Technical Working Group
Report and Recommendations
Working Draft November 27, 2019

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I. History that brought us here.

In February of 2019, the Technical Working Group (TWG) was created to advise the Airport Vision Committee (AVC) on technical areas of the proposed airport improvements. Specifically, the AVC has asked the (TWG) to answer the following questions:

To meet our community values and goals, what is our desired "design aircraft?"

- How could the existing or future "fleet mix" meet the air pollution reduction, modest enplanement growth, and noise abatement goals established by the ASE Vision process?
- In light of those community goals, what does the future airfield look like in terms of safety and airport design?
- What are the implications of the status quo VS Airport Design Group II VS Airport Design Group D-III? Could any variations exist within these design groups that might help us attain our community goals?
- What should be the commercial Design Aircraft for Aspen given what aircraft are currently available and known future aircraft?
- For the desired Design Aircraft, does the airfield need to be ADG II or ADG III?

The **Airplane Design Group** (ADG) is an FAA-defined grouping of aircraft types which has six groups based on wingspan and tail height

FAA Airplane Design Groups (ADG)

Group #	Tail Height (ft)	Wingspan (ft)
I	<20	<49
II	20 - <30	49 - <79
III	30 - <45	79 - <118
IV	45 - <60	118 - <171
V	60 - <66	171 - <214
VI	66 - <80	214 - <262

In addition to the questions specifically posed by the AVC, the TWG is also tasked with addressing Success Factors identified by the Community Character Working Group (CCWG) final report.

This report constitutes the findings and recommendations of the Technical Working Group. The report is divided into: History and Background; Findings; Recommendations and Success Factor Response. These recommendations were formed over a number of meetings between September 11, 2019 and December 3rd, 2019. Meeting materials and recordings can be found at: https://www.asevision.com/twg/

Background:

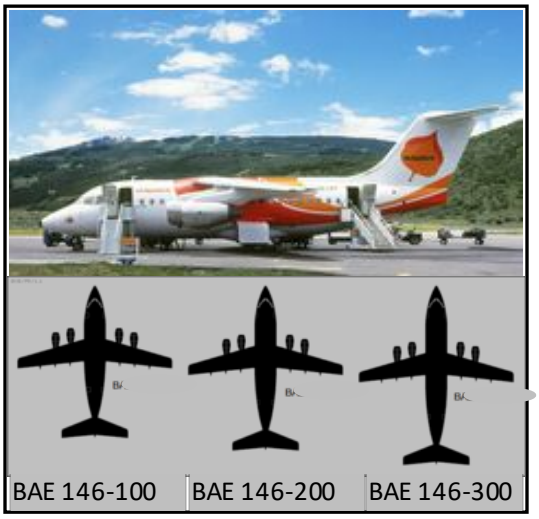
Airport Facilities and Aircraft History:

Walter Paepcke and John Spachner founded the Aspen-Pitkin County Airport (ASE) as a privately owned, public use gravel landing strip in 1946. The original facility consisted of a log cabin terminal building and a gravel runway. In 1956, Aspen Airport Corporation officially deeded the Airport to Pitkin County making it a publicly owned public use airport, one of the requirements to receive federal grants for airport development.

The Civil Aeronautics Administration (now FAA) and Pitkin County, as airport sponsor, funded the initial construction of Runway 15/33, a connecting taxiway, and an apron in 1957. This effort was led primarily by Commissioner Thomas J. Sardy. The original paved runway was 5,200 feet long by 60 feet wide. In 1958, the airport was officially dedicated as the Aspen/Pitkin County (Sardy Field) Airport. In 1963, the runway was lengthened to 6,000 feet. By 1969, the use of larger aircraft required the widening of the runway to 80 feet. The apron area was also expanded to 400,000 square feet during the same project.

During the 1970s, in order to focus on commercial air service, the County planned and provided for centralized passenger service. A parcel of land containing approximately 29 acres was acquired to accommodate a new terminal building; and an aircraft-parking apron was constructed in 1973 to serve the new terminal. The new 17,500 square foot terminal building was constructed in 1976 and was the first commercial building in the United States to use passive solar heating. Commercial service during this period was provided by the Convair 240, 340, 440 and the De Havilland DHC-6 Twin Otter with capacities from 19-56 passengers and up to 105' 4" wingspan (Convair 440).

In 1982 Pitkin County voters authorized the County to issue up to $3,250,000 in bonds to lengthen and widen the runway to accommodate larger aircraft. The question was approved 2,637 to 1,369 votes. The runway at Aspen-Pitkin County Airport was lengthened and widened in 1983 to 7,006 feet long by 100 feet wide. In 1988 voters again authorized the County to issue up to $3,000,000 in bonds for the general purpose of "acquiring and improving airport facilities," which passed 4,097 to 1,829. Following completion of runway improvements in 1983 three variants of the BAE146 operated at ASE for 21 years from 1985-2006. The BAE 146-300, the largest commercial airliner to ever operate at ASE, was an Airport Design Group III aircraft with a Categoy C approach speed rating. The BAE146 had a maximum seating capacity of 100 and an 86' wingspan.



In 1995 the County sought authorization from voters to issue up to $1.9 million in airport revenue bonds to widen and strengthen the runway to accept larger aircraft. The resolution approving the ballot language included a requirement that if the bond was approved, the Board would pursue another vote before allowing Boeing 737 or similar aircraft to operate at the airport. The bond authorization failed by a vote of 1,883 for and 2,824 against as did any subsequent requirements in the resolution approving the ballot language.

In 1998 the County proposed relocating Taxiway "A" from 221.5 ft. east of the runway centerline to 320 ft. east of the runway centerline to provide more separation for aircraft safety. In 1999 the FAA approved this proposal as a modification to standards with the following understanding:

> "Although the proposal [for a taxiway centerline at a separation of 320 feet from the runway centerline] does not meet criteria for all of Design Group III, the County is prepared to enact an ordinance restricting aircraft with wingspans greater than 95 feet. . . This 95-foot restriction will establish that this modification is contingent upon the ordinance being enacted and that the modified standard applies only to operations by aircraft with wingspans less than 95 feet. ***Should regular operations by a larger aircraft occur, the modification would be rescinded and the airport would be required to meet the standard separation.*** This will ensure the airport meets the [Runway Object Free Area] standard even at the busiest times." [emphasis added]

In 2001 Pitkin County adopted an ordinance restricting aircraft to wingspans of 95 ft. or less and maximum landed weight of 100,000 lbs. In 2005 the County completed relocation of Taxiway "A" to 320 ft. (ESID project), and readopted the 95 ft. wingspan restriction in County Code. In 2007 runway 15/33 was rehabilitated (7,000 ft X 100 ft. wide with shoulders)

Following the retirement of the BAE 146 from commercial service at ASE in 2006, three aircraft have provided commercial service under the restrictions established by the County and FAA: the 37 psgr Bombardier Dash 8-200 (1997-2008), the 70-74 psgr Bombardier Q-400 (2008-2016), and the 65-70 psgr CRJ700 (2006-present). In 2011 the runway was lengthened to its present dimensions of 8,006 feet long by 100 feet wide to improve safety and efficiency, especially during the summer months.

