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2 Purpose and Need

The FAA has prepared this Draft EA to evaluate the potential environmental impacts associated with implementation of new RNAV-based flight procedures for the Las Vegas Metroplex (Proposed Action). As required by FAA Order 1050.1F, an EA must include a discussion of the underlying purpose and need for the Proposed Action. This includes a discussion of the problem(s) being addressed and what the FAA plans to achieve by implementing the Proposed Action. The following sections describe the need for the Proposed Action (i.e. the existing issues in the Las Vegas Metroplex that would be addressed by the Proposed Action), as well as the Proposed Action itself.

2.1 The Need for the Proposed Action

In the context of an EA, "need" describes the problem that the Proposed Action is intended to resolve. The problem in this case is the inefficiency of the existing aircraft flight procedures in the Las Vegas Metroplex. RNAV-based SIDs and STARs have been in effect in the Las Vegas Metroplex for nearly 20 years. However, since these procedures were first implemented, RNAV design criteria and guidance have been regularly updated as experience has been gained in the design and use of RNAV procedures. As a consequence, older RNAV procedures do not take full advantage of current RNAV design capabilities and have become increasingly less efficient. The arrival and departure procedures serving the Las Vegas Metroplex can be improved to increase the efficient use of the airspace to the benefit of pilots, controllers, and the general public. Additionally, Conventional procedures lack efficiencies inherent in RNAV-based design. This is because they rely on technology that cannot provide specific and precise navigational benefits for aircraft, including predetermined speeds or altitudes. Furthermore, as discussed in Section 1.2.5.1, conventional procedures are subject to lateral and vertical flight path limitations eliminated through use of RNAV technology. RNAV procedures can reduce the need for controllers to employ vectoring and speed adjustments, thus reducing controller and pilot workload. In turn, this adds efficiency to an air traffic system by enhancing predictability, flexibility, and route segregation. By taking advantage of the increased benefits associated with RNAV technology, the FAA is better able to meet one of its primary missions as mandated by Congress – to provide for the efficient use of airspace, to develop plans and policy for the use of the navigable airspace, and to assign by regulation or order the use of

the airspace necessary to ensure the safety of aircraft and the efficient use of airspace.

The following sections describe the problem in greater detail. Explanations of the technical terms and concepts used in this chapter are found in Chapter 1, *Background*.

2.1.1 Description of the Problem

There are several issues associated with the arrival and departure procedures currently implemented in the Las Vegas Metroplex. These issues are predominantly caused by inefficient lateral and vertical paths, procedures lacking adequate runway transitions, conflicts between arriving and departing traffic, and delays associated with the close proximity of LAS and surrounding satellite (other airports within the Las Vegas Class B airspace) airports.

Most of the STARs serving LAS only offer transitions serving one runway. When a controller issues instructions for a pilot to follow an RNAV STAR with a runway transition, the controller knows when and where the aircraft will fly until it reaches the final approach to the runway. Without a runway transition, the controller must issue vectors and speed adjustments to direct the aircraft to the final approach to the runway. This requires increased communication between controller and pilot. Consequently, less-precise flight paths may result due to the time it takes the controller to issue an instruction to the pilot and for the pilot to read the instruction back to the controller for confirmation before the instruction can be executed. As a result, flight route predictability is reduced, as is efficient use of the airspace.

Current departure traffic flows merge close to the airport increasing task complexity and have inefficient routes and altitudes. Merging flows requires sequencing and separation through the vectoring of aircraft reducing the predictability and repeatability of the procedures while increasing the complexity of the task.

Predictability is also reduced due to a lack of RNAV procedures serving satellite airports. VGT is only served by conventional procedures. RNAV routes allow controllers to know the expected location of aircraft, their altitudes (i.e., where and how high), and speeds (i.e., how fast and when) at key points along a flight path. Procedures that provide these elements result in more predictable routes for both controllers and pilots.

In addition, some arrival and departure flight paths intersect, requiring controllers to direct pilots to level off to maintain adequate vertical and lateral separation between aircraft. Aircraft arriving to LAS on all RNAV STARs and departing on some RNAV SIDs experience more than one segment of level-off during flight. Departures from HND and VGT experience delays due to conflicts with arrivals into LAS. These complex, converging interactions require more frequent controller-to-pilot and controller-to-controller communication and reduce the efficient use of the airspace.

Similarly, underutilized en route transitions limit the number of entry and exit points into L30 airspace. As a result, multiple arriving and departing traffic flows must be sequenced over the same points, increasing both controller and pilot workload and complexity. The entry point for southeast and southwest arrivals and the current northeast STAR serving HND require coordination between ZLA controllers managing neighboring airspace sectors. Furthermore, some departure procedures are inefficient due to design constraints, and there are an insufficient number of departure procedures serving the airport during all operating configurations. Again, these issues lead to an increase in controller-to-pilot and controller-to-controller communication and reduce flexibility in the management of the airspace.

The FAA’s ability to meet one of its primary missions as mandated by Congress – to provide for the efficient use of airspace – is impeded as a result of these types of inefficiencies. Therefore, the problem is the inability to fully employ the additional efficiency provided by current RNAV design criteria and guidance. By developing RNAV procedures that take full advantage of current design criteria and guidance, the air traffic system would experience increased efficiency demonstrated by enhanced predictability, route segregation, and flexibility.

