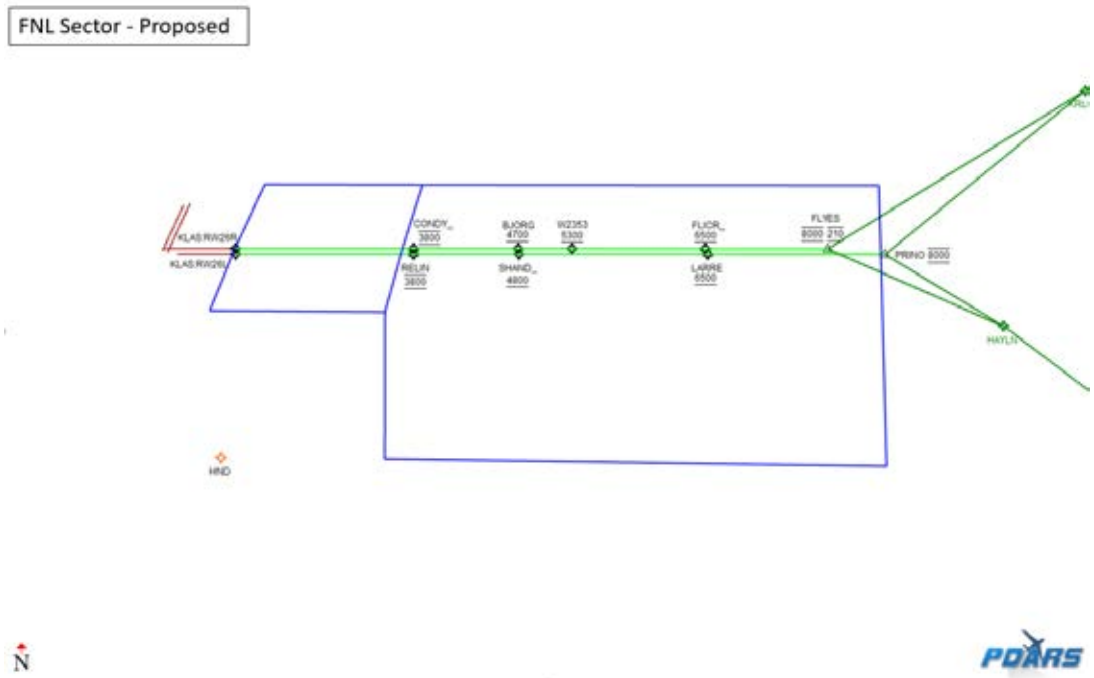


Figure 13: Overlay of Proposed FNL Sector with Proposed RNAV Procedures

L30 GNT Sector

The current GNT Sector is depicted in Figure 14.

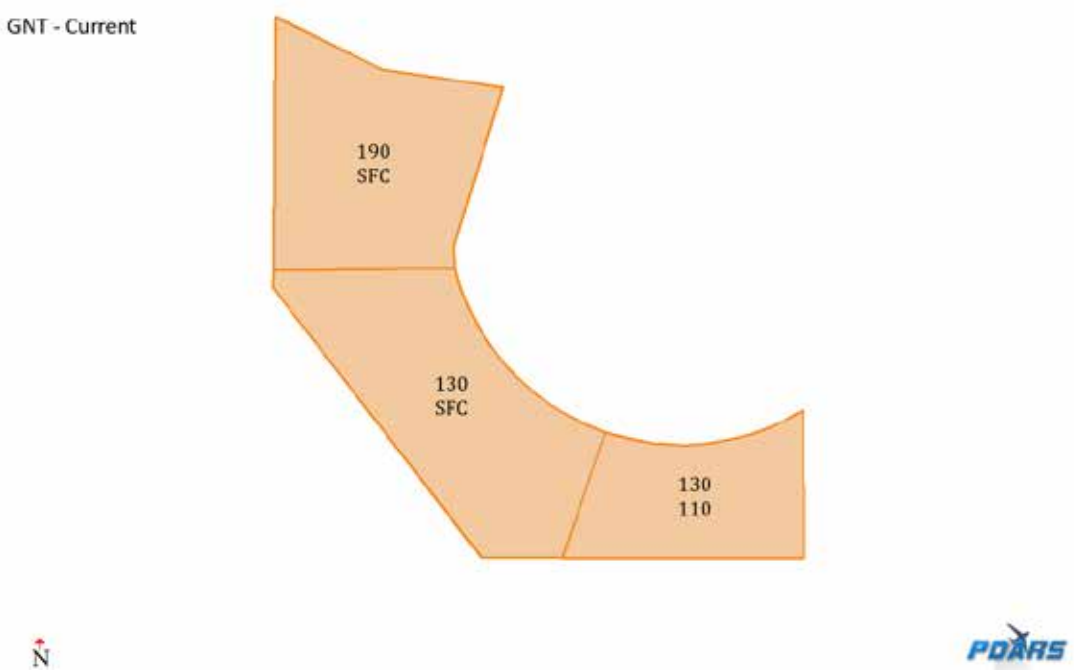


Figure 14: Current GNT Sector

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

The GNT Sector was expanded laterally on the southern, southwestern and western edges of the sector with airspace acquired from ZLA Sectors 06 and 16. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between GNT and L30 Sectors CYN, DAG, MED and SAT.

The proposed GNT Sector is depicted in Figure 15.
An overlay of the current and proposed GNT Sector is depicted in Figure 16.

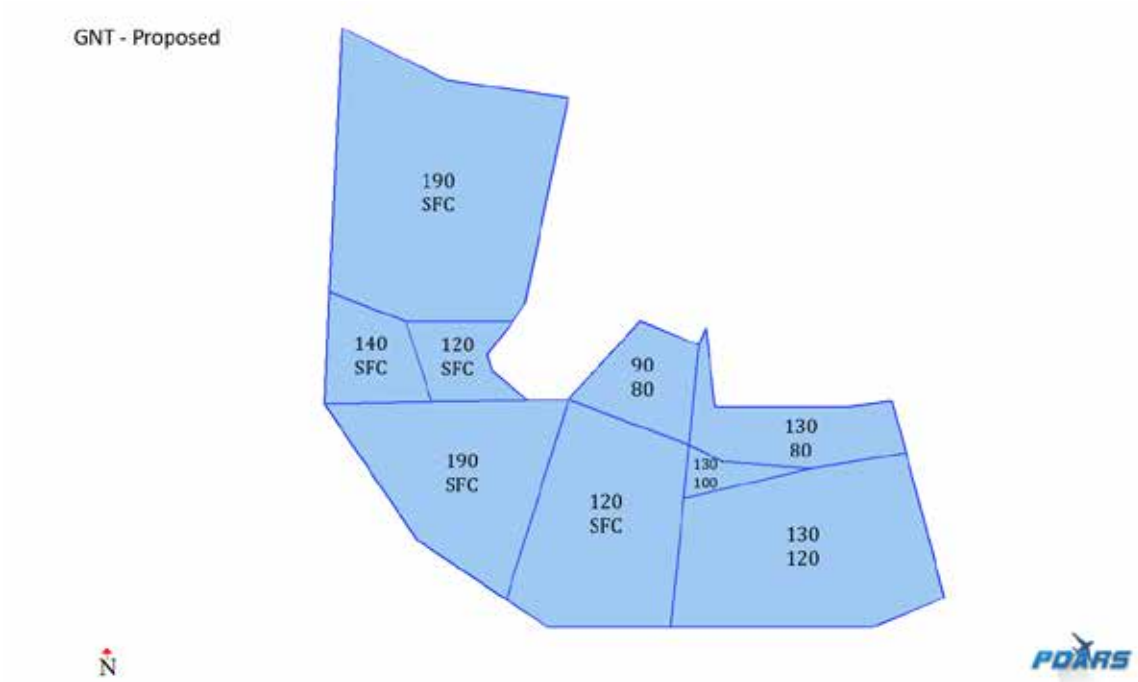


Figure 15: Proposed GNT Sector

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

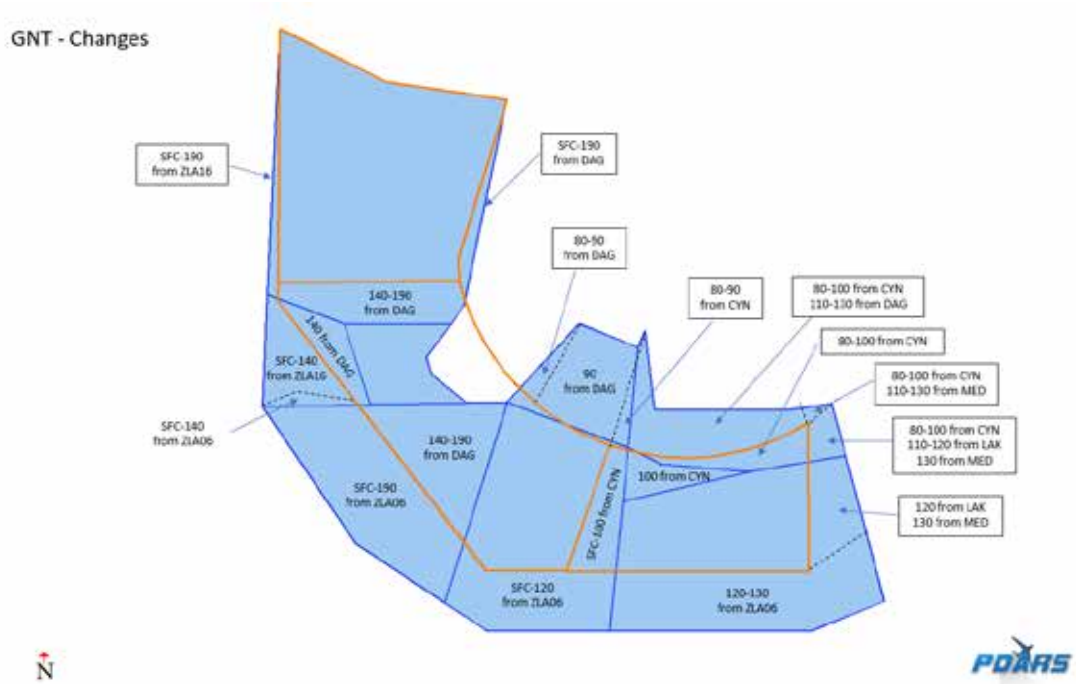


Figure 16: Overlay of Current and Proposed GNT Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND GAMES STAR
- KLAS COKTL STAR
- KLAS JAYSN STAR
- KLAS RNDRZ STAR

An overlay of the proposed GNT Sector with proposed RNAV procedures is depicted in Figure 17.

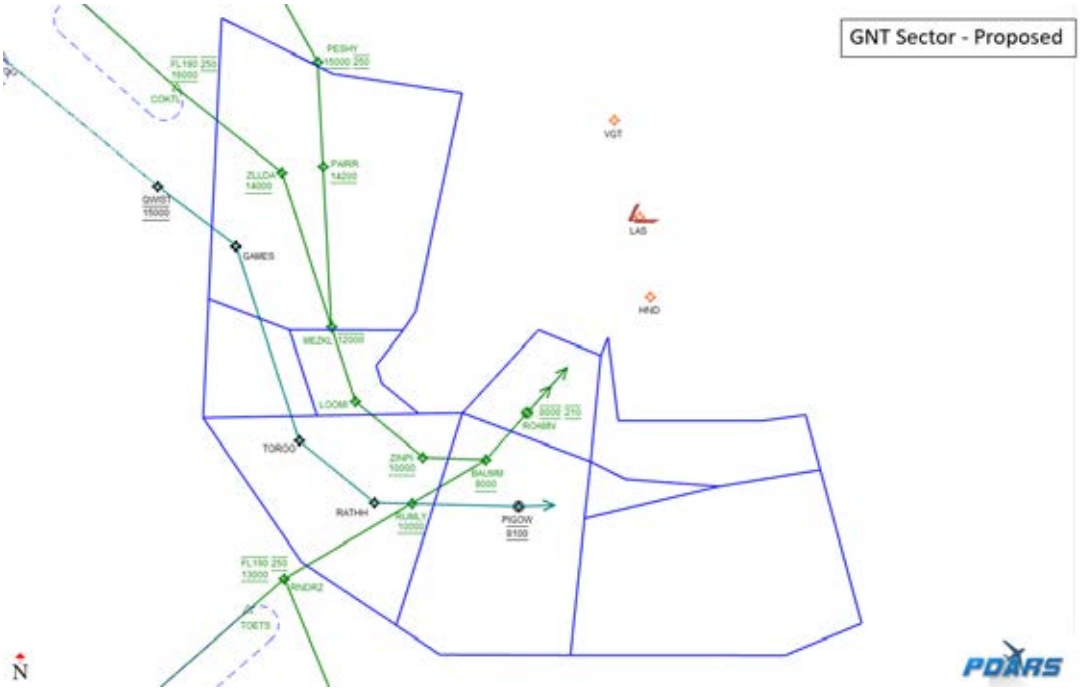


Figure 17: Overlay of Proposed GNT Sector with Proposed RNAV Procedures

L30 KNO Sector

The current KNO Sector is depicted in Figure 18.

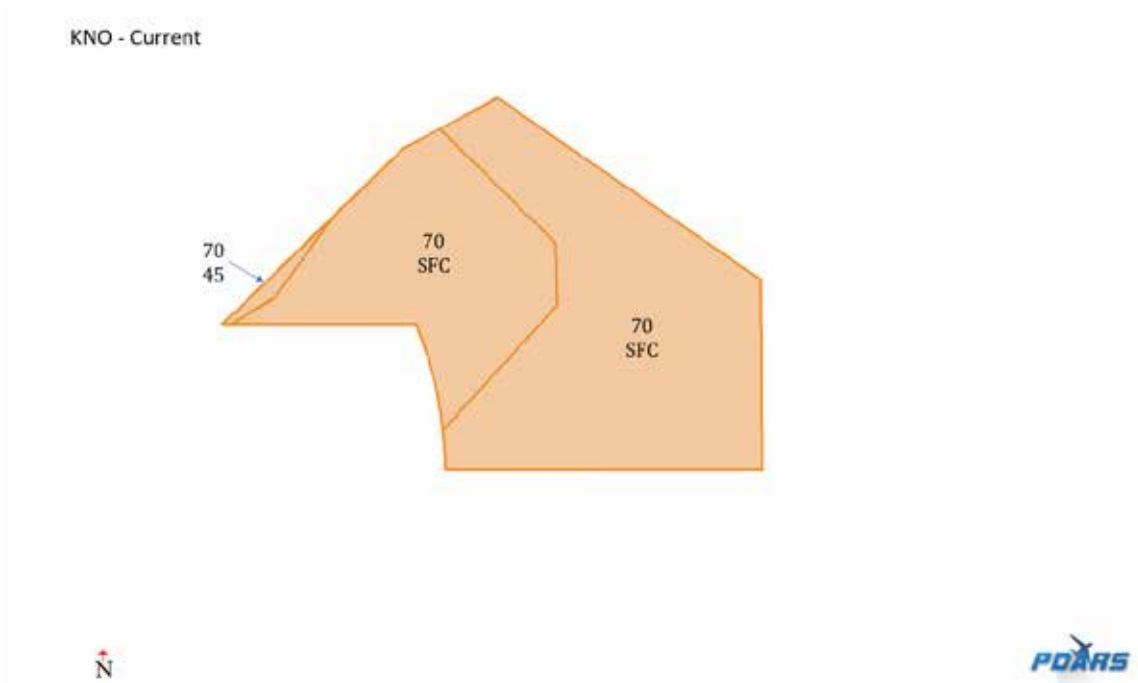


Figure 18: Current KNO Sector

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

The KNO Sector was expanded laterally on the eastern edge of the sector with airspace acquired from ZLA Sectors 07 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between KNO and L30 Sectors FNL, LAK and MED.

The proposed KNO Sector is depicted in Figure 19.
An overlay of the current and proposed KNO Sector is depicted in Figure 20.

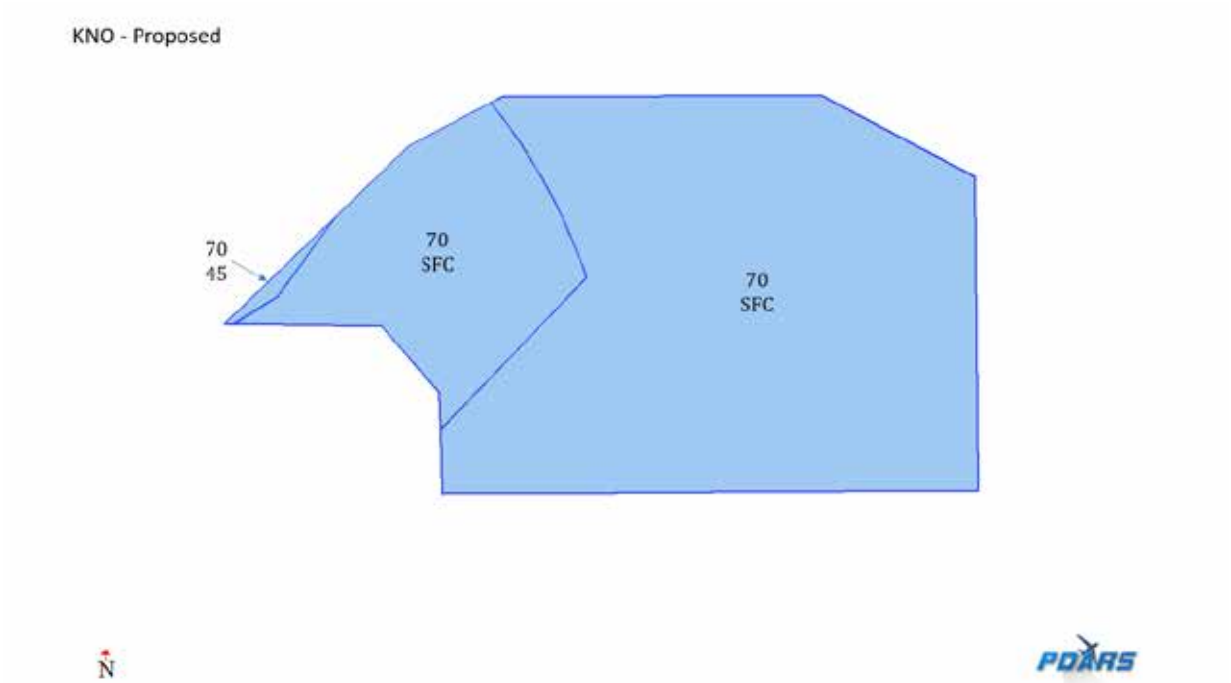


Figure 19: Proposed KNO Sector

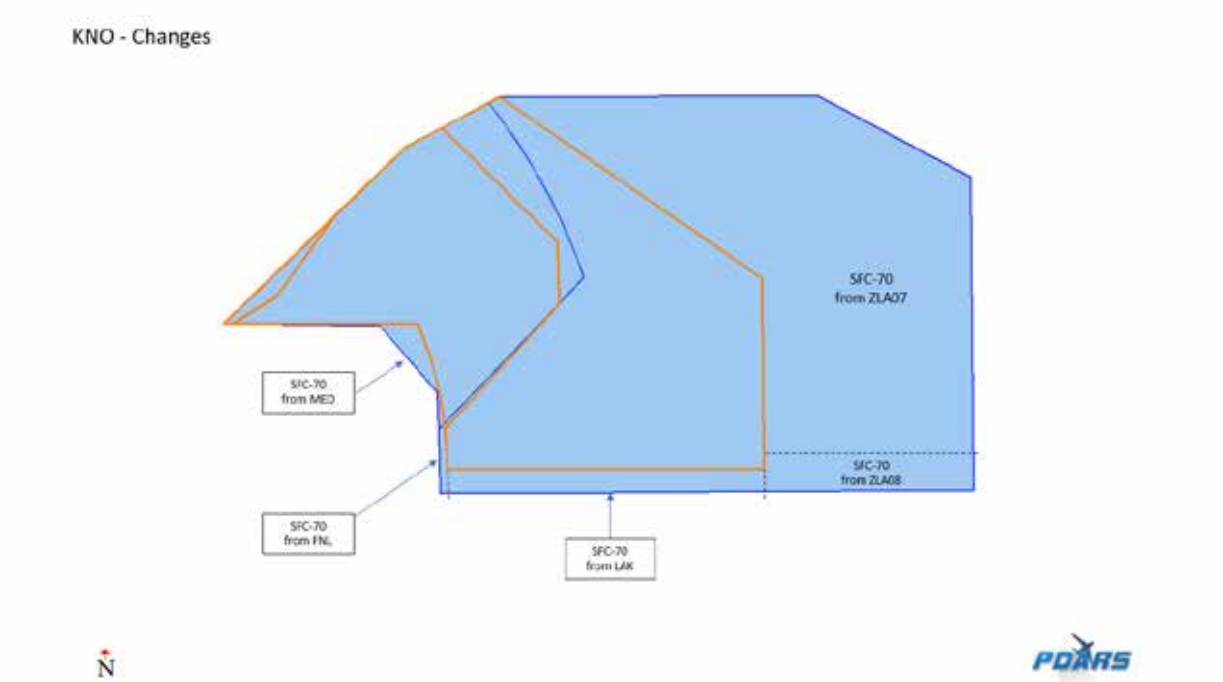


Figure 20: Overlay of Current and Proposed KNO Sector

No new RNAV procedures route through the proposed KNO Sector. These changes will help reduce complexity and accommodate airspace changes for other affected L30 Sectors.

<u>L30 LAK Sector</u>

The current LAK Sector is depicted in Figure 21.

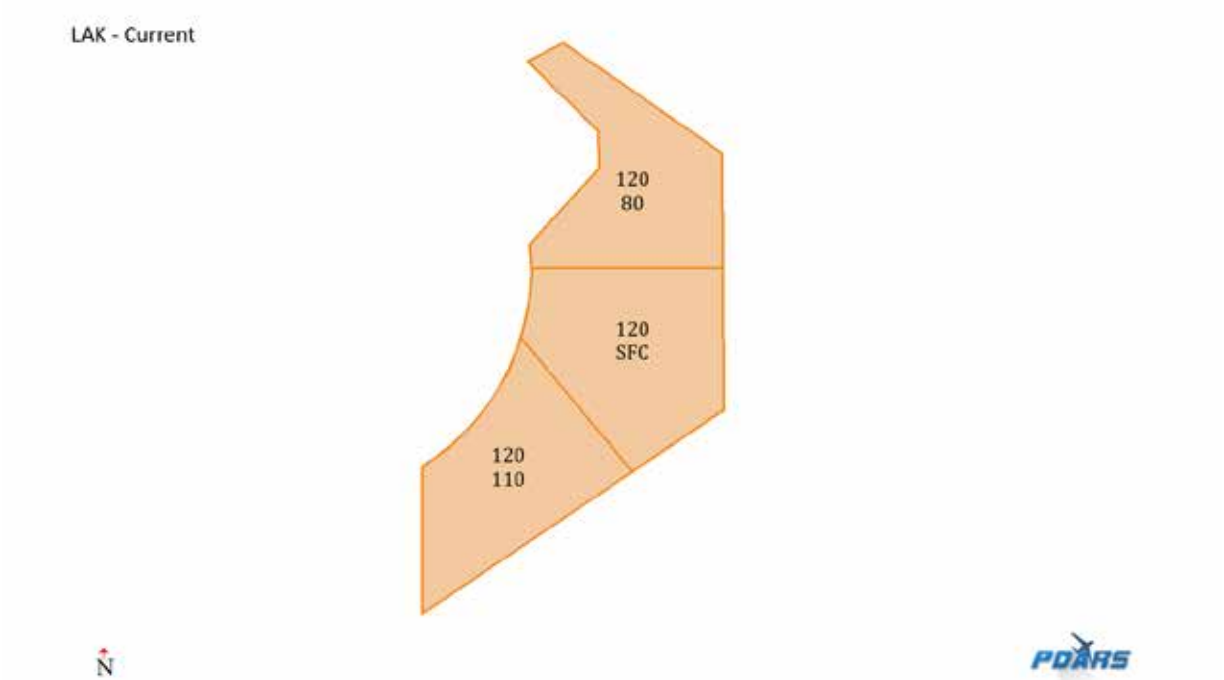


Figure 21: Current LAK Sector

The LAK Sector was expanded laterally on the southeastern, eastern and northeastern edges of the sector with airspace acquired from ZLA Sectors 07 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between KNO and L30 Sectors CYN, FNL, GNT, KNO ad MED.

The proposed LAK Sector is depicted in Figure 22.
An overlay of the current and proposed LAK Sector is depicted in Figure 23.

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

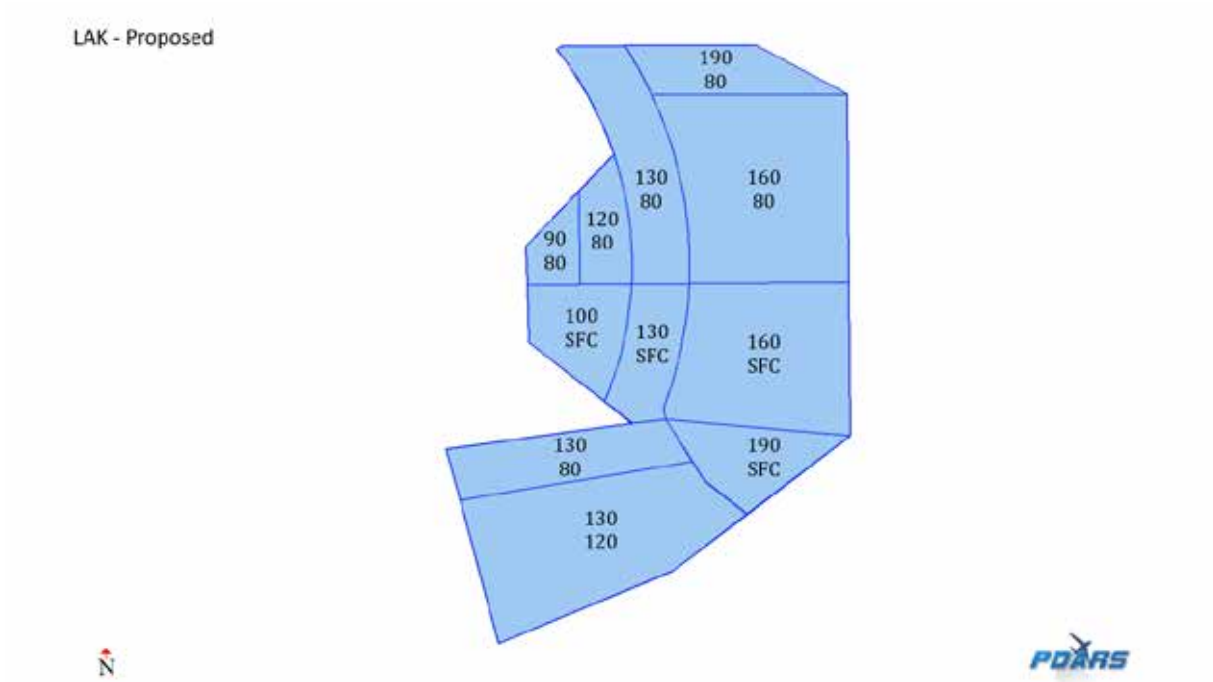


Figure 22: Proposed LAK Sector

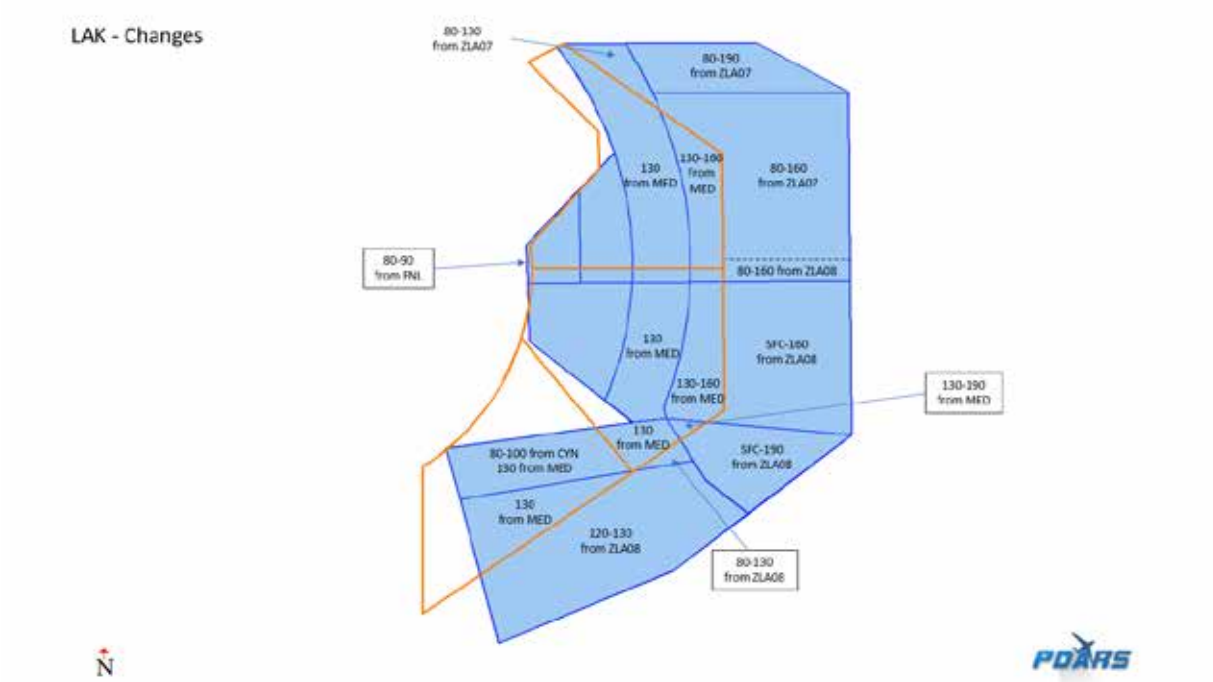


Figure 23: Overlay of Current and Proposed LAK Sector

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND BOEGY STAR
- KLAS CHOWW STAR
- KLAS RKSTR STAR
- KVGT WYLND STAR

An overlay of the proposed LAK Sector with proposed RNAV procedures is depicted in Figure 24.

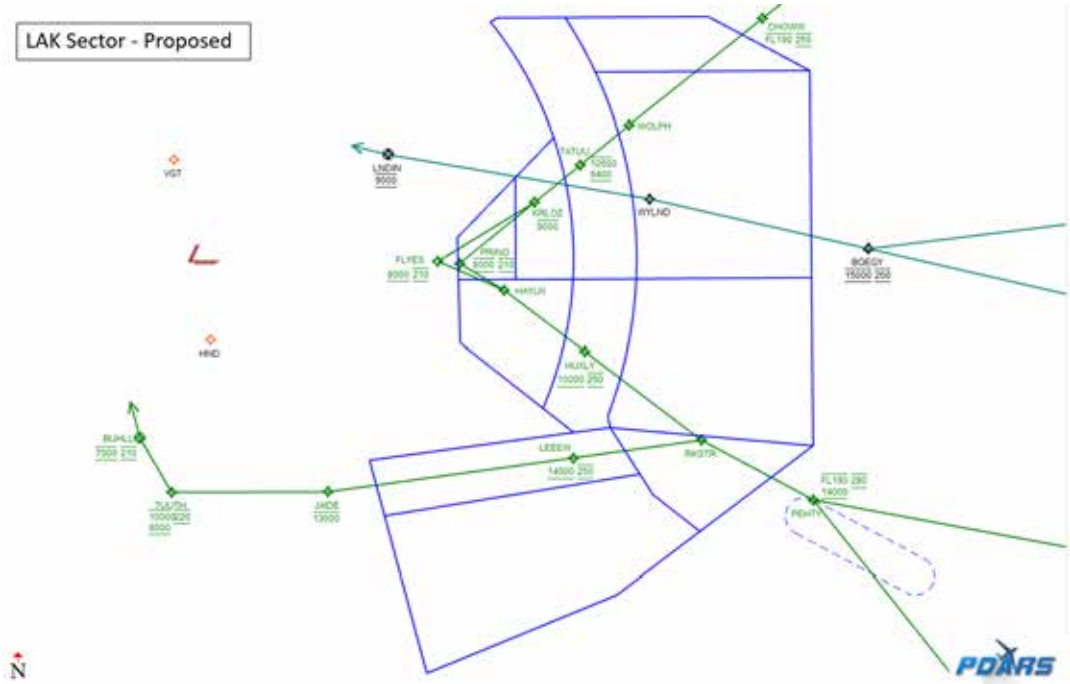


Figure 24: Overlay of Proposed LAK Sector with Proposed RNAV Procedures

L30 MED Sector

The current MED Sector is depicted in Figure 25.

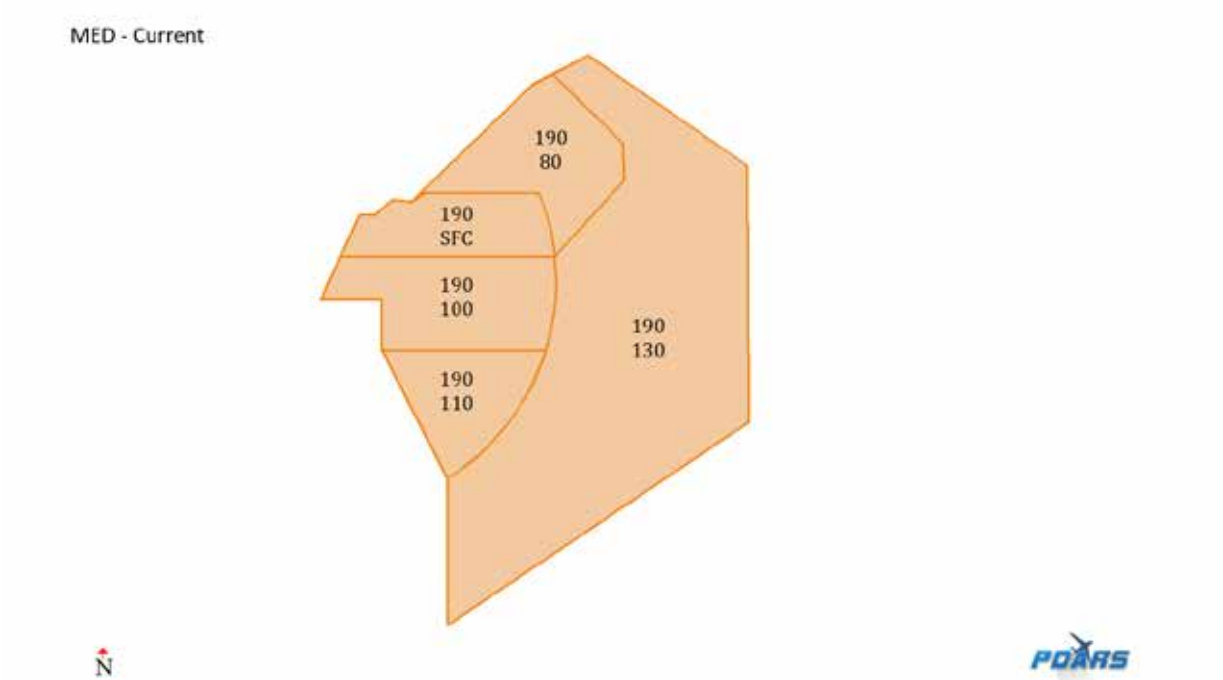


Figure 25: Current MED Sector

The MED Sector was expanded laterally on the eastern and southeastern edges of the sector with airspace acquired from ZLA Sectors 06, 07 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between MED and L30 Sectors DAG, GNT, FNL, KNO and LAK.

The proposed MED Sector is depicted in Figure 26.
An overlay of the current and proposed MED Sector is depicted in Figure 27.

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

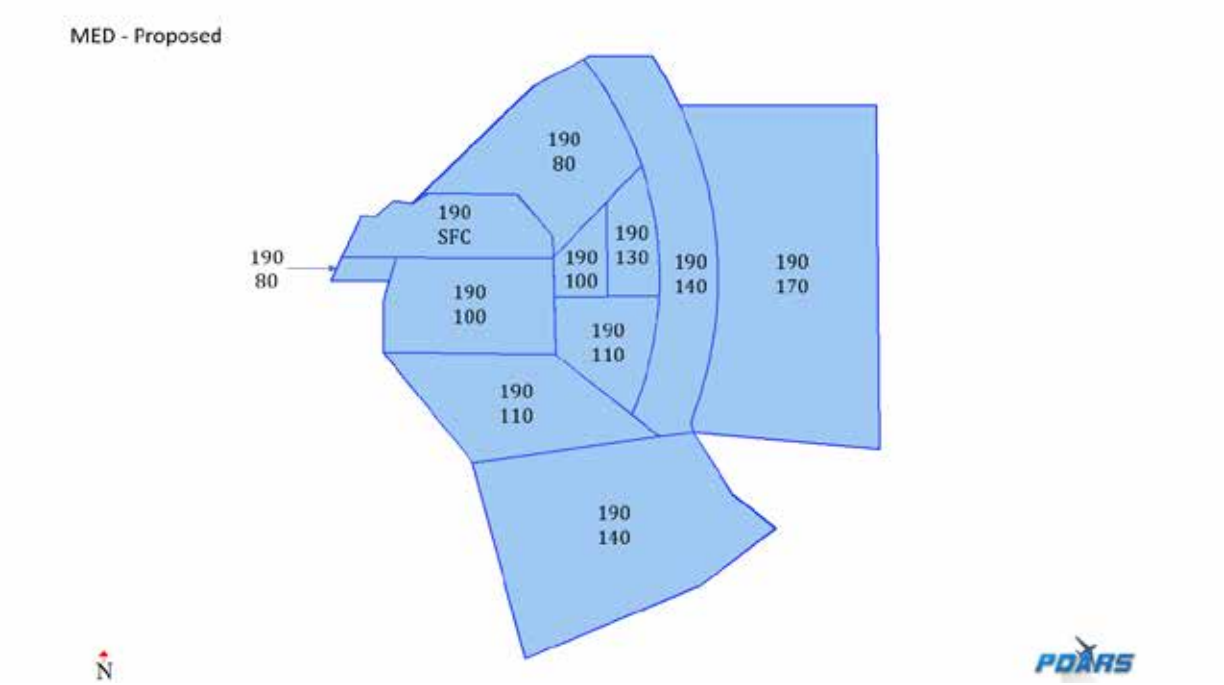


Figure 26: Proposed MED Sector

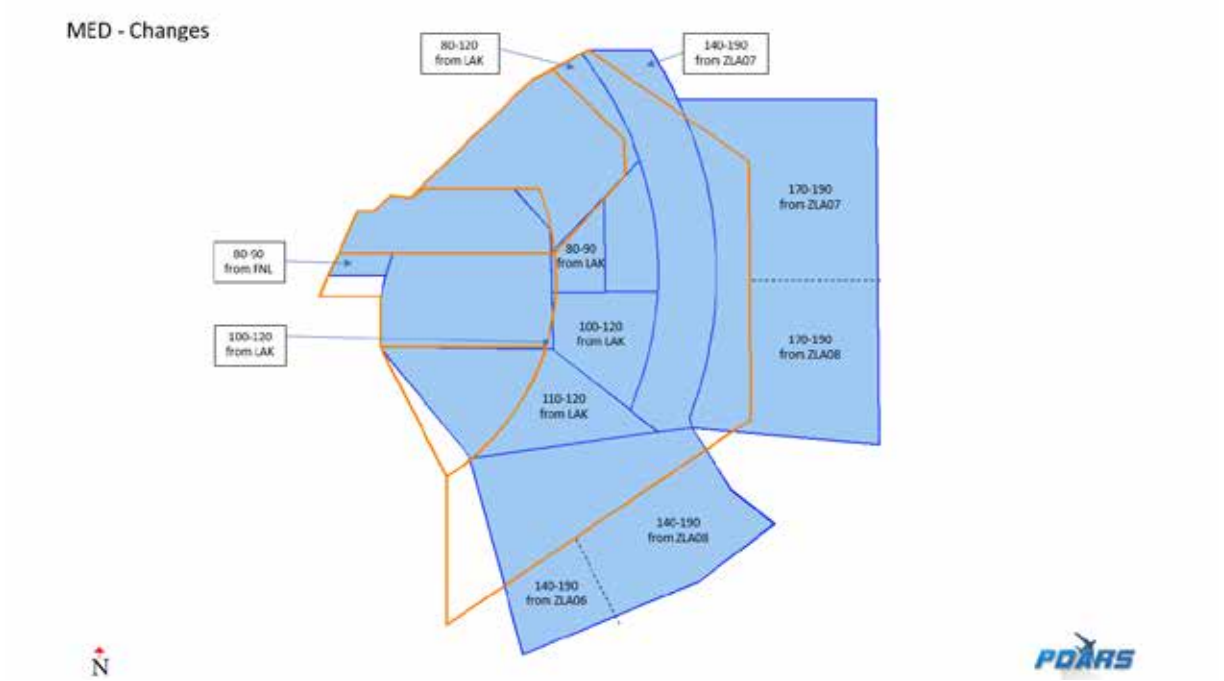


Figure 27: Overlay of Current and Proposed MED Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND BOEGY STAR
- KLAS GIDGT SID
- KLAS NIITZ SID
- KLAS RASLR SID
- KLAS RATPK SID
- KVGT WYLND STAR

An overlay of the proposed MED Sector with proposed RNAV procedures is depicted in Figure 28.