In 2012 the County conducted a regular update of the Airport Layout Plan (ALP). The update of the ALP did not recommend changing the runway/taxiway separation, 95' wingspan restriction, nor the 100,000lb max landing weight (MLW). In August 2013, the FAA approved the ALP with the following exception: "**The FAA's approval of this ALP does not apply to the proposed runway/taxiway separation distance of 320 feet on the west side of Runway 15/33…"** In response the County initiated a multi-year Future of Air Services Study to answer the following:

- What is the changing technology of future aircraft serving ASE?
- What can ASE do to best sustain future air service?
- How would ASE accommodate these operations?
- What are the impacts and benefits to the airport and community?
- What is best for the future health of the community?

This study is available at http://aspenairport.com/future-air-service-study/phase-i. The study found that the one commercial aircraft serving ASE (the CRJ700) had not had a North American order since 2011, and there were no other current regional jets that could serve ASE because of the required aircraft performance due to surrounding mountain terrain. Additionally, the study found that future regional aircraft would not meet the restrictions under the existing modification to standards primarily due to the 95' wingspan restriction and 100,000lb weight limit. Working with the FAA, the County examined 16 alternative airfield alignments, and found two feasible options to meet ADGIII design standards and FAA airspace safety standards. After significant public outreach, the Board of Commissioners approved the current ALP meeting full ADGIII separation standards in 2014.

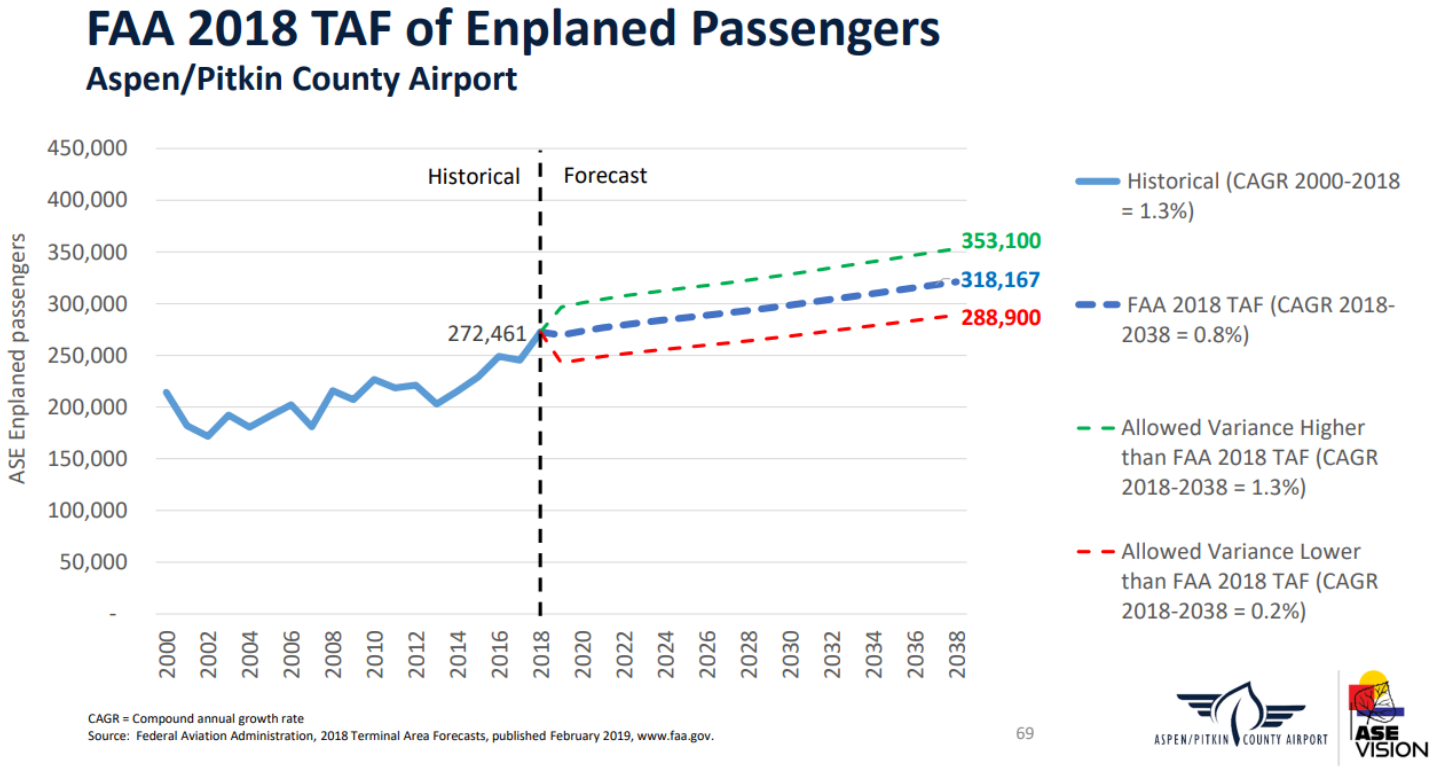
In September 2015, the County initiated an Environmental Assessment (EA) per FAA requirements to analyze improvements proposed in the 2014 ALP. The EA analysis was conducted over a two-year period with significant public input. On August 25, 2017 the FAA released the draft EA for additional public comment, and following public comment the Board approved the draft EA for final submission on October 25, 2017. On July 26th, 2018 the FAA approved the final Environmental Assessment for the Aspen/Pitkin County Airport for runway and terminal improvement projects. A summary of the approved airport EA can be found at: http://www.aspenairport.com/airport-improvements-ea/summary

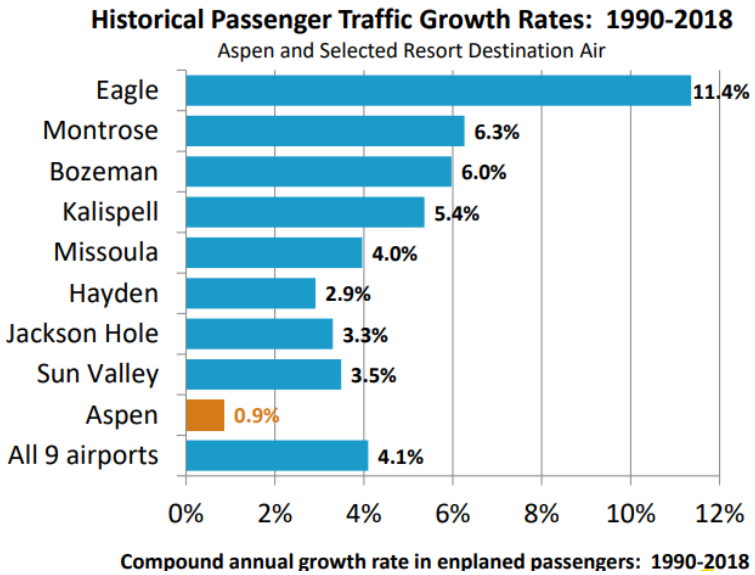
One of the concerns expressed by members of the public about the EA process was that it didn't allow for the full scope of conversation about proposed airport improvements that are expected by residents of Pitkin County. To address these concerns, Pitkin County initiated a comprehensive community engagement process beginning in February 2019 to help establish a vision for the future of Aspen/Pitkin County Airport. This vision will define airport modernization and improvements for the next 30 years.

