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Crucial aviation forecast fudges facts, ignores Aspen conditions, scraps local choice

Executive Summary

Whether Aspen Airport accepts bigger airplanes depends on whether the Airport Advisory Board (AAB), then the Board of County Commissioners (BoCC), approves a 78-page draft Forecast predicting how many aircraft of which kinds will fly here to 2042. The AAB declined a 20 April 2023 request to vote on the Forecast before reading it, and will reconsider it on 18 May 2023. To support that evaluation, Aspen Fly Right performed this unsolicited independent review.

We assess that the draft Forecast's significant analytic flaws and gaps make it unsound and unreliable.

Aviation growth is projected from a single tenuously related variable without analyzing causality, competition, or economics. No lodging constraints or other Aspen conditions are considered. Projected growth is grossly inflated by the 2014–19 airline passenger surge—87% of all 2000–22 growth—just as Short-Term Rentals doubled lodging capacity in 2015–18. Coincidence? Probably not—but that burst is extrapolated for another 20 years as if it were a permanent driver.

Historic data don't support such exuberant extrapolations. Aspen's winter commercial seats flown peaked 30 years ago. Many 1995–2014 trends were flat or declining. The FAA rejected the forecasters' "realistic" lower variant, just below the County's own growth-management target and requiring no new airside nor bigger planes. Yet even the preferred mid-range variant, growing over twice as fast, shows no rapid shift to bigger planes. Seen from 2042, removing the 95´ wingspan limit in 2032 would look a decade premature—not a ripe choice that can or should be prudently made now.

The Forecast and FAA would ignore and override the community's long-established intent to manage aviation growth. Forecasted growth is instead required to approximate an FAA projection that envisages a half-million Aspen airline passengers by 2050, two-thirds more than now—with no recognition of our community's needs, wishes, or circumstances. Emergency medical response capacity, barely adequate for an accident with today's 70-seat regional jets, is not considered, yet new planes are projected to carry twice that many seats if not more.

The Forecast includes no superefficient or electric planes. Seven months ago, the forecasters warmly received our technical brief on how this revolution can radically cut Aspen noise and emissions without needing an expanded airside, and probably sooner. Yet the AAB must now evaluate the Forecast without yet having seen that innovation analysis.

Of the Forecast's three chosen fossil-fueled airliners, one (planned to begin Aspen service in 2023–24) is dirtier, noisier, and probably less profitable to operate than current regional jets. Another has apparently not been proven safely landable in Aspen. It and the third type, both with 115´ wingspans, would require the major airside redesign that opens the Airport to *any* airplane up to 118´—even types dirtier and noisier than now allowed, like older private 737s and A319s. All three chosen aircraft types look riskier than the current regional jets that could keep flying for another 20 years—or, as the lead forecaster and the manufacturer both said, 30—and that the Forecast provides no analytic basis for replacing.

The Forecast's capable authors told the AAB that their proposed fleet mix meets three County goals (CO_2, air pollutants, and noise), is only modestly above the County's growth target, and violates only the limits on takeoff weight and seats. In fact, the first three criteria were misinterpreted and *not* met, so the Forecast, reportedly at FAA demand, has rejected all six community goals set by the Board of County Commissioners. In 2042, the new fleet would be imperceptibly (0.~~3~~7 dB) quieter, and ~40% more NO_x- and ~12% less CO_2-emitting, than the airlines' current jets. The FAA will reportedly reject slower growth or other aircraft—but *does* normally consider overlooked evidence and logic. Let's talk.

Proven alternatives, both operating and rapidly emerging, *can* meet all six County goals. Even if the FAA suspends discretionary grants, Aspen Airport can evolve and thrive. It can amply fund needed improvements by substituting $15+-million-a-year net revenues from restoring public control of the Fixed Base Operation—an imminent BoCC choice. We therefore recommend that the Airport Advisory Board not endorse this draft Forecast for approval by the BoCC, but ask FAA Staff to consider the evidence presented here as a new basis for accepting the lower forecast they rejected in its absence. That would defer bigger-plane choices. Meanwhile, the BoCC could restore a responsive public-interest FBO model (contractor- or County-operated), and explore the novel toolbox we've assembled for influencing all Aspen flights and impacts. Together, these steps could sustain robust Aspen airline service while meeting community goals for safety, noise, air, health, community character, and financial strength. If the FAA wishes to help, it could remain a cherished partner. If not, the County should continue to rely on the FAA's peerless safety skills, but defer any decision on bigger planes, keep its existing 95´ wingspan limit, and fund its own Airport design from its own FBO income at its own pace.

