

9.0 INSTRUMENT APPROACH ANALYSIS

9.1 Introduction

Central Colorado Regional Airport's (AEJ or the Airport) ability to provide the most advanced instrument approaches that technology and the operating environment will allow is critical to the safety and efficiency of the Airport's users, as well as to AEJ's future economic success. To ensure AEJ remains as accessible as possible in all types of weather conditions, this chapter analyzes both existing instrument approach procedures, as well as new or other technologies that may be available during the 20-year planning period. It is important that airports stay on top of the state-of-the-art in FAA technology in order to take maximum advantage of new capabilities.

9.2 Existing Instrument Approaches

The FAA has published two GPS instrument approaches to Runway 33 at AEJ, both of which are non-precision approaches: a localizer performance (LP) approach without vertical guidance, and a lateral navigation approach (LNAV), also without vertical guidance. The LP approach procedure requires the use of a wide area augmentation system (WAAS¹), and provides lower approach minimums than the LNAV. Aircraft using the LNAV approaches may use WAAS, but are not required to do so. The instrument approach chart is in **Figure 9-1**.

The FAA has provided two sets of minimums for both the LP and LNAV approaches to Runway 33 (shown in **Figure 9-1**). The lower minimums are marked with a # symbol, and FAA notes that the lower minimums can be used if the aircraft can fly the missed approach procedure with a minimum climb gradient of 425 feet per nautical mile to 14,100 feet above mean sea level (MSL). If aircraft cannot fly that climb gradient, then they must use the higher minimums due to the high terrain north of the Airport.

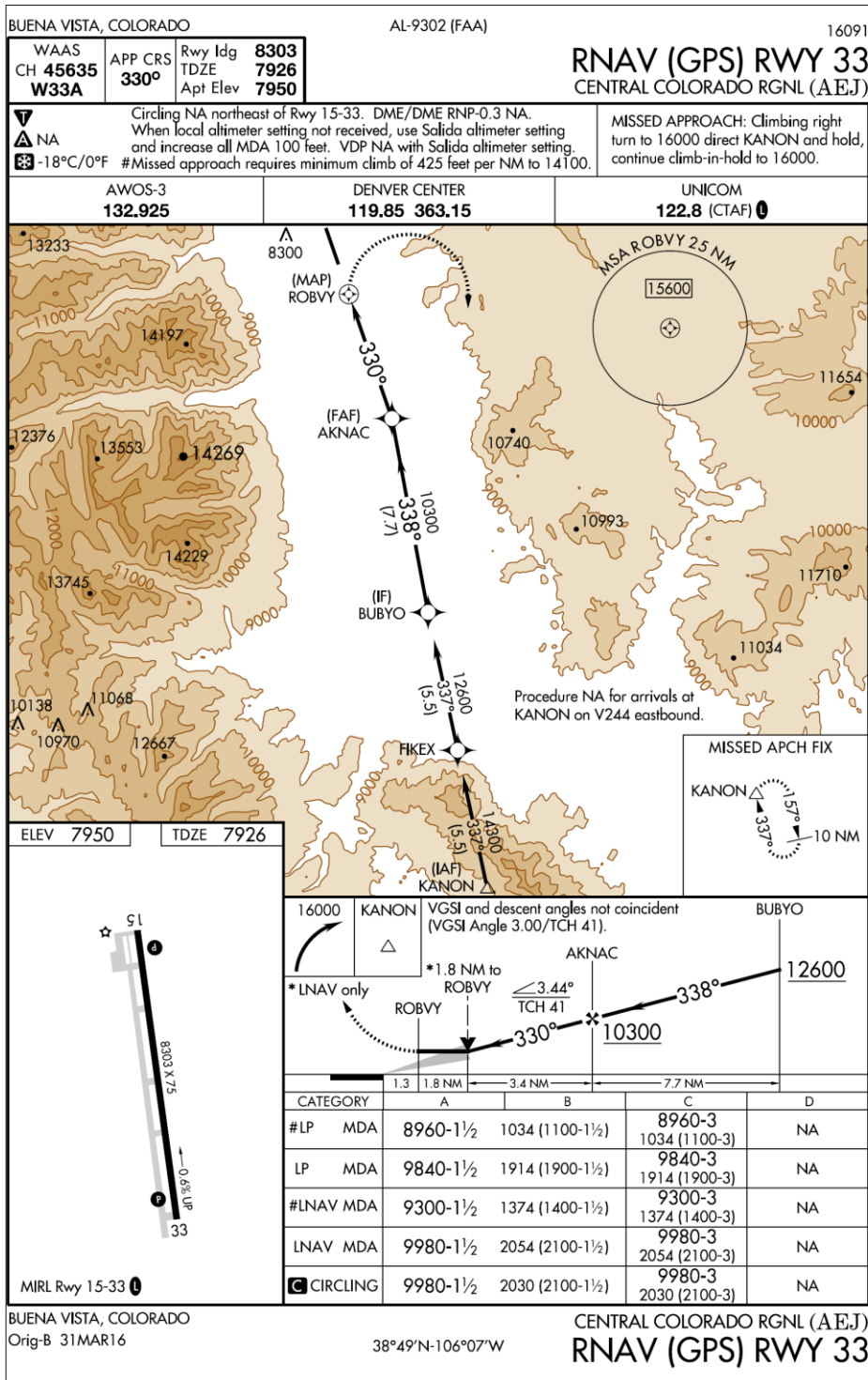
The visibility minimums of 1½ miles are higher than standard minimums for non-precision approaches due to the high terrain surrounding AEJ, resulting in relatively high minimum descent altitudes (MDA) and the lack of an approach lighting system (ALS) to Runway 33. Given the relatively high MDA, FAA may not be able to lower the visibility minimums even if an approach lighting system were installed because of the requirements in FAA Order 8260.3, *U.S. Standard for Terminal Instrument Procedures (TERPS)*.

