APPENDIX C
AIRSPACE IMPACT ANALYSIS

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TABLE OF CONTENTS

List of Figures

List of Tables

ACRONYMS AND ABBREVIATIONS

ADS-B	Automatic Dependent Surveillance Broadcast
AGL	Above Ground Level
ARTCC	Air Route Traffic Control Center
ATC	Air Traffic Control
ATCAA	Air Traffic Control Assigned Airspace
ATS	Air Traffic Service
CFA	Controlled Firing Area
CFR	Code of Federal Regulations
DAF	Department of the Air Force
DoD	Department of Defense
EIS	Environmental Impact Statement
FAA	Federal Aviation Administration
FAF	Final Approach Fix
FAR	Federal Aviation Regulations
FL	Flight Level
GA	General Aviation
GPS	Global Positioning System
IAF	Initial Approach Fixes
IAP	Instrument Approach Procedure
IFR	Instrument Flight Rules
ILS/LOC	Instrument Landing System/Localizer
IR	Instrument Route
JO	Joint Order
KTAS	Knots True Airspeed
L/MF	Low/Medium Frequency
MOA	Military Operations Area
MSL	Mean Sea Level
MTR	Military Training Route
NAS	National Airspace System
NAVAID	Navigational Aid
NM	Nautical Mile
NOTAM	Notice to Airmen
NSA	National Security Area
PDARS	Performance Data Analysis and Reporting System
RNAV	Area Navigation
ROI	Region of Influence
SUA	Special Use Airspace
U.S.	United States
USC	United States Code
VFR	Visual Flight Rules
VOR	Very High Frequency Omnidirectional Range
VR	Visual Route

1.0 INTRODUCTION

1.1 NATIONAL AIRSPACE SYSTEM

The National Airspace System (NAS) is a network of two categories of airspace. Regulatory airspace is an airspace that is governed specifically by the formal rules within Federal Aviation Regulations (FAR) Part 73, whereas non-regulatory airspace generally relies on advisories and warnings. Within these categories, there are four types of airspace: controlled airspace, uncontrolled airspace, special use airspace (SUA), and other airspace. The category and type of airspace is determined by the complexity and density of aircraft movements, the nature of the operations conducted within the airspace, the level of safety required, and national and public interest. The NAS also includes air navigation facilities, equipment and services, airports and landing areas, aeronautical charts, information and services, rules and regulations, procedures and technical information, and manpower and material (Federal Aviation Administration [FAA] 2025a). Airspace management and use considers how airspace is designated, used, and administered in a manner that best accommodates the individual and common needs of military, commercial, general aviation, and other users of the airspace.

In the United States (U.S.), airspace is managed and controlled by the FAA. The FAA is solely responsible for developing plans and policy for the use of airspace and for managing airspace in such a manner that it ensures the safety of flight and that all users of the NAS can operate in a safe, secure, and efficient manner (49 U.S. Code [U.S.C.] 40103[b]). The FAA considers multiple and sometimes competing demands for airspace in relation to airport operations, Air Traffic Service (ATS) Routes, military training airspace, and other special needs to determine how the NAS can best be structured to address all user requirements.

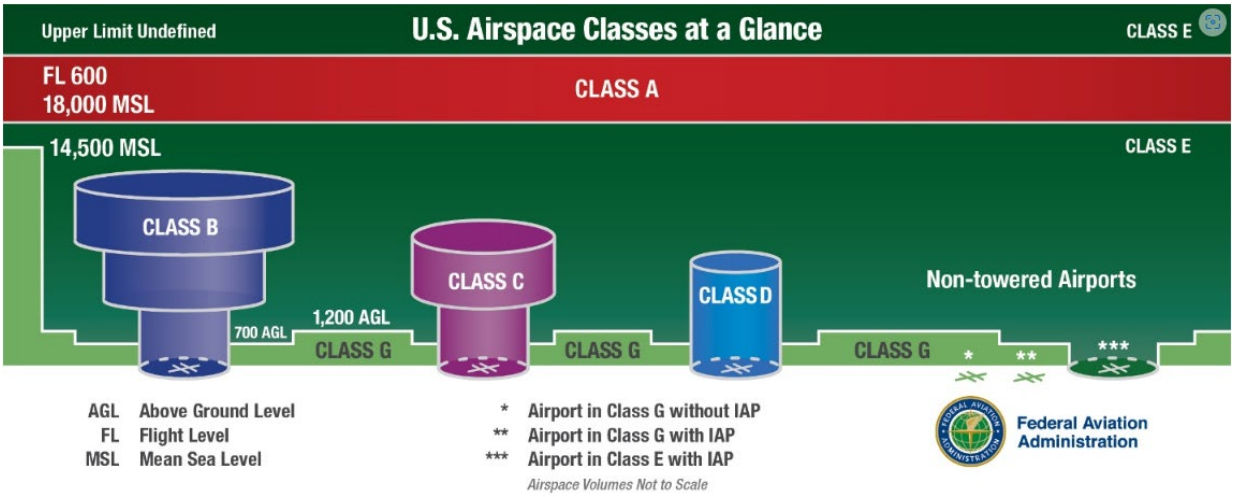
The Department of Defense (DoD) requests airspace from the FAA and schedules and uses airspace in accordance with the processes and procedures detailed in DoD Directive 5030.19, *DoD Responsibilities on Federal Aviation*, and FAA regulations. SUA identified for military and other governmental activities is charted and published by the National Aeronautical Charting Office in accordance with *FAA Order JO 7400.2R*, *Procedures for Handling Airspace Matters* (FAA 2025b). Descriptions of approved SUA, except temporary areas and controlled firing areas, are compiled and published once a year in *FAA Joint Order (JO) 7400.10G*, SUA (FAA 2025c). For military operations areas (MOAs) which overlay public use airports, there is an airspace exclusion of 1,500 feet above ground level (AGL) and below within a 3 nautical mile (NM) radius. This exclusion may be extended when necessary. If the MOA floor extends below 1,200 feet AGL over a charted private airport, coordination should be conducted with the airport operator to accommodate airport operations (FAA 2025b). Airspace designated for military use is released to the FAA when the airspace is not needed for military requirements (DoD 2023).

Procedures governing the use of training areas and airspace operated and controlled by the Department of the Air Force (DAF) are included in Air Force Policy Directive 13-2, *Air Traffic, Airfield, Airspace and Range Management* and its implementing regulations. The DAF manages airspace in accordance with processes and procedures detailed in Air Force Manual 13-201, *Airspace Management*, which also provides guidance and procedures used to develop and process SUA actions. It governs airspace management instructions on creating and maintaining airspace that allows the DAF to meet operational needs for readiness, and this includes the airspace required to support the flight training necessary to ensure pilot proficiency (DAF 2025). DAF bases supplement regulatory guidance in local flying

instructions in conjunction with letters of agreement with the FAA, which expand guidance for operations within this airspace.

1.2 AIRSPACE CLASSIFICATION

Airspace is a three-dimensional resource defined by latitude, longitude, and altitude. There are six classes of airspace, A, B, C, D, E (controlled), and G (uncontrolled) that are available to all users (civilian and military) (**Figure 1.2-1**). The airspace classes dictate pilot qualification requirements, rules of flight that must be followed, and the type of equipment necessary to operate within that airspace (**Table 1.2-1**).



Legend: IAP = Instrument Approach Procedure

Figure 1.2-1 Airspace Classification

Controlled airspace is airspace of defined dimensions within which air traffic control (ATC) service is provided to support airport operations and en route transit from place to place (FAA 2025d). Controlled airspace is categorized into five classes, Classes A through E.

Uncontrolled airspace is designated as Class G airspace. Within the Continental U.S. and out to 12 NM offshore, Class G airspace includes all airspace up to 14,500 feet mean sea level (MSL) that has not been designated as Class A, B, C, D, or E. Class G airspace has no specific prohibitions associated with its use. Class G airspace is described as uncontrolled because there are no entry requirements, and ATC service is not guaranteed.

Table 1.2-1 Airspace Classification Requirements

Airspace	Class A	Class B	Class C	Class D	Class E	Class G
General Definition	Controlled airspace from 18,000 feet MSL up to and including FL600.	Controlled airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of each Class B airspace area is individually tailored and consists of a surface area and two or more layers.	Although the configuration of each Class C airspace area is individually tailored, the airspace usually consists of a 5 NM radius core surface area of controlled airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower and are serviced by radar approach control.	Controlled airspace that extends upward from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower.	Controlled airspace designated to serve a variety of terminal or en route purposes. Class E airspace is often designated for an airport where instrument procedures exist without the presence of a control tower and as extensions to Class B, C, D, and E surface areas.	Uncontrolled airspace that has not been designated as Class A, B, C, D, or E.
Entry Requirements	Air Traffic Control Clearance	Air Traffic Control Clearance	Two-way communication with Air Traffic Control/Control Tower, an operable radar beacon transponder with automatic altitude reporting capability and operable ADS-B Out equipment.	Two-way radio communication is established with the Air Traffic Control facility providing services.	No specific requirement.	None
Two-Way Radio Communication	Required	Required	Required	Required	Required only under IFR flight plan[1].	Not required[1]

Airspace	Class A	Class B	Class C	Class D	Class E	Class G
VFR Visibility Minimum[2]	NA	3 SM	3 SM	3 SM	Below 10,000 feet MSL 3 SM At or above 10,000 feet MSL: 5 SM	Below 1,200 feet AGL (regardless of MSL): Day: 1 SM; Night: 3 SM; Above 1,200 feet AGL and less than 10,000 feet MSL: Day: 1 SM; Night: 3 SM More than 1200 feet AGL and at or above 10,000 MSL: 5 SM.
Traffic Advisories	Yes	Yes	Yes	Workload Permitting	Workload Permitting	Workload Permitting

Notes: [1]Unless a temporary tower is present.
[2]Minimum distance from clouds varies by airspace class and altitude.
Legend: ADS-B = Automatic Dependent Surveillance-Broadcast; AGL = Above Ground Level; FL = Flight Level; IFR = Instrument Flight Rules; MSL = Mean Sea Level; NA = Not Applicable; NM = Nautical Mile; SM = Statute Mile; VFR = Visual Flight Rules.
Source: FAA 2025d.

The airspace described above, and in **Figure 1.2-1** (except Class G airspace) is regulatory. Non-regulatory airspace includes MOAs, warning areas, alert areas, controlled firing areas and national security areas. Within these two categories of airspace, there are four subcategories, controlled, uncontrolled, SUA and other airspace (FAA 2025d).

1.3 GENERAL FLIGHT RULES AND RESOURCES

There are specific operational requirements for each class of airspace. Some airspace, such as Class A, requires users to operate under instrument flight rules (IFR), while other airspace allows for visual flight rules (VFR), and in many cases IFR/VFR operate within the same space. The FAA produces charts and publications to guide civil and military flights within the NAS. Aviators can find specific information on airspace and regulatory requirements in VFR/IFR Navigation Charts, Planning Charts, and a variety of supplementary charts and publications (FAA 2025d). These aeronautical charts depict information necessary for flight operations, such as ATS routes (victor airways and jet routes), military training routes (MTRs), aerial refueling tracks, public and private airports, and available aids to navigation.

FAA JO 7110.65BB, *Air Traffic Control*, establishes procedures and phraseology for use by personnel who provide ATC services within the NAS (FAA 2025e). The primary purpose of the ATC system is to prevent a collision involving aircraft operating in the NAS. The ATC system is designed to give first priority (duty priority) to separating aircraft, issuing safety alerts, and providing support to national security and homeland defense activities. Behind duty priority is the ATC system's operational priority, which provides service to aircraft on a "first come, first served" basis with the following exceptions (list is not all inclusive): aircraft in distress, air ambulance flights, presidential aircraft and support elements,

active air defense missions and other national security related flights, and flight check aircraft (FAA 2025e).

1.4 SPECIAL USE AIRSPACE

SUA is an airspace of defined dimensions where activities must be confined due to their nature and where limitations are imposed on aircraft operations that are not a part of those activities (non-participating aircraft). This airspace is defined by designated altitude ceilings and floors and horizontal boundaries described in geographic coordinates. Prohibited and restricted areas are regulatory SUA. Warning areas, MOAs, alert areas, controlled firing areas (CFAs), and national security areas (NSAs) are nonregulatory SUA. Brief descriptions of SUA are below. Full descriptions (except CFAs) are contained in aeronautical charts and in *FAA JO 7400.10G* (FAA 2025c).

1.4.1 Types of Special Use Airspace and Air Traffic Control Assigned Airspace

1.4.1.1 Alert Areas

Alert areas are depicted on aeronautical charts to inform non-participating pilots of areas that may contain a high volume of pilot training or an unusual type of aerial activity. Pilots should be particularly alert when flying in these areas. All activity within an alert area must be conducted in accordance with Code of Federal Regulations (CFR), without waiver, and pilots of participating aircraft, as well as pilots transiting the area, must be equally responsible for collision avoidance (FAA 2025d).

1.4.1.2 Controlled Firing Area (CFA)

CFAs contain activities which, if not conducted in a controlled environment, could be hazardous to non-participating aircraft. The distinguishing feature of the CFA, as compared to other SUA, is that its activities are suspended immediately when spotter aircraft, radar, or ground lookout positions indicate an aircraft might be approaching the area. There is no need to chart CFAs since they do not cause a non-participating aircraft to change its flight path (FAA 2025d).

1.4.1.3 Military Operations Area (MOA)

MOAs consist of airspace with defined vertical and lateral limits established for the purpose of separating certain military training activities from IFR traffic. Whenever a MOA is being used, non-participating IFR traffic may be cleared through a MOA if IFR separation can be provided by ATC. Otherwise, ATC reroutes or restricts non-participating IFR traffic. VFR traffic, which is permitted up to 18,000 feet, is not prohibited from flying within an active MOA and does so at their own risk (FAA 2025d).

1.4.1.4 National Security Area (NSA)

NSAs consist of airspace of defined vertical and lateral dimensions established at locations where there is a requirement for increased security and safety of ground facilities. Pilots are requested to voluntarily avoid flying through NSA. When it is necessary to provide a greater level of security and safety, flight in NSAs may be temporarily prohibited by regulation under the provisions of 14 CFR section 99.7. Regulatory prohibitions will be issued by System Operations Security and disseminated via Notice to Airmen (NOTAM) (FAA 2025d).

1.4.1.5 Prohibited Area

Prohibited areas contain airspace of defined dimensions identified by an area on the surface of the earth within which the flight of aircraft is prohibited. Such areas are established for security or other reasons associated with the national welfare. These areas are published in the *Federal Register* and are depicted on aeronautical charts (FAA 2025d).

1.4.1.6 Restricted Area

Restricted areas consist of airspace with defined vertical and lateral limits within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Activities in these areas must be confined because of their nature or limitations imposed upon aircraft operations that are not part of those activities or both. Restricted areas denote the existence of unusual, often invisible, hazards to aircraft, such as artillery firing, aerial gunnery, or guided missiles (FAA 2025d).

1.4.1.7 Warning Area

A warning area is airspace of defined dimensions, extending from 3 NM outward from the coast of the U.S., that contains activity that may be hazardous to non-participating aircraft. The purpose of such warning areas is to warn non-participating pilots of the potential danger. A warning area may be located over domestic or international waters or both (FAA 2025d).

1.4.1.8 Air Traffic Control Assigned Airspace (ATCAA)

ATCAA is airspace of defined vertical and lateral limits, assigned by ATC, for the purpose of providing air traffic segregation between the specified activities being conducted within the assigned airspace and other IFR traffic. ATCAAs are not classified as SUA and are not published on aeronautical charts but rather designated in a Letter of Agreement with the FAA. An ATCAA can be used for the same types of activities as a MOA and usually overlays a MOA within Class A airspace (18,000–60,000 feet). Non-military aircraft may fly in ATCAA during military training so long as ATC can maintain IFR separation from military aircraft; only non-hazardous military activities may be undertaken in an ATCAA (FAA 2025d).

1.4.2 SUA Scheduling and Activation

Several different terms are used to describe the use of the SUA at various times during the day. The definitions are below and illustrated in **Figure 1.4-1**, which shows how these terms apply to use of a SUA during a notional day. In this example, SUA refers to MOAs. The FAA annually publishes a listing of regulatory and non-regulatory airspace, to include the times of use and the using and scheduling agency, in this case the DAF. The below scheduling and activation information is provided for baseline understanding only; individual airspaces have unique nuances and procedures defined in applicable letters of agreement that may differ from the notional schedule.

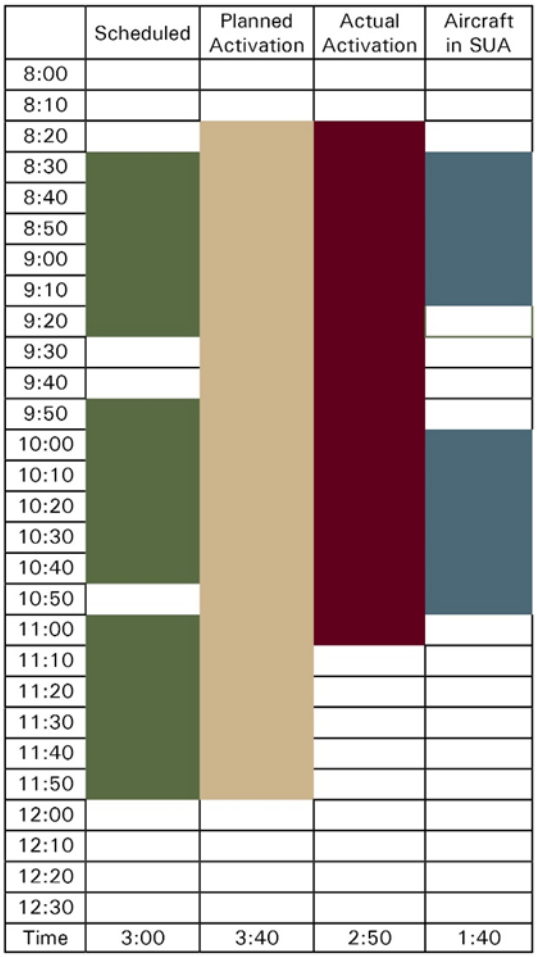


Figure 1.4-1 Notional Partial-Day Schedule for SUA

Scheduled. When a military flying unit wants to use a particular SUA, it will be scheduled ahead of time with central scheduling for discreet time blocks. For instance, in order to accomplish a particular training event, a squadron may schedule a restricted area for 1 hour, with the intent of having multiple aircraft use it for that hour. In **Figure 1.4-1**, the green bars show three separate 1-hour periods.

Planned Activation. When military users schedule a particular SUA for discreet blocks of time, with only short times in between, the airspace will generally be considered "active" during this down period. The process of returning airspace for a short period of time would generate more work for controllers while not providing appreciable benefit to potential airspace users. In the example shown in **Figure 1.4-1**, there are two short "gap" times between military scheduled use, one of 20 minutes, and one of 30 minutes. In cases like these, the planned activation time (shown as tan) will include those small gaps. It is generally more efficient for all users of the airspace to plan for airspace activation times that cover these small discreet gaps. Also note that the activation typically begins slightly before the arrival of the first military user, so essentially there should be no delay for entering into the SUA. In the example shown in **Figure 1.4-1**, the planned activation would begin 10 minutes prior to the first user and last until the last user leaves the airspace, per the schedule. SUA activation times can be retrieved from the FAA's SUA website, https:/sua.faa.gov.

Actual Activation. This is the amount of time that the SUA is activated in real time, and accounts for any changes from the plan. In the example shown in **Figure 1.4-1**, the actual activation time is shown in maroon. The airspace is activated as planned at 8:20, 10 minutes prior to the first scheduled user's arrival in the airspace. It is kept activated (per the plan) until it is apparent that the third user, scheduled to begin at 11:00, will not be using the airspace, at which time the SUA is deactivated, and is therefore available for other uses. A cancellation of scheduled SUA time can happen for a multitude of reasons, including maintenance problems with the aircraft or weather conditions that preclude the aircraft from either flying or completing the training as planned. Actual activation of a SUA is what would restrict VFR/IFR aircraft from flying through that section of airspace.

Aircraft in SUA. This is simply the time that military aircraft are present in the activated SUA. In the example shown in **Figure 1.4-1**, aircraft presence in the SUA is shown with the blue bars. The first scheduled user arrives on time at 8:30 and departs about 10 minutes early at 9:20 (perhaps from training being complete, being low on fuel, or some other reason). The second event shown is scheduled from 9:50 until 10:50, but the aircraft arrives to the airspace late (at 10:00) and leaves per their schedule. The third event is cancelled and will not use the airspace as scheduled. When the ATC learns that the SUA will not be used as scheduled, the FAA is informed through internal coordination procedures, and the SUA deactivated. Once deactivated, ATC will allow aircraft to travel through the confines of the SUA. Non-participating aircraft will be rerouted or vectored by ATC to ensure approved separation exits. Aircraft using a MEDEVAC callsign are afforded priority handling where the MOA would be required to go "cold" to allow a transition through. Emergency aircraft have the right-of-way over all other air traffic and would also have the MOA go "cold" to allow a transition. The pilot of civil aircraft should always plan for deviations around active MOAs.

In summary, **Figure 1.4-1** shows four different schedule terms commonly used when discussing the use of SUA. In this example, the hypothetical SUA was "scheduled" for 3 hours. It was planned to be activated for a single long block of 3 hours, 40 minutes. Its actual activation time (in real time) was just 2 hours and 50 minutes. During actual activation, there were military aircraft actively present in the MOA for an hour and 40 minutes. This section and **Figure 1.4-1** highlight that aircraft are not present for the full published times of use. Aircraft presence will vary on any given day depending on the training event.

1.4.3 SUA General Operating Procedures

Operations within SUA are generally conducted under VFR and with some IFR exceptions. MOAs, for instance, are established to separate certain military activities from IFR traffic. Non-participating IFR traffic may be cleared through the airspace if ATC can provide IFR separation. Pilots operating under VFR are not prohibited from transiting an active MOA but should exercise extreme caution when military activity is being conducted. Pilots can request the status of a MOA by contacting the flight service stations within 100 miles of the area or by contacting the using or controlling agency (FAA 2025d). Additionally, the FAA maintains an informational SUA website to assist pilots and aircrew with flight planning and familiarization (FAA 2025f).

1.5 AIR TRAFFIC SERVICE (ATS) ROUTES AND OTHER ROUTING PROCEDURES

ATS routes are specified routes designed to channel the flow of air traffic as necessary for the safe and efficient management of air traffic operations (FAA 2025b). Domestic ATS routes are defined in 14 CFR

section 71.13*, Classification of Air Traffic Service (ATS) Routes*. Route designators and significant points defining the routes are listed in FAA Order JO 7400.11*, Airspace Designations and Reporting Points*.

1.5.1 Low Altitude ATS Route Structure

The published low altitude route structure in the U.S. consists of Very High Frequency Omnidirectional Range (VOR) Federal airways, Low/Medium Frequency (L/MF) Federal airways, and low altitude area navigation (RNAV) routes. The low altitude route structure is for use from 1,200 feet above the surface (or in some instances higher) up to, but not including, 18,000 feet MSL. Applicable elements of the low altitude ATS route structure are published on the IFR Enroute Low Altitude-U.S. chart series. Low altitude routes are designated as Class E airspace (FAA 2025g).

1.5.1.1 VOR Federal Airways

The VOR Federal Airway system is an air traffic system based on a series of ground-based line-of-sight VOR navigational aids (NAVAIDs) that serve as a type of omnidirectional beacon and are spaced no greater than 80 NM apart. VOR Federal Airways are typically depicted in black on aeronautical charts and identified by a "V" followed by the airway number (i.e., V12). As such, these routes are commonly referred to as "Victor" routes (FAA 2025g).

1.5.1.2 L/MF Federal Airways

L/MF Federal Airways are predicated solely on L/MF NAVAIDs and are depicted in brown on aeronautical charts. L/MF routes are identified by a color name and number (i.e., Amber One) and are therefore regularly referred to as colored airways. Green and Red airways are plotted east and west. Amber and Blue airways are plotted north and south. Segments of L/MF airways are used to supplement VOR Federal Airways in Alaska. This is due to the rugged terrain characteristics coupled with line-of-sight limitations of VOR NAVAIDS. The result is that L/MF NAVAIDs provide greater reliability to transmit signals over longer distances in such instances (FAA 2025g).

1.5.1.3 Low Altitude RNAV Routes

RNAV is a method of navigation that permits aircraft operation on any desired flight path within the coverage of ground-based or space-based navigation aids or within the limits of the capability of self-contained aids, or a combination of these. In the future, there will be a continued increase in dependence on the use of RNAV in lieu of routes defined by ground-based navigation aids (FAA 2025d). Low altitude RNAV routes, also known as T-routes, are normally depicted in blue on aeronautical charts and identified by the letter "T" (i.e., T205). T-routes are available for use by Global Positioning System (GPS) or GPS/Wide Area Augmentation System (WAAS) equipped aircraft (FAA 2025g).

1.5.2 High Altitude ATS Route Structure

The published high altitude route structure in the U.S. consists of jet routes and high altitude RNAV routes. The high-altitude route structure is for use at and above 18,000 feet MSL. Applicable elements of the high altitude ATS route structure are published on the IFR En Route High Altitude-U.S. chart series. The high-altitude route structure is contained within Class A airspace (FAA 2025g).

1.5.2.1 Jet Routes

The jet route system consists of jet routes established from 18,000 feet MSL to Flight Level (FL) 450 inclusive. Jet routes are depicted in black on aeronautical charts and are identified by a "J" (Jet) followed by the airway number (i.e., J12). Jet routes, like VOR airways, are based on VOR NAVAIDs, except in Alaska, where again they may be supplemented by L/MF NAVAIDs (FAA 2025g).

1.5.2.2 High Altitude RNAV Routes (Q-Routes)

RNAV routes are also available in the high-altitude structure. In this case, RNAV routes are typically labeled with the letter "Q" followed by the airway number (i.e., Q13) and therefore are commonly referred to as Q-routes. These Q-routes are available for use by RNAV equipped aircraft between 18,000 feet MSL and FL450 inclusive. Q-routes are depicted in blue on En Route High-Altitude Charts (FAA 2025g).

1.5.3 Other Routes

1.5.3.1 Military Training Routes

Among the wide variety of tactics toward which the military services must train, is "low level" combat tactics proficiency. The required maneuvers and high speeds are such that they may occasionally make the see-and-avoid aspect of VFR flight more difficult without increased vigilance in areas containing such operations. In an effort to ensure the greatest practical level of safety for all flight operations, the MTR program was conceived. The routes above 1,500 feet AGL are developed to be flown, to the maximum extent possible, under IFR. The routes at 1,500 feet AGL and below are generally developed to be flown under VFR. Generally, MTRs are established below 10,000 feet MSL for operations at speeds in excess of 250 knots. IFR MTRs, annotated by IR (for Instrument Route) followed by three or four characters (i.e., IR1206) are utilized for operations conducted in accordance with IFR regardless of weather conditions. VFR MTRs, annotated by VR (for Visual Route) followed by three or four characters (i.e., VR1207) are utilized for operations conducted in accordance with VFR except flight visibility must be 5 miles or more; and flights must not be conducted below a ceiling of less than 3,000 feet AGL. Both are depicted on IFR En Route Low Altitude Charts and VFR Sectional Aeronautical Charts (FAA 2025d).

1.5.3.2 Published VFR Routes

Published VFR routes for transitioning around, under, and through complex airspace, such as Class B airspace, were developed through a number of FAA and industry initiatives. "VFR Flyway," "VFR Corridor," and "VFR Transition Route" have all been used when describing this type of airspace.

A VFR Flyway is defined as a general flight path not defined as a specific course, for use by pilots in planning flights into, out of, through, or near complex terminal airspace to avoid Class B airspace. An ATC clearance is NOT required to fly these routes.

The design of a few of the first Class B airspace areas provided a corridor for the passage of uncontrolled traffic. A VFR corridor is defined as airspace through Class B airspace, with defined vertical and lateral boundaries, in which aircraft may operate without an ATC clearance or communication with ATC. These corridors are, in effect, a "hole" through Class B airspace.

To accommodate VFR traffic through terminal airspace, VFR Transition Routes and Helicopter Routes were developed. These routes are defined as specific VFR flight courses. Communication with ATC

where the route transitions Class B, Class C, and/or Class D airspace is required. In addition to communication requirements, a clearance is required to operate in Class B airspace. Both routes are meant to ease coordination between pilots and controllers (FAA 2025d).

1.5.4 Terminal Procedures

1.5.4.1 Departure Procedures

Instrument departure procedures are available at certain airports that enable ease of coordination between departure control and the pilot, provide efficient departure for aircraft to their appropriate enroute structure, and most importantly provide proper obstacle clearance for pilots who abide by the procedures (FAA 2025d).

1.5.4.2 Standard Terminal Arrival (STAR) Procedures

A STAR is an ATC-coded IFR arrival route established for application to arriving IFR aircraft destined for certain airports. STARs simplify clearance delivery procedures and also facilitate transition between enroute and instrument approach procedures (IAP) (FAA 2025d).

1.5.4.3 Instrument Approach Procedures (IAP)

IAPs are based on joint civil and military criteria contained in the U.S. Standard for Terminal Instrument Procedures (TERPS.) The design of IAPs based on criteria contained in TERPS takes into account the interrelationship between airports, facilities, and the surrounding environment, terrain, obstacles, noise sensitivity, etc. Appropriate altitudes, courses, headings, distances, and other limitations are specified and, once approved, the procedures are published and distributed by government and commercial cartographers as instrument approach charts. IAPs designed to provide an IFR descent from the enroute environment to a point where a safe landing can be made, and a qualified pilot, with a properly equipped and certified aircraft that adheres to the altitudes, flight paths, and weather minimums depicted on the IAP chart or vectors and altitudes issued by the radar controller, is assured of terrain and obstruction clearance and runway or airport alignment during approach for landing (FAA 2025d).

2.0 METHODOLOGY FOR ANALYSIS

This study is focused on the proposed action as described in the Environmental Impact Statement (EIS) for the Optimization of Powder River Training Complex (PRTC). As outlined in this document, the DAF is proposing to address shortfalls in aircrew readiness by improving day-to-day training and increasing the capability of Large Force Exercises (LFEs) hosted at PRTC to meet emerging threats to National Security. The Proposed Action includes:

- Actions to improve training capability of LFEs:
  - Raise the available altitude to FL600
  - Increase the total days allowed annually from 10 days to 30 days
  - Increase duration allowed for individual LFEs from 3 days to 12 days
- Actions to improve day-to-day operations:
  - Raise the ceiling of the most used ATCAAs (PR 2, Gateway East, and Gateway West) from FL260 to FL600
  - Change times of use for PRTC to 07:00 to 00:30 (07:00 a.m. to 12:30 a.m.) Monday to Thursday, 07:00 to 18:00 (07:00 a.m. to 06:00 p.m.) Friday, and other times by NOTAM

2.1 IMPACTS TO CIVIL AIR TRAFFIC

2.1.1 Data Source

FAA's Performance Data Analysis and Reporting System (PDARS) data was used to analyze the existing civil traffic in the project's area of influence. The PDARS continuously collects flight plan and radar track data from systems located at Air Route Traffic Control Centers (ARTCCs), Terminal Radar Approach Control Facilities, and ATC towers. The dataset in this study is based on recorded flight data from 1 July 2024 to 1 July 2025. A full year was analyzed to adequately cover any seasonal fluctuations in use.

2.1.2 Filtering of Flight Tracks

For each proposed airspace area, historical radar-based flight tracks were analyzed to identify those that intersect the lateral and vertical boundaries during proposed times of operation. For Day-to-Day operations, the analysis assumes routine activation of the airspace in accordance with proposed times, and flight data were filtered accordingly. This filtering was designed to quantify the number of civil aircraft that would potentially be affected by airspace activation during specified days and times. While additional activation periods may be coordinated via NOTAM, the study focuses on these primary windows to ensure consistency and relevance. For LFE operations, no time filter was used, assuming the proponent would likely not keep to specific times during LFEs. In all cases, military and unidentified aircraft were excluded to isolate potential impacts to general aviation and commercial traffic.

2.1.3 Impacts on Flight and Rerouting Methodology

For each civilian flight track that intersected the proposed areas, the origin and destination airports were identified and tallied to determine the most frequently used airport pairs. While the dataset included thousands of unique origin-destination combinations-many of which occurred only once or infrequently,

the analysis was refined to include only those combinations that occurred with at least once a week frequency to ensure the results remain representative of likely affected traffic while maintaining analytical clarity. Military aircraft were excluded under the assumption that the DoD activation of the proposed SUA implies acceptance of any operational impacts to other DoD assets during periods of activation.