Introduction

On 20 April 2023, the draft official Forecast of aviation demand and fleet mix for Aspen Airport[1] was given to the Airport Advisory Board (AAB) for its review. They postponed their vote until they'd received and read the Forecast's 78-page report. On 18 May 2023, the AAB will resume its consideration and decide whether to recommend the Forecast for approval and FAA submission by the Pitkin County Board of County Commissioners (BoCC), or to make an alternative recommendation. To help support the AAB's, BoCC's, and public's evaluation, this Essay independently assesses the Forecast and its implications.

While we criticize below some aspects of how the Forecast was done and then presented to the AAB, we respect the forecasters' ability, knowledge, experience, and personal integrity. We also fully agree with them that every forecast is wrong, forecasts are not divine oracles, and a forecaster can only strive to create a reasonable, responsible, prudent, and appropriate-for-purpose estimate of how the future may unfold—something usefully between the unavoidable and the miraculous. We have the impression that these forecasters are under immense client pressure to find the indicated answer and produce desired impressions and outcomes. Having experienced such pressures ourselves in a half-century of global consultancy for the public and private sectors, and seen how the proverbial "Whose bread I eat, his song I sing" can influence honest consultants, we'd assign prime responsibility for any inappropriate results to the client demanding them.

We'll refer below to Pitkin County Staff as a surrogate for the Pitkin County Government, whose actions may not be wholly identical to the wishes of most citizens or even of the elected Board of County Commissioners. (Any student of local government will be aware of a common pattern in which capable County Staff, often more permanent than the elected officials they support, may form and advance more cohesive, consistent, and durable policies, often reinforced by confirmation bias.) We'll loosely say "the FAA" when we mean the FAA's Denver Airports District Office (ADO), a regional part of that very large and diverse organization. Both County Staff and the FAA's ADO are striving to achieve an Aspen Airport that can accommodate all Group III aircraft—but for different reasons. County Staff's motive is unknown, and some observers deny it exists, though we think it can be convincingly inferred from very longstanding behaviors. The FAA's motives are clear and rational: standardized airport designs and increased airport access.

In our view, the FAA's 11 April 2023 threat to withhold Aspen Airport discretionary grants[2], even for landside investments, if the County doesn't conform to its airside wishes is not playing well politically and may backfire: the County has other funding options that look even more attractive. It would be deeply unfortunate if recent events turned a potentially fruitful partnership into a collision. We hope this Forecast assessment may reveal important insights that may have been missed both by the forecasters and by the FAA staff who guided their work. We hope this information might help to make the FAA more receptive to a better Forecast—potentially opening a path to a graceful resolution that could meet both the FAA's and the County's needs.

What the Pitkin County Board of County Commissioners required

Pitkin County Staff continues full speed ahead[3] on a three-decade effort to bring more people to Aspen in bigger, heavier, fossil-fueled airplanes, both commercial and private. For its own

mission and functional reasons, the Federal Aviation Administration seems to concur. The only substantial obstacle is gaining the FAA's approval for a new Airport Layout Plan (ALP) to be based on an updated FAA-approved Forecast of airport use and airline fleet mix. That is the new Forecast whose 20 April 2023 review draft we assess here.

To govern that process, BoCC Resolution 105-2020[4] explicitly established these Core Community Goals for the Airport, as summarized by County staff on 20 April 2023[5]:

Core Community Goals for the Pitkin County-Aspen Airport
Resolution 105-2020

1. Safety in the air and on the ground
2. Reduce greenhouse gas and other pollutant emissions by at least 30%
3. Manage the growth of airline enplanements to be consistent with community growth management plans with input and assistance from the Airport Advisory Board to attain the core community goals for the Pitkin County-Aspen Airport. *
4. Reduce noise by at least 30%

*Manage the growth of airline enplanements to be consistent with approximately 0.8% growth per year

Resolution 105-2020's Goal #2 further specified the timing[6]: "Implement strategies to reduce emissions by at least 30% as soon as possible, but no later than 2030." The ~0.8%/y enplanement growth target was proposed and set by the County itself[7] as a "Guiding Principle" at the start of the 2019–20 ASE Vision community process, continuing throughout and after that process.