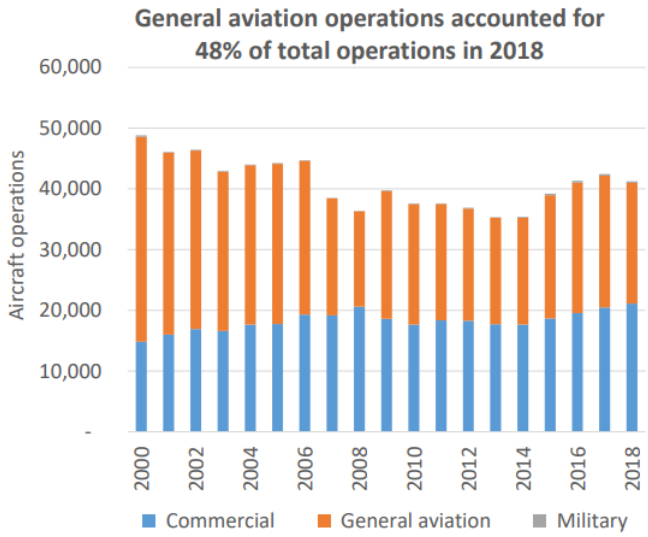
The Board of Commissioners appointed interested members of the public to four working groups: Community Character; Airport Experience; Technical; and Focus; each tasked with advising the Airport Vision Committee who is tasked with recommending a final vision for airport improvements to the Board of Commissioners.

Aircraft Operations and Commercial Enplanement History:

Overall aircraft operations into ASE have decreased from 2000 to 2018, however, since 2014 there have been increased operations. Overall, since 2000 the number of commercial operations have increased in actual number and as a percentage of overall aircraft operations. In 2018 52% of aircraft operations were commercial and 48% were General Aviation. This is a significant change from 2000 when commercial operations represented roughly 1/3 of all operations. Between 1990 and 2018 commercial enplanements have grown by a compound rate of 0.9%, which is much lower than compound growth in other similarly situated resorts. Since 2013 the number of enplanements has grown at a greater than historical rate of just over 6% a year. This followed a period between 2000 and 2013 where enplanements decreased and remained relatively flat.







History of Airport Safety:

Airport safety in the air and on the ground has been a major point of discussion in all airport planning processes. Aspen Airport sits at 7,815 feet above sea level in the Roaring Fork Valley. The terrain to the Northwest is modest and is the preferred approach with the vast majority of landings occurring on runway 15. In all other directions, peaks and ridges up to 14,000+ feet surround ASE making the terrain challenging for those without knowledge of it. The terrain around ASE leads to an uncommon approach and departure procedure where planes both depart and for the most part arrive from the Northwest. The head to head operations significantly reduce the number of operations that can occur at ASE to ensure appropriate safety clearances between aircraft on approach and takeoff.

According to data from the NTSB there have been 44 aircraft incidents on or around ASE from 1980 through today, 13 of the incidents were fatal resulting in 44 fatalities over that 39 year period. 43 of the 44 incidents were General Aviation aircraft operating for personal use or as charters. Over the 39 year period for which data was available there was only one commercial incident that occurred in 1999 (BAE 146-200 with 88 passengers) that resulted in minor aircraft damage and no fatalities or injuries. The most significant accident occurred in 2001 when a Gulf-Stream III operating as a charter crashed into a hillside killing all 18 onboard. The NTSB determined that the probable cause of that accident was: "The flight crew's operation of the airplane below the minimum descent altitude without an appropriate visual reference for the runway." Table one shows that for each 10 year period the total number of aircraft incidents at ASE has decreased, as have the number of incidents resulting in substantially damaged or destroyed aircraft. All modes of travel are attended by risk of accident and injury. For example, from 2010 through October 2019, there were 18 fatal automobile accidents, resulting in 19 deaths in Pitkin County.

NTSB Aircraft Incident Data for ASE 1980-Present								
Years	Total # of Incidents	Aircraft Damage			# of Fatal Incidents	# of Fatalities	# of Commercial Incidents	# of Commercial fatalities
		Minor	Substantial	Destroyed				
2010 - Present	3	0	2	1	1	1	0	0
2000 - 2009	11	2	7	2	2	22	0	0
1990 - 1999	13	1	7	5	4	11	1	0
1980 - 1989	17	0	9	8	6	10	0	0
Total	**44**	**3**	**25**	**16**	**13**	**44**	**1**	**0**

II. Technical Working Group (TWG) Mission and Meeting Summary

The Board of Commissioners appointed community advisory groups to convene community collaboration across a diverse and inclusive cross-section of interests to provide feedback, share project information, and ultimately inform Pitkin County's decision-making process. The Vision Committee is ultimately tasked with providing the Board with a recommendation of improvements to be made at ASE. To facilitate the work of the Vision Committee four work groups were appointed: Community Character, Airport Experience, Technical and Focus.

The Technical group has been tasked with defining the desired functionality and physical facility requirements that will optimize the airport's ability to meet the community's future air service needs within the limited space available and to make recommendations for specific parameters for the future design of the Aspen / Pitkin County Airport (ASE). These came as the form as several questions from the Airport Visioning Committee (AVC) and from the Community Character Working Group (CCWG). You'll find the responses to these questions in Sections III and IV respectively.

Working Group Meeting History

Technical Working Group Meeting #1 - Wednesday, September 11, 2019, 4pm – 7pm at the Airport Operations Center (AOC). The meeting focused on establishing a baseline of technical information prior to developing any recommendations. The group reviewed strategic questions assigned by the Airport Vision Committee (AVC) and reference documents setting the stage for a deeper discussion on the preferred design aircraft. Airport external factors were discussed, as well as current operational metrics. Reference materials included a technical memo presented by Kimley-Horn regarding the current performance of the Airport. Members were given a binder that included a large-scale map of the Airport Layout Plan and Master Plan. The outcome of the meeting was aligning and organizing the Technical Working Group around specific background information.

Technical Working Group Meeting #2 Wednesday, September 18, 2019, 4pm – 7pm, at the AOC. This meeting began a deeper dive into the technical data including reviewing characteristics of available aircraft against the stated community values and guiding principles. The values-based scorecard was introduced, ranking the available aircraft on noise, emissions and community values. Linda Perry, consultant with LeighFisher gave a presentation on the methodology and approach used in developing the aviation forecast. An initial ranking of aircraft was conducted.