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

2.1.2 Causal Factors

The inefficiencies and resulting complexities associated with existing procedures are the primary foundation for the problem in the Las Vegas Metroplex. A problem (or need) is best addressed by examining the circumstances or factors that cause it. Addressing the causal factors behind the problem will help develop a reasonable alternative designed to resolve the problem (i.e., meet the “purpose”).

As summarized above, several issues have been identified as causes for the inefficiencies in the Metroplex. For purposes of this EA, these issues were grouped into three key causal factors:

- Lack of predictable standard routes defined by procedures to/from airport runways to/from en route airspace
- Complex converging and dependent route procedure interactions
- Lack of flexibility in the efficient transfer of traffic between the en route and terminal area airspace

These three causal factors are discussed in the following sections.

2.1.2.1 Lack of Predictable Standard Routes Defined by an Insufficient Number of RNAV Procedures and Insufficient Airport Runway Transitions

Predictable standard routes allow both pilots and controllers to know ahead of time how, where, and when an aircraft should be operated along a defined route. This also allows controllers and pilots to better plan airspace use and the control of aircraft in the given volume of airspace. A predictable route may include expected locations (where), altitudes (where and how high), and speeds (how fast and when) at key points. A procedure that provides these elements results in a more predictable route for the pilot and controller.

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

The following sections describe some of the issues with predictability in the Las Vegas Metroplex airspace.

Current Procedures Do Not Take Full Advantage of RNAV Capabilities

As shown in **Table 2-1**, the Study Airports are currently served by 18 RNAV procedures and 11 conventional procedures. Most of the current procedures serving LAS, HND, and VGT were first developed as part of the LAS Four Corner-Post Plan airspace redesign project in 2000. The airspace redesign first required development of conventional procedures and then development of RNAV procedures that mirrored the conventional procedures so all aircraft could follow the same route. Because conventional procedures are dependent on the location of ground-based navigational aids, the locations where procedures can be established are limited due to factors such as terrain. Accordingly, the RNAV procedures developed to mirror the conventional procedures do not take full advantage of RNAV design capabilities. As a result, the overall benefit that could have been gained for RNAV-equipped aircraft has not been fully realized.

Table 2-1 Las Vegas Metroplex – Existing STAR and SID Procedures (1 of 2)

Airport Served	Gate Served	Procedure Name	Procedure Type	Runway Transitions
ARRIVALS				
LAS, HND, VGT	Northeast (Arrivals)	LUXOR TWO	Conventional	None
LAS		GRNPA TWO	RNAV	None
LAS		SITEE TWO	RNAV	1L, 1R, 8L, 8R, 19L, 19R, 26L, 26R
HND		NOOTN TWO	RNAV	None
LAS, HND, VGT	Southeast (Arrivals)	KADDY TWO	Conventional	None
LAS		TYSSN FIVE	RNAV	26L
HND		KNGMN TWO	RNAV	None
LAS, HND, VGT	Southwest (Arrivals)	CLARR THREE	Conventional	26L/R (LAS)
LAS		KEPEC SIX	RNAV	26L
LAS		CRESO FOUR	Conventional	26L/R
HND		JOMIX ONE	RNAV	35L/R
LAS, HND, VGT	Northwest (Arrivals)	FUZZY EIGHT	Conventional	26L/R (LAS)
LAS		SUNST FOUR	RNAV	26L
HND		ADDEL ONE	RNAV	None

Table 2-1 Las Vegas Metroplex – Existing STAR and SID Procedures (2 of 2)

Airport Served	Gate Served	Procedure Name	Procedure Type	Runway Transitions
DEPARTURES				
LAS	Northeast (Departures)	LAS VEGAS FIVE	Conventional	None
LAS		STAAV EIGHT	RNAV	26L/26R
LAS		TRALR NINE	RNAV	1L, 1R, 8L, 8R, 19L, 19R, 26L, 26R
HND		ACSIN FIVE	RNAV	17R, 35L
LAS	Southeast (Departures)	HOOVER SIX	Conventional	None
LAS		COWBY EIGHT	RNAV	1L, 1R, 8L, 8R, 19L, 19R, 26L, 26R
LAS		PRFUM FOUR	RNAV	19L, 19R, 26L, 26R
LAS		FLAMZ FIVE	RNAV	17R, 35L
VGT		NORTHTOWN FOUR	Conventional	None
VGT		RIGHTTURN THREE	Conventional	None
VGT		BOULDER CITY ONE	Conventional	None
LAS	South/West (Departures)	MCCARRAN FIVE	Conventional	None
LAS		BOACH EIGHT	RNAV	1L, 1R, 8L, 8R, 19L, 19R, 26L, 26R
LAS		SHEAD ONE	RNAV	1L, 1R, 8L, 8R, 19L, 19R, 26L, 26R
HND		PALLY FIVE	RNAV	17R, 35L

Notes:
Radar vectors are not a defined route and therefore are not included in runway transition counts.
ZLA – Los Angeles Center *LAS – McCarran International Airport* *VGT – North Las Vegas Airport*
L30 – Las Vegas Terminal Radar Approach Control (TRACON) *HND – Henderson Executive Airport*

Source: U.S. Department of Transportation, Federal Aviation Administration, Instrument Flight Procedures Information Gateway <https://www.faa.gov/air_traffic/flight_info/aeronav/procedures/>, accessed June 2018.
Prepared by: ATAC Corporation, June 2018.