The AAB's role in approving Aspen Airport's airside redesign to accept bigger planes, defined in Task #12 and discussed on p 8 below, is unique and critical. Before authorizing that redesign in four sections[8], BoCC Resolution 105-2020 added this italicized Preface:

> *Pursuit of the work in the proposed Airport Layout Plan will not be approved by the Board of County Commissioners until such time as either negotiations with the FAA and/or the airlines, and other partners, or clear and convincing evidence in an updated fleet mix study indicate that only aircraft which are cleaner, quieter, and of certain size that will serve ASE[.]*

While the last line's syntax is obscure, its intent seems clear: *either* negotiations (with the FAA or operators or others or some combination—now reduced[9] to just the FAA) *or* "clear and convincing evidence in an updated fleet mix study" must first show that Aspen Airport's airline service will be provided only by "cleaner, quieter" aircraft "of certain size" (echoing the ASE Vision Community Character Working Group's call[10] for a capacity broadly similar to that of existing regional jets). While this preface is only a qualitative summary, its details are filled in by the specific Core Community Goals listed above—listed just before the BoCC Resolution's Goal #1, with "at least 30%" twice printed in boldface[11]—and supplemented by Goal #12's further instruction:

- Negotiate with airlines and FAA to achieve agreements with the county that ASE will be served by aircraft with the following characteristics:
  - greenhouse gas and other emissions that are significantly lower than the CRJ-700
  - quieter than the CRJ-700
  - weight limit of 140,000 [lb] MTOW
  - seat limitation of no more than 100-120 passengers

However, as we'll next see, the forecasters' 20 April 2023 brief to the AAB ignored all the 30% quantitative goals, cherrypicking only the qualitative versions; treated those cleaner-and-quieter goals as met by even a tiny improvement; tacitly changed the emissions comparisons from per-airplane to per-passenger, making emissions appear to shrink rather than grow; and contravened even the qualitative goal by shifting to a dirtier and noisier airplane for the next decade-plus.

The FAA's demands and the draft Forecast both violate all six BoCC conditions

The draft Forecast, pre-negotiated to meet reported FAA requirements, shifts to Embraer E175LR+EW[12] regional jets in the near term. After the assumed removal of the 95´ wingspan limit in 2032, Airbus A220-100 and A220-300 narrowbody jets gradually take a minority share (except in the lowest forecast, reportedly rejected by the FAA but using only regional jets). Here's how these aircraft and the enplanement forecasts contrast with the conditions set by the Board of County Commissioners in 2020, citing Forecast page numbers in curly brackets {}:

1. **CO_2 emissions**: per *aircraft*, which is how the BoCC's requirements are stated, the three proposed aircraft would emit 7–26%[13] more CO_2 per Landing and Takeoff cycle (LTO) than the current CRJ700 regional jets they'd replace. Having more seats, the new planes would emit 4% less CO_2 per LTO per *passenger* for the E175LR regional jet than the CRJ700, and 19–41% less for the bigger A220s. This would save total CO_2 *if* the new planes brought no more total passengers and from no farther away. However, the forecasters chose the A220s precisely because their higher capacity and longer range could bring in more people and on new routes, helping to fulfill the higher growth forecast—while inconsistently assuming (implicitly by using a per-passenger metric) that bigger planes emitting less per person will shrink CO_2 emissions by bringing no more people[14]. (Superefficient and non-fossil-fueled, usually electrified, planes *could* offset the added emissions, but aren't in the Forecast.)
2. **Air pollutants**: From the same data source[15], NO_x emissions *per passenger* per LTO are said to be 95% of the CRJ's for the E175LR, 49% for the A220-100, and 40% for the A220-300. But on the BoCC's criterion—per airplane, not per passenger—the unstated figures shift to 2.065 kg per LTO for the CRJ700, 2.306 for the E175LR, 4.014 for the A220-100, and 3.511 for the A220-300—again, all worse than the incumbent CRJ700. The forecasters also used total rather than per-LTO NO_x data, favoring the E175LR and A220-100. We found no data that would enable us to compare other air pollutants' emissions by these aircraft types[16].
3. **Noise**: No airplane considered is quieter than the existing CRJ700 until at least 2032. (Much quieter advanced models that we expect in service sooner than the new airside's 2032 target[17] are excluded from the Forecast.) On the contrary, the adopted E175LR is much noisier than the CRJ700—by an average of 1.7 dBA (range 0.8–2.5)[18], according to the forecasters' latest data after unspecified adjustments by Mr. Tomcich, but 5.1 dBA before them. The A220-100 averages 2.1 dBA quieter (range 1.1–3.6), and the A220-300, 1.5 dBA quieter (range 0.2–

2.1) than the CRJ700[19]—all modest improvements. To meet the BoCC's 30%-quieter target[20], replacements for the CRJ700 would need to be ~~nearly 6~~about 5 dBA quieter.