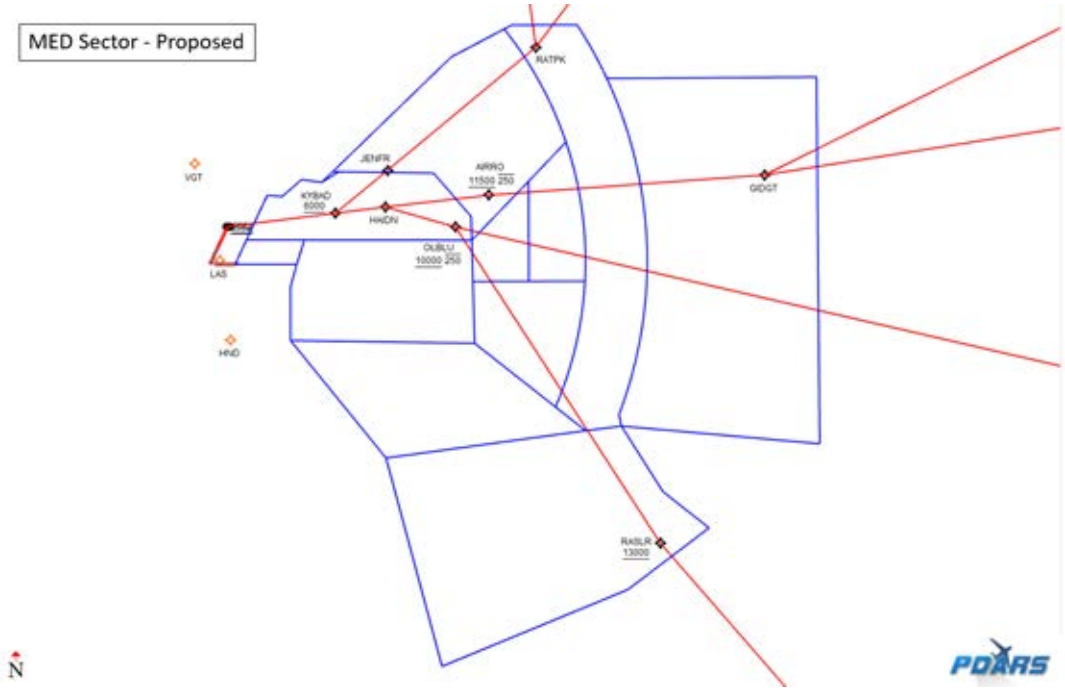


Figure 28: Overlay of Proposed MED Sector with Proposed RNAV Procedures

<u>L30 SAT Sector</u>

The current SAT Sector is depicted in Figure 29.

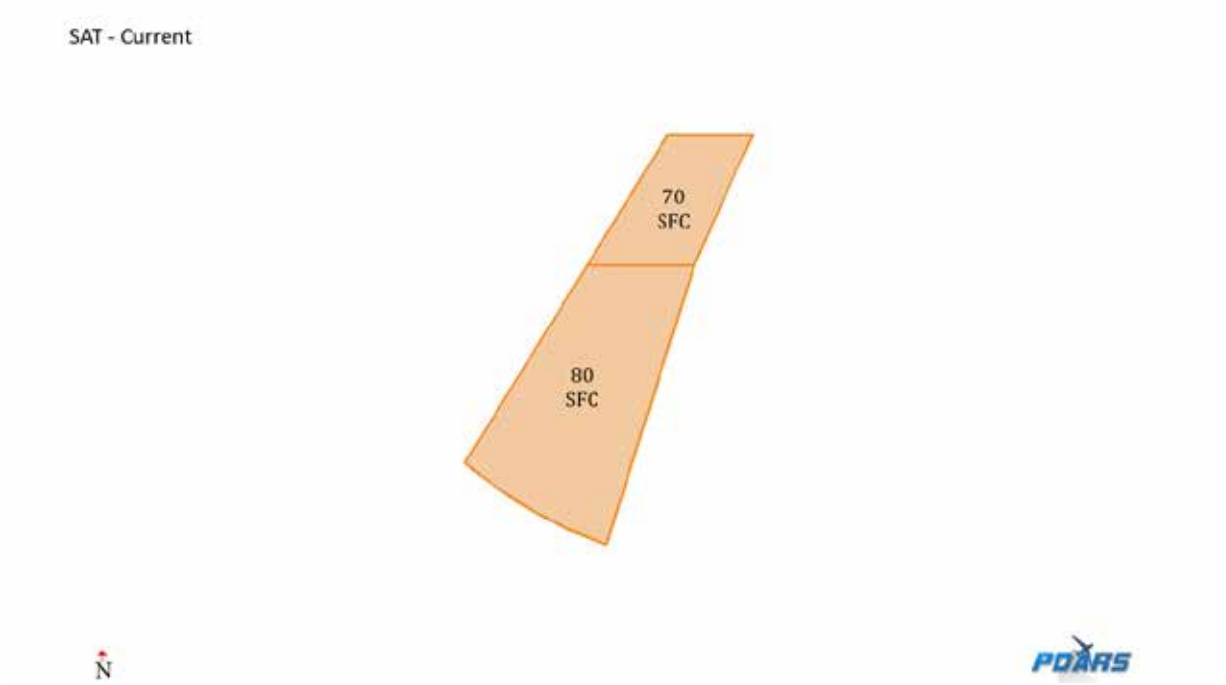


Figure 29: Current SAT Sector

The SAT Sector was changed with airspace transferred between FNL and L30 Sectors CYN, DAG and GNT.

The proposed SAT Sector is depicted in Figure 30.
An overlay of the current and proposed SAT Sector is depicted in Figure 31.

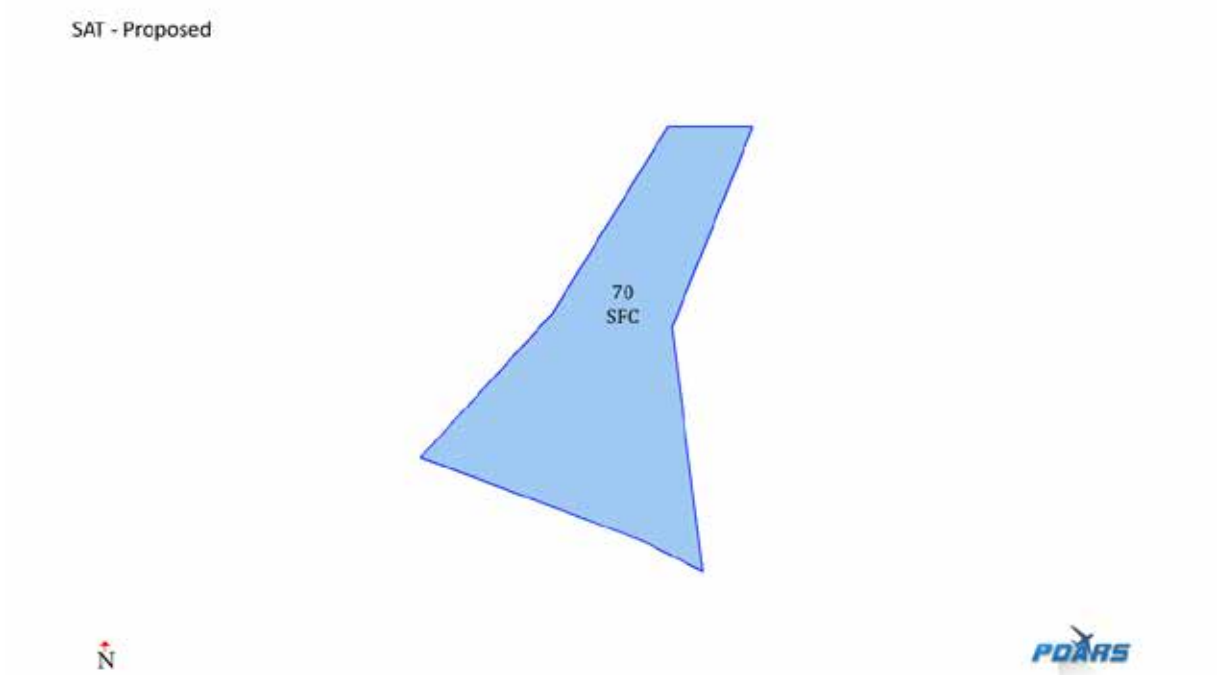


Figure 30: Proposed SAT Sector

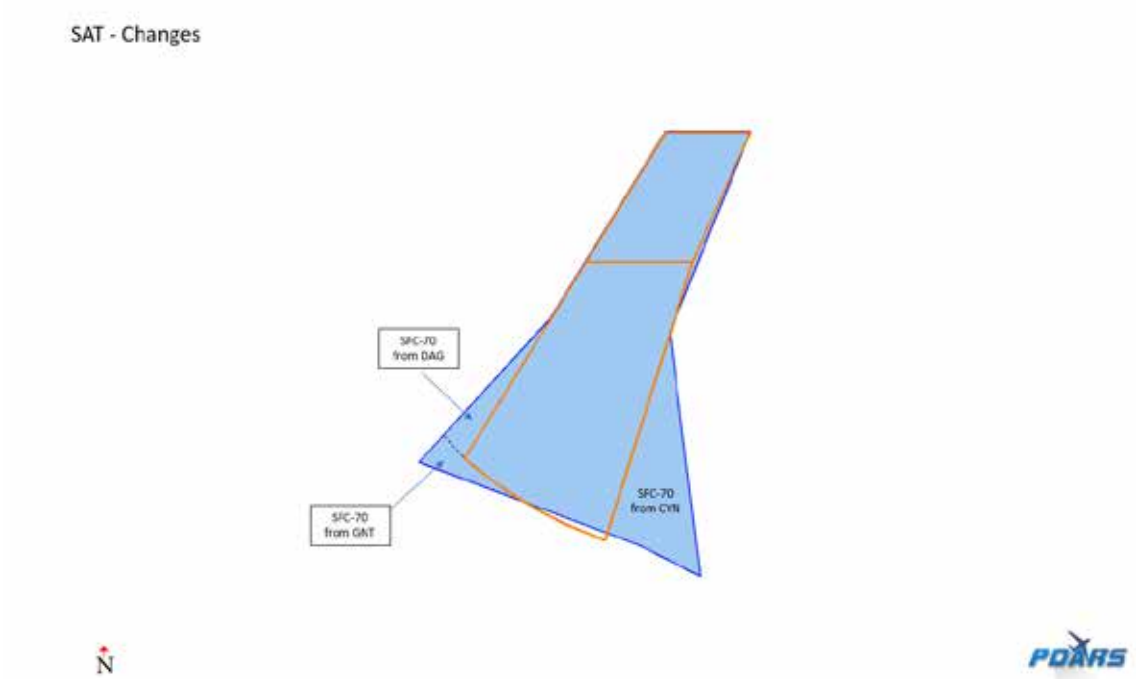


Figure 31: Overlay of Current and Proposed SAT Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KLAS COKTL STAR
- KLAS RKSTR STAR
- KLAS RNDRZ STAR

An overlay of the proposed SAT Sector with proposed RNAV procedures is depicted in Figure 32.

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

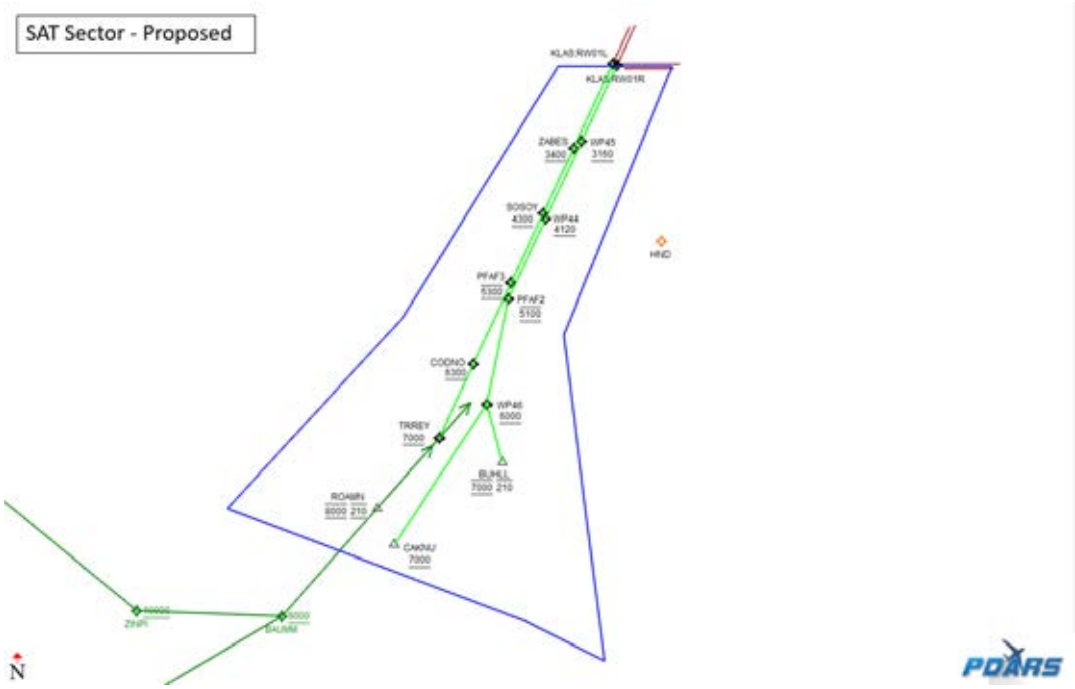


Figure 32: Overlay of Proposed SAT Sector with Proposed RNAV Procedures

Additional Design Considerations

- Spectrum analysis will be required for the proposed airspace changes associated with the proposed RNAV procedures.

The L30 airspace changes affect the following facility area(s) as indicated:

- Nellis Air Traffic Control Facility (NATCF)
- Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors:
  - CYN
  - DAG
  - FNL
  - GNT
  - KNO
  - LAK
  - MED
  - SAT
- Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors:
  - 06
  - 0
  - 08
  - 16

Implementation Dependencies

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND and KVGT.

Document changes/modifications include:

- ZLA Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- ZLA and L30 sector boundary maps
- ZLA/L30 Letter of Agreement (LOA)
- L30/LAS LOA
- LAS/L30/HND LOA
- ZLA Standard Operating Procedures (SOP)
- L30 SOP
- LAS SOP
- ERAM and STARS Automation Changes (ADRS, ADAR, Waypoint Pairs, etc.)
- NAS Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Standard Operating Procedures
- Airspace Illustrations
- Spectrum package
- Automation package
- Table of frequencies for all affected sectors/positions
- Spectrum analysis results
- HITL simulation results

Las Vegas OAPM Design Package

L30 Configuration Three Airspace Changes

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	P/Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23APR19 Date

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

The Las Vegas Metroplex Project was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation, providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures in to and out of area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows, allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures.

Extensive changes were made to designated airspace at air traffic control sectors in the Las Vegas Terminal Radar Control (L30 TRACON) and Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

Name of Change and Airport/s	Change Classification
Las Vegas Terminal Radar Control Facility (TRACON/L30) Airspace Changes	Delegated Airspace
OAPM Study Team Reference(s)	**Current Phase of Design**
4.2 L30 Airspace Expansion	☐ Preliminary Operational Design (PD) ☒ Proposed Final Design (PFD)
Package Date	**Implementation Date**
5/31/2019	5/21/2020
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
McCarran International Airport (KLAS), Henderson Executive Airport (KHND), North Las Vegas Airport (KVGT), Nellis Air Force Base (KLSV) Nellis Air Traffic Control Facility (NATCF) Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: CYN, DAG, FNL, GNT, KNO, LAK, MED, SAT Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 06, 07, 08, 16	KLAS JOHKR Standard Instrument Departure (SID) KLAS RADYR SID KLAS RASLR SID KLAS NIITZ SID KLAS GIDGT SID KLAS RATPK SID KLAS LOHLA SID KLAS COKTL Standard Terminal Arrival Route (STAR) KLAS RNDRZ STAR KLAS RKSTR STAR KLAS CHOWW STAR KLAS JAYSN STAR KHND OYODA SID KHND SCAMR SID KHND GAMES STAR KHND NTNDO STAR KHND BOEGY STAR KVGT FLCHR STAR KVGT WYLND STAR
Associated Data Files	
Standard Operating Procedures Airspace Illustrations Spectrum package Automation package Table of frequencies for all affected sectors/positions Spectrum analysis results HITL simulation results	

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

Purpose

The Las Vegas Metroplex Project was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation, providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures in to and out of area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows, allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures.

Extensive changes are required for designated airspace at air traffic control sectors in the Las Vegas Terminal Radar Control (L30 TRACON) and Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

Study Team Issues and Solutions

Issues

L30's current lateral airspace boundary is insufficient to accommodate runway transitions for LAS arrivals for all configurations. During periods of moderate and heavy traffic, sequencing to Runways 25L/R localizers extends back to ZLA airspace. Arrivals from the southwest, landing Runway 01L/R have difficulty meeting speed and altitude assignments. The current ZLA/L30 Transfer of Control Points (TCP) do not allow for the timely issuance of runway assignments.

The HND NOOTN STAR entry point into L30's airspace requires excessive coordination between ZLA Sectors 7 and 8.

Solutions

Expanding L30's current lateral boundary allowed the Las Vegas MST to develop Optimized Profile Descent (OPD) STARs with runway transitions for all configurations. The Las Vegas MST recommended airspace expansion would allow sequencing to Runways 25L/R to be contained within L30 airspace. Optimized procedures facilitate compliance with speed and altitude assignments thereby reducing transmissions and pilot/controller task complexity.

The Las Vegas MST recommends ZLA issues the LAS landing direction (one option per configuration per gate) and L30 issues the runway transition.

The proposed airspace modification reduces coordination and complexity, allows for timely runway assignments, and provides additional airspace for sequencing. The Las Vegas MST considered surveillance coverage when designing L30 airspace expansion. D&I should further analyze the airspace expansion to ensure adequate surveillance coverage. Figure 4-3 depicts the Las Vegas MST conceptual L30 airspace expansion.

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

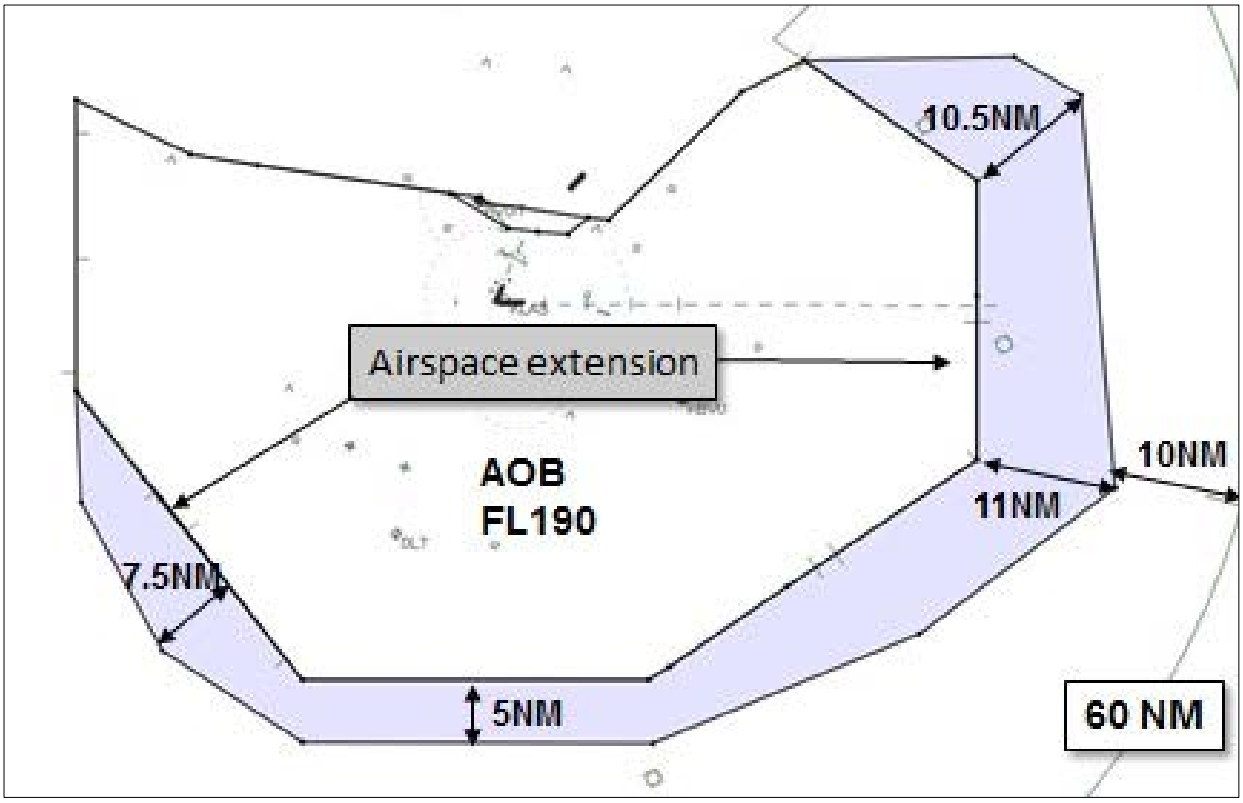


Figure 1: MST Proposed L30 Airspace

Proposed Final Design

The Design and Implementation (D&I) Team undertook an extensive review of airspace at L30 and ZLA to determine the suitability of current airspace and changes that would be necessary to accommodate new designs. The L30 delegated airspace was expanded laterally with airspace transferred from ZLA to provide flexibility and increased options for controllers as they sequence arrivals and departures to Las Vegas Valley airports. This expanded L30 airspace will also allow the issuance of alternate runway assignment for arrivals if required.

Current L30 Sector internal airspace delegation is dependent on which configuration is being utilized at KLAS. The Proposed Final Design will also provide changing lateral and vertical boundaries tailored to individual configurations.

This Proposed Final Design Package presents changes for KLAS Configuration Two, which serves arrivals and departures on KLAS Runways 01 L/R; and 08 L/R.

The Proposed Final Design of L30 airspace for KLAS Configuration Two is as follows:

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

L30 CYN Sector

In current state, there is no CYN Sector in KLAS Configuration Two. A new CYN Sector was developed with airspace transferred from L30 Sectors DAG, FNL and LAK and from ZLA Sectors 06 and 08. The transfer of ZLA airspace will expand the entire L30 airspace responsibility to the south.

The proposed CYN Sector, along with sectors contributing airspace is depicted in Figure 2.

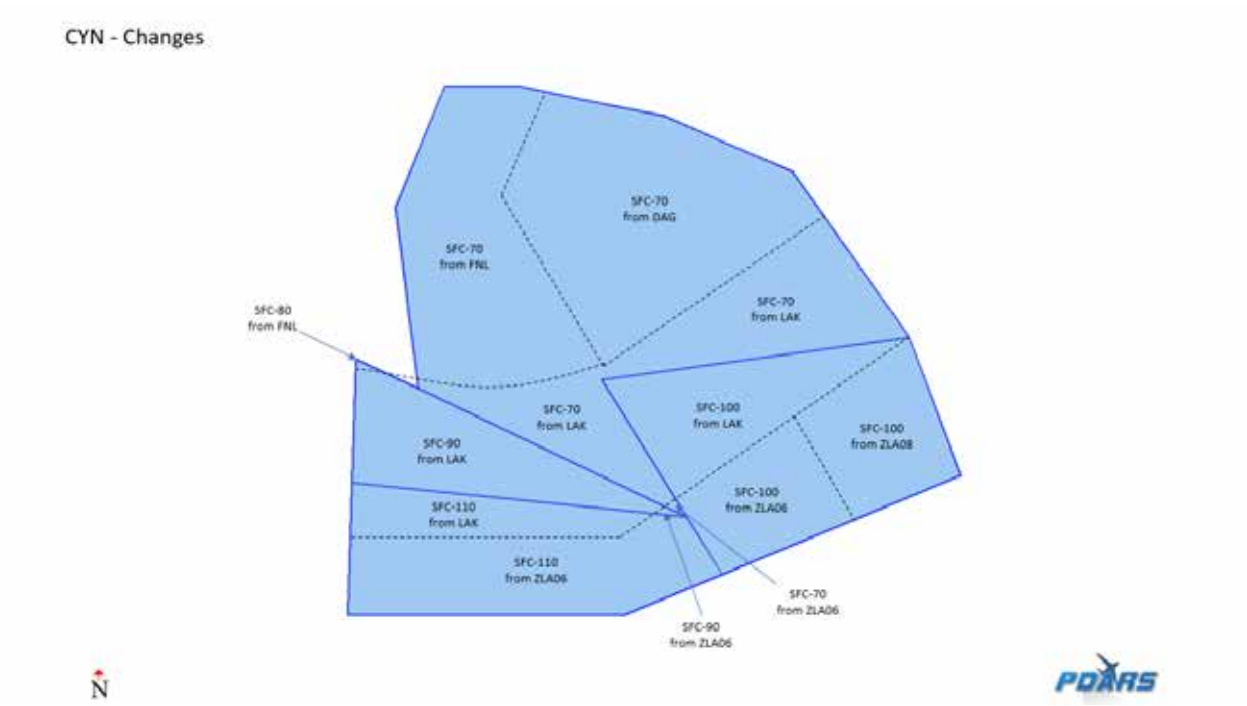


Figure 2: Proposed CYN Sector

The creation of the CYN Sector in Configuration Two will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND BOEGY STAR
- KHND GAMES STAR
- KHND NTNDO STAR
- KHND OYODA SID
- KHND SCAMR SID

An overlay of the proposed CYN Sector with proposed RNAV procedures is depicted in Figure 3.

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

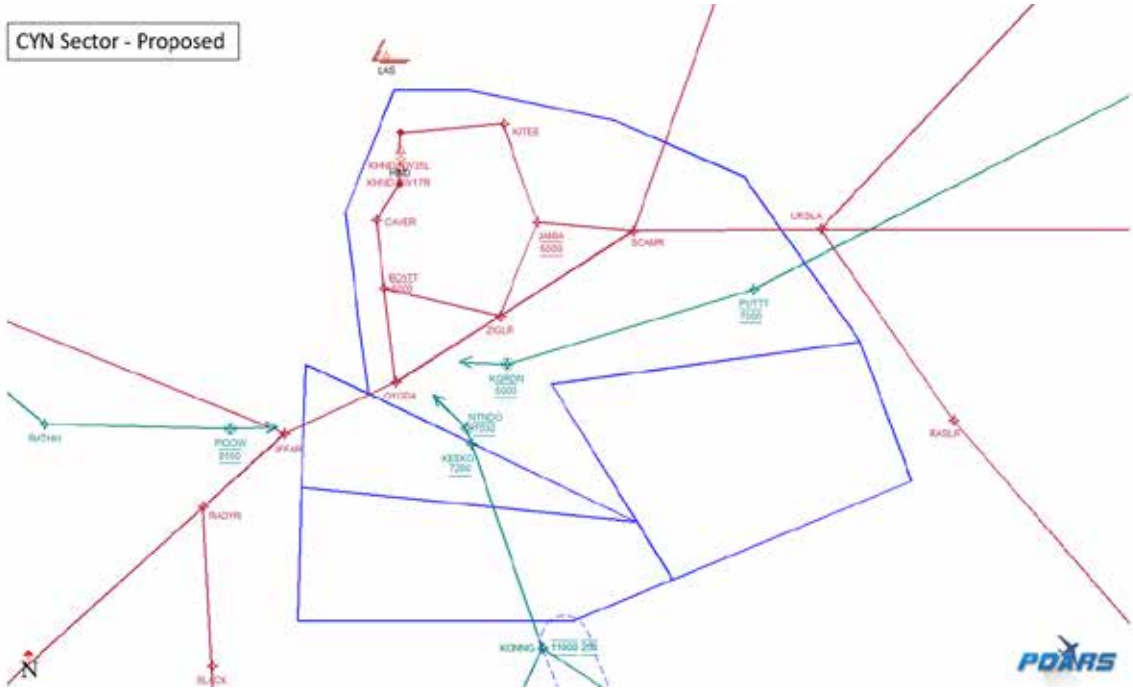


Figure 3: Overlay off Proposed CYN Sector with Proposed RNAV Procedures

L30 DAG Sector

The current DAG Sector is depicted in Figure 4.

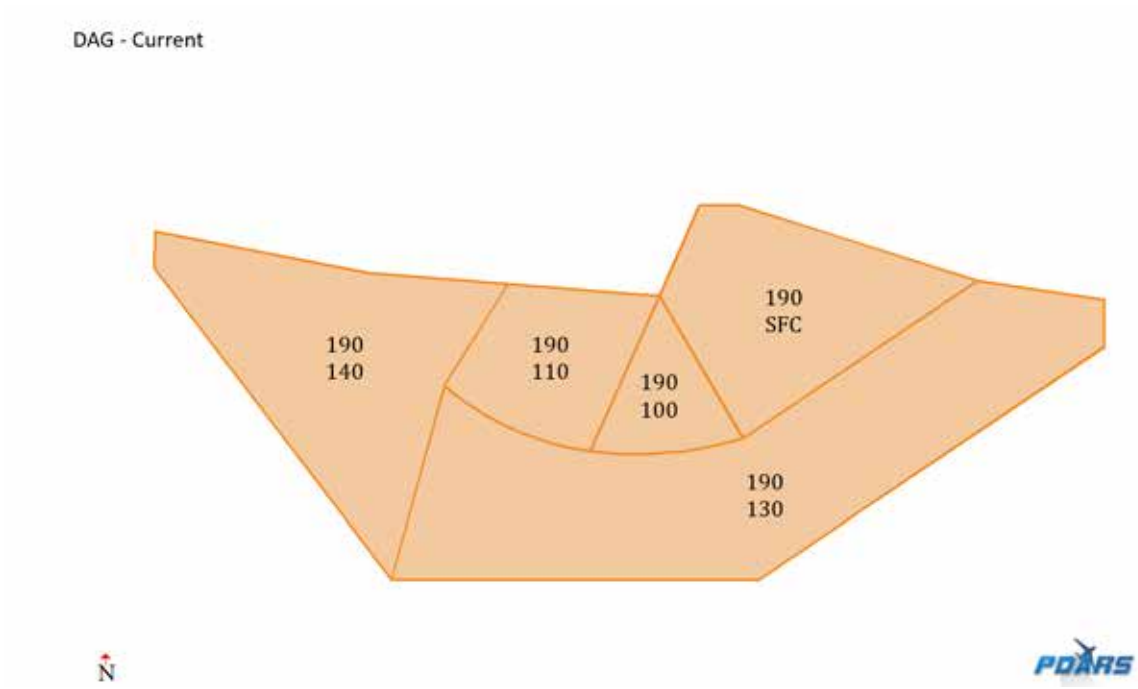


Figure 4: Current DAG Sector

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

The DAG Sector was expanded laterally on the southern and western edges of the sector with airspace acquired from ZLA Sectors 06 and 16. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between DAG and L30 Sectors CYN, GNT, LAK and MED.

The proposed DAG Sector is depicted in Figure 5.
An overlay of the current and proposed DAG Sector is depicted in Figure 6.

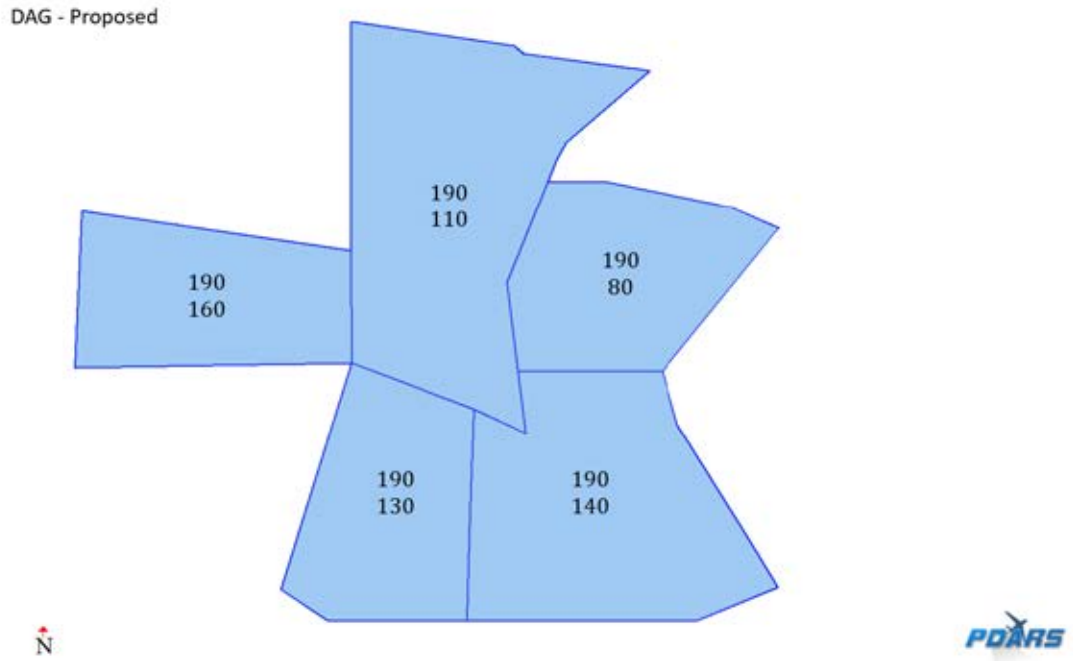


Figure 5: Proposed DAG Sector

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

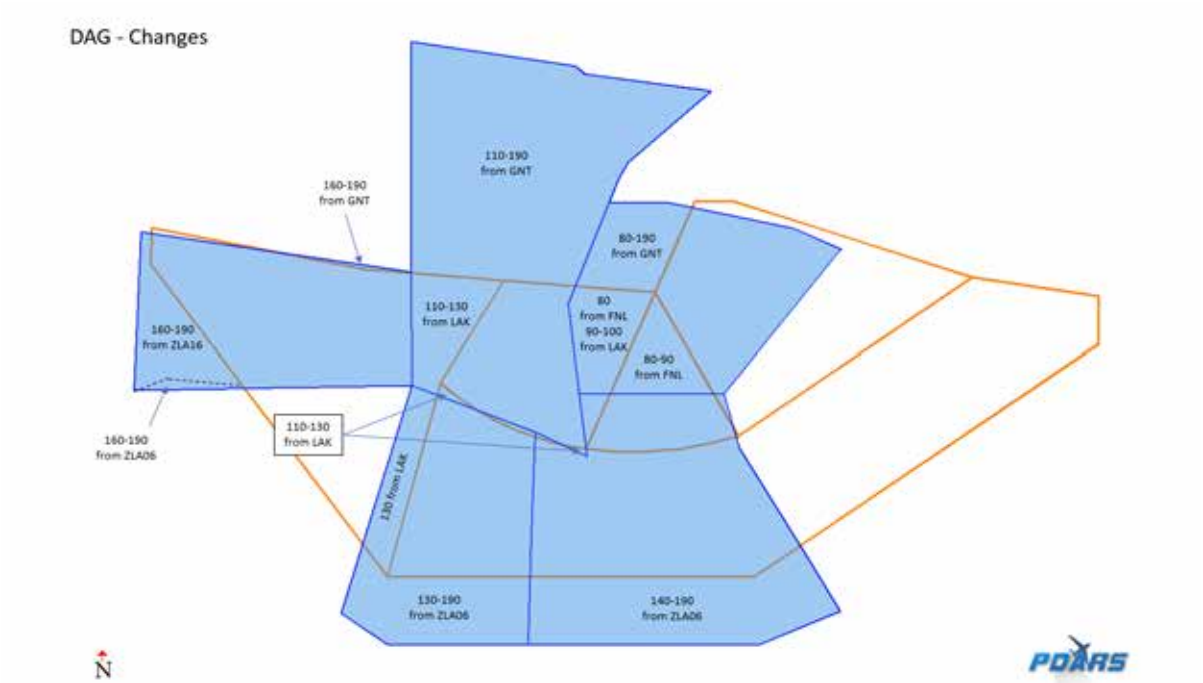


Figure 6: Overlay of Current and Proposed DAG Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND OYODA SID
- KHND SCAMR SID
- KLAS JOHKR SID
- KLAS LOHLA SID
- KLAS RADYR SID
- KLAS RATPK SID

An overlay of the proposed DAG Sector with proposed RNAV procedures is depicted in Figure 7.