Since the implementation of the Four Corner-Post Plan, RNAV design criteria and guidance have been regularly updated as experience has been gained in the design and use of RNAV procedures. Consequently, the older RNAV procedures in effect in the Las Vegas Metroplex do not take full advantage of current RNAV design capabilities and have become increasingly less efficient. This inefficiency has grown increasingly unwarranted, as over the last two decades the percentage of RNAV equipped aircraft has increased substantially. As of 2015, 98 percent of IFR operations at LAS were conducted by aircraft equipped for RNAV.[1] Maintaining the current conventional procedures and the RNAV procedures that mirror them decreases flight route predictability by reducing the efficiency of the airspace and increasing complexity due to increased controller and pilot workload.

Lack of Runway Transitions

As discussed in Section 1.4.1, LAS operates under four different runway operating configurations depending on factors such as weather, wind direction, and air traffic conditions.

[1] Las Vegas Metroplex Study Team Report, November 2015

As a result, it is possible for the runway ends used for arrivals and departures to change several times throughout a day. Because of the high level of aircraft traffic, especially during peak periods, not providing procedures for each runway end contributes to a less efficient air traffic system.

As the only major airport in L30 airspace, LAS experiences a high level of aircraft traffic. As shown in **Table 2-1** above, LAS is currently served by five RNAV STARs. Of the five RNAV STARs serving LAS, only the SITEE STAR provides runway transitions to both Runways 19L/R and 26L/R. The TYSSN, KEPEC, and SUNST STARs only provide runway transitions to Runways 26L, and the GRNPA STAR has no runway transitions. The lack of runway transitions requires controllers to use vectors to direct aircraft to their final approach. The extensive vectoring required results in more frequent controller-to-pilot and controller-to-controller communication, increasing controller and pilot workload and reducing predictability.

Lack of Predictable Satellite Airport Procedures

The existing procedures for the satellite Study Airports do not allow for predictable segregation of routes between air traffic arriving to or departing from these Study Airports and LAS. While HND is currently served by four RNAV STARs and three RNAV SIDs, the STARs serving HND are inefficient. Arrivals from the northeast and east interact with the busiest arrival flow into LAS. In addition, the entry point for HND arrivals from the northeast, southeast, south, and southwest require coordination between ZLA controllers, increasing controller workload, reducing predictability.

Currently, VGT has no established RNAV procedures. All southbound departures are vectored and must be released for departure by L30. The lack of RNAV procedures for the VGT Study Airport increases workload for both controllers and pilots and reduces predictability.

2.1.2.2 Complex Converging and Dependent Route Procedure Interactions

In some areas, the separation between arrival and departure flight routes (e.g., lateral separation between two routes or vertical separation between crossing routes) does not allow for efficient use of the airspace. This requires that controllers carefully observe aircraft activity along the nearby or crossing flight routes and be prepared to provide air traffic services to ensure standard separation is maintained.[2] For example, where arrival and departure flight routes intersect, flight level-offs may be required for either arrivals or departures to ensure adequate vertical separation between aircraft. In some cases, arriving and departing aircraft on nearby flight routes may need to be vectored to ensure safe lateral separation. In other cases, controllers may need to issue point-outs (a physical or automated action taken by a controller to transfer the radar identification of an aircraft to another controller if the aircraft will or may enter the airspace or protected airspace of another controller and radio communications will not be transferred).

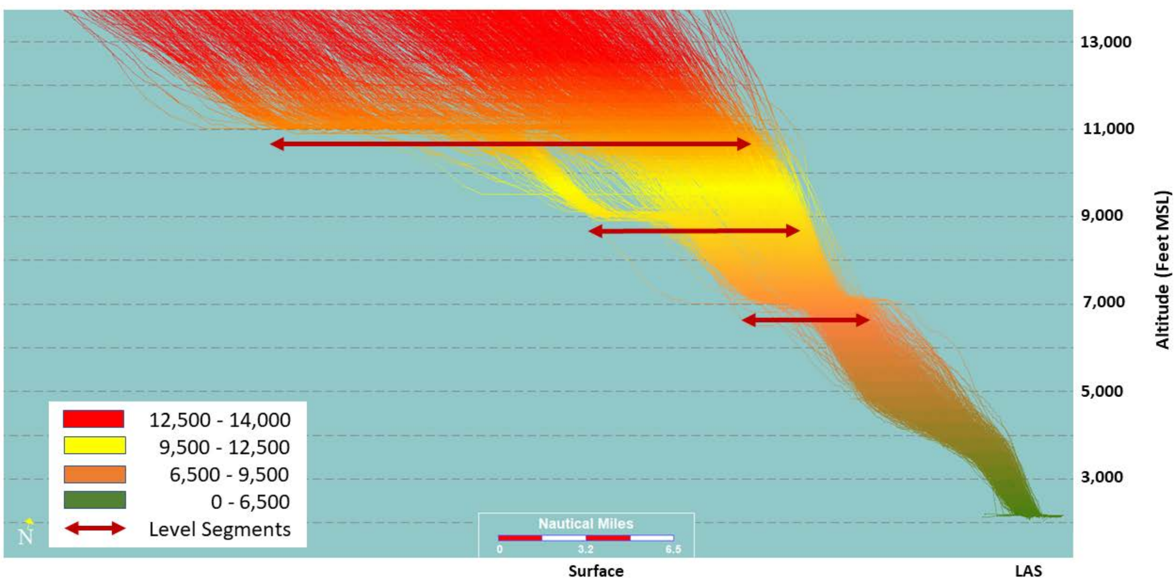
Because the procedures currently in use in the Las Vegas Metroplex do not take full advantage of RNAV capabilities, multiple procedures share the same NAVAIDs. This may result in conflicts such as aircraft flying at different speeds along adjacent routes, requiring greater separation to prevent operations at similar altitudes or occupation of the same airspace. To avoid potential conflicts, controllers may need to reroute aircraft by issuing

[2] Areas where the lateral or vertical separation distances are inadequate to allow efficient use of the airspace are referred to as "confliction points" by air traffic controllers.

vectors or directing aircraft to level off. This increases pilot and controller workload and system complexity.