Technical Working Group Meeting #3 – Wednesday, October 2, 2019, 4-7pm at the Aspen Meadows, Doerr-Hoiser Center. This meeting continued the conversation and dialogue around the preferred design aircraft. Two guest speakers presented: Mary Vigilante, Synergy Consultants, Inc. and Alec Seybold, Flight Tech Engineering. Alec's presentation was centered on planning for the future fleet mix at ASE. Mary Vigilante prepared the first airport-wide greenhouse gas inventory for the 2006 Canary Initiative. Mary's presentation was focused on considerations for data sets to examine air emissions, mainly aircraft fuel burn. Her presentation highlighted noise data and new technology to reduce noise of aircraft such as longer wingspan, winglets and geared turbo fan engines. This meeting gave the Technical Working Group much to consider; the information and resource materials were robust. The group also revisited scoring the preferred design aircraft.

Technical Working Group Meeting #4 – Wednesday, October 16, 2019, 4 – 7 pm, Airport Operations Center. This meeting began with a suggestion to table the discussion of preferred design aircraft due to limited control over the airlines choice of aircraft. Bob Jones from Kimley-Horn gave a presentation on specific elements of Airfield Design such as runway safety and taxiway separation. We reviewed ASE non-standard conditions. More detailed information was provided on requested additional aircraft data characteristics. Several reference materials were presented including an FAA Advisory Circular regarding Airport Design and a presentation on aircraft that are no longer flying into ASE. A straw poll was conducted on recommending ADG III. It was determined to not conduct a formal vote and get more information on potential mitigation options.

Technical Working Group Meeting #5 – Wednesday, October 23, 2019, 4-7 pm at the Aspen Police Department Building Meeting Room. The meeting provided information on the history of non-standard conditions at ASE and a detailed spreadsheet was reviewed listing all the potential options for aligning ADG III Airfield with Community Values. The TWG discussed these options as a group and listed their preferences in pursuing the mitigation options. No vote was taken at this meeting.

Preferred Design Aircraft Scoring Exercise Explained:

The FAA defines Design Aircraft as the most demanding aircraft type or grouping of aircraft with similar characteristics that make regular use of the airport. Regular use is 500 annual operations, including both itinerant and local operations but excluding touch-and-go operations. The AVC asked the TWG what is the preferred design aircraft for that best meets our community values. To answer this question the TWG was presented with a list of ADG II and ADG III Aircraft that are capable of operating at ASE now and into to the foreseeable future. Characteristics of each Aircraft were presented in a chart with data points on Noise, Emissions, Operational Capability and Operational Data. The Aircraft were also classified by Engine, Approach Speed, Seating, Wingspan and MTOW. The TWG was asked to score Aircraft based on what Aircraft met community goals, the CRJ 700 was the baseline in this analysis. The following ranking system was used:

1= Measurably meets community goals; 2= Generally, maintains current condition; 3= Worsens current condition. Results of initial ranking identified A220-300, A320 NEO Sharklet, EMB 195-E2, A220-100 and A319-100 Sharklet were the top-ranking aircraft. It should be noted a final vote was not taken.

Initial Aircraft Ranking TWG (9-18-2019) Draft_v1

	Emissions	Emissions Rank	Noise	Noise Rank	Enplanements/ Operations	Enplanements Rank	Average Score	Overall Rank
A220-300	1.125	2	1.25	1	1.833333333	5	1.4027778	3
A320 NEO Sharklet	1	1	1.25	1	1.833333333	5	1.3611111	2
737-MAX 8	1.5	5	2.25	8	2.166666667	11	1.9722222	6
A320-200 Sharklet	1.25	3	2.875	15	1.833333333	5	1.9861111	7
EMB 195-E2	1.625	6	2.5625	12	1.333333333	1	1.8402778	4
A220-100	1.25	3	1.25	1	1.333333333	1	1.2777778	1
A319-100 Sharklet	1.75	7	2.375	9	1.5	3	1.875	5
737-700 with winglets	2	9	2.875	15	1.5	3	2.125	10
EMB 175 LR, extended wingtips	1.875	8	2.625	13	2.666666667	16	2.3888889	14
EMB 190-E2	2.375	13	2.4375	11	1.833333333	5	2.2152778	11
E 190 Standard	2.5	15	2.375	9	1.833333333	5	2.2361111	13
CRJ 100/200/440 LR (CL-600-2B19)	2.375	13	1.5	5	2.8	19	2.225	12
CRJ 700/701/702 LR	2	9	2	6	2	10	2	8
E 170 Standard	2.1666667	12	2.6875	14	2.4	14	2.4180556	15
CRJ 550 (Same airframe as CRJ-700)	2.8333333	16	2	6	2.8	19	2.5444444	16
M100 SpaceJet		#N/A		#N/A	2.666666667	16		#N/A
M90 SpaceJet		#N/A		#N/A	2.333333333	13		#N/A
EMB 175-E2		#N/A		#N/A	2.5	15		#N/A
737-MAX 7 (same engine as MAX 8)		#N/A		#N/A	2.166666667	11		#N/A
Dash 8 Q400	2	9	1.375	4	2.666666667	16	2.0138889	9

III. Technical Working Group Findings

The TWG has been presented with numerous reports, reviewed technical presentations and documents from experts in the field of airport design, noise and carbon emissions, aircraft design and utilization, airline specific operations, and airport operations. Analysis has been conducted of all technical information and reporting to develop this report. The following determinations have been discussed and agreed on by the group:

A. Safety

1. According to National Transportation Safety Board data from 1980 to today commercial operations (FAA Part 119) at ASE have been very safe. For the 39-year period between 1980 and today there has only been one commercial aircraft incident, which resulted in minor damage and no injuries or deaths. Commercial pilots operate under strict operating procedures and training required by airlines and FAA that reduce the likelihood accidents.
2. National Transportation Safety Board data from 1980 to today shows there have been 43 incidents with GA Aircraft at or around ASE. Of those 43 incidents, 13 were fatal with 44 total deaths. Pitkin County is preempted by the FAA and is not able to require all pilots to adhere to the same safety requirements as commercial pilots. The TWG does recognize that Part 135 (charter) operators have more demanding requirements than Part 91 (civil) operators. These regulations are implemented and enforced by the FAA exclusively. The County is able to promote information to Part 135 and Part 91 operators to help these operators familiarize themselves and operate more safely in and out of ASE.

3. According to NTSB data, since 1980 the number of aircraft incidents at or around ASE have decreased for each 10-year period with a high of 17 incidents from 1980-1989 and a low of 3 incidents from 2010-present.
4. The current terminal facility has several safety challenges, including, but not limited to: The terminal does not meet National Fire Protection Code with the most significant issue being the slope of the ramp that drains back to the terminal. In the event of a fuel spill, fuel would drain towards and not away from the terminal.
5. Safety of aircraft operations has been identified by the ASE Vision Community Survey as the #1 priority.
6. The proposed runway to taxiway separation improvements identified in the Environmental Assessment and accepted by the FAA represent important safety enhancements which are feasible to implement at ASE.

