

**Inaugural essay (numbered #2) in Aspen Fly Right’s public-education series, 22 Dec 2022
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Have a safe flight

Aviation safety is the top community priority identified by the [ASE Vision](#) process and for the mission of the Federal Aviation Administration (FAA) that regulates US airports. Yet ways to enhance Aspen/Pitkin County Airport’s (ASE’s) safety have not yet been examined in depth. Safety is not even among the 14 topics mentioned as main responsibilities of the Airport Advisory Board¹. However, Barry Vaughan’s encouraging new initiative²—a new Safety Task Force he chairs under the Airport Advisory Board—is convening a dozen locally experienced pilots in public meetings to explore how to make our Airport safer.

There’s a lot to do. Besides being rated (fairly or not) by *Travel+Leisure* as the worst US small airport to fly into³, and highest in winter-holiday flight disruptions of the top 100 US airports⁴, Aspen is said to have the most dangerous commercial airport in the country⁵. The National Transportation Safety Board (NTSB) has issued final reports investigating 41 Aspen aviation accidents and three further incidents occurring during the 33 years 1982–2014, with other investigations still underway. Of those 41 accidents, 13 caused a total of 44 deaths (though trending down)⁶. The worst single accident⁷, in 2001, killed 18 people, nearly matching the 19 deaths in nearly a decade of Pitkin County auto accidents (2010–October 2019)⁸. A larger partial compilation found 50 Aspen aviation accidents in the past 55 years⁹.

Then in late 2022, Mr. Vaughan’s personal compilation expanded the database to the 58 years 1964–2022. His preliminary, unofficial spreadsheet of the reports¹⁰ found 124 NTSB-listed accidents or incidents (averaging 2.1 per year), 58 on and 66 off (but related to) Aspen Airport. The outcomes totaled 36 fatal flights, 120 deaths, 33 serious injuries, and 41 destroyed aircraft.

The senior County manager overseeing the Airport “said the airport is about as safe as it can possibly be. ‘We have a very safe airport,’ he said”¹¹. He has no aviation background, and may have been referring only to the airport’s physical assets. But of course the issue is how airport assets and users’ knowledge and behavior interact with the surrounding terrain, winds, weather, special procedures, and other challenging conditions. The convenience of an airport just three miles from Aspen and six miles from Snowmass Village comes with confined terrain, tricky winds, erratic visibility, hence less-reliable service and potentially greater risk.

The County compiled¹² a list of 40 NTSB final reports of Aspen-related aviation accidents, but declined¹³ to analyze them to extract common attributes and causes, so some local pilots did. Mr. Vaughan’s analysis confirmed that all but two¹⁴ of the incidents or accidents¹⁵ in the County’s initial list, and *all* the fatal accidents, *were not in commercial airliners but in General Aviation* (GA—nonmilitary, non-airline planes), and that *over half appear due to pilot error*¹⁶. His own larger analysis concurred. So why is Aspen GA so consistently and disturbingly accident-prone?

Deficient General Aviation pilot training

Aspen Airport’s all-SkyWest commercial pilots’ zero-fatality safety record over many decades reflects their high professional skills and their intensive, critically important Aspen-specific training. In contrast, GA pilots landing at Aspen in daylight¹⁷ may have only general training and ordinary—highly variable—levels of skill. GA pilots may choose various forms of Aspen-specific training, real or virtual¹⁸, but they are not required to have any, and Aspen Airport’s Air Traffic Manager estimates that roughly nine in ten have none¹⁹. GA operators do come in various categories (charters, fractionals, corporate, private, etc.) with quite different training practices or requirements. Some undergo regular safety retraining and even pre-fly their Aspen approach on a simulator. Yet many GA pilots land at Aspen Airport only infrequently, some for the first time, and some with apparent insouciance born of limited awareness of its unique challenges.

Under current regulation, only the FAA could mandate Aspen-specific pilot training and require that filed flight plans into Aspen attach evidence of it. (Some European airports in mountainous terrain reportedly have such airport familiarization requirements, even including simulator training.) Aspen Airport’s Director strongly supports this outcome, but the County has not asked the FAA to consider it, fearing industry lobbyists’ veto²⁰. But that seems no reason not to try, and Mr. Vaughan’s Task Force will seek collaboration from GA trade groups in the hope of finding convergent interests. There is also an opportunity to establish a major privately funded GA safety training center in the ABC, more ambitious than current efforts. Aspen’s uniquely comprehensive portfolio of aviation hazards could attract pilots from all over the country—a potential source of revenue, training flights in currently slack periods, and above all, a solid basis for improving aviation safety for Aspen and the whole industry.