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

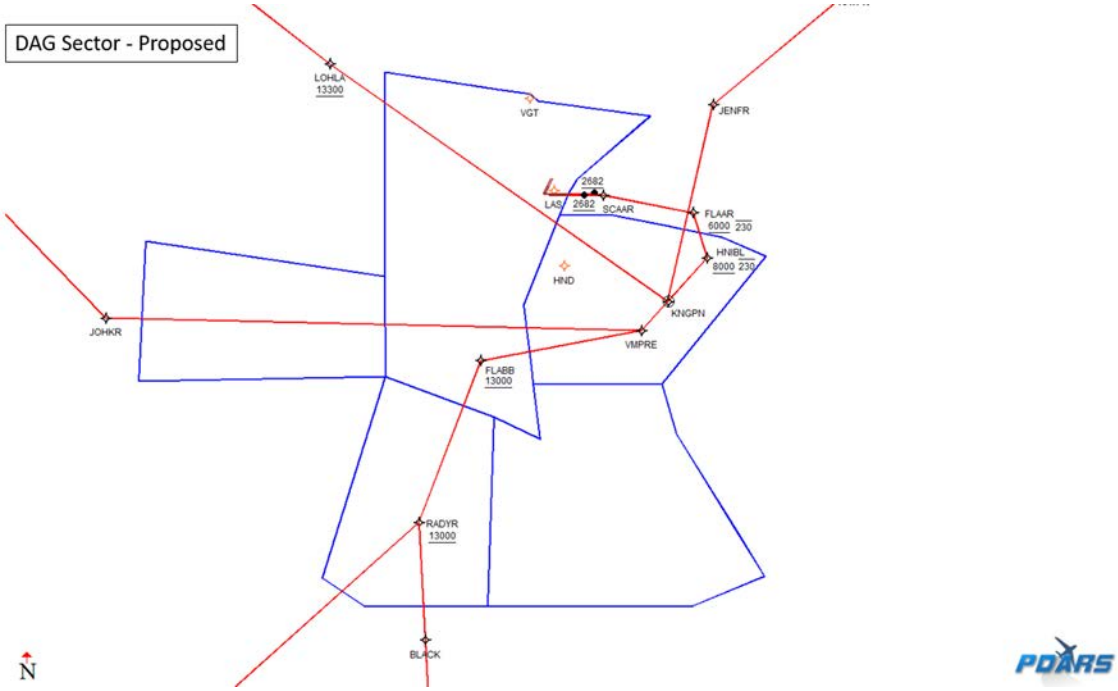


Figure 7: Overlay of Proposed DAG Sector with Proposed RNAV Procedures

L30 FNL Sector

The current FNL Sector is depicted in Figure 8.

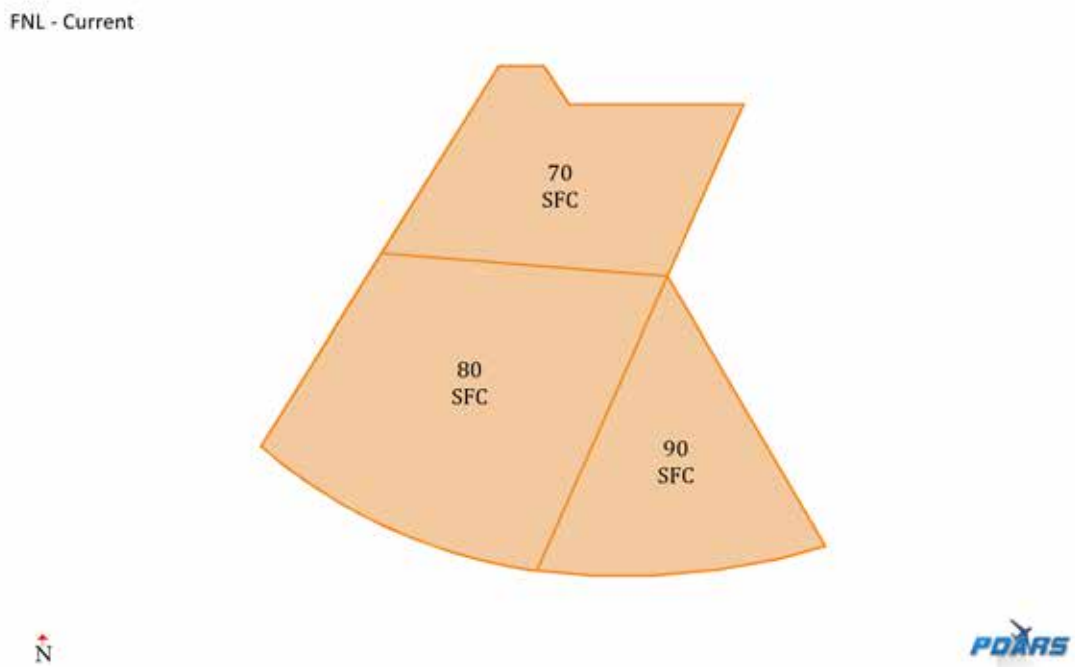


Figure 8: Current FNL Sector

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

The FNL Sector was changed with airspace transferred between FNL and L30 Sectors CYN, GNT, LAK, MED and SAT.

The proposed FNL Sector is depicted in Figure 9.
An overlay of the current and proposed FNL Sector is depicted in Figure 10.

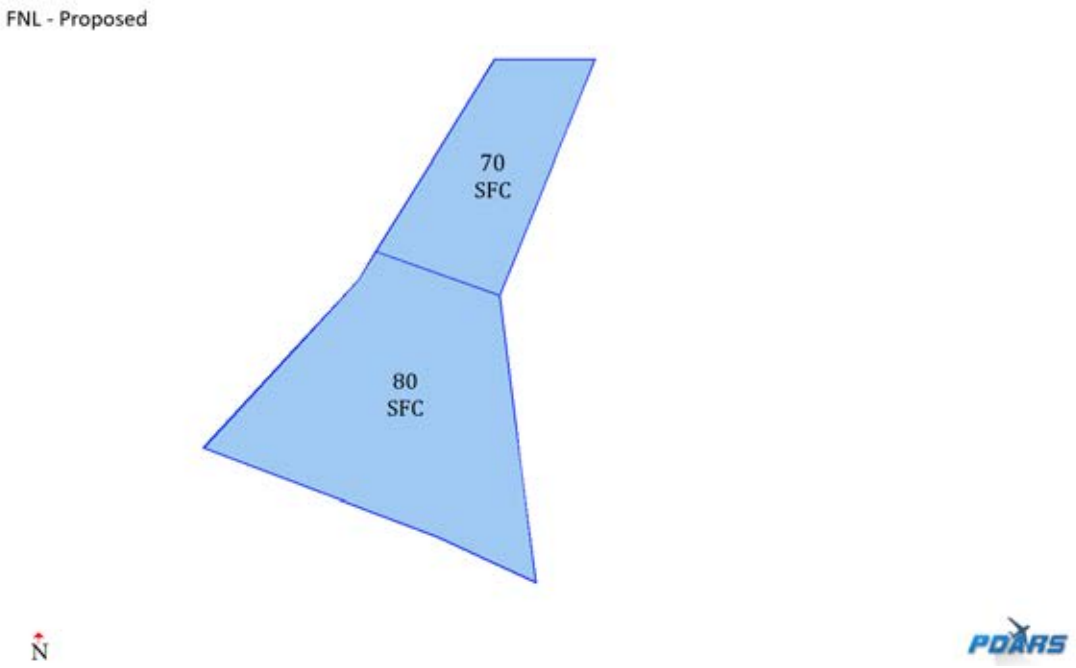


Figure 9: Proposed FNL Sector

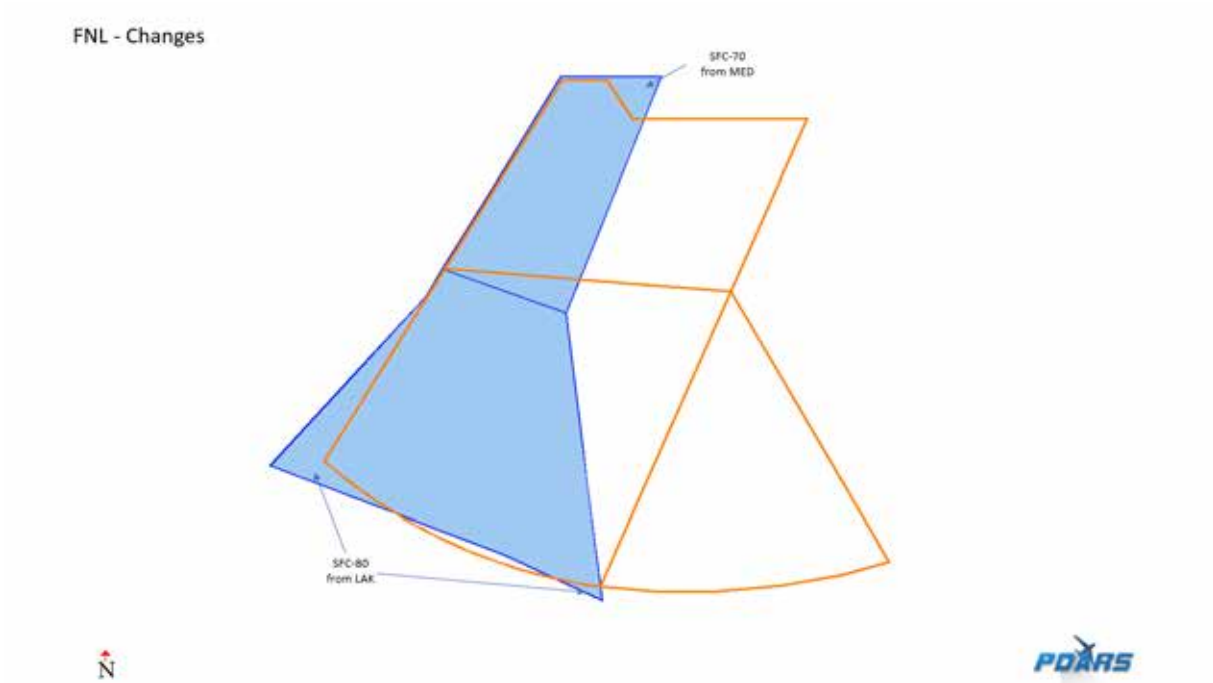


Figure 10: Overlay of Current and Proposed FNL Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KLAS CHOWW STAR
- KLAS COKTL STAR
- KLAS JAYSN STAR
- KLAS RKSTR STAR
- KLAS RNDRZ STAR

An overlay of the proposed FNL Sector with proposed RNAV procedures is depicted in Figure 11.

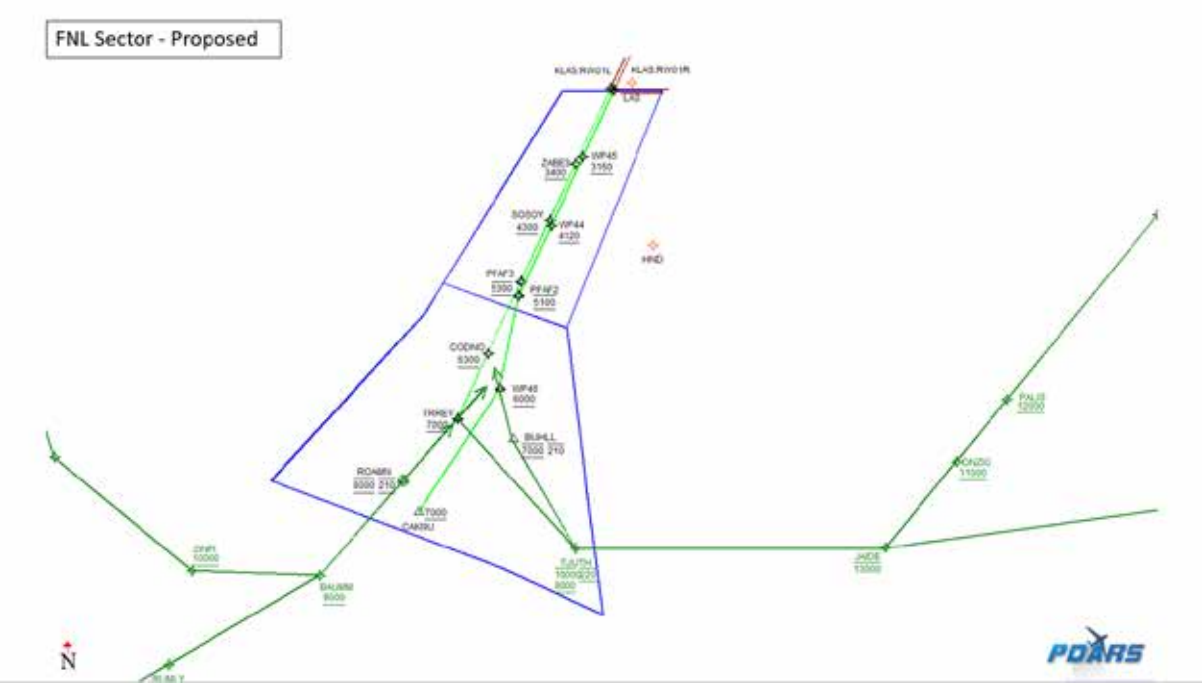


Figure 11: Overlay of Proposed FNL Sector with Proposed RNAV Procedures

L30 GNT Sector

The current GNT Sector is depicted in Figure 12.

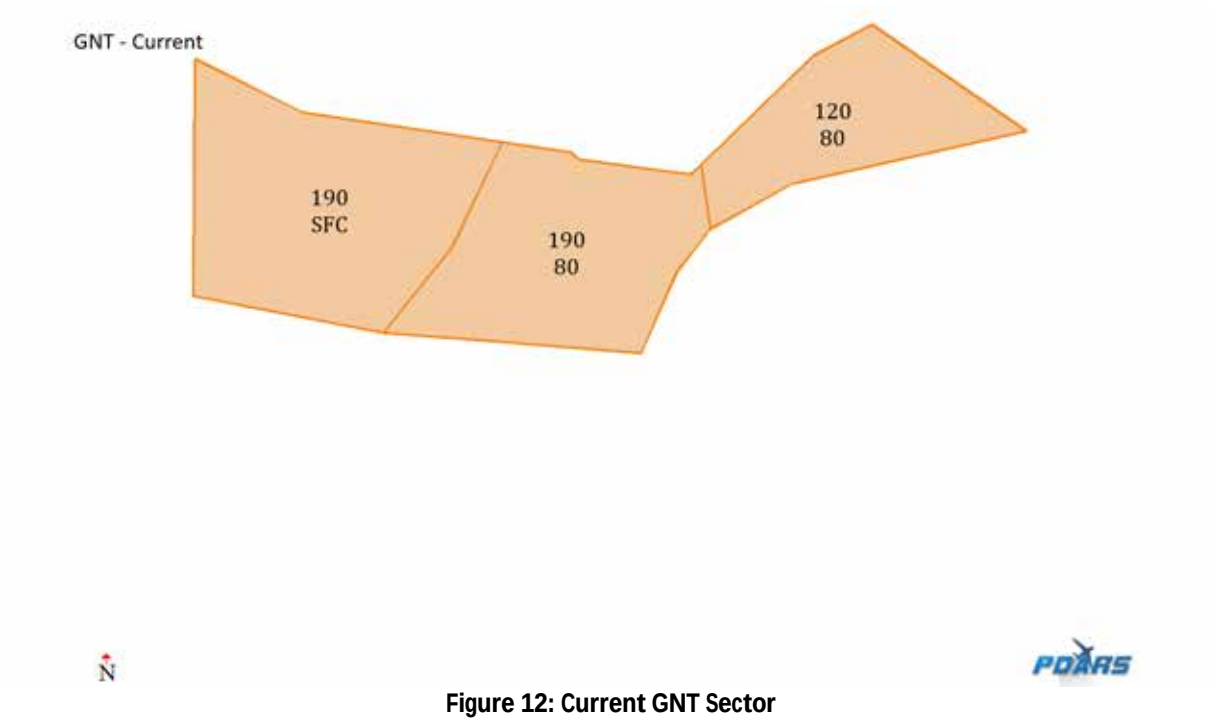


Figure 12: Current GNT Sector

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

The GNT Sector was expanded laterally on the southern, southwestern and western edges of the sector with airspace acquired from ZLA Sectors 06 and 16. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between GNT and L30 Sectors DAG, GNT, FNL, LAK, MED and SAT.

The proposed GNT Sector is depicted in Figure 13.
An overlay of the current and proposed GNT Sector is depicted in Figure 14.

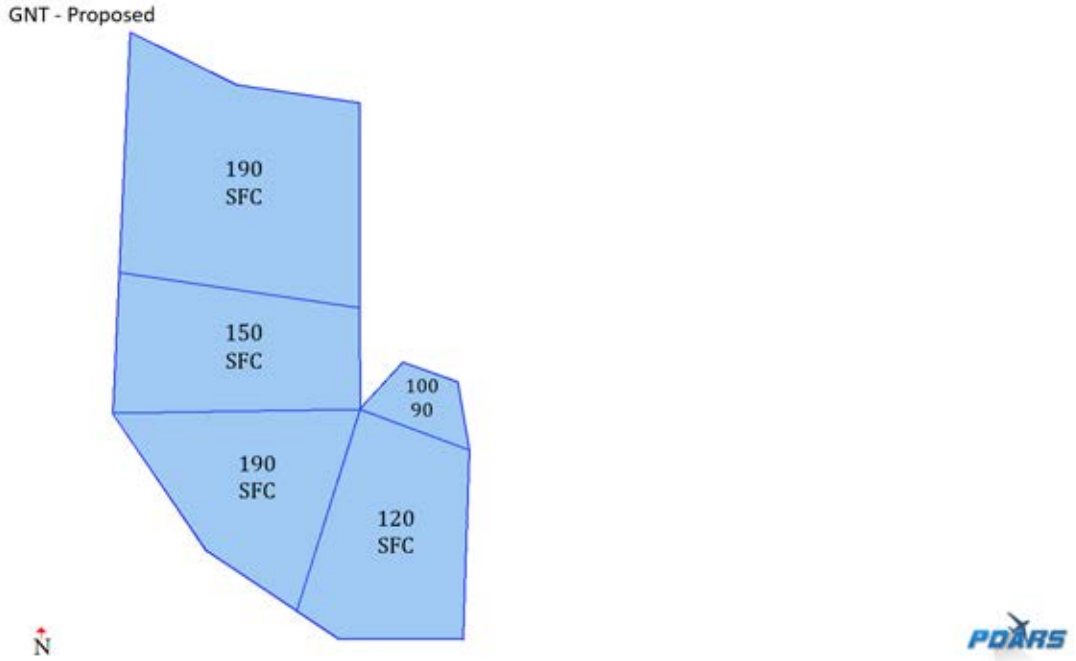


Figure 13: Proposed GNT Sector

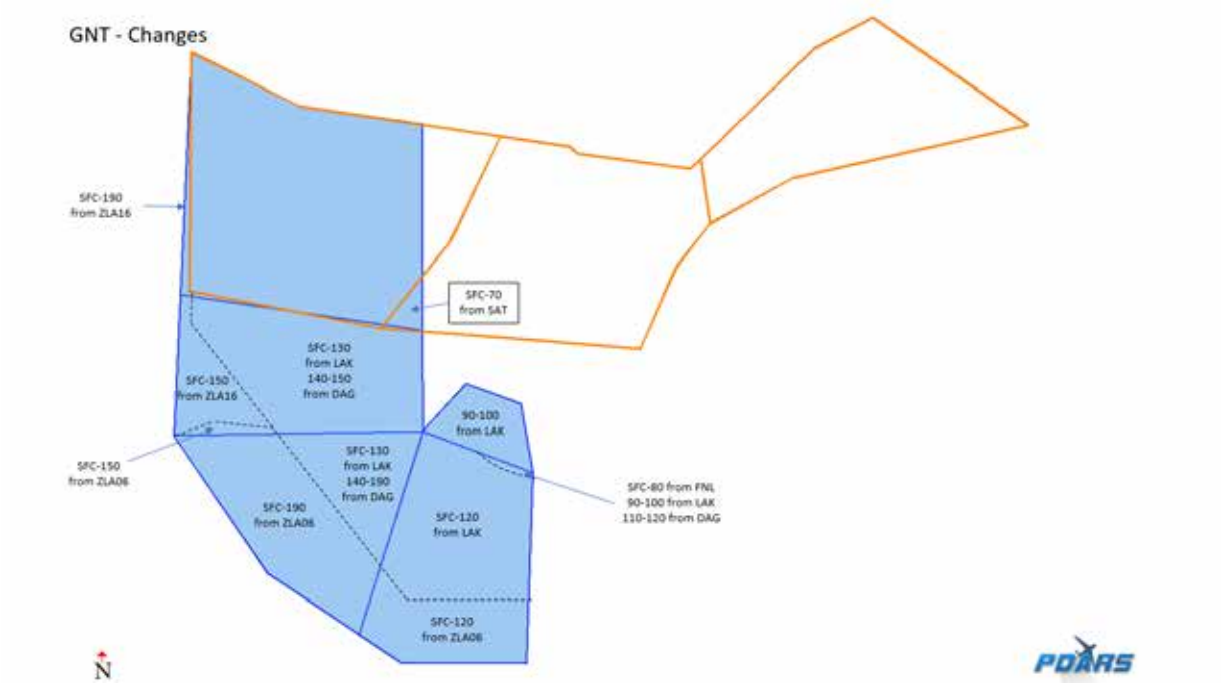


Figure 14: Overlay of Current and Proposed GNT Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND GAMES STAR
- KLAS COKTL STAR
- KLAS JAYSN STAR
- KLAS RNDRZ STAR

An overlay of the proposed GNT Sector with proposed RNAV procedures is depicted in Figure 15.

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

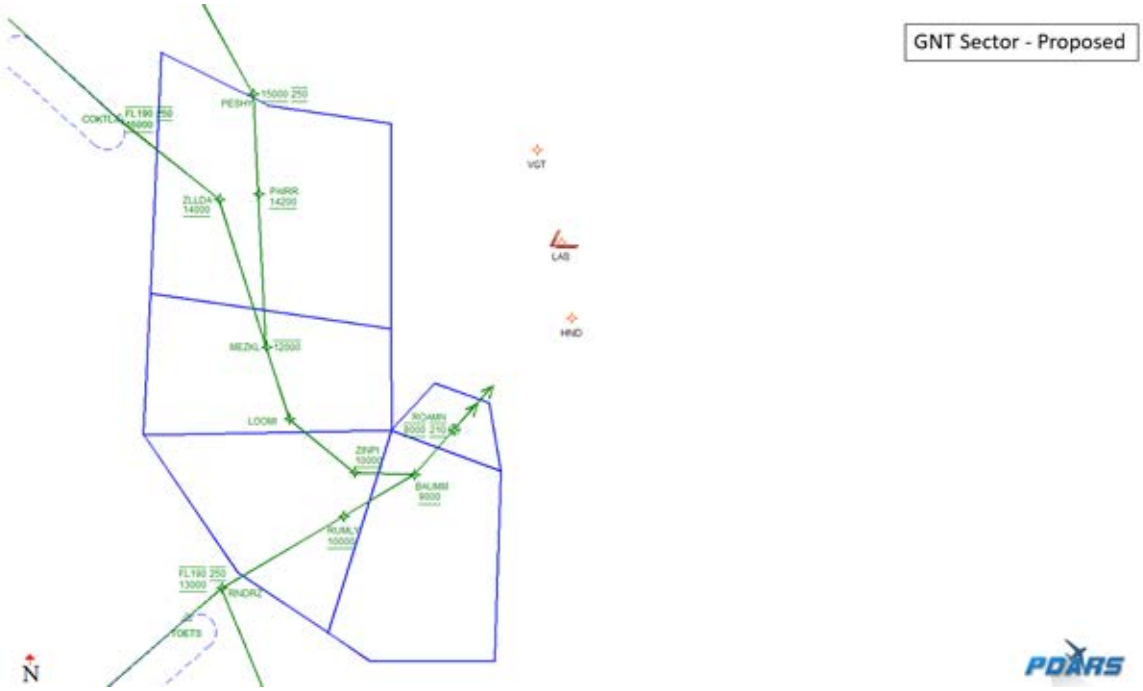


Figure 15: Overlay of Proposed GNT Sector with Proposed RNAV Procedures

L30 KNO Sector

The current KNO Sector is depicted in Figure 16.

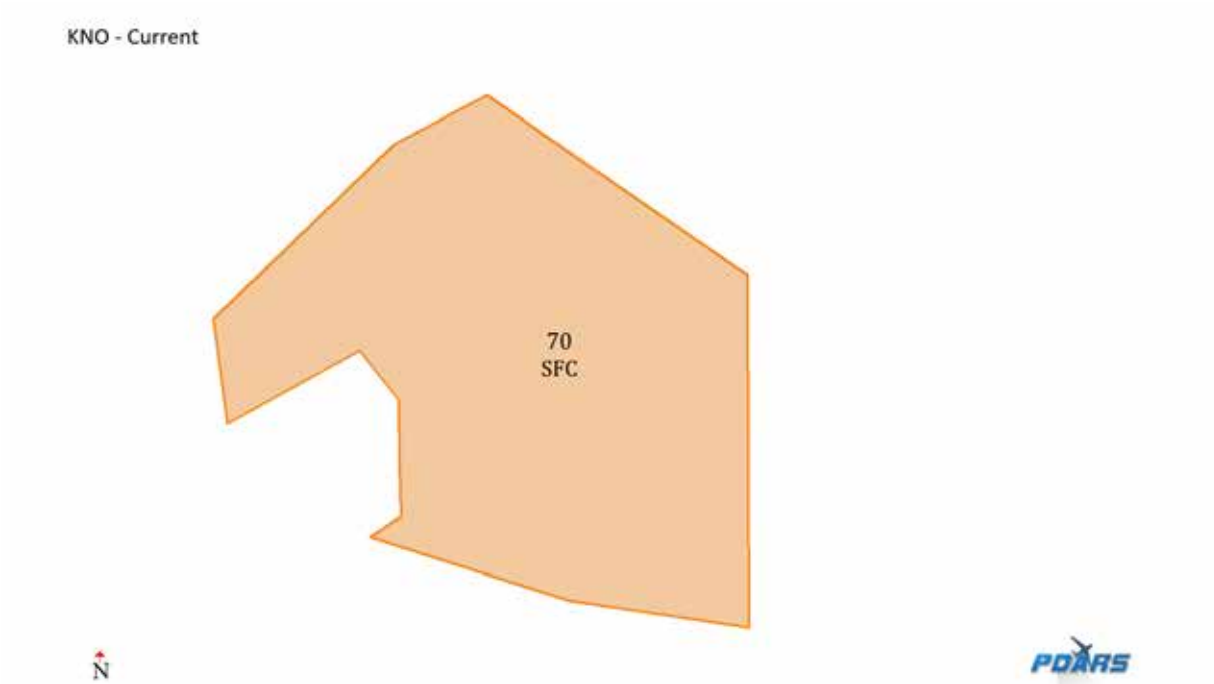


Figure 16: Current KNO Sector

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

The KNO Sector was expanded laterally on the eastern and northeastern edges of the sector with airspace acquired from ZLA Sectors 07 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between KNO and L30 Sectors LAK, MED and SAT.

The proposed KNO Sector is depicted in Figure 17.
An overlay of the current and proposed KNO Sector is depicted in Figure 18.

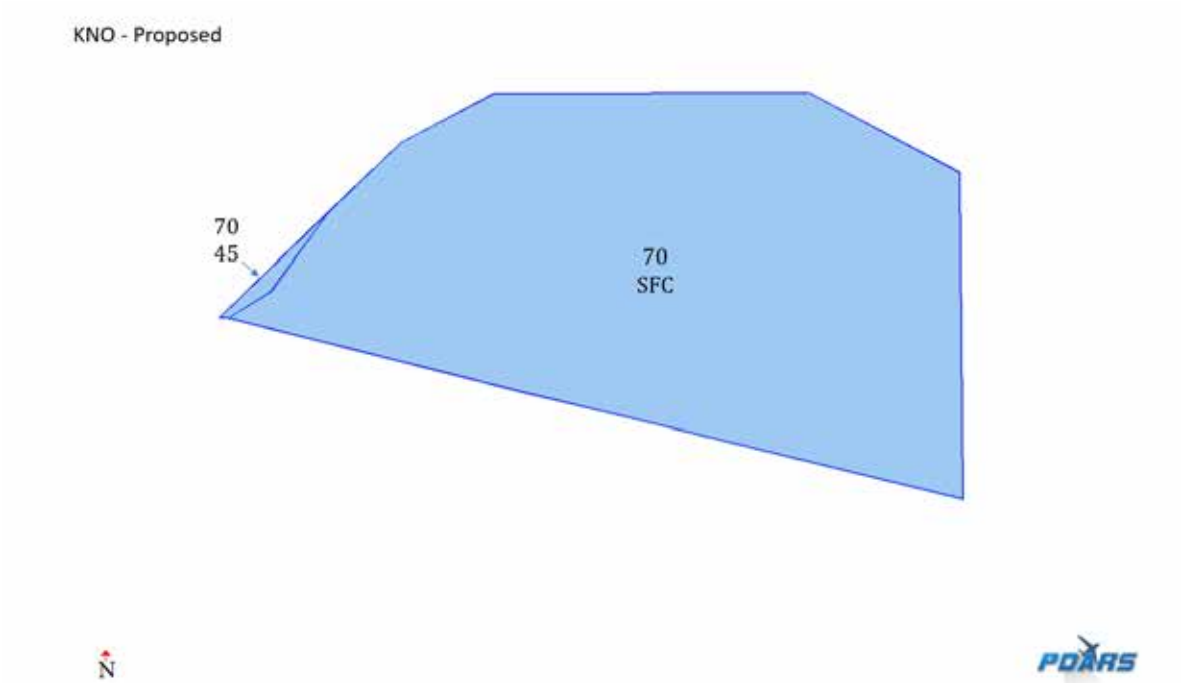


Figure 17: Proposed KNO Sector

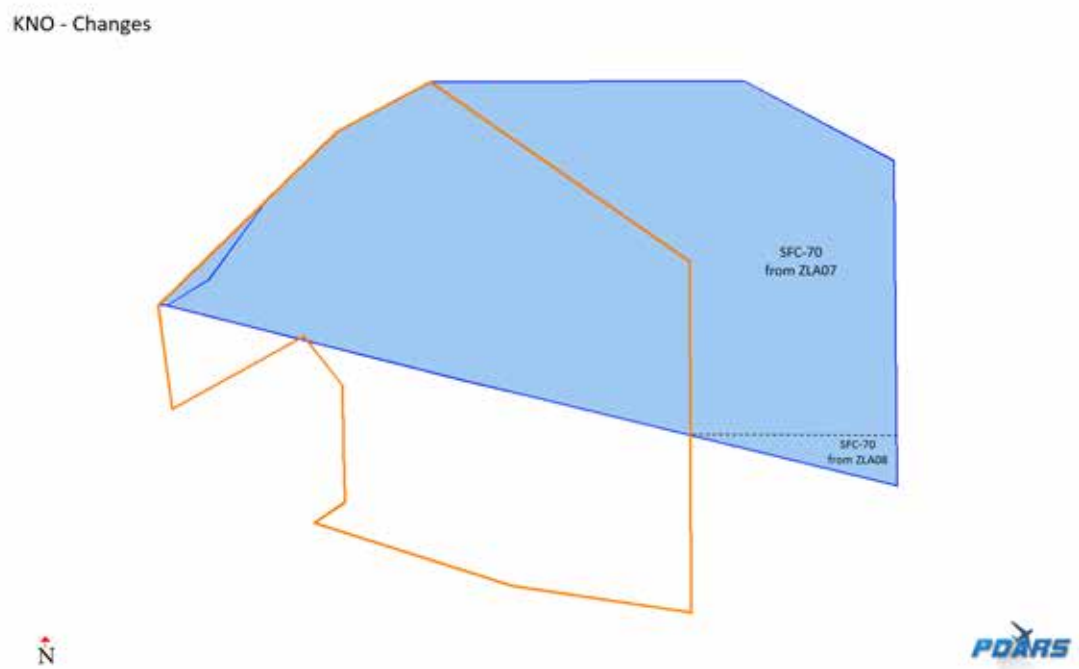


Figure 18: Overlay of Current and Proposed KNO Sector

No new RNAV procedures route through the proposed KNO Sector. These changes will help reduce complexity and accommodate airspace changes for other affected L30 Sectors.

<u>L30 LAK Sector</u>

The current LAK Sector is depicted in Figure 19.

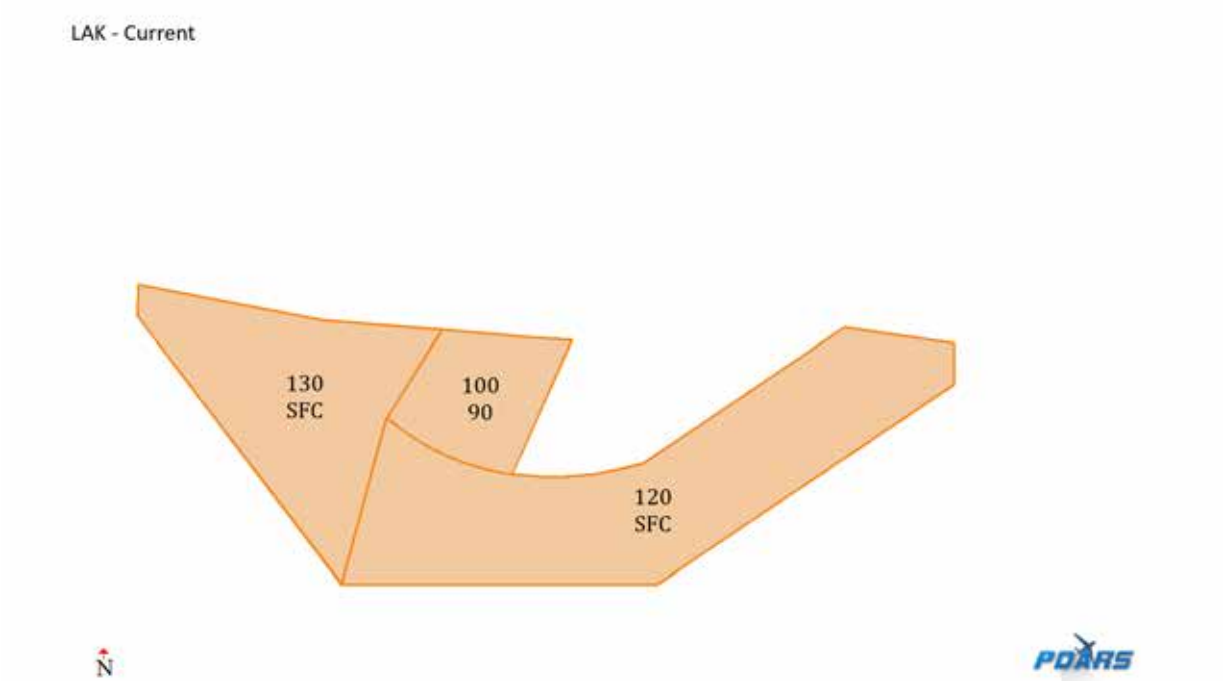


Figure 19: Current LAK Sector

The LAK Sector was expanded laterally on the southeastern, eastern and northeastern edges of the sector with airspace acquired from ZLA Sectors 06, 07 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between KNO and L30 Sectors CYN, DAG, FNL, GNT and MED.

The proposed LAK Sector is depicted in Figure 20.
An overlay of the current and proposed LAK Sector is depicted in Figure 21.

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

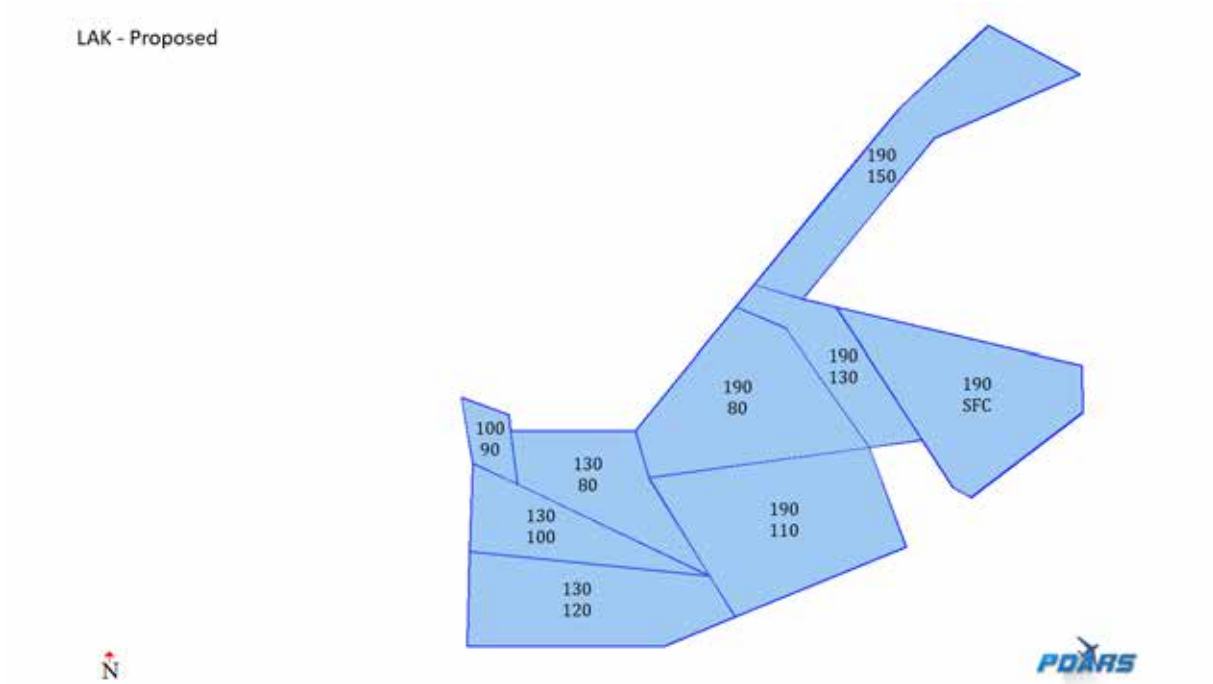


Figure 20: Proposed LAK Sector

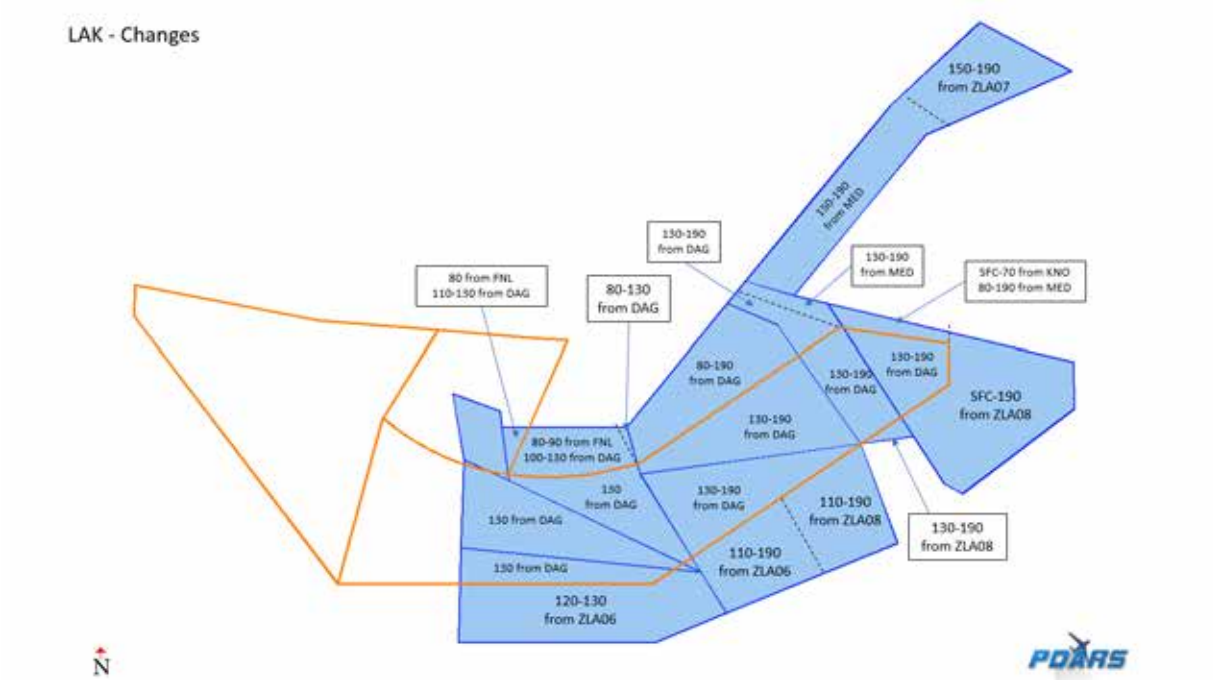


Figure 21: Overlay of Current and Proposed LAK Sector

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KLAS CHOWW STAR
- KLAS RKSTR STAR
- KHND BOEGY STAR

An overlay of the proposed LAK Sector with proposed RNAV procedures is depicted in Figure 22.