B. Commercial Airplane Availability

1. The only existing commercial aircraft certified to operate into ASE under the current 95' wingspan restriction are the Bombardier CRJ-700 and Dash-8 Q400. The only commercial aircraft operating at ASE today is the CRJ-700. The only remaining Q400 aircraft in the U.S. are operated by Horizon Airlines and are operated by Alaska Airlines hubs in SEA & PDX. The last CRJ-700 was delivered to a North American operator in 2011. Retirement of the CRJ700 is dependent on two factors: 1.) business decisions of airlines and 2.)The useful life of the aircraft. The CRJ-700 will likely be retired from service over the next 10-15 years (2030-2035). The CRJ-550 is the only 50-passenger regional jet with the required operational performance to successfully operate at ASE. Neither the Bombardier CRJ-200 nor the Embraer ERJ-145 have this capability. The range of the CRJ-550 is less than the CRJ700 due to reduced maximum takeoff weight (MTOW) and would not be able to serve the ORD and ATL markets currently within the CRJ-700 capabilities. We also note that the CRJ-550 are not new planes but are effectively interior conversions of CRJ-700's with the same limitations to their service life as the CRJ-700 fleet.

2. The TWG identified five narrow body aircraft that best align with community goals for emissions, noise, and number of operations at ASE: Airbus A220 (100 & 300); Airbus A320 Neo; Embraer 195-E2; and Airbus A319-100. All have wingspans and weights that exceed ASE's current 95' wingspan restriction and 100,000 lb. weight restriction. The only next generation aircraft that may meet ASE's current restrictions is the Mitsubishi MRJ-100. The MRJ-100 is currently in design, no prototype has been built, nor has Mitsubishi ever certified a commercial aircraft in the United States. Implementing Airport Design Group (ADG) III separation standards will give airlines the flexibility to make future fleet decisions that would retain commercial service as the CRJ-700 is replaced. The prospect of possibly not having commercial aircraft available to service the needs of the community would cause irreparable harm to its businesses and residents, and the TWG recognizes its fiscal responsibility to Pitkin County and other communities throughout the Roaring Fork Valley.

3. It is recognized that if the wingspan restriction at ASE is increased to 118' (ADG III), this would allow certain high performance mainline and some larger GA aircraft to operate at

ASE. Based on the current forecast, it appears that market conditions are such that it is unlikely that an airline would choose to operate mainline aircraft into ASE exclusively without also being able to offer a smaller regional aircraft for the majority of their flights to allow for schedule diversity, connectivity and continuity of year-round service into ASE.

C. GA Aircraft

1. ADG-III GA aircraft with wingspans of 95' or less currently operate at ASE. GA Aircraft that have wingspans larger than 95 feet are relatively rare and all of them are very new designs with the most efficient engines and quietest operation of any of the ADG-III GA planes. The differences between the largest of today's ADG-III GA aircraft are minor with the largest of dedicated GA planes having wingspans of approximately 100 feet. Overall GA operations have decreased since 2000. The Aviation Activity Forecast projects modest growth in GA operations regardless of future changes to airfield geometry.

D. Scope Clause

1. A scope clause is part of a contract between a major airline and the trade union of its pilots that limit the number and size of aircraft that may be flown by the airline's regional airline affiliate (currently 51-76 seats). The goal is to protect the union pilots' jobs at the major airline from being outsourced by limiting the regional airlines' passenger capacity. Every time a new regional jet (e.g. Embraer 175) is added to an airline fleet an older scope compliant aircraft (e.g. CRJ700) has to be removed from the airline's fleet. Aircraft with 50 seats or less are not included for the scope clause (e.g. CRJ550). Scope clause is a major driving factor in aircraft purchase decisions. The "scope clause" contract is contract between major airline and the trade union of its pilots that limit the number and size of aircraft that may be flown by the airline's regional airline affiliate.
2. Industry Challenges: It should be noted there are challenges with both staffing airline personnel and availability of trained commercial pilots into the future. The current commercial operation at ASE is understaffed with chronic shortages in airline ground personnel. These staffing shortages have resulted in aircraft sitting at available gates during peak periods but unable to unload or board due to the lack of ground support crews.

E. Phasing

1. The full scope of potential improvements will require phasing to ensure the airport remains operational during busy seasons. Additionally, the scope of the project may also require phasing to be economically feasible depending on FAA grant availability.

IV. Technical Working Group Recommendation

The risks associated with the uncertainty of any future aircraft with wingspans of 95' or less actually being able to operate at ASE, and the likely degradation of commercial air service into if ASE is more consequential than the undesired impacts of the possible introduction of some mainline aircraft. The TWG recommends moving forward with removing the Non-Standard conditions at ASE and building an ADG-III airfield that fully complies with ADGIII separation standards. The TWG also recommends that the County explore phasing options to meet full ADGIII compliance. Phasing

should be prioritized to first meet separation standards, followed by runway strength (weight capacity; and finally runway width (approach speed).

To mitigate the concerns of the community, we further recommend exploring the following mitigation options:

A. Reduction in Emissions

1. Modernization of Airport planning should include an aspirational goal of 30% reduction in Green House Gases and Emissions and should take the following into consideration for airport design and operations:
    a. The TWG has studied the overall goal of reducing Green House Gases and Emissions by 30% at length (See report in Appendix XX) and notes that no specifics on how this should be measured or the timeframe for implementation were provided with that goal. Along with implementing strategies to reduce carbon usage in the terminal, construction and for general airfield equipment (GSE, Snow removal and general operations primarily), the group recommends relative to the largest component – aviation fuel use, that the goal be established to reduce total fuel sales at ASE by 30% by the year 2030. The TWG believes this to be an aggressive, but attainable goal
    b. Realizing that changes to the airfield which would allow newer more efficient planes to operate will not be in place until 2025 at the earliest, the TWG recommends participating in a certified and verifiable Carbon Offset Program. Without the ability to change from the current CRJ-700, there is no way to make any appreciable headway on the 30% GHG/emissions reduction on commercial operations, therefore the offset program should be implemented immediately.
    c. Pitkin County should become a leading voice supporting implementation of Bio-Fuels as an aviation fuel. We should explore the feasibility of not only providing ready access to these fuels at ASE but advocate for their adoption into the commercial and GA fleet serving ASE.
    d. To encourage GHG reductions, the County should investigate financial incentives to the use of more efficient and/or alternative fuel aircraft including taxes on fossil fuel sales, and landing fees which encourage the next generation of "greener" aircraft.
    e. The TWG review of all commercial aircraft currently identified as suitable for service at ASE (both ADG-II and ADG-III planes), suggests that the newest small narrow body aircraft are significantly more fuel efficient and quieter than the current CRJ-700 fleet or any of the smaller available regional jets. To meet the community goals of reducing both noise and emissions/GHG we should provide an airfield which can allow these aircraft to operate.
    f. Electrify airfield to provide for electric ground support equipment, ground power and air tempering for both GA and Commercial ramps. This will significantly reduce APU usage, and noise/air emissions from ground equipment.
    g. All new airport facilities should be designed to be net zero.