So far, the ASE Vision process has only encouraged pilot information programs²¹. But if proper training by video, online tutorial, or simulation cannot be required (perhaps even as a license endorsement) as a condition of landing, perhaps the Airport might require a precision (in pilot-speak, ILS, MLS, or GPS) approach using Instrument Flight Rules (IFR). After all, inadequately trained pilots impose not just risks but costs on all Airport users and hence on Aspen’s reputation and resort performance. Even small disruptions can have big consequences. Just this year, six times in six months, in a seemingly unprecedented cluster of pilot errors, Aspen Airport was shut down by private pilots’ runway excursions or blockages. In consequence, a total of 32 inbound and 47 outbound commercial flights got cancelled²², 15 diverted, and 29–36 delayed by over an hour²³, with uncounted but doubtless substantial inconvenience to those 123–130 flights’ estimated ~6,000 passengers²⁴—on the order of a thousand bad Aspen experiences per GA pilot error:

Date	Closure duration	Cancelled	Diverted	Delayed >1h
21 Feb 2022	8h57m	20 inbound, 22 outbound	7 inbound, to GJT	4 outbound delayed to next morning
24 Feb 2022	1h37m	5 inbound, 13 outbound	3 inbound, to GJT	8 inbound, 11 outbound
26 June 2022	1h44m	2 inbound, 3 outbound	1 inbound, to GJT	1 inbound, 1 outbound, both by nearly 5h
1501 12 July 2022	1h1m	0	0	3 outbound
1620 12 July 2022	0h27m			
15 Aug 2022	6h16m	5 inbound, 4 outbound Mon PM + 5 Tue AM	1 inbound to GJT + 1 each to origin city (IAH, SFO, ORD)	1 outbound delayed to Tue AM, + 7 more Tue outbounds (due to this incident or to other causes—no way to tell)

Only a small fraction of GA pilots—2.6% of itinerants on the day of Pete McBride’s classic one-day July [photograph](#)—choose to arrive under Visual Flight Rules (VFR). But these few often delay commercial flights. That’s because IFR flights have priority, so controllers like to divert small VFR planes out of the IFR jets’ sequence, then fit them opportunistically into later gaps; but airspace for holding patterns is extremely limited—circling over Aspen or Snowmass Village, causing noise complaints and perhaps increasing risk. Thus in practical effect, each VFR landing, by gumming up the flow, eliminates one IFR takeoff slot, causing cascading delays at peak periods²⁵. FAA’s prime objectives of safety and efficiency would be better met if Aspen could become, reasonably enforceably, an all-IFR airport. Conceivably this might be done by reclassifying Aspen’s airspace as Class B, closed to planes without an IFR clearance, as is common around large metro airports. Local small-plane pilots may consider such a rule unnecessarily arduous. Or maybe there’s some way to require IFR except for expert local pilots.

Capacity and congestion

Aspen’s constrained airspace and terrain, and its fickle winds and weather, limit its maximum capacity to about 300 landings or takeoffs (“operations”) per day in fine weather²⁶. FAA rules require that this limited capacity be allocated first-come-first-served, with no preference between GA and commercial flights. Some pilots have found ways to game that system, potentially creating an airspace conflict. The Airport’s complex and exacting procedures permit a maximum rate of just 28–32 operations per hour in ideal conditions. That’s because of the greater required separation between successively arriving and departing aircraft. A 2018 study estimated that proposed ASE upgrades might raise good-weather capacity to ~40 operations per hour, but still sharply lower in bad weather²⁷.

The main cause of Aspen flight delays, besides the policy to land one way and take off in the opposite direction, is simply that demand on busy days exceeds capacity. Developing more ways to stretch capacity—most simply by better using the slack hours 0700–1000—could stretch capacity, cut delays, raise flexibility, and improve safety. The PACER program already reports real-time congestion so pilots can choose to avoid it, but this seems to have little effect because one of the selling points of GA travel is availability on demand, not on someone else’s schedule.

FAA favors congestion-cutting, but unfortunately, found that a decade-old experimental aircraft landing reservation system didn’t work well because Aspen has too many weather and other contingencies for booked slots to be reliably available, and because some pilots cheated²⁸. However, in principle Aspen could ask FAA to allow congestion pricing, which FAA has long sought to advance, if the pricing applied equally to GA and commercial operations. Such a request appears not to have been made. Both slots *and airplane parking* might be priced—though wealthy owners or clients may not respond as the minority, private small-plane owners, probably would.