To evaluate the potential impact of the proposed airspace areas, point-to-point (via great-circle routing) distances were calculated for each origin-destination pair. Although these straight-line paths do not reflect actual filed or flown routes, they serve as a conservative baseline for estimating minimum flight distances and the impacts of airspace implementation along the route. In many cases, the great-circle routing did not intersect the proposed Special Activity Airspace (SAA)[1]. An analysis was conducted to identify any obvious justification for traveling through the SAA. One such case was identified, which is due to ensuring the flight remains within domestic airspace vice navigate through Canadian airspace. In such cases, an intermediate point was added to the baseline route to ensure the effects of such cases were captured. No other apparent justification for modification of baseline routes was identified.

Alternative routes were constructed to circumnavigate the SAA laterally by a given flight. Each rerouted path incorporated an intermediate NAVAID or fix guiding the aircraft around the lateral boundaries of the airspace in question. The total rerouted distance was calculated by summing the segments from origin to fix and from fix to destination, with the difference from the baseline route used to determine the effects of additional distance flown.

Flight time effects were then calculated by applying representative cruise true airspeeds (TAS). Knots True Airspeed (KTAS) was used based on the below altitude band airspeed assumptions in a zero-wind situation. The intent was for the speeds to reflect steady-state cruise conditions that are consistent with published planning:

- **300 feet AGL–14,000 feet MSL:**
    - 170 KTAS
    - Reflects a mix of general aviation, light turboprops, and climbing or descending commercial aircraft. The average was heavily weighted to account for slower speeds below 10,000 feet (120–170 KTAS).
- **10,000–14,000 feet MSL:**
    - 220 KTAS
    - Most traffic consists of fast turboprops and entry-level business jets.
- **14,000–18,000 feet MSL:**
    - 330 KTAS
    - Typical of regional jets, mid-size business jets, and potential decelerating/accelerating larger commercial aircraft.

[1] Special Activity Airspace (SAA) refers to airspace designated for operations that may cause limitations on other aircraft. In this document, the term SAA refers collectively to SUA and ATCAAs.

- **FL180 and Above:**
  - 450 KTAS
  - Consistent with domestic enroute cruise speeds for commercial and business jets.

2.2 FUEL COSTS

From a fuel-planning perspective, reroutes are generally a manageable and routine consideration, but they do introduce a small, predictable cost component in addition to added time.

Fuel costs vary widely based on aircraft type, operating weight, altitude, speed, atmospheric conditions, operator-specific procedures, and fuel prices themselves fluctuate over time and by location. Because of these inherent variables, it is not prudent to calculate or present a single total fuel cost associated with each alternative. Instead, this section is provided to describe the methodology by which additional distance can be translated into additional time, fuel burn, and cost, allowing individual operators to assess potential impacts using parameters that reflect their specific aircraft, operating profile, and fuel pricing assumptions.

When an aircraft is required to fly additional distance at cruise, that added distance translates into additional time at a known speed, which directly results in increased fuel burn and fuel cost. While the per-flight impact is typically modest, it is accounted for to ensure the full scope of operational and cost effects is understood.

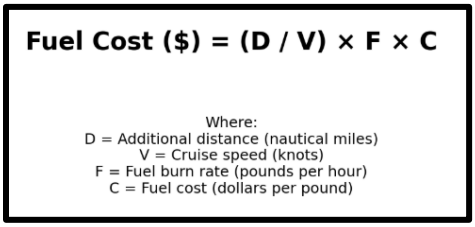


Figure 2.1-1 Basic Fuel Cost Calculation

Example A: An airliner cruising at FL300 at approximately 450 KTAS that is required to fly an additional 37.5 nautical miles would incur about five minutes of additional flight time. Using a representative narrowbody cruise fuel burn of approximately 5,000 pounds per hour, five minutes of additional flight results in roughly 420 pounds of additional fuel consumed, which equates to an incremental fuel cost of approximately $525 per occurrence, assuming a fuel cost of $1.25 per pound.

Example B: A single-engine aircraft operating at approximately 2,500 feet MSL and 120 KTAS that flies an additional 10 nautical miles would also incur about five minutes of additional flight time. At an average fuel burn of approximately 10 gallons per hour, this equates to about five pounds of additional fuel consumed, resulting in an incremental fuel cost of approximately $6 per occurrence at $1.25 per pound.

2.3 AIRPORTS IN THE REGION OF INFLUENCE

FAA air traffic controllers are responsible for ensuring the safe flight of aircraft through the NAS. Requirements for reporting airport aircraft operations are detailed in FAA JO 7210.55G, *Operational Data Reporting Requirements* (FAA 2017). This analysis uses airport data operations reported to the FAA as the basis for analyzing the potential effects on aircraft operations at airports located beneath, or in close proximity to the existing and proposed SUA.

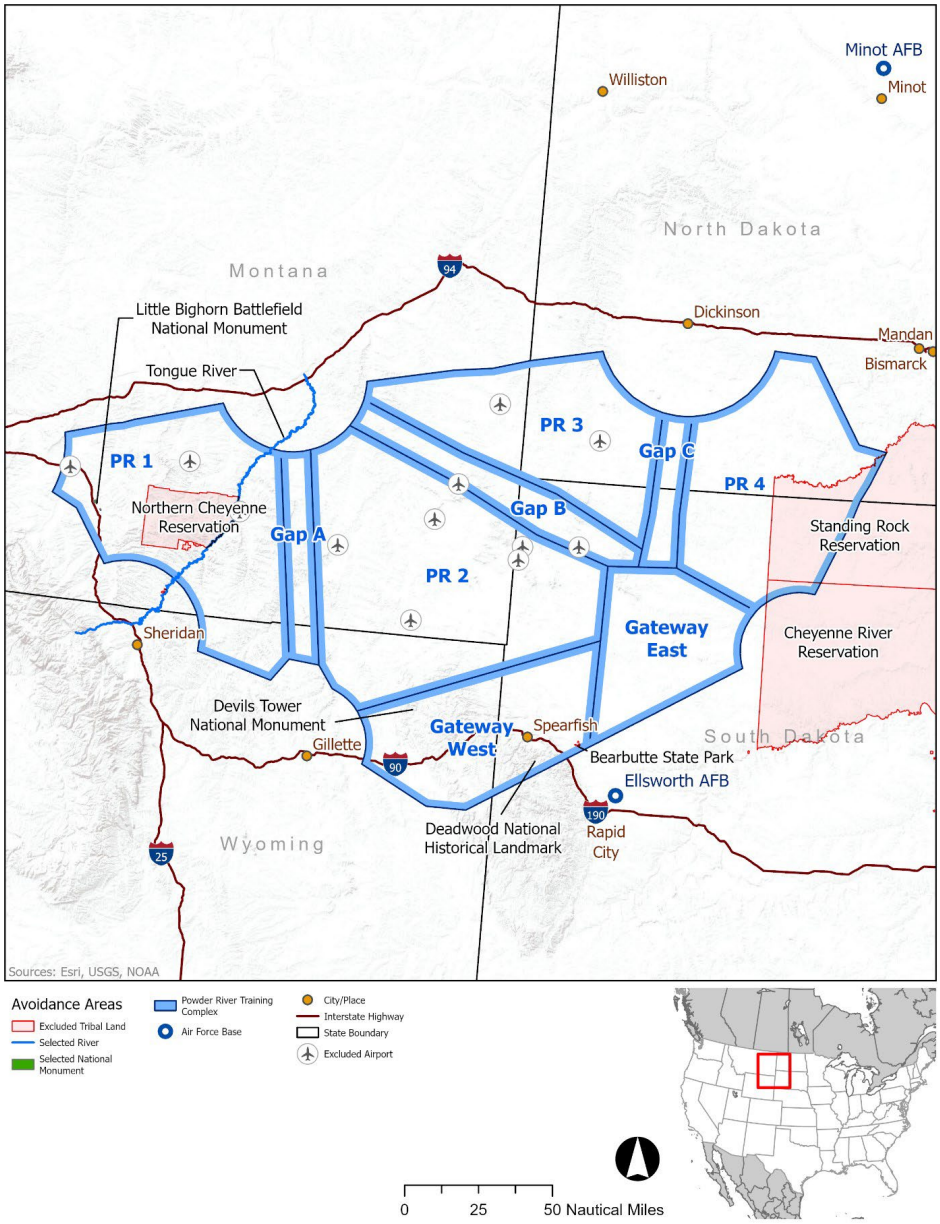
There are two types of airports, towered and non-towered, which are further subdivided into Civil Airports that are open to the public; Military/Federal Government Airports that are operated by the

military or other agencies of the Federal Government; and Private Airports that are designated for private or restricted use and not open to the public. Towered airports have an operating control tower in which ATC is responsible for providing the safe, orderly and expeditious flow of air traffic and all pilots are required to maintain two-way radio communication with ATC. Non-towered airports do not have operating control towers and, although advisable, two-way radio communications are not required. Airports within the region of influence (ROI) for the PRTC are listed in **Enclosure A**. Since the Proposed Action does not change the horizontal dimensions of PRTC, no new or additional airports would be within the ROI of the Proposed Action.

3.0 ANALYSIS

3.1 INTRODUCTION

This analysis evaluates two action alternatives addressed in the EIS: Alternative 1 and Alternative 2, described in the following sections. The No Action Alternative would not modify any of the existing airspace; thus, a detailed analysis on the impacts to civil airspace users is not necessary. The airspace under review is shown in **Figure 3.1-1** and proposed annual use of airspace by aircraft type is shown in **Table 3.1-1**.



Legend: PR = Powder River; PRTC = Powder River Training Complex; SAA = Special Activity Airspace

Figure 3.1-1 PRTC SAA Boundaries

Table 3.1-1 Annual Sorties in PRTC Airspace by Aircraft

Aircraft	Existing Sorties
B-1	1,945
B-2	8
B-52	1,086
Tanker	134
Transient Fighter	52
Transient Heavy	5
RQ/MQ	4
Total	***3,234***

Note: Transient fighter activity includes the most common fighters utilizing the airspace: F-15, F-16, and F-22.
Legend: MQ = multi-role remotely piloted aircraft system; PRTC = Powder River Training Complex; RQ = reconnaissance unmanned aircraft system
Source: DAF 2024

3.2 ALTERNATIVE 1

Alternative 1 proposes:

- Actions to improve training capability of LFEs:
  - Raise the available altitude to FL600
  - Increase the total days allowed annually from 10 days to 30 days
  - Increase duration allowed for individual LFEs from 3 days to 12 days
- Actions to improve day-to-day operations:
  - Raise the ceiling of the most used ATCAAs (PR 2 and Gateway West) from FL260 to FL600
  - Change times of use for PRTC to 07:00 to 00:30 (07:00 a.m. to 12:30 a.m.) Monday to Thursday, 07:00 to 18:00 (07:00 a.m. to 06:00 p.m.) Friday, and other times by NOTAM

Potential impacts to civil aviation are evaluated in detail. These assessments consider both IFR and VFR traffic, with routing assumptions based on conservative scenarios.

3.2.1 LFE Operations

Alternative 1 LFE area includes the entire PRTC complex as shown in **Figure 3.1-1**. The Proposed Action is to raise the available altitude to FL600, increase the total days allowed annually from 10 days to 30 days, and increase duration allowed for individual LFEs from 3 days to 12 days.

3.2.1.1 Airports

Table 3.2-1 provides information for each of the public and private airports located within 20 NM of PRTC that are potentially affected by the airspace initiative. **Enclosure A** provides details on each airport under and within 20 NM of the entire complex, regardless of assessed effects. Given that FAA Order JO 7400.2 dictates that SUA must avoid airport areas by 3 NM up to 1,500 feet AGL, and that many private airports within PRTC are also avoided by 1 NM up to 1,500 feet AGL, there is little anticipated impact to most airports in the area. Effects are generally associated with transiting to/from those airports.

Table 3.2-1 Airports in PRTC LFE ROI with Potential Impacts

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
Baker Municipal	BHK	PR 3	Coordinates: N46°20.80' / W104°15.49' Located 01 miles SE of Baker, Montana on 206 acres of land. Surveyed Elevation is 2,980 ft MSL. Public Airport Tower: No Publicly owned Owner: BAKER CITY AND FALLON CO BOX 846 BAKER, MT 59313 406-778-2883	RNAV RWY 13 Approach (Up to 6,000 ft MSL including missed approach via PR 3 Only).	RNAV RWY 31 Approach (Up to 5,400 ft MSL for approach and 6,000 ft MSL for missed approach via PR 3 Only).			Not reported	Approaches and Missed approaches require up to 6,000 ft MSL in PR 3 to accomplish. This may be affected by increased LFE days. Total impact would depend upon unknown weather variables and unavailable operations data.
Big Horn County	00U	PR 1	Coordinates: N45°44.66' / W107°39.63' Located 03 miles W of Hardin, Montana. Surveyed Elevation is 3,025 ft MSL. Public Airport Tower: No Publicly owned COUNTY OF BIG HORN PO BOX 908 HARDIN, MT 59034 406-665-9700	RNAV RWY 26 Approach (Up to 10,000 ft MSL for approach and 6,500 ft MSL for missed approach via PR 1A with a feeder route impacting PR 1C				Not reported	Single approach affects PR 1A and C at or below 10,000 ft MSL. This may be affected by increased LFE days. Total impact would depend upon unknown weather variables and unavailable operations data.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
Bowman Regional	BWW	PR 3	Coordinates: N46°9.93' / W103°18.04' Located 04 miles E of Bowman, North Dakota on 428 acres of land. Surveyed Elevation is 2,965 ft MSL. Public Airport Tower: No Publicly owned BOWMAN COUNTY ARPT AUTH PO BOX 331 BOWMAN, ND 58623 701-523-7484	RNAV RWY 13 Approach (Up to 5,800 ft MSL via PR 3 / 6,000 ft MSL on the Missed Approach via Gap C)	RNAV RWY 31 Approach (Up to 5,800 ft MSL via PR 3 / 6,000 ft MSL on the Missed Approach via Gap C)			Not reported	RNAV RWY 13 and 31 approaches both occur up to 5,800 feet MSL in PR 3 and 6,000 feet MSL on Missed Approach into Gap C. The missed approach is under Gap C, but the approaches occur within PR 3 airspace. These may be affected by increased LFE days. Total impact would depend upon unknown weather variables and unavailable operations data.
Colstrip	M46	PR 1	Coordinates: N45°51.17' / W106°42.56' Located 03 miles SW of Colstrip, Montana. Surveyed Elevation is 3,427 ft MSL. Public Airport. Tower: No Publicly owned COUNTY OF ROSEBUD PO BOX 47 FORSYTH, MT	GPS RWY 6 Approach (Up to 6,000 ft MSL via PR 1A and PR 1B)	GPS RWY 24 Approach (up to 5,500 ft MSL on approach and 6,000 ft MSL on missed approach in PR 1B with feeder from Gap A)	Departure RWY 6 - Standard Climb up to 9,000 ft MSL via PR 1B and Gap A with a heading towards PR 2 a few miles away.	Departure RWY 24	Not reported	Departure procedures from RWY 6 occur in PR 1B, GAP A and PR 2 at and below 9,000 ft MSL. This may be affected by increased LFE days and/or increased day-to-day times. Departure procedures from RWY 24 affect PR 1B at 6,000 ft MSL and below. GPS RWY 6 Approach occurs up to 6,000 ft MSL via PR 1A and PR 1B.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			59327 406-346-2251						GPS RWY 24 Approach occurs up to 6,000 ft MSL via PR 1B and Gap A. These may be affected by increased LFE days. Total impact would depend upon unknown weather variables and unavailable operations data.
Ekalaka Airport	97M	PR 2	Coordinates: N45°52.59' / W104°32.25' Located 02 miles SE of Ekalaka, Montana on 162 acres of land. Surveyed Elevation is 3,504 ft MSL. Public Airport Tower: No Publicly owned Owner: COUNTY OF CARTER COUNTY COURT HOUSE PO BOX 315 EKALAKA, MT 59324 406-775-8749	RNAV RWY 13 Approach (Up to 14,000 ft MSL via Gap, PR 2, and PR 3)	RNAV RWY 31 Approach (Up to 14,000 ft MSL via Gap, PR 2, and PR 3)			Not reported	Approach RNAV RWY 13 requires up to 14,000 ft MSL with one IAF in PR 2, one IAF in PR 3, one IAF in Gap B and FAF in Gap B. Can be flown as low as 7,000 depending on the direction. This may be affected by increased LFE days. RNAV RWY 31 requires up to 14,000 ft MSL with 1 x IAF in Gap B, and 2 x IAF in PR 2. FAF in PR 2. MA Point in Gap B at 7,000 feet MSL. Potential to be affected with increased LFE days and Day-to-Day times. Total impact would depend upon unknown weather variables and unavailable operations data.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
Hulett Municipal	W43	Gateway West	Coordinates: N44°39.77' / W104°34.07' Located 02 miles SE of Hulett, Wyoming on 330 acres of land. Surveyed Elevation is 4,263 ft MSL. Public Airport Tower: No Publicly owned TOWN OF HULETT P.O. BOX 278 HULETT, WY 82720 307-467-5771	RNAV RWY 13 Approach (Up to 7,000 feet MSL via PR 2 and GW-W and Missed Approach up to 7,600 ft MSL via GW-W) IMUNTE to FANRO (IFs) go via PR 2	RNAV (GPS)-A Approach (Up to 7,600 ft MSL. Missed Approach Up to 15,000 ft MSL via GW-W)	LLADN One Departure (Up to 8,100 ft MSL primarily under GW-W)		Not reported	RNAV-A Impacts up to 15,000 ft MSL under GW-W. Will not be affected as it is under airspace in question. LLADN One Up to 8,100 ft MSL under GW-W. Will not be affected as departure is under airspace in question. RNAV RWY 13 Impacts PR 2 at 7,000 ft MSL and below GW-W up to 7,600. Potential to be affected with increased LFE days and Day-to-Day times. Total impact unknown due to weather variables and unavailable operations data.

Legend: FAF = Final Approach Fix; ft = foot/feet; GPS = Global Positioning System; GW-W = Gateway West; IAF = Initial Approach Fix; LFE = Large Force Exercise; MA = Missed Approach; MOA = Military Operations Area; MSL = mean sea level; PR = Powder River; RNAV = Area Navigation; ROI = Region of Influence; RWY = Runway.

Source: SkyVector 2025.

Any potential impact would be procedural and conditional, occurring primarily when instrument approaches are required due to instrument meteorological conditions and may result in additional coordination to facilitate traffic during those periods. MOAs do not restrict VFR access to or from these airports, and impacts would be limited to increased radio coordination rather than denial of access.

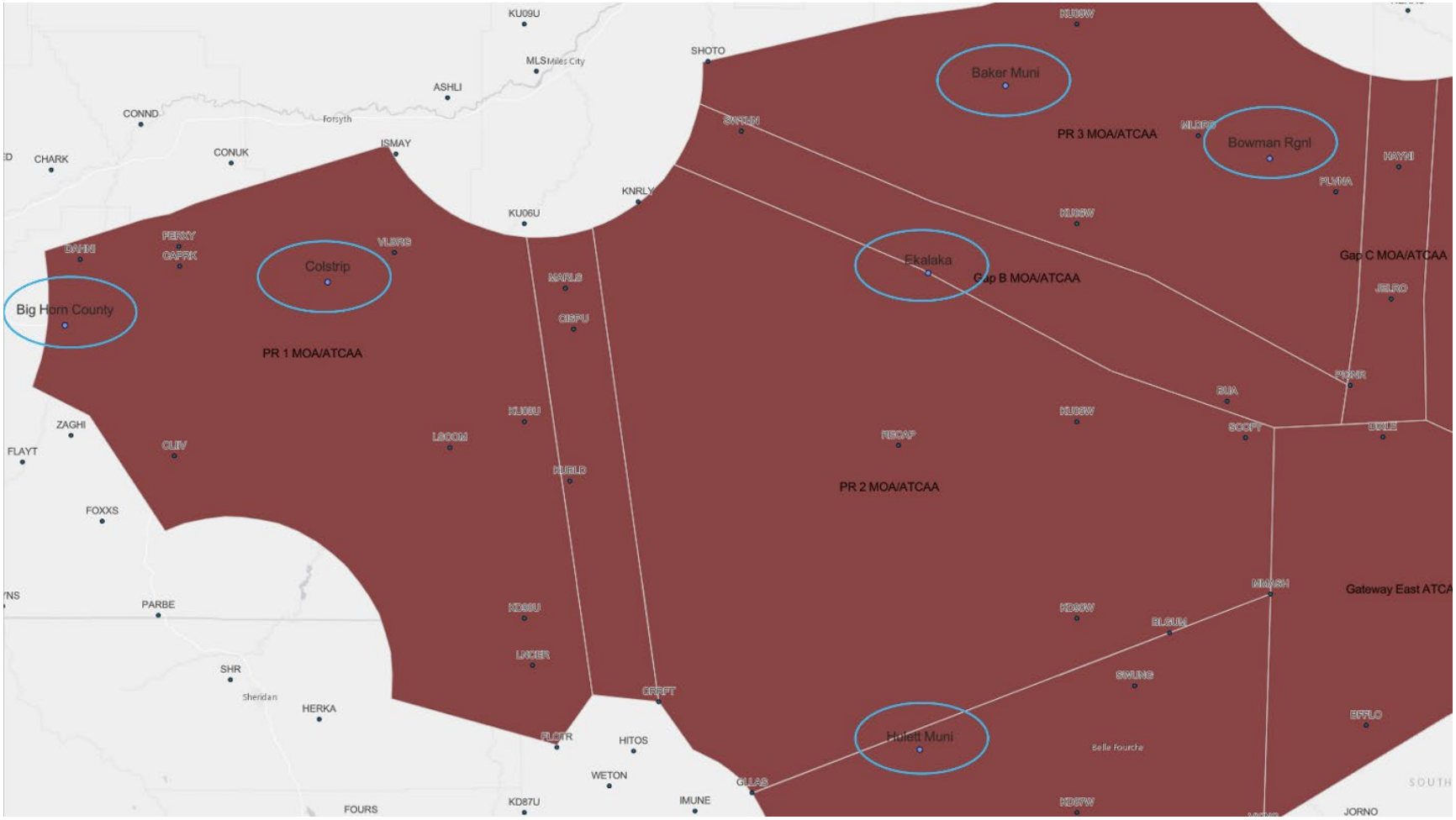
There are, however, six public airports within the PRTC ROI that have the potential for portions of their published instrument approach or departure procedures to be affected by the increase in LFE days. The additional LFE days do not represent entirely new days of airspace use, but rather an expansion of airspace utilization beyond routine day-to-day operating areas. As a result, only those portions of airspace used in excess of normal daily operations represent incremental effects attributable to the LFE increase. Review of PDARS data also indicates that traffic associated with these airports was observed within the affected airspace at a frequency of less than once per month to no occurrences at all, suggesting limited routine use and that many operations may be VFR or not conducted on a filed flight plan with transponder data available. Taken together, these factors indicate a minimal likelihood of significant operational impacts. Furthermore, during instrument meteorological conditions, the likelihood of dynamic LFE maneuvering at the affected altitudes is reduced, allowing potential impacts to be mitigated through coordination and, if necessary, the establishment of procedures for dynamic airspace floor updates via letters of agreement between the proponent and the FAA.

Figure 3.2-1 provides a visual depiction of the location of these airports. Detailed discussions of each airport follow the table. As shown in **Table 3.2-1**, operational statistics are not available or not reported to the FAA for any of these airports within the PRTC ROI.

Baker Municipal (BHK): Baker Municipal Airport is a public, non-towered field 1 mile southeast of Baker, Montana, at a surveyed elevation of approximately 2,981 MSL. It has a single grooved asphalt runway (13/31) about 5,900 × 75 feet with medium-intensity runway lights (MIRL), precision approach path indicators (PAPI) on both ends, and runway end identifier lights (REIL). The common traffic advisory frequency (CTAF) is 122.9, and Salt Lake City ARTCC provides approach/departure services.

Approaches and missed approaches require altitudes up to 6,000 feet MSL within PR 3 boundaries to accomplish.

Figure 3.2-2 and **Figure 3.2-3** are the applicable instrument procedures for the airport.



Legend: LFE = Large Force Exercise; PRTC = Powder River Training Complex; ROI = Region of Influence

Figure 3.2-1 Airports in PRTC LFE ROI with Potential Impacts

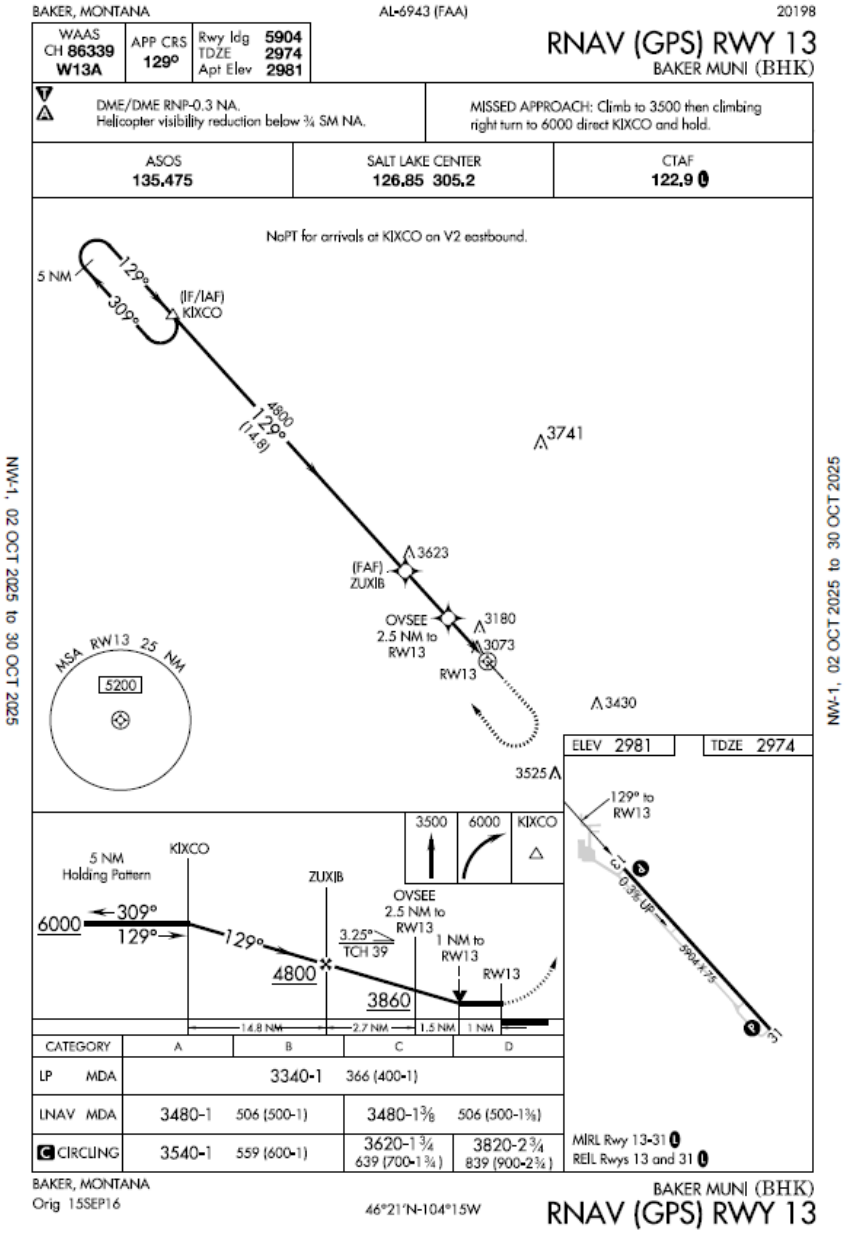


Figure 3.2-2 BHK RNAV (GPS) RWY 13

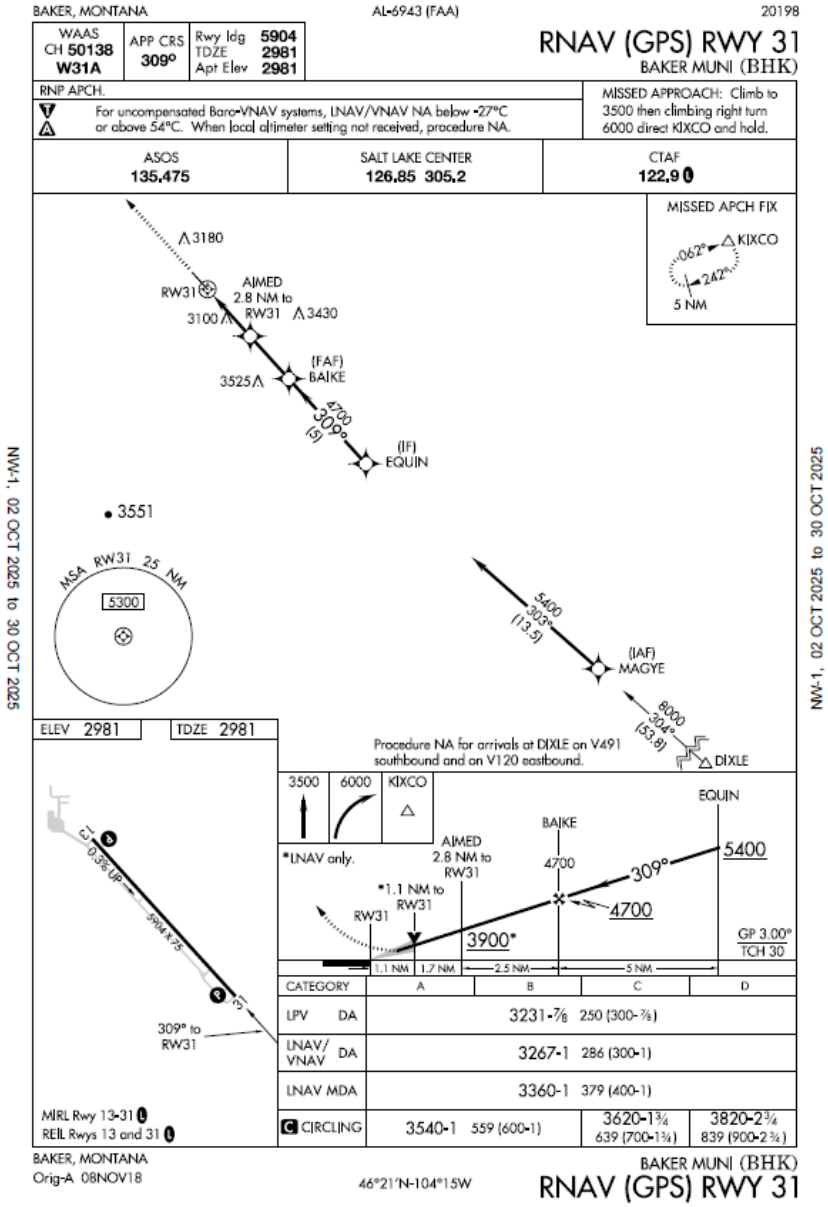


Figure 3.2-3 BHK RNAV (GPS) RWY 31

Big Horn County (00U): Big Horn County Airport is a public, unattended general-aviation field 3 miles west of Hardin, Montana, at an elevation of about 3,025 feet MSL. It has one asphalt runway (08/26) approximately 4,491 × 75 feet with MIRL and PAPI on both ends, CTAF/UNICOM 122.8, and an automated weather observing system (AWOS-3) on 118.325.

The RNAV (GPS) Runway (RWY) 26 approach has sections within PR 1A up to 10,000 feet MSL and 6,500 feet MSL on the missed approach, with a feeder route transiting a portion of PR 1C.

Figure 3.2-4 is the applicable instrument procedure for the airport.