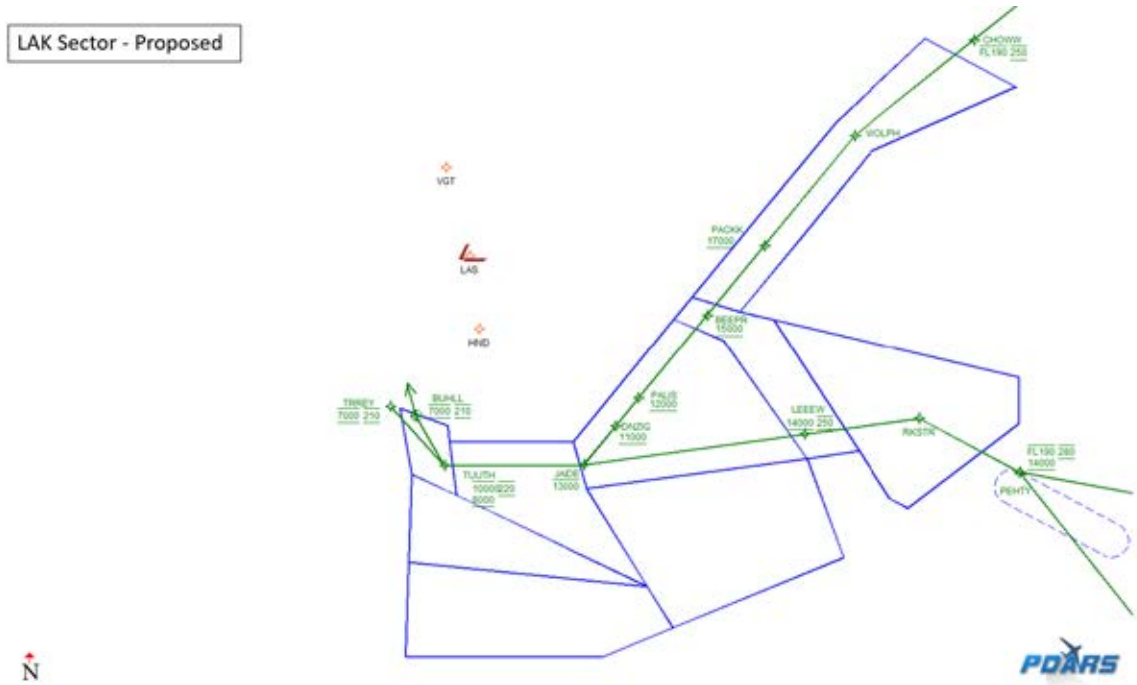


Figure 22: Overlay of Proposed LAK Sector with Proposed RNAV Procedures

L30 MED Sector

The current MED Sector is depicted in Figure 23.

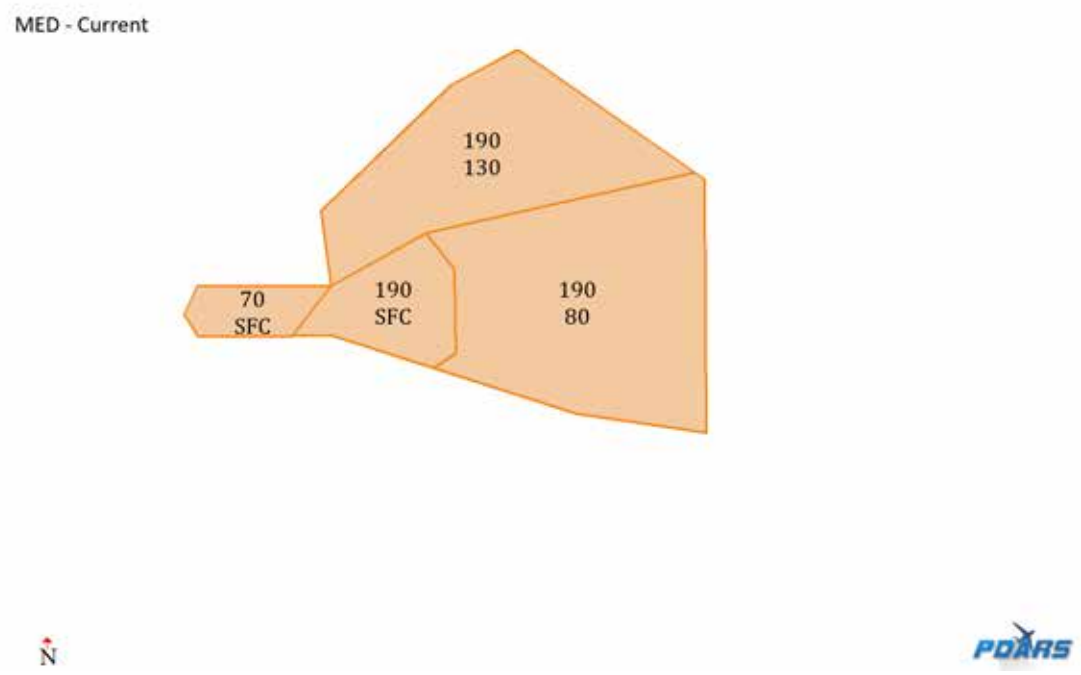


Figure 23: Current MED Sector

The MED Sector was expanded laterally on the northeastern, eastern and southeastern edges of the sector with airspace acquired from ZLA Sectors 07 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between MED and L30 Sectors DAG, GNT, KNO and LAK.

The proposed MED Sector is depicted in Figure 24.
An overlay of the current and proposed MED Sector is depicted in Figure 25.

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

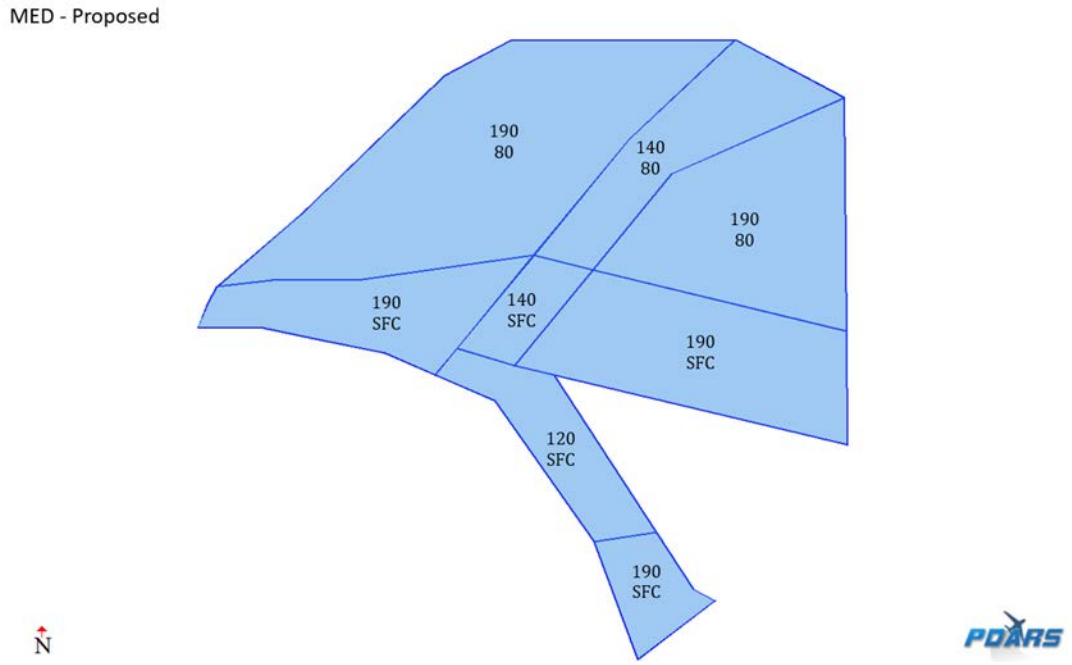


Figure 24: Proposed MED Sector

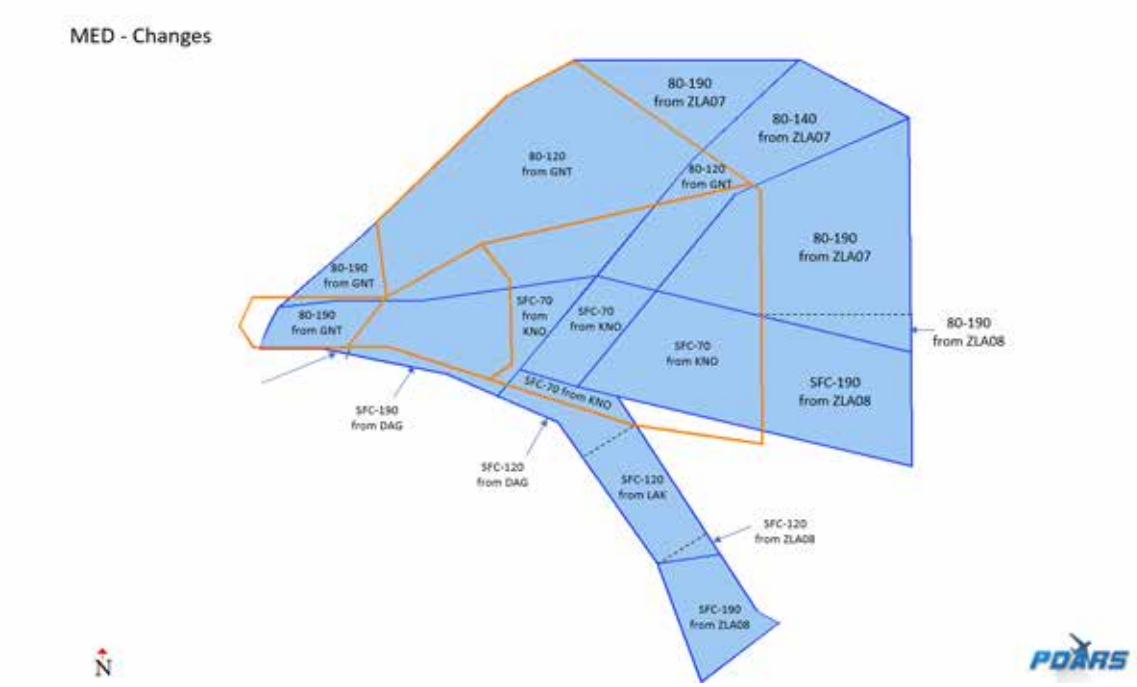


Figure 25: Overlay of Current and Proposed MED Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND BOEGY STAR
- KHND SCAMR SID
- KLAS GIDGT SID
- KLAS JOHKR SID
- KLAS LOHLA SID
- KLAS NIITZ SID
- KLAS RADYR SID
- KLAS RATPK SID
- KVGT WYLAND STAR

An overlay of the proposed MED Sector with proposed RNAV procedures is depicted in Figure 26.

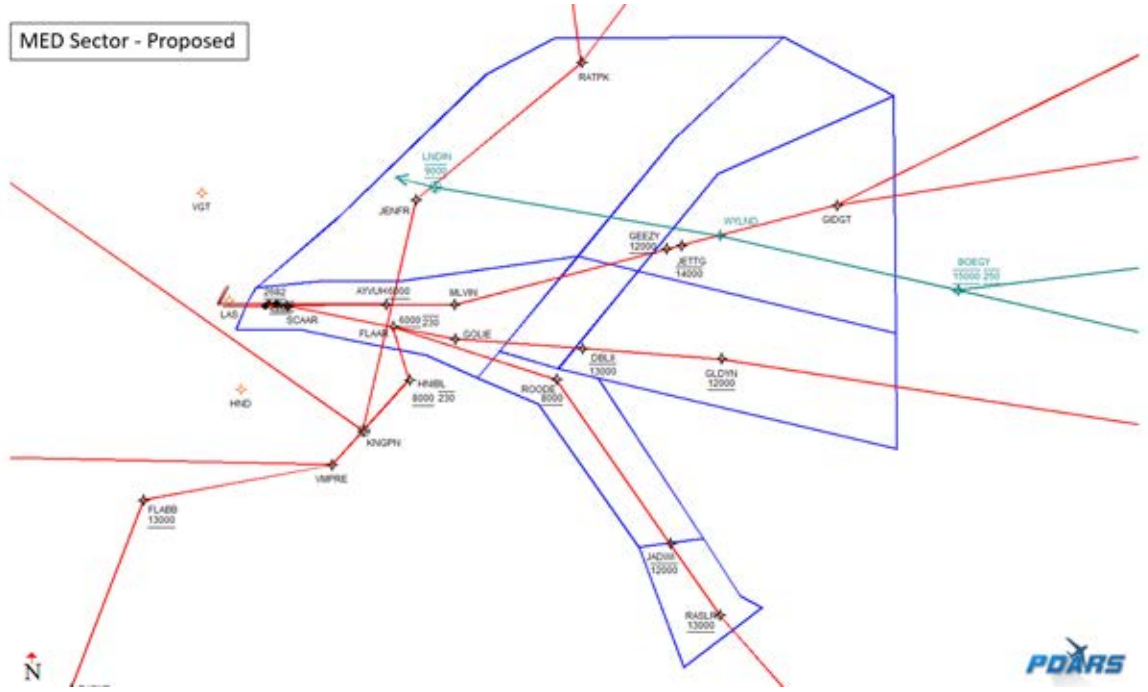


Figure 26: Overlay of Proposed MED Sector with Proposed RNAV Procedures

L30 SAT Sector

The current SAT Sector is depicted in Figure 27.

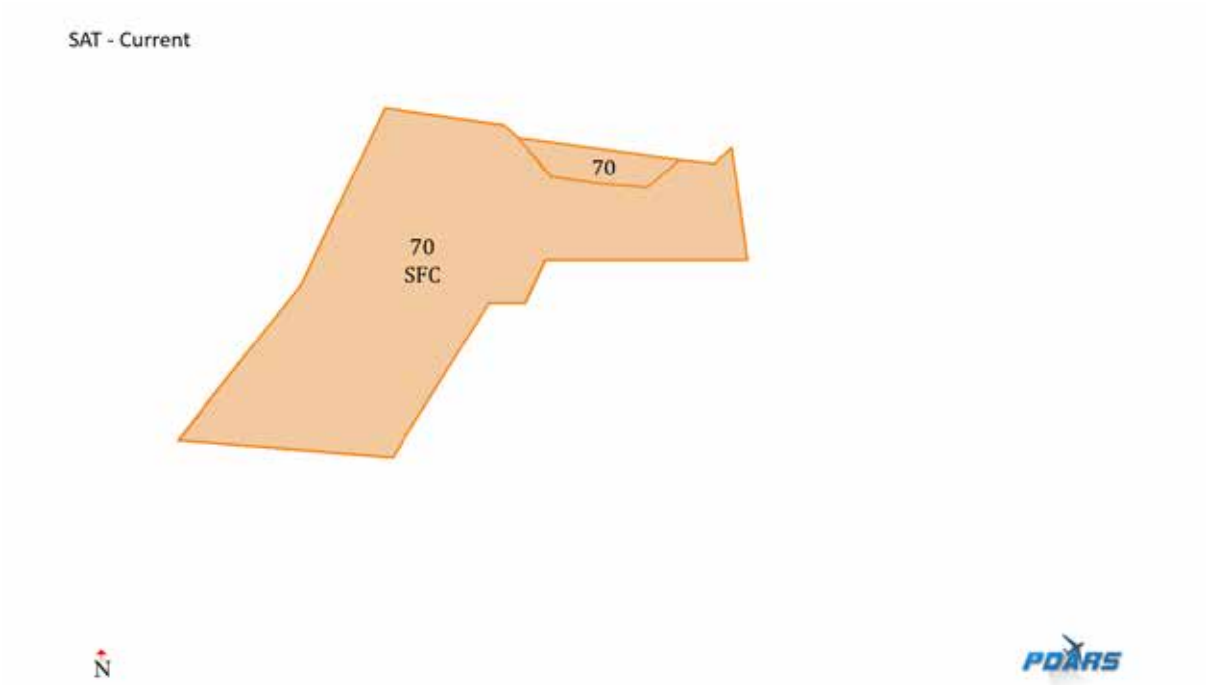


Figure 27: Current SAT Sector

The SAT Sector was changed with airspace transferred between SAT and L30 Sectors GNT, KNO, LAK and MED.

The proposed SAT Sector is depicted in Figure 28.
An overlay of the current and proposed SAT Sector is depicted in Figure 29.

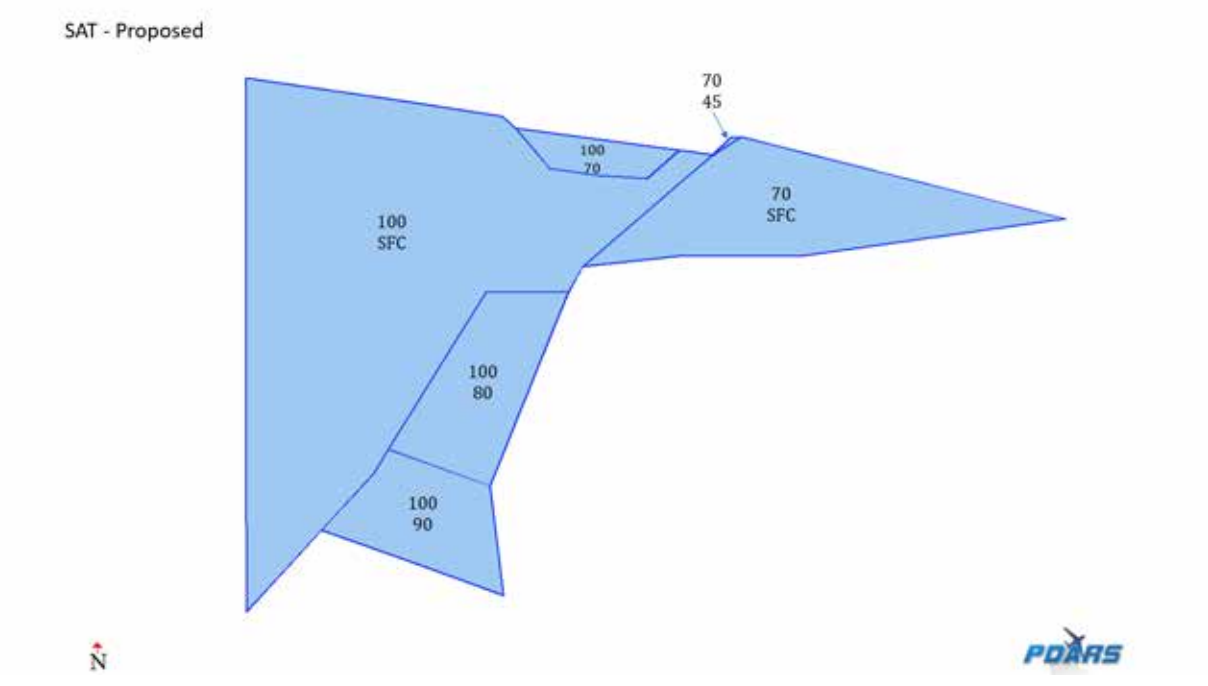


Figure 28: Proposed SAT Sector

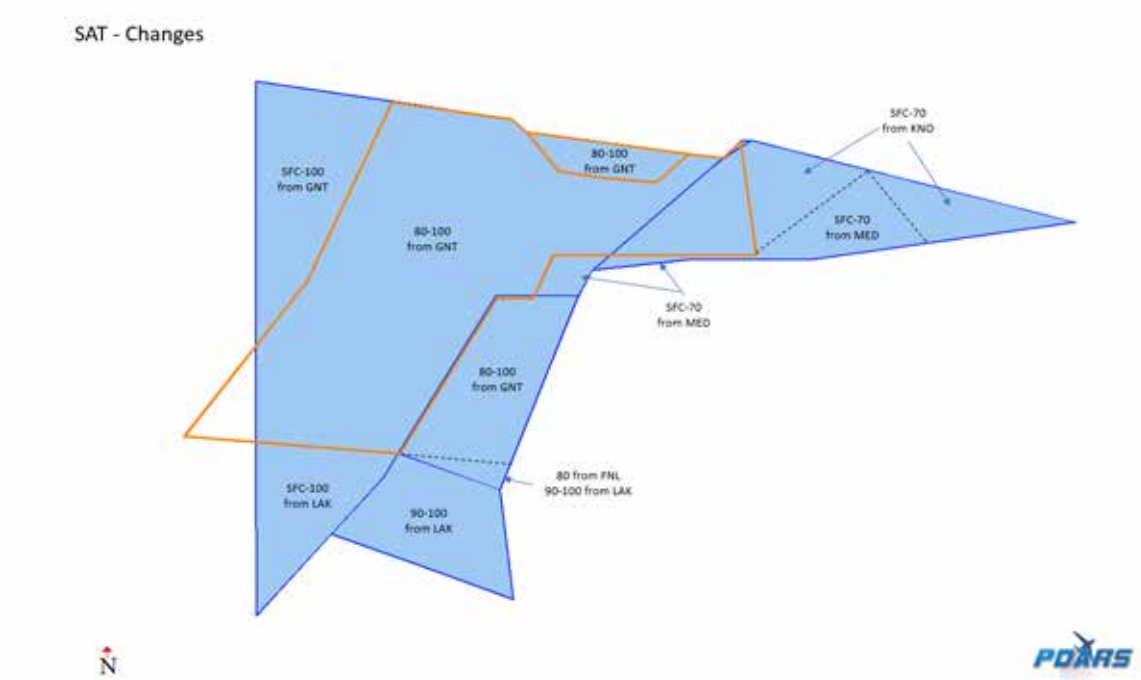


Figure 29: Overlay of Current and Proposed SAT Sector

No new RNAV procedures route through the proposed SAT Sector. These changes will help reduce complexity and accommodate airspace changes for other affected L30 Sectors.

<u>Additional Design Considerations</u>

- Spectrum analysis will be required for the proposed airspace changes associated with the proposed RNAV procedures.

The L30 airspace changes affect the following facility area(s) as indicated:

- Nellis Air Traffic Control Facility (NATCF)
- Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors:
    - CYN
    - DAG
    - FNL
    - GNT
    - KNO
    - LAK
    - MED

    - SAT
- Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors:
    - 06
    - 0
    - 08
    - 16

Implementation Dependencies

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND and KVGT.

Document changes/modifications include:

- ZLA Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- ZLA and L30 sector boundary maps
- ZLA/L30 Letter of Agreement (LOA)
- L30/LAS LOA
- LAS/L30/HND LOA
- ZLA Standard Operating Procedures (SOP)
- L30 SOP
- LAS SOP
- ERAM and STARS Automation Changes (ADRS, ADAR, Waypoint Pairs, etc.)
- NAS Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Standard Operating Procedures
- Airspace Illustrations
- Spectrum package
- Automation package
- Table of frequencies for all affected sectors/positions
- Spectrum analysis results
- HITL simulation results

Las Vegas OAPM Design Package

L30 Configuration Two Airspace Changes

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	P/Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23APR19 Date

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

The Las Vegas Metroplex Project was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation, providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures in to and out of area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows, allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures.

Extensive changes were made to designated airspace at air traffic control sectors in the Las Vegas Terminal Radar Control (L30 TRACON) and Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

Name of Change and Airport/s	Change Classification
Las Vegas Terminal Radar Control Facility (TRACON/L30) Airspace Changes	Delegated Airspace
OAPM Study Team Reference(s)	**Current Phase of Design**
4.2 L30 Airspace Expansion	☐ Preliminary Operational Design (PD) ☒ Proposed Final Design (PFD)
Package Date	**Implementation Date**
5/31/2019	5/21/2020
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
McCarran International Airport (KLAS), Henderson Executive Airport (KHND), North Las Vegas Airport (KVGT), Nellis Air Force Base (KLSV) Nellis Air Traffic Control Facility (NATCF) Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: CYN, DAG, FNL, GNT, KNO, LAK, MED, SAT Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 06, 07, 08, 16	KLAS JOHKR Standard Instrument Departure (SID) KLAS RADYR SID KLAS RASLR SID KLAS NIITZ SID KLAS GIDGT SID KLAS RATPK SID KLAS LOHLA SID KLAS COKTL Standard Terminal Arrival Route (STAR) KLAS RNDRZ STAR KLAS RKSTR STAR KLAS CHOWW STAR KLAS JAYSN STAR KHND OYODA SID KHND SCAMR SID KHND GAMES STAR KHND NTNDO STAR KHND BOEGY STAR KVGT FLCHR STAR KVGT WYLND STAR
Associated Data Files	
Standard Operating Procedures Airspace Illustrations Spectrum package Automation package Table of frequencies for all affected sectors/positions Spectrum analysis results HITL simulation results	

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

Purpose

The Las Vegas Metroplex Project was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation, providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures in to and out of area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows, allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures.

Extensive changes are required for designated airspace at air traffic control sectors in the Las Vegas Terminal Radar Control (L30 TRACON) and Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

Study Team Issues and Solutions

Issues

L30's current lateral airspace boundary is insufficient to accommodate runway transitions for LAS arrivals for all configurations. During periods of moderate and heavy traffic, sequencing to Runways 25L/R localizers extends back to ZLA airspace. Arrivals from the southwest, landing Runway 01L/R have difficulty meeting speed and altitude assignments. The current ZLA/L30 Transfer of Control Points (TCP) do not allow for the timely issuance of runway assignments.

The HND NOOTN STAR entry point into L30's airspace requires excessive coordination between ZLA Sectors 7 and 8.

Solutions

Expanding L30's current lateral boundary allowed the Las Vegas MST to develop Optimized Profile Descent (OPD) STARs with runway transitions for all configurations. The Las Vegas MST recommended airspace expansion would allow sequencing to Runways 25L/R to be contained within L30 airspace. Optimized procedures facilitate compliance with speed and altitude assignments thereby reducing transmissions and pilot/controller task complexity. The Las Vegas MST recommends ZLA issues the LAS landing direction (one option per configuration per gate) and L30 issues the runway transition.

The proposed airspace modification reduces coordination and complexity, allows for timely runway assignments, and provides additional airspace for sequencing. The Las Vegas MST considered surveillance coverage when designing L30 airspace expansion. D&I should further analyze the airspace expansion to ensure adequate surveillance coverage. Figure 4-3 depicts the Las Vegas MST conceptual L30 airspace expansion.

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

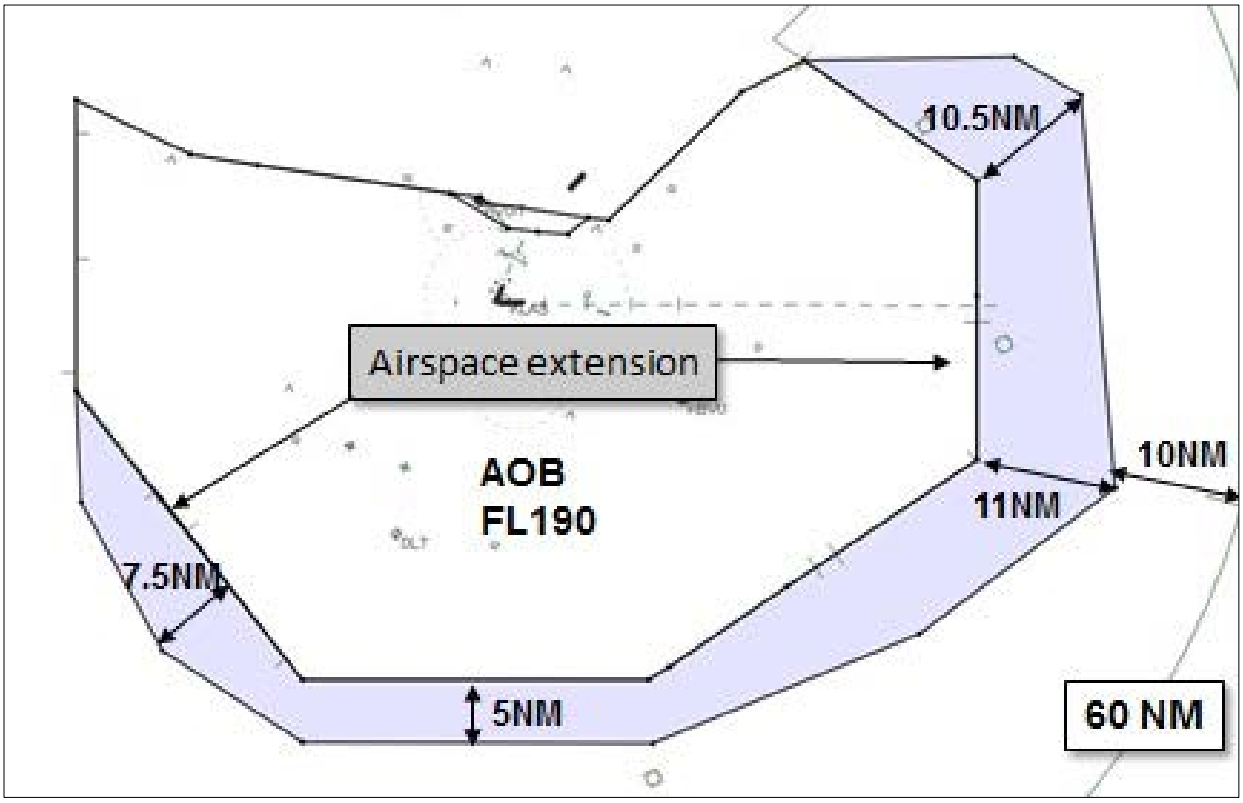


Figure 1: MST Proposed L30 Airspace

Proposed Final Design

The Design and Implementation (D&I) Team undertook an extensive review of airspace at L30 and ZLA to determine the suitability of current airspace and changes that would be necessary to accommodate new designs. The L30 delegated airspace was expanded laterally with airspace transferred from ZLA to provide flexibility and increased options for controllers as they sequence arrivals and departures to Las Vegas Valley airports. This expanded L30 airspace will also allow the issuance of alternate runway assignment for arrivals if required.

Current L30 Sector internal airspace delegation is dependent on which configuration is being utilized at KLAS. The Proposed Final Design will also provide changing lateral and vertical boundaries tailored to individual configurations.

This Proposed Final Design Package presents changes for KLAS Configuration Four, which serves arrivals and departures on KLAS Runways 08 L/R; and 19 L/R.

The Proposed Final Design of L30 airspace for KLAS Configuration Four is as follows:

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

<u>L30 CYN Sector</u>

The current L30 CYN Sector is depicted in Figure 2.

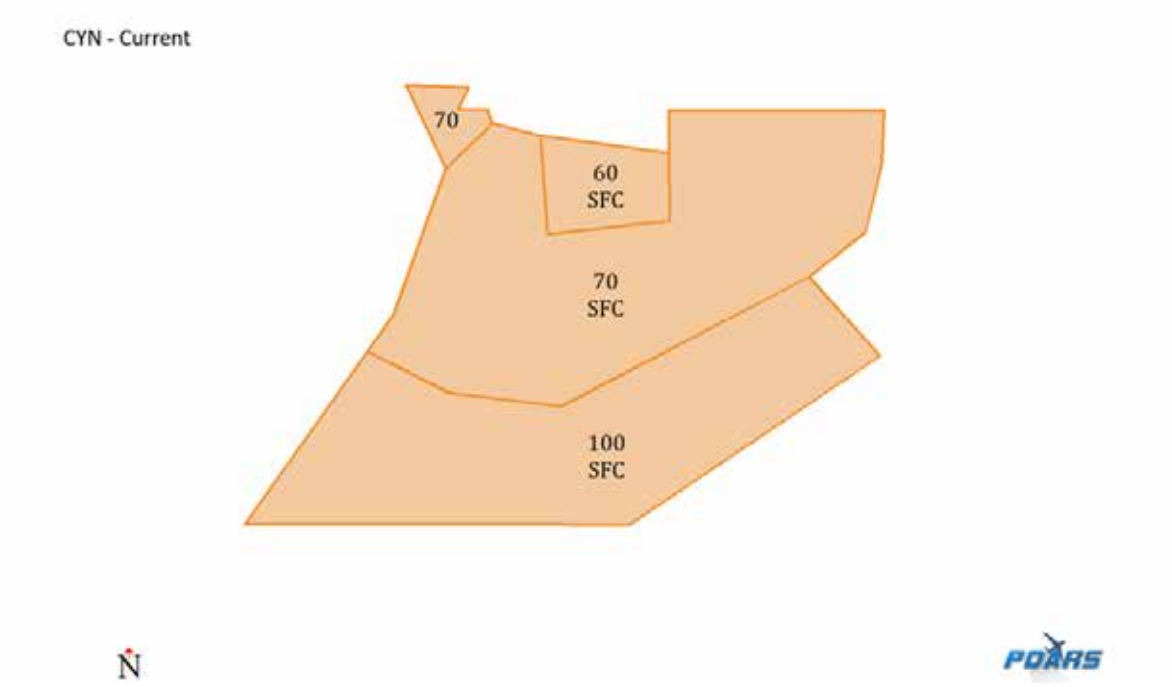


Figure 2: Current CYN Sector

The CYN Sector was expanded laterally on the southern edge of the sector with airspace acquired from ZLA Sectors 06 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between CYN and L30 Sectors DAG, FNL, GNT, LAK and MED.

The proposed CYN Sector is depicted in Figure 3.
An overlay of the current and proposed CYN Sector is depicted in Figure 4.

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

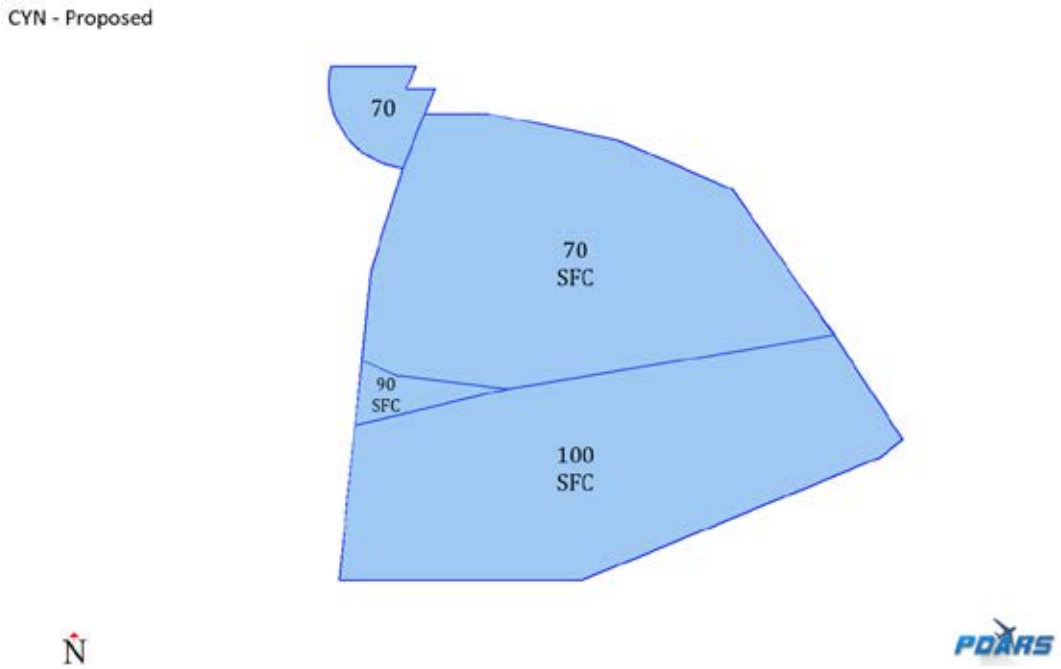


Figure 3: Proposed CYN Sector

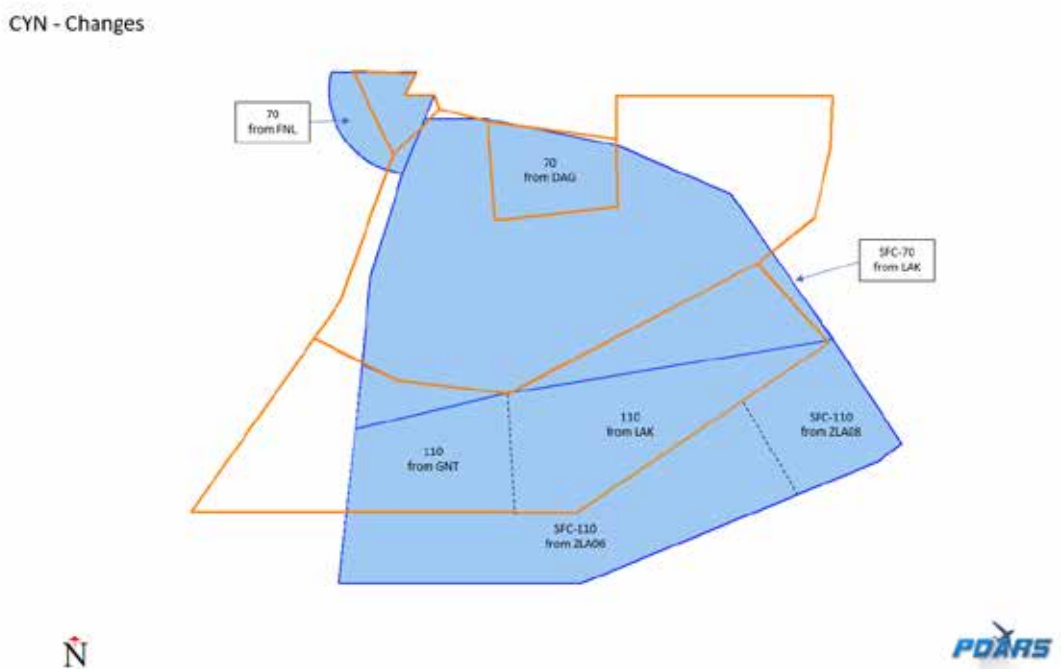


Figure 4: Overlay of Current and Proposed CYN Sector

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND BOEGY STAR
- KHND GAMES STAR
- KHND NTNDO STAR
- KHND OYODA SID
- KHND SCAMR SID

An overlay of the proposed CYN Sector with proposed RNAV procedures is depicted in Figure 5.