FAA’s rates and charges policy explicitly allows “peak pricing systems” and doesn’t consider them discriminatory²⁹. Specifically, for example, airports may adopt a two-part landing fee (not to exceed allowable airfield costs) with both per-operation *and* weight-based components. The resulting higher fee per passenger for aircraft with fewer seats “may be justified by the effect of the fee on congestion and operating delays and the total number of passengers accommodated during congested hours³⁰”—precisely the goal of the congestion pricing the County says it wants.

Head-on traffic

At most of America's 5,000-odd public-use airports except the smallest, multiple runways let planes both land and take off into the wind, helping them fly better and more safely. (Tailwinds are destabilizing, so many jets aren't certified to take off or land in tailwinds over 10 knots.) Aspen, however, has room for only one physical runway. Pilots can choose to land or take off in either direction³¹, but about 99%³² are said to land heading upvalley and take off heading downvalley (into prevailing winds to improve takeoff lift). This head-to-head traffic—one way in, one way out—is like driving on a one-lane road with traffic going both ways, without being able to maneuver around obstacles. Only a handful of US airports use such "Opposite Direction Operations." Aspen, with its uniquely constrained terrain, is the only US airport to use both directions *simultaneously*³³—meticulously choreographed to prevent collisions in the air or on the ground.

This unique Aspen operational practice³⁴ could confuse unfamiliar pilots. It reduces capacity because planes must be farther apart. Safely operating both ways at once requires very strict FAA coordination, reliance on instruments, visual separation, and other special procedures that take a new Aspen tower controller about a year and a half to learn³⁵. Contrast that with the zero Aspen-specific training required of GA pilots landing in Aspen. These opposite conditions—required control complexity and permitted user ignorance—create an intolerable tension between welcoming all comers to our public-use airport and keeping our guests and our community safe. Reconciling these goals requires a less *laissez-faire* approach to GA pilot training practices.

Deeply experienced local pilots recommend that as in Europe's most challenging airports, the County and City ask FAA to require and the Airport to implement ASE-specific, enforceable, consistent GA-pilot training procedures that protect pilots, passengers, and the community. If the Safety Task Force can enlist support from GA trade groups, so much the better, but if not, that shouldn't preclude action. If safety is truly our highest priority, then we should be willing to tell pilots unwilling to learn how to fly safely in and out of Aspen that they are welcome here, but must choose a less demanding airport (such as Rifle) and reach Aspen by car—or, in due course, a vertical-takeoff-and-landing air taxi.

Tower, operations, and wildlife

The Safety Task Force could also valuably advise the County on a modernized, relocated, and probably taller tower from which air traffic controllers can see, or monitor by modern remote cameras, the entire airport and its approaches. The tower's midfield location, suitable decades ago, has become suboptimal.

Another obvious safety need is dramatically modernized navigation equipment³⁶. Aspen's legacy Ground Based Navigation equipment is obsolescent and hard to maintain. When it fails, some planes need higher ceiling and better visibility to land in. The best *airborne* precision landing systems are being vigorously deployed nationwide and internationally. Full deployment will take some years, but meanwhile, most—one expert estimates perhaps 80%—of GA planes already have an onboard system linking multiple ground sources (not just local), and often satellite (GPS) data, to the cockpit Flight Director screen and the autopilot for a safe automated approach. That airborne equipment is far more sophisticated and redundant than Aspen's public-use ground

equipment, whose obsolescence constrains bad-weather operations by certain GA planes that mainly rely on it. Others simply use it as an en-route confirming cross-check.

The Task Force could consider how bad-weather landing decisions are made. Air traffic controllers only advise about airport conditions; they don't declare the Airport open or closed except in emergencies, though the County can close the Airport for maintenance or snow-plowing. Pilots always make the final choice about whether and how to land, considering controllers' advice if the tower is open at the time (0700–2000; at other times, Denver FAA controls Aspen's airspace). One pilot also notes that a pilot could effectively close an airport by reporting the braking action as "nil" to the tower so as to advise other inbound traffic; then pilots trying to land later may void their insurance coverage or operations specifications or both.

Surer exclusion of wildlife from the runway also needs attention. The Airport sits astride old elk movement and migration corridors³⁷ that may not have been properly planned for³⁸, so elk and deer abound, and substantial fence gaps have been observed. On 9 November 2022, Airport staff had to remove about 200 elk from Gate 8³⁹. One elk could seriously harm a plane or passengers.