2. **Safety and Airspace Clearance** –
    a. The County should work with the FAA to masterplan the airspace around ASE to ensure maximum safety clearances, ensure continued efficiency and understand the

implications of implementing next generation avionics. Greater separation between planes could result in fewer peak operations at the airport.

b. The County should provide information about safe operations in and out of ASE to GA (FAA Part 91 and 135 operators). The County should work with the FAA to require minimum standards for GA pilots to operate at ASE.

V. Vision Committee Questions

A. *To meet our community values and goals, what is our desired "design aircraft?"*

The TWG did not formally vote on *a* preferred design aircraft, although there was a consensus around a group of next generation available aircraft: Airbus A220-100, Mitsubishi M100 SpaceJet, and Embraer E175/190/195-E2. Next generation of small narrow body aircraft are quieter, use less fuel per passenger and will likely require fewer operations to meeting market demands. (Refer to appendices for charts of ranked aircraft characteristics.)

All these new generation small narrow body jets have similar capacity to those aircraft that operated at ASE prior to when the CRJ700 was introduced in 2006.

Examples: The BAE146-300 had 100 seats and operated at ASE for 17 years (1988-2005), the BAE 146-200 had 86-100 seats and operated at ASE for 20 years (1986-2006), and the BAE 146-100 had 86 seats and operated at ASE for 16 years (1985-2001).

B. *How could the existing or future "fleet mix" meet the air pollution reduction, limited enplanement growth, and noise abatement goals established by the ASE Vision process?*

The following design specifications should be considered:

- Weight limit the asphalt to the most rigorous regional aircraft likely to serve ASE (e.g. Airbus A220).
- Electrify airfield to provide for electric ground support equipment, ground power and air tempering for both GA and Commercial ramps. This will significantly reduce APU usage, and noise/air emissions from ground equipment.
- Reconfigure FBO ramps to move heavy GA aircraft to North end of airport away from North40 residents.
- Increase berm and sound-walls along HWY 82 to reduce noise at the AABC and North Forty.

C. *In light of those community goals, what does the future airfield look like in terms of safety and airport design?*

- Meet runway design separation standards for ADG III.
- Increase spacing between aircraft on approach to improve safety – will result in less peak maximum operations during peak periods. (FAA ATC would have to make this decision). And will provide additional separation for head to head operations.
- Enhance training/resources available to Pilots regarding unique characteristics of ASE operations.
- Implement NextGen avionics technology and precision approaches.
- Greater separations on the airfield reduce the likelihood to conflicts on the ground.

D. ***What should be the commercial Design Aircraft for Aspen given what aircraft are currently available and known future aircraft? For the desired Design Aircraft, does the airfield need to be ADG II or ADG III.***

- Next generation small narrow body jet (e.g. Airbus A220, Misubishi SpaceJet or Embraer E2)
- Build to accommodate weight of most restrictive next generation regional aircraft.
- Airfield geometry will need to accommodate ADG III dimensions.

E. How could our future airfield be as green and carbon neutral as possible?

The airfield, and associated facilities should incorporate all energy conservation measures feasible for onsite design, such as:

- Geo-thermal (facilities and snowmelt),
- LED lighting (airfield and facilities),
- Electrifying the airfield to accommodate plug-ins for GA and commercial aircraft (limit APU usage),
- Utilization of onsite renewables (e.g. solar) to support facilities and airfield.
- Implement a carbon pricing strategy such as basing landing fees and/or fuel costs on efficiency. Use fees to fund onsite renewables and then to purchase certified carbon off-sets to meet goal to reduce Greenhouse Gas emissions by 30%.

VI. Community Character Success Factors: How do these recommendations address or not address Community Character success factors?

The TWG recognizes that safety is of upmost priority. Many of the items that the Community Character group have identified in this area we agree with.

A. Safety in the Air and on the Ground:

1. The CCWG asked that prioritization of investments be made in policies and procedures that minimize the risk of crashes, accidents and hazardous materials spills. The technical committee is recommending that the County pursue increasing the spacing between aircraft on approach to improve safety. While the FAA will make the final call on this, the County should advocate for increasing the spacing. This item would also reduce the total capacity for operations during peak periods.

2. The CCWG asked that enhanced requirements for pilots flying into ASE Airport be made. Pitkin County is not able to require all pilots adhere to the same safety requirements as commercial pilots. The TWG does recognize that Part 135 Pilots have more demanding requirements than Part 91 Pilots. These regulations are implemented and enforced by the FAA exclusively. The TWG does recommend that the County enhance training and resources available to pilots regarding the unique characteristics of ASE operations.

3. Additionally, advancing the airfield to the full ADGIII design requirements brings the separation between the taxiway and runway of the airfield up to higher safety standards. This addresses the safety concerns brought by the FAA in 2012 when the ALP was filed with them.

B. Airside Community Character

1. The CCWG encouraged the use of next generation of regional aircraft, capping passengers to 76 per flight (consistent with current US Scope Clause restrictions). The next generation of aircraft does aid in meeting the environmental goals that the process has set forth. The technical working committee recognizes that in order to continue viable commercial service into ASE, upgrading the airside to ADGIII separation standards is necessary. Because the County cannot unjustly discriminate against aircraft, this makes it impossible to ban aircraft with higher capacities. The market and existing conditions will necessitate that many of the flights will need to be served by regional aircraft and pilots, however, a next generation, scope compliant aircraft that can operate at ASE cannot be identified at this time. Bringing the airfield geometry to ADG-III separation standards will give the airlines some flexibility in identifying future aircraft.

2. There are several aircraft identified to come to market soon, however, most have capacities of more than 76 passengers and all are ADG-III meaning they are mainline narrowbody aircraft (operated by the major airlines, not regional carriers like SkyWest). Use of aircraft larger than 76 seats will reduce the number of operations needed to accommodate the demand into ASE regardless of what that demand is. These newer planes are also more fuel

efficient and quieter than the CRJ-700 and include aircraft such as the Airbus A220-100 and has the potential to reduce operations by 30% or more compared to today. These new larger aircraft are also closer in capacity to some of the aircraft that flew into ASE in the past including the BAE146-300 (100 passenger) which operated between 1988 and 2005, the BAE146-200 (86-100 passenger) which operated between 1986-2006, and the BAE 146-100 (86 seats) which operated 1985-2001.

3. In the attempt to reduce the noise generated at the airport, the TWG has evaluated the potential aircraft that could fly into ASE. The Airbus 220 (100 and 300), Boeing 737-Max is a quieter aircraft than the CRJ 700 in all segments of the ICAO data. These include Lateral/Full-Power, Approach, and Flyover measurements. Reducing noise by a percentage is a difficult metric to contemplate because of the difficulty in defining the metric. Sound is typically measured in decibel which is a logarithmic scale. There are other mitigations available to help relieve the noise experienced by airport neighbors including building sound walls and berms, reconfiguring the FBO ramps to move heavy GA toward the north end of the airport, away from the North 40, and increase the spacing between aircraft to improve safety, resulting in less operations. These are all mitigatory efforts that the TWG recommends.