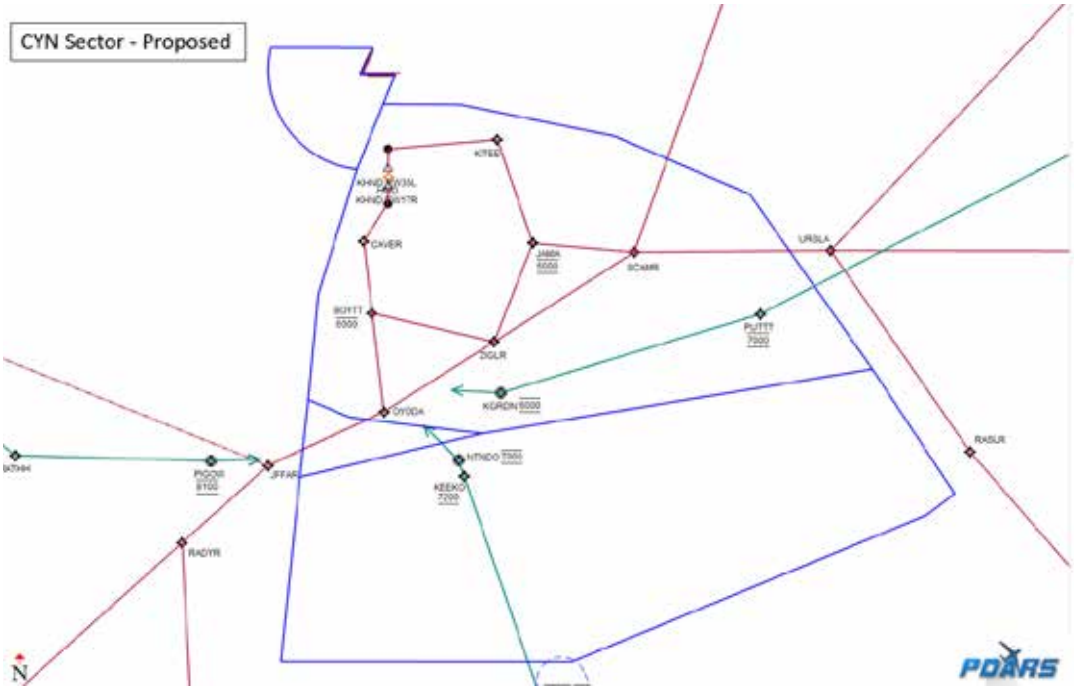


Figure 5: Overlay off Proposed CYN Sector with Proposed RNAV Procedures

L30 DAG Sector

The current DAG Sector is depicted in Figure 6.

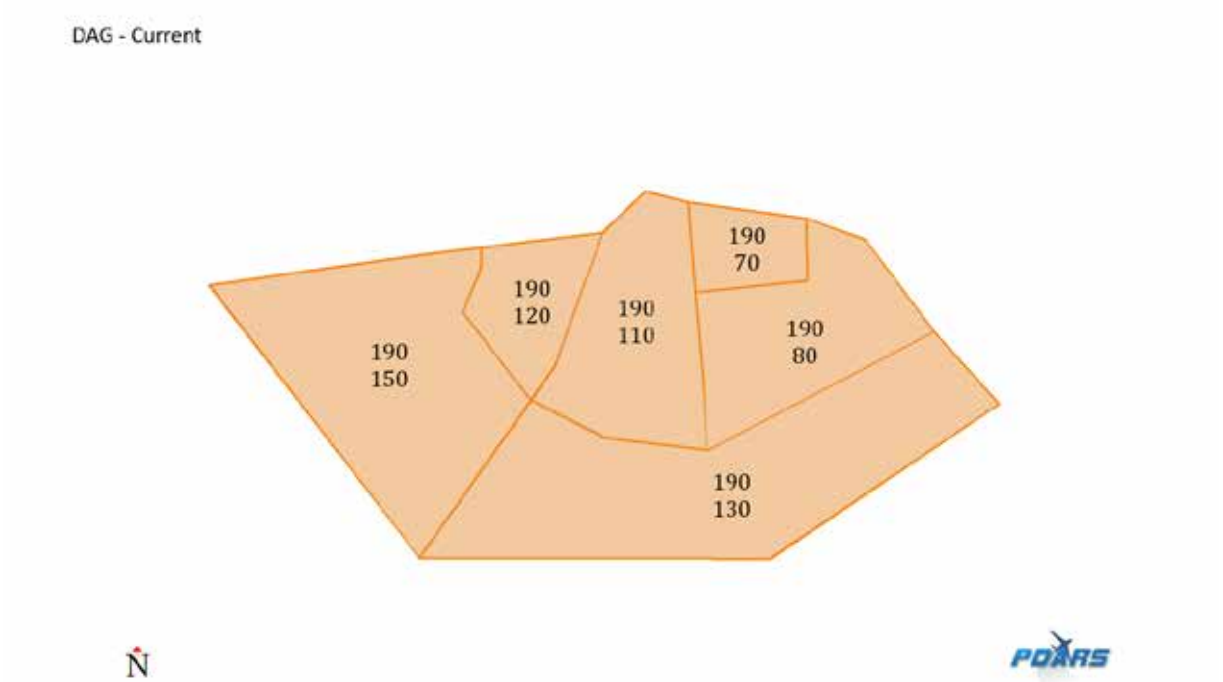


Figure 6: Current DAG Sector

The DAG Sector was expanded laterally on the western and southern edges of the sector with airspace acquired from ZLA Sectors 06, 08 and 16. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between DAG and L30 Sectors CYN, GNT, LAK and MED.

The proposed DAG Sector is depicted in Figure 7.
An overlay of the current and proposed DAG Sector is depicted in Figure 8.

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

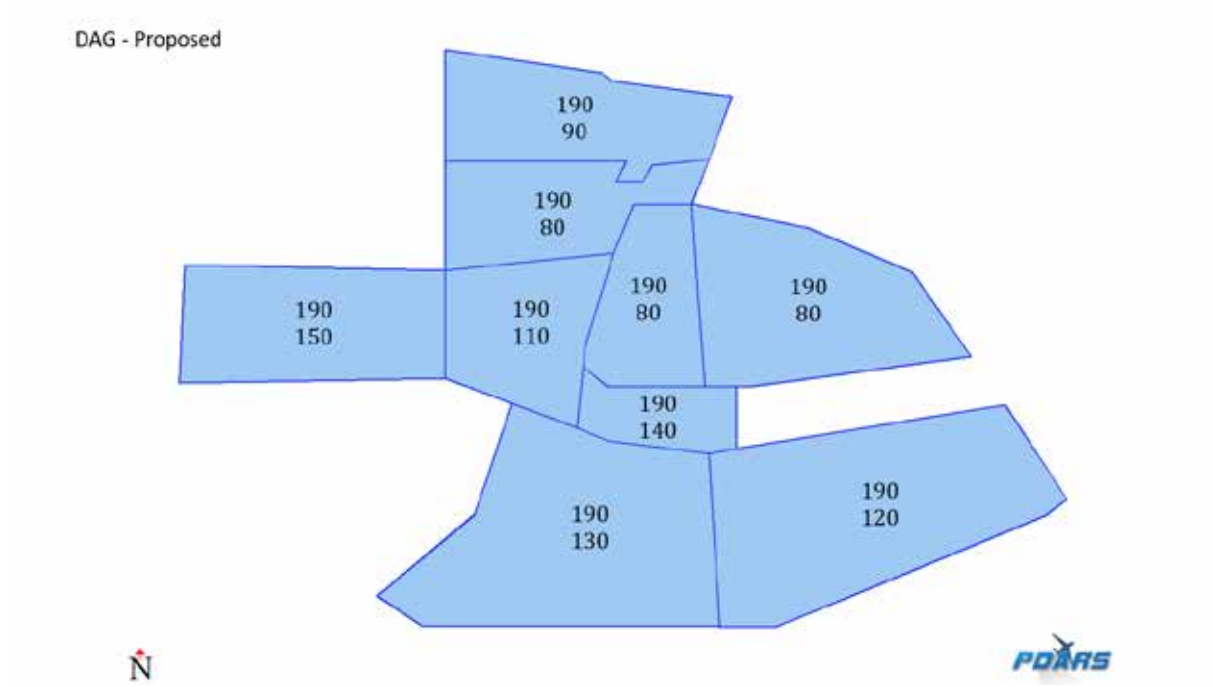


Figure 7: Proposed DAG Sector

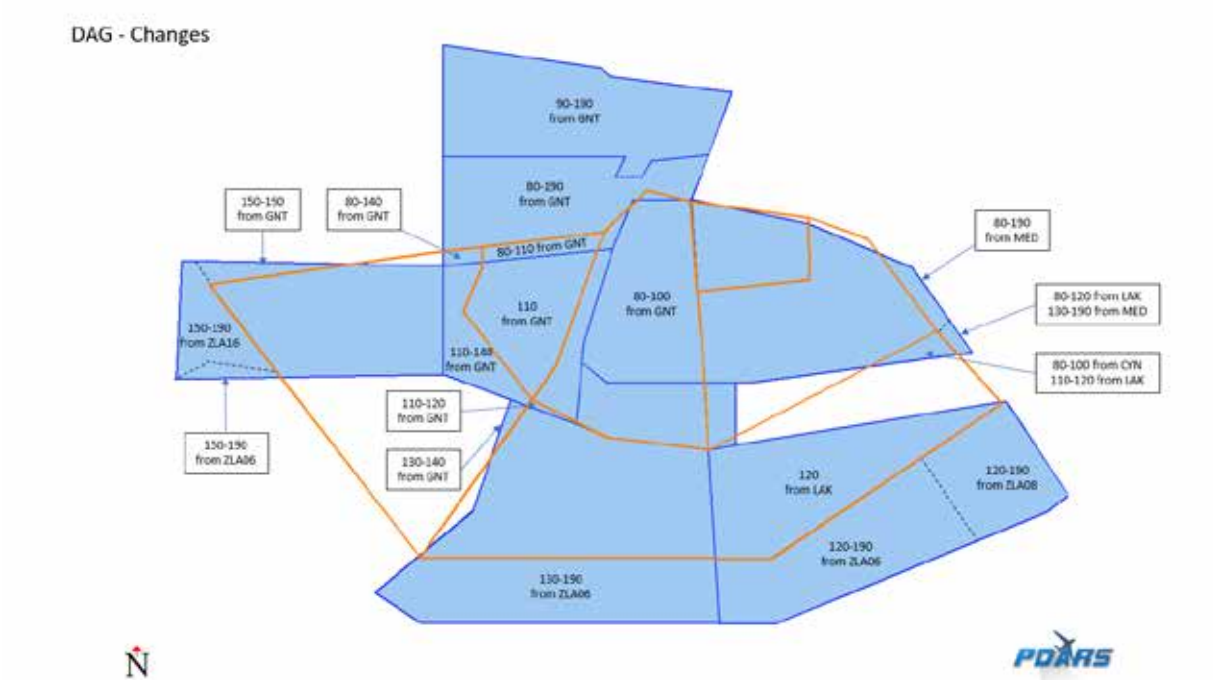


Figure 8: Overlay of Current and Proposed DAG Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND OYODA SID
- KHND SCAMR SID
- KLAS JOHKR SID
- KLAS LOHLA SID
- KLAS RATPK SID
- KLAS RAYDR SID

An overlay of the proposed DAG Sector with proposed RNAV procedures is depicted in Figure 9.

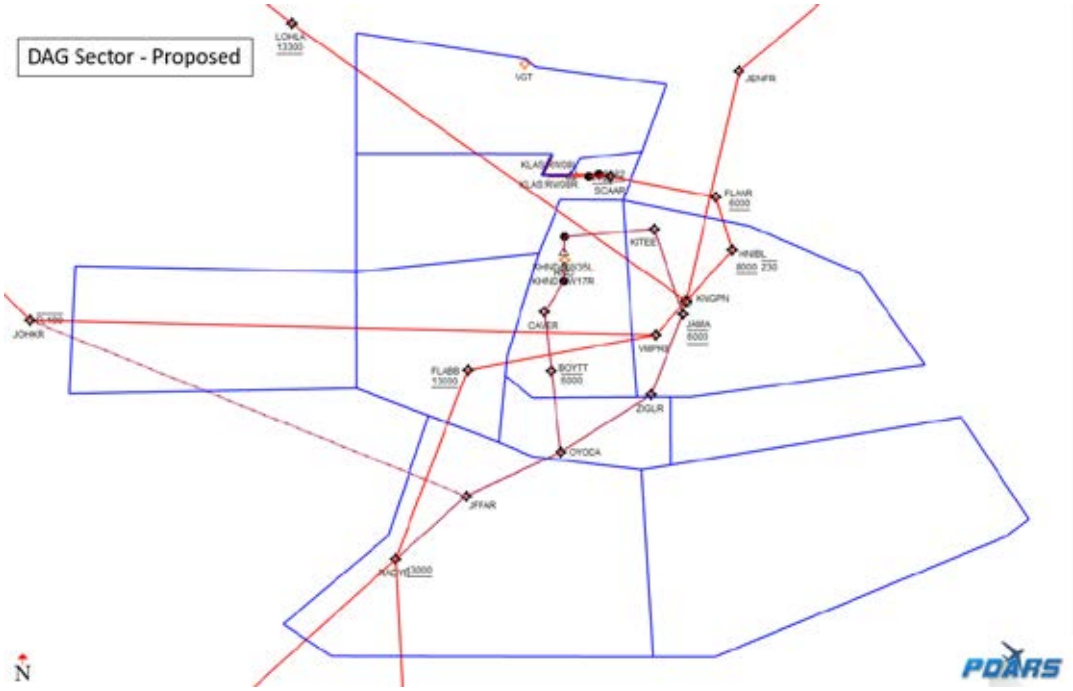


Figure 9: Overlay of Proposed DAG Sector with Proposed RNAV Procedures

L30 FNL Sector

The current FNL Sector is depicted in Figure 10.

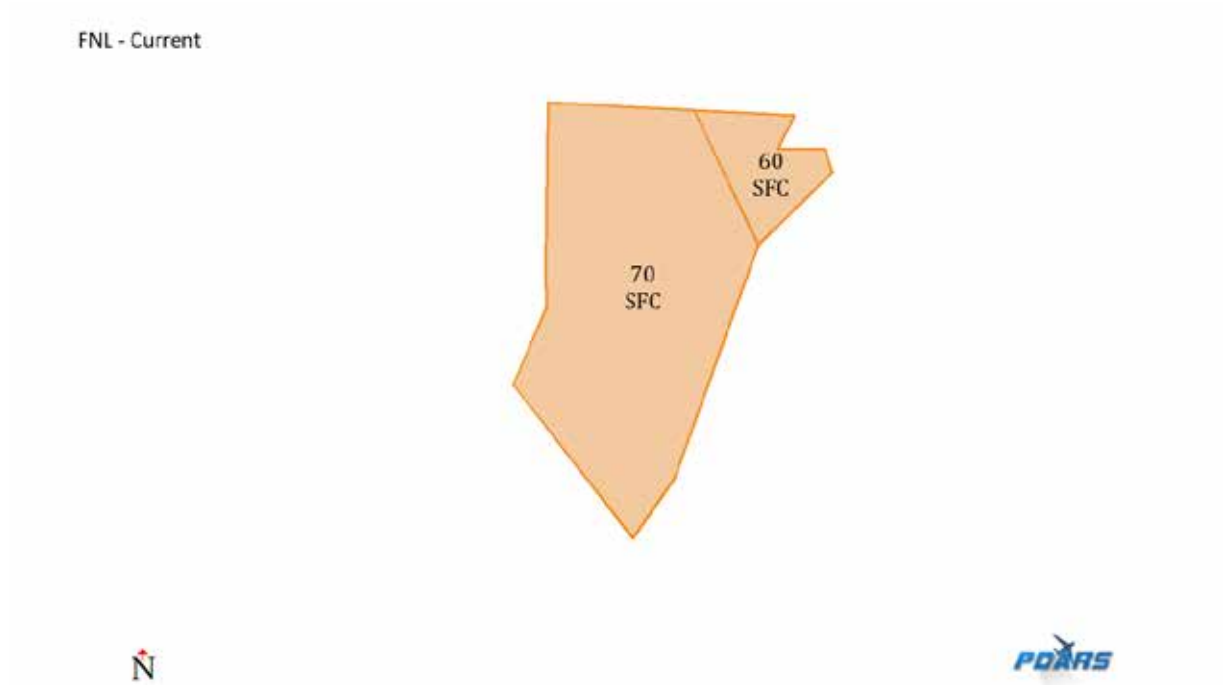


Figure 10: Current FNL Sector

The FNL Sector was changed with airspace transferred between FNL and L30 Sectors CYN, GNT, MED and SAT.

The proposed FNL Sector is depicted in Figure 11.
An overlay of the current and proposed FNL Sector is depicted in Figure 12.

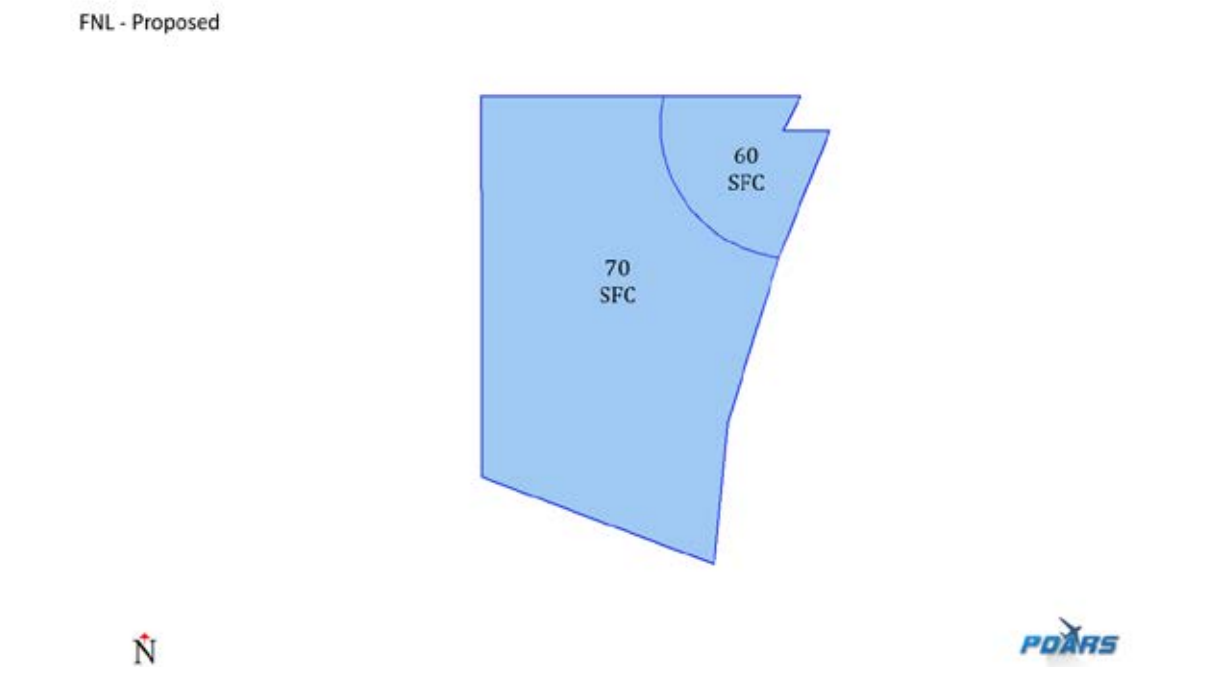


Figure 11: Proposed FNL Sector

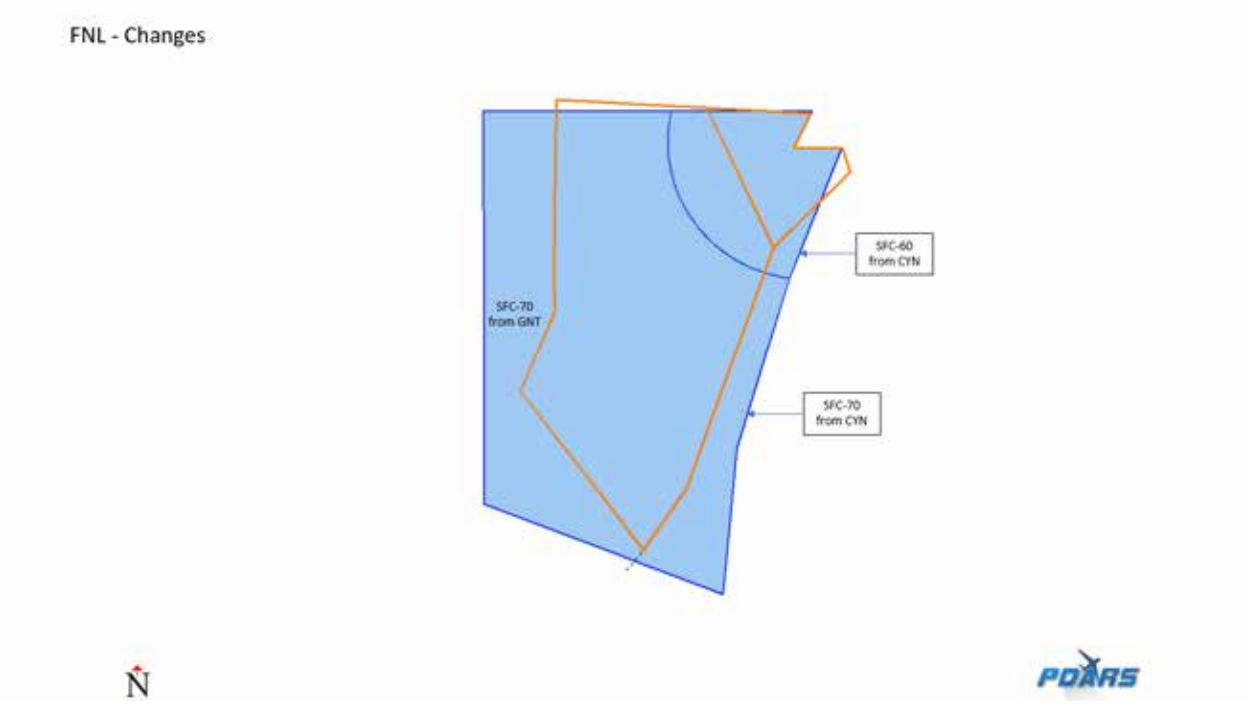


Figure 12: Overlay of Current and Proposed FNL Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KLAS COKTL STAR
- KLAS JAYSN STAR
- KLAS RKSTR STAR
- KLAS RNDRZ STAR

An overlay of the proposed FNL Sector with proposed RNAV procedures is depicted in Figure 13.

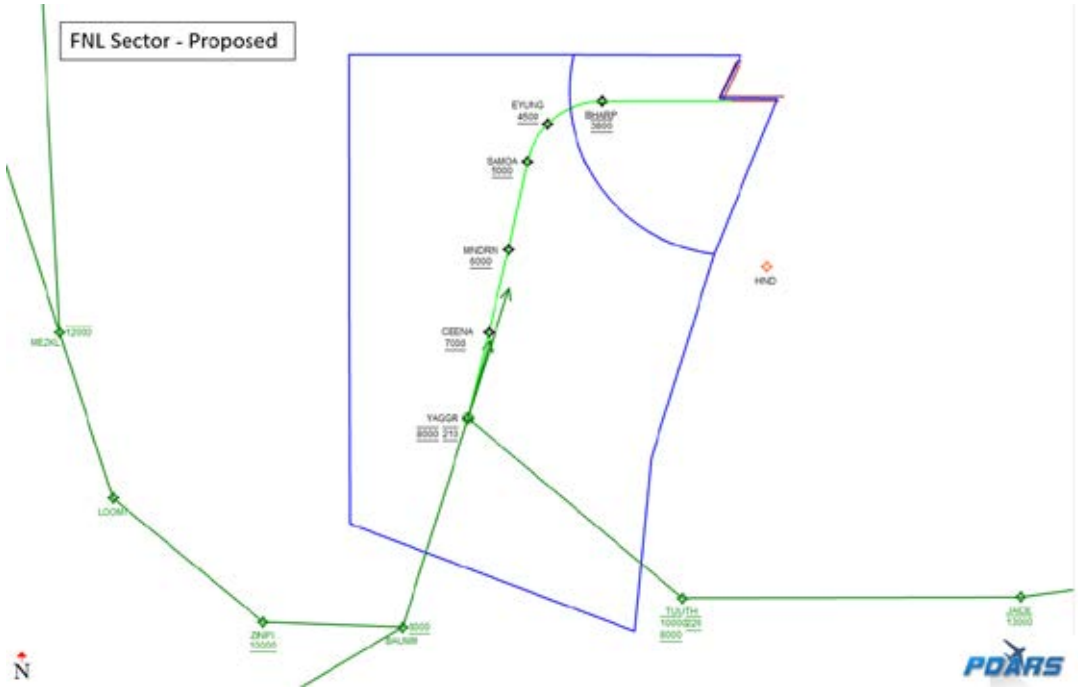


Figure 13: Overlay of Proposed FNL Sector with Proposed RNAV Procedures

L30 GNT Sector

The current GNT Sector is depicted in Figure 14.

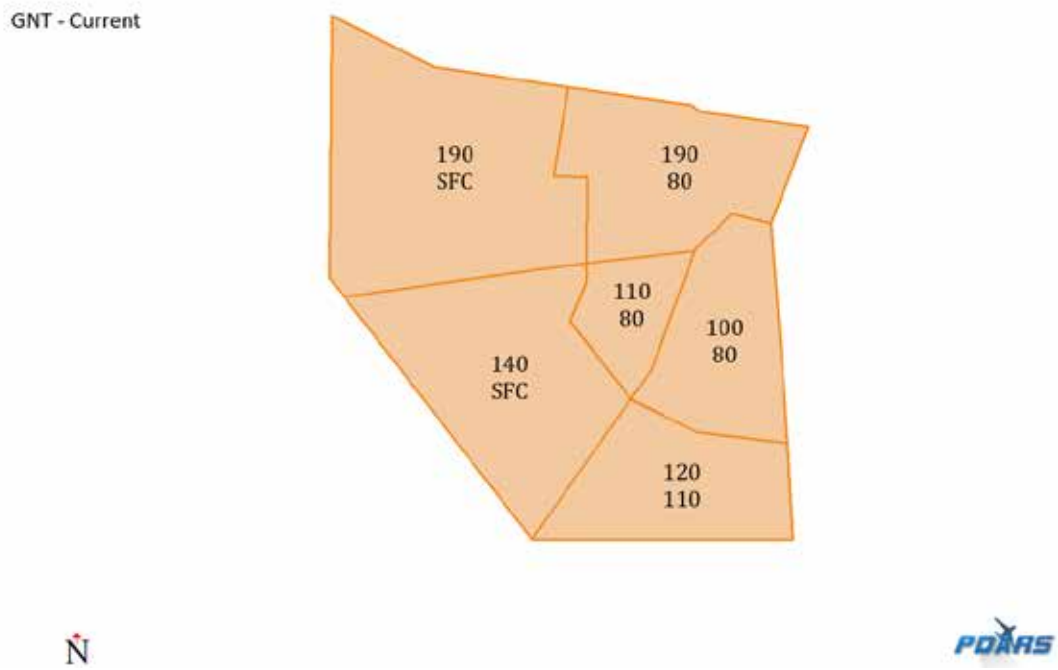


Figure 14: Current GNT Sector

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

The GNT Sector was expanded laterally on the southern, southwestern and western edges of the sector with airspace acquired from ZLA Sectors 06 and 16. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between GNT and L30 Sectors CYN, DAG, FNL and SAT.

The proposed GNT Sector is depicted in Figure 15.
An overlay of the current and proposed GNT Sector is depicted in Figure 16.

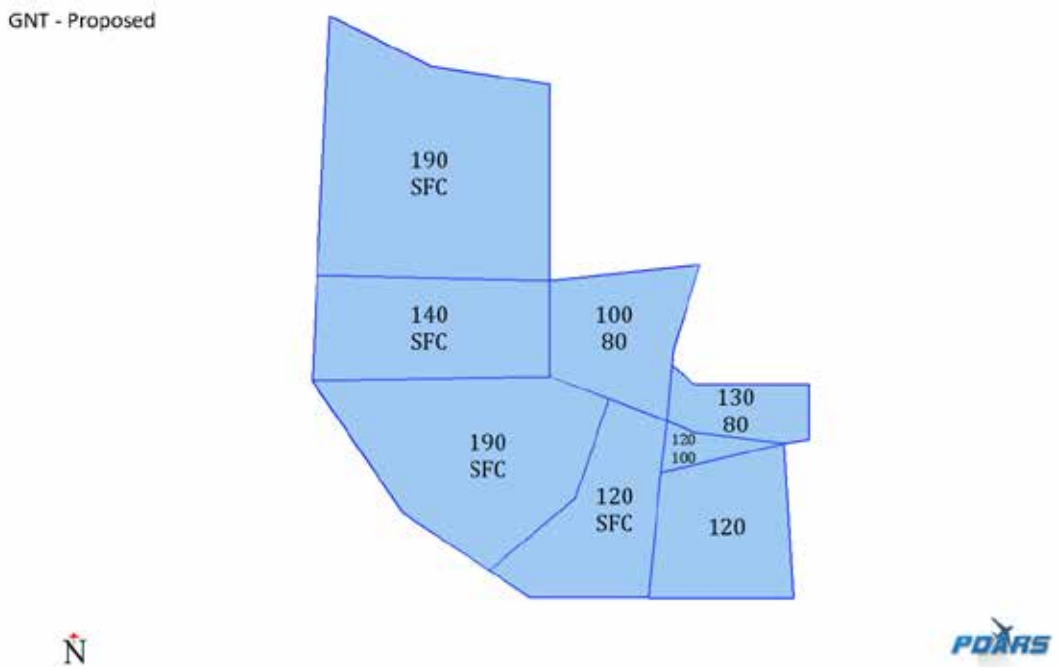


Figure 15: Proposed GNT Sector

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

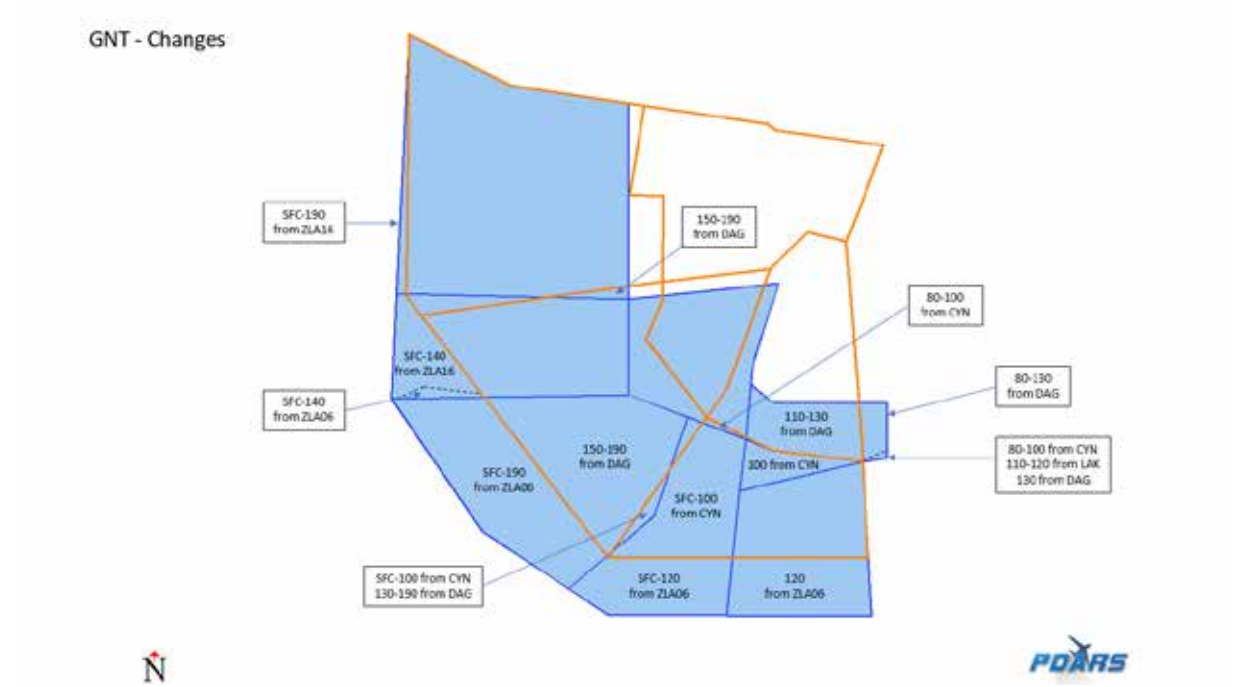


Figure 16: Overlay of Current and Proposed GNT Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- HND GAMES STAR
- KLAS COKTL STAR
- KLAS JAYSN STAR
- KLAS RNDRZ STAR

An overlay of the proposed GNT Sector with proposed RNAV procedures is depicted in Figure 17.

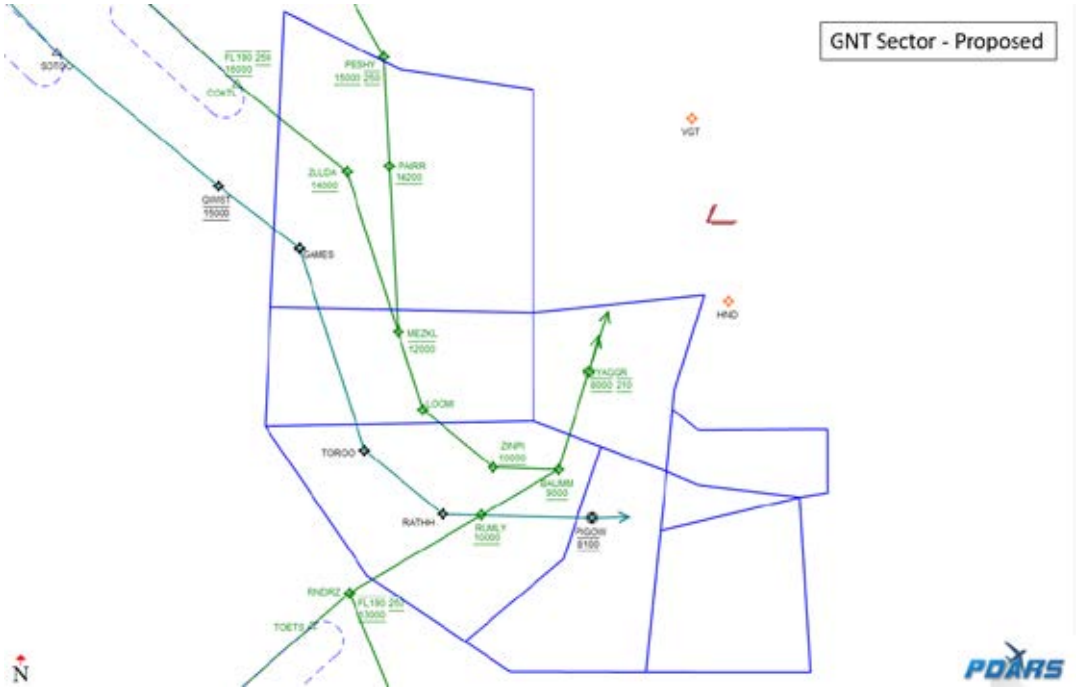


Figure 17: Overlay of Proposed GNT Sector with Proposed RNAV Procedures

L30 KNO Sector

In current state, there is no KNO Sector in KLAS Configuration Four. A new KNO Sector was developed with airspace transferred from ZLA Sector 07 and L30 Sector SAT. The transfer of ZLA airspace will expand the entire L30 airspace responsibility to the east.

The proposed KNO Sector along with sectors contributing airspace is depicted in Figure 18.

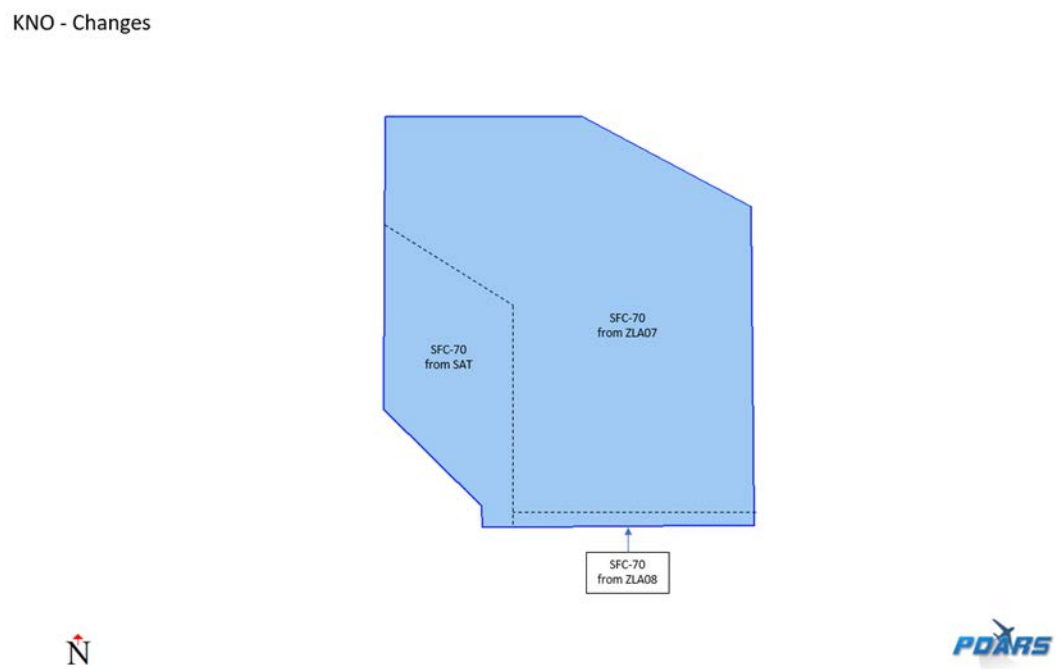


Figure 18: Proposed KNO Sector

No new RNAV procedures route through the proposed KNO Sector. These changes will help reduce complexity and accommodate airspace changes for other affected L30 Sectors.

<u>L30 LAK Sector</u>

The current LAK Sector is depicted in Figure 19.

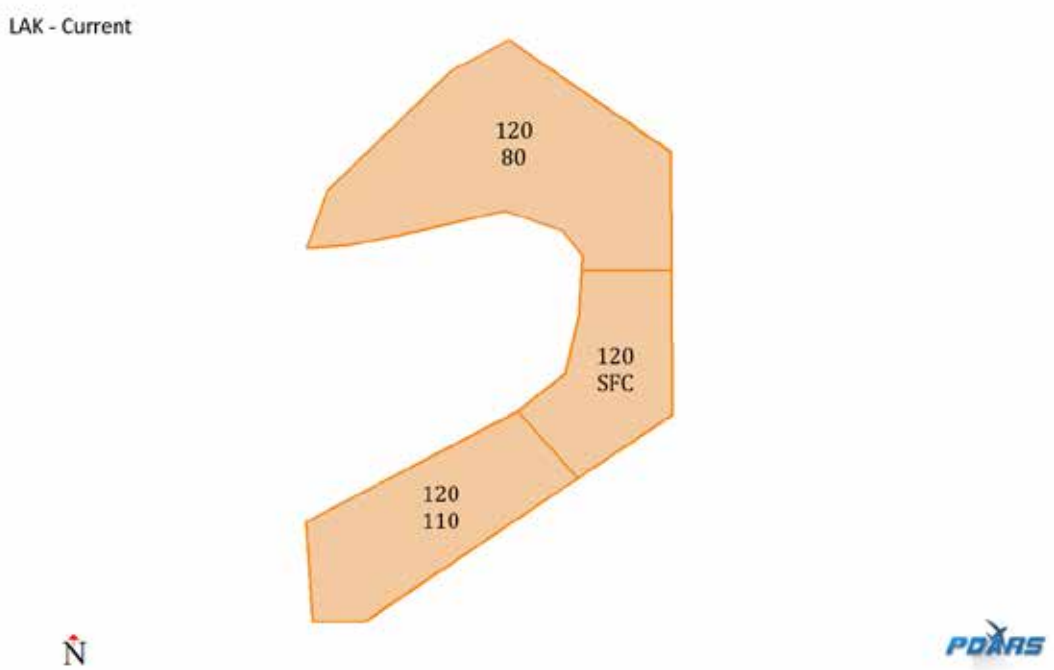


Figure 19: Current LAK Sector

The LAK Sector was expanded laterally on the eastern edge of the sector with airspace acquired from ZLA Sectors 07 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between KNO and L30 Sectors CYN, DAG, GNT, MED and SAT.