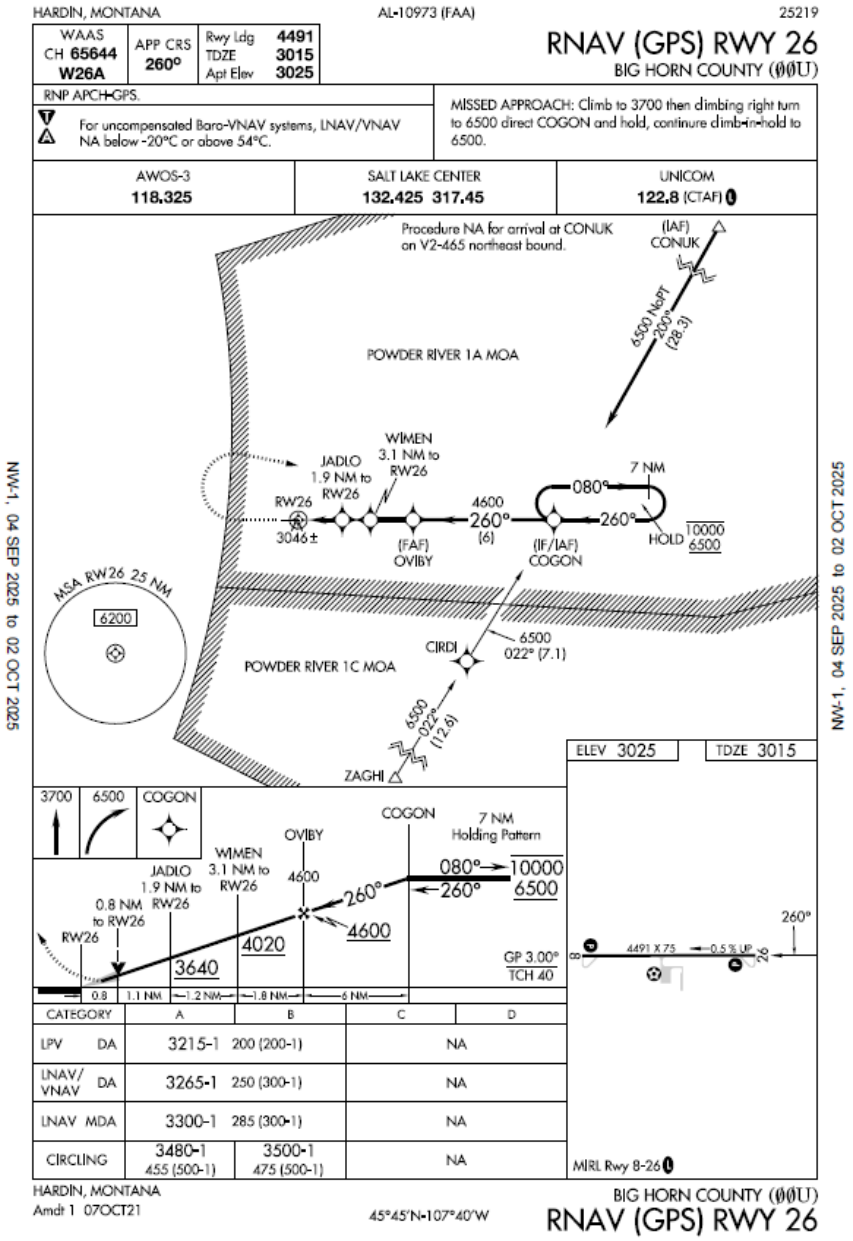


Figure 3.2-4 00U RNAV (GPS) RWY 26

Bowman Regional (BWW): Bowman Regional Airport is a public facility located 4 miles east of Bowman, North Dakota, at an elevation of about 2,965 feet MSL. It has a concrete, grooved runway (13/31) 5,701 × 75 feet with MIRL, PAPI, and REIL; CTAF/UNICOM is 122.8, and AWOS is 118.075.

RNAV RWY 13 and RNAV RWY 31 both have sections at 5,800 feet MSL within PR 3 and 6,000 feet MSL must be established on the missed approach into Gap C. The missed approach is under Gap C, but the approaches have effects within PR 3 airspace.

Figure 3.2-5 and **Figure 3.2-6** are the applicable instrument procedures for the airport.

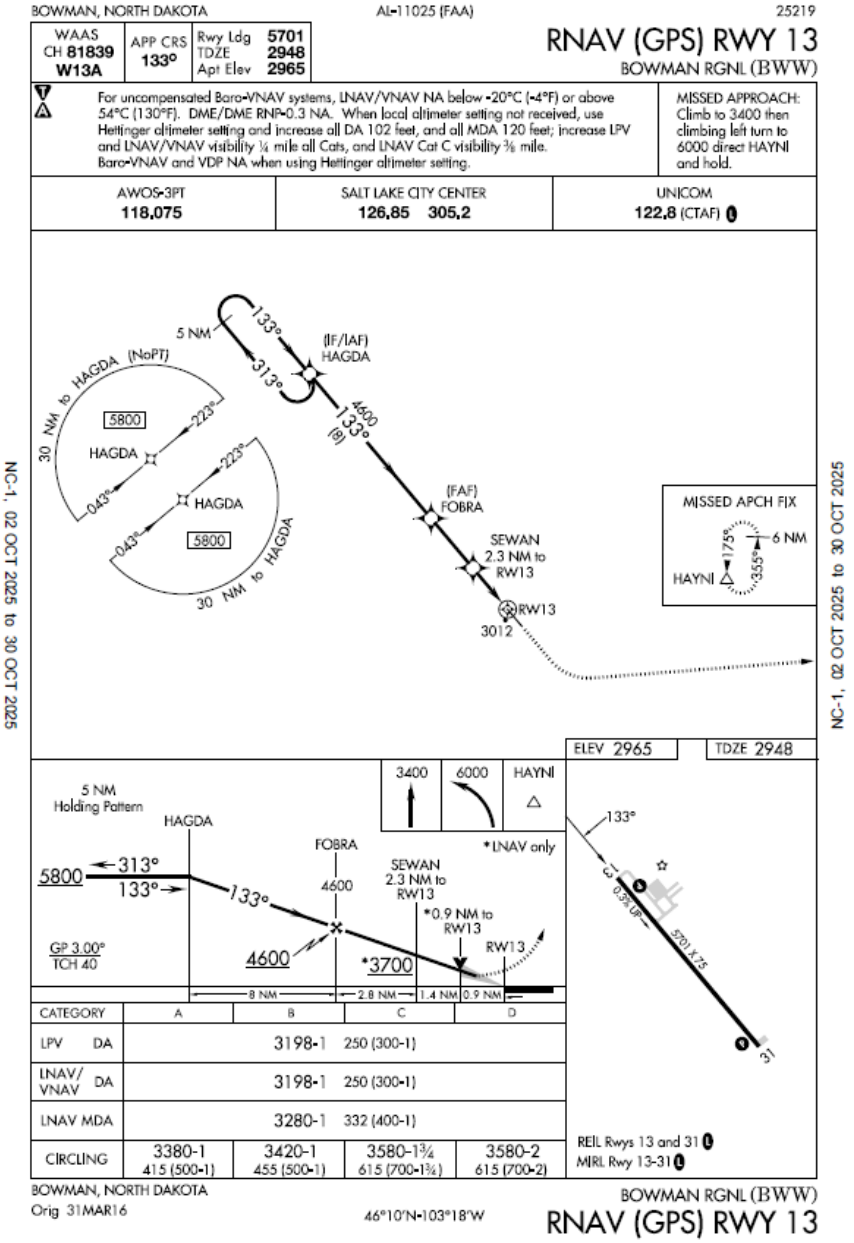


Figure 3.2-5 BWW RNAV (GPS) RWY 13

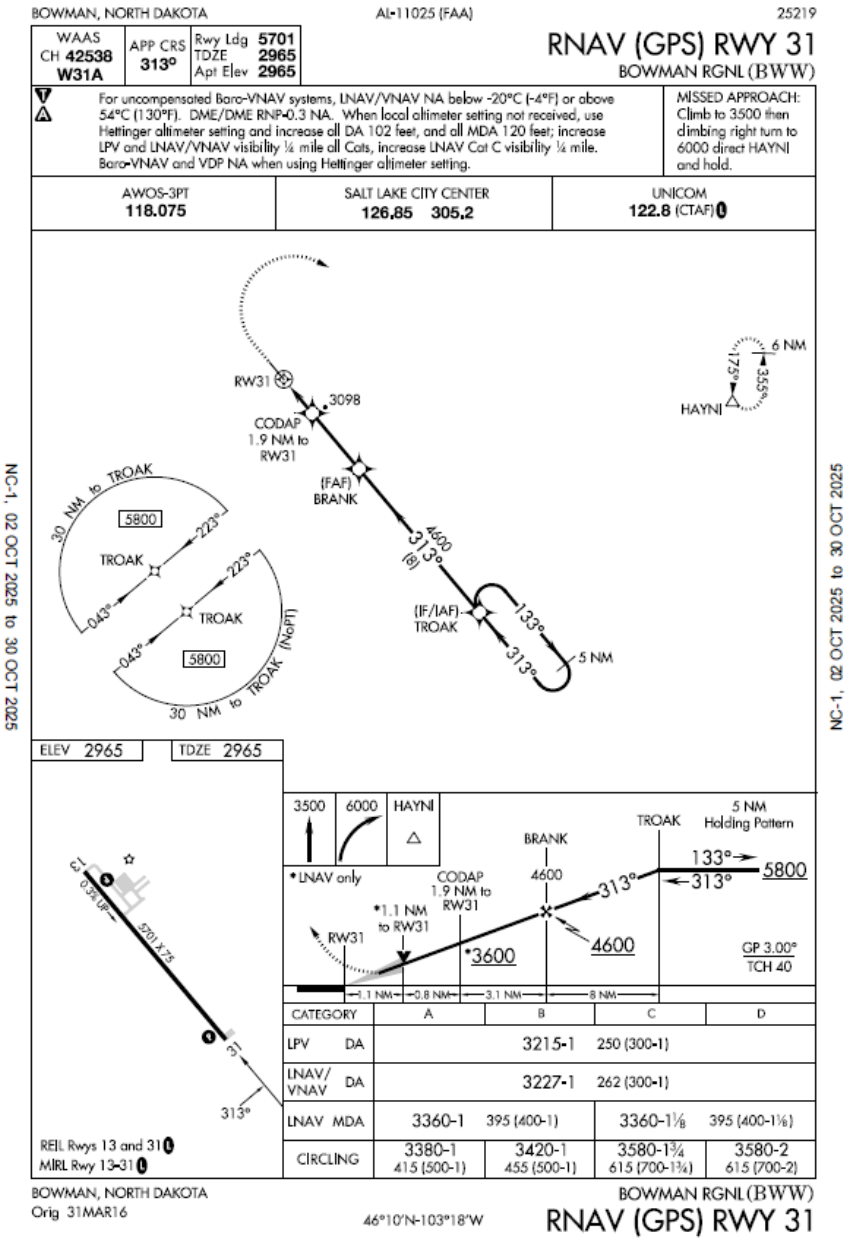


Figure 3.2-6 BWW RNAV (GPS) RWY 31

Colstrip (M46): Colstrip Airport is a public, on-call field 3 miles southwest of Colstrip, Montana, at an elevation of about 3,428 feet MSL. It has one asphalt runway (06/24) 5,100 × 75 feet with MIRL and PAPI both ends, CTAF/UNICOM 122.7, and AWOS on 118.525.

Departure procedures from RWY 6 have impacts in PR 1B, Gap A, and/or PR 2 below 9,000 feet MSL and may be affected by increased LFE days and/or increased day-to-day times. Departure procedures from RWY 24 have sections within PR 1B at 6,000 feet MSL and below. Approach GPS RWY 6 requires up to 6,000 feet MSL via PR 1A and PR 1B. Approach GPS RWY 24 requires up to 6,000 feet MSL via PR 1B and Gap A.

Figure 3.2-7 through Figure 3.2-10 are the applicable instrument procedures for the airport.

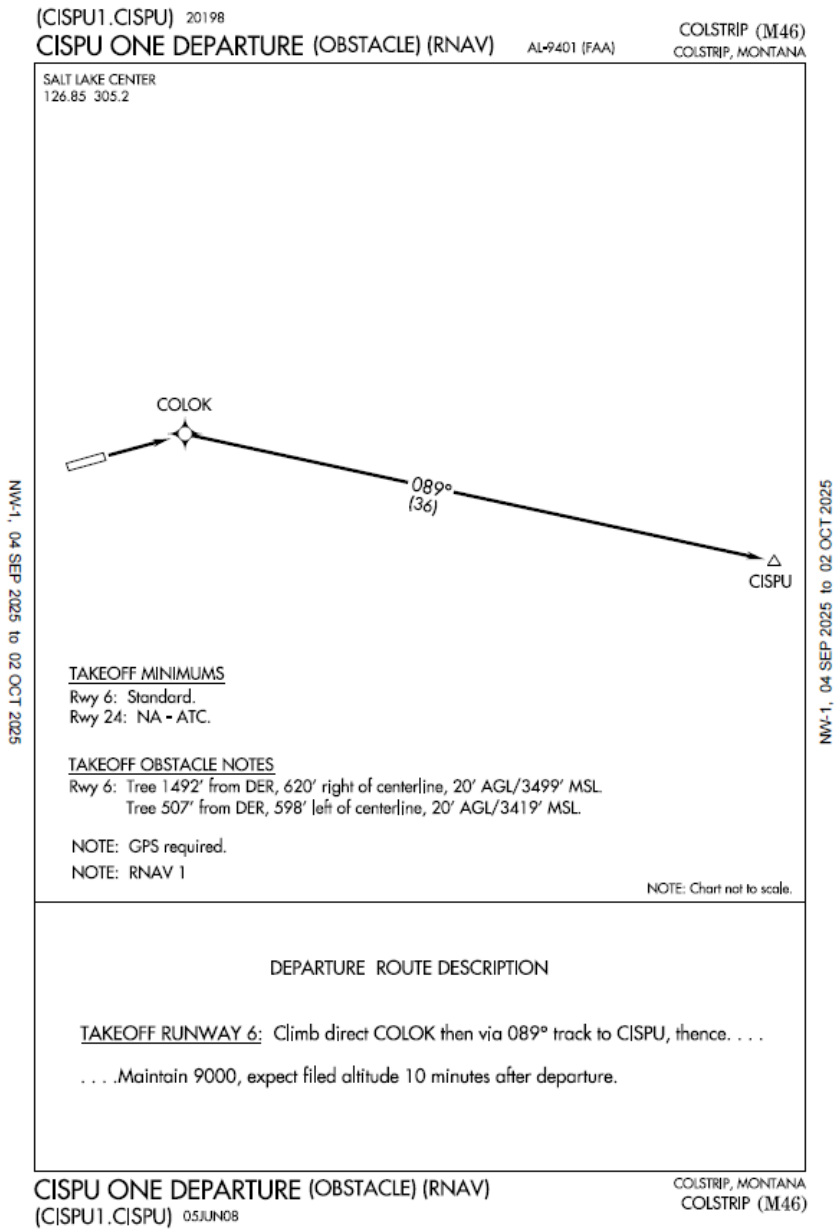


Figure 3.2-7 M46 CISPU ONE DEPARTURE

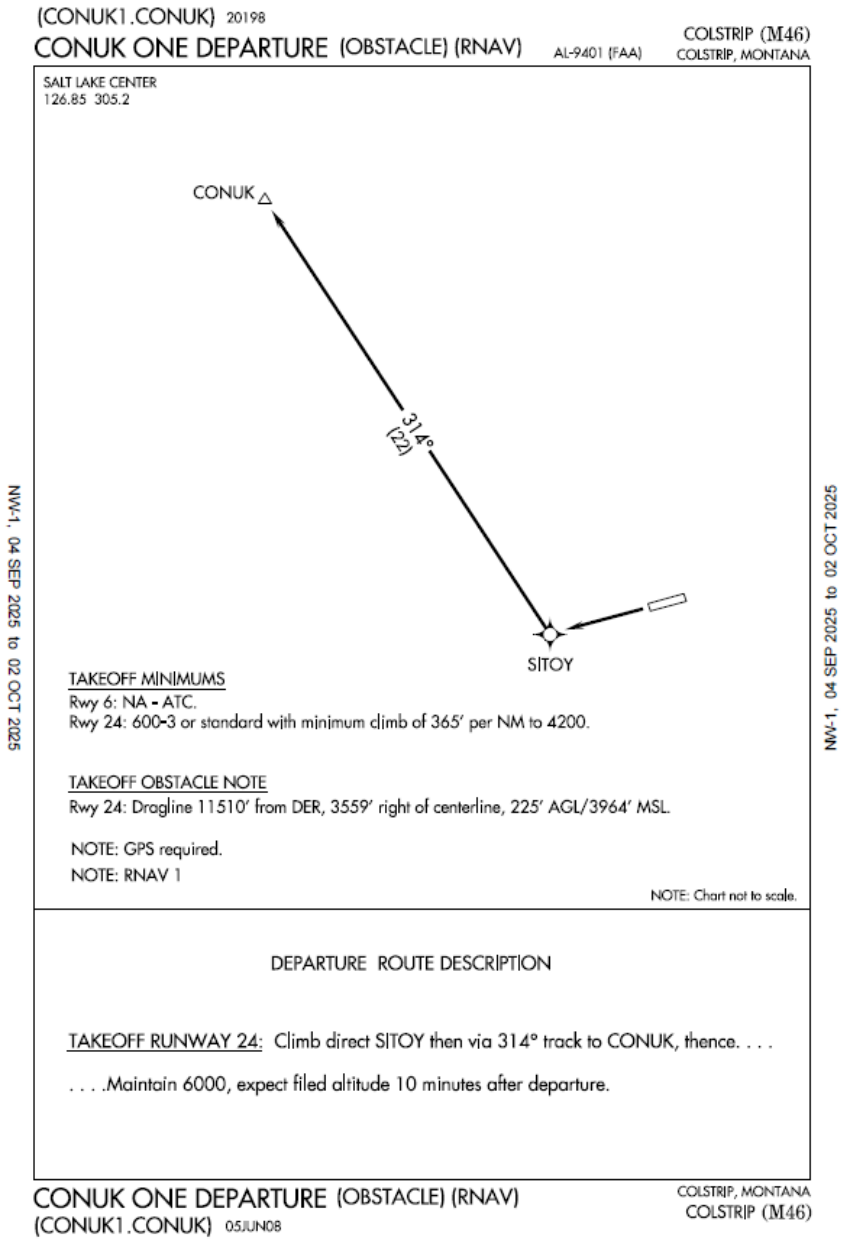


Figure 3.2-8 M46 CONUK ONE DEPARTURE

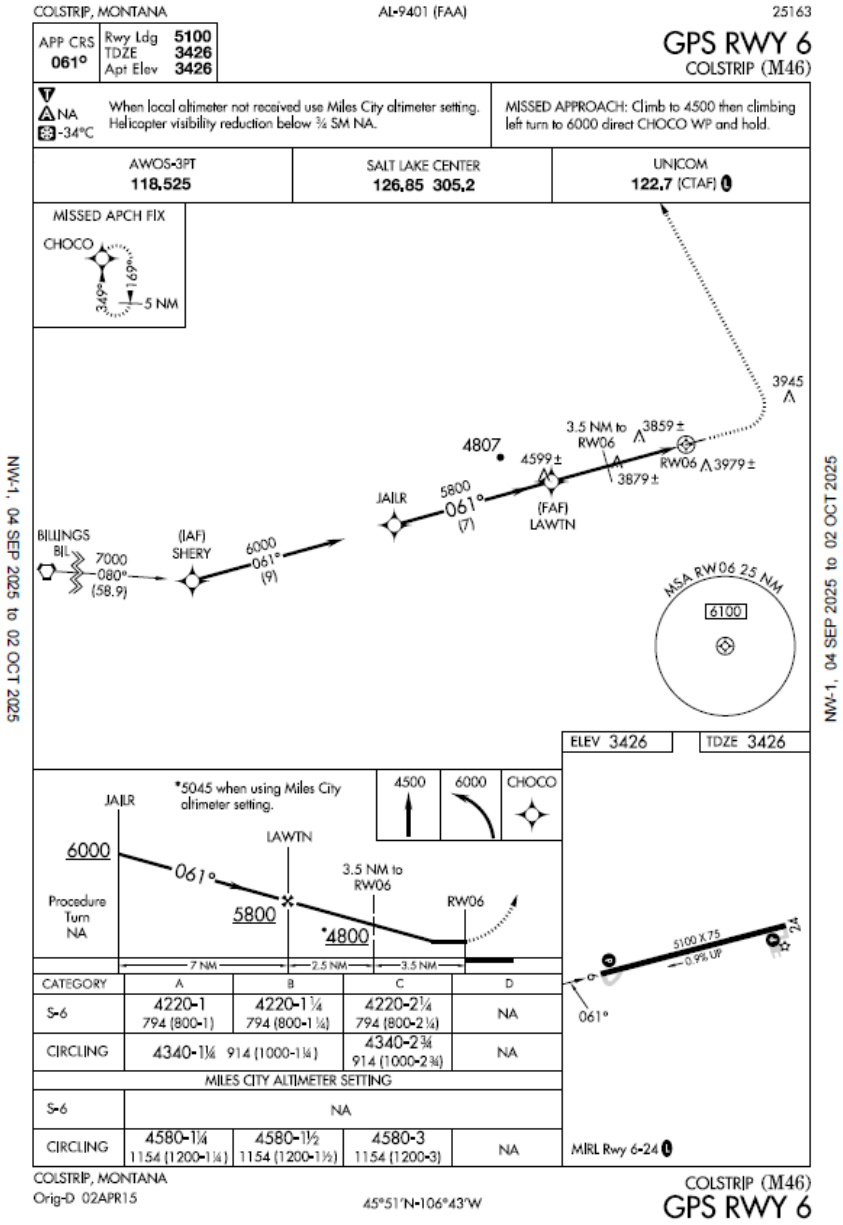


Figure 3.2-9 M46 GPS RWY 6

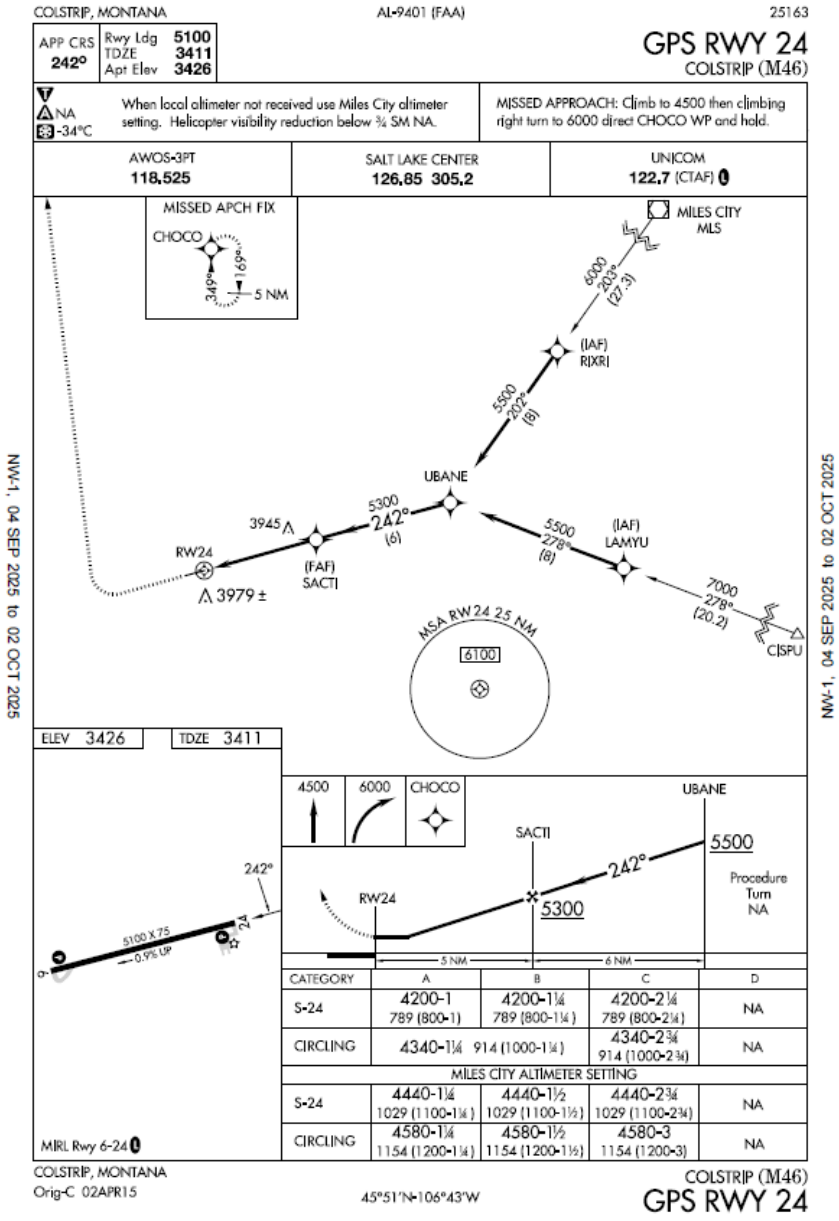


Figure 3.2-10 M46 GPS RWY 24

Ekalaka Airport (97M): Ekalaka Airport is a public, unattended field 2 miles southeast of Ekalaka, Montana, at an elevation of about 3,505 feet MSL. It has a single asphalt runway (13/31) approximately 3,798 × 75 feet with MIRL and PAPI; CTAF is 122.9.

RNAV RWY 13 requires up to 14,000 feet MSL with one initial approach fix (IAF) in PR 2, one IAF in PR 3, one IAF in Gap B, and the final approach fix (FAF) in Gap B. It can be flown as low as 7,000 feet depending on direction. RNAV RWY 31 requires up to 14,000 feet with one IAF in Gap B and two IAFs in PR 2, FAF in PR 2, and a missed approach point in Gap B at 7,000 feet.

Figure 3.2-11 and **Figure 3.2-12** are the applicable instrument procedures for the airport.

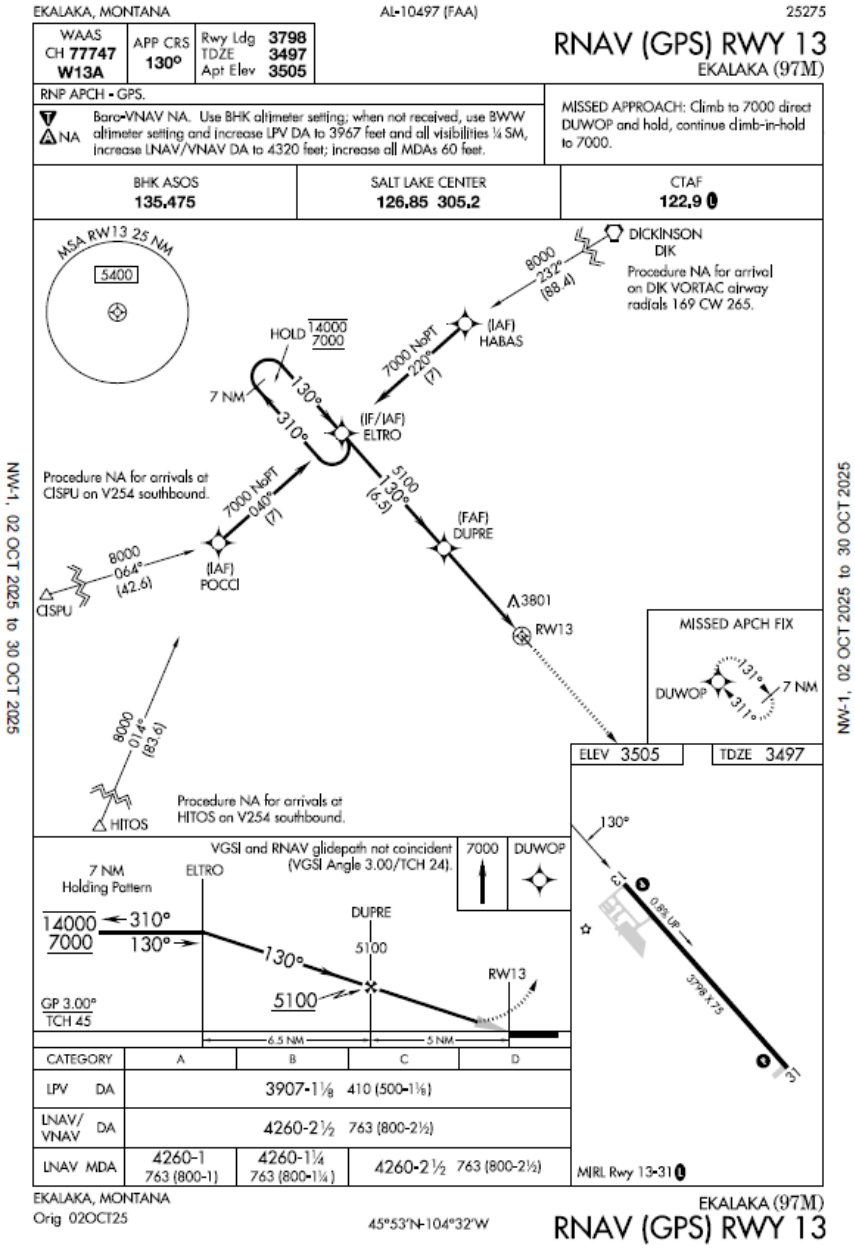


Figure 3.2-11 97M RNAV (GPS) RWY 13

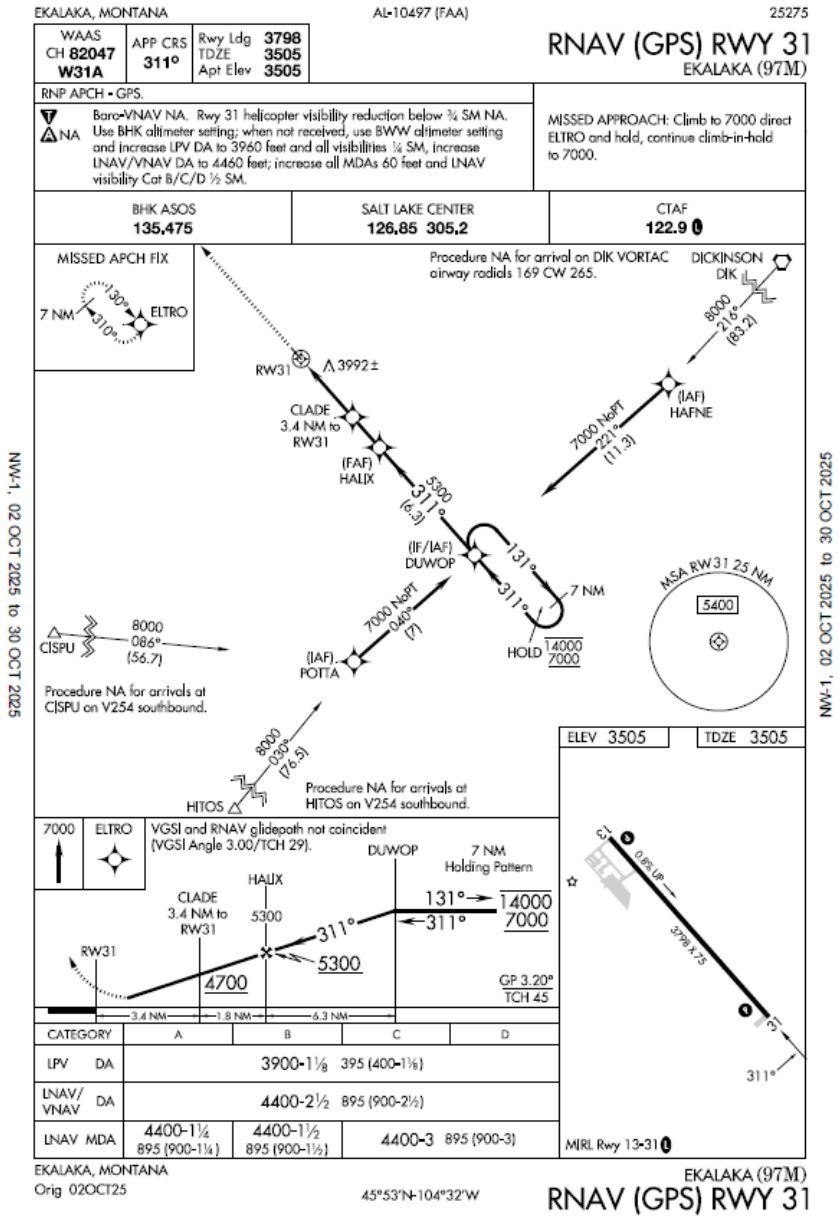


Figure 3.2-12 97M RNAV (GPS) RWY 31

Hulett Municipal (W43): Hulett Municipal Airport is a public, unattended airport 2 miles southeast of Hulett, Wyoming, at an elevation of about 4,264 feet MSL. It has a single asphalt runway (13/31) 5,500 × 75 feet with MIRL, PAPI, and REIL; CTAF/UNICOM is 122.8, and AWOS is 128.775.

RNAV-A requires up to 15,000 feet MSL under Gateway West with no anticipated effects as it is under the airspace in question. LLADN ONE departure up to 8,100 feet MSL is also under Gateway West with no anticipated impact. RNAV RWY 13 has sections within PR 2 at 7,000 feet MSL and below.

Figure 3.2-13 through Figure 3.2-15 are the applicable instrument procedures for the airport.