Aircraft arriving to LAS are frequently required to level off during descent to maintain vertical separation from other arriving and departing aircraft. Aircraft operating on the GRNPA, TYSSN, KEPEC, and SUNST STARs typically experience two or more periods of level-off of more than 10 nautical miles (NM). Similarly, aircraft operating on SIDs departing the Las Vegas Metroplex may also experience periods of level-off. **Exhibit 2-3** shows the vertical profiles for aircraft departing LAS on the SHEAD SID. As shown by the red lines, aircraft using the SHEAD SID are directed to level off for approximately five NM at 7,000 and 9,000 feet above mean sea level (MSL) and five to ten NM at 11,000 feet MSL. Extended level-offs often result in increased controller-to-pilot communication and may require traffic alerts to pilots of the proximity of other aircraft or point-outs to other controllers responsible for neighboring airspace sectors. This adds to the complexity of managing and operating in the airspace due to higher controller workload, increased controller-to-pilot communication, and inefficient use of aircraft performance capabilities during descent or climb.

Exhibit 2-3 SHEAD SID - Vertical Profile



Notes:
LAS – McCarran International Airport

Source:	Performance Data and Reporting System (PDARS) radar data, November 1, 2016 to October 31, 2017, ATAC Corporation.
Prepared by:	ATAC Corporation, September 2019.

2.1.2.3 Lack of Flexibility in the Efficient Transfer of Traffic between the En Route and Terminal Area Airspace

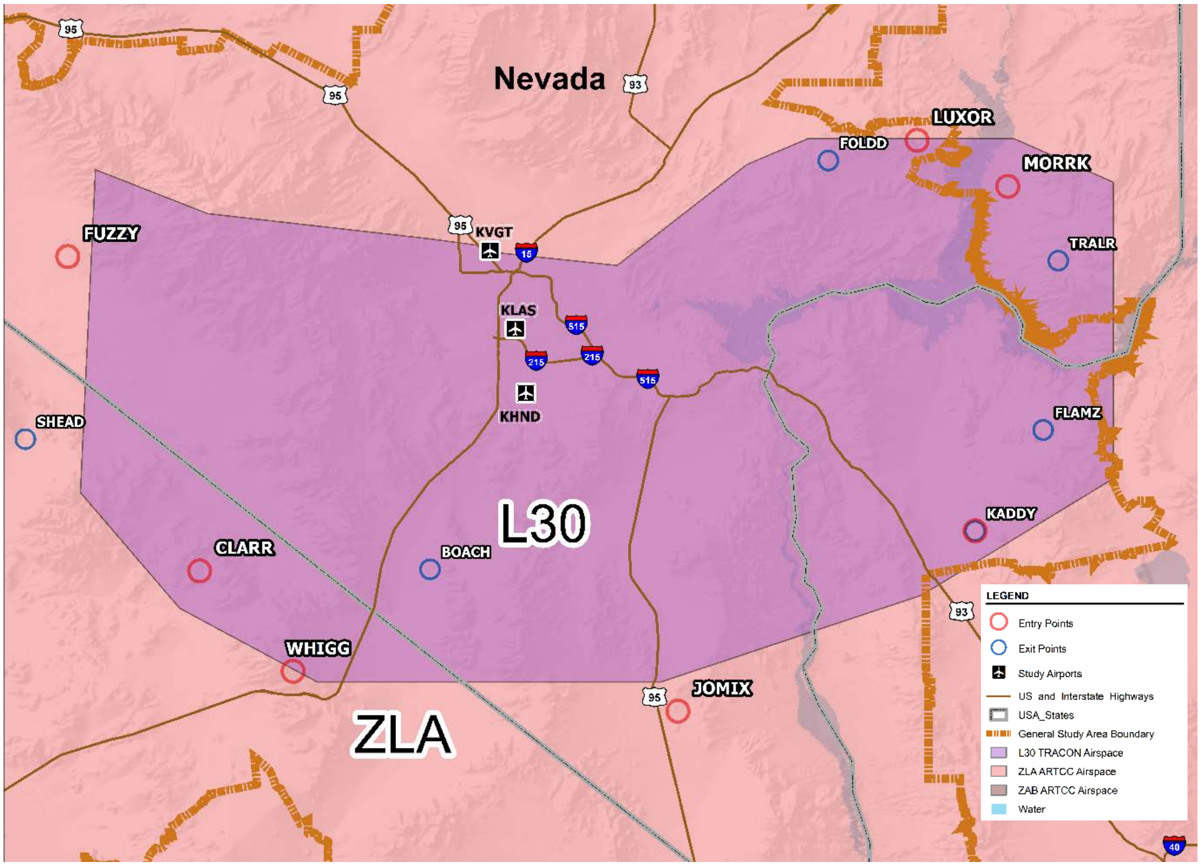
Flexibility allows controllers to plan for and adapt to traffic demands, which change frequently throughout the day. Although commercial flights are scheduled, delays in other regions of the U.S. or severe weather along a route may cause aircraft to enter or exit the en route and terminal area airspace at times other than those previously scheduled. Controllers require options to manage shifting traffic demand.