Questionable aircraft

Some unauthorized larger private airplanes, like older and noisier 737s just within the 95-foot wingspan limit but rated as exceeding the 100,000-pound weight limit⁴⁰, have occasionally landed at Aspen Airport⁴¹, and at least one private 737 was alleged to visit "fairly regularly"⁴². It's unclear who decided, on what basis, that this type qualifies for our challenging Airport under standard safety contingencies⁴³: the Aspen safety adequacy of a 737 is probably at best marginal, starting with its limited accelerate/stop capability. Indeed, Richard R. Arnold questions the worst-case contingency performance even of some currently operating planes⁴⁴.

Emergency medical capacity

Such concerns call attention to our community's medical response capabilities, especially when passengers per plane are officially proposed to rise by up to 71%, and that's not a limit. Have we really thought through the medical and reputational risk of a potential 130-casualty catastrophic event, plus any victims on the ground? Aspen is blessed with a 5-star Level III Trauma Center hospital with casualty capacity⁴⁵ suited for a multi-car or small-plane accident. A gratifyingly improved mass-casualty plan is designed for up to 70 victims (like a CRJ700 or, roughly, a school bus). Airport training's "worst case" scenarios assume up to 150 casualties, but that "would exceed the capacity of [all] the Roaring Fork Valley's hospitals and require mass transportation to more distant facilities."⁴⁶ Mutual Aid may be infeasible if the Airport or highways or both are closed by accident or weather or both.

The implications for airplane size are obvious: smaller is better, bigger is worse. The trend toward smaller planes flying point-to-point routes could greatly reduce the risk of overwhelming emergency capacity. Bigger planes would enhance that risk.⁴⁷ And the proposed Lumberyard major housing development near the runway could increase it further, as we'll explore later.

Conclusions

Aspen's sterling reputation for commercial flight safety cannot afford even one accident. Its troubled reputation for noncommercial flight safety, with about one accident per year and some 120 people killed so far, needs prompt and major improvement. Comprehensive safety is about the whole system of the airport, its 200 square miles of airspace up to 21,000', and the proficiency and training of inbound flight crews. The ASE Vision [agenda](#) scarcely began to address this priority in comprehensive, specific, and actionable terms, even though it's rightly at the top of everyone's declared list of concerns.

The Airport Advisory Board's long-overdue Safety Task Force has just launched with commendable intent and momentum, and we wish it every success. But piecemeal patches to this complex system won't suffice. The linked opportunities to address Aspen Airport's safety *and* other concerns require a highly integrated portfolio of simultaneous design, technological, business-model, governance, and perhaps regulatory improvements that forthcoming ads and essays in this series will explore. Together, that portfolio's elements can reveal important new opportunities.

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¹ Dan Bartholomew (Aspen Airport Director), brief to Airport Advisory Board, 18 Aug 2022, https://drive.google.com/file/d/1Jg4THrjD_dxmwOWatiHcBntTIdEYnYdc/view.

² Proposed 20 Oct 2022 with County foreknowledge, unanimously approved by the AAB 17 Nov 2022 and unanimously confirmed 6 Dec 2022 by the BoCC.

³ <https://www.travelandleisure.com/airlines-airports/best-small-airports-in-the-us>, 7 Mar 2022, based on <https://www.valuepenguin.com/airports-to-fly-into-study#Worst>, 28 Feb 2022, showing 26.4% delay rate, 8.4% major delay rate, 26.21-minute average delay, 3.5% arrival cancellation rate, and top (\$607) average airfare—scoring in the nation's bottom three on each metric examined. County Staff correctly pointed out to the Airport Advisory Board on 21 Jul 2022 that the article's causal logic is sketchy, but it's out there.

⁴ Z. Wichter & D. Zhang, "USA TODAY analysis: Here are the 10 airports with the most flight cancellations around the holidays," *USA Today*, 15 Dec 2022, <https://www.usatoday.com/story/travel/airline-news/2022/12/15/us-airports-most-flight-cancellations-delays/10888995002/>.

⁵ E.g. T. Gorman & S. Sarhaddi Nelson, <https://www.latimes.com/archives/la-xpm-2001-mar-31-mn-45154-story.html> (31 Mar 2001) and Bloomberg News, <https://www.denverpost.com/2017/03/20/aspens-telluride-airport-landings/> (20 Mar & 12 Apr 2017). FAA's Special Pilot in Command Qualification Airport List for commercial airlines (14 CFR Part 121) lists Aspen—not mentioning winds or weather—as having

"Mountainous terrain in immediate vicinity of airport, all quadrants; high climb gradient performance requirements; special procedures."

⁶ ASE Vision *Technical Working Group Report*, 20 Dec 2019, pp 8–9, https://dmcvpykjhjv3.cloudfront.net/sites/214/2019/12/24105603/TWG-Final-Report-and-Recommendation-12_20_19-with-added-Appendix1.pdf.