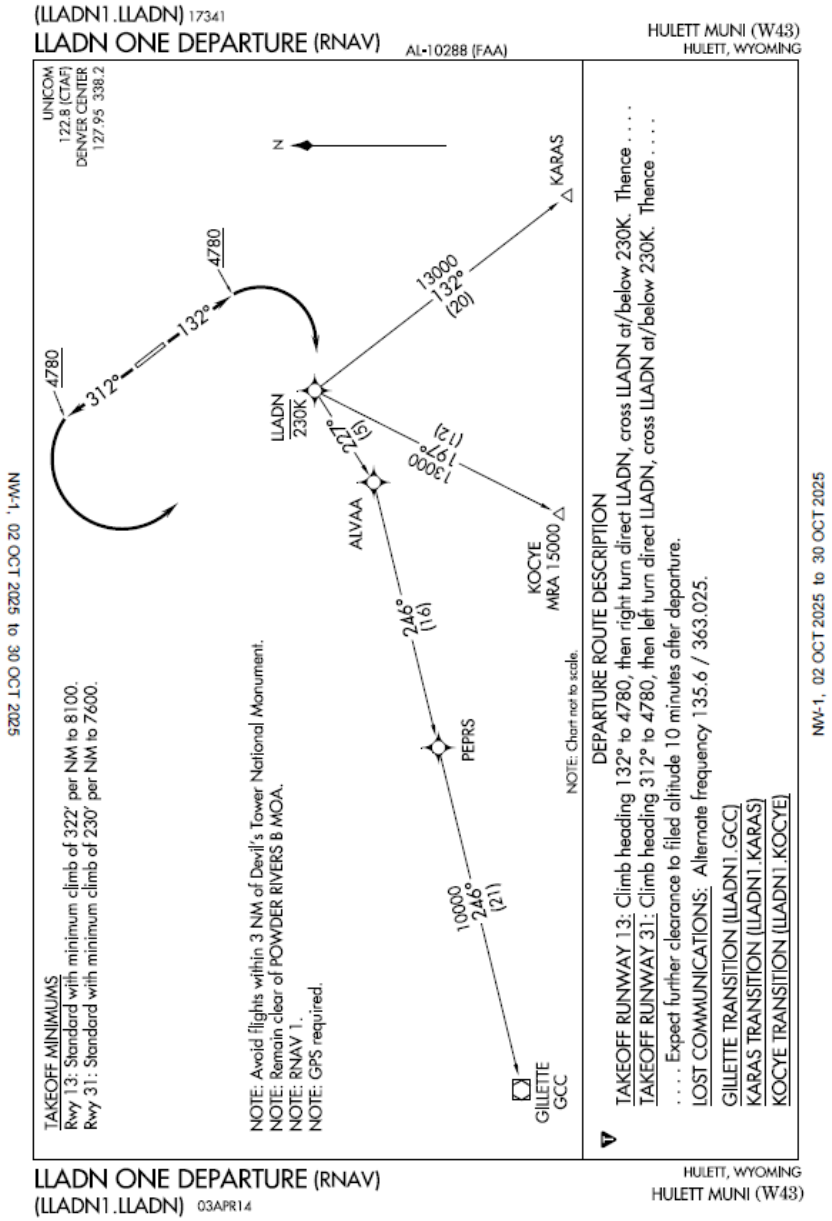


Figure 3.2-13 W43 LLADN ONE DEPARTURE

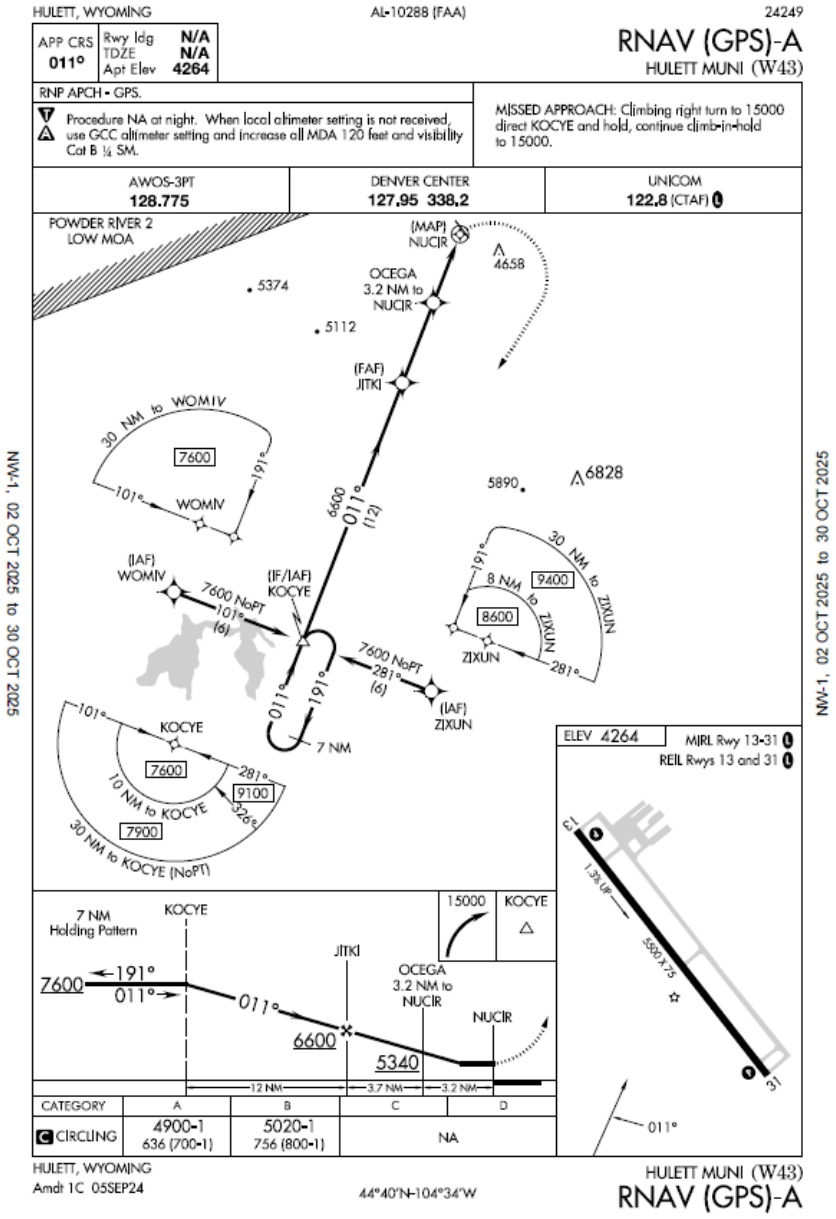


Figure 3.2-14 W43 RNAV (GPS) -A

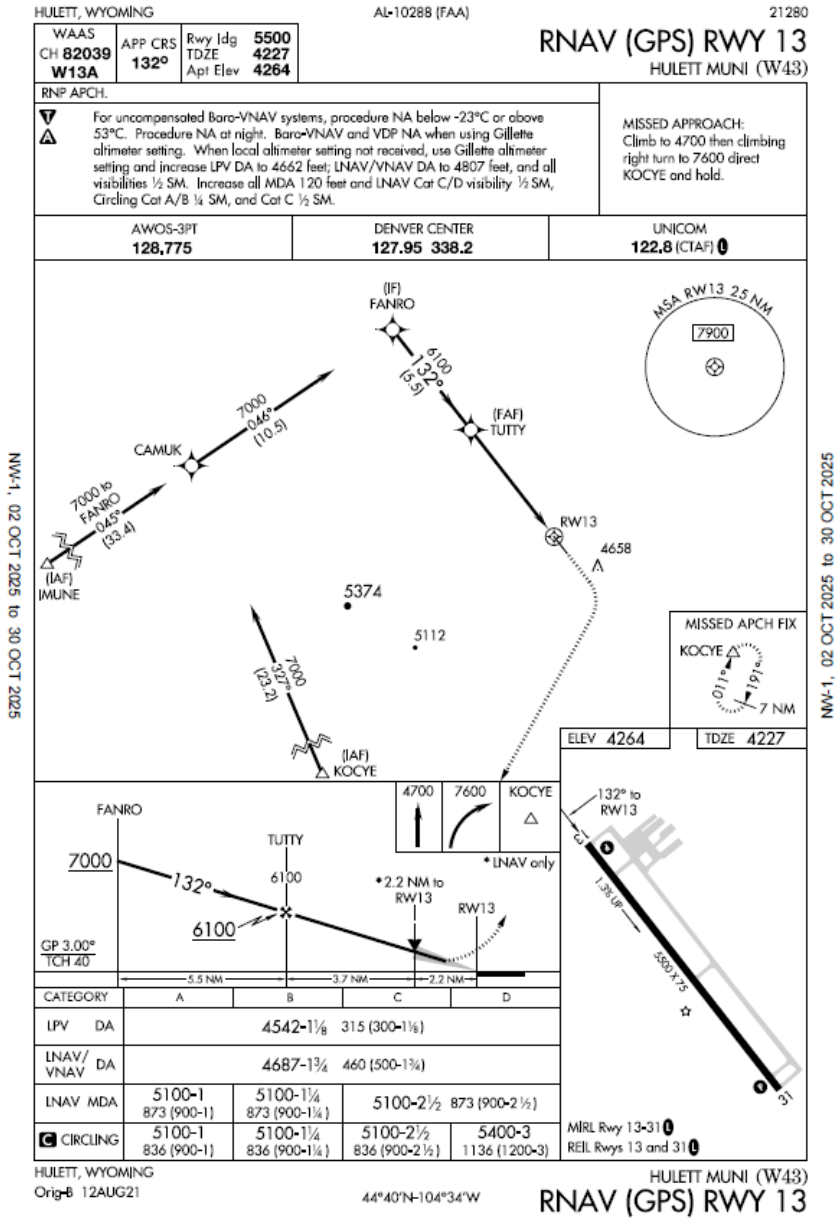


Figure 3.2-15 W43 RNAV (GPS) RWY 13

3.2.1.2 Flight Traffic

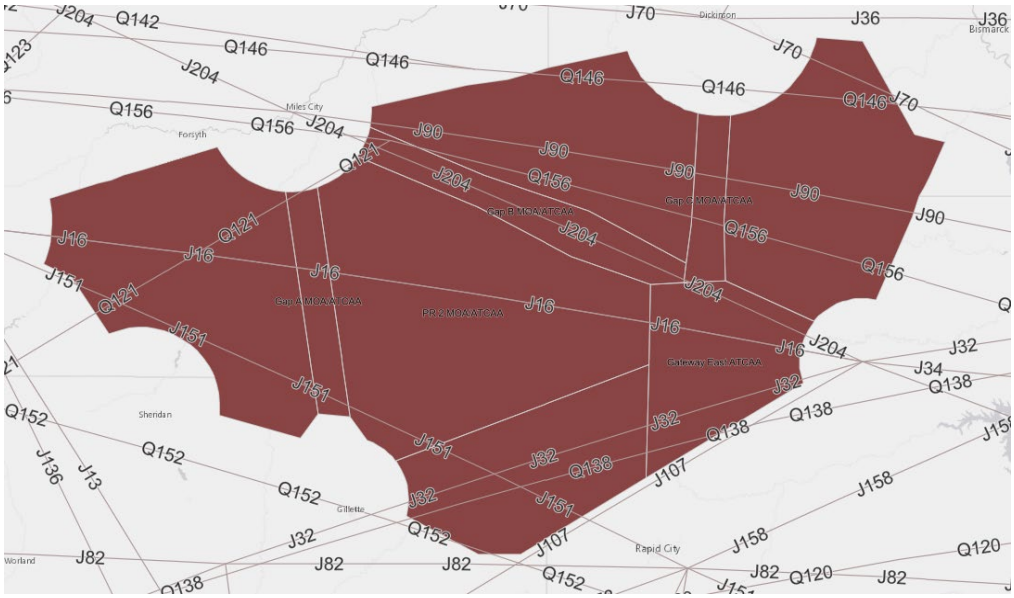
ATS Routes

There are 11 ATS routes which traverse the PRTC LFE lateral boundaries at altitudes from FL260–FL600. The route distances within the boundaries of each airspace within PRTC are listed in **Table 3.2-2** and a depiction of the routes can be seen in **Figure 3.2-16**.

Table 3.2-2 ATS Routes Intersecting LFE Area (Above FL260 to FL600) Sorted by Approximate Distance

Route Name	Type	PR 1 (NM)	PR 2 (NM)	PR 3 (NM)	PR 4 (NM)	Gap A (NM)	Gap B (NM)	Gap C (NM)	Gateway East (NM)	Gateway West (NM)	Total Distance (NM)
J16	Jet Route	89	117	0	0	12	0	0	55	0	273
J151	Jet Route	95	35	0	0	14	0	0	0	60	204
J90	Jet Route	0	0	116	67	0	0	11	0	0	194
Q156	Q-Route	0	0	100	61	0	18	12	0	0	191
J204	Jet Route	0	0	0	0	0	124	2	46	0	172
J32	Jet Route	0	0	0	0	0	0	0	59	92	151
Q138	Q-Route	0	0	0	0	0	0	0	28	90	118
Q121	Q-Route	80	2	0	0	6	12	0	0	0	100
Q146	Q-Route	0	0	41	41	0	0	0	0	0	82
J70	Jet Route	0	0	0	32	0	0	0	0	0	32
Q152	Q-Route	0	0	0	0	0	0	0	0	13	13

Legend: NM = Nautical Mile; PR = Powder River

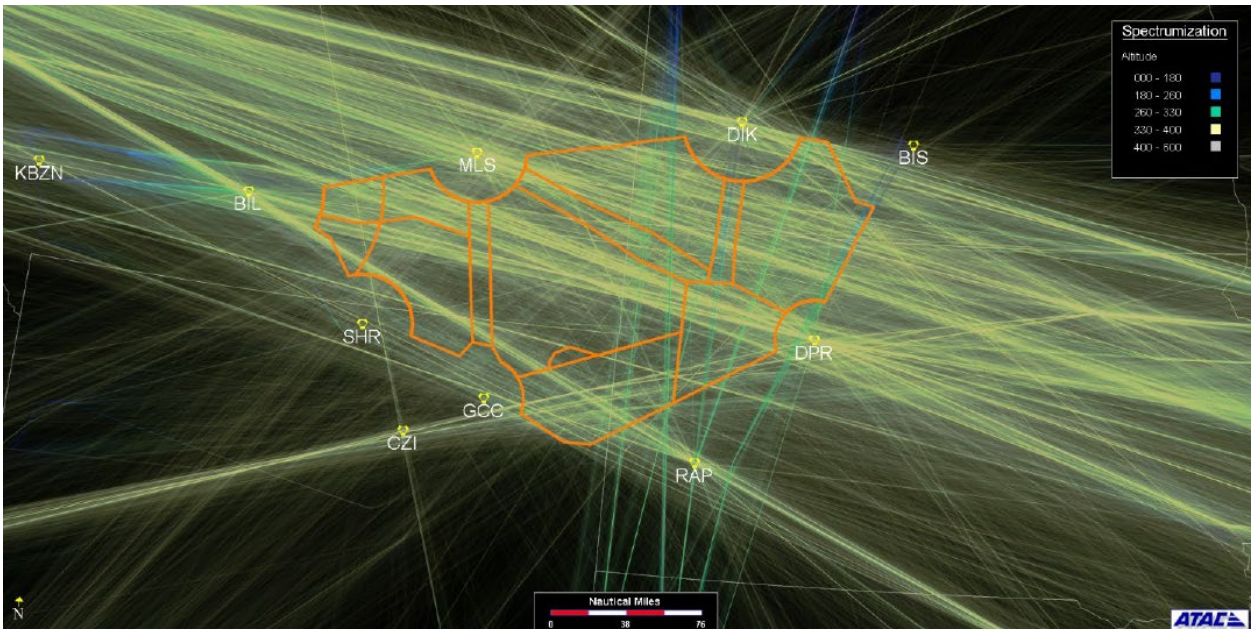


Legend: ATS = Air Traffic Service; FL = Flight Level; LFE = Large Force Exercise; PRTC = Powder River Training Complex

Figure 3.2-16 ATS Routes Traversing the PRTC LFE Area between FL260–FL600

Under Alternative 1, Aircraft that typically fly these routes through the area would require alternate routes or radar vectors to avoid the SAA only during the proposed times of activation. The impacts of rerouting traffic along these routes is a portion of traffic analysis included within the civil traffic section below.

Further, the heat map in **Figure 3.2-17** illustrates a strong east-to-west travel pattern across the analyzed airspace. This trend is likely largely attributable to the absence of major Jetways or Q-routes running predominantly north-south, which limits vertical connectivity at these altitudes and reinforces east-west movement. Among the available high-altitude routes, J-16, Q-156, J-15, and J-90 emerge as the most frequently utilized corridors although frequent off-route traffic is also evident.



Legend: LFE = Large Force Exercise; PRTC = Powder River Training Complex

Figure 3.2-17 Heat Map of Flights Traversing the PRTC LFE Area

Civil Traffic

There are 170,457 aircraft flights that annually traverse at least part of the area encompassing the proposed PRTC LFE Area above FL260 to FL600. The most common aircraft in this list are Boeing 737 and 777 series, Airbus A320/A321 families, and regional jets like the CRJ variants (**Table 3.2-3**). Listed below are the top 10 aircraft types, by percentage of flights per year. Assumptions for converting distance to time in this analysis were that aviation traffic at FL260–FL600 was traveling at 450 KTAS given most aircraft at these altitudes are domestic airliners and long-range business jets.

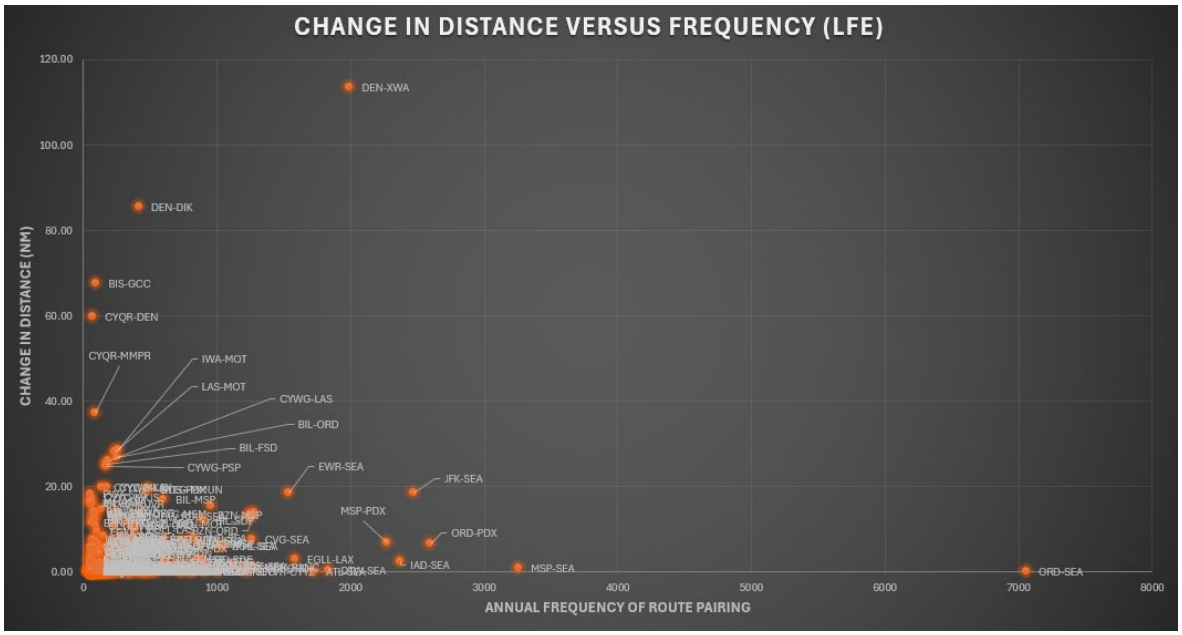
Table 3.2-3 Aircraft Types Intersecting PRTC LFE Area (Above FL260 to FL600)

Aircraft Type	Aircraft Name	Percent of Total
B739	Boeing 737-900	12%
B738	Boeing 737-800	9.8%
B39M	Boeing 737 MAX 9 (BBJ)	5.8%
B38M	Boeing 737 MAX 8 (BBJ)	5.0%
A321	Airbus A321	3.9%
A320	Airbus A320	3.8%
A21N	Airbus A321neo	3.7%
CRJ2	Bombardier CRJ-200	3.4%
B763	Boeing 767-300	3.1%
B77L	Boeing 777-200LR	2.3%

Legend: % = percent; FL = Flight Level; LFE = Large Force Exercise; PRTC = Powder River Training Complex

Of the 170,457 tracks that were found to have transited the LFE area during the year of data gathered, 1,472 (0.86 percent) being military carrier, and 120 (0.07 percent) being unknown carriers were removed from impact analysis. Further, the LFE proposal states that operations would not occur on weekends, thus avoiding impact to 47,300 (27.8 percent) of the potential flights impacted which occurred on Saturday or Sunday, which were also removed. Finally, 38 tracks were removed due to unknown origin and/or destination, and 34 were removed due to being local area flights (i.e., same origin/destination). The

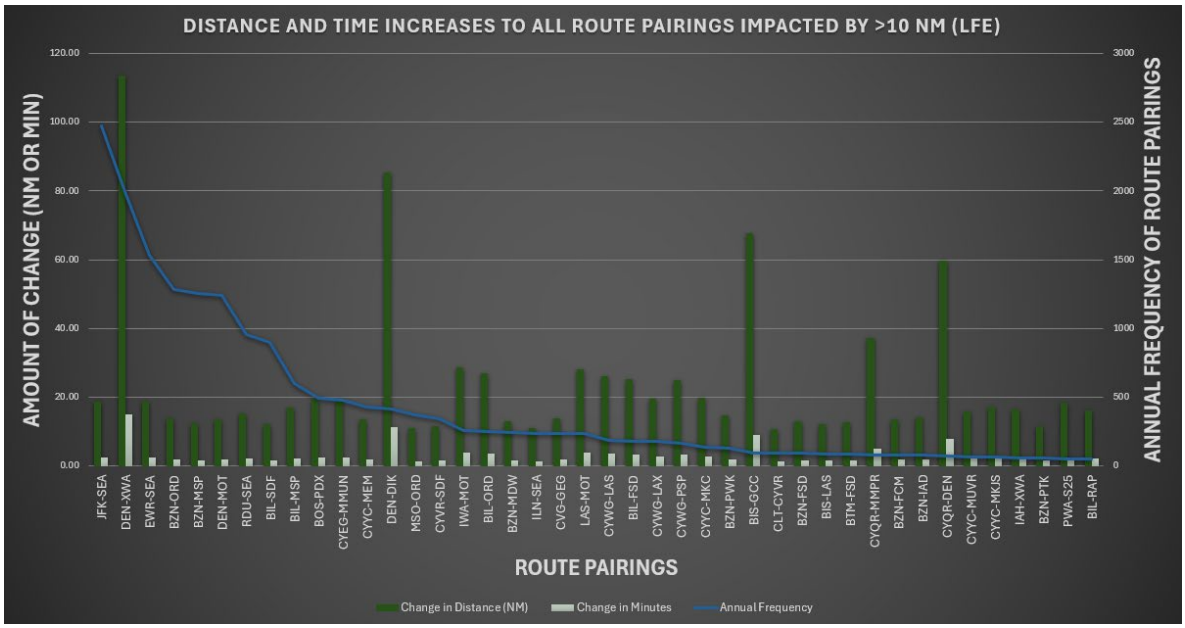
remaining 121,492 tracks were used to conduct a detailed analysis of the airspace establishment. Within this track set, it was determined that 5,706 Origin/Destination (route) pairings existed for all the tracks that passed through the airspace. Most of the route pairings occurred sparingly. Only 269 route pairings occurred at a frequency of once a week or greater (i.e., 52 times or more throughout the year). These 269 weekly or more frequent route pairings accounted for 121,492 tracks or 85.23 percent of total available data. The lower frequency tracks were removed from further analysis due to the already low impact the Proposed Action would have. The 269 route pairings were all plotted and assessed for impact pertaining to that of the direct great circle route vs. the route required to circumnavigate the proposed airspace. The list of all routes can be found in **Enclosure B**. **Figure 3.2-18** shows a graph of all 269 route pairings plotted with the change in distance required should the Proposed Action be implemented versus the annual frequency of that route pairing. As seen, most of the frequent routes have very low route effects, and most time-affected routes occur infrequently. Some route pairings, however, are outliers and have potential effects at higher frequencies such as DEN-XWA and DEN-DIK.



Legend: LFE = Large Force Exercise

Figure 3.2-18 LFE Change In Distance Versus Annual Frequency

Of the 269 route pairings, only 42 were affected by a course deviation of 10 NM or greater; 10 NM at 450 KTAS takes approximately 1 minute and 20 seconds, thus any routes affected to this degree or less are considered negligible. **Figure 3.2-19** and **Table 3.2-4** show all 42 routes that require greater than 10 NM deviation from the direct great circle route to circumnavigate the proposed area. In **Figure 3.2-19**, route pairings frequency are represented with the blue line. Effects to the great circle route by distance and time are represented by the green bars.



Legend: > = greater than; LFE = Large Force Exercise; NM = Nautical Mile

Figure 3.2-19 LFE Distance and Time Impacts to Route Pairings > 10 NM

Table 3.2-4 LFE Route Pairings Impacted by >10 NM Sorted by Frequency

Route Pairings	Annual Frequency	Baseline Great Circle Distance (NM)	Circumnavigation Distance (NM)	Change in Distance (NM)	Change as % of Baseline Route (%)	Change in Time (Min)
JFK-SEA	2476	2146.03	2164.68	18.65	0.9%	2.49
DEN-XWA	1994	505.78	619.27	113.48	22.4%	15.13
EWR-SEA	1536	2128.04	2146.69	18.65	0.9%	2.49
BZN-ORD	1281	1027.51	1041.35	13.84	1.3%	1.85
BZN-MSP	1254	757.07	769.53	12.45	1.6%	1.66
DEN-MOT	1244	524.81	538.32	13.51	2.6%	1.80
RDU-SEA	953	2041.39	2056.77	15.38	0.8%	2.05
BIL-SDF	898	1111.08	1123.12	12.04	1.1%	1.61
BIL-MSP	600	647.94	664.95	17.01	2.6%	2.27
BOS-PDX	492	2283.67	2302.91	19.24	0.8%	2.57
CYEG-MMUN	476	2292.32	2311.67	19.35	0.8%	2.58
CYYC-MEM	426	1417.37	1430.90	13.53	1.0%	1.80
DEN-DIK	415	424.49	509.92	85.43	20.1%	11.39
MSO-ORD	372	1154.84	1165.75	10.91	0.9%	1.46
CYVR-SDF	346	1733.66	1745.27	11.62	0.7%	1.55
IWA-MOT	261	1011.88	1040.62	28.75	2.8%	3.83
BIL-ORD	252	919.13	946.05	26.92	2.9%	3.59
BZN-MDW	243	1038.12	1051.04	12.93	1.2%	1.72
ILN-SEA	240	1727.42	1738.36	10.94	0.6%	1.46
CVG-GEG	239	1511.30	1525.17	13.87	0.9%	1.85
LAS-MOT	237	953.91	982.11	28.20	3.0%	3.76
CYWG-LAS	184	1137.99	1164.16	26.18	2.3%	3.49
BIL-FSD	179	520.58	545.95	25.37	4.9%	3.38
CYWG-LAX	176	1337.45	1357.17	19.71	1.5%	2.63
CYWG-PSP	166	1286.21	1311.07	24.85	1.9%	3.31

Route Pairings	Annual Frequency	Baseline Great Circle Distance (NM)	Circumnavigation Distance (NM)	Change in Distance (NM)	Change as % of Baseline Route (%)	Change in Time (Min)
CYYC-MKC	136	1087.52	1107.30	19.77	1.8%	2.64
BZN-PWK	133	1024.90	1039.61	14.71	1.4%	1.96
BIS-GCC	96	248.49	316.14	67.65	27.2%	9.02
CLT-CYVR	94	2024.55	2035.26	10.72	0.5%	1.43
BZN-FSD	91	628.15	641.25	13.10	2.1%	1.75
BIS-LAS	87	909.80	922.07	12.27	1.3%	1.64
BTM-FSD	86	685.33	698.14	12.81	1.9%	1.71
CYQR-MMPR	83	1786.55	1823.80	37.25	2.1%	4.97
BZN-FCM	83	747.76	761.33	13.57	1.8%	1.81
BZN-IAD	79	1537.27	1551.32	14.05	0.9%	1.87
CYQR-DEN	70	634.66	694.54	59.88	9.4%	7.98
CYYC-MUVR	66	2262.86	2278.67	15.82	0.7%	2.11
CYYC-MKJS	63	2598.27	2615.63	17.36	0.7%	2.31
IAH-XWA	61	1163.35	1179.79	16.43	1.4%	2.19
BZN-PTK	59	1201.48	1212.94	11.46	1.0%	1.53
PWA-S25	53	777.20	795.50	18.30	2.4%	2.44
BIL-RAP	52	256.03	272.22	16.19	6.3%	2.16

Legend: % = percent; BIL = Billings Logan International Airport (MT); BIS = Bismarck Municipal Airport (ND); BOS = Boston Logan International Airport (MA); BTM = Bert Mooney Airport (MT); BZN = Bozeman Yellowstone International Airport (MT); CLT = Charlotte Douglas International Airport (NC); CVG = Cincinnati/Northern Kentucky International Airport (KY); CYEG = Edmonton International Airport (AB); CYQR = Regina International Airport (SK); CYVR = Vancouver International Airport (BC); CYWG = Winnipeg James Armstrong Richardson International Airport (MB); CYYC = Calgary International Airport (AB); DEN = Denver International Airport (CO); DIK = Dickinson Theodore Roosevelt Regional Airport (ND); EWR = Newark Liberty International Airport (NJ); FCM = Flying Cloud Airport (MN); FSD = Sioux Falls Regional Airport (SD); GCC = Gillette-Campbell County Airport (WY); GEG = Spokane International Airport (WA); IAD = Washington Dulles International Airport (VA); IAH = George Bush Intercontinental Airport (TX); ILN = Wilmington Air Park (OH); IWA = Phoenix-Mesa Gateway Airport (AZ); JFK = John F. Kennedy International Airport (NY); LAS = Harry Reid International Airport (NV); LAX = Los Angeles International Airport (CA); MDW = Chicago Midway International Airport (IL); MEM = Memphis International Airport (TN); Min = Minutes; MMPR = Licenciado Gustavo Díaz Ordaz International Airport (Mexico); MMUN = Cancún International Airport (Mexico); MOT = Minot International Airport (ND); MSP = Minneapolis-St. Paul International Airport (MN); MSO = Missoula Montana Airport (MT); MUVR = Varadero Juan Gualberto Gómez Airport (Cuba); MKC = Charles B. Wheeler Downtown Airport (MO); MKJS = Sangster International Airport (Jamaica); NM = Nautical Mile; ORD = Chicago O'Hare International Airport (IL); PDX = Portland International Airport (OR); PSP = Palm Springs International Airport (CA); PTK = Oakland County International Airport (MI); PWA = Wiley Post Airport (OK); PWK = Chicago Executive Airport (IL); RAP = Rapid City Regional Airport (SD); RDU = Raleigh-Durham International Airport (NC); S25 = Wokal Field/Glasgow Airport (MT); SEA = Seattle-Tacoma International Airport (WA); SDF = Louisville Muhammad Ali International Airport (KY); XWA = Williston Basin International Airport (ND)

Table 3.2-5 highlights the six route-pairings that were impacted by a 3 percent change to the baseline route or greater, with BIS-GCC, DEN-XWA, and DEN-DIK being the most affected, each by over 20 percent.

Table 3.2-5 Route Pairings Affected by 3 Percent or More of Baseline Route by LFE Airspace

Route Pairings	Annual Frequency	Change in Distance (NM)	Change in Time (Min)	Change as a Percentage of Baseline Route (%)
BIS-GCC	96	67.65	9.02	27.2%
DEN-XWA	1994	113.48	15.13	22.4%
DEN-DIK	415	85.43	11.39	20.1%
CYQR-DEN	70	59.88	7.98	9.4%

Route Pairings	Annual Frequency	Change in Distance (NM)	Change in Time (Min)	Change as a Percentage of Baseline Route (%)
BIL-RAP	52	16.19	2.16	6.3%
BIL-FSD	179	25.37	3.38	4.9%

Legend: % = percent; BIL = Billings Logan International Airport (MT); BIS = Bismarck Municipal Airport (ND); CYQR = Regina International Airport (SK); DEN = Denver International Airport (CO); DIK = Dickinson Theodore Roosevelt Regional Airport (ND); FSD = Sioux Falls Regional Airport (SD); GCC = Gillette-Campbell County Airport (WY); LFE = Large Force Exercise; Min = Minutes; NM = Nautical Mile; RAP = Rapid City Regional Airport (SD); XWA = Williston Basin International Airport (ND)

Per Route Impact Analysis: Only five routes are affected by approximately 5 minutes or more per route at average speeds (450 KTAS) and at the altitudes in consideration. DEN-XWA has the greatest potential per flight effect of a 15-minute change. DEN-DIK has potential per flight effect of approximately 11 minutes. BIS-GCC has a potential effect of approximately 9 minutes although, some of this route's impact may be mitigated by transiting at different altitudes. CYQR-MMPR, an international flight route between Canada and Mexico, has potential per flight effect of approximately 5 minutes. Lastly, CYQR-DEN has potential effect of approximately 8 minutes per flight.

Days of Use Considerations: The proposal describes up to 30 total days per year for the LFE area, and a 10 of 12-day per exercise iteration (no flights on Saturday or Sunday). This results in 6 weeks of use out of the 52 weeks where data was collected, or 11.54 percent.