4. The CCWG encouraged the TWG to consider unintended consequences of a new class of general aviation aircraft. For the size of aircraft being considered, bringing the airfield up to full ADG III standard would only allow several additional aircraft. Gulfstream and Bombardier make the only GA specific private aircraft with wingspans over 95 feet. The Gulfstream G650 series has a wingspan of 99.6 feet and the just announced G700 has a wingspan of 103 feet. The Bombardier Global 7500 and 8000 both have wingspans of 104 feet. Determining how these aircraft would be mixed into the General Aviation Fleet Mix is difficult. Both Boeing and Airbus sell "Private Jet" versions of their commercial aircraft. As of the end of 2018 Boeing had orders for 20 BBJ MAX series (based on the latest 737). In total across all types, Boeing had delivered 233 BBJs (1996 thru 2018). As of June 2019, Airbus has 213 operating business jets (all sizes but the majority are based on the A319) and they had 222 on order, of which 128 are based on the A320. The majority of BBJ and Airbus Business Jet sales have been to Middle East customers. There have been two Boeing Business Jet operations into ASE in the last year. This jet has a 94.75' wingspan and meets the current ASE wingspan. These larger private jets would create difficult parking situations for the fixed base operator. The final data point to be considered here is that Netjet operates approximately 50% of the GA flights at ASE (2018). The largest aircraft in their current fleet is the Bombardier Global 6000, which has a 94' wingspan.

C. Environmental Responsibility

1. CCWG recommends a baseline emission study be completed including particulates and VOCs to aid in establishing a 30% (at minimum) reductions from those baseline emissions. The technical working group has evaluated the potential aircraft to serve ASE in the future, should it go to ADG III. In this analysis it is apparent that most other aircraft analyzed burn less fuel per landing, takeoff, and operation (LTO) cycle per passenger than the CRJ 700. These aircraft are cable of

saving up to 41% of LTO compared to the CRJ 700. Along with fuel spent, other considerations were CO2 Total Mass per passenger, and NOx total mass per passenger. This analysis, the Airbus A320 NEO Sharklet and A220-300 ranked highest. The TWG also recommends the promotion of the use of aviation biofuels in servicing local aircraft.

2. Mary Vigilante presented to the TWG and discussed these metrics as well. Overall, in the US Method 2 is used to baseline carbon emissions in the air industry. This contemplates the total fuel burn. While it may not be as accurate at the granular local level, it takes a holistic view of the country. The TWG recommends creating a baseline like the national standards on a local level, working with partners such as the Canary Initiative, CORE, Rocky Mountain Institute, etc.

3. For non-aircraft specific recommendations, the TWG has discussed and endorses LED lighting on the airfield, electrification of the airfield equipment, such as ground support equipment (GSE) as much as practical and encouraging other improvements that may address climate change.

D. Reflect the Local Culture and Values

1. The CCWG request that models be created to test the consequences of design options on the current character of the airports and surrounding areas. In general, this is what the airports EA is concerned with which was cleared by the FAA.

VIII. Appendices

A. Commercial Aircraft

CRJ-700

- The newest CRJ-700 was built in 2011.
- Delta has actively begun retiring CRJ-700 aircraft primarily due to fuel consumption. There are only 12 CRJ-700's in Delta's SkyWest fleet and they have reduced ASE service this year by one flight per day due to aircraft availability.
- The CRJ-700 falls within the "Scope Clause" meaning for every new "in scope" aircraft the airlines buy (Currently E175's), they must retire one CRJ-700. United has ordered 20 additional E-175's in 2019 with 19 further options.
- Mitsubishi has purchased the entire CRJ program from Bombardier in 2019. They are responsible for the ongoing maintenance, support, refurbishment, sales and marketing commitments for the entire CRJ family. Mitsubishi has openly stated that the purchase of the CRJ line was made to provide a US Network for service of their announced SpaceJet family and they have no intentions of continuing any CRJ activities beyond that required by the purchase agreement.
- The CRJ-550 are mid-life CRJ-700 airframes with a new exterior paint job and a new interior to seat 50 passengers. The refresh did not include any major maintenance checks nor did it extend the life of the airframes. A total of 54 of these aircraft have been ordered by United to use in small markets where planes under the Scope clause (50 passengers or less, and under 65,000 lb MTOW) and limited range (current max scheduled is 850NM) are appropriate to service demands.
- GoJet is the only regional operator announced to fly the CRJ-550 for United based out of O'Hare and Newark. The CRJ-550 does not have the range for ASE to either ORD or EWR.

Embraer

- The Embraer E175 is the only "scope compliant" regional jet currently in production being purchased by US Airlines. As of June 2019 backlog stood at 194 planes.
- Boeing has announced the intent to acquire the majority interest in Embraer' commercial aircraft division plans to rebrand it Boeing Brazil. The Joint Venture is expected to close in 2020. Until the deal closes, they remain separate companies.
- Embraer has announced a next generation of their regional jets starting with the E190-E2. The E2 program was announced in 2013 and the E190-E2 was certified by the FAA in Feb 2018. The E195-E2 was certified in April 2019. The first E175-E2 is final assembly and Embraer promises revenue service by the end of 2021. None of the E2 series planes meet current US Scope Clause limits.

Mitsubishi M100 SpaceJet

- The Mitsubishi M100 SpaceJet, is promised to be a 76 passenger, scope compliant plane with an approximately 91-foot wingspan. No prototype of this plane yet exists, however Mitsubishi states it is based on their discontinued MRJ70 aircraft which had Pratt & Whitney, PW1000G series Geared Turbofan Engines, like that on the Airbus A220 series. Current service entry date is targeted as 2023 according to Mitsubishi. Mitsubishi materials for the M100 state it will be the only in-production jet with the capability to serve ASE. The time sequence of the MRJ program is as follows:
    - 2005 – Formerly adopted a program to develop a 70-90 seat regional jet
    - 2007 – Mockup of MRJ90 shown at Paris Airshow
    - 2008 – Officially launched with order for 25 MRJ90's for ANA Airlines to be delivered in 2013
    - 2010 – Announced start of production for MRJ90
    - 2012 – First MRJ90 delivery pushed back to 2017
    - 2014 – Official Rollout of first MRJ90 test plane
    - 2015 – MRJ90 maiden test flight. Announced delay of delivery to mid-2018
    - 2017 – Two-year delay for MRJ90 announced with delivery to ANA set for mid-2020
    - 2019 – Announced M100 program (sized between MRJ90 and MRJ70) with delivery anticipated in mid-2023. Cabin mock-up presented at Paris Air Show.
    - 2019 – Announced a Memorandum of Understanding to negotiate purchase of up to 100 (50 firm orders / 50 options) M100's with Mesa Airlines. SkyWest has conditional order for up to 100 MRJ90 planes which could be converted to M100's depending on how changes to scope clause limits are resolved.