In addition to the straight-in approaches to Runway 33, FAA allows aircraft to circle-to-land on Runway 15. However, FAA does not allow aircraft to circle to the northeast of the Airport due to high terrain. The circle-to-land minimums are the same as the higher LNAV straight in approach minimums.

¹ Wide area augmentation system (WAAS) is a ground-based system that improves the accuracy of satellite GPS signals, enabling FAA to publish more precise instrument approach procedures.

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FIGURE 9-1 - AEJ RUNWAY 33 GPS INSTRUMENT APPROACH CHART



Source: FAA Terminal Procedures Publication. Notes: LP = Localizer Performance. LNAV = Lateral Navigation. NA = not available

Not Be Used for Navigation

FIGURE 9-2 - CATEGORY A, B, C, D APPROACH SPEEDS

A	Approach speed less than 91 knots
B	Approach speed 91 knots or more but less than 121 knots
C	Approach speed 121 knots or more but less than 141 knots
D	Approach speed 141 knots or more but less than 166 knots

Source: FAA AC 150/5300-13A, paragraph 105C

FAA has not published instrument approach procedures to Runway 15 because of high terrain to the north of the Airport.

FAA does not allow instrument departures on Runway 33 to the north due to high terrain. Instrument departures from AEJ are only allowed on Runway 15 (see **Appendix 9-A**).

FIGURE 9-3 - AEJ TAKEOFF MINIMUMS AND PROCEDURES

**TAKEOFF MINIMUMS, (OBSTACLE) DEPARTURE PROCEDURES, AND
DIVERSE VECTOR AREA (RADAR VECTORS)**

BUENA VISTA, CO

**CENTRAL COLORADO RGNL (AEJ)
TAKEOFF MINIMUMS AND (OBSTACLE)
DEPARTURE PROCEDURES
AMDT 1 03247 (FAA)**

TAKEOFF MINIMUMS: **Rwy 15**, std. with a min. climb of 400' per NM to 8200 then 340' per NM to 15500. **Rwy 33**, NA-due to terrain.

DEPARTURE PROCEDURE: **Rwy 15**, use PUEBLO RNAV DEPARTURE. **Rwy 33**, NA-due to terrain.