Impact Projection: Projecting a weighted impact metric was completed by using 11.54 percent (6 of 52 weeks) of the total annual flights and the per flight time deviations required to circumnavigate the area. This resulted in the total amount of projected effect to each route pairing throughout the year. Only four route pairings were projected to be affected by five flight hours or greater annually. DEN-XWA, JFK-SEA, DEN-DIK, and EWR-SEA have the greatest overall effect considering both frequency and duration. Flights between JFK or EWR and SEA have no distance impact if those flights are authorized through Canadian airspace. All 42 routes that were impacted by over 10 NM are shown below sorted by weighted impact metric in **Table 3.2-6**.

Table 3.2-6 Route Pairings Sorted by Weighted Impact Metric

Route Pairings	Annual Frequency	Change in Distance (NM)	Change as a Percentage of Baseline Route (%)	Change in Time per Flight (Min)	Weighted Impact Metric - 6 of 52 weeks x Change in Time (Hours)
DEN-XWA	1994	113.48	22.4%	15.13	58.03
JFK-SEA	2476	18.65	0.9%	2.49	11.84
DEN-DIK	415	85.43	20.1%	11.39	9.09
EWR-SEA	1536	18.65	0.9%	2.49	7.35
BZN-ORD	1281	13.84	1.3%	1.85	4.55
DEN-MOT	1244	13.51	2.6%	1.80	4.31
BZN-MSP	1254	12.45	1.6%	1.66	4.00
RDU-SEA	953	15.38	0.8%	2.05	3.76
BIL-SDF	898	12.04	1.1%	1.61	2.77
BIL-MSP	600	17.01	2.6%	2.27	2.62
BOS-PDX	492	19.24	0.8%	2.57	2.43
CYEG-MMUN	476	19.35	0.8%	2.58	2.36
IWA-MOT	261	28.75	2.8%	3.83	1.92
BIL-ORD	252	26.92	2.9%	3.59	1.74
LAS-MOT	237	28.20	3.0%	3.76	1.71
BIS-GCC	96	67.65	27.2%	9.02	1.67

Route Pairings	Annual Frequency	Change in Distance (NM)	Change as a Percentage of Baseline Route (%)	Change in Time per Flight (Min)	Weighted Impact Metric - 6 of 52 weeks x Change in Time (Hours)
CYYC-MEM	426	13.53	1.0%	1.80	1.48
CYWG-LAS	184	26.18	2.3%	3.49	1.24
BIL-FSD	179	25.37	4.9%	3.38	1.16
CYQR-DEN	70	59.88	9.4%	7.98	1.07
CYWG-PSP	166	24.85	1.9%	3.31	1.06
MSO-ORD	372	10.91	0.9%	1.46	1.04
CYVR-SDF	346	11.62	0.7%	1.55	1.03
CYWG-LAX	176	19.71	1.5%	2.63	0.89
CVG-GEG	239	13.87	0.9%	1.85	0.85
BZN-MDW	243	12.93	1.2%	1.72	0.81
CYQR-MMPR	83	37.25	2.1%	4.97	0.79
CYYC-MKC	136	19.77	1.8%	2.64	0.69
ILN-SEA	240	10.94	0.6%	1.46	0.67
BZN-PWK	133	14.71	1.4%	1.96	0.50
BZN-FSD	91	13.10	2.1%	1.75	0.31
BZN-FCM	83	13.57	1.8%	1.81	0.29
BZN-IAD	79	14.05	0.9%	1.87	0.28
BTM-FSD	86	12.81	1.9%	1.71	0.28
CYYC-MKJS	63	17.36	0.7%	2.31	0.28
BIS-LAS	87	12.27	1.3%	1.64	0.27
CYYC-MUVR	66	15.82	0.7%	2.11	0.27
CLT-CYVR	94	10.72	0.5%	1.43	0.26
IAH-XWA	61	16.43	1.4%	2.19	0.26
PWA-S25	53	18.30	2.4%	2.44	0.25
BIL-RAP	52	16.19	6.3%	2.16	0.22
BZN-PTK	59	11.46	1.0%	1.53	0.17

Legend: % = percent; BIL = Billings Logan International Airport (MT); BIS = Bismarck Municipal Airport (ND); BOS = Boston Logan International Airport (MA); BTM = Bert Mooney Airport (MT); BZN = Bozeman Yellowstone International Airport (MT); CLT = Charlotte Douglas International Airport (NC); CVG = Cincinnati/Northern Kentucky International Airport (KY); CYEG = Edmonton International Airport (AB); CYQR = Regina International Airport (SK); CYVR = Vancouver International Airport (BC); CYWG = Winnipeg James Armstrong Richardson International Airport (MB); CYYC = Calgary International Airport (AB); DEN = Denver International Airport (CO); DIK = Dickinson Theodore Roosevelt Regional Airport (ND); EWR = Newark Liberty International Airport (NJ); FCM = Flying Cloud Airport (MN); FSD = Sioux Falls Regional Airport (SD); GCC = Gillette-Campbell County Airport (WY); GEG = Spokane International Airport (WA); IAD = Washington Dulles International Airport (VA); IAH = George Bush Intercontinental Airport (TX); ILN = Wilmington Air Park (OH); IWA = Phoenix-Mesa Gateway Airport (AZ); JFK = John F. Kennedy International Airport (NY); LAS = Harry Reid International Airport (NV); LAX = Los Angeles International Airport (CA); MDW = Chicago Midway International Airport (IL); MEM = Memphis International Airport (TN); Min = Minutes; MMPR = Licenciado Gustavo Díaz Ordaz International Airport (Mexico); MMUN = Cancún International Airport (Mexico); MOT = Minot International Airport (ND); MSP = Minneapolis-St. Paul International Airport (MN); MSO = Missoula Montana Airport (MT); MUVR = Varadero Juan Gualberto Gómez Airport (Cuba); MKC = Charles B. Wheeler Downtown Airport (MO); MKJS = Sangster International Airport (Jamaica); NM = Nautical Mile; ORD = Chicago O'Hare International Airport (IL); PDX = Portland International Airport (OR); PSP = Palm Springs International Airport (CA); PTK = Oakland County International Airport (MI); PWA = Wiley Post Airport (OK); PWK = Chicago Executive Airport (IL); RAP = Rapid City Regional Airport (SD); RDU = Raleigh-Durham International Airport (NC); S25 = Wokal Field/Glasgow Airport (MT); SEA = Seattle-Tacoma International Airport (WA); SDF = Louisville Muhammad Ali International Airport (KY); XWA = Williston Basin International Airport (ND)

3.2.1.3 Use of GAP A/B/C MOAs Below FL260

In addition to impacts within the PRTC at or above FL260, there is potential for the Proposed Action to affect civil aviation below FL260 in the GAP A/B/C MOAs given the increased LFE days. Under current conditions, LFEs occur about 10 days per year; the Proposed Action could increase this to as many as 30 days annually. This means up to 20 additional days per year when the GAP A/B/C MOAs could be activated below FL260, adding to existing flight restrictions for civil aircraft (General Aviation, Air Taxi, and Air Carrier) in these corridors.

To assess potential impacts, the PDARS dataset was filtered for flights operating in the GAP MOAs below FL260. This analysis was independent of previously discussed activity at or above FL260.

GAP A MOA: Annual use of the GAP A MOA below FL260 was recorded 95 times (roughly twice per week). Of these, 46 flights had unknown origins/destinations, and 38 were of unknown aircraft type. Operations may include use of the V-254 ATS Route, IFR direct routing between MLS and GCC, or VFR flights between PR 1 and PR 2 MOAs (below 18,000 feet MSL). Most unknown aircraft were below 12,000 feet MSL, suggesting short-distance flights or light aircraft without supplemental oxygen. Among flights with known origins/destinations, only a few occurred more than once annually. The conclusion is that GAP A MOA is rarely used as a transit path through the PRTC complex below FL260.

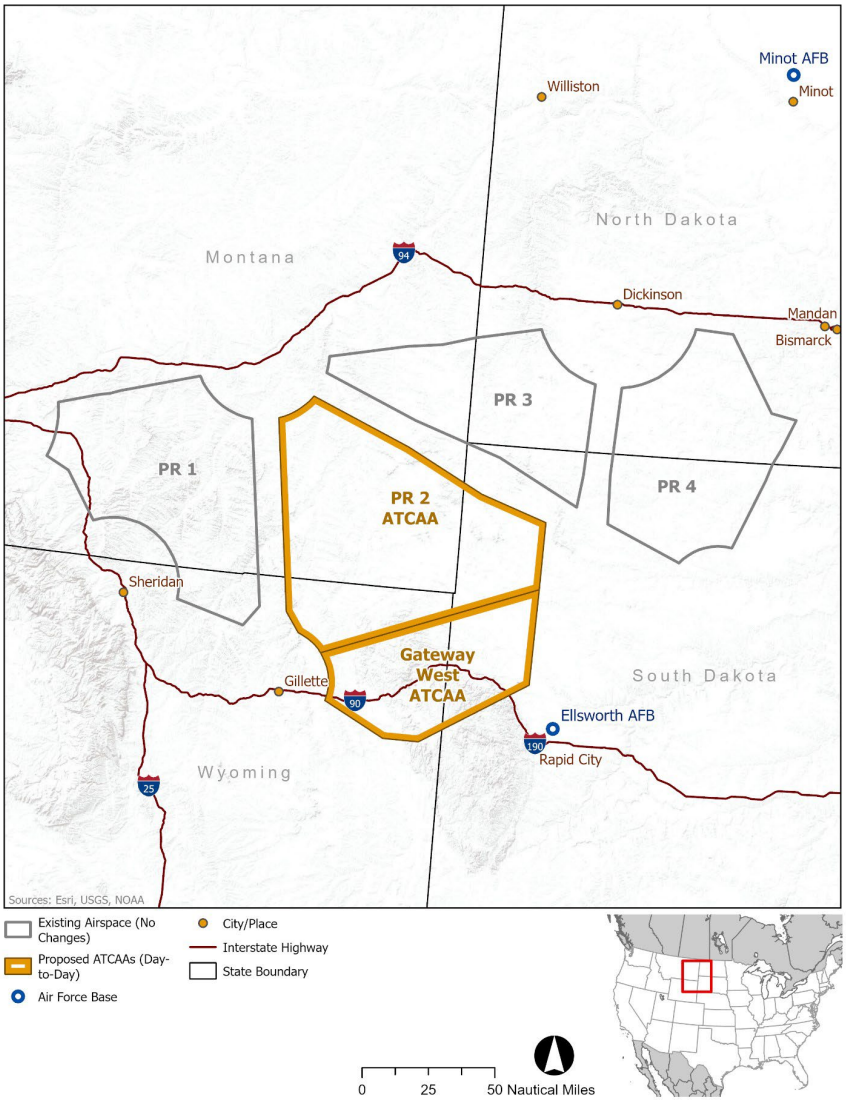
GAP B MOA: Although GAP B MOA sees more traffic at higher altitudes, its use below FL260 is even lighter than GAP A. Data shows 83 uses annually (less than twice per week). Of these, 17 were unknown aircraft; identified flights were mostly light General Aviation (GA) aircraft (Pilatus, Cirrus, Beech, Cessna). GAP B MOA aligns with V-120 ATS Route at low altitudes and J-204 at higher altitudes. Most flights (50 of 83) appear to follow V-120, while 33 align with J-204 (FL180–FL260).

GAP C MOA: Below FL260, GAP C MOA is used less than once per week (36 annual uses). It contains V-491 and overlaying T286 ATS routes, both lightly used below FL260. There is no J or Q route through GAP C, though there is a fix JELRO at its southern end (defined off Dickinson VHF Omnidirectional Range/Tactical Air Navigation [VORTAC]) that could support direct routing above FL180. This appears rarely used.

Summary: Combined, GAP A/B/C MOAs are used about four times per week below FL260 (214 annual uses total). Under the Proposed Action, these operations could be affected during up to four additional weeks per year (due to increased LFE training). Assuming full-day activation for an LFE (a conservative assumption), potential impact equates to roughly 16 flights annually (4/52 × 214) whose historical routing would need adjustment.

3.2.2 Day-To-Day Operations

Under Alternative 1, the actions to improve day-to-day operations include raising the ceiling of the most used ATCAAs, PR 2 and Gateway West from FL260 to FL600. Additionally, times of use for PRTC is proposed to change to 07:00 to 00:30 (07:00 a.m. to 12:30 a.m.) Monday to Thursday, 07:00 to 18:00 (07:00 a.m. to 06:00 p.m.) Friday, and other times by NOTAM (**Figure 3.2-20**).



Legend: ATCAA = Air Traffic Control Assigned Airspace; PR = Powder River

Figure 3.2-20 Alternative 1 Day-To-Day Area

3.2.2.1 Airports

Impacts to airports during day-to-day operations would be the same as those described for the LFE scenario and published instrument approach and departure procedure impacts would involve the same airports identified in **Table 3.2-1**. As with LFE operations, any potential impacts would be procedural and conditional, occurring primarily when instrument approaches are required due to instrument meteorological conditions and when portions of those procedures transit affected airspace. MOAs would not restrict VFR access to or from these airports, and any effects would be limited to increased radio coordination rather than denial of access. Unlike LFE operations, however, any potential impacts associated with day-to-day use would only occur during the proposed scheduled hours of airspace activation.

No additional airports, procedures, or altitudes would be affected beyond those identified in the LFE analysis.

3.2.2.2 Flight Traffic

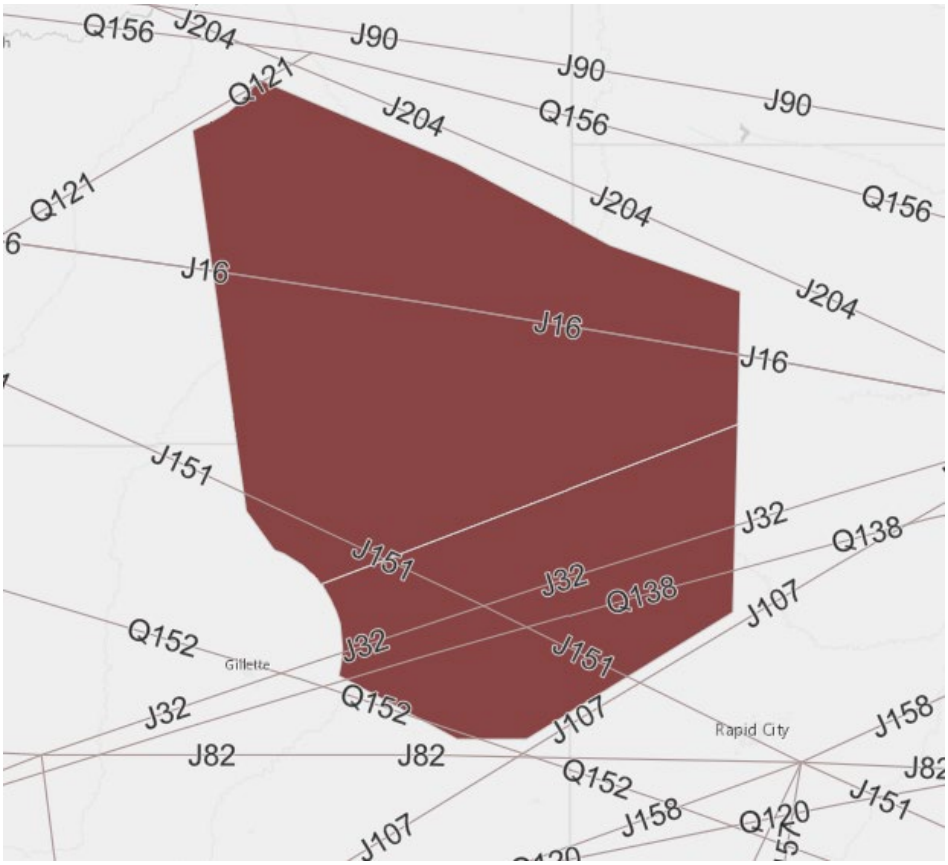
ATS Routes

There are six ATS routes which traverse the PRTC Alternative 1 Day-to-Day Proposed Changes from FL260–FL600. The route distances affected are listed below in **Table 3.2-7** and a depiction of the routes can be seen in **Figure 3.2-21**.

Table 3.2-7 PRTC Alternative 1 Day-to-Day ATS Routes

Route Name	Type	PR 2 (NM)	Gateway West (NM)	Total Distance (NM)
J16	Jet Route	117	0	117
J151	Jet Route	35	60	95
J32	Jet Route	0	92	92
Q138	Q-Route	0	90	90
Q152	Q-Route	0	13	13
Q121	Q-Route	2	0	2

Legend: NM = Nautical Mile; PR = Powder River



Legend: ATS = Air Traffic Service; ATCAA = Air Traffic Control Assigned Airspace; PR = Powder River

Figure 3.2-21 ATS Routes Traversing the PRTC Day-To-Day Area (PR 2 and Gateway West ATCAAs)

As a result of establishment of airspace in this area, the aircraft that typically fly these routes through the area would require alternate routing or radar vectors to avoid the SAA only at times when it is active. The

impact of rerouting traffic along these routes is a portion of traffic analysis included within the civil traffic section below.

Further, the heat maps in **Figure 3.2-22 and Figure 3.2-23** illustrate a strong east-to-west travel pattern across the analyzed airspace. This trend is likely largely attributable to the absence of major Jetways or Q-routes running predominantly north-south, which limits vertical connectivity at these altitudes and reinforces east-west movement. The heat maps indicate that routing through the various airspace occurs regularly both on established Jetway/Q-Routes as well as off of established routes, particularly in the PR 2 area.

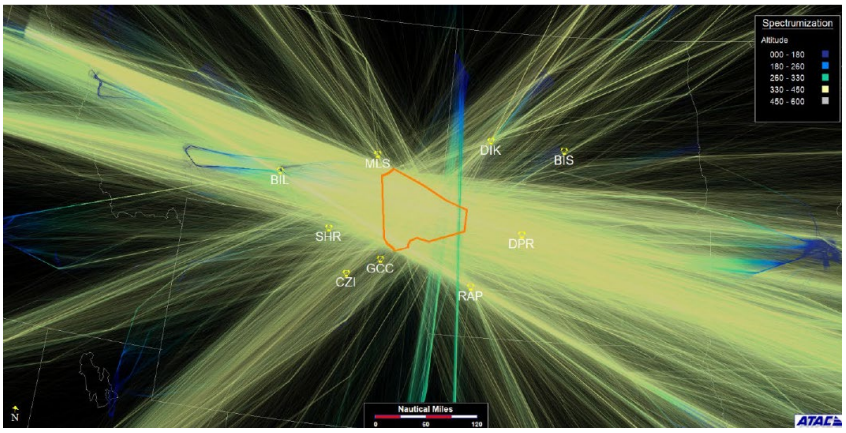


Figure 3.2-22 PR 2 Heat Map

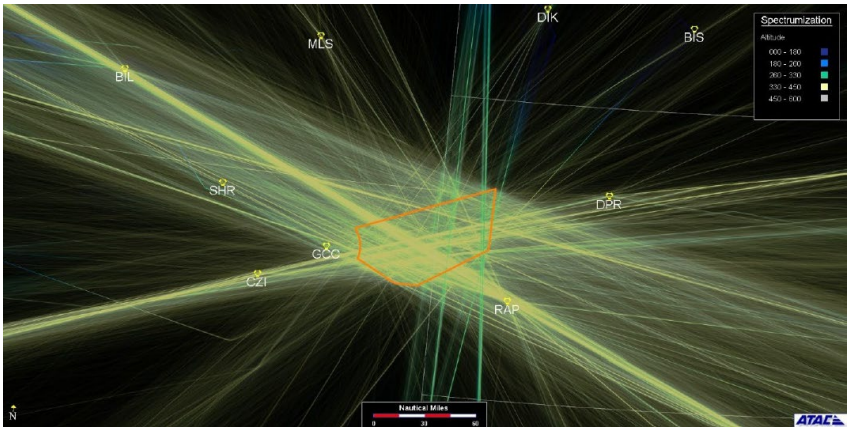


Figure 3.2-23 Gateway West Heat Map

Civil Traffic

During the year of data collection, 97,571 aircraft flights traversed at least part of the area encompassing the proposed PRTC Alternative 1 Day-to-Day area above FL260 to FL600. The most common aircraft in this list are Boeing 737 and 777 series, Airbus A320/A321 families, and regional jets like the CRJ variants. Listed in **Table 3.2-8** are the top 10 aircraft types, by number of flights per year. Assumptions for converting distance to time were that aviation traffic at FL260–FL600 was traveling at 450 KTAS given most aircraft at these altitudes are domestic airliners and long-range business jets.

Table 3.2-8 Aircraft Types Intersecting PRTC Alternative 1 Day-to-Day Area (Above FL260 to FL600)

Aircraft Type	Aircraft Name	Percent of Total
B739	Boeing 737-900	12.7%
B738	Boeing 737-800	10.3%
B39M	Boeing 737 MAX 9 (BBJ)	5.9%
B38M	Boeing 737 MAX 8 (BBJ)	4.7%
A320	Airbus A320	4.2%
A321	Airbus A321	4.1%
A21N	Airbus A321neo	3.8%
B763	Boeing 767-300	3.6%
CRJ2	Bombardier CRJ-200	2.7%
B752	Boeing 757-200	2.1%

Legend: % = percent; FL = Flight Level; PRTC = Powder River Training Complex

Of the 97,571 tracks that were found to have transited the Alternative 1 Day-to-Day area during the year of data gathered, 885 (0.91 percent) being military carrier, and 78 (0.08 percent) being unknown carriers were removed from impact analysis. Further, the Alternative 1 Day-to-Day proposal states that operations will generally not occur on weekends, thus avoiding impact to 26,993 (27.66 percent) of the potential flights impacted which occurred on Saturday or Sunday, which were also removed. Additionally, the Alternative 1 Day-to-Day proposal state that the airspace schedule is proposed to change to 07:00 to 00:30 (07:00 a.m. to 12:30 a.m.) Monday to Thursday, 07:00 to 18:00 (07:00 a.m. to 06:00 p.m.) Friday. Focusing the analysis on the proposed schedule eliminated 11,001 (11.27 percent) additional tracks. Finally, 21 tracks were removed due to unknown origin and/or destination, and 16 were removed due to being local area flights (i.e., same origin/destination). The remaining 58,557 tracks were used to conduct a detailed analysis of the airspace establishment effects. Within this track set, it was determined that 4,089 Origin/Destination (route) pairings existed for all the tracks that passed through the airspace. Most of the route pairings occurred sparingly. Only 170 route pairings occurred at a frequency of once a week or greater (i.e., 52 times or more throughout the year). These 170 weekly or more frequent route pairings accounted for 45,547 tracks or 77.78 percent of the remaining data set. The lower frequency tracks were removed from further analysis due to the low impact the establishment of airspace would have on those route pairings. The 170 route pairings were all plotted and assessed for effects pertaining to that of the direct great circle route vs. the route required to circumnavigate the proposed airspace. The list of all route pairings can be found in **Enclosure C**. **Figure 3.2-24** shows a graph of all 170 route pairings plotted with the change in distance required in the event the airspace was established versus the annual frequency of that route pairing. As seen, most of the frequent routes have very low route effects, and most time-effected routes occur infrequently. Some route pairings, however, are outliers and have potential effects at higher frequencies such as DEN-XWA and BIS-GCC.

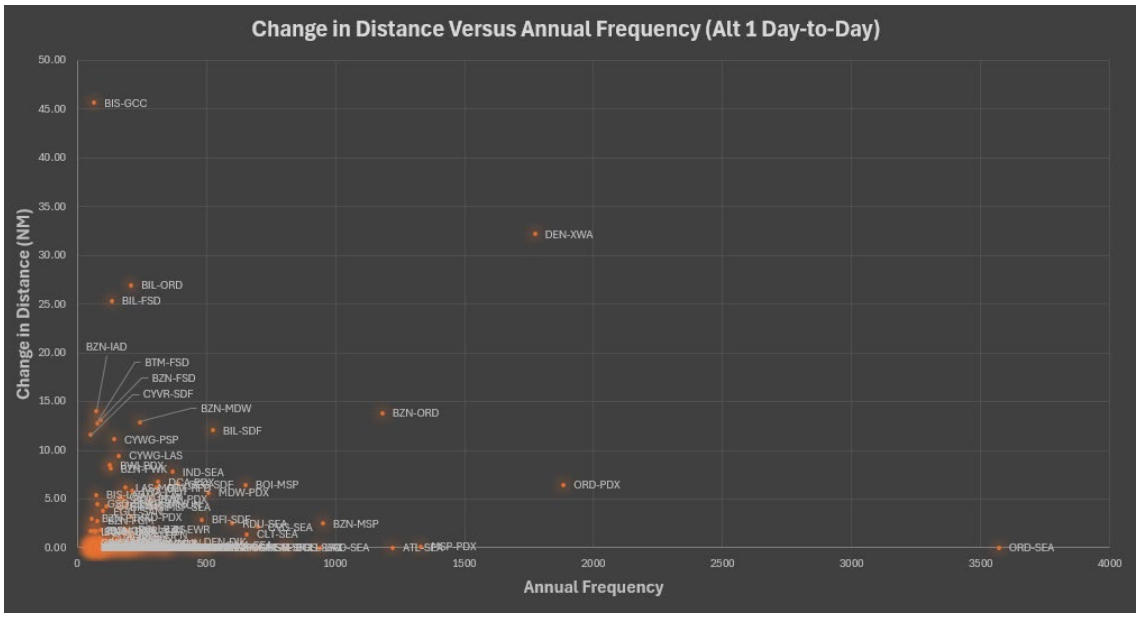
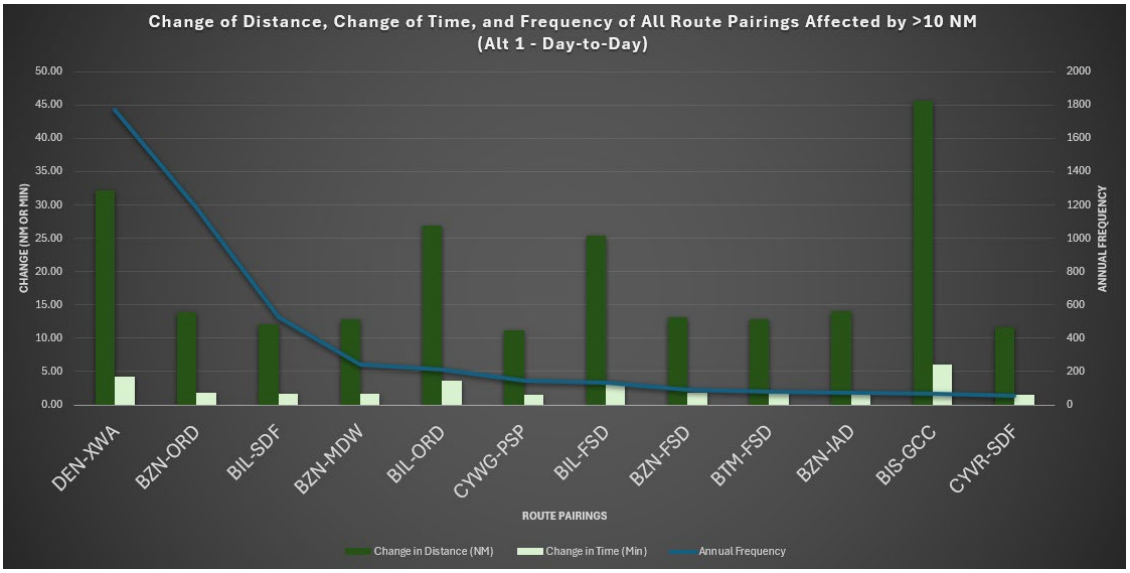


Figure 3.2-24 Alternative 1 Day-to-Day Change In Distance Versus Annual Frequency

Of the 170 route pairings, 52 percent of great circle routes did not pass through the proposed airspace and are likely not impacted and only 12 route pairings were impacted by a course deviation of 10 NM or greater; 10 NM at 450 KTAS takes approximately 1 minute and 20 seconds, thus any routes impacted to this degree or less are considered negligible. **Figure 3.2-25** and **Table 3.2-9** show all 12 routes that require greater than 10 NM deviation from the direct great circle route to circumnavigate the proposed area. In **Figure 3.2-25**, route pairings frequency are represented with the blue line. Effects to the great circle route by distance and time are represented by the green bars. **Table 3.2-10** highlights the 3 routes with greater than 3% change.



Legend: > = greater than; NM = Nautical Mile

Figure 3.2-25 Alternative 1 Day-to-Day Distance and Time Impacts to Route Pairings > 10 NM

Table 3.2-9 Alternative 1 Day-to-Day Route Pairings Impacted by >10 NM Sorted by Frequency

Route Pairings	Annual Frequency	Sum of Baseline Distance (NM)	Sum of Circumnavigation Distance (NM)	Change in Distance (NM)	Change as a Percentage of Baseline (%)	Change in Time (Min)
DEN-XWA	1773	505.78	537.99	32.21	6%	4.29
BZN-ORD	1183	1027.51	1041.35	13.84	1%	1.85
BIL-SDF	526	1111.08	1123.12	12.04	1%	1.61
BZN-MDW	242	1038.12	1051.04	12.93	1%	1.72
BIL-ORD	209	919.13	946.05	26.92	3%	3.59
CYWG-PSP	143	1286.21	1297.36	11.15	1%	1.49
BIL-FSD	135	520.58	545.95	25.37	5%	3.38
BZN-FSD	89	628.15	641.25	13.10	2%	1.75
BTM-FSD	77	685.33	698.14	12.81	2%	1.71
BZN-IAD	74	1537.27	1551.32	14.05	1%	1.87
BIS-GCC	66	248.49	294.15	45.66	18%	6.09
CYVR-SDF	54	1733.66	1745.27	11.62	1%	1.55

Legend: % = percent; BIL = Billings Logan International Airport (MT); BIS = Bismarck Municipal Airport (ND); BZN = Bozeman Yellowstone International Airport (MT); BTM = Bert Mooney Airport (MT); CYVR = Vancouver International Airport (BC); CYWG = Winnipeg James Armstrong Richardson International Airport (MB); DEN = Denver International Airport (CO); FSD = Sioux Falls Regional Airport (SD); GCC = Gillette-Campbell County Airport (WY); IAD = Washington Dulles International Airport (VA); MDW = Chicago Midway International Airport (IL); Min = Minutes; NM = Nautical Mile; ORD = Chicago O'Hare International Airport (IL); PSP = Palm Springs International Airport (CA); SDF = Louisville Muhammad Ali International Airport (KY); XWA = Williston Basin International Airport (ND).

Table 3.2-10 Alternative 1 Day-to-Day Route Pairings Affected by 3 Percent Change from Baseline Route or Greater

Route Pairings	Annual Frequency	Baseline Distance (NM)	Circumnavigation Distance (NM)	Change in Distance (NM)	Change as a Percentage of Baseline (%)	Change in Time (Min)
BIS-GCC	66	248.49	294.15	45.66	6.09	18%
DEN-XWA	1773	505.78	537.99	32.21	4.29	6%
BIL-FSD	135	520.58	545.95	25.37	3.38	5%

Legend: % = percent; BIL = Billings Logan International Airport (MT); BIS = Bismarck Municipal Airport (ND); DEN = Denver International Airport (CO); FSD = Sioux Falls Regional Airport (SD); GCC = Gillette-Campbell County Airport (WY); NM = Nautical Mile; XWA = Williston Basin International Airport (ND).

Per Route Impact Analysis: Only two routes are affected by approximately 5 minutes or more per route at average speeds (450 KTAS) and at the altitudes in consideration. BIS-GCC has the greatest potential to be affected on a per flight basis with a 6-minute change, though some of this may be mitigated through altitude choices. DEN-XWA has potential to be affected per flight by approximately 4 minutes.

Impact Projection: Projecting a weighted impact metric was completed by using the total annual flights and the per flight time deviations required to circumnavigate the area. This resulted in the total amount of potential effect to each route pairing throughout the year. Only seven route pairings were projected to have an effect of five flight hours or greater annually despite the daily operations projected for the airspace. DEN-XWA is affected the greatest at 126 annual hours. BZN-ORD is the second most affected at 36 hours annually. BIL-SDF, BIL-ORD, BIL-FSD, BZN-MDW, and BIS-GCC are the next most affected considering both frequency and duration at times between 6 and 14 hours annually. All 12 routes that were affected by over 10 NM by Alternative 1 Day-to-Day airspace are shown below sorted by weighted impact metric in **Table 3.2-11**.