Factors such as too few entry or exit points, requiring multiple aircraft flows to be sequenced over the same point, can increase the amount of vectoring needed to merge traffic and maintain safe separation. In addition, too few departure procedures can increase airspace complexity and workload for both controllers and pilots. The following sections further discuss flexibility issues specific to Las Vegas Metroplex airspace.

Entry Points

Exhibit 2-4 depicts the entry and exit points into L30 airspace from ZLA airspace. Aircraft bound for the Study Airports use procedures that require aircraft to enter the L30 airspace on single arrival streams through one of the seven entry points. Several of the terminal airspace entry points require excessive coordination between sectors which can result in gaps in the arrival flows to the Study Airports.

Exhibit 2-4 L30 Entry and Exit Points



Notes:
The KADDY waypoint is used as both an entry and exit point for L30s airspace
ZLA – Los Angeles Center *LAS – McCarran International Airport* *VGT – North Las Vegas Airport*
L30 – Las Vegas Terminal Radar Approach Control (TRACON) *HND – Henderson Executive Airport*

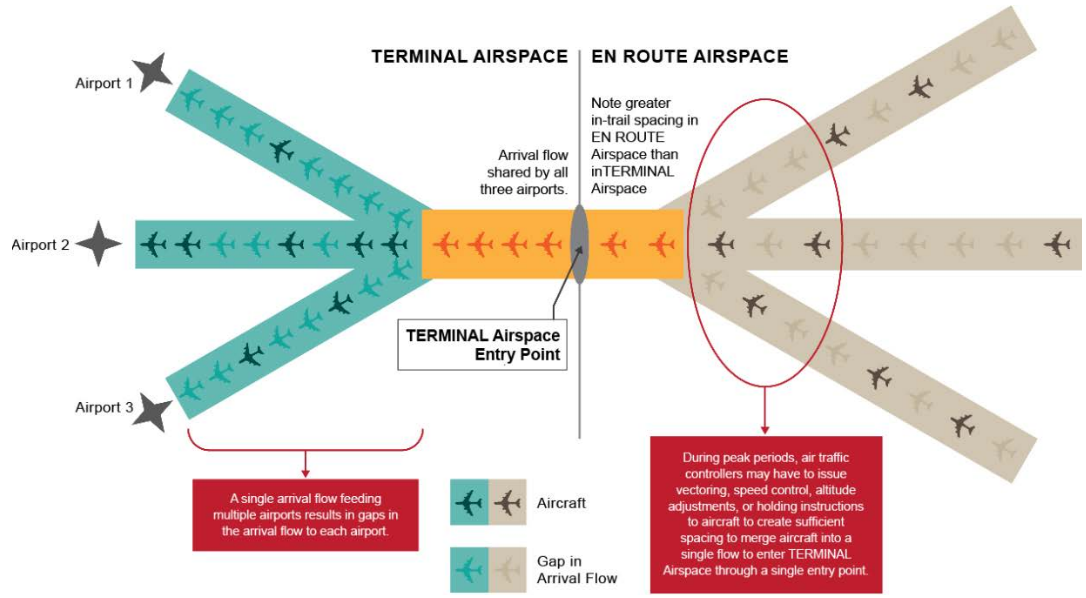
Source: Las Vegas Metroplex Study Team Report, November 2015.
Prepared by: ATAC Corporation, March 2017.

Exhibit 2-5 illustrates how aircraft arrivals are sequenced in the en route airspace and then merged to enter terminal airspace through a single-entry gate. Aircraft arriving from en route airspace must be merged into a single arrival flow before entering terminal airspace through an entry gate. This is similar to automobile traffic travelling in multiple freeway lanes merging into one lane before exiting a freeway. The process of multiple lanes of traffic merging into one lane can cause congestion. In terms of air traffic, to maintain safe separation, controllers must create sufficient gaps between aircraft along a route to safely line up aircraft from multiple streams. This may require controllers to employ airspace management techniques such as vectoring aircraft off procedures or directing pilots to reduce speed, which can increase congestion. The need to employ these management techniques commonly results in increased workload for both the controller and pilot.

Aircraft destined for the Study Airports share arrival procedures that enter the terminal airspace on a single arrival flow through an entry point. Aircraft are then split from a single arrival flow and issued instructions to the final approaches to the various runways at the different Study Airports. Similar to what is depicted in **Exhibit 2-5**, gaps in the flow to the individual Study Airports can develop after aircraft are sequenced and directed to the final approaches to the Study Airport runways.

To some extent, the gaps can be closed if controllers direct the rear aircraft to increase speed along the arrival route to the airport. However, at this critical phase of flight, when aircraft are descending and maneuvering to the final approach to a runway, the feasibility of making significant speed adjustments and reducing the gaps in the arrival flow is limited.