The proposed LAK Sector is depicted in Figure 20.
An overlay of the current and proposed LAK Sector is depicted in Figure 21.

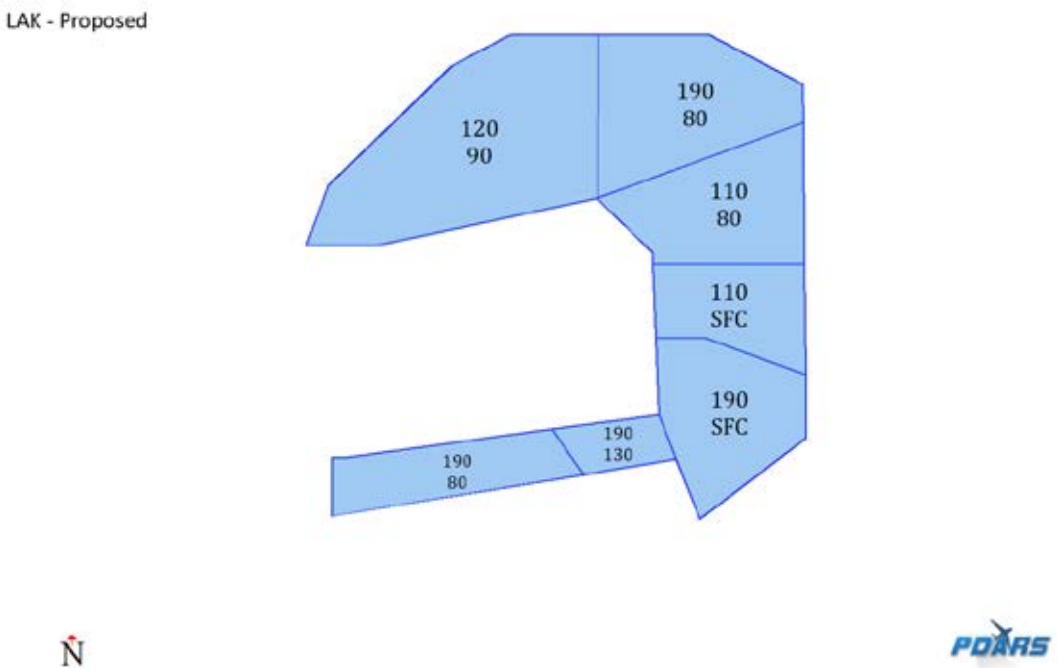


Figure 20: Proposed LAK Sector

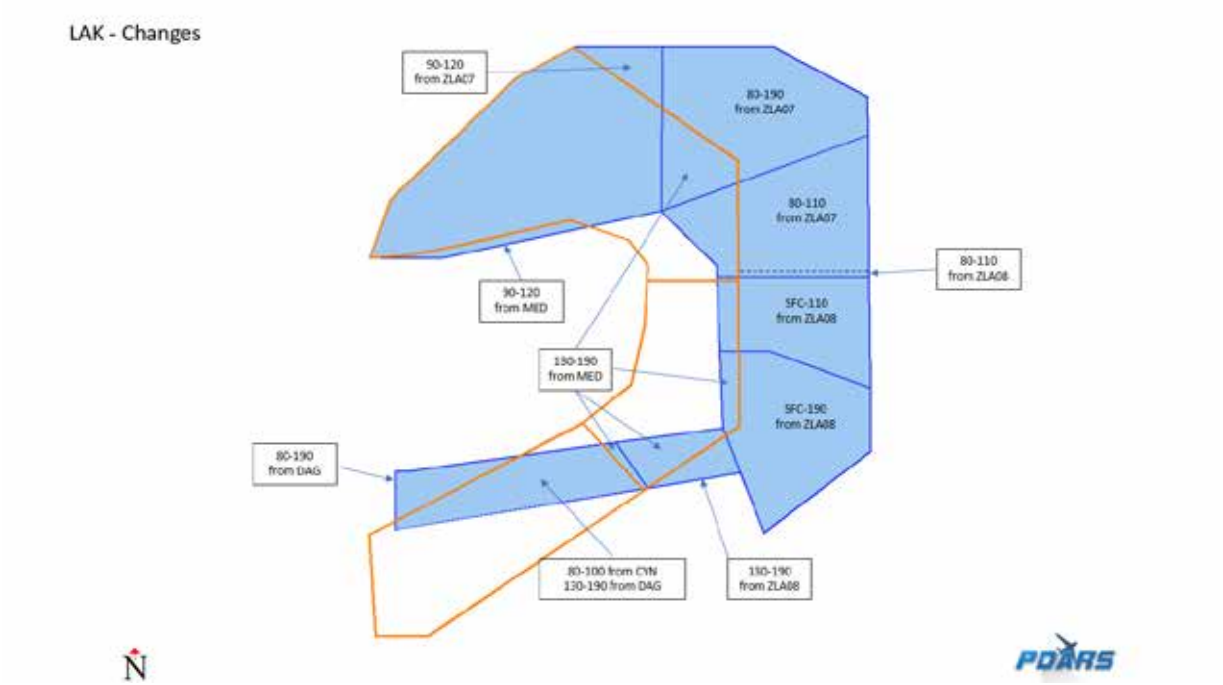


Figure 21: Overlay of Current and Proposed LAK Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND BOEGY STAR
- KLAS COKTL STAR
- KLAS RKSTR STAR
- KVGT WYLND STAR

An overlay of the proposed LAK Sector with proposed RNAV procedures is depicted in Figure 22.

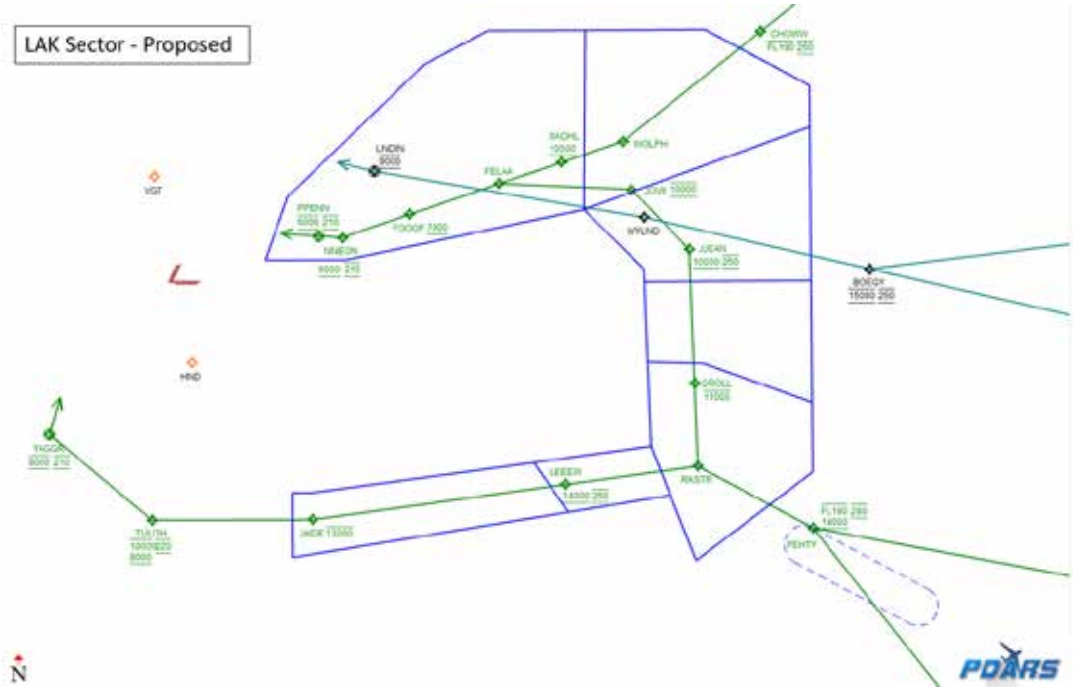


Figure 22: Overlay of Proposed LAK Sector with Proposed RNAV Procedures

L30 MED Sector

The current MED Sector is depicted in Figure 23.

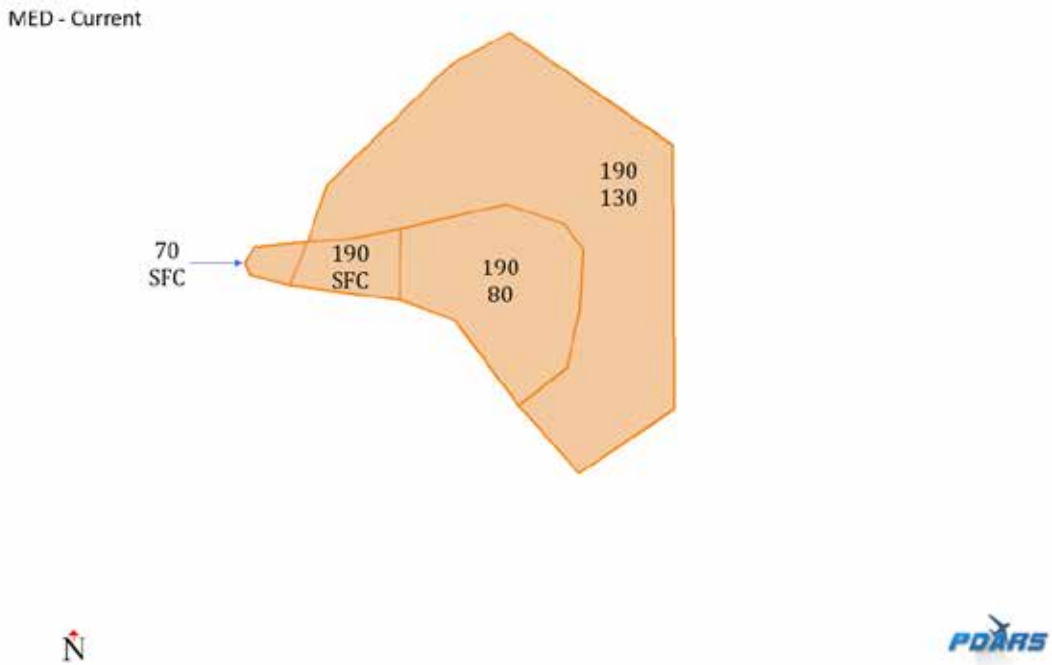


Figure 23: Current MED Sector

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

The MED Sector was expanded laterally on the northeastern, eastern and southeastern edgse of the sector with airspace acquired from ZLA Sectors 07 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between MED and L30 Sectors CYN, DAG, LAK and SAT.

The proposed MED Sector is depicted in Figure 24.
An overlay of the current and proposed MED Sector is depicted in Figure 25.

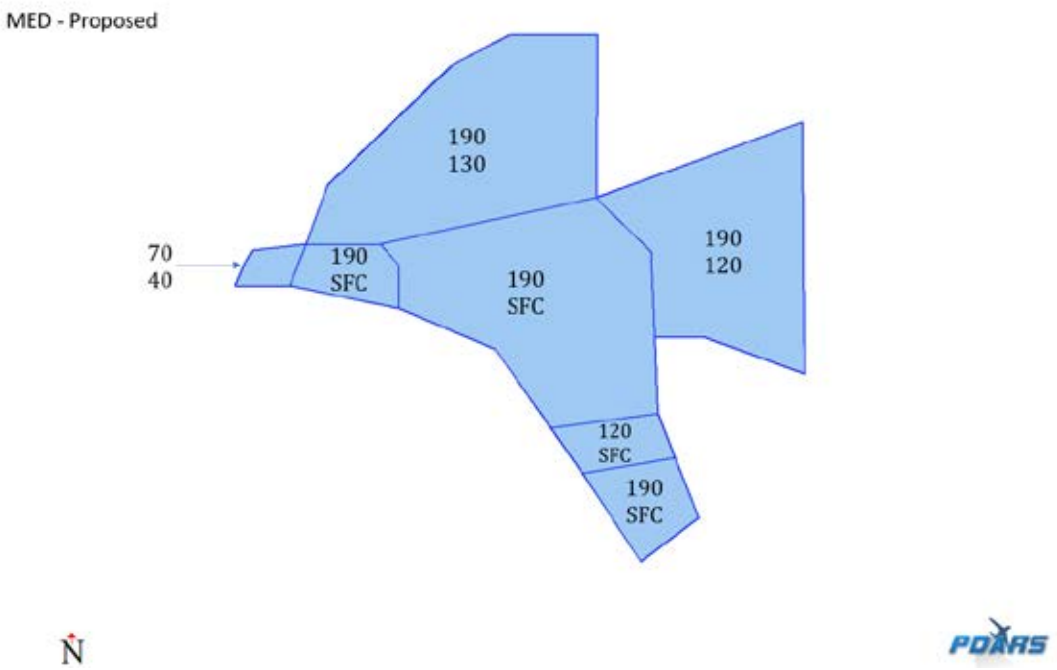


Figure 24: Proposed MED Sector

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

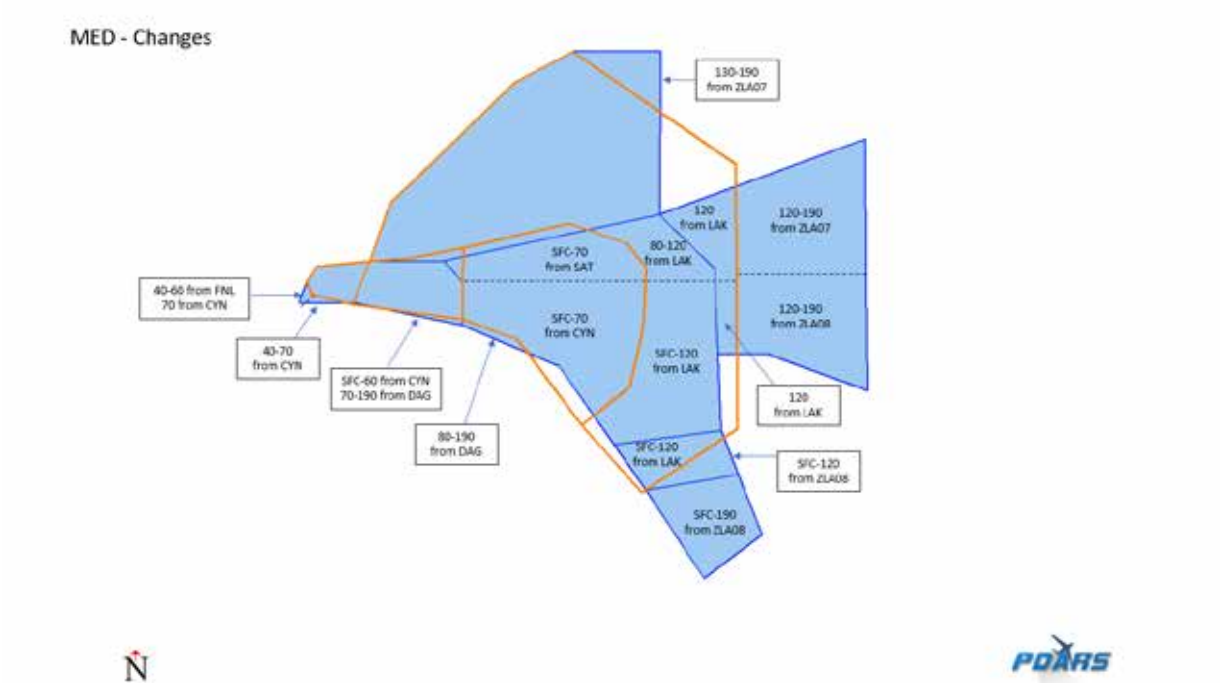


Figure 25: Overlay of Current and Proposed MED Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND SCAMR SID
- KLAS GIDGT SID
- KLAS JOHKR SID
- KLAS LOHLA SID
- KLAS NIITZ SID
- KLAS RADYR SID
- KLAS RASLR SID
- KLAS RATPK SID

An overlay of the proposed MED Sector with proposed RNAV procedures is depicted in Figure 26.

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

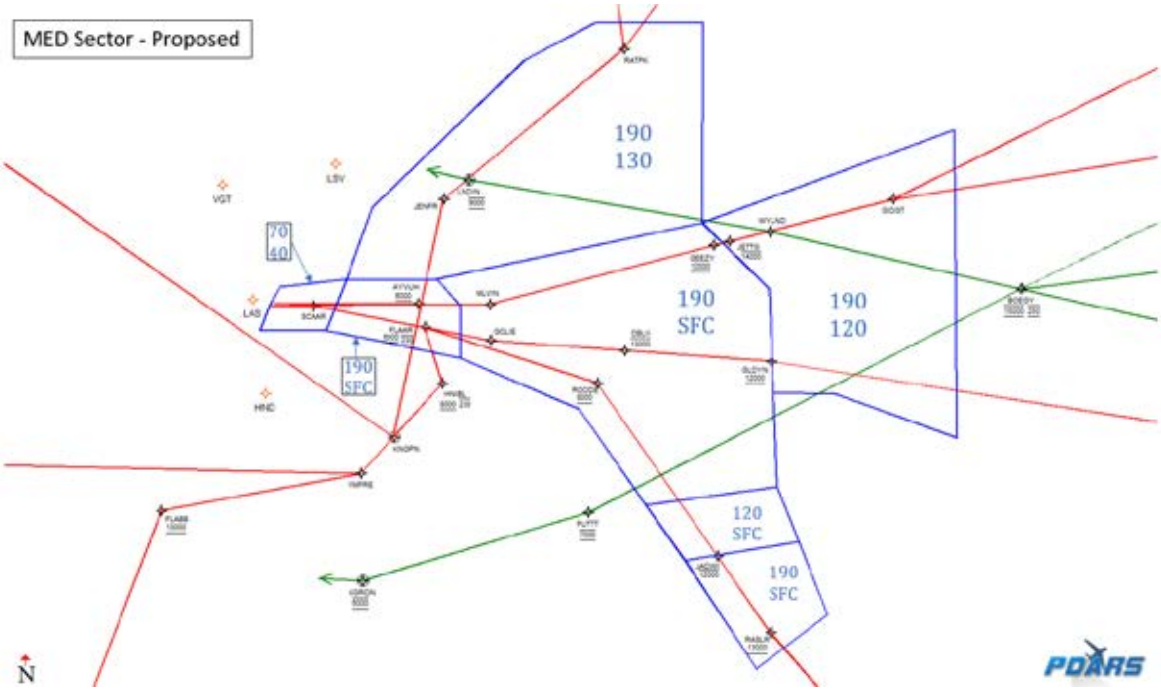


Figure 26: Overlay of Proposed MED Sector with Proposed RNAV Procedures

L30 SAT Sector

The current SAT Sector is depicted in Figure 27.

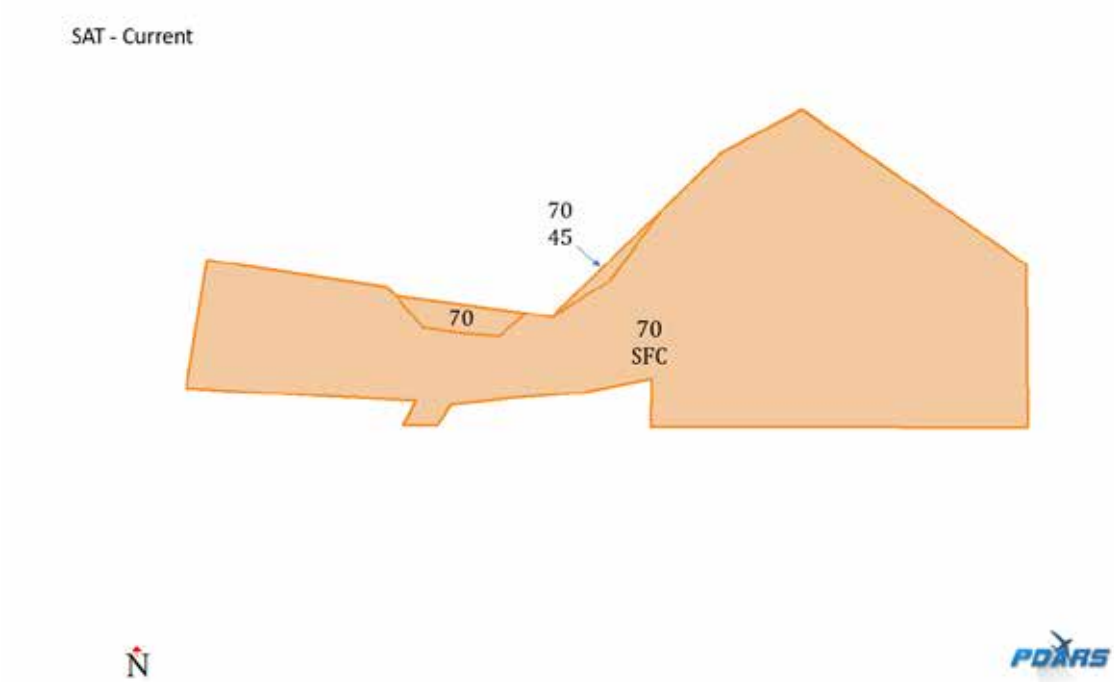


Figure 27: Current SAT Sector

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

The SAT Sector was expanded laterally on the northeastern edge of the sector with airspace acquired from ZLA Sectors 07. The SAT Sector was changed with airspace transferred between SAT and L30 Sectors FNL, GNT, KNO, LAK and MED.

The proposed SAT Sector is depicted in Figure 28.
An overlay of the current and proposed SAT Sector is depicted in Figure 29.

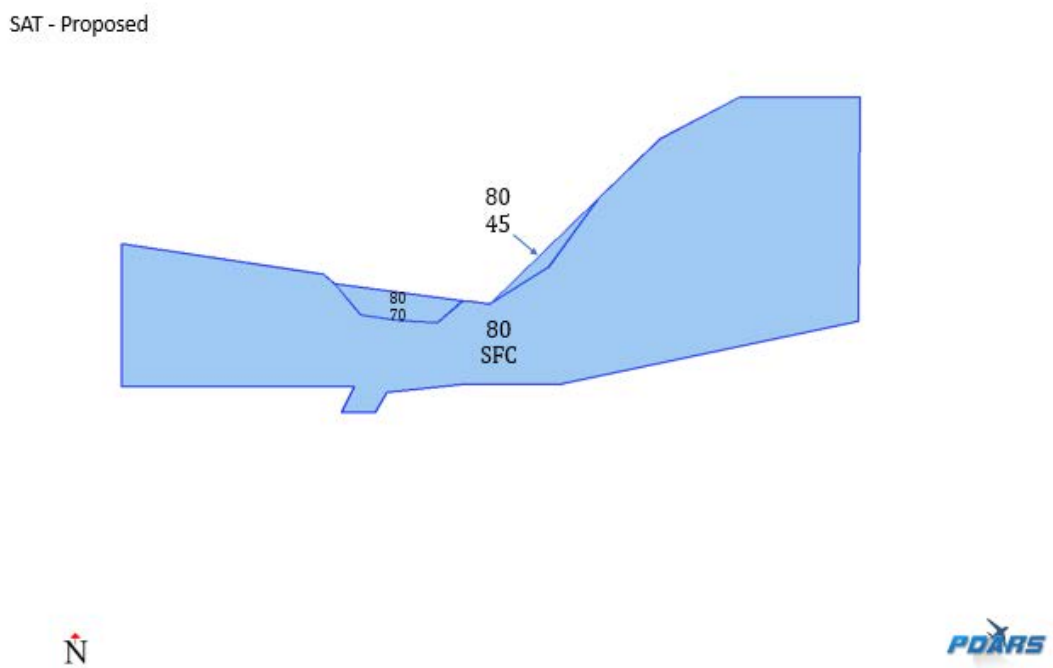


Figure 28: Proposed SAT Sector

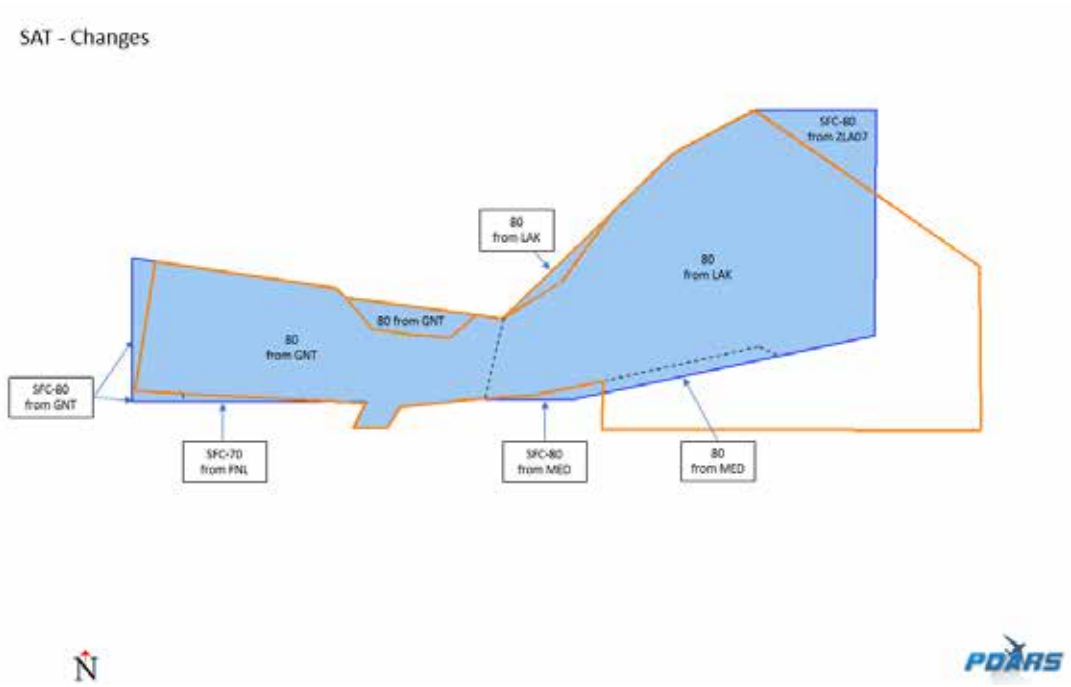


Figure 29: Overlay of Current and Proposed SAT Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KLAS CHOWW STAR
- KLAS RKSTR STAR

An overlay of the proposed SAT Sector with proposed RNAV procedures is depicted in Figure 30.

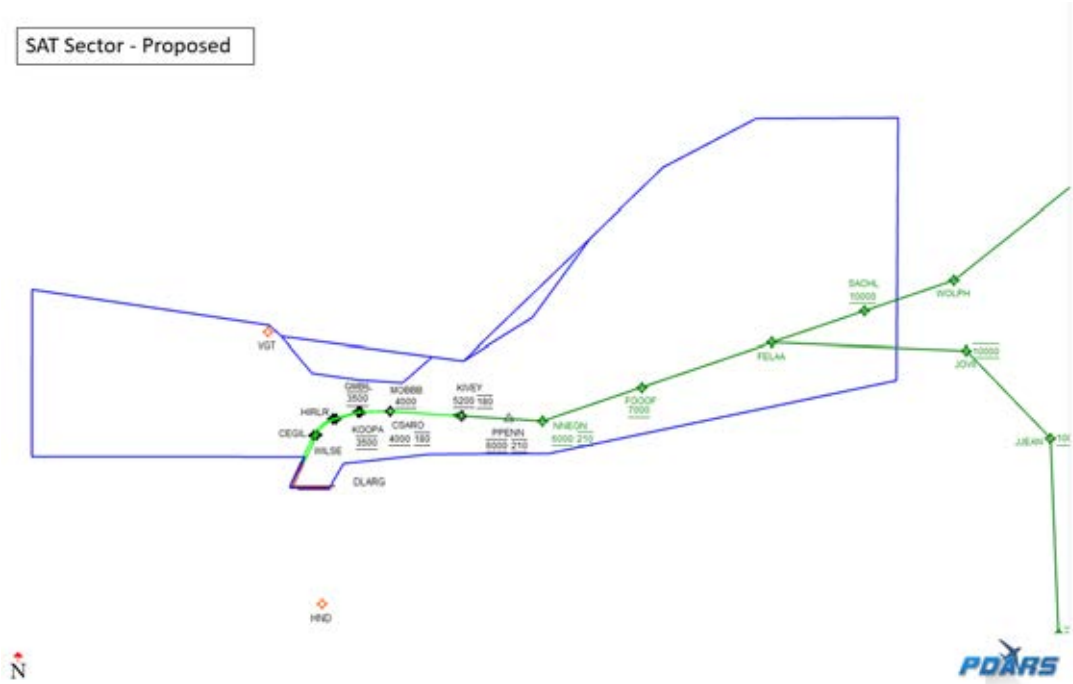


Figure 30: Overlay of Proposed SAT Sector with Proposed RNAV Procedures

Additional Design Considerations

- Spectrum analysis will be required for the proposed airspace changes associated with the proposed RNAV procedures.

The L30 airspace changes affect the following facility area(s) as indicated:

- Nellis Air Traffic Control Facility (NATCF)
- Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors:
  - CYN
  - DAG
  - FNL
  - GNT
  - KNO
  - LAK
  - MED
  - SAT
- Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors:
  - 06
  - 07
  - 08
  - 16

Implementation Dependencies

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND and KVGT.

Document changes/modifications include:

- ZLA Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- ZLA and L30 sector boundary maps
- ZLA/L30 Letter of Agreement (LOA)
- L30/LAS LOA
- LAS/L30/HND LOA
- ZLA Standard Operating Procedures (SOP)
- L30 SOP
- LAS SOP
- ERAM and STARS Automation Changes (ADRS, ADAR, Waypoint Pairs, etc.)
- NAS Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Standard Operating Procedures
- Airspace Illustrations
- Spectrum package
- Automation package
- Table of frequencies for all affected sectors/positions
- Spectrum analysis results
- HITL simulation results

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	P/Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23APR19 Date

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

The Las Vegas Metroplex Project was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation, providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures in to and out of area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows, allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures.

Extensive changes were made to designated airspace at air traffic control sectors in the Las Vegas Terminal Radar Control (L30 TRACON) and Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

Name of Change and Airport/s	Change Classification
Las Vegas Terminal Radar Control Facility (TRACON/L30) Airspace Changes	Delegated Airspace
OAPM Study Team Reference(s)	**Current Phase of Design**
4.2 L30 Airspace Expansion	☐ Preliminary Operational Design (PD) ☒ Proposed Final Design (PFD)
Package Date	**Implementation Date**
5/31/2019	5/21/2020
Affected Airport(s), Facilities and Positions, Areas, and/or Sectors	**Related/Dependent Submissions**
McCarran International Airport (KLAS), Henderson Executive Airport (KHND), North Las Vegas Airport (KVGT), Nellis Air Force Base (KLSV) Nellis Air Traffic Control Facility (NATCF) Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors: CYN, DAG, FNL, GNT, KNO, LAK, MED, SAT Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors: 06, 07, 08, 16	KLAS JOHKR Standard Instrument Departure (SID) KLAS RADYR SID KLAS RASLR SID KLAS NIITZ SID KLAS GIDGT SID KLAS RATPK SID KLAS LOHLA SID KLAS COKTL Standard Terminal Arrival Route (STAR) KLAS RNDRZ STAR KLAS RKSTR STAR KLAS CHOWW STAR KLAS JAYSN STAR KHND OYODA SID KHND SCAMR SID KHND GAMES STAR KHND NTNDO STAR KHND BOEGY STAR KVGT FLCHR STAR KVGT WYLND STAR
Associated Data Files	
Standard Operating Procedures Airspace Illustrations Spectrum package Automation package Table of frequencies for all affected sectors/positions Spectrum analysis results HITL simulation results	

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

Purpose

The Las Vegas Metroplex Project was tasked with developing advanced Area Navigation (RNAV) air traffic control procedures for the Las Vegas Valley area. These new procedures are based on satellite navigation, providing repeatable and predictable paths, reducing complexity and increasing efficiency in the National Airspace System (NAS). The final RNAV designs provide dedicated, but not exclusive, corridors that funnel arrivals and departures in to and out of area airports in a more efficient manner. The procedures were designed to provide segregation of traffic flows, allowing Optimized Profile Descents (OPDs) for arrivals and less restrictive climbs for departures. The Project developed Standard Terminal Arrival Routes (STARs), Standard Instrument Departures (SIDs) and Required Navigation (RNP) approach procedures.

Extensive changes are required for designated airspace at air traffic control sectors in the Las Vegas Terminal Radar Control (L30 TRACON) and Los Angeles Air Route Traffic Control Center (ZLA ARTCC) to accommodate new traffic flows.

Study Team Issues and Solutions

Issues

L30's current lateral airspace boundary is insufficient to accommodate runway transitions for LAS arrivals for all configurations. During periods of moderate and heavy traffic, sequencing to Runways 25L/R localizers extends back to ZLA airspace. Arrivals from the southwest, landing Runway 01L/R have difficulty meeting speed and altitude assignments. The current ZLA/L30 Transfer of Control Points (TCP) do not allow for the timely issuance of runway assignments.

The HND NOOTN STAR entry point into L30's airspace requires excessive coordination between ZLA Sectors 7 and 8.

Solutions

Expanding L30's current lateral boundary allowed the Las Vegas MST to develop Optimized Profile Descent (OPD) STARs with runway transitions for all configurations. The Las Vegas MST recommended airspace expansion would allow sequencing to Runways 25L/R to be contained within L30 airspace. Optimized procedures facilitate compliance with speed and altitude assignments thereby reducing transmissions and pilot/controller task complexity. The Las Vegas MST recommends ZLA issues the LAS landing direction (one option per configuration per gate) and L30 issues the runway transition.

The proposed airspace modification reduces coordination and complexity, allows for timely runway assignments, and provides additional airspace for sequencing. The Las Vegas MST considered surveillance coverage when designing L30 airspace expansion. D&I should further analyze the airspace expansion to ensure adequate surveillance coverage. Figure 4-3 depicts the Las Vegas MST conceptual L30 airspace expansion.

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

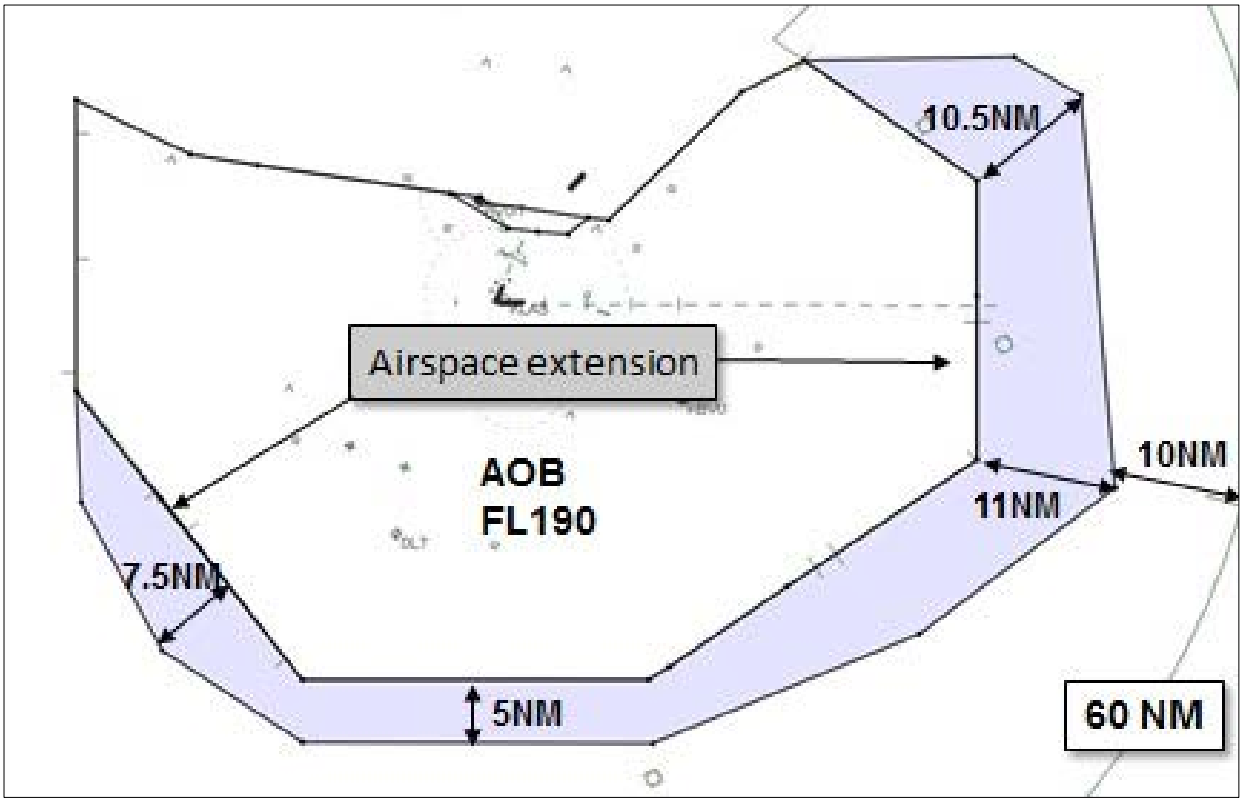


Figure 1: MST Proposed L30 Airspace

Proposed Final Design

The Design and Implementation (D&I) Team undertook an extensive review of airspace at L30 and ZLA to determine the suitability of current airspace and changes that would be necessary to accommodate new designs. The L30 delegated airspace was expanded laterally with airspace transferred from ZLA to provide flexibility and increased options for controllers as they sequence arrivals and departures to Las Vegas Valley airports. This expanded L30 airspace will also allow the issuance of alternate runway assignment for arrivals if required.

Current L30 Sector internal airspace delegation is dependent on which configuration is being utilized at KLAS. The Proposed Final Design will also provide changing lateral and vertical boundaries tailored to individual configurations.

This Proposed Final Design Package presents changes for KLAS Configuration Four, which serves arrivals and departures on KLAS Runways 08 L/R; and 19 L/R.

The Proposed Final Design of L30 airspace for KLAS Configuration Four is as follows:

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

<u>L30 CYN Sector</u>

The current L30 CYN Sector is depicted in Figure 2.