Table 3.2-11 Route Pairings Sorted by Weighted Impact Metric (Alt 1 Day-to-Day)

Route Pairings	Annual Frequency	Sum of Baseline Distance (NM)	Sum of Circumnavigation Distance (NM)	Change in Distance (NM)	Change as a Percentage of Baseline (%)	Change in Time (Min)	Weighted Impact Metric (Change in Time x Frequency) (Hours)
DEN-XWA	1773	505.78	537.99	32.21	6%	4.29	126.90
BZN-ORD	1183	1027.51	1041.35	13.84	1%	1.85	36.40
BIL-SDF	526	1111.08	1123.12	12.04	1%	1.61	14.07
BIL-ORD	209	919.13	946.05	26.92	3%	3.59	12.50
BIL-FSD	135	520.58	545.95	25.37	5%	3.38	7.61
BZN-MDW	242	1038.12	1051.04	12.93	1%	1.72	6.95
BIS-GCC	66	248.49	294.15	45.66	18%	6.09	6.70
CYWG-PSP	143	1286.21	1297.36	11.15	1%	1.49	3.54
BZN-FSD	89	628.15	641.25	13.10	2%	1.75	2.59
BZN-IAD	74	1537.27	1551.32	14.05	1%	1.87	2.31
BTM-FSD	77	685.33	698.14	12.81	2%	1.71	2.19
CYVR-SDF	54	1733.66	1745.27	11.62	1%	1.55	1.39

Legend: % = percent; BIL = Billings Logan International Airport (MT); BIS = Bismarck Municipal Airport (ND); BTM = Bert Mooney Airport (MT); BZN = Bozeman Yellowstone International Airport (MT); CYVR = Vancouver International Airport (BC); CYWG = Winnipeg James Armstrong Richardson International Airport (MB); DEN = Denver International Airport (CO); FSD = Sioux Falls Regional Airport (SD); GCC = Gillette-Campbell County Airport (WY); IAD = Washington Dulles International Airport (VA); MDW = Chicago Midway International Airport (IL); Min = Minutes; NM = Nautical Mile; ORD = Chicago O'Hare International Airport (IL); PSP = Palm Springs International Airport (CA); SDF = Louisville Muhammad Ali International Airport (KY); XWA = Williston Basin International Airport (ND).

3.3 ALTERNATIVE 2

Alternative 2 includes changes to improve day-to-day operations and training capability of LFEs. These actions are described in more detail in the following sections.

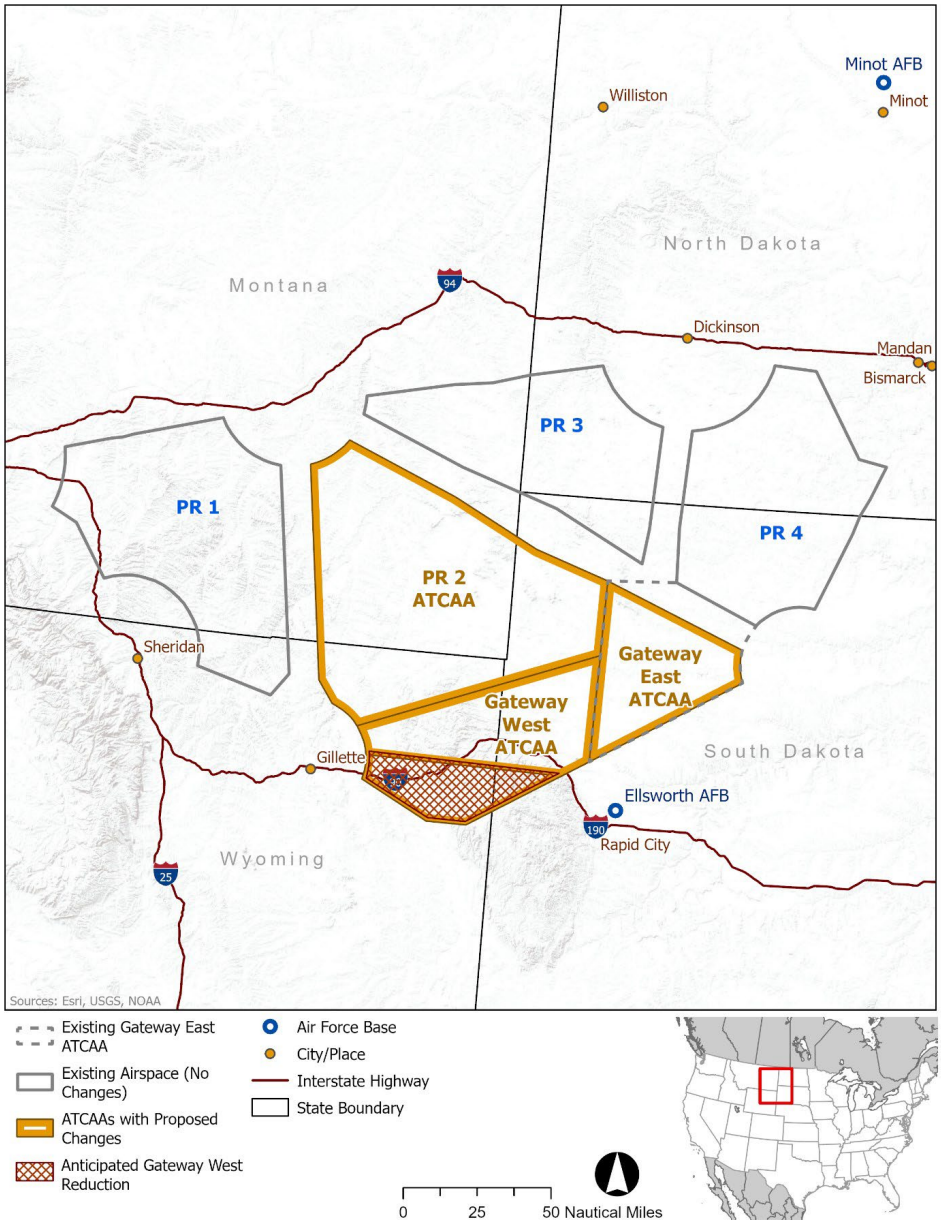
3.3.1 Large Force Exercises

Alternative 2 includes the same changes to LFEs as Alternative 1, but it incorporates modifications to Gateway East and West ATCAAs. The northern border of the Gateway East ATCAA would be shifted south to align with the PR 2 ATCAA northern border. A new Gap D ATCAA would be established in place of the northern portion of Gateway East ATCAA. The southern corner of Gateway West ATCAA would be moved to the north to facilitate civilian traffic, though the exact location of the new southern boundary would be coordinated with FAA. All other proposed changes would be the same as described in Alternative 1: authorizing operations up to FL600 and increasing the annual total from 10 days to 30. The impacts to airports and civil traffic would be the same as Alternative 1 described in **Section 3.2.1**.

3.3.2 Day-To-Day Operations

Under Alternative 2, the northern border of the Gateway East ATCAA would be shifted south to align with the PR 2 ATCAA northern border (**Figure 3.3-1**). This modified Gateway East ATCAA would be available for day-to-day operations (currently use of Gateway East ATCAA is limited to LFEs only). The southern corner of Gateway West ATCAA would be moved to the north to facilitate civilian traffic, though the exact location of the new southern boundary would be coordinated with FAA during a revision to the Letter of Agreement for this ATCAA. Since a new boundary would not be known until much later

in the aeronautical review process, the airspace analysis was conducted on the full Gateway West ATCAA to represent the greatest area of potential effect. The ceiling of the PR2 ATCAA and the modified Gateway East/West ATCAAs would be raised to FL600. The published times of use for PRTC day-to-day operations would be changed to 0700 to 0030 (7:00 am to 12:30 am) Monday to Thursday, 0700 to 1800 (7:00 am to 6:00 pm) Friday, and other times by NOTAM (same as Alternative 1).

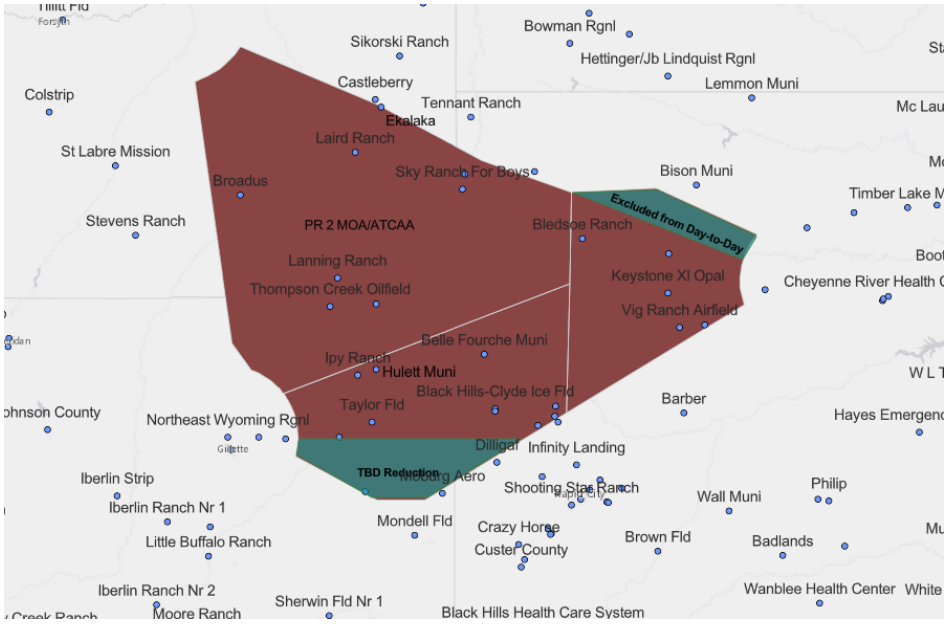


Legend: ATCAA = Air Traffic Control Assigned Airspace; PR = Powder River

Figure 3.3-1 Alternative 2 Day-To-Day Area

3.3.2.1 Airports

Under Alternative 2, the measured effects to airports on a day-to-day basis remain the same as that under PRTC Alternative 1 Day-To-Day. Detailed information on those affects can be found in **Section 3.2.2.1**. Airport positions as they pertain to the Alternative 2 proposal can be seen below in **Figure 3.3-2**.



Note: Exclusion and reduction areas are estimated for visual indicators only and not to scale.

Figure 3.3-2 Airports Near Alternative 2 Day-to-Day Area

3.3.2.2 Flight Traffic

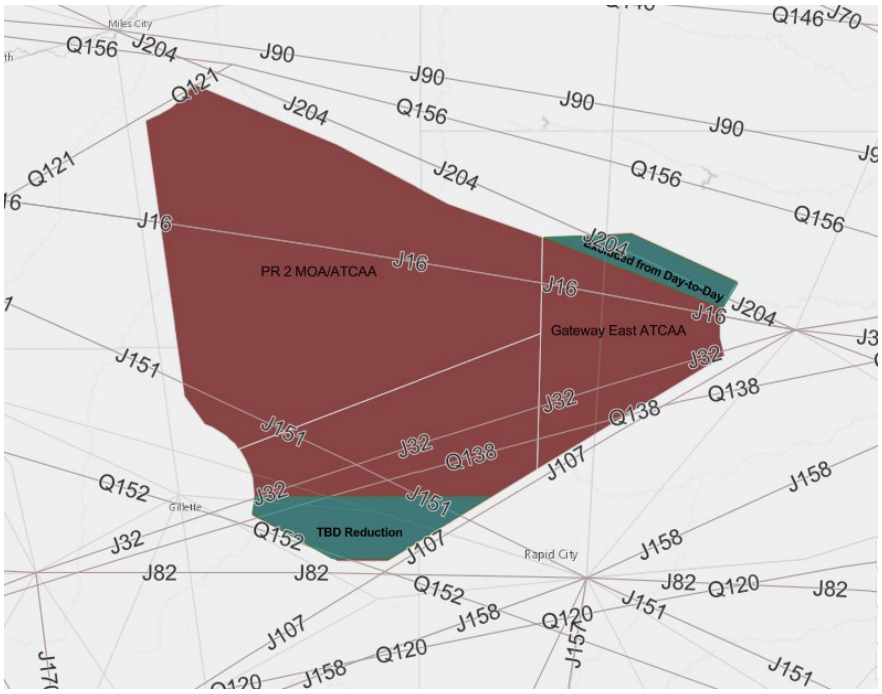
ATS Routes

There is only minor differences in the ATS Routes affected under Alternative 2. The same six ATS routes which traverse the PRTC Alternative 2 Day-to-Day lateral boundaries at altitudes from FL260-FL600 are the same as those affected by Alternative 1 Day-to-Day in **Section 3.2.2**. The route distances affected under Alternative 2 change slightly and are listed below in **Table 3.3-1** and a depiction of the routes can be seen in **Figure 3.3-3**.

Table 3.3-1 PRTC Alternative 2 Day-to-Day ATS Routes

Route Name	Type	PR 2 (NM)	Gateway East (NM)	Gateway West (NM)	Total Distance (NM)
J16	Jet Route	117	55	0	172
J151	Jet Route	35	0	60	95
J32	Jet Route	0	59	92	151
Q138	Q-Route	0	28	90	118
Q152	Q-Route	0	0	13	13
Q121	Q-Route	2	0	0	2

Legend: ATS = Air Traffic Service; NM = Nautical Mile; PR = Powder River; PRTC = Powder River Training Complex



Note: Exclusion and reduction areas are estimated for visual indicators only and not to scale.

Figure 3.3-3 ATS Routes Traversing the PRTC Alternative 2 Day-To-Day Area (PR 2, Gateway East, and Gateway West ATCAAs)

Aircraft that typically fly these routes through the area would require alternate routing or radar vectors to avoid the SAA only at times when it is active. The impact of rerouting traffic along these routes is a portion of traffic analysis included within the civil traffic section below.

Civil Traffic

During the year of data collection, 99,212 aircraft flights traversed at least part of the area encompassing the proposed PRTC Alternative 2 Day-to-Day area above FL260 to FL600. The most common aircraft in this list are Boeing 737 and 777 series, Airbus A320/A321 families, and regional jets like the CRJ variants. Listed below are the top 10 aircraft types, by percentage of flights per year (**Table 3.3-2**). Assumptions for converting distance to time were that aviation traffic at FL260–FL600 was traveling at 450 KTAS given most aircraft at these altitudes are domestic airliners and long-range business jets.

Table 3.3-2 Aircraft Types Intersecting PRTC Alternative 2 Day-to-Day Area (Above FL260 to FL600)

Aircraft Type	Aircraft Name	Percent of Total
B739	Boeing 737-900	12.4%
B738	Boeing 737-800	10.1%
B39M	Boeing 737 MAX 9 (BBJ)	5.8%
B38M	Boeing 737 MAX 8 (BBJ)	4.7%
A320	Airbus A320	4.1%
A321	Airbus A321	4.0%
A21N	Airbus A321neo	3.7%
B763	Boeing 767-300	3.5%
CRJ2	Bombardier CRJ-200	3.4%
B752	Boeing 757-200	2.1%

Legend: % = percent; FL = Flight Level; PRTC = Powder River Training Complex

Of the 99,212 tracks that were found to have transited the Alternative 2 Day-to-Day area during the year of data gathered, 908 (0.92 percent) being military carrier, and 78 (0.08 percent) being unknown carriers were removed from impact analysis. Further, the Alternative 2 Day-to-Day proposal states that operations will generally not occur on weekends, thus avoiding impact to 27,448 (27.67 percent) of the potential flights which occurred on Saturday or Sunday, which were also removed. Additionally, the Alternative 2 Day-to-Day proposal state that the airspace schedule is proposed to change to 07:00 to 00:30 Monday to Thursday, 07:00 to 18:00 Friday. Focusing the analysis on the proposed schedule eliminated 11,114 (11.2 percent) additional tracks. Finally, 22 tracks were removed due to unknown origin and/or destination, and 16 were removed due to being local area flights (i.e., same origin/destination). The remaining 59,626 tracks were used to conduct a detailed analysis of the airspace establishment effects. Within this track set, it was determined that 4,183 Origin/Destination (route) pairings existed for all the tracks that passed through the airspace. Most of the route pairings occurred sparingly. Only 171 route pairings occurred at a frequency of once a week or more (i.e., 52 times or more throughout the year). These 171 weekly or more frequent route pairings accounted for 46,227 tracks or 77.53 percent of the remaining data set. The lower frequency tracks were removed from further analysis due to the low impact the establishment of airspace would have on those route pairings. The 171 route pairings were all plotted and assessed for impact pertaining to that of the direct great circle route vs. the route required to circumnavigate the proposed airspace. The list of all route pairings can be found in **Enclosure D**. **Figure 3.3-4** shows a graph of all 171 route pairings plotted with the change in distance required in the event the airspace was established versus the annual frequency of that route pairing. As seen, most of the frequent routes have very low route impacts, and most time impacted routes occur infrequently. Some route pairings, however, are outliers and have potential impacts at higher frequencies such as DEN-XWA, BZN-ORD, DEN-DIK and BIS-GCC.

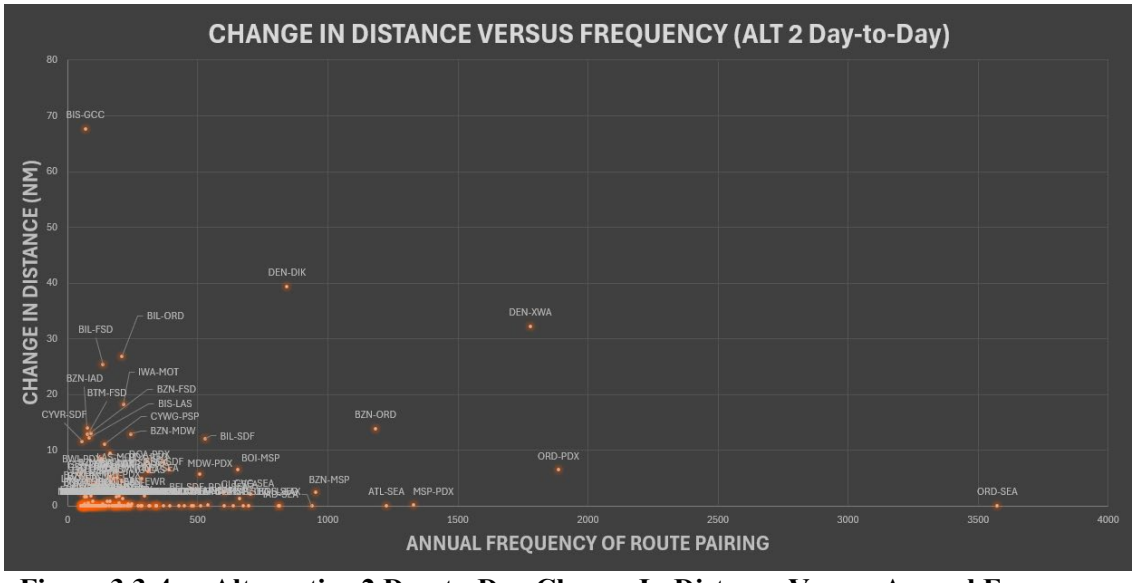
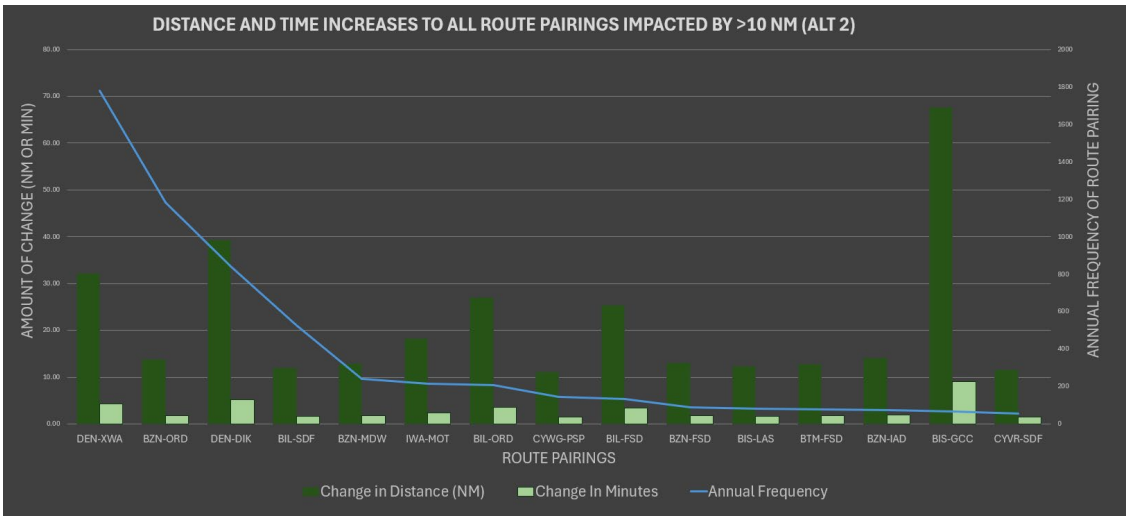


Figure 3.3-4 Alternative 2 Day-to-Day Change In Distance Versus Annual Frequency

Of the 171 route pairings, 51 percent of great circle routes did not pass through the proposed airspace and are likely not impacted, and only 15 route pairings were impacted by a course deviation of 10 NM or greater; 10 NM at 450 KTAS takes approximately 1 minute and 20 seconds, thus any routes impacted to this degree or less are considered negligible. **Figure 3.3-5** and **Table 3.3-3** show all 15 routes that require greater than 10 NM deviation from the direct great circle route to circumnavigate the proposed area. In

Figure 3.3-5, route pairings frequency are represented with the blue line. Impacts to the great circle route by distance and time are represented by the green bars.



Legend: > = greater than; NM = Nautical Mile

Figure 3.3-5 Alternative 2 Day-to-Day Distance and Time Impacts to Route Pairings > 10 NM

Table 3.3-3 Alternative 2 Day-to-Day Route Pairings Impacted by >10 NM Sorted by Frequency

Route Parings	Annual Frequency	Baseline Distance (NM)	Circumnavigation Distance (NM)	Change in Distance (NM)	Change to Baseline Route (%)	Change in Time (Min)
DEN-XWA	1778	505.78	537.99	32.21	6.4%	4.29
BZN-ORD	1183	1027.51	1041.35	13.84	1.3%	1.85
DEN-DIK	843	424.49	463.83	39.34	9.3%	5.24
BIL-SDF	527	1111.08	1123.12	12.04	1.1%	1.61
BZN-MDW	242	1038.12	1051.04	12.93	1.2%	1.72
IWA-MOT	214	1011.88	1030.07	18.19	1.8%	2.43
BIL-ORD	209	919.13	946.05	26.92	2.9%	3.59
CYWG-PSP	143	1286.21	1297.36	11.15	0.9%	1.49
BIL-FSD	135	520.58	545.95	25.37	4.9%	3.38
BZN-FSD	89	628.15	641.25	13.10	2.1%	1.75
BIS-LAS	83	909.80	922.07	12.27	1.3%	1.64
BTM-FSD	77	685.33	698.14	12.81	1.9%	1.71
BZN-IAD	74	1537.27	1551.32	14.05	0.9%	1.87
BIS-GCC	68	248.49	316.14	67.65	27.2%	9.02
CYVR-SDF	56	1733.66	1745.27	11.62	0.7%	1.55

Legend: % = percent; BIL = Billings Logan International Airport (MT); BIS = Bismarck Municipal Airport (ND); BTM = Bert Mooney Airport (MT); BZN = Bozeman Yellowstone International Airport (MT); CYVR = Vancouver International Airport (BC); CYWG = Winnipeg James Armstrong Richardson International Airport (MB); DEN = Denver International Airport (CO); DIK = Dickinson Theodore Roosevelt Regional Airport (ND); FSD = Sioux Falls Regional Airport (SD); GCC = Gillette-Campbell County Airport (WY); IAD = Washington Dulles International Airport (VA); IWA = Phoenix–Mesa Gateway Airport (AZ); LAS = Harry Reid International Airport (NV); MDW = Chicago Midway International Airport (IL); Min = Minutes; MOT = Minot International Airport (ND); NM = Nautical Mile; ORD = Chicago O'Hare International Airport (IL); PSP = Palm Springs International Airport (CA); SDF = Louisville Muhammad Ali International Airport (KY); XWA = Williston Basin International Airport (ND).

Per Route Impact Analysis: Only three routes are impacted by approximately 5 minutes or more per route at average speeds (450 KTAS) and at the altitudes in consideration. BIS-GCC has the greatest potential to be affected on a per flight basis with a 9-minute change, though some of this may be

mitigated through altitude choice. DEN-DIK is potentially impacted by 5 minutes per route, and DEN-XWA has potential to be affected per flight by approximately 4 minutes.

Impact Projection: Projecting a weighted impact metric was completed by using the total annual flights and the per flight time deviations required to circumnavigate the area. This resulted in the total amount of potential effect to each route pairing throughout the year. Only nine route pairings were projected to have an effect of five flight hours or greater annually despite the daily operations projected for the airspace. DEN-XWA is affected the greatest at 127 annual hours. The DEN–DIK route is the second most affected, with approximately 74 hours of annual effect. It represents the greatest difference between Alternative 1 and Alternative 2 Day-to-Day proposals, with increased activation of the Gateway East ATCAA, which requires a more pronounced easterly diversion for flights between these two airports. BZN-ORD is affected by 36 hours of flight time annually. BIL-SDF, BIL-ORD, BIS-GCC, IWA-MOT, BIL-FSD, and BZN-MDW are the next most affected considering both frequency and duration at times between 7 and 14 hours annually. All 15 routes that were affected by over 10 NM by Alternative 2 Day-to-Day airspace are shown below sorted by weighted impact metric in **Table 3.3-4**. BZN-ORD is the second most affected at 36 hours annually. BIL-SDF, BIL-ORD, BIL-FSD, BZN-MDW, and BIS-GCC

Table 3.3-4 Route Pairings Sorted by Weighted Impact Metric (Alt 2 Day-to-Day)

Route Parings	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change to Baseline Route (Percentage)	Change in Time (Min)	Weighted Impact Metric (Frequency x Per Route Affect) (Hours)
DEN-XWA	1778	505.78	537.99	32.21	6.4%	4.29	127.26
DEN-DIK	843	424.49	463.83	39.34	9.3%	5.24	73.69
BZN-ORD	1183	1027.51	1041.35	13.84	1.3%	1.85	36.40
BIL-SDF	527	1111.08	1123.12	12.04	1.1%	1.61	14.10
BIL-ORD	209	919.13	946.05	26.92	2.9%	3.59	12.50
BIS-GCC	68	248.49	316.14	67.65	27.2%	9.02	10.22
IWA-MOT	214	1011.88	1030.07	18.19	1.8%	2.43	8.65
BIL-FSD	135	520.58	545.95	25.37	4.9%	3.38	7.61
BZN-MDW	242	1038.12	1051.04	12.93	1.2%	1.72	6.95
CYWG-PSP	143	1286.21	1297.36	11.15	0.9%	1.49	3.54
BZN-FSD	89	628.15	641.25	13.10	2.1%	1.75	2.59
BZN-IAD	74	1537.27	1551.32	14.05	0.9%	1.87	2.31
BIS-LAS	83	909.80	922.07	12.27	1.3%	1.64	2.26
BTM-FSD	77	685.33	698.14	12.81	1.9%	1.71	2.19
CYVR-SDF	56	1733.66	1745.27	11.62	0.7%	1.55	1.45

Legend: % = percent; BIL = Billings Logan International Airport (MT); BIS = Bismarck Municipal Airport (ND); BTM = Bert Mooney Airport (MT); BZN = Bozeman Yellowstone International Airport (MT); CYVR = Vancouver International Airport (BC); CYWG = Winnipeg James Armstrong Richardson International Airport (MB); DEN = Denver International Airport (CO); DIK = Dickinson Theodore Roosevelt Regional Airport (ND); FSD = Sioux Falls Regional Airport (SD); GCC = Gillette-Campbell County Airport (WY); IAD = Washington Dulles International Airport (VA); IWA = Phoenix–Mesa Gateway Airport (AZ); LAS = Harry Reid International Airport (NV); MDW = Chicago Midway International Airport (IL); Min = Minutes; MOT = Minot International Airport (ND); NM = Nautical Mile; ORD = Chicago O'Hare International Airport (IL); PSP = Palm Springs International Airport (CA); SDF = Louisville Muhammad Ali International Airport (KY); XWA = Williston Basin International Airport (ND).

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Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
Baker Municipal	BHK	PR 3	Coordinates: N46°20.80' / W104°15.49' Located 01 miles SE of Baker, Montana on 206 acres of land. Surveyed Elevation is 2,980 ft MSL. Public Airport Tower: No Publicly Owned Owner: BAKER CITY AND FALLON CO BOX 846 BAKER, MT 59313 406-778-2883	RNAV RWY 13 Approach (Up to 6,000 ft MSL including missed approach via PR 3 Only).	RNAV RWY 31 Approach (Up to 5,400 ft MSL for approach and 6,000 ft MSL for missed approach via PR 3 Only).			Not reported	Approaches and Missed approaches require up to 6,000 ft MSL in PR 3 to accomplish and may be affected by increased LFE days. Total impact would depend upon unknown weather variables and unavailable operations data.
Barbar	SD98	Gateway East	Coordinates: N44°27.75' / W102°33.11' Located 07 miles S of Enning, South Dakota. Estimated Elevation is 2,655 ft MSL. Private Airfield Tower: No Privately Owned MARVIN BARBER 20250 ELM SPRINGS RD ENNING, SD 57737 605-985-5515					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
Bell Fourche Municipal	KEFC	Gateway West	Coordinates: N44°44.07' / W103°51.71' Located 04 miles N of Belle Fourche, South Dakota on 279 acres of land. Surveyed Elevation is 3,190 ft MSL. Public Airport Tower: No Publicly owned CITY OF BELLE FOURCHE 511 6TH AVE. BELLE FOURCHE, SD 57717 605-892-2494	RNAV RWY 32 (Up to 10,000 max and 7,600 minimum for standard approach, missed approach up to 7,600 all via GW-W)				Not reported	Single approach needs 10,000 feet MSL below GW-W. This is below airspace in question and does not indicate any conflict.
Big Horn County	00U	Powder River 1	Coordinates: N45°44.66' / W107°39.63' Located 03 miles W of Hardin, Montana. Surveyed Elevation is 3,025 ft MSL. Public Airport Tower: No Publicly owned COUNTY OF BIG HORN PO BOX 908 HARDIN, MT 59034 406-665-9700	RNAV RWY 26 Approach (Up to 10,000 ft MSL for approach and 6,500 ft MSL for missed approach via PR 1A with a feeder route impacting PR 1C				Not reported	Single approach impacts at or below 10,000 ft MSL in PR 1A and C may be affected by increased LFE days. Total impact would depend upon unknown weather variables and unavailable operations data.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
Bison Municipal	6V5	PR 4	Coordinates: N45°31.10' / W102°28.07' Located 00 miles SW of Bison, South Dakota on 95 acres of land. Surveyed Elevation is 2,791 ft MSL. Public Airport Tower: No Publicly owned BISON CITY PO BOX 910, 309 1ST AVE W BISON, SD 57620 605-244-5677					Not reported	No approach/ departure procedures to impact airspace.
Black Hills - Clyde Ice Field	SPF	Gateway West	Coordinates: N44°28.86' / W103°47.16' Located 03 miles E of Spearfish, South Dakota on 485 acres of land. Surveyed Elevation is 3,933 ft MSL. Public Airport Tower: No Publicly owned CITY OF SPEARFISH 625 NORTH FIFTH STREET SPEARFISH, SD	RNAV RWY 13 Approach (7,000–14,000 ft MSL needed for approach, 4,600 ft MSL for missed approach all via GW-W)	RNAV RWY 31 Approach (8,200 ft MSL needed for approach, 7,000 ft MSL for missed approach all via GW-W)	SWUNG TWO Departure (Up to 4,800 ft MSL all via GW-W)		Not reported	Procedures are well below airspace floor.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			57783 605-642-1333						
Bledsoe Ranch	0SD3	Gateway East	Coordinates: N45°16.17' / W103°13.03' Located 10 miles NE of Hoover, South Dakota. Estimated Elevation is 2,872 ft MSL. Private Airstrip Tower: No Privately Owned ROBERT E. BLEDSOE BOX 406 WRAY, CO 80758 (970) 332-4955					Not reported	No approach/ departure procedures to impact airspace.
Blomberg 42 Ranch (Pvt)	SD48	Gateway East	Coordinates: N45°12.00' / W102°39.03' Located 28 miles NW of Faith, South Dakota. Estimated Elevation is 2,610 ft MSL. Private Airfield Tower: No Privately Owned LESTER BLOMBERG 42 RANCH FAITH, SD 56726 605-866-4632					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
Bowman Regional	BWW	PR 3	Coordinates: N46°9.93' / W103°18.04' Located 04 miles E of Bowman, North Dakota on 428 acres of land. Surveyed Elevation is 2,965 ft MSL. Public Airport Tower: No Publicly owned BOWMAN COUNTY ARPT AUTH PO BOX 331 BOWMAN, ND 58623 701-523-7484	RNAV RWY 13 Approach (Up to 5,800 feet MSL via PR 3 / 6,000 ft MSL on the Missed Approach via Gap C)	RNAV RWY 31 Approach (Up to 5,800 feet MSL via PR 3 / 6,000 ft MSL on the Missed Approach via Gap C)			Not reported	RNAV RWY 13 and 31 both affect airspace up to 5,800 feet in PR 3 and 6,000 on Missed Approach into Gap C. The missed approach is under Gap C, but the approaches conflict with PR 3 airspace and therefore have potential affect with increased LFE days. Total impact would depend upon unknown weather variables and unavailable operations data.
Boyd's Turf	0NA9	PR 3	Coordinates: N46°45.00' / W103°48.06' Located 09 miles NE of Golva, North Dakota on 2 acres of land. Estimated Elevation is 2,750 ft MSL. Private Airstrip Tower: No					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			Privately Owned Owner: BOYD H. TRESTER 180 ELLIOT ST SENTINEL BUTTE, ND 58654 701-260-1053						
Brands	ND62	PR 4	Coordinates: N46°50.90' / W102°27.48' Located 03 miles SW of Taylor, North Dakota on 400 acres of land. Estimated Elevation is 2,423 ft MSL. Private Airstrip Tower: No Privately Owned LELAND BRAND 9511 39TH ST., S.W. TAYLOR, ND 58656-6624 701-974-3578					Not reported	No approach/ departure procedures to impact airspace.
Broadus	00F	PR 2	Coordinates: N45°28.23' / W105°27.43' Located 03 miles NW of Broadus, Montana on 160 acres of land. Estimated Elevation is 3,282 ft MSL. Public Airport Tower: No					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			Publicly owned POWDER RIVER CO PO BOX 200 BROADUS, MT 59317 406-436-2361						
Bruch Airfield	SD35	Gateway West	Coordinates: N44°29.65' / W103°23.67' Located 08 miles NE of Sturgis, South Dakota. Elevation is 2,980 ft MSL. Private Airstrip Tower: No Privately Owned JOHN H BRUCH 20073 COLONY PLACE STURGIS, SD 57785 605-347-5269					Not reported	No approach/ departure procedures to impact airspace.
Camp Crook Municipal	80A5	PR 2	Coordinates: N45°34.00' / W103°59.03' Located 00 miles NW of Camp Crook, South Dakota. Surveyed Elevation is 3,140 ft MSL. Private Helipad Tower: No					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
Castleberry	MT45	Gap B	Coordinates: N45°54.53' / W104°34.56' Located 02 miles NW of Ekalaka, Montana on 14 acres of land. Estimated Elevation is 3,373 ft MSL. Private Airstrip Tower: No Privately Owned CASTLEBERRY INC BOX 281 EKALAKA, MT 59324 406-775-6526					Not reported	No approach/ departure procedures to impact airspace.
Chase Airstrip	6NA5	Powder River 4	Coordinates: N46°54.77' / W102°0.54' Located 02 miles ESE of Hebron, North Dakota on 9 acres of land. Estimated Elevation is 2,140 ft MSL. Private Airstrip Tower: No Privately Owned KEITH & CHERYL CHASE PO BOX 48 HEBRON, ND 58638 701-878-4735					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
Colstrip	M46	PR 1	Coordinates: N45°51.17' / W106°42.56' Located 03 miles SW of Colstrip, Montana. Surveyed Elevation is 3,427 ft MSL. Public Airport. Tower: No Publicly owned COUNTY OF ROSEBUD PO BOX 47 FORSYTH, MT 59327 406-346-2251	GPS RWY 6 Approach (Up to 6,000 ft MSL via PR 1A and PR 1B	GPS RWY 24 Approach (up to 5,500 ft MSL on approach and 6,000 ft MSL on missed approach in PR 1B with feeder from Gap A)	Departure RWY 6 - Standard Climb up to 9,000 ft MSL via PR 1B and Gap A with a heading towards PR 2 a few miles away.	Departure RWY 24	Not reported	Departure procedures from RWY 6 have effect on PR 1B, GAP A or PR 2 below 9,000 ft MSL. This may be impacted by increased LFE days and/or increased day-to-day times. Departure procedures from RWY 24 affects PR 1B at 6,000 ft MSL and below. Approach GPS RWY 6 up to 6,000 ft MSL via PR 1A and PR 1B. Approach GPS RWY 24 up to 6,000 ft MSL via PR 1B and Gap A. These approaches have potential impacts with increased LFE days. Total impact would depend upon unknown weather variables and