Exhibit 2-5 Illustration of Single Terminal Airspace Entry Point and Single Arrival Flow with Traffic Sequenced to Multiple Airports

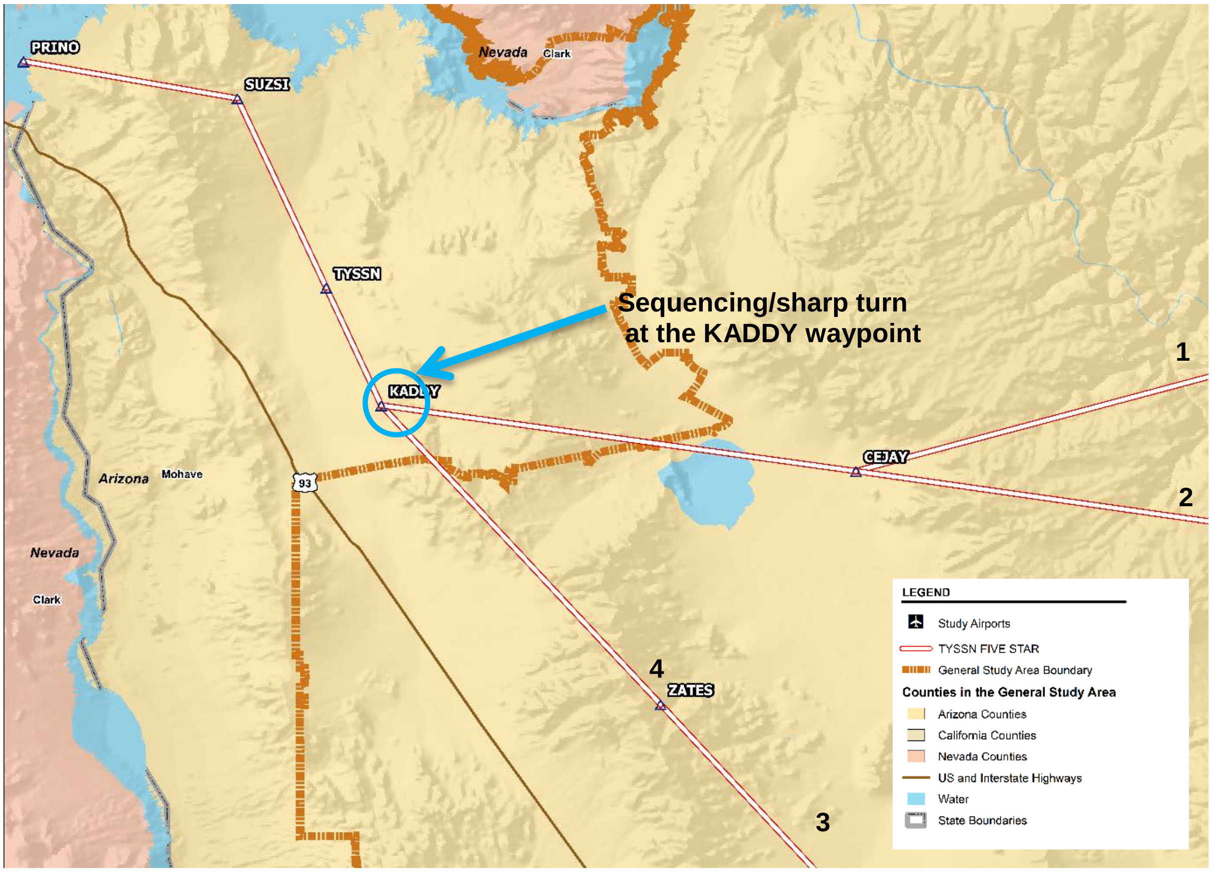


Notes:
ZLA – Los Angeles Center
L30 – Las Vegas Terminal Radar Approach Control (TRACON)
LAS – McCarran International Airport
HND – Henderson Executive Airport
VGT – North Las Vegas Airport

Source: Las Vegas Metroplex Study Team Report, November 2015.
Prepared by: ATAC Corporation, March 2017.

Exhibit 2-6 depicts arrivals to the Las Vegas Metroplex on the TYSSN STAR. The TYSSN STAR offers an example of the issues that can arise when sequencing multiple traffic flows over a single point. The TYSSN STAR has four en route transitions that require multiple ZLA controllers to sequence four separate arrival flows over the KADDY waypoint which also serves as the entry point into L30's airspace. The four en route transitions are numbered on Exhibit 2-6 and includes a transition that begins at the ZATES waypoint to serve traffic in the immediate vicinity. A sharp turn at KADDY creates excessive compression along the boundary between L30 and ZLA, requiring L30 controllers to vector aircraft off the procedure to maintain adequate in-trail spacing between aircraft. Sequencing arriving aircraft over the KADDY waypoint and managing adequate separation result in gaps in the arrival flow to the Study Airports. This in turn increases controller and pilot workloads and reduces the overall flexibility of the system.