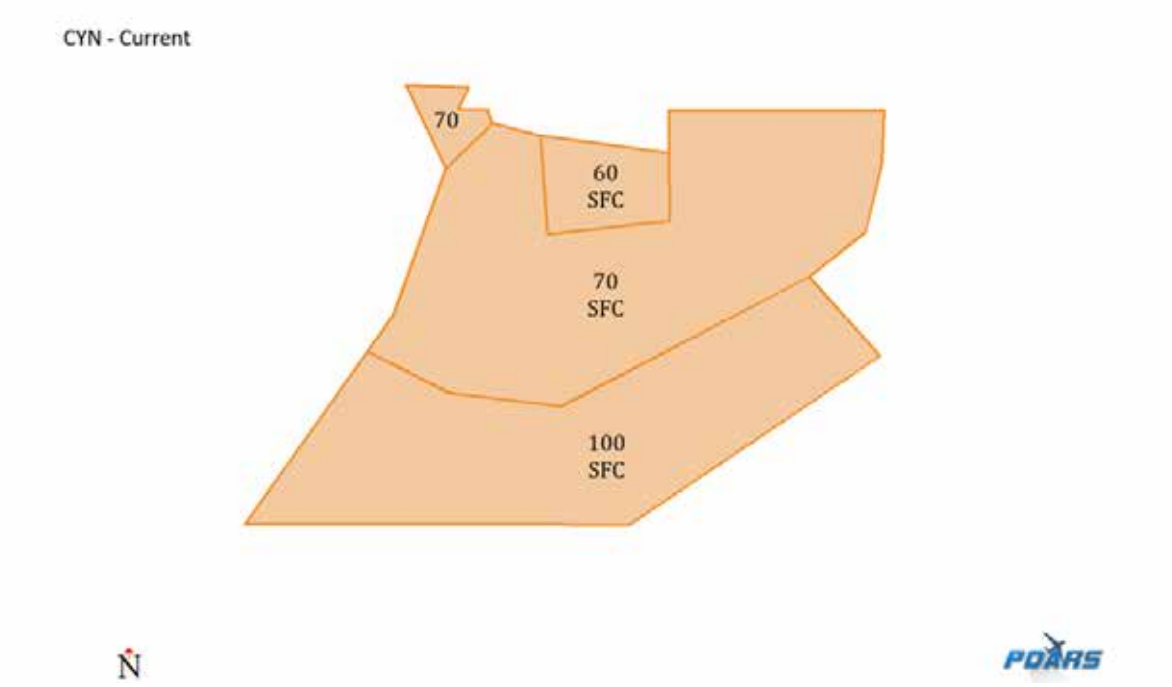


Figure 2: Current CYN Sector

The CYN Sector was expanded laterally on the southern edge of the sector with airspace acquired from ZLA Sectors 06 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between CYN and L30 Sectors DAG, FNL, GNT, LAK and MED.

The proposed CYN Sector is depicted in Figure 3.
An overlay of the current and proposed CYN Sector is depicted in Figure 4.

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

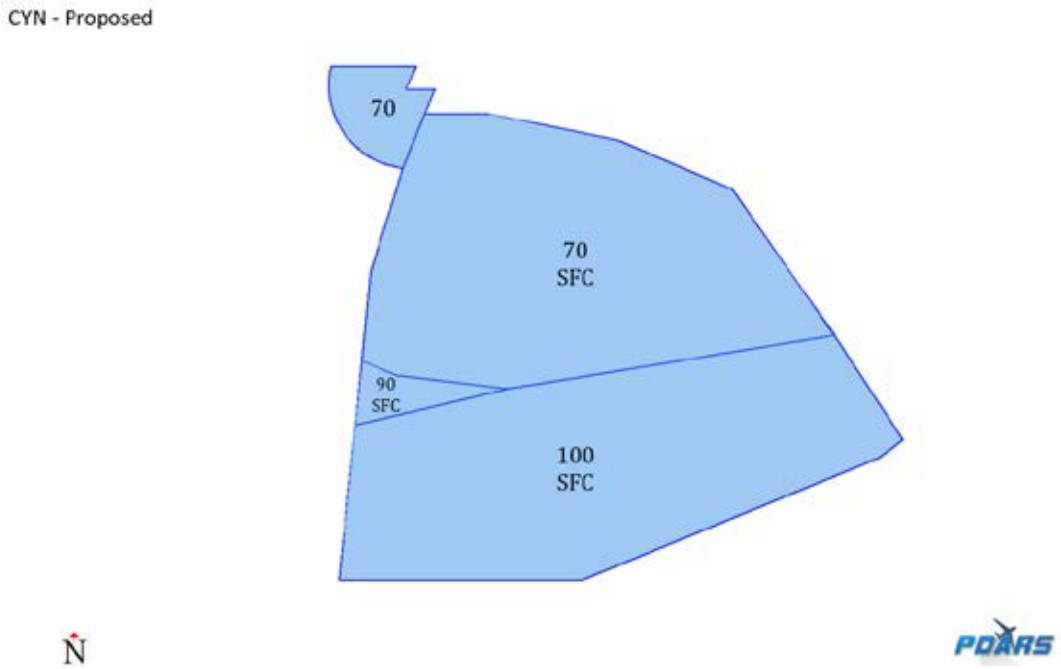


Figure 3: Proposed CYN Sector

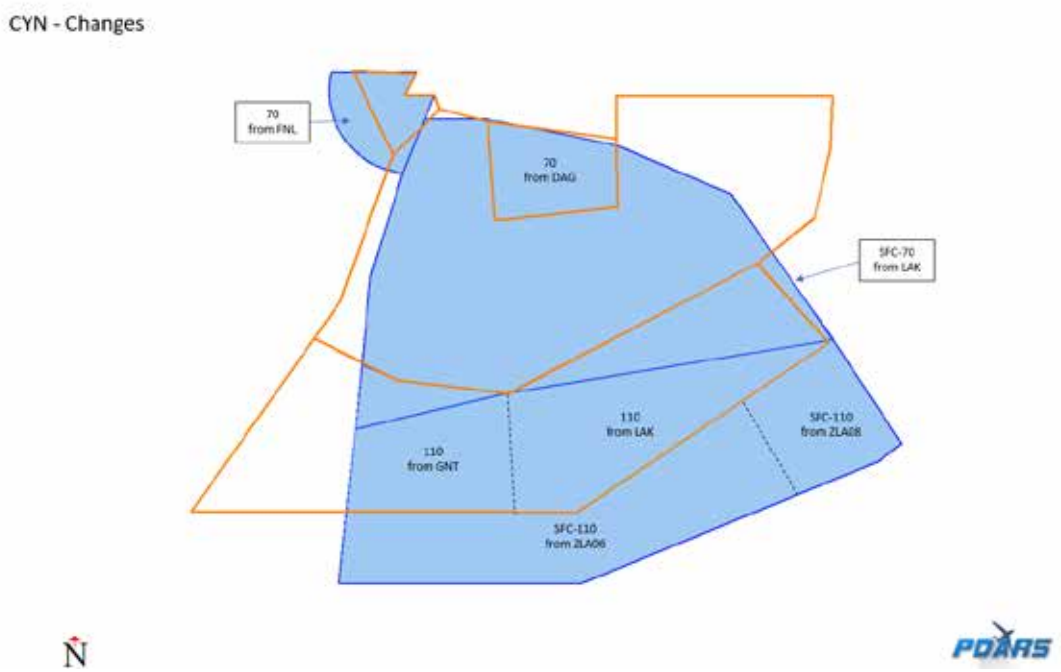


Figure 4: Overlay of Current and Proposed CYN Sector

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND BOEGY STAR
- KHND GAMES STAR
- KHND NTNDO STAR
- KHND OYODA SID
- KHND SCAMR SID

An overlay of the proposed CYN Sector with proposed RNAV procedures is depicted in Figure 5.

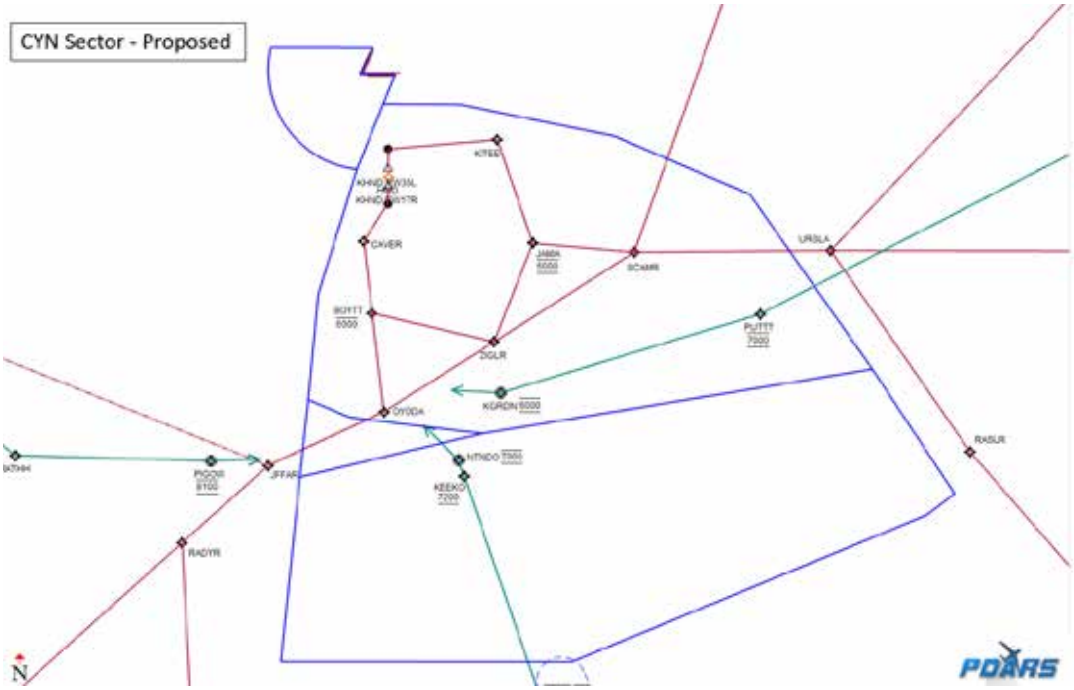


Figure 5: Overlay off Proposed CYN Sector with Proposed RNAV Procedures

L30 DAG Sector

The current DAG Sector is depicted in Figure 6.

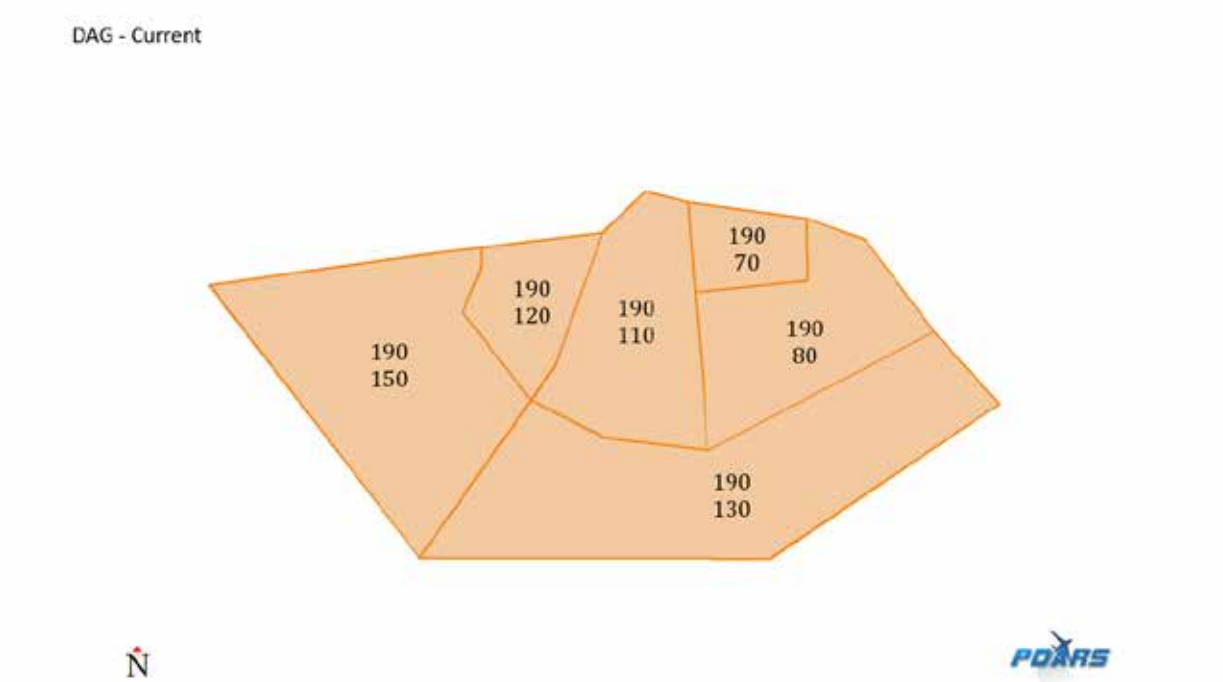


Figure 6: Current DAG Sector

The DAG Sector was expanded laterally on the western and southern edges of the sector with airspace acquired from ZLA Sectors 06, 08 and 16. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between DAG and L30 Sectors CYN, GNT, LAK and MED.

The proposed DAG Sector is depicted in Figure 7.
An overlay of the current and proposed DAG Sector is depicted in Figure 8.

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

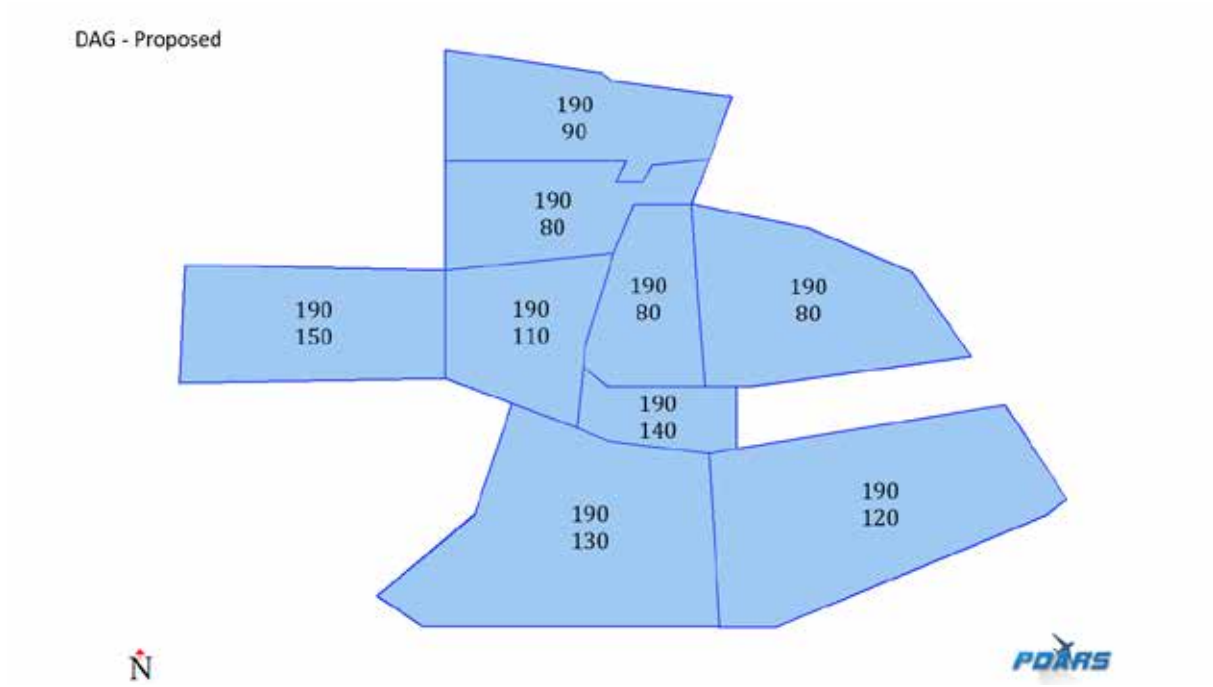


Figure 7: Proposed DAG Sector

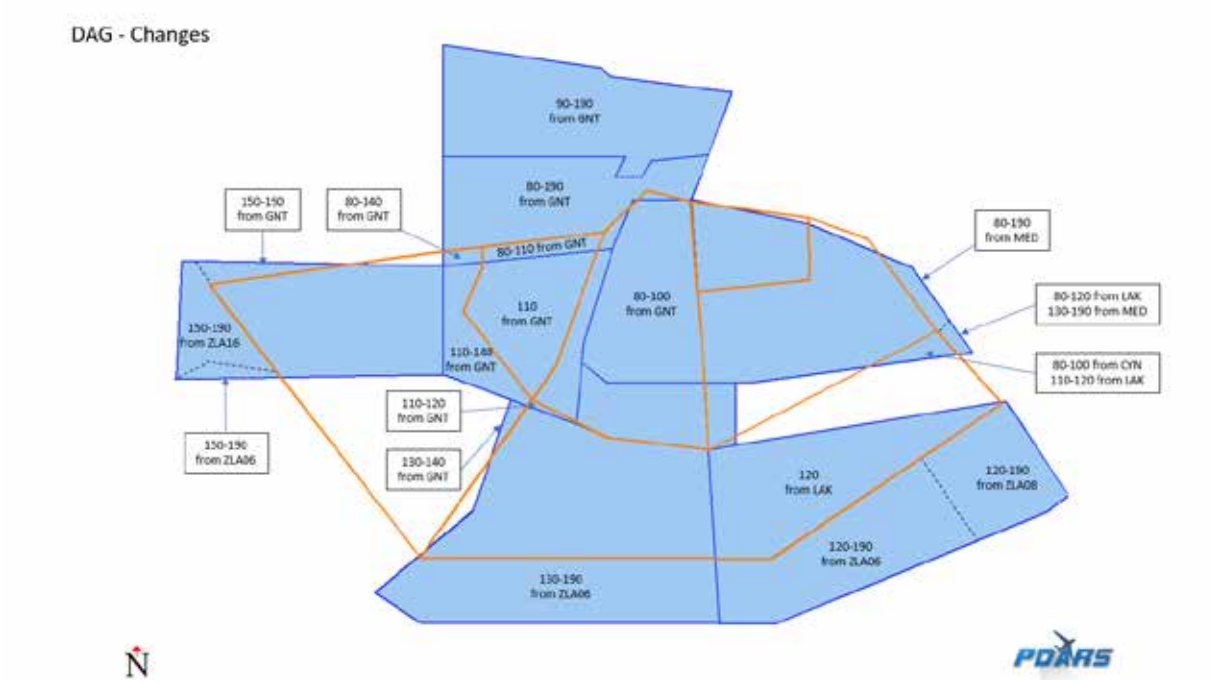


Figure 8: Overlay of Current and Proposed DAG Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND OYODA SID
- KHND SCAMR SID
- KLAS JOHKR SID
- KLAS LOHLA SID
- KLAS RATPK SID
- KLAS RAYDR SID

An overlay of the proposed DAG Sector with proposed RNAV procedures is depicted in Figure 9.

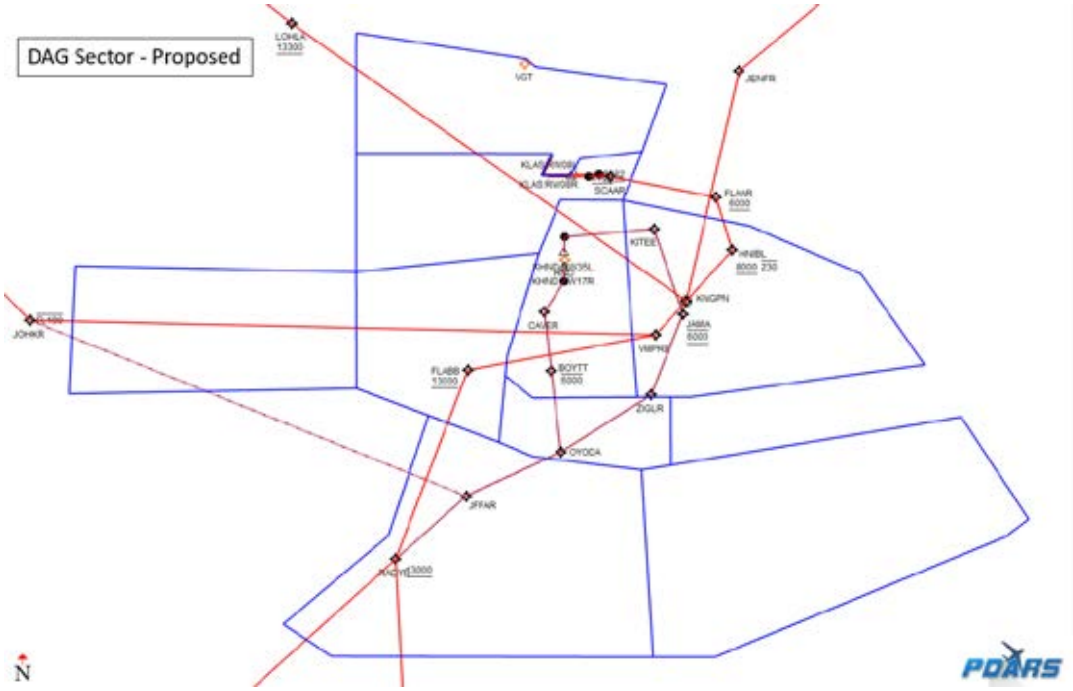


Figure 9: Overlay of Proposed DAG Sector with Proposed RNAV Procedures

L30 FNL Sector

The current FNL Sector is depicted in Figure 10.

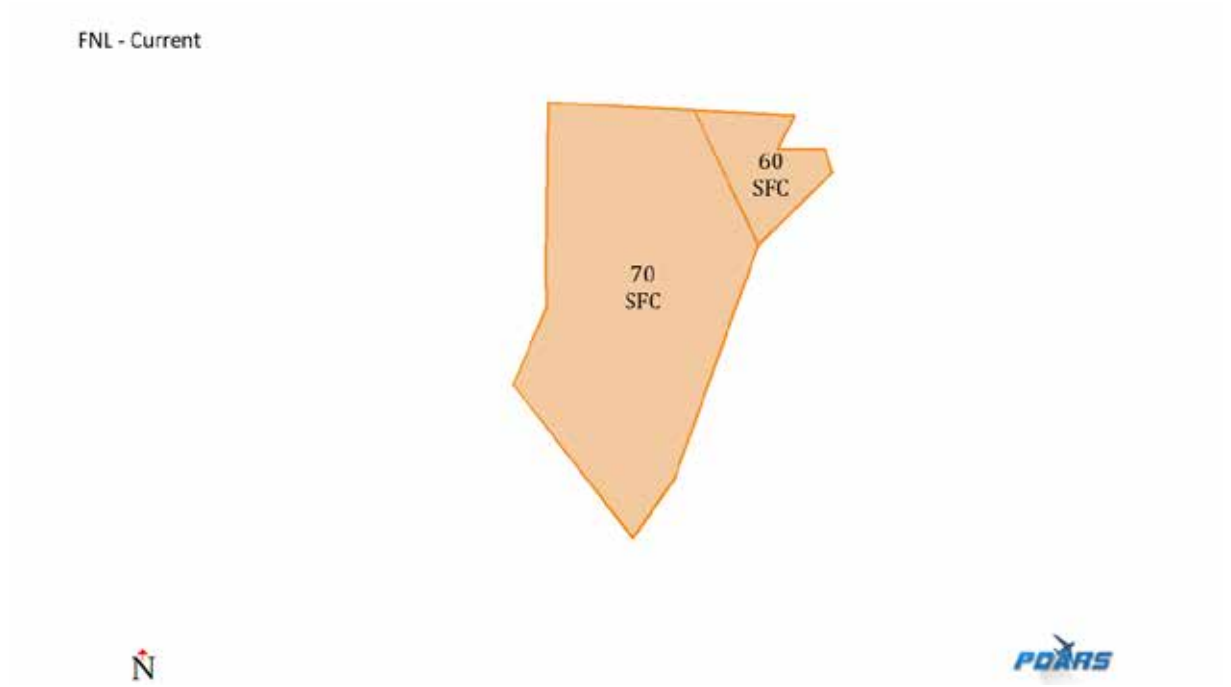


Figure 10: Current FNL Sector

The FNL Sector was changed with airspace transferred between FNL and L30 Sectors CYN, GNT, MED and SAT.

The proposed FNL Sector is depicted in Figure 11.
An overlay of the current and proposed FNL Sector is depicted in Figure 12.

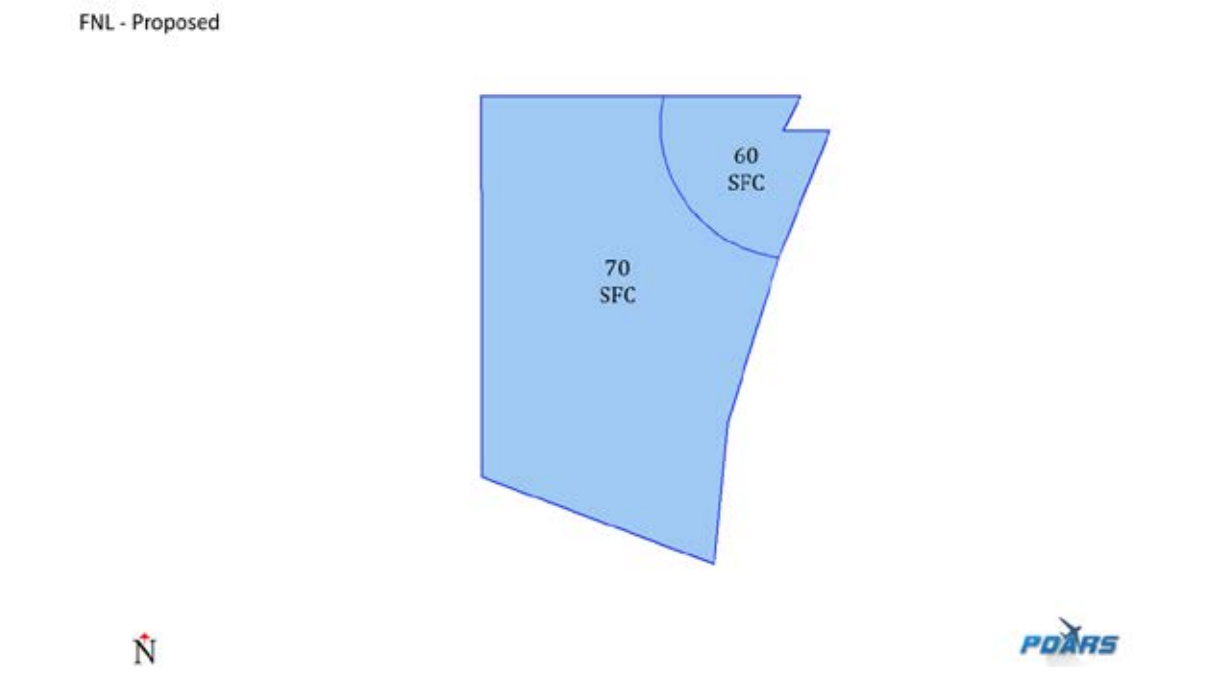


Figure 11: Proposed FNL Sector

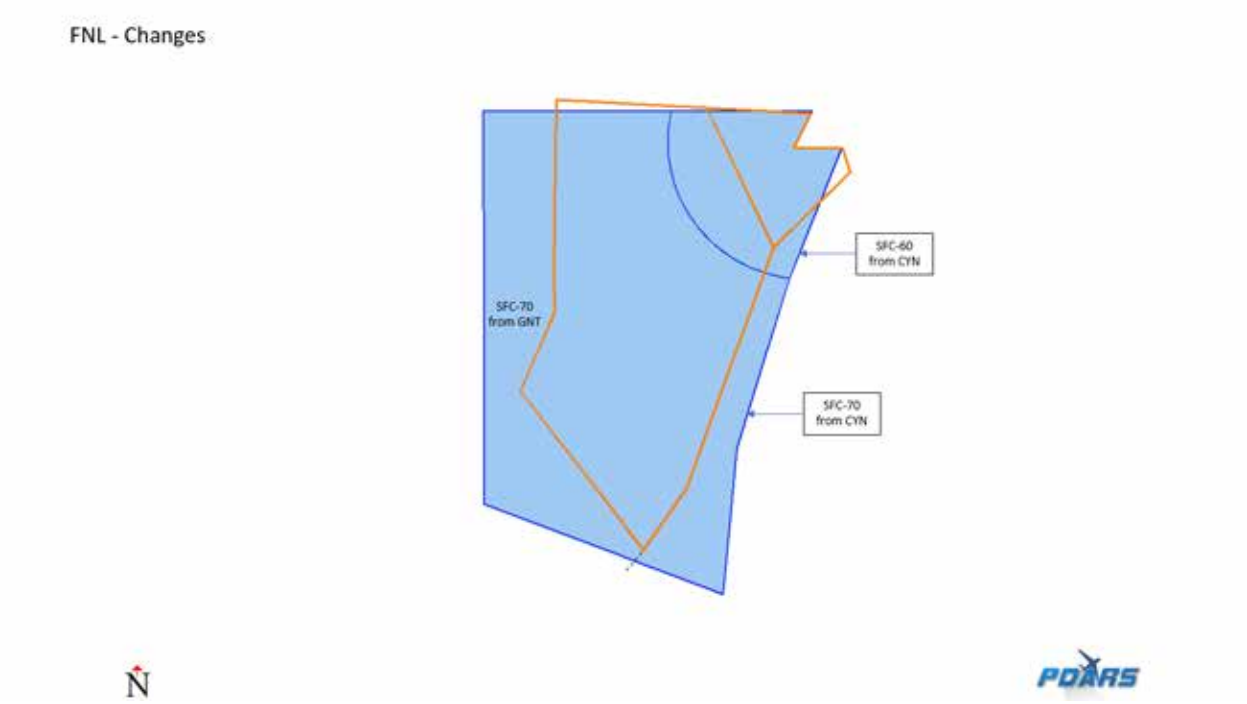


Figure 12: Overlay of Current and Proposed FNL Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KLAS COKTL STAR
- KLAS JAYSN STAR
- KLAS RKSTR STAR
- KLAS RNDRZ STAR

An overlay of the proposed FNL Sector with proposed RNAV procedures is depicted in Figure 13.

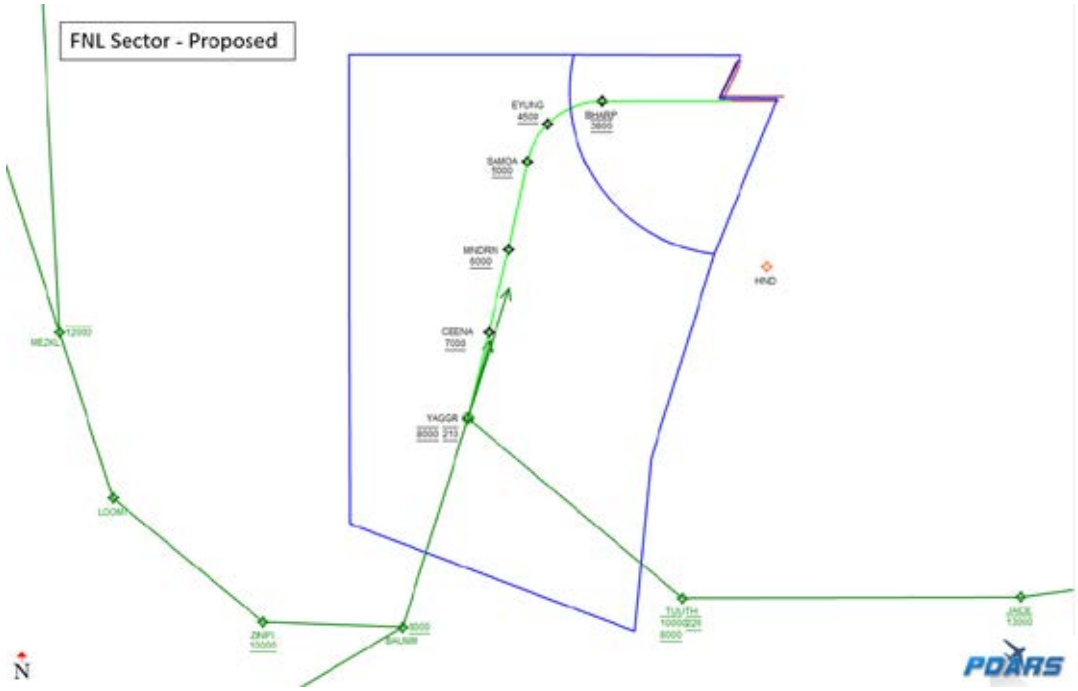


Figure 13: Overlay of Proposed FNL Sector with Proposed RNAV Procedures

L30 GNT Sector

The current GNT Sector is depicted in Figure 14.

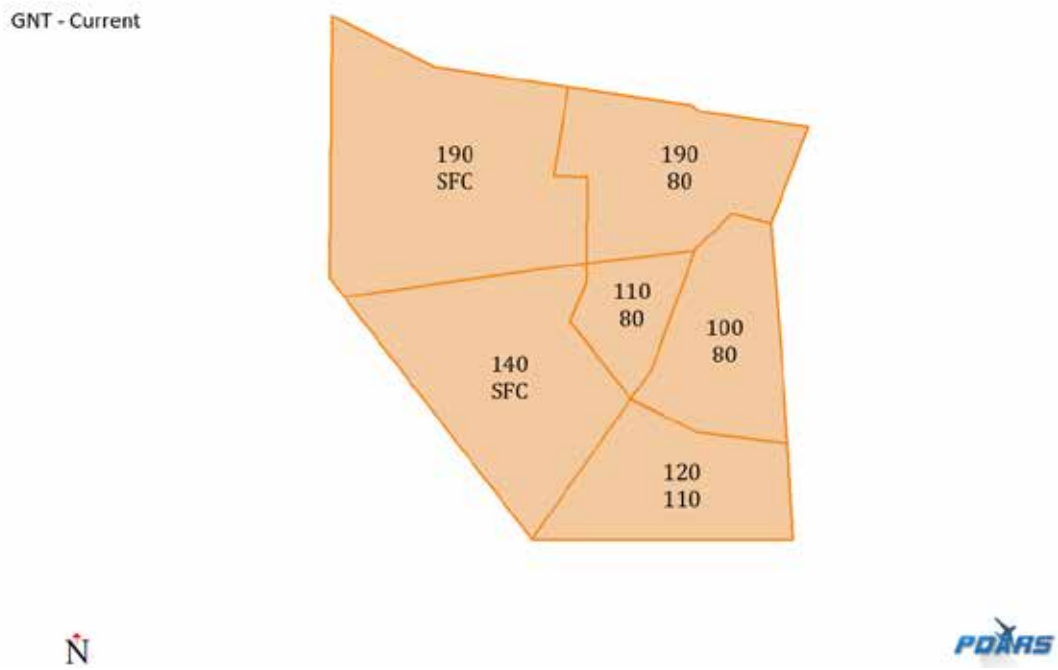


Figure 14: Current GNT Sector

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

The GNT Sector was expanded laterally on the southern, southwestern and western edges of the sector with airspace acquired from ZLA Sectors 06 and 16. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between GNT and L30 Sectors CYN, DAG, FNL and SAT.

The proposed GNT Sector is depicted in Figure 15.
An overlay of the current and proposed GNT Sector is depicted in Figure 16.

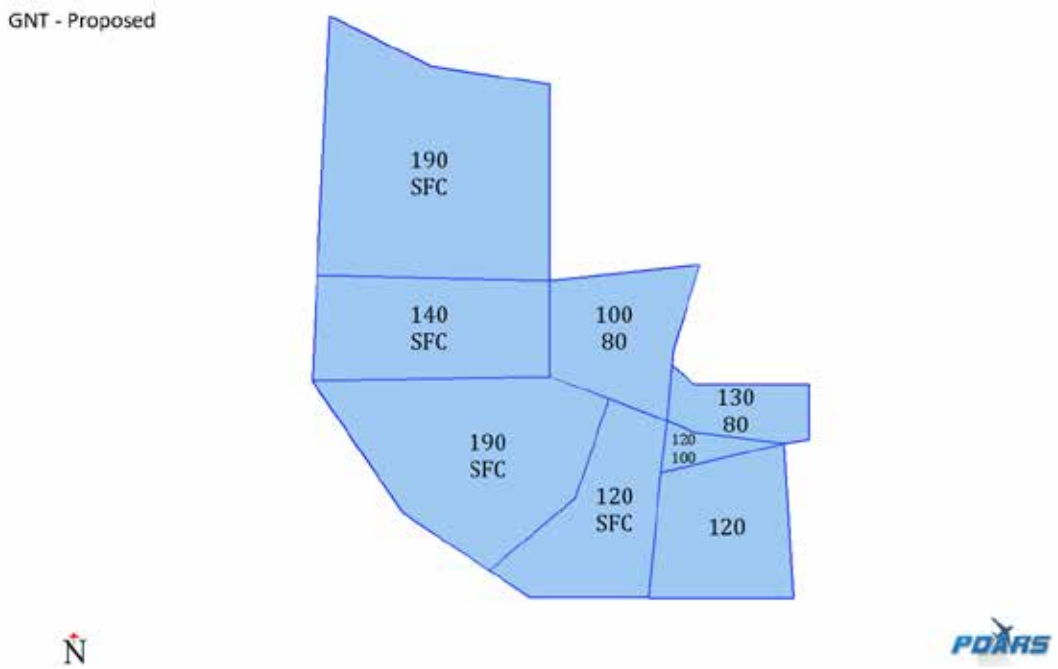


Figure 15: Proposed GNT Sector

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

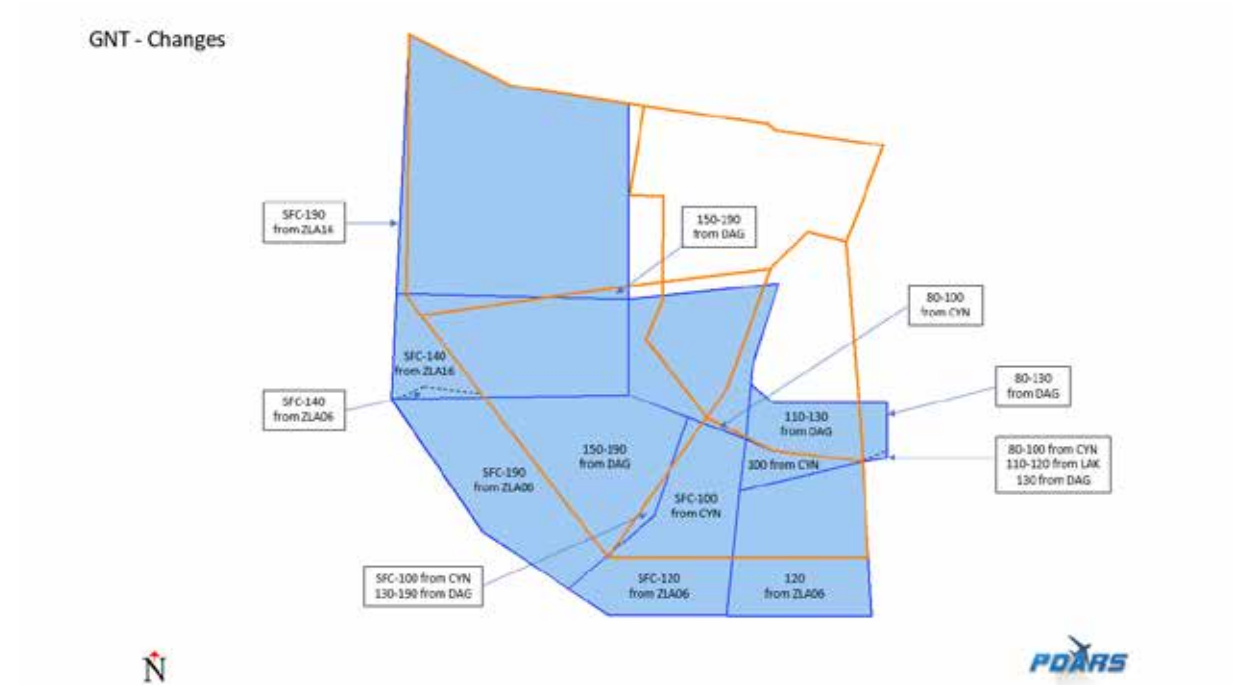


Figure 16: Overlay of Current and Proposed GNT Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- HND GAMES STAR
- KLAS COKTL STAR
- KLAS JAYSN STAR
- KLAS RNDRZ STAR

An overlay of the proposed GNT Sector with proposed RNAV procedures is depicted in Figure 17.