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
									unavailable operations data.
Dilligaf	Unknown	Gateway West	No information available					Not reported	No information available.
Dilse Airstrip	NA98	PR 3	Coordinates: N46°18.15' / W103°10.21' Located 10 miles N of Scranton, North Dakota on 2 acres of land. Estimated Elevation is 2,878 ft MSL. Private Airstrip Tower: No Privately Owned Owner: TED D. DILSE 7603 135TH AVE SW SCRANTON, ND 58653 701-275-8256					Not reported	No approach/ departure procedures to impact airspace.
Dorsey Ranch	1SD0	PR 4	Coordinates: N45°19.38' / W101°44.53' Located 05 miles SE of Glad Valley, South Dakota. Estimated Elevation is 2,350 ft MSL. Private Airfield Tower: No Privately Owned					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			KEITH W. DORSEY BOX 54 ISABEL, SD 57633 605-466-2427						
Eden Valley	SD24	Gateway West	Coordinates: N44°26.83' / W103°23.72' Located 05 miles NE of Sturgis, South Dakota. Estimated Elevation is 3,070 ft MSL. Private Airstrip Tower: No Privately Owned EDEN VALLEY LLC 20400 GRAVEL RD STURGIS, SD 57785 605-347-1385					Not reported	No approach/ departure procedures to impact airspace.
Ekalaka Airport	97M	PR 2	Coordinates: N45°52.59' / W104°32.25' Located 02 miles SE of Ekalaka, Montana on 162 acres of land. Surveyed Elevation is 3,504 ft MSL. Public Airport Tower: No Publicly owned Owner: COUNTY OF CARTER COUNTY COURT	RNAV RWY 13 Approach (Up to 14k via Gap, PR 2, and PR 3)	RNAV RWY 31 Approach (Up to 14k via Gap, PR 2, and PR 3)			Not reported	Approach RNAV RWY 13 requires up to 14,000 ft MSL with one IAF in PR 2, one IAF in PR 3, one IAF in Gap B and FAF in Gap B. It can be flown as low as 7,000 ft MSL depending on the direction. RNAV RWY 31 requires up to

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			HOUSE PO BOX 315 EKALAKA, MT 59324 406-775-8749						14,000 feet MSL with 1 x IAF in Gap B, and 2 x IAF in PR 2. FAF in PR 2. MA Point in Gap B at 7,000 ft MSL. These approaches have potential effects with increased day-to-day times and LFE days. Total impact would depend upon unknown weather variables and unavailable operations data.
Elgin Municipal	Y71	PR 4	Coordinates: N46°22.97' / W101°50.69' Located 01 miles S of Elgin, North Dakota on 10 acres of land. Surveyed Elevation is 2,355 ft MSL. Public Airstrip Tower: No Publicly owned ELGIN ARPT AUTHORITY 7125 67TH AVE SW					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			ELGIN, ND 58533 701-220-3442						
Faith Municipal	D07	Gateway East	Coordinates: N45°2.11' / W102°1.24' Located 01 miles E of Faith, South Dakota on 78 acres of land. Surveyed Elevation is 2,584 ft MSL. Public Airfield Tower: No Publicly owned CITY OF FAITH PO BOX 368 FAITH, SD 57626 605-967-2261					Not reported	No approach/ departure procedures to impact airspace.
Fort Smith Landing Strip	5U7	PR 1	Coordinates: N45°19.25' / W107°55.87' Located 01 miles N of Fort Smith, Montana on 60 acres of land. Surveyed Elevation is 3,242 ft MSL. Public Airport Tower: No Publicly owned NATIONAL PARK SERVICE BIG HORN CANYON PO , PO					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			BOX 7458 HARDIN, MT 59035 406-666-2412						
Glen Ulin Regional	D57	PR 4	Coordinates: N46°48.86' / W101°51.91' Located 02 miles W of Glen Ullin, North Dakota on 240 acres of land. Surveyed Elevation is 2,091 ft MSL. Public Airport Tower: No Publicly owned GLEN ULLIN ARPT AUTHORITY BOX 70 GLEN ULLIN, ND 58631-0070 701-348-3649	RNAV RWY 29 (No higher than 6,000 ft MSL with Missed Approach no higher than 4,600				Not reported	The one approach can be flown clear of the lateral boundaries and below of PR 4. No impact on airport operations anticipated.
Hagen	14ND	Gap C	Coordinates: N46°12.47' / W102°54.51' Located 07 miles NE of Reeder, North Dakota. Estimated Elevation is 2,810 ft MSL. Private Airstrip Tower: No Privately Owned BRUCE HAGEN 1406 15TH AVE NW					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			REEDER, ND 58649 701-853-2881						
Harding County	9D2	Gap B	Coordinates: N45°34.77' / W103°31.73' Located 01 miles SE of Buffalo, South Dakota on 120 acres of land. Estimated Elevation is 2,891 ft MSL. Public Airport Tower: No Publicly owned HARDING COUNTY P O BOX 26 BUFFALO, SD 57720 605-375-3130					Not reported	No approach/ departure procedures to impact airspace.
Hettinger/JB Lindquist Regional	HEI	PR 4	Coordinates: N46°0.89' / W102°39.36' Located 01 miles NW of Hettinger, North Dakota on 271 acres of land. Surveyed Elevation is 2,705 ft MSL. Public Airport Tower: No Publicly owned ADAMS CO ARPT AUTH	RNAV RWY 12 (Up to 5,000 feet for approach required via / Up to 9,000 feet for the Missed Approach via PR 4 and Gap C	RNAV RWY 30 (Up to 5000 ft MSL via PR 4 and up to 6,000 ft MSL for missed approach via PR 4 and GAP C.			Not reported	Approaches can be flown below both PR 4 and Gap C airspace

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			BOX 429 HETTINGER, ND 58639 701-567-2069						
Hulett Municipal	W43	Gateway West	Coordinates: N44°39.77' / W104°34.07' Located 02 miles SE of Hulett, Wyoming on 330 acres of land. Surveyed Elevation is 4,263 ft MSL. Public Airport Tower: No Publicly owned TOWN OF HULETT P.O. BOX 278 HULETT, WY 82720 307-467-5771	RNAV RWY 13 Approach (Up to 7,000 feet MSL via PR 2 and GW-W and Missed Approach up to 7,600 via GW-W) IMUNTE to FANRO (IFs) go via PR 2	RNAV (GPS)-A Approach (Up to 7,600 feet MSL. Missed Approach Up to 15,000 via GW-W)	LLADN One Departure (Up to 8,100 feet MSL primarily under GW-W)		Not reported	RNAV-A has effect up to 15,000 ft MSL under GW-W. No anticipated impact as it is under airspace in question. LLADN One Up to 8,100 ft MSL under GW-W. No anticipated impact as departure is under airspace in question. RNAV RWY 13 has effects on airspace in PR 2 at 7,000 ft MSL and below GW-W up to 7,600. Potential to affect PR 2 airspace exists with increased LFE days and day-to-day times. Total impact unknown due to weather

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
									variables and unavailable operations data.
Hysham	6U7	PR 1	Coordinates: N46°17.61' / W107°11.60' Located 02 miles E of Hysham, Montana on 40 acres of land. Estimated Elevation is 2,624 ft MSL. Tower: No Public Airport Publicly owned TREASURE COUNTY COUNTY COURTHOUSE, 200 SPURLING ST HYSHAM, MT 59038 406-342-5547					Not reported	No approach/ departure procedures to impact airspace.
Infinity Landing	SD25	Gateway West	Coordinates: N44°13.10' / W103°15.18' Located 06 miles E of Piedmont, South Dakota. Estimated Elevation is 3,159 ft MSL. Private Airfield Tower: No Privately Owned INFINITY					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			PROPERTIES LLC 7190 INFINITY DR SUMMERSET, SD 57718 605-787-2180						
Ipy Ranch	WY14	Gateway West	Coordinates: N44°38.25' / W104°41.31' Located 04 miles SW of Hulett, Wyoming. Estimated Elevation is 3,960 ft MSL. Private Airfield Tower: No Privately Owned IPY RANCH, LTD P.O. BOX 50 DEVILS TOWER, WY 82714 307-467-5540					Not reported	No approach/ departure procedures to impact airspace.
Isabel Municipal	3Y7	PR 4	Coordinates: N45°23.38' / W101°26.25' Located 00 miles SW of Isabel, South Dakota on 139 acres of land. Estimated Elevation is 2,398 ft MSL. Public Airfield Tower: No Publicly owned CITY OF ISABEL PO BOX 268					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			ISABEL, SD 57633 605-466-2177						
Johnny Creek	79MT	PR 3	Coordinates: N46°25.82' / W104°14.65' Located 04 miles NNE of Baker, Montana. Estimated Elevation is 3,076 ft MSL. Private Airstrip Tower: No Privately Owned ROGER MEGGERS PO BOX 979, 79 JOHNY CREEK TRAIL BAKER, MT 59313 406-852-0771					Not reported	No approach/ departure procedures to impact airspace.
Keyhole	01WY	Gateway West	Coordinates: N44°20.83' / W104°48.65' Located 08 miles NE of Moorcroft, Wyoming. Estimated Elevation is 4,250 ft MSL. Private Airstrip Tower: No Privately Owned GEORGE B. WATERS KEYHOLE RANCH INC, 647 MCKEAN					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			RD MOORCROFT, WY 82721-9778 307-756-3279						
Keystone XI Opal	SD04	Gateway East	Coordinates: N45°1.20' / W102°39.53' Located 12 miles NW of Opal, South Dakota. Estimated Elevation is 3,001 ft MSL. Private Helipad Tower: No Privately Owned TRANSCANADA KEYSTONE XL PIPELINE 13710 FNB PARKWAY, SUITE 300 OMAHA, NE 68154 402-492-7594					Not reported	No approach/ departure procedures to impact airspace.
Kissack/Reynolds	22WY	Gateway West	Coordinates: N44°20.28' / W105°9.73' Located 04 miles NE of Rozet, Wyoming on 80 acres of land. Estimated Elevation is 4,380 ft MSL. Private Airstrip Tower: No Privately Owned					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			DOUG KISSACK P. O. BOX 9, 231 S. HEPTNER RD ROZET, WY 82727 307-682-9026						
Laird Ranch Airport	MT05	PR 2	Coordinates: N45°40.08' / W104°42.20' Located 15 miles SW of Ekalaka, Montana. Surveyed Elevation is 3,462 ft MSL. Private Airport Tower: No Privately Owned Owner: ERLEND LAIRD 1824 CHALK BUTTES RD EKALAKA, MT 59324 406-775-6458					Not reported	No approach/ departure procedures to impact airspace.
Lanning Ranch	MT50	PR 2	Coordinates: N45°5.27' / W104°49.16' Located 18 miles NW of Alzada, Montana. Estimated Elevation is 3,995 ft MSL. Private Airstrip Tower: No Privately Owned DANNY LANNING 200 LANNING					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			TRAIL ALZADA, MT 59311 406-828-4522						
Lemmon Municipal	LEM	PR 4	Coordinates: N45°55.10' / W102°6.33' Located 03 miles SE of Lemmon, South Dakota on 640 acres of land. Surveyed Elevation is 2,572 ft MSL. Public Airport Tower: No Publicly owned CITY OF LEMMON 303 1ST AVE WEST LEMMON, SD 57638 605-374-5681	RNAV RWY 30 (Up to 6,000 ft MSL for approach and 4,500 ft MSL for the missed approach all within PR 4)				Not reported	Approach can be flown below PR 4 airspace.
Madsen	WY65	Gateway West	N44°20.93' / W105°20.25' Located 10 miles NE of Gillette, Wyoming on 40 acres of land. Estimated Elevation is 4,500 ft MSL. Private Airstrip Tower: No Privately Owned B. MADSEN & C. OVERBY 71 MADSEN ROAD					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			GILLETTE, WY 82716 307-682-4390						
Mitchells Strip	SD90	Gateway West	N44°28.03' / W103°47.23' Located 05 miles E of Spearfish, South Dakota. Estimated Elevation is 3,920 ft MSL. Private Airstrip Tower: No Privately Owned LAWRENCE L MITHHELL 1020 MAITLAND RD SPEARFISH, SD 605-642-3181					Not reported	No approach/ departure procedures to impact airspace.
Moburg Aero	WY53	Gateway West	Coordinates: N44°4.98' / W104°7.92' Located 01 miles ENE of Four Corners, Wyoming. Estimated Elevation is 5,968 ft MSL. Private Airstrip Tower: No Privately Owned JAMES HAYES 29 MALLO RD FOUR CORNERS,					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			WY 82715 612-743-9266						
Mondell Field	ECS	Gateway West	Coordinates: N43°53.06' / W104°18.87' Located 05 miles NW of Newcastle, Wyoming on 241 acres of land. Surveyed Elevation is 4,177 ft MSL. Public Airport Tower: No Publicly owned CITY OF NEWCASTLE/WESTON CO COUNTY COURT HOUSE/1 W MAIN NEWCASTLE, WY 82701 307-746-4744	RNAV RWY 14 Approach (Up to 8,000 ft MSL for approach and 9,400 ft MSL for missed approach all via GW-W)	RNAV RWY 14 Approach (Up to 8,000 ft MSL for approach and 9,500 ft MSL for missed approach all via GW-W)	VOR RWY 32 Approach (up to 6,800 ft MSL for approach and 7,500 ft MSL for missed approach all via GW-W		Not reported	No impacts as procedures are well below the Gateway West.
Mott Municipal	3P3	PR 4	Coordinates: N46°21.55' / W102°19.69' Located 01 miles S of Mott, North Dakota on 115 acres of land. Surveyed Elevation is 2,413 ft MSL. Public Airport Tower: No Publicly owned MOTT AIRPORT					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			AUTHORITY OWEN BLICKENSDERFER CHRMN APT AUTH 701-567-3861. 406 MEADOW LANE MOTT, ND 58646 701-260-3525						
Pale Morning Dun Ranch Airport	9MT0	PR 1	Coordinates: N45°24.18' / W107°46.45' Located 10 miles SW of Fort Smith, Montana on 200 acres of land. Estimated Elevation is 3,220 ft MSL. Private Airport Tower: No Privately Owned MIKE PARNELL PO BOX 1390 EASTBOUND, WA 98245 360-317-4026					Not reported	No approach/ departure procedures to impact airspace.
Paradise Valley	2SD0	Gateway West	Coordinates: N44°9.82' / W103°28.73' Located 03 miles SE of Nemo, South Dakota on 32 acres of land. Estimated Elevation is 4,500 ft MSL.					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			Private Airstrip Tower: No Privately Owned L.A. KRAEMER 12856 NEMO RD DEADWOOD, SD 57732 605-342-2339						
Pierce Ranch	WY56	PR 2	Coordinates: N44°58.21' / W104°34.11' Located 17 miles N of Hulett, Wyoming. Estimated Elevation is 3,550 ft MSL. Private Airstrip Tower: No Privately Owned JOHN PIERCE 3071 LITTLE MISSOURI RD HULETT, WY 82720-9627 605-381-2033					Not reported	No approach/ departure procedures to impact airspace.
Richardton	4E8	PR 4	Coordinates: N46°53.75' / W102°21.40' Located 02 miles NW of Richardton, North Dakota on 20 acres of land. Estimated Elevation is 2,498 ft MSL.					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			Public Airport Tower: No Publicly owned RICHARDTON APT AUTHORITY 11 SOUTH AVENUE W RICHARDTON, ND 58652 701-290-4335						
Sikorski Ranch	MT74	PR 3	Coordinates: N46°6.42' / W104°24.91' Located 17 miles NE of Ekalaka, Montana on 20 acres of land. Estimated Elevation is 3,330 ft MSL. Private Airstrip Tower: No Privately Owned SIKORSKI & SONS 24 WICKLOW LN BAKER, MT 59313 406-775-6535					Not reported	No approach/ departure procedures to impact airspace.
Sky Ranch For Boys	SD33	PR 2	Coordinates: N45°30.00' / W104°0.03' Located 03 miles S of Camp Crook, South Dakota. Estimated Elevation is 3,200 ft MSL. Private Airport					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			Tower: No Privately Owned ALVIN CORDELL 13125 LITTLE MISSOURI RIVER RD CAMP CROOK, SD 57724 605-797-4539						
St Labre Mission	3U4	PR 1	Coordinates: N45°36.39' / W106°16.45' Located 01 miles NW of Ashland, Montana Estimated Elevation is 2,909 ft MSL. Privately owned airport, open to the public. Tower: No Privately Owned ST LABRE MISSION PO BOX 77, 112 CAMPUS ROAD ASHLAND, MT 59003 406-784-4500					Not reported	No approach/ departure procedures to impact airspace.
Stevens Ranch	1M6	PR 1	Coordinates: N45°17.28' / W106°8.72' Located 19 miles SE of Ashland, Montana. Estimated Elevation is 3,300 ft MSL.					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			Privately owned, open to the public. Privately Owned WILLIAM C. STEVENS 5 FORT ROAD ASHLAND, MT 59003 406 784 2469						
Sturgis Heliport	2SD5	Gateway West	Coordinates: N44°24.17' / W103°30.53' Located 01 miles S of Sturgis, South Dakota. Estimated Elevation is 3,510 ft MSL. Private Helipad Tower: No Privately Owned MICHAEL JACOB RAPID HELICOPTERS INC, 620 WEST BLVD RAPID CITY, SD 67701 605-343-5058					Not reported	No approach/ departure procedures to impact airspace.
Sturgis Municipal	49B	Gateway West	Coordinates: N44°25.12' / W103°22.66' Located 04 miles E of Sturgis, South Dakota on 275 acres	RNAV RWY 11 Approach (Up to 6,600 ft MSL for approach and 7,000 ft MSL	RNAV RWY 11 Approach (Up to 7,00 ft MSL for approach and			Not reported	Procedures are well below airspace floor.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			of land. Estimated Elevation is 3,254 feet MSL. Public Airport Tower: No Publicly owned CITY OF STURGIS 1040 SECOND ST STE. 103 STURGIS, SD 57785 605-347-4422	for missed approach all under GW-W	missed approach all under GW-W				
Taylor Field	WY55	Gateway West	Coordinates: N44°25.16' / W104°35.74' Located 09 miles W of Sundance, Wyoming. Estimated Elevation is 4,950 ft MSL. Private Airstrip Tower: No Privately Owned GUY DAVID TAYLOR P.O. BOX 370 SUNDANCE, WY 82779 307-290-1097					Not reported	No approach/ |departure procedures to impact airspace.
Tennant Ranch	SD76	Gap B	Coordinates: N45°49.77' / W103°56.73' Located 17 miles N of Camp Crook, South Dakota.					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			Estimated Elevation is 3,090 ft MSL. Private Airstrip Tower: No Privately Owned GARY TENNANT 10995 N CAMP CROOK RD CAMP CROOK, SD 57724 605-797-4470						
Thompson Creek Oilfield	11WY	Powder River 2	Coordinates: N44°57.52' / W104°52.12' Located 24 miles SE of Hulett, Wyoming on 15 acres of land. Estimated Elevation is 3,814 ft MSL. Private Airstrip Tower: No Privately Owned SIGNAL HILL REALTY COMPANY, LLC P.O. BOX 3220 CODY, WY 82414 307-250-7930					Not reported	No approach/ departure procedures to impact airspace.
Tillitt Field	1S3	Powder River 1	Coordinates: N46°16.27' / W106°37.43' Located 03 miles E of Forsyth, Montana on 266 acres of land.	RNAV RWY 27 Approach				Not reported	No impacts within PRTC boundaries from approach.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			Surveyed Elevation is 2,729 ft MSL. Public Airport Tower: No Publicly owned COUNTY OF ROSEBUD P.O. BOX 47 FORSYTH, MT 59327 (406) 346-2251						
Upton Municipal	83V	Gateway West	Coordinates: N44°5.43' / W104°38.45' Located 01 miles SW of Upton, Wyoming on 140 acres of land. Estimated Elevation is 4,290 ft MSL. Public Airstrip Tower: No Publicly owned TOWN OF UPTON & WESTON CO PO BOX 203 UPTON, WY 82730 307-468-2441					Not reported	No approach/ departure procedures to impact airspace.
Vig Limousine	1SD4	Gateway East	Coordinates: N44°52.20' / W102°24.84' Located 22 miles SW of Faith, South Dakota. Estimated Elevation					Not reported	No approach/ departure procedures to impact airspace.

Airfields	ICAO	Airspace	About	Approach/ Departure	Approach/ Departure2	Approach/ Departure3	Approach/ Departure4	Ops Data	Notes and Assessment:
			is 2,558 ft MSL. Private Airfield Tower: No Privately Owned CHERYL J. VIG 18201 OPAL RD OPAL, SD 57758 605-748-2249						
Vig Ranch Airfield	SD72	Gateway East	Coordinates: N44°51.57' / W102°34.60' Located 04 miles SW of Opal, South Dakota. Estimated Elevation is 2,626 ft MSL. Private Airfield Tower: No Privately Owned CECIL VIG MUD BUTTE, SD 57758 605-967-2357					Not reported	No approach/ departure procedures to impact airspace.

Legend: FAF = Final Approach Fix; ft = foot/feet; GPS = Global Positioning System; IAF = Initial Approach Fix; LFE = Large Force Exercise; MSL = mean sea level; PR = Powder River; PRTC = Powder River Training Complex; RNAV = Area Navigation; RWY = Runway

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ENCLOSURE B
ALL LFE ROUTE PAIRINGS AT WEEKLY OR GREATER ANNUAL FREQUENCY

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Route Pairing	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change as a Percentage of Baseline Route (%)	Change in Time (Min)
ORD-SEA	7058	1491	1491	0	0.0%	0.00
MSP-SEA	3259	1212	1213	1	0.1%	0.11
ORD-PDX	2595	1507	1514	6	0.4%	0.86
JFK-SEA	2476	2146	2165	19	0.9%	2.49
IAD-SEA	2370	1999	2001	3	0.1%	0.34
MSP-PDX	2270	1236	1243	7	0.6%	0.92
DEN-XWA	1994	506	619	113	22.4%	15.13
DTW-SEA	1837	1670	1671	0	0.0%	0.05
ATL-SEA	1727	1893	1893	0	0.0%	0.00
EGLL-LAX	1584	4730	4733	3	0.1%	0.40
EWR-SEA	1536	2128	2147	19	0.9%	2.49
BZN-ORD	1281	1028	1041	14	1.3%	1.85
CVG-SEA	1267	1703	1711	8	0.4%	1.01
MEM-PANC	1263	2735	2736	1	0.0%	0.15
BZN-MSP	1254	757	770	12	1.6%	1.66
DEN-MOT	1244	525	538	14	2.6%	1.80
CYVR-CYYZ	1227	1807	1807	0	0.0%	0.00
CYVR-ORD	1208	1529	1530	1	0.0%	0.10
CLT-SEA	1123	1976	1978	1	0.1%	0.18
PHL-SEA	1050	2087	2093	6	0.3%	0.82
BOS-SEA	1021	2268	2274	6	0.3%	0.82
BOS-SFO	1016	2344	2344	0	0.0%	0.00
RDU-SEA	953	2041	2057	15	0.8%	2.05
JFK-PDX	922	2127	2128	1	0.1%	0.18
MIA-PANC	914	3475	3475	0	0.0%	0.00
DCA-SEA	911	2019	2020	2	0.1%	0.22
BIL-SDF	898	1111	1123	12	1.1%	1.61
BFI-SDF	886	1686	1689	3	0.2%	0.39
GEG-MSP	880	1018	1019	1	0.1%	0.11
BOI-MSP	871	989	996	6	0.7%	0.86
LAX-LFPG	832	4915	4917	2	0.0%	0.32
IND-SEA	826	1618	1625	8	0.5%	1.04
JFK-SFO	823	2242	2242	0	0.0%	0.00
BNA-SEA	813	1715	1715	0	0.0%	0.00
MSP-SFO	782	1378	1378	0	0.0%	0.00
GEG-SDF	767	1496	1503	7	0.4%	0.87
MDW-SEA	739	1502	1510	7	0.5%	0.99
SEA-STL	735	1482	1482	0	0.0%	0.00
EWR-PDX	731	2109	2111	2	0.1%	0.20
CYYC-ORD	723	1201	1201	0	0.0%	0.00
ATL-CYYC	698	1661	1663	2	0.1%	0.28
BWI-SEA	680	2024	2025	1	0.0%	0.12
CYYC-IAH	644	1519	1519	0	0.0%	0.06
MDW-PDX	613	1518	1523	6	0.4%	0.75
MSO-MSP	609	878	881	3	0.3%	0.41
BFI-RFD	609	1437	1445	8	0.5%	1.03
MKE-SEA	604	1468	1471	2	0.1%	0.29
BIL-MSP	600	648	665	17	2.6%	2.27
OMA-SEA	588	1186	1186	0	0.0%	0.03
CYYZ-SEA	548	1786	1786	0	0.0%	0.00
CMH-SEA	534	1748	1754	6	0.3%	0.81

Route Pairing	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change as a Percentage of Baseline Route (%)	Change in Time (Min)
ATL-RKSI	532	6203	6203	0	0.0%	0.00
PDX-SDF	522	1691	1691	0	0.0%	0.00
MCO-SEA	507	2216	2216	0	0.0%	0.00
BOS-PDX	492	2284	2303	19	0.8%	2.57
ORD-PANC	490	2467	2467	0	0.0%	0.00
CLE-SEA	486	1751	1752	1	0.0%	0.10
CYEG-MMUN	476	2292	2312	19	0.8%	2.58
EGLL-SFO	469	4652	4652	0	0.0%	0.00
CYYZ-SFO	467	1959	1959	0	0.0%	0.00
CYVR-MSP	465	1244	1244	0	0.0%	0.00
GPI-MSP	463	889	889	0	0.0%	0.00
PDX-RFD	456	1453	1459	6	0.4%	0.82
CVG-PDX	452	1712	1712	0	0.0%	0.05
PIT-SEA	448	1842	1843	1	0.1%	0.16
JFK-RJTT	448	5872	5872	0	0.0%	0.00
MSP-PSC	443	1087	1091	5	0.4%	0.62
CYYC-FSD	427	833	834	2	0.2%	0.23
CYYC-MEM	426	1417	1431	14	1.0%	1.80
ORD-RJTT	424	5466	5466	0	0.0%	0.00
BIS-DEN	416	449	449	0	0.0%	0.02
DEN-DIK	415	424	510	85	20.1%	11.39
EWR-SFO	410	2224	2224	0	0.0%	0.00
CYYC-DFW	402	1324	1325	1	0.1%	0.11
CYYC-MMUN	400	2209	2213	4	0.2%	0.58
EGLL-LAS	390	4533	4543	10	0.2%	1.33
DCA-PDX	379	2037	2044	7	0.3%	0.90
BZN-EWR	378	1631	1639	8	0.5%	1.02
GPI-ORD	376	1172	1174	2	0.1%	0.23
MSO-ORD	372	1155	1166	11	0.9%	1.46
ORD-RJAA	371	5439	5439	0	0.0%	0.00
PANC-SDF	369	2707	2707	0	0.0%	0.00
GTF-MEM	366	1214	1218	4	0.4%	0.57
ATL-GEG	355	1708	1708	0	0.0%	0.00
CYEG-DEN	350	886	886	0	0.0%	0.00
LAX-LTFM	349	5941	5941	0	0.0%	0.00
CYVR-SDF	346	1734	1745	12	0.7%	1.55
CVG-CYYC	344	1426	1426	0	0.0%	0.00
EDDF-LAX	340	5033	5034	0	0.0%	0.01
DTW-PDX	339	1693	1699	6	0.4%	0.86
CYYC-MCO	318	2004	2009	5	0.3%	0.67
CYVR-EWR	317	2165	2166	0	0.0%	0.06
EHAM-LAX	311	4836	4836	0	0.0%	0.02
CYUL-SFO	300	2201	2201	0	0.0%	0.00
ATL-CYVR	297	1950	1951	0	0.0%	0.04
IAD-PDX	290	2017	2024	7	0.3%	0.87
RFD-SEA	288	1438	1446	8	0.6%	1.09
GTF-MSP	286	769	769	1	0.1%	0.11
ATL-PDX	281	1884	1884	0	0.0%	0.00
MCI-SEA	280	1291	1291	0	0.0%	0.00
BNA-CYYC	274	1476	1478	1	0.1%	0.19
DFW-PANC	272	2640	2640	0	0.0%	0.00