Exhibit 2-6 Arrivals at KADDY on the TYSSN STAR



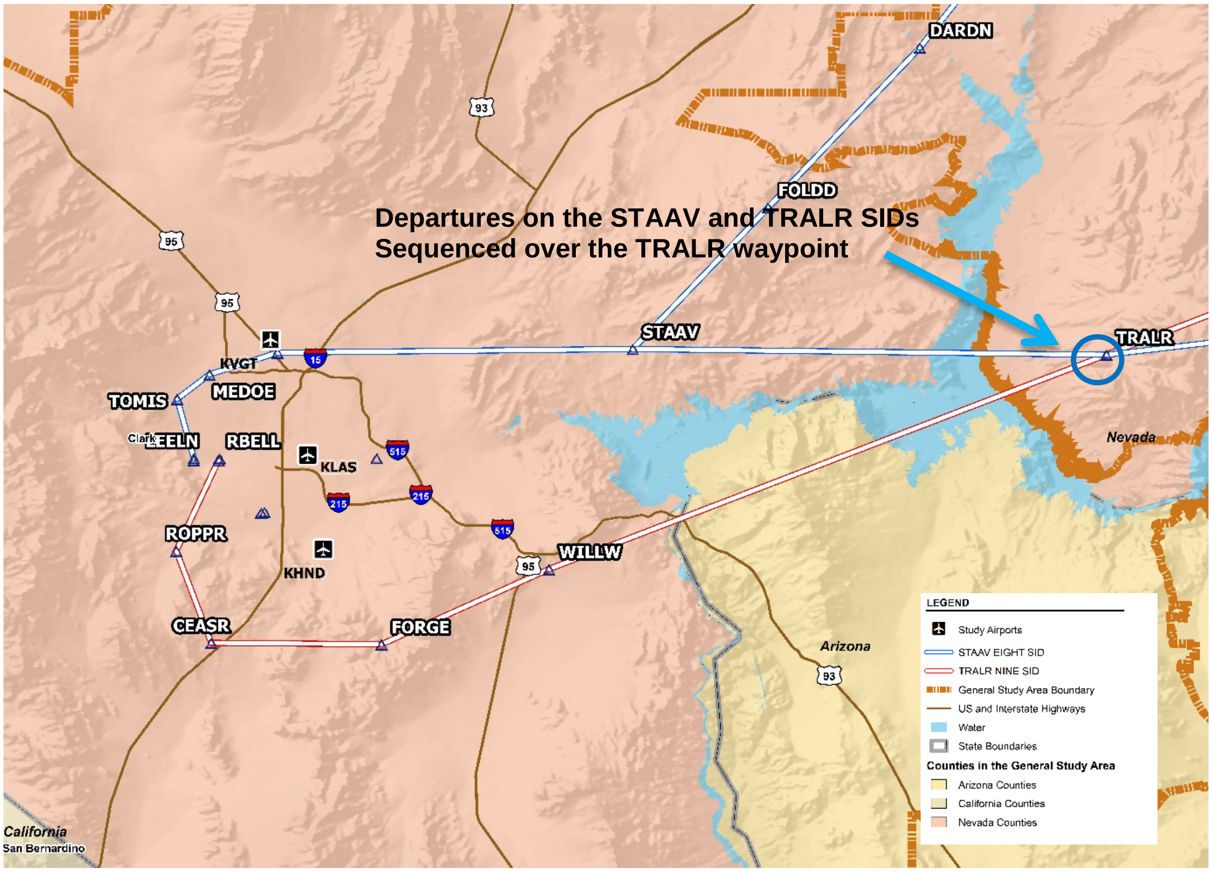
Notes:

Source:	Sources: Road Network File, U.S. Census Bureau, 2017 (2017 TIGER/Line Shapefiles (machine-readable data files), County Boundary File, US Census Bureau, (2017 TIGER/Line Shapefiles (machine-readable data files); Airports file, Federal Aviation Administration, 2018 Coded Instrument Flight Procedures (CIFP). Shaded Relief, 2018. ATAC Corporation, 2018, (2018 General Study Area boundary).
Prepared by:	ATAC Corporation, November 2019.

Exit Points

A similar situation applies to aircraft departing L30 airspace through one of the six terminal airspace exit points as depicted in Exhibit 2-4. Departures assigned to the same exit point must be merged into a single flow within L30 airspace before moving into en route airspace at the assigned exit point. Merging departing aircraft into departure flows can lead to delays. During peak departure periods, controllers must frequently employ management tools such as holding departing aircraft on the ground before takeoff to control air traffic volume in the surrounding airspace. This directly affects departure efficiency at the Study Airports. **Exhibit 2-7** depicts departures on the STAAV and TRALR SIDs. These procedures conflict, as both require aircraft to fly over the TRALR waypoint. This requires L30 controllers to vector departing aircraft to maintain adequate lateral separation while sequencing aircraft to the TRALR waypoint.

Exhibit 2-7 Departures over TRALR on the STAAV and TRALR SIDs



Notes:
KLAS - McCarran International Airport *KHND – Henderson Executive Airport* *KVGT – North Las Vegas Airport*

Source: Sources: Road Network File, U.S. Census Bureau, 2017 (2017 TIGER/Line Shapefiles (machine-readable data files), County Boundary File, US Census Bureau, (2017 TIGER/Line Shapefiles (machine-readable data files); Airports file, Federal Aviation Administration, 2018 Coded Instrument Flight Procedures (CIFP). Shaded Relief, 2018. ATAC Corporation, 2018, (2018 General Study Area boundary).
Prepared by: ATAC Corporation, September 2019.

In addition, departing aircraft may conflict with arriving aircraft when sequenced over the same point. There are several consequences that result from arrivals and departures to and from the Study Airports using common arrival and departure procedures and terminal airspace entry and exit points. These consequences include:

- The need to merge arriving aircraft into a single arrival flow at each entry point can increase flight time and distances.
- Gaps in the final arrival flows do not allow for the formation of a constant stream of aircraft to the Study Airports.
- Merging departing aircraft into single departure streams for each exit point requires controllers to create greater separation between subsequent departures from the same airport than would otherwise be required if the routes were separated.
- Holding aircraft on the runway to protect enough airspace to allow for adequate separation leads to departure delays, especially during peak travel periods.