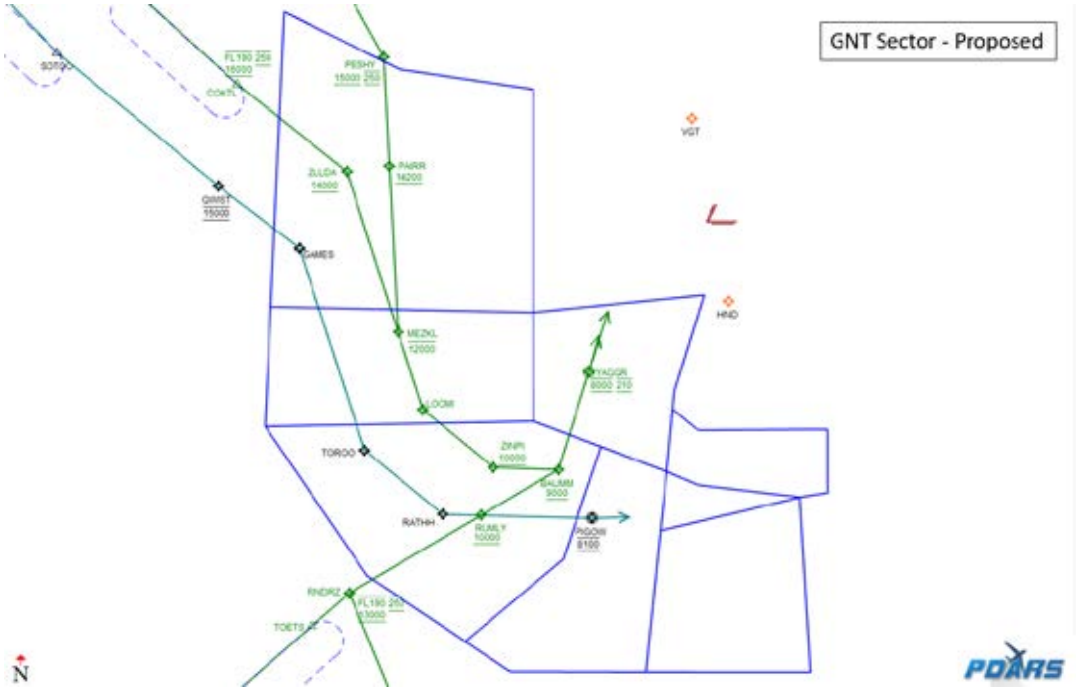


Figure 17: Overlay of Proposed GNT Sector with Proposed RNAV Procedures

L30 KNO Sector

In current state, there is no KNO Sector in KLAS Configuration Four. A new KNO Sector was developed with airspace transferred from ZLA Sector 07 and L30 Sector SAT. The transfer of ZLA airspace will expand the entire L30 airspace responsibility to the east.

The proposed KNO Sector along with sectors contributing airspace is depicted in Figure 18.

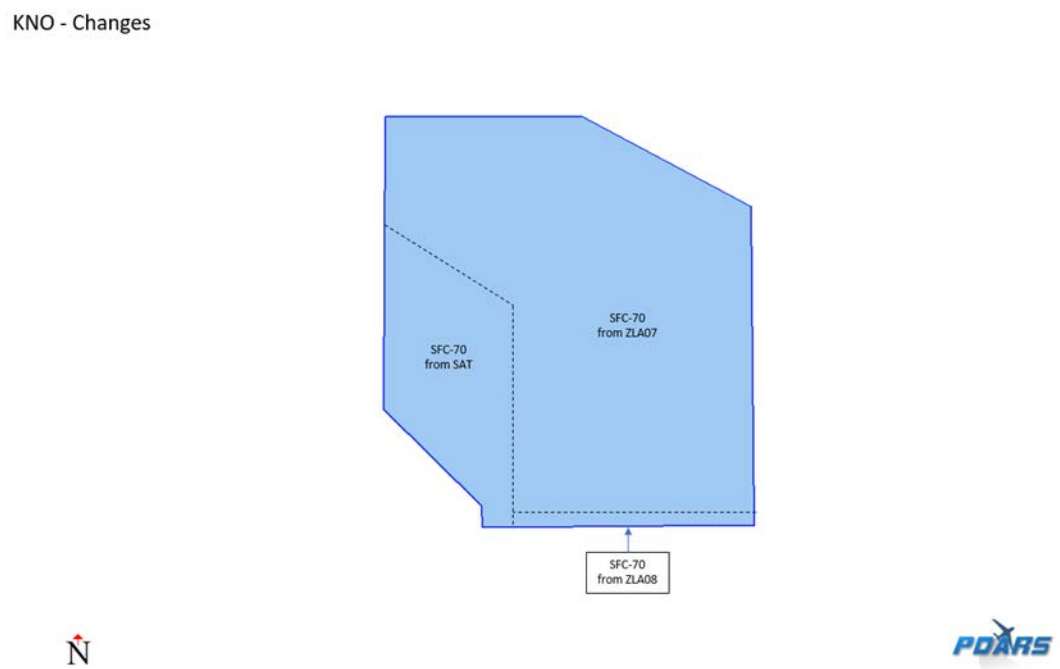


Figure 18: Proposed KNO Sector

No new RNAV procedures route through the proposed KNO Sector. These changes will help reduce complexity and accommodate airspace changes for other affected L30 Sectors.

<u>L30 LAK Sector</u>

The current LAK Sector is depicted in Figure 19.

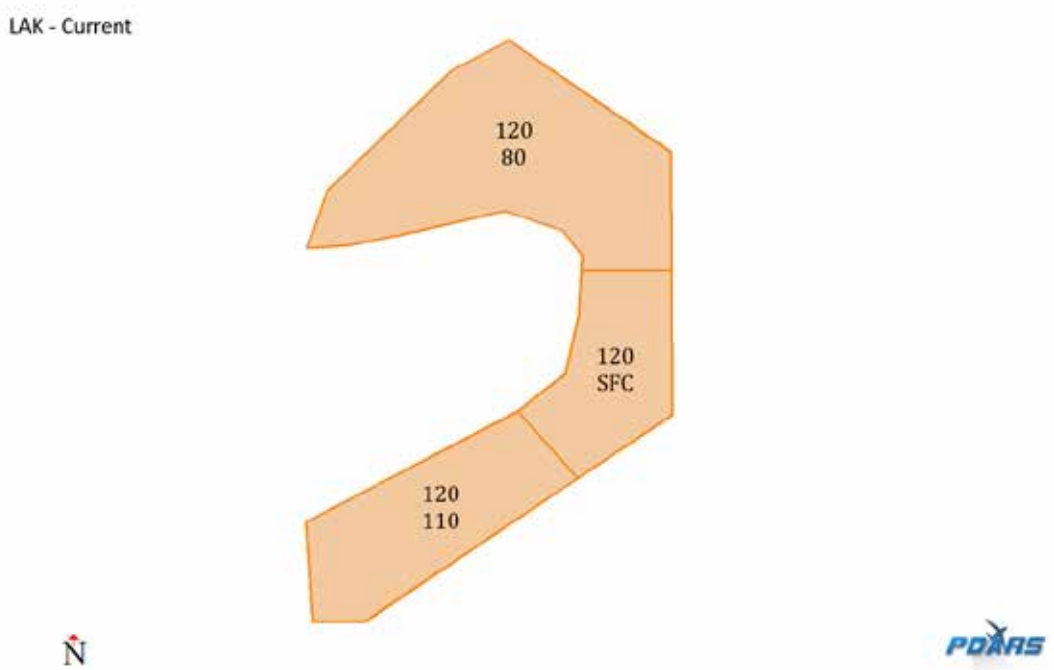


Figure 19: Current LAK Sector

The LAK Sector was expanded laterally on the eastern edge of the sector with airspace acquired from ZLA Sectors 07 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between KNO and L30 Sectors CYN, DAG, GNT, MED and SAT.

The proposed LAK Sector is depicted in Figure 20.
An overlay of the current and proposed LAK Sector is depicted in Figure 21.

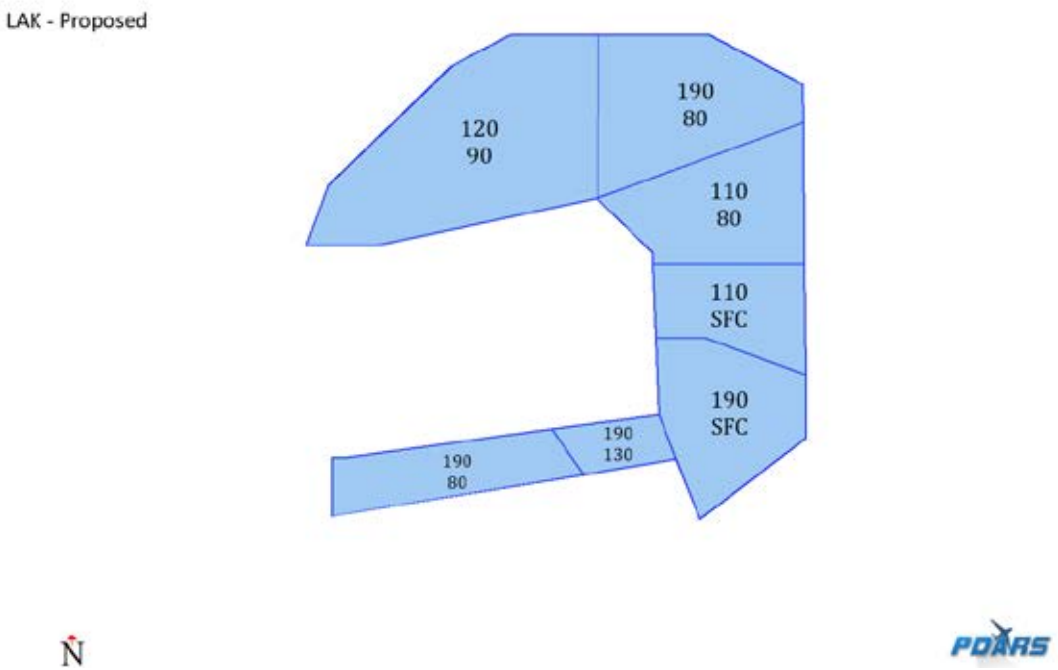


Figure 20: Proposed LAK Sector

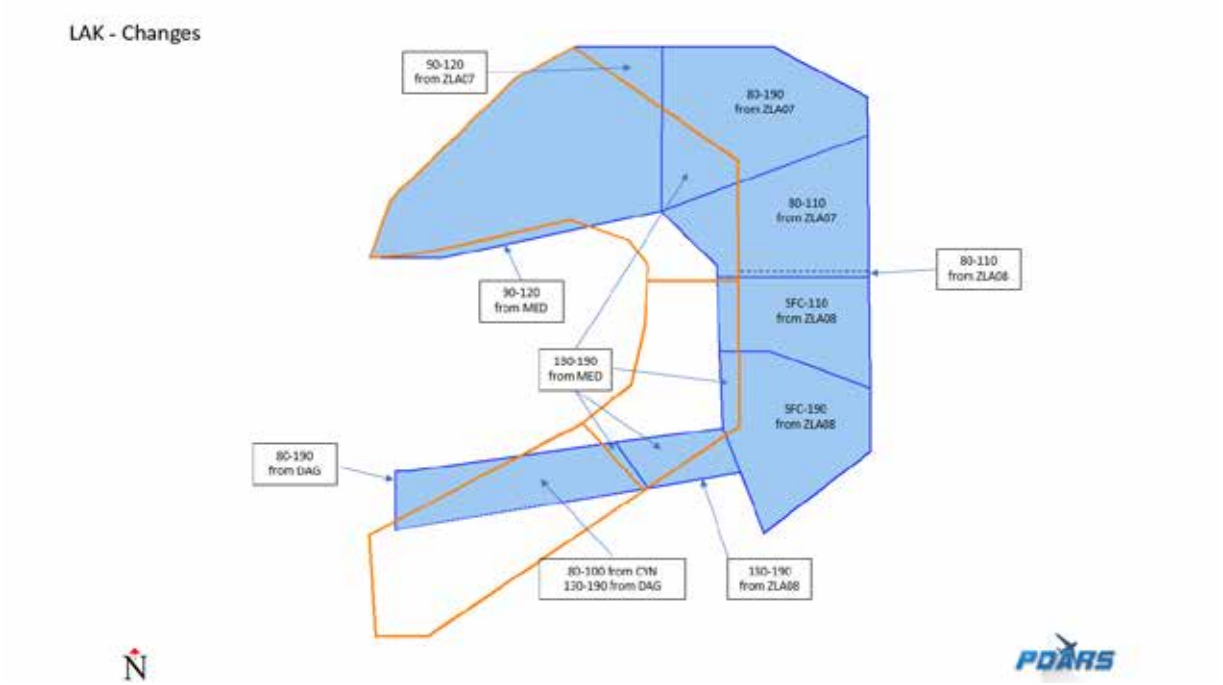


Figure 21: Overlay of Current and Proposed LAK Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND BOEGY STAR
- KLAS COKTL STAR
- KLAS RKSTR STAR
- KVGT WYLND STAR

An overlay of the proposed LAK Sector with proposed RNAV procedures is depicted in Figure 22.

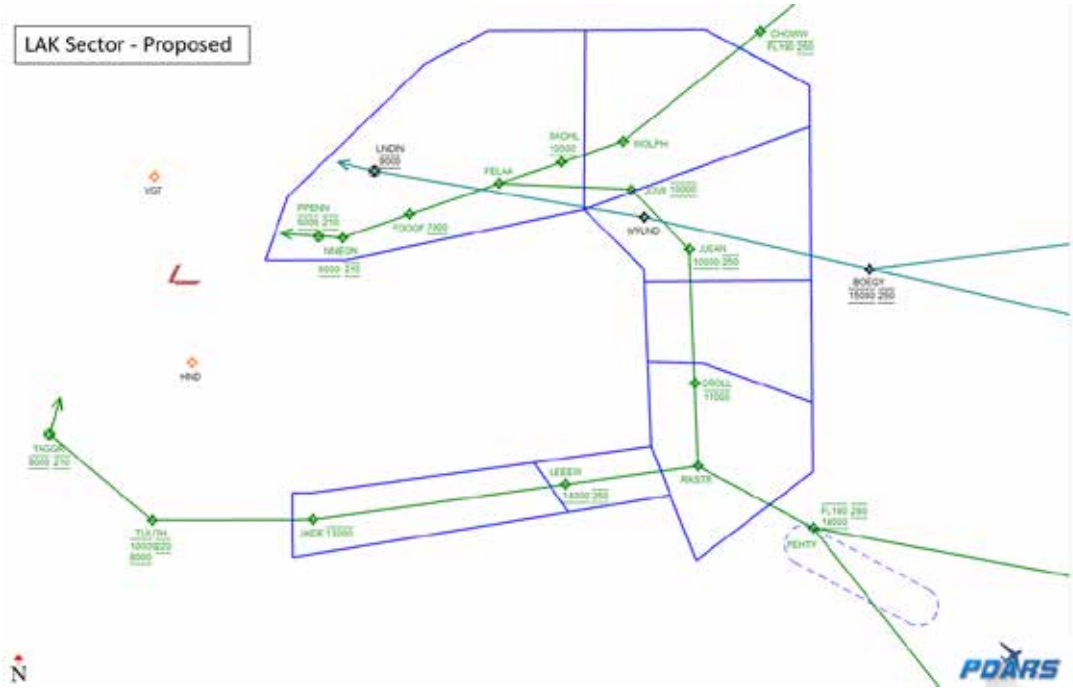


Figure 22: Overlay of Proposed LAK Sector with Proposed RNAV Procedures

L30 MED Sector

The current MED Sector is depicted in Figure 23.

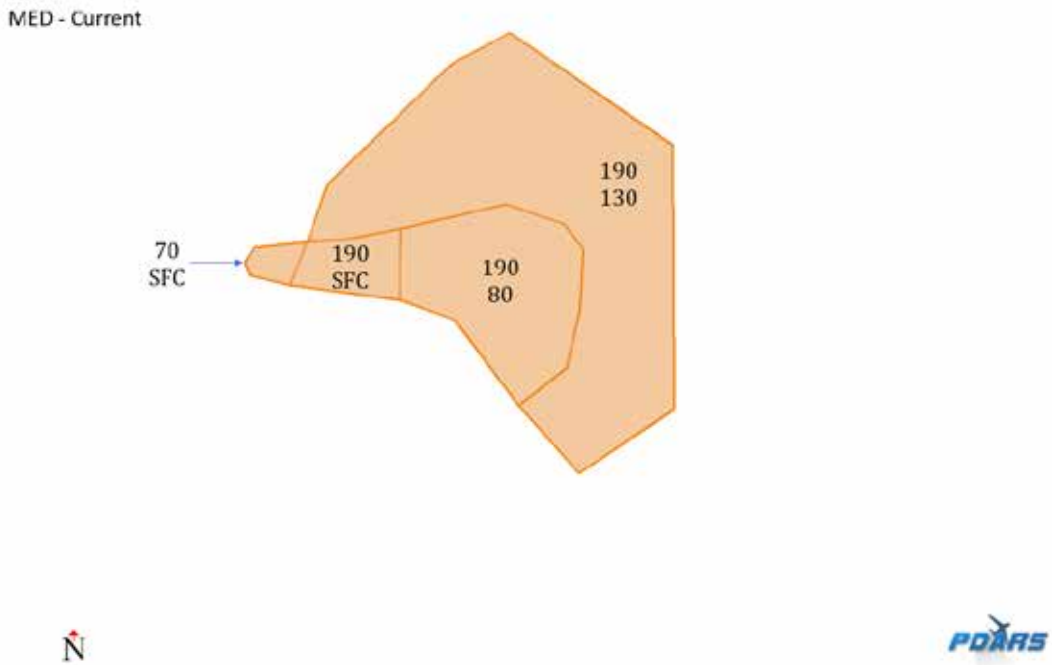


Figure 23: Current MED Sector

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

The MED Sector was expanded laterally on the northeastern, eastern and southeastern edgse of the sector with airspace acquired from ZLA Sectors 07 and 08. Additional changes were made to the lateral and vertical boundaries internal to L30 with airspace transfers between MED and L30 Sectors CYN, DAG, LAK and SAT.

The proposed MED Sector is depicted in Figure 24.
An overlay of the current and proposed MED Sector is depicted in Figure 25.

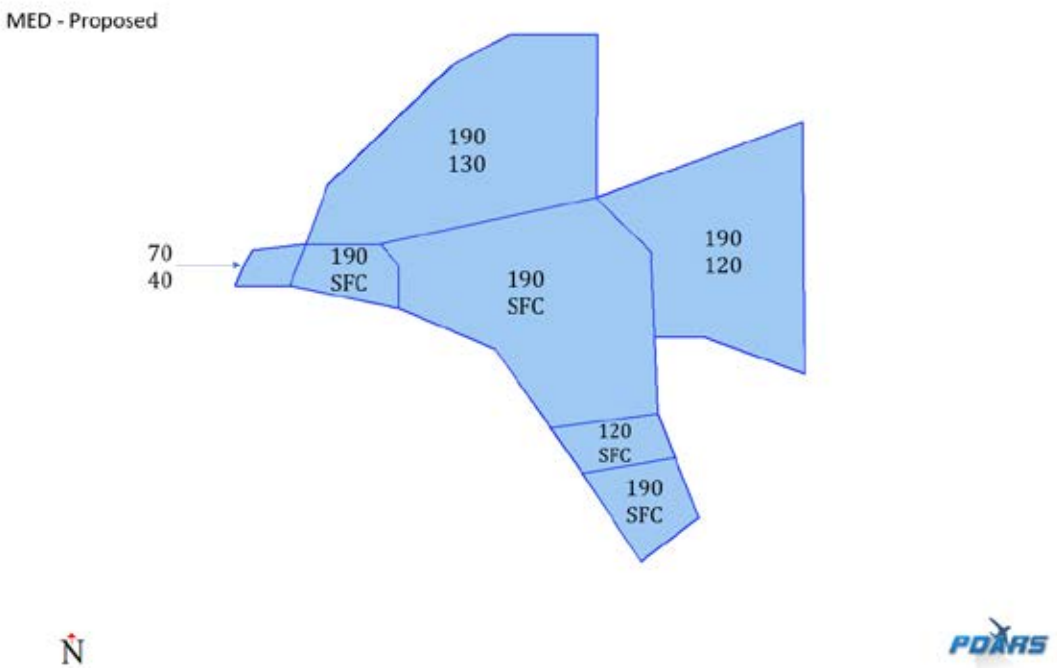


Figure 24: Proposed MED Sector

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

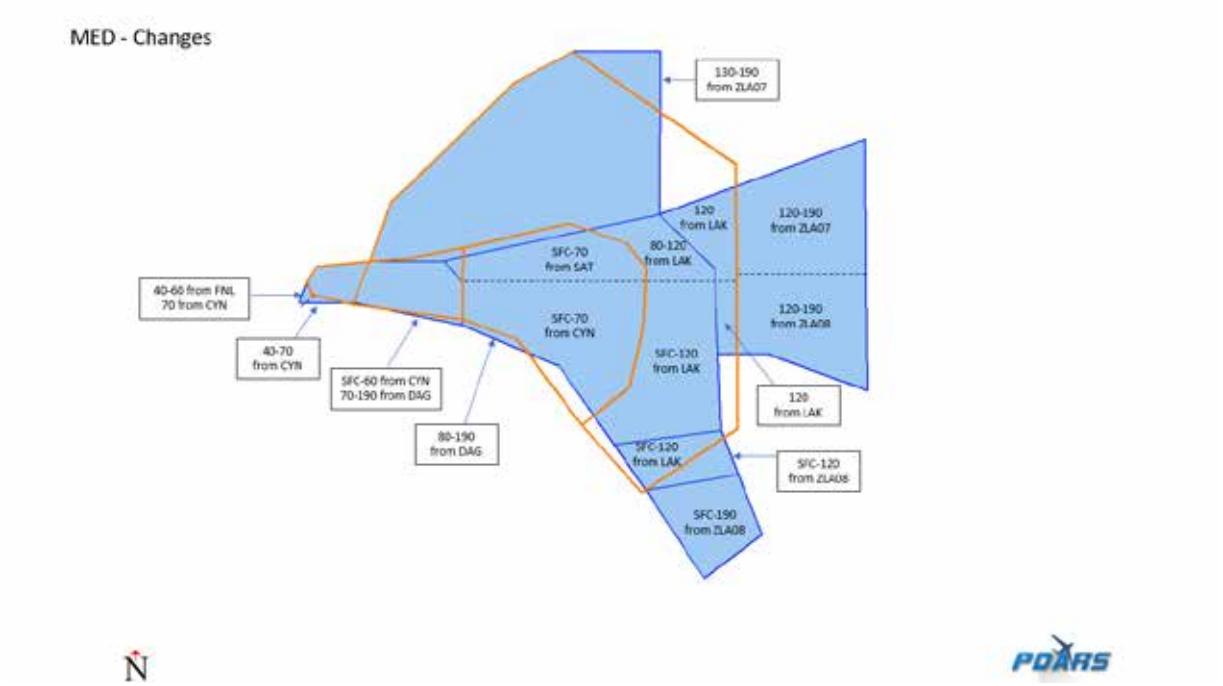


Figure 25: Overlay of Current and Proposed MED Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KHND SCAMR SID
- KLAS GIDGT SID
- KLAS JOHKR SID
- KLAS LOHLA SID
- KLAS NIITZ SID
- KLAS RADYR SID
- KLAS RASLR SID
- KLAS RATPK SID

An overlay of the proposed MED Sector with proposed RNAV procedures is depicted in Figure 26.

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

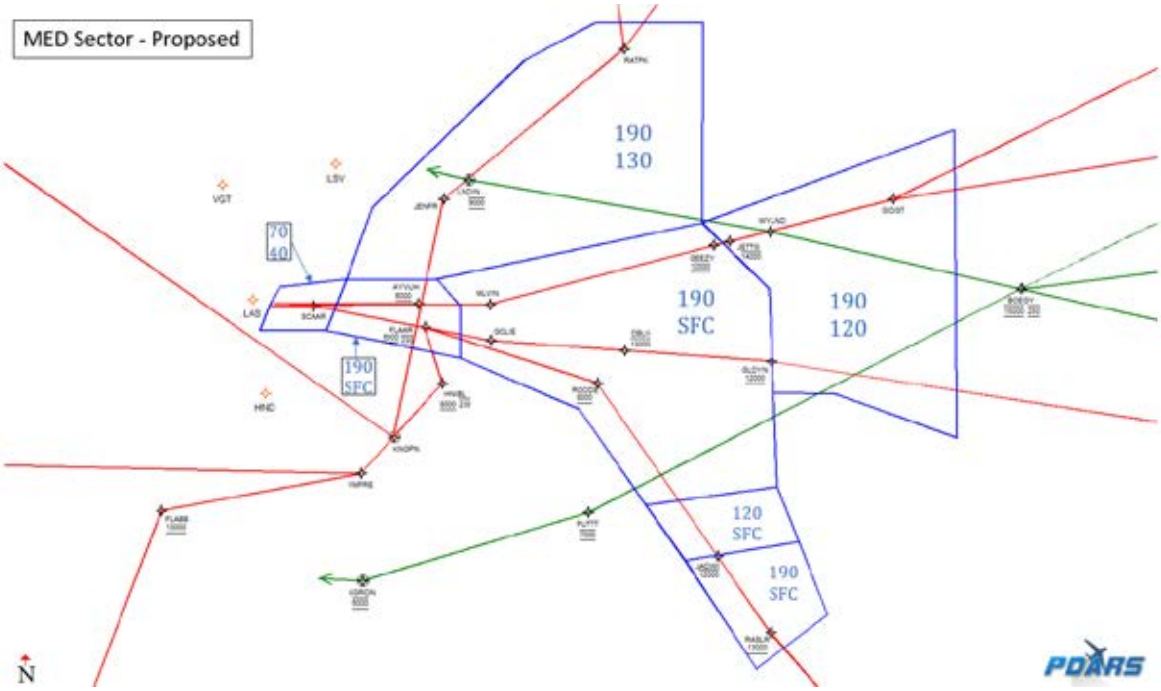


Figure 26: Overlay of Proposed MED Sector with Proposed RNAV Procedures

L30 SAT Sector

The current SAT Sector is depicted in Figure 27.

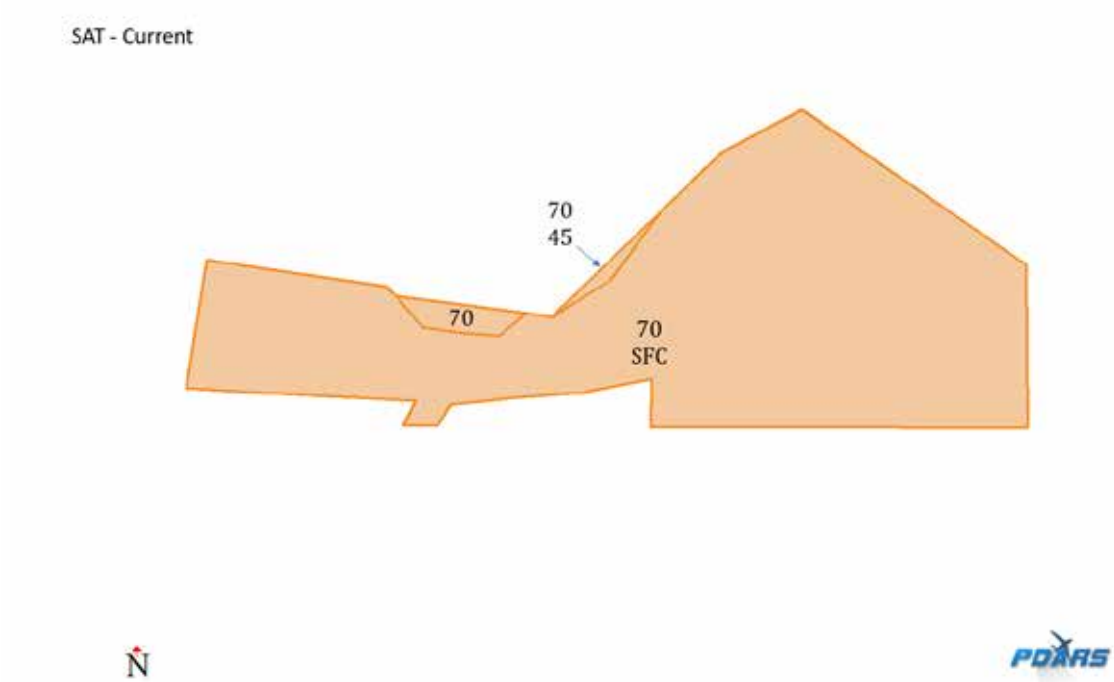


Figure 27: Current SAT Sector

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

The SAT Sector was expanded laterally on the northeastern edge of the sector with airspace acquired from ZLA Sectors 07. The SAT Sector was changed with airspace transferred between SAT and L30 Sectors FNL, GNT, KNO, LAK and MED.

The proposed SAT Sector is depicted in Figure 28.
An overlay of the current and proposed SAT Sector is depicted in Figure 29.

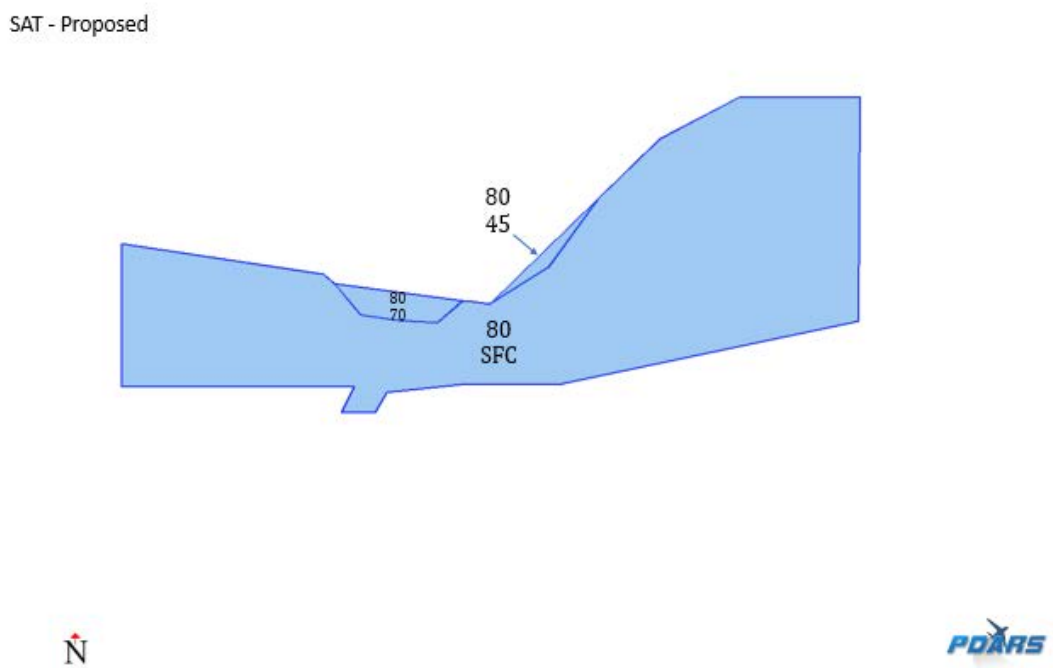


Figure 28: Proposed SAT Sector

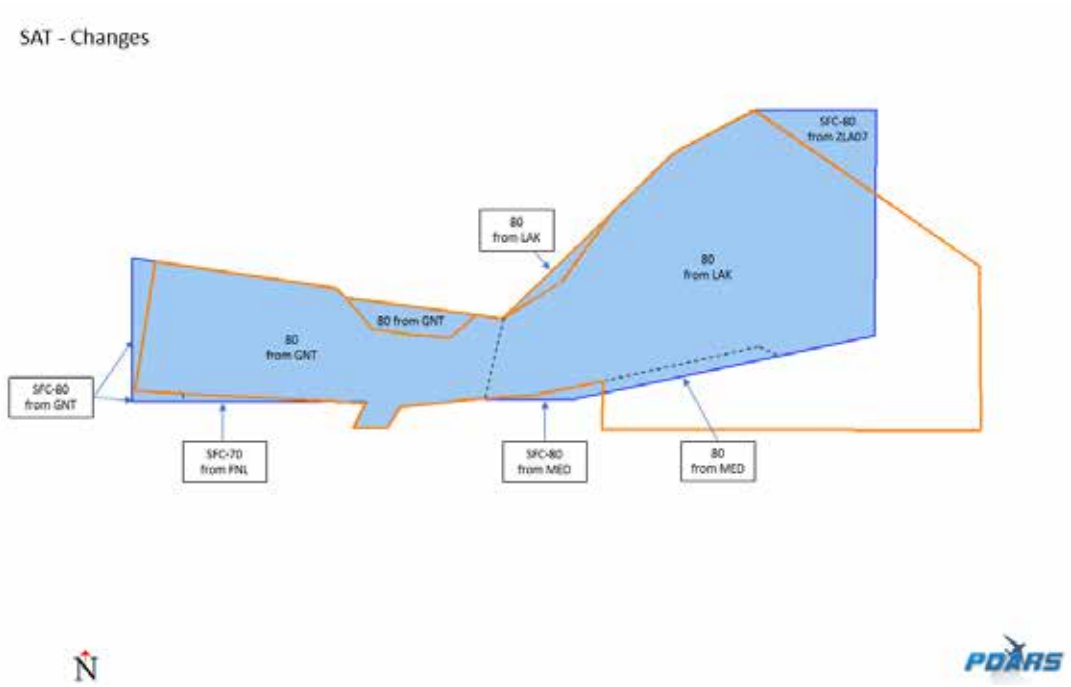


Figure 29: Overlay of Current and Proposed SAT Sector

These changes will help reduce complexity and accommodate arrivals/departures on the newly designed RNAV routes:

- KLAS CHOWW STAR
- KLAS RKSTR STAR

An overlay of the proposed SAT Sector with proposed RNAV procedures is depicted in Figure 30.

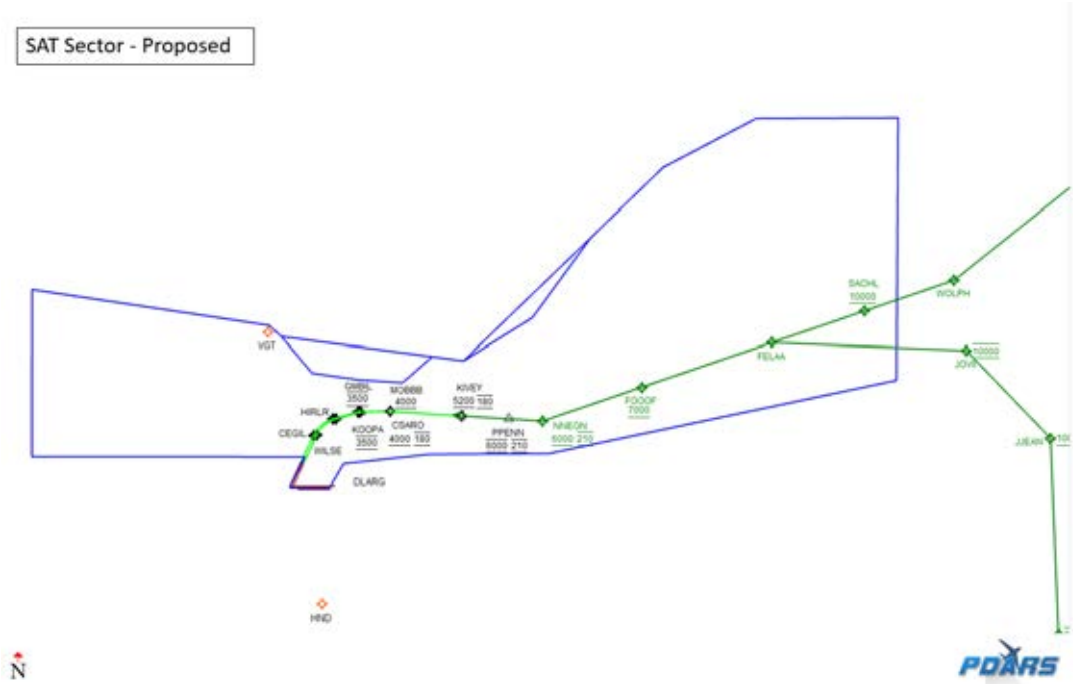


Figure 30: Overlay of Proposed SAT Sector with Proposed RNAV Procedures

Additional Design Considerations

- Spectrum analysis will be required for the proposed airspace changes associated with the proposed RNAV procedures.

The L30 airspace changes affect the following facility area(s) as indicated:

- Nellis Air Traffic Control Facility (NATCF)
- Las Vegas Terminal Radar Approach Control (L30 TRACON) Sectors:
  - CYN
  - DAG
  - FNL
  - GNT
  - KNO
  - LAK
  - MED
  - SAT
- Los Angeles Air Route Traffic Control Center (ZLA ARTCC) Sectors:
  - 06
  - 07
  - 08
  - 16

Implementation Dependencies

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

This procedure will be implemented in conjunction with affected SIDs and STARs designed to serve KLAS, KHND and KVGT.

Document changes/modifications include:

- ZLA Facility Operations and Administration Order 7210.3
- L30 Facility Operations and Administration Order 7210.3
- LAS Facility Operations and Administration Order 7210.3
- ZLA and L30 sector boundary maps
- ZLA/L30 Letter of Agreement (LOA)
- L30/LAS LOA
- LAS/L30/HND LOA
- ZLA Standard Operating Procedures (SOP)
- L30 SOP
- LAS SOP
- ERAM and STARS Automation Changes (ADRS, ADAR, Waypoint Pairs, etc.)
- NAS Integrated Display System (NIDS)
- Enroute Information Display System (ERIDS)
- Enroute Decision Support Tool (EDST)

Additional staffing, facilities, or equipment requirements:

- None anticipated

Attachments

- Standard Operating Procedures
- Airspace Illustrations
- Spectrum package
- Automation package
- Table of frequencies for all affected sectors/positions
- Spectrum analysis results
- HITL simulation results

Las Vegas OAPM Design Package

L30 Configuration Four Airspace Changes

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	Date	Chris Thomas LAS NATCA Lead	Date
Sarah Fletcher ZLA Facility Lead	Date	Martin Ramirez ZLA NATCA Lead	Date
William Wadley L30 Facility Lead	Date	Dan Hauptman L30 NATCA Lead	Date

Review Signatures

The D&I Team have reached agreement through consensus on these procedures using the OAPM process in accordance with the OAPM Memorandum of Understanding.

Bradley R. Mayhugh LAS FAA Lead	4/23/19 Date	Chris Thomas LAS NATCA Lead	4/23/19 Date
Sarah Fletcher ZLA Facility POC	4/23/19 Date	P/Martin Ramirez ZLA NATCA POC	5/2/19 Date
Anita Engelmann TWAB Representative	4/25/19 Date	Dan Hauptman L30 NATCA POC	23APR19 Date