Route Pairing	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change as a Percentage of Baseline Route (%)	Change in Time (Min)
CVG-CYVR	266	1746	1751	5	0.3%	0.62
IWA-MOT	261	1012	1041	29	2.8%	3.83
GEG-ORD	259	1298	1304	6	0.5%	0.79
BIL-ORD	252	919	946	27	2.9%	3.59
BZN-MDW	243	1038	1051	13	1.2%	1.72
ATL-PANC	243	2964	2964	0	0.0%	0.00
ILN-SEA	240	1727	1738	11	0.6%	1.46
CVG-GEG	239	1511	1525	14	0.9%	1.85
LAS-MOT	237	954	982	28	3.0%	3.76
ORD-RCTP	234	6468	6468	0	0.0%	0.00
CYEG-MEM	232	1482	1482	1	0.1%	0.12
CYYJ-CYYZ	232	1820	1820	0	0.0%	0.00
IND-PDX	230	1627	1627	1	0.0%	0.07
CHS-SEA	221	2095	2095	0	0.0%	0.00
BIS-IWA	221	949	954	5	0.5%	0.67
BZN-HPN	219	1642	1648	6	0.4%	0.81
BZN-TEB	218	1632	1639	7	0.4%	0.94
SEA-TPA	217	2187	2187	0	0.0%	0.00
ORD-RKSI	211	5680	5680	0	0.0%	0.00
LPPT-SFO	211	4925	4925	0	0.0%	0.00
MIA-SEA	209	2365	2365	0	0.0%	0.00
EDDF-SFO	208	4940	4940	0	0.0%	0.00
EIDW-LAX	207	4491	4494	3	0.1%	0.37
EHAM-SLC	203	4324	4327	2	0.1%	0.32
CLT-PDX	202	1978	1978	0	0.0%	0.00
EGLL-SAN	200	4755	4761	6	0.1%	0.85
ORD-SFO	196	1600	1600	0	0.0%	0.00
EDDF-LAS	196	4840	4844	4	0.1%	0.53
IAD-RJTT	195	5881	5881	0	0.0%	0.00
BOI-ORD	186	1246	1246	0	0.0%	0.00
EPWA-LAX	186	5215	5215	0	0.0%	0.00
BFI-IAD	185	1998	2000	2	0.1%	0.22
CYWG-LAS	184	1138	1164	26	2.3%	3.49
ATL-RJTT	180	5968	5968	0	0.0%	0.00
BIL-FSD	179	521	546	25	4.9%	3.38
LFPG-SFO	179	4839	4839	0	0.0%	0.00
FLL-SEA	176	2359	2359	0	0.0%	0.00
CYWG-LAX	176	1337	1357	20	1.5%	2.63
BNA-BZN	169	1245	1245	0	0.0%	0.00
CYWG-PSP	166	1286	1311	25	1.9%	3.31
ATL-CYEG	166	1713	1713	0	0.0%	0.00
EKCH-LAX	164	4875	4875	0	0.0%	0.00
LAX-OTHH	162	7207	7207	0	0.0%	0.00
JFK-PHNL	161	4323	4323	0	0.0%	0.00
MSP-RKSI	161	5417	5417	0	0.0%	0.00
LFPG-SLC	160	4402	4408	6	0.1%	0.76
CYVR-IAD	159	2032	2032	0	0.0%	0.00
CVG-RJGG	155	5808	5808	0	0.0%	0.00
EDDM-LAX	152	5192	5192	0	0.0%	0.00
BWI-PDX	150	2044	2053	8	0.4%	1.13
DFW-RJTT	150	5603	5603	0	0.0%	0.00

Route Pairing	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change as a Percentage of Baseline Route (%)	Change in Time (Min)
LAX-LLBG	145	6570	6570	0	0.0%	0.00
JFK-VHHH	145	7003	7003	0	0.0%	0.00
BOS-BZN	144	1725	1727	2	0.1%	0.23
MSP-PHNL	143	3447	3447	0	0.0%	0.00
MSP-RJTT	142	5185	5185	0	0.0%	0.00
ATL-BZN	142	1423	1423	0	0.0%	0.00
ORD-VHHH	139	6762	6762	0	0.0%	0.00
CYYC-MKC	136	1088	1107	20	1.8%	2.64
BFI-TEB	134	2081	2081	0	0.0%	0.00
BZN-PWK	133	1025	1040	15	1.4%	1.96
CYVR-JFK	132	2122	2122	0	0.0%	0.00
DTW-SFO	131	1802	1802	0	0.0%	0.00
LAX-LIRF	127	5509	5511	2	0.0%	0.28
CVG-RKSI	126	5903	5903	0	0.0%	0.00
LAX-LSZH	126	5148	5149	1	0.0%	0.09
EGLL-SLC	121	4217	4222	5	0.1%	0.69
EHAM-LAS	120	4642	4646	4	0.1%	0.56
EGLL-PHX	120	4569	4569	0	0.0%	0.00
EDDM-SAN	118	5223	5227	4	0.1%	0.57
DEN-EDDM	117	4528	4528	0	0.0%	0.00
JFK-WSSS	115	8283	8283	0	0.0%	0.00
CYYC-FLL	111	2154	2161	7	0.3%	0.88
JAC-ORD	110	1007	1007	0	0.0%	0.00
BED-BZN	109	1711	1713	2	0.1%	0.23
BNA-CYVR	109	1770	1772	2	0.1%	0.23
MSP-SMF	108	1316	1316	0	0.0%	0.00
EDDM-SFO	107	5096	5096	0	0.0%	0.00
CYYC-MSP	107	911	911	0	0.0%	0.00
EGKK-LAS	107	4553	4563	9	0.2%	1.25
IND-RJBB	105	5795	5795	0	0.0%	0.00
CYYC-MDPC	105	2906	2906	0	0.0%	0.02
DEN-EGLL	105	4048	4048	0	0.0%	0.00
EWR-JAC	104	1624	1624	0	0.0%	0.01
LSZH-SFO	102	5063	5063	0	0.0%	0.00
DEN-EDDF	101	4368	4368	0	0.0%	0.00
EHAM-SFO	101	4744	4744	0	0.0%	0.00
CYVR-MEM	101	1686	1686	0	0.0%	0.00
BOS-PHNL	100	4420	4420	0	0.0%	0.00
CVG-VHHH	99	6978	6978	0	0.0%	0.00
BZN-JFK	99	1649	1656	7	0.4%	0.98
DTW-RJTT	99	5572	5572	0	0.0%	0.00
BIS-GCC	96	248	316	68	27.2%	9.02
CLT-CYVR	94	2025	2035	11	0.5%	1.43
BZN-FSD	91	628	641	13	2.1%	1.75
IAD-SFO	89	2097	2097	0	0.0%	0.00
GSO-SEA	89	1987	1992	5	0.2%	0.60
CYYC-MRLB	89	2806	2806	0	0.0%	0.03
DTW-ZSPD	87	6189	6189	0	0.0%	0.00
LTFM-SFO	87	5813	5813	0	0.0%	0.00
BFI-MDW	87	1502	1509	7	0.5%	0.93
BIS-LAS	87	910	922	12	1.3%	1.64

Route Pairing	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change as a Percentage of Baseline Route (%)	Change in Time (Min)
PDX-PHL	86	2086	2090	4	0.2%	0.60
BTM-FSD	86	685	698	13	1.9%	1.71
MEM-RJBB	85	5925	5926	1	0.0%	0.16
DFW-RKSI	84	5933	5933	0	0.0%	0.00
CYQR-MMPR	83	1787	1824	37	2.1%	4.97
BZN-FCM	83	748	761	14	1.8%	1.81
FAR-LAS	82	1046	1046	0	0.0%	0.00
EDDP-LAX	82	5061	5061	0	0.0%	0.00
CYVR-MIA	82	2432	2432	0	0.0%	0.00
LAX-LEBL	80	5224	5226	2	0.0%	0.32
BZN-IAD	79	1537	1551	14	0.9%	1.87
BOS-RJAA	77	5810	5810	0	0.0%	0.00
CYYC-CYYZ	75	1452	1452	0	0.0%	0.00
BIS-EAN	75	335	341	6	1.7%	0.78
CVG-RJAA	75	5669	5669	0	0.0%	0.00
IAH-RJAA	73	5761	5761	0	0.0%	0.00
DTW-PHNL	73	3883	3883	0	0.0%	0.00
LAX-LOWW	72	5321	5321	0	0.0%	0.00
CYXE-MMPR	72	1892	1900	8	0.4%	1.01
LIRF-SFO	72	5431	5431	0	0.0%	0.00
ORD-RJBB	72	5642	5642	0	0.0%	0.00
EGKK-LAX	71	4750	4752	2	0.0%	0.26
JFK-RKSI	71	5988	5988	0	0.0%	0.00
LAX-OMDB	70	7235	7235	0	0.0%	0.00
DTW-RKSI	70	5754	5754	0	0.0%	0.00
CYQR-DEN	70	635	695	60	9.4%	7.98
MSP-SJC	70	1366	1366	0	0.0%	0.00
GEG-MEM	68	1442	1442	0	0.0%	0.00
ORD-RJGG	68	5580	5580	0	0.0%	0.00
BNA-PDX	68	1711	1711	0	0.0%	0.00
IAD-RKSI	67	6033	6033	0	0.0%	0.00
LEBL-SFO	67	5176	5176	0	0.0%	0.00
BOS-SLC	67	1825	1825	0	0.0%	0.00
DEN-LTFM	67	5313	5313	0	0.0%	0.00
CYYC-MUVR	66	2263	2279	16	0.7%	2.11
MEM-RJAA	66	5707	5712	4	0.1%	0.55
CLT-GEG	64	1787	1791	5	0.3%	0.65
BIKF-DEN	64	3092	3092	0	0.0%	0.00
CYYC-MKJS	63	2598	2616	17	0.7%	2.31
CYLW-CYYZ	63	1655	1655	0	0.0%	0.00
MEM-ZSPD	63	6447	6447	0	0.0%	0.00
MSP-RNO	63	1218	1218	0	0.0%	0.00
IAH-XWA	61	1163	1180	16	1.4%	2.19
CYYC-EWR	61	1753	1753	0	0.0%	0.00
ELLX-LAX	59	4990	4990	1	0.0%	0.09
BZN-PTK	59	1201	1213	11	1.0%	1.53
ATW-PDX	58	1440	1443	3	0.2%	0.44
CYVR-DTW	58	1701	1701	0	0.0%	0.00
CYYZ-PDX	58	1817	1817	0	0.0%	0.00
BIL-FAR	56	490	492	2	0.4%	0.26
BFI-MSP	56	1212	1212	1	0.1%	0.10

Route Pairing	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change as a Percentage of Baseline Route (%)	Change in Time (Min)
GFK-LAS	56	1068	1074	6	0.5%	0.78
ORD-SMF	56	1544	1544	0	0.0%	0.00
CYYZ-VHHH	55	6776	6776	0	0.0%	0.00
JFK-RCTP	55	6773	6773	0	0.0%	0.00
CYQR-MMUN	55	1955	1955	0	0.0%	0.00
LFPO-SFO	54	4848	4848	0	0.0%	0.00
CYQR-LAS	54	974	974	0	0.0%	0.00
LAX-LFPO	54	4922	4925	3	0.1%	0.41
EIDW-SFO	53	4418	4418	0	0.0%	0.00
BZN-PBI	53	1871	1871	0	0.0%	0.00
PWA-S25	53	777	795	18	2.4%	2.44
BFI-OMA	53	1186	1186	0	0.0%	0.00
BIL-RAP	52	256	272	16	6.3%	2.16
PHL-SFO	52	2186	2186	0	0.0%	0.00

ENCLOSURE C
ALL ALTERNATIVE 1 DAY-TO-DAY ROUTE PAIRINGS AT WEEKLY OR GREATER ANNUAL FREQUENCY

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Route Pairings	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change as a Percentage of Baseline (%)	Change in Time (Min)
ORD-SEA	3569	1491	1491	0	0%	0.00
ORD-PDX	1884	1507	1514	6	0%	0.86
DEN-XWA	1773	506	538	32	6%	4.29
MSP-PDX	1331	1236	1236	0	0%	0.02
ATL-SEA	1223	1893	1893	0	0%	0.00
BZN-ORD	1183	1028	1041	14	1%	1.85
BZN-MSP	952	757	760	2	0%	0.33
IAD-SEA	938	1999	1999	0	0%	0.00
BOS-SFO	809	2344	2344	0	0%	0.00
EGLL-LAX	808	4730	4730	0	0%	0.00
CVG-SEA	699	1703	1705	2	0%	0.29
MSP-SFO	695	1378	1378	0	0%	0.00
JFK-SFO	675	2242	2242	0	0%	0.00
CLT-SEA	656	1976	1978	1	0%	0.18
BOI-MSP	652	989	996	6	1%	0.86
SEA-STL	638	1482	1482	0	0%	0.00
BNA-SEA	601	1715	1715	0	0%	0.00
RDU-SEA	601	2041	2044	2	0%	0.33
OMA-SEA	538	1186	1186	0	0%	0.03
BIL-SDF	526	1111	1123	12	1%	1.61
MDW-PDX	509	1518	1523	6	0%	0.75
LAX-LFPG	508	4915	4915	0	0%	0.00
DCA-SEA	482	2019	2019	0	0%	0.00
BFI-SDF	482	1686	1689	3	0%	0.39
JFK-SEA	475	2146	2146	0	0%	0.00
DEN-DIK	451	424	425	1	0%	0.08
CYYC-IAH	449	1519	1519	0	0%	0.00
MDW-SEA	426	1502	1502	0	0%	0.01
JFK-PDX	393	2127	2127	0	0%	0.00
GEG-SDF	390	1496	1503	7	0%	0.87
IND-SEA	369	1618	1625	8	0%	1.04
CYYZ-SFO	367	1959	1959	0	0%	0.00
EWR-SEA	342	2082	2082	0	0%	0.00
MCO-SEA	340	2216	2216	0	0%	0.00
CYVR-ORD	340	1529	1529	0	0%	0.00
DTW-SEA	339	1670	1670	0	0%	0.00
EWR-SFO	317	2224	2224	0	0%	0.00
PDX-SDF	314	1691	1691	0	0%	0.00
DCA-PDX	314	2037	2044	7	0%	0.90
PDX-RFD	309	1453	1459	6	0%	0.82
MSP-SEA	306	1283	1287	4	0%	0.56
BZN-EWR	294	1631	1633	2	0%	0.25
BWI-SEA	286	2024	2024	0	0%	0.00
EWR-PDX	283	2144	2149	5	0%	0.66
CYYC-DFW	281	1324	1324	0	0%	0.00
BFI-RFD	280	1437	1437	0	0%	0.00
EGLL-SFO	269	4652	4652	0	0%	0.00
CVG-PDX	247	1712	1712	0	0%	0.05
ATL-GEG	243	1708	1708	0	0%	0.00
BZN-MDW	242	1038	1051	13	1%	1.72

Route Pairings	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change as a Percentage of Baseline (%)	Change in Time (Min)
MSP-PSC	239	1087	1087	0	0%	0.00
BOS-SEA	232	2163	2163	0	0%	0.00
MSO-ORD	231	1155	1155	0	0%	0.05
ATL-PDX	228	1884	1884	0	0%	0.00
CYUL-SFO	228	2201	2201	0	0%	0.00
MSO-MSP	217	878	878	0	0%	0.00
PHL-SEA	213	2061	2061	0	0%	0.00
IWA-MOT	213	1012	1018	6	1%	0.78
BZN-HPN	210	1642	1643	1	0%	0.18
BIL-ORD	209	919	946	27	3%	3.59
IAD-PDX	208	2017	2020	3	0%	0.42
ATL-RKSI	202	6203	6203	0	0%	0.00
MEM-PANC	202	2735	2735	0	0%	0.00
MIA-PANC	198	3475	3475	0	0%	0.00
EGLL-LAS	197	4533	4535	2	0%	0.25
CYYC-MMUN	195	2209	2209	0	0%	0.07
MCI-SEA	194	1291	1291	0	0%	0.00
CYEG-MMUN	193	2292	2297	4	0%	0.59
EHAM-LAX	191	4836	4836	0	0%	0.00
LAX-LTFM	190	5941	5941	0	0%	0.00
BZN-TEB	187	1632	1634	2	0%	0.22
LAS-MOT	187	954	960	6	1%	0.83
LPPT-SFO	183	4925	4925	0	0%	0.00
EDDF-LAX	181	5033	5033	0	0%	0.00
BOI-ORD	180	1246	1246	0	0%	0.00
BOS-PDX	178	2284	2289	5	0%	0.66
SEA-TPA	177	2187	2187	0	0%	0.00
CMH-SEA	174	1748	1748	0	0%	0.00
ORD-SFO	171	1600	1600	0	0%	0.00
BIL-MSP	166	648	652	4	1%	0.56
CYWG-LAX	163	1337	1343	5	0%	0.69
ILN-SEA	163	1727	1728	1	0%	0.11
CYWG-LAS	162	1138	1147	9	1%	1.26
BNA-BZN	160	1245	1245	0	0%	0.00
BIS-IWA	156	949	949	0	0%	0.00
DTW-PDX	153	1693	1693	1	0%	0.10
CLT-PDX	150	1773	1773	0	0%	0.00
CHS-SEA	145	2095	2095	0	0%	0.00
CYWG-PSP	143	1286	1297	11	1%	1.49
EDDF-LAS	143	4840	4840	0	0%	0.01
ATL-BZN	140	1423	1423	0	0%	0.00
FLL-SEA	135	2359	2359	0	0%	0.00
BIL-FSD	135	521	546	25	5%	3.38
ATL-CYVR	134	1950	1951	0	0%	0.04
MIA-SEA	132	2365	2365	0	0%	0.00
DFW-RJTT	131	5603	5603	0	0%	0.00
BZN-PWK	129	1025	1033	8	1%	1.09
BWI-PDX	127	2044	2053	8	0%	1.13
DFW-PANC	120	2640	2640	0	0%	0.00
BOS-BZN	120	1725	1725	0	0%	0.00

Route Pairings	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change as a Percentage of Baseline (%)	Change in Time (Min)
CVG-CYVR	118	1746	1746	0	0%	0.00
CYVR-CYYZ	116	1807	1807	0	0%	0.00
EDDF-SFO	114	4940	4940	0	0%	0.00
GTF-MEM	112	1214	1218	4	0%	0.57
JAC-ORD	108	1007	1007	0	0%	0.00
EHAM-SLC	107	4324	4324	0	0%	0.00
EIDW-LAX	107	4491	4491	0	0%	0.00
LFPG-SFO	103	4839	4839	0	0%	0.00
DTW-SFO	102	1802	1802	0	0%	0.00
EGLL-SAN	101	4755	4759	4	0%	0.50
EKCH-LAX	98	4875	4875	0	0%	0.00
LFPG-SLC	96	4402	4402	0	0%	0.00
CLE-SEA	95	1751	1751	0	0%	0.00
ATL-RJTT	95	5968	5968	0	0%	0.00
EWR-JAC	94	1624	1624	0	0%	0.01
CVG-GEG	93	1511	1512	1	0%	0.11
PIT-SEA	92	1842	1842	0	0%	0.00
MKE-SEA	92	1468	1468	0	0%	0.00
GPI-ORD	92	1172	1172	0	0%	0.00
BZN-JFK	89	1649	1650	2	0%	0.24
BZN-FSD	89	628	641	13	2%	1.75
MSP-SMF	88	1316	1316	0	0%	0.00
LAX-OTHH	82	7207	7207	0	0%	0.00
EDDM-LAX	80	5192	5192	0	0%	0.00
IND-PDX	80	1627	1627	1	0%	0.07
LAX-LIRF	80	5509	5509	0	0%	0.00
GEG-MSP	79	1018	1018	0	0%	0.00
BZN-FCM	79	748	751	3	0%	0.37
IND-RJBB	78	5795	5795	0	0%	0.00
GSO-SEA	77	1987	1992	5	0%	0.60
BTM-FSD	77	685	698	13	2%	1.71
IAD-SFO	77	2097	2097	0	0%	0.00
RFD-SEA	75	1438	1438	0	0%	0.01
CYYZ-SEA	74	1786	1786	0	0%	0.00
BIS-LAS	74	910	915	5	1%	0.73
BZN-IAD	74	1537	1551	14	1%	1.87
BNA-CYVR	73	1770	1772	2	0%	0.23
FAR-LAS	70	1046	1046	0	0%	0.00
EHAM-LAS	68	4642	4642	0	0%	0.00
GEG-ORD	68	1298	1298	0	0%	0.00
PANC-SDF	67	2707	2707	0	0%	0.00
JFK-PHNL	67	4323	4323	0	0%	0.00
BIS-GCC	66	248	294	46	18%	6.09
BED-BZN	65	1711	1712	0	0%	0.01
EGKK-LAS	65	4553	4555	2	0%	0.23
EDDM-SAN	64	5223	5223	0	0%	0.04
MSP-SJC	63	1366	1366	0	0%	0.00
BOS-PHNL	63	4420	4420	0	0%	0.00
CYYC-MCO	63	2004	2004	0	0%	0.00
LTFM-SFO	62	5813	5813	0	0%	0.00

Route Pairings	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change as a Percentage of Baseline (%)	Change in Time (Min)
EGLL-SLC	62	4217	4217	0	0%	0.00
LAX-LLBG	62	6570	6570	0	0%	0.00
LSZH-SFO	61	5063	5063	0	0%	0.00
CYVR-MIA	59	2432	2432	0	0%	0.00
BNA-PDX	59	1711	1711	0	0%	0.00
EHAM-SFO	58	4744	4744	0	0%	0.00
ATL-CYYC	57	1661	1661	0	0%	0.00
EGLL-PHX	57	4569	4569	0	0%	0.00
BOS-SLC	57	1825	1825	0	0%	0.00
BZN-PTK	56	1201	1204	3	0%	0.40
IAH-RJAA	55	5761	5761	0	0%	0.00
ATW-PDX	55	1440	1440	0	0%	0.00
LAX-LSZH	54	5148	5148	0	0%	0.00
EGKK-LAX	54	4750	4750	0	0%	0.00
CYVR-SDF	54	1734	1745	12	1%	1.55
MSP-RNO	54	1218	1218	0	0%	0.00
LAX-LEBL	53	5224	5225	2	0%	0.23
GFK-LAS	52	1068	1068	0	0%	0.06
MSP-PHNL	52	3447	3447	0	0%	0.00
EDDP-LAX	52	5061	5061	0	0%	0.00

ENCLOSURE D
ALL ALTERNATIVE 2 DAY-TO-DAY ROUTE PAIRINGS AT WEEKLY OR GREATER ANNUAL FREQUENCY

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Route Pairings	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change to Baseline Route (Percentage)	Change in Time (Min)
ORD-SEA	3573	1491	1491	0	0%	0.00
ORD-PDX	1886	1507	1514	6	0%	0.86
DEN-XWA	1778	506	538	32	6%	4.29
MSP-PDX	1331	1236	1236	0	0%	0.02
ATL-SEA	1225	1893	1893	0	0%	0.00
BZN-ORD	1183	1028	1041	14	1%	1.85
BZN-MSP	954	757	760	2	0%	0.33
IAD-SEA	938	1999	1999	0	0%	0.00
DEN-DIK	843	424	464	39	9%	5.24
EGLL-LAX	814	4730	4730	0	0%	0.00
BOS-SFO	809	2344	2344	0	0%	0.00
CVG-SEA	702	1703	1705	2	0%	0.29
MSP-SFO	695	1378	1378	0	0%	0.00
JFK-SFO	675	2242	2242	0	0%	0.00
CLT-SEA	660	1976	1978	1	0%	0.18
BOI-MSP	653	989	996	6	1%	0.86
SEA-STL	638	1482	1482	0	0%	0.00
RDU-SEA	602	2041	2044	2	0%	0.33
BNA-SEA	602	1715	1715	0	0%	0.00
OMA-SEA	538	1186	1186	0	0%	0.03
BIL-SDF	527	1111	1123	12	1%	1.61
LAX-LFPG	510	4915	4915	0	0%	0.00
MDW-PDX	509	1518	1523	6	0%	0.75
BFI-SDF	484	1686	1689	3	0%	0.39
DCA-SEA	482	2019	2019	0	0%	0.00
JFK-SEA	476	2146	2146	0	0%	0.00
CYYC-IAH	449	1519	1519	0	0%	0.00
MDW-SEA	426	1502	1502	0	0%	0.01
JFK-PDX	393	2127	2127	0	0%	0.00
GEG-SDF	390	1496	1503	7	0%	0.87
IND-SEA	369	1618	1625	8	0%	1.04
CYYZ-SFO	367	1959	1959	0	0%	0.00
CYVR-ORD	342	1529	1529	0	0%	0.00
EWR-SEA	342	2082	2082	0	0%	0.00
MCO-SEA	341	2216	2216	0	0%	0.00
DTW-SEA	340	1670	1670	0	0%	0.00
EWR-SFO	317	2224	2224	0	0%	0.00
PDX-SDF	314	1691	1691	0	0%	0.00
DCA-PDX	314	2037	2044	7	0%	0.90
PDX-RFD	309	1453	1459	6	0%	0.82
MSP-SEA	307	1283	1291	8	1%	1.07
BZN-EWR	294	1631	1633	2	0%	0.25
CYYC-DFW	286	1324	1324	0	0%	0.00
BWI-SEA	286	2024	2024	0	0%	0.00
EWR-PDX	283	2144	2149	5	0%	0.66
BFI-RFD	280	1437	1437	0	0%	0.00
EGLL-SFO	269	4652	4652	0	0%	0.00
CVG-PDX	247	1712	1712	0	0%	0.05
ATL-GEG	243	1708	1708	0	0%	0.00
BZN-MDW	242	1038	1051	13	1%	1.72
MSP-PSC	239	1087	1087	0	0%	0.00

Route Pairings	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change to Baseline Route (Percentage)	Change in Time (Min)
BOS-SEA	233	2163	2163	0	0%	0.00
MSO-ORD	231	1155	1155	0	0%	0.05
CYUL-SFO	228	2201	2201	0	0%	0.00
ATL-PDX	228	1884	1884	0	0%	0.00
MSO-MSP	220	878	878	0	0%	0.00
IWA-MOT	214	1012	1030	18	2%	2.43
PHL-SEA	213	2061	2061	0	0%	0.00
BZN-HPN	210	1642	1643	1	0%	0.18
CYEG-MMUN	209	2292	2297	4	0%	0.59
BIL-ORD	209	919	946	27	3%	3.59
IAD-PDX	209	2017	2020	3	0%	0.42
MEM-PANC	206	2735	2735	0	0%	0.00
MIA-PANC	205	3475	3475	0	0%	0.00
ATL-RKSI	203	6203	6203	0	0%	0.00
EGLL-LAS	198	4533	4535	2	0%	0.25
CYYC-MMUN	198	2209	2209	0	0%	0.07
MCI-SEA	194	1291	1291	0	0%	0.00
EHAM-LAX	191	4836	4836	0	0%	0.00
LAX-LTFM	191	5941	5941	0	0%	0.00
BIS-IWA	191	949	954	5	1%	0.67
BZN-TEB	187	1632	1634	2	0%	0.22
LAS-MOT	187	954	960	6	1%	0.83
LPPT-SFO	183	4925	4925	0	0%	0.00
EDDF-LAX	181	5033	5033	0	0%	0.00
BOI-ORD	180	1246	1246	0	0%	0.00
BOS-PDX	178	2284	2289	5	0%	0.66
SEA-TPA	177	2187	2187	0	0%	0.00
CMH-SEA	174	1748	1748	0	0%	0.00
ORD-SFO	171	1600	1600	0	0%	0.00
BIL-MSP	166	648	652	4	1%	0.56
CYWG-LAX	163	1337	1343	5	0%	0.69
ILN-SEA	163	1727	1728	1	0%	0.11
CYWG-LAS	162	1138	1147	9	1%	1.26
BNA-BZN	160	1245	1245	0	0%	0.00
DTW-PDX	153	1693	1693	1	0%	0.10
CLT-PDX	150	1978	1978	0	0%	0.00
CHS-SEA	145	2095	2095	0	0%	0.00
CYWG-PSP	143	1286	1297	11	1%	1.49
EDDF-LAS	143	4840	4840	0	0%	0.01
ATL-BZN	140	1423	1423	0	0%	0.00
BIL-FSD	135	521	546	25	5%	3.38
FLL-SEA	135	2359	2359	0	0%	0.00
ATL-CYVR	134	1950	1951	0	0%	0.04
MIA-SEA	133	2365	2365	0	0%	0.00
DFW-RJTT	132	5603	5603	0	0%	0.00
BZN-PWK	129	1025	1033	8	1%	1.09
BWI-PDX	127	2044	2053	8	0%	1.13
DFW-PANC	124	2640	2640	0	0%	0.00
BOS-BZN	120	1725	1725	0	0%	0.00
CVG-CYVR	118	1746	1746	0	0%	0.00
CYVR-CYYZ	118	1807	1807	0	0%	0.00

Route Pairings	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change to Baseline Route (Percentage)	Change in Time (Min)
DEN-MOT	115	525	528	3	1%	0.46
EDDF-SFO	114	4940	4940	0	0%	0.00
GTF-MEM	112	1214	1218	4	0%	0.57
JAC-ORD	109	1007	1007	0	0%	0.00
EHAM-SLC	107	4324	4324	0	0%	0.00
EIDW-LAX	107	4491	4491	0	0%	0.00
DTW-SFO	103	1802	1802	0	0%	0.00
LFPG-SFO	103	4839	4839	0	0%	0.00
EGLL-SAN	100	4755	4759	4	0%	0.50
EKCH-LAX	99	4875	4875	0	0%	0.00
GPI-ORD	96	1172	1172	0	0%	0.00
CVG-GEG	96	1511	1512	1	0%	0.11
LFPG-SLC	96	4402	4402	0	0%	0.00
CLE-SEA	95	1751	1751	0	0%	0.00
ATL-RJTT	95	5968	5968	0	0%	0.00
EWR-JAC	94	1624	1624	0	0%	0.01
PIT-SEA	92	1842	1842	0	0%	0.00
MKE-SEA	92	1468	1468	0	0%	0.00
BZN-FSD	89	628	641	13	2%	1.75
BZN-JFK	89	1649	1650	2	0%	0.24
MSP-SMF	88	1316	1316	0	0%	0.00
BIS-LAS	83	910	922	12	1%	1.64
LAX-OTHH	82	7207	7207	0	0%	0.00
GEG-MSP	80	1018	1018	0	0%	0.00
EDDM-LAX	80	5192	5192	0	0%	0.00
LAX-LIRF	80	5509	5509	0	0%	0.00
IND-PDX	80	1627	1627	1	0%	0.07
BZN-FCM	79	748	751	3	0%	0.37
IND-RJBB	78	5795	5795	0	0%	0.00
GSO-SEA	77	1987	1992	5	0%	0.60
BTM-FSD	77	685	698	13	2%	1.71
IAD-SFO	77	2097	2097	0	0%	0.00
CYYZ-SEA	75	1786	1786	0	0%	0.00
RFD-SEA	75	1438	1438	0	0%	0.01
BZN-IAD	74	1537	1551	14	1%	1.87
BNA-CYVR	73	1770	1772	2	0%	0.23
FAR-LAS	70	1046	1046	0	0%	0.00
GEG-ORD	69	1298	1298	0	0%	0.00
CYYC-MCO	68	2004	2004	0	0%	0.00
EHAM-LAS	68	4642	4642	0	0%	0.00
BIS-GCC	68	248	316	68	27%	9.02
PANC-SDF	67	2707	2707	0	0%	0.00
JFK-PHNL	67	4323	4323	0	0%	0.00
EGKK-LAS	66	4553	4555	2	0%	0.23
BED-BZN	65	1711	1712	0	0%	0.01
EDDM-SAN	64	5223	5223	0	0%	0.04
MSP-SJC	63	1366	1366	0	0%	0.00
BOS-PHNL	63	4420	4420	0	0%	0.00
LAX-LLBG	63	6570	6570	0	0%	0.00
ATL-CYYC	63	1661	1661	0	0%	0.00
LTFM-SFO	62	5813	5813	0	0%	0.00

Route Pairings	Annual Frequency	Baseline Distance D1 (NM)	Circumnavigation Distance D2 (NM)	Change in Distance (NM)	Change to Baseline Route (Percentage)	Change in Time (Min)
EGLL-SLC	62	4217	4217	0	0%	0.00
LSZH-SFO	61	5063	5063	0	0%	0.00
EGLL-PHX	60	4569	4569	0	0%	0.00
BNA-PDX	59	1711	1711	0	0%	0.00
EHAM-SFO	59	4744	4744	0	0%	0.00
CYVR-MIA	59	2432	2432	0	0%	0.00
BOS-SLC	57	1825	1825	0	0%	0.00
IAH-RJAA	56	5761	5761	0	0%	0.00
BZN-PTK	56	1201	1204	3	0%	0.40
CYVR-SDF	56	1734	1745	12	1%	1.55
ATW-PDX	55	1440	1440	0	0%	0.00
LAX-LSZH	55	5148	5148	0	0%	0.00
MSP-RNO	54	1218	1218	0	0%	0.00
EGKK-LAX	54	4750	4750	0	0%	0.00
LAX-LEBL	53	5224	5226	2	0%	0.32
MSP-PHNL	52	3447	3447	0	0%	0.00
GFK-LAS	52	1068	1074	6	1%	0.78
EDDP-LAX	52	5061	5061	0	0%	0.00