⁷ The sobering NTSB report is at <https://www.nts.gov/investigations/AccidentReports/Reports/AAB0203.pdf>.

⁸ Ref. 6.

⁹ Amory Lovins, introduction to public forum, 22 Oct 2022; Mr. Vaughan's new 1964–2022 compilation finds far more. The introductory text is on pp 171–186 at <https://civicclerk.blob.core.windows.net/stream/PITKINCOCO/4a5da1c89a.pdf?sv=2015-12-11&sr=b&sig=zXNgNGU24FM1e7C1PuFDyCnkKdL%2BJuFxBf1JaoAFBA%3D&st=2022-11-27T16%3A41%3A56Z&se=2023-11-27T16%3A46%3A56Z&sp=r&rsec=no-cache&rset=application%2Fpdf>. The complete video, including discussion with Dick Arnold and Tom Keough, is on YouTube at <https://youtu.be/F-MVGgAVk-k>, and is also available at https://www.google.com/url?q=https://youtu.be/F-MVGgAVk-k&source=gmail-imap&ust=160451_8013000000&usg=AOvVaw2jWamp2HJUSouYGdFbQTE.

¹⁰ B. Vaughan, emails to A. Lovins, 10 and 14 Dec 2022. Mr. Vaughan is to be commended for undertaking this onerous public service, and for his generosity in sharing these preliminary results and kindly authorizing them to be shared further. His private analysis has not yet been checked by aviation experts, so some details may change, but the overall totals cited here look durable.

¹¹ https://www.aspendailynews.com/news/aspens-airport-operations-up-20-for-first-half-of-2021/article_c29e6c3e-ffcf-11eb-9f55-eb760153232b.html, 18 Aug 2021.

¹² Caroline Bonyng, ACE, ASC, C.M., Director of Operations, Safety & ARFF, Aspen/Pitkin County Airport, 2 Apr 2021 email "NTSB Accident Reporting" to Rich Engelhart, then Interim Airport Manager. The list is useful but appears to be incomplete and is now superseded.

¹³ Most recently in County Staff's [response](#) to Amory Lovins's 19 Apr 2022 [letter](#) to the BoCC, p 6: "No reasonable benefit would be ascertained from the County performing its own accident study since all this information can be gleaned from the NTSB reports."

¹⁴ Both involving the 100-seat BAe-146 airliner: in 1998, a hydraulic failure sent it beyond the runway with blown-out tires, narrowly missing another plane, coming to rest in three feet of snow, and slightly damaging the plane with no injuries to the 77 passengers plus crew; of note, it was sliding toward Buttermilk, whose parking lot is 0.3 miles from the end of the runway. Then in 2000, one engine's turbine disc failed during climb-out, but as designed, the plane landed safely using the other three engines. In addition, one CRJ700 no-injury accident, a 2017 engine fire after landing, is reported at <https://www.aeroinside.com/9833/skywest-crj7-at-denver-on-jul-2nd-2017-engine-fire-on-landing>, and the same site lists four ASE-related incidents for that aircraft type.

¹⁵ The difference is that accidents involve death, serious injury, or substantial damage to the aircraft.

¹⁶ Mr. Vaughan’s personal interpretation of the accident reports (he’s a pilot but emphasizes that he does not hold himself out as an aviation expert) implicated basic pilot error in 73 of the 120 mishaps, mountain flying conditions in 45, and mechanical failure in 24. Fourteen were “controlled flight into terrain”—flying a working aircraft into the ground under the pilot’s control.

¹⁷ Aspen Airport rules applying specifically to GA landings state this from a half-hour after sunset to airport closure for curfew at 2300 (<https://www.aspenairport.com/operation/operating-procedures/curfew/>; see also §517 at <https://www.congress.gov/103/statute/STATUTE-108/STATUTE-108-Pg1569.pdf>):

VFR Operations: Aircraft equipped as required under FAR 91.205 (D) for instrument flight and pilot is instrument rated; VFR pilot in command has completed at least one takeoff or landing in the preceding 12 months at ASE.

IFR Operations: Execute approach and departure procedures with air traffic control clearance.

¹⁸ ASE-specific simulator training has greatly improved over the past few years for the professional corporate aviator.

¹⁹ Keith Geirach, 18 Aug 2022 brief to Airport Advisory Board, https://drive.google.com/file/d/1Jg4THrjD_dxmWOWatiHcBntTIdEYnYdc/view, at 51:06.