NOTE: **Rwy 15**, tree 4468' from DER, 659' right of centerline, 60' AGL/8159' MSL.

Source: https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dtpp/

9.3 Analyze Use of New or Other Technologies

The advent of GPS instrument approaches has allowed FAA to publish procedures without the need for ground-based navigation aids (NAVAIDs), such as Very High Frequency Omni-directional Radio-range (VOR), localizer or glide slope antennas, etc. This has reduced both the initial cost and the recurrent expenses associated with ground-based NAVAIDs. Operationally, GPS instrument approach minimums are equivalent to minimums for ground-based NAVAIDs. For example, FAA has published GPS lateral performance with vertical guidance (LPV) instrument approaches that provide the same minimums as the traditional instrument landing system (ILS).

Because the high terrain surrounding AEJ is a mountain range and subsequently cannot be modified, it is not anticipated that FAA will publish any new instrument approaches to AEJ, nor lower the

existing approach minimums. Review of FAA’s Instrument Flight Procedures Information Gateway² also indicates that no new procedures are being developed for AEJ.

FAA has developed and published required navigation performance (RNP) instrument approach procedures. RNP approaches were originally developed by airlines and the FAA primarily for airports located in mountain states, such as Alaska, where many airports either did not have instrument approaches or else had very high approach minimums. Some airports in Colorado now have published RNP approaches.

RNP approaches use a variety of ground-based and GPS NAVAIDs, and must also meet stringent accuracy and monitoring requirements. RNP approaches often provide lower minimums than either LP or LNAV approaches. However, both the equipment in the aircraft and the pilots must be specifically certified by FAA to use RNP procedures; subsequently, not all aircraft or pilots are qualified to use the procedures.

FAA specifically added a note to AEJ’s GPS Runway 33 approach chart stating: “DME/DME RNP-0.3 NA,” (see Figure 9-1), which means that RNP approaches are not allowed to Runway 33. However, FAA could re-examine the Runway 33 approach, utilizing the AGIS mapping, and see if their criteria would now allow them to publish an RNP approach to Runway 33. As noted above, even if FAA were to publish an RNP approach to Runway 33 some aircraft and pilots would not be qualified by FAA to fly the procedure. FAA could also examine a possible RNP approach to Runway 15, but the high terrain to the north of the airport decreases the likelihood of an instrument approach to 15.

Two other areas of new technology currently being developed by the FAA are the Next Generation Air Transportation System (NextGen) and ground-based augmentation system (GBAS), both of which will result in much more accurate air traffic monitoring, control, and spacing, resulting in greater airspace capacity. One program that has already come out of NextGen and has been implemented in Colorado is the wide area multilateration (WAM) system.