Retirement of Available Aircraft

- The remaining CRJ700's operated by SkyWest for either American, Delta or United are facing retirement over the next decade, while the only remaining Q400 aircraft in the U.S. are operated by Horizon Airlines and have been relegated to Alaska Airlines hubs in SEA & PDX.
- The current Embraer E175 with enhanced performance winglets (EPW) has been studied by regional airlines for ASE operations, but procedures have not yet been successfully developed that potential operators are comfortable with that would allow this aircraft to safely and reliably operate into ASE on a year-round basis.
- The recently announced Mitsubishi SpaceJet M100 is a potential CRJ700 replacement. To date there is no flying prototype of this aircraft, actual performance capabilities are unknown and there are not any firm orders by US carries yet in place. The announced service entry date for this plane is currently 2023, however Mitsubishi has yet to certify a commercial plane under FAA rules and regulations.
- The CRJ-550 is the only 50-passenger regional jet with the required operational performance to successfully operate at ASE. Neither the Bombardier CRJ-200 nor the Embraer ERJ-145 have this capability. The range of the CRJ-550 is less than the CRJ700 due to reduced maximum takeoff weight (MTOW) and would not be able to serve the ORD and ATL markets currently within the CRJ-700 capabilities. We also note that the CRJ-550 are not new planes but are effectively interior conversions of CRJ-700's with the same limitations to their service life as the CRJ-700 fleet.

B. ASE Historical Commercial Aircraft

- The BAE146-300 was the largest aircraft to operate at ASE. Passenger Capacity was 100 seats and the plane operated for 17 years at ASE from 1988 to 2005
- The Table below lists the commercial planes which have served ASE

Plane	Years flown to ASE	Duration at ASE	Seats
Convair 240	68-70	2	52
Convair 340/440	70-77	7	52
De Havilland Twin Otter	68-86	17	19
Convair 580	73-94	21	56
De Havilland Dash-7	78-94	16	50
ATR 42	90-94	4	50
ATR 72	93-94	2	70
BAE 146-100	85-01	16	86
BAE 146-200	86-06	20	86-100
BAE 146-300	88-05	17	100
Avro RJ70	95-96	1	70
Dornier 328	95-98	3	30
Avro RJ85	97-06	9	69
Bombardier Dash 8-200	97-08	11	37
Bombardier Q400	08-16	8	69-74
Bombardier CRJ-700	06-Present	13 so far	63-70

C. General Aviation

- Gulfstream and Bombardier make the only GA specific private jets with wingspans over 95 feet. For Gulfstream both the G650 series (WS= 99.6 feet) and the just announced G700 (WS=103) are over the 95-foot ASE limit. Bombardier makes the Global 7500 and 8000 (both with WS=104)
- Both Boeing and Airbus sell "Private Jet" versions of their commercial aircraft. As of the end of 2018 Boeing had orders for 20 BBJ MAX series (based on the latest 737). In total across all types, Boeing had delivered 233 BBJs (1996 thru 2018). As of June 2019, Airbus has 213 operating business jets (all sizes but the majority are based on the A319) and they had 222 on order, of which 128 are based on the A320.
- A BBJ based on the Boeing 737-500 has come into ASE twice in the last 12 months. It has a wingspan of 94.75 feet and meets the current ASE wingspan and weight limits.

- NetJets operated approximately 50% of the GA flights at ASE in 2018. The largest of their current fleet is the Bombardier Global 6000 which has a 94-foot wingspan.

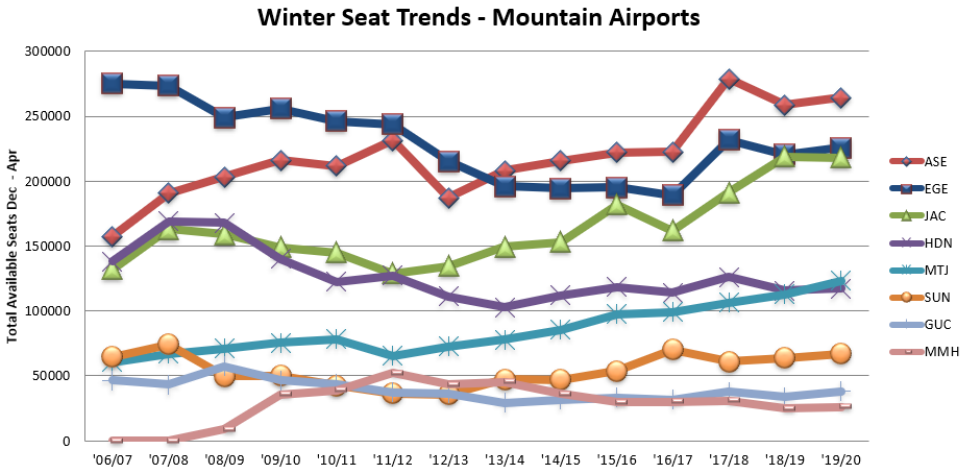
D. Number of Gates Analysis

Limiting the number of gates at an airport, provides one constraint on the peak number of planes which can be processed in any given time period. For an airport such as ASE with a mid-day peak which is four times busier than the daily average, limiting gates would encourage airlines to adjust schedules so that at peak periods, planes are not sitting on the apron with passengers unable to disembark or board. Given the connecting bank schedules in use at the hubs for the 3 airlines serving ASE, it might be expected that limiting ASE to 6 gates may result in a shift of 4 roundtrip flights earlier and later, thereby "flattening" the peak but extending the duration operating "at peak" by 2 hours. Reducing to 5 gates, may shift 6 roundtrip flights and providing 4 gates would shift up to 11 round trip flights if the airlines wants to maintain the same number of flights into ASE. At some point limited gates will probably also drive airlines to simply cut out some number of flights, particularly those which can no longer meet their ideal connection bank at the 10 major hubs ASE is connected to via flights daily (DEN, LAX, SFO, PHX, SLC, DFW, ORD, IAH, ATL and MSP).

Limiting gates has other impacts as well particularly when the airport is experiencing irregular operations. Even when weather is generally not good, ASE still experiences weather "windows" where flights can arrive and depart, sometimes for only a few minutes. Having limited gates is likely to further increase delays during IROPS because with gate limitations they can't process as many planes in these short windows and more flights will simply miss them and be further delayed. More cancellations will likely result as they will not 'gamble" on will there be room to stage or park an aircraft at ASE while waiting for the limited number of gates.

TWG Assumptions:

a. Limiting the number of gates will likely decrease commercial operations due to Airline scheduling.
b. The more limited the number of gates the higher probability that the number of flights will decrease or affect service into the future.


Winter Seat Trends - Mountain Airports
Total Available Seats Dec - Apr
300000
250000
200000
150000
100000
50000
0
'06/07
'07/08
'08/09
'09/10
'10/11
'11/12
'12/13
'13/14
'14/15
'15/16
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ASE
EGE
JAC
HDN
MTJ
SUN
GUC
MMH