²⁰ This sentence is based on Airport Director Dan Bartholomew’s remarks in a 19 Oct 2022 discussion at

https://drive.google.com/file/d/118-LR-uA6jvN0yRs-VERgB_m9FMGfuzi/view?usp=sharing.

²¹ A tutorial is at <https://code7700.com/kase.htm#gsc.tab=0>. County Staff’s response (Ref. 13) states at p 6: “The Airport does work with the FAA in support of their safety video series ‘From the Flight Deck,’ which addresses safety initiatives at certain unique airport facilities, including ASE. It is the responsibility of pilots and aircraft operators to become educated on best practices.” Many pilots suggested another good start—an Aspen-specific instructional pamphlet that may now be available. The FBO could automatically send it to any pilot filing a flight plan to Aspen. A pamphlet is better than nothing, but inferior to videos and simulator training. The Airport’s website at 1 Dec 2022 included useful but less-detailed information at <https://www.aspenairport.com/operation/operating-procedures/high-altitude-safety/>.

²² For example, eight inbound and eight outbound flights were cancelled just in the 15 Aug 2022 incident described at https://www.aspendailynews.com/news/incident-that-closed-airport-monday-was-4th-time-this-year-private-jet-skipped-runway/article_681dbc48-21c4-11ed-bdc2-b71f1de45445.html.

²³ Data very kindly provided by Airport Director Dan Bartholomew on request, emails to A. Lovins, 1 and 7 Dec 2022.

²⁴ That is, 123 to 130 flights × ~67 average seats × ~0.7 to 0.8 nominal load factor = 5,769 to 6,968 pax. Actual counts are unavailable.

²⁵ This paragraph and the next three are informed by the Geirach brief, Ref. 19.

²⁶ However, <http://aspenairport.wpenginepowered.com/wp-content/uploads/2022/10/Capture-sept.jpg> says 448/day capacity in ideal conditions.

²⁷ Lean Engineering, Ref. 43, at pp 119–120, though this improvement “could occur with or without the runway safety enhancements and...relocations” (p 126). Conversely (p 124), large jets in marginal conditions could inhibit even 16 ops/h nominal capacity.

²⁸ Geirach, *loc. cit.*, Ref. 19, at 1:07:30.

²⁹ US Department of Transportation, FAA, RIN 212-AF90, “Policy Regarding Airport Rates and Charges,” *Fed. Register* 78(175):55335 (10 Sep 2013), particularly §3.2: “A properly structured peak pricing system that allocates limited resources using price during periods of congestion will not be considered to be unjustly discriminatory. An airport proprietor may, consistent with the policies expressed in this policy statement, establish fees that enhance the efficient utilization of the airport.” Also, §2.4.2(c) on p 55333 specifically allows noise-abatement and mitigation charges as part of “reasonable environmental costs” if they reflect a corresponding actual expenses to the airport.

³⁰ US Department of Transportation, FAA, RIN 212-AF90, “Policy Regarding Airport Rates and Charges,” *Fed. Register* 78(175):55330 (10 Sep 2013), particularly §2.1.4 at p 55333.

³¹ Experienced local pilots in smaller jets or piston planes are more likely than itinerants to land from upvalley. Takeoffs over town require prior written approval, though it’s unclear whether that rule is consistently enforced. Aspen’s operational procedures are unique. A former SkyWest/Aspen pilot explained in 2014 (<https://www.boldmethod.com/blog/2014/01/aspen-approach/>): “A special approach, the LOC DME to Runway 15, allows aircraft to land at Aspen with lower minimums—down to 8,780’ MSL (roughly 1,000’ AGL [half the requirement for non-precision instrument approaches]) and three miles of flight visibility. This procedure has a special missed approach procedure. If you can’t land after crossing the missed approach point, you execute an emergency extraction procedure. The approach requires special training and isn’t published in the standard package of approach procedures.” However, an easier curved approach to Runway 15 (landing from downvalley), allowing just 537’ height above touchdown and 1¼-mile visibility, was FAA-approved in 2021 for modern private aircraft equipped with Honeywell avionics, including the Gulfstream G350/450/500/550/600 (the G600 is the largest that can now use ASE) and the Dassault Falcon 8X, all subject to specific pilot training, review, and instrument requirements: <https://aerospace.honeywell.com/us/en/about-us/blogs/honeywell-receives-faa-approval-aspen-rnav-approach?idl>.

³² Ref. 19. However, p 33 of the 2018 Lean Engineering report cited in Ref. 43 says “Over 90 percent of landing aircraft use Runway 15 and 95% of departing aircraft use Runway 33,” indicating that the Air Traffic Manager’s 99% estimate *might* be higher than actual.