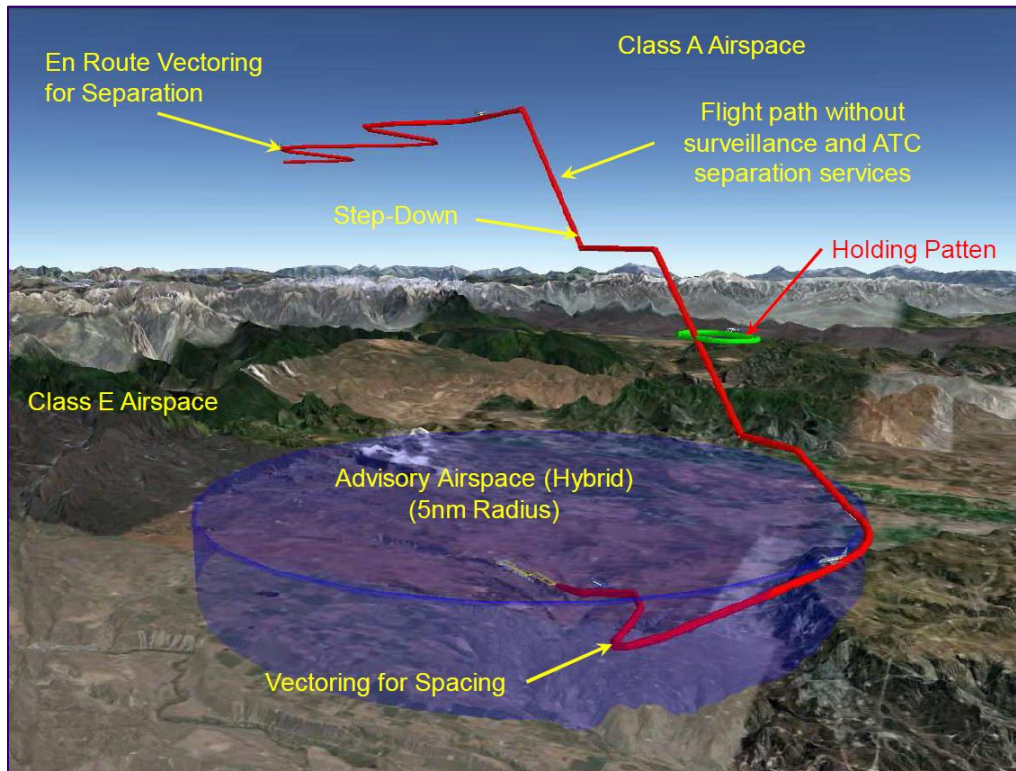
The WAM is a NextGen surveillance capability that enables air traffic controllers to track aircraft flying into and out of airports in mountainous areas with no radar coverage. WAM provides surveillance through a network of small sensors deployed in remote areas.

One feature of the project is the “blended airport concept,” where a seamless transition from the terminal to the en route phase is developed (see **Figure 9-4**).

² Source: https://www.faa.gov/air_traffic/flight_info/aeronav/procedures/

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FIGURE 9-4 - WAM – BLENDED AIRSPACE CONCEPT FOR MOUNTAIN AIRPORTS



Source: Colorado DOT Division of Aeronautics, Colorado Surveillance Project, Phases I, II, and III, 2011

WAM sensors are inexpensive compared to multi-million-dollar radar installations and much easier to install around airports in mountainous areas, and even on mountain tops. Six sensors can cover a wide swath of previously unobserved airspace. The Colorado Division of Aeronautics, in conjunction with FAA, has installed WAM sensors in the state that have greatly improved air traffic control (ATC) monitoring of aircraft traffic to and from mountain airports.

Another new technology being implemented is FAA's GBAS, formerly referred to as the Local Area Augmentation System (LAAS). GBAS has a radius of approximately 23 nautical miles (nm), and provides differential corrections and integrity monitoring of global navigation satellite systems (GNSS). GBAS also provides extremely accurate precision approaches in the vicinity of the host airport (i.e. those within 23 nm of the GBAS station). GBAS yields the extremely high accuracy, availability, and integrity necessary for Category I, and eventually Category II and III precision approaches.

It is possible that a combination of NextGen and GBAS might result in new instrument approach procedures to AEJ with lower instrument approach minimums. However, at present there is no schedule for the installation of that new technology at AEJ. FAA Flight Procedures Division noted that current constraint on instrument approach procedures and minimums at AEJ are due to aircraft performance limitations and FAA's standards for Terminal Instrument Procedures (TERPS), not GPS limitations.

9.4 Recommend Best Course(s) of Action

The recommended courses of action include:

- Continuously monitor FAA developments with the implementation of NextGen and GBAS.
- Communicate with FAA Flight Procedures on a regular basis (at least annually) to discuss whether changes in FAA TERPS criteria or the adoption of new technologies could allow the publication of new GPS approaches to AEJ.
- Hold regular discussions with AEJ users about the limitations of the current instrument approach and departure procedures, and how much the publication of an LPV or GBAS instrument approach might benefit their operation.
 - Investigate how many operators that use AEJ are certified to use RNP instrument approaches, and whether the publication of an RNP approach to AEJ would benefit their operation.
 - Discuss aircraft performance limitations in the vicinity of AEJ given the high terrain around the Airport. This information is useful to FAA when examining the need for instrument approach procedures.