- The need for additional controller-to-pilot communication to issue the variety of instructions required to merge and desegregate the flow of aircraft adds to the workload of both controllers and pilots.
- Options for controllers to redirect aircraft to avoid bad weather or more efficiently handle sequencing are limited when the pilot does not have the runway in sight due to low visibility.

Departure Procedures Unavailable for All Operating Configurations

Certain departure procedures, such as the STAAV and PRFUM SIDs, are only available for use during one-runway operating configuration. Other departure procedures may be available during multiple runway operating configurations; however, inefficient altitude restraints and exit point locations increase the complexity of these procedures and increase both controller and pilot workload. Over all, a lack of procedures decreases the flexibility for controllers and pilots.

2.2 Purpose of the Proposed Action

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

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

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

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

2.2.1 Improve the Predictability of Transitioning Air Traffic

As discussed in Section 2.1.2.1, the lack of up-to-date RNAV procedures requires controllers to use air traffic management techniques such as vectoring to ensure safe vertical and lateral separation between aircraft during the arrival and departure phases of flight. As a result, controllers and pilots experience a more complex workload. In addition, there are an insufficient number of runway transitions to and from the runways at each of the Study Airports. Finally, there is a lack of RNAV procedures to and from the Satellite Airports, preventing pilots from filing (submitting a flight plan to ATC) their preferential arrival or departure with predictable flight expectations. These factors affect predictability within the Las Vegas Metroplex.

This objective can be measured with the following criteria:

- Ensure that the majority of STARs and SIDs to and from the Study Airports are based on RNAV technology utilizing the most current RNAV criteria (measured by count of RNAV STARs and SIDs for an individual Study Airport)
- Increase the number of runway transitions (measured by count of runway transitions for all STAR procedures)

2.2.2 Segregate Arrivals and Departures

As discussed in Section 2.1.2.2, aircraft are frequently required to level off to ensure adequate separation between different traffic flows. RNAV procedures can be designed with capabilities such as speed control and altitude restrictions that segregate aircraft on the route while reducing controller and pilot workload by reducing the complexity of the procedures. One objective of the Proposed Action is to implement procedures that would better segregate arrivals and departures within the airspace. This objective can be measured by number of RNAV STARs and/or SIDs that can be used independently to/from Study Airports.

2.2.3 Improve Flexibility in Transitioning Aircraft Traffic

As discussed in Section 2.1.2.3, the limited number of available transitions and associated procedures constrain efficiency in the terminal and en route transitional airspace. This requires merging multiple traffic flows before aircraft arrive at and depart from terminal airspace. One objective of the Proposed Action is to minimize the need for merging traffic flows by increasing the number of transitions and procedures that are dedicated to specific Study Airports. This objective can be measured with the following criteria:

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

2.3 Criteria Application

The FAA will evaluate the Proposed Action to determine how well it meets the purpose and need based on the measurable criteria and objectives described above. The evaluation of alternatives will include the No Action Alternative, under which the existing (2017) air traffic procedures serving the Study Airports would remain unchanged except for planned procedure modifications, independent of the Las Vegas Metroplex Project, which were or are expected to be approved for implementation. The criteria are intended to help compare the Proposed Action with the No Action Alternative.

2.4 Description of the Proposed Action

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

Implementation of the Proposed Action would not increase the number of aircraft operations at the Study Airports. Furthermore, the Proposed Action does not involve physical construction of any facilities such as additional runways or taxiways, and does not require permitting or other approvals or actions at either the state or local level. Therefore, the implementation of the proposed changes to procedures in the Las Vegas Metroplex would not require any physical alterations.

2.5 Required Federal Actions to Implement Proposed Action

Implementing the Proposed Action requires the FAA to publish new or revised STARs, SIDs, and transitions and undertake controller training.

2.6 Agency Coordination

On September 18, 2018, the FAA distributed an early notification letter to 246 federal, state, regional, and local officials as well as to 43 tribes. The FAA sent the early notification letter to:

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

On September 30, 2018, a notice of intent to prepare an EA was published in the Las Vegas Review Journal newspaper. Three comments were received in response to the notice of intent and were considered in preparation of the Draft EA. Appendix A, Agency Coordination, Community Involvement and List of Receiving Parties, includes a copy of the notice of intent letter (and attachments), an affidavit of newspaper publication, and a list of the receiving agencies.

On October 25, 2018 the FAA initiated Section 106 consultation with the Arizona, California, and Nevada SHPO offices and Tribal Historic Preservations Officers from the Colorado River Indian Tribes, Hualapai Tribe, Pyramid Lake Paiute Tribe, Reno-Sparks Indian Colony, Timbisha Shoshone Tribe, Twenty-Nine Palms Band of Mission Indians, and Washoe Tribe that may have interests within the General Study Area in accordance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. § 470 et seq.) and the implementing regulations at 36 C.F.R. Part 800.

Appendix A, Agency Coordination, Community Involvement, and List of Receiving Parties, includes a copy of the notice of intent letter (and attachments), affidavits of newspaper publication, as well as a list of the receiving agencies.

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