³³ Ref. 19.

³⁴ The Airport’s Approach and Departure Procedures at <https://www.aspenairport.com/operation/operating-procedures/approach-departure/> now specify: “Meteorological conditions permitting, use Runway 15 [from downvalley to upvalley] for all landings,” and “Runway 15 takeoffs requires [*sic*] a waiver to be signed by Atlantic Aviation.” More formally and somewhat differently, Pitkin County Code §10-12-040 begins: “There is established at the Airport a preferential Runway system for the taking off of all Aircraft. Subject to Runway closures, weather conditions, and emergencies, Aircraft shall take off to the northwest on Runway 33. Departures from Runway 15 are permitted only with written authorization of the Director of Aviation, and must be consistent with the Director of Aviation’s criteria for approval of take-off on Runway 15 as published by the Director.... There is established at the Airport a preferential Runway system for the landing of all Aircraft. Subject to Runway closures, weather conditions, and emergencies, Aircraft shall land on Runway 15.”

³⁵ Ref. 19.

³⁶ Existing SkyWest commercial planes, which the Airport Director recently criticized as outdated in this regard (25 Oct 200222, https://www.aspendailynews.com/news/local-news-in-brief-oct-25/article_9e9d5e74-5412-11ed-87fe-a3251393f302.html), actually have a unique, FAA-approved electronic landing system, using proprietary software and data, that permits safe landings in worse conditions than all but the most sophisticated private jets can tolerate. This system is not mentioned in a 5 Jul 2022 article on potential satellite-based landing systems that have reduced delays at Sun Valley (www.aspentimes.com/news/theres-hope-for-reducing-delays-cancellations-of-airline-flights-at-aspen/).

³⁷ According to a local wildlife expert with decades of experience collaborating on wildlife issues with agency and university scientists and other experts—Tom Cardamone (personal communications, 10 Apr and 17 Dec 2022), whom the County hadn’t asked.

³⁸ The FAA-approved 2012 *Wildlife Hazard Management Plan* (four parts, URLs at <https://www.aspenairport.com/operation/planning/resource-documents/>) reported in 1990–2011 no wildlife strike bigger than a fox. A search of all four parts for the word “elk” found none. The broader context of local wildlife issues is well described by S. Condon, “Effort underway to create safe passages for wildlife across Hwy 82,” *Aspen*

Daily News, 19 Dec 2022, https://www.aspendailynews.com/news/effort-underway-to-create-safe-passages-for-wildlife-across-highway-82/article_17848aca-7f55-11ed-8d05-b3b248132ab5.html.

³⁹ Tweeted by the Airport 9 Nov 2022 at <https://twitter.com/FlyAspenAirport?status/1590478237444556912>.

⁴⁰ With the 737's dual wheels. Tandem-wheeled planes can weigh up to 160,000 lb, but planes that comply with Aspen's 95' wingspan limit and can perform adequately at Aspen's altitude are very unlikely to use tandem wheels.

⁴¹ For example, B73S planes (i.e. 737-300 according to https://www.fly.faa.gov/edct/common/aircraft_types.txt) landing at 1046 on 4 Dec 2020 and at 1340 26 Dec 2020 were recorded by landing-fee collector Vector at 120,500 lb maximum landing weight and 143,500 lb maximum takeoff weight. It's unclear whether these are nominal specifications (which are 138,500 lb for the commercial 737-300), specific weights declared in the flight plan, or someone's estimate; conventionally, each type's maximum certificated landing weight is assumed, but private jets might weigh less depending on configuration details and, of course, type variants. Thus ASE's first 737 landing (J. Auslander, "'Whale' 737 makes first-ever landing as Aspen's airport as debate about larger plane continues," *Aspen Times*, 29 Dec 2018, <https://skifederation.org/whale-737-makes-first-ever-landing-at-aspens-airport-as-debate-about-larger-plane-continues>) was apparently the rather unusual shortened 737-500 with rated empty weight 70,510 lb, landing at under 90,000 lb and taking off at just under 80,000 lb (<https://community.infiniteflight.com/t/kase-aircraft-size-restriction/312182/45?page=3>). ASE's 100,000-lb weight limit is meant partly to protect the runway and taxiways from costly damage. (County Staff, in Ref. 13, says "We are unaware of any unauthorized aircrafts being given clearance to operate at ASE. We would encourage those facts being shared.") Wingspan is similarly determined by published specifications. In another example, the ERJ190 that landed 23 Mar 2021 has a maximum landing weight of 94,799/97,003 lb (LR/AR model) but a maximum takeoff weight of 110,893/114,199 lb (https://www.embraercommercialaviation.com/wp-content/uploads/2017/02/Embraer_spec_190_web.pdf), so if it were desired to stay below the 100,000-lb limit at takeoff too, it would have had to load little fuel, unless its private interior configuration were considerably lighter than the commercial version and this difference were officially recognized.

⁴² https://www.aspendailynews.com/opinion/semple-the-sounds-of-silence/article_962edb22-d899-11ec-b88f-27634eef7643.html/

⁴³ Such as engine loss at decision speed (i.e. accelerate/stop distance and second-segment climb gradient) and bad-weather go-around. The 737 family has not demonstrated the agility to maneuver out of trouble in these conditions at Aspen, where air is thin (especially in hot summer weather), weather and winds are erratic, and the clouds have rocks in them. Planes like the 737 whose engines are slung under their wings rather than mounted on their fuselage are especially awkward because failure of one engine causes yaw (sideways turning) that can make it hard to control the plane on its rapid and narrowly constrained climb-out to avoid terrain. At least one airline reportedly concurs (J. Auslander, "Aspen airport expansion will allow for 737-sized planes, but will they come?," *Aspen Times*, 12 Aug 2018, <https://www.aspentimes.com/news/aspen-airport-expansion-will-allow-for-737-sized-planes-but-will-they-come/>). A 2018 technical review of the 737-8 MAX for the County found at p 2 that "feasibility [of scheduled services] relies upon updating existing approach category (CAT) D operations. If no new approach procedures or SMS [Safety Management System] risk mitigations materialize to permit a CAT D aircraft to operate on CAT C approaches, then the 737-8 MAX may either be downgraded to charter feasibility or be considered non-feasible following the runway relocation [to meet ADG-III standards]." Lean Engineering, *Airspace Impact and Aircraft Feasibility Assessment Update*, 25 Aug 2018 report (filename suggests 26 Aug draft) to Aspen Pitkin County Airport https://aspensairport.wpenginepowered.com/wp-content/uploads/2020/09/ASE_Airspace-and-Aircraft-Feasibility-Draft_082618-1.pdf [sic]. The report also analyzed the 737-700, -800, and -7MAX, but apparently not the -300 already privately operating as noted. The 737-9MAX and -900 were found infeasible (p 4). (Of course, recent MAX modifications may change the analysis.) The weather assessment on pp 13–14 is also sobering, but the runway and wind analysis on pp 18–22 helps illuminate potential approaches from upvalley discussed above.

⁴⁴ At pp A12–A13 (4 Apr 2021) of <https://civicclerk.blob.core.windows.net/stream/PITKINCOCO/8950407993.pdf?sv=2015-12-11&sr=b&sig=etIZVRYf3kPVKYIZGuXdUDySUJUITys56CjU%2BOKcPOQ%3D&st=2021-12-21T15%3A53%3A22Z&se=2022-12-21T15%3A58%3A22Z&sp=r&rsc=no-cache&rset=application%2Fpdf>.

⁴⁵ Aspen Valley Hospital has 25 staffed total patient beds (including four now used or easily usable as ICU beds, with the rest potentially convertible). Its Emergency department has one trauma room and 16 monitor-wired regular beds. The four AVH ambulances can each hold one critical/red-status trauma patient with two EMTs and, in a pinch, up to one yellow and two green patients. Hospital resources already in routine use may be unavailable for casualties. Hospital staff and other medical professionals downvalley of the Airport may be unable to reach it. In a major emergency, some other hospital areas could be adapted to add surge capacity to meet the 70-casualty design basis. Airlift or road transfer to other hospitals may be too slow or impossible in the bad weather in which an accident is most likely to occur. A crashing plane could also take out Highway 82 and the frontage road—and even, as in one tested preparedness exercise, the Holy Cross Energy substation behind the ABC. Obviously any mass-casualty event would be extremely challenging—and worse if it's bigger.

⁴⁶ *The Final Report of the Airport Vision Committee: The Common Ground Recommendations*, p 7.

⁴⁷ An additional issue is that FAA's requirement that airlines' planes be able to evacuate passengers within 90 seconds, regardless of cabin capacity, is tested with only 60 able-bodied people, none of whom are elderly, children, or people with disabilities. Two US Senators have asked FAA to devise and adopt realistic standards: <https://www.airlinerwatch.com/2022/12/two-us-senators-want-faa-to-rearrange.html>, Dec 2022. Until potential new standards work through the fleet over decades, safe evacuation in a crash at Aspen cannot be assumed, so it would be prudent to assume more and graver casualties than if all passengers could swiftly evacuate.