4. **Maximum takeoff weight**: The A220-300 that the FAA insists[21] on using as the critical design aircraft weighs 156,300 lb, above the BoCC's limit of 140,000 lb.
5. **Passenger seats**: The A220-300[22] has 130 seats in the Delta Airlines configuration, or 140 in the ASE Vision ICAO/Kimley Horn database, or up to 150 in other configurations. All exceed the BoCC's limit of 100–120 seats. (ASE's highest capacity historically was the 100-seat BAe 146-300, and ASE Vision could tolerate 10–20% more[23].)
6. **Enplanement growth**: the reportedly FAA-mandated 1.3%/y enplanement growth assumption is five-eighths faster than ASE Vision's Common Ground Recommendation and the BoCC's Core Community Goal of ~0.8%/y[24]. It is also more than twice the forecasters' own lower-range case (0.6%/y). Via exponential arithmetic, the half-a-percentage-point excess of the FAA's over BoCC's target yields a 5% higher value after 20 years, 10% after 50 years, and more later[25]; the forecasters consider these differences reasonable or negligible. Compared with *2022* enplanements, 1.3%/y is +14% in 10 years, *+29%* (actually 31%) in 20.

The forecasters told the AAB that their Forecast's fleet met the BoCC's criteria for greenhouse-gas and other emissions ("significantly lower than the CRJ-700") and were "Quieter than the CRJ-700." But they compared emissions per passenger, not per airplane as the criteria are written, and referred to the longer-term A220 aircraft rather than the short-term E175LR aircraft, which they agreed[26] is dirtier and noisier than the CRJ700. These distinctions were not briefed to the AAB, which was only shown green type on a slide listing criteria "that had been met[27]," and acknowledging unmet requirements *only* for items #5 and #6[28]: "Those are the two things that did not line up with the Common Ground recommendations." That's incorrect: Common Ground emphatically featured the overlooked –30% noise and emissions goals[29]. The briefer later said[30] the C220-300 "meets all of the [BoCC's] noise and emissions criteria" without mentioning that it falls far short of the specific –30% goals and uses an unauthorized per-passenger metric. Thus the brief misrepresented the BoCC's criteria #1–3, selectively reading the BoCC's goals and context to imply that the Forecast fleet mix satisfies these criteria when in fact it does not. In fact, *none* of the impact goals is met, even on a per-passenger basis. Our Exhibit 1 now shows this in two parts—first just for aircraft characteristics, then adding growth in aircraft uses:

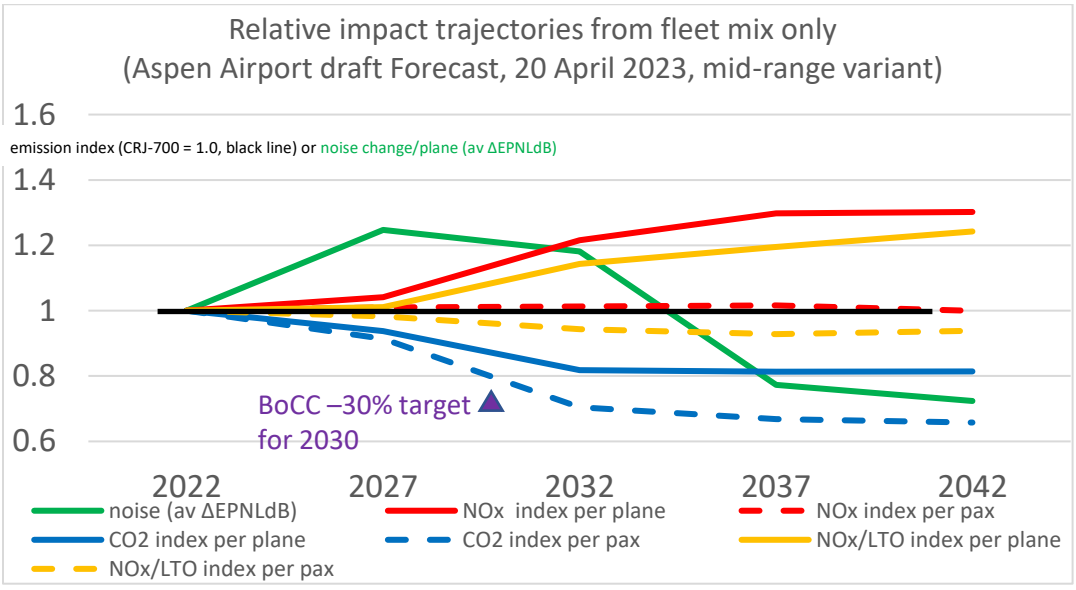


Exhibit 1a. Actual 2022 and projected 2022–42 Forecast impacts caused by changing the fleet mix from continued operation of CRJ700s (the black line with index value 1.0). Curves above the black line show noise or emissions worse than the current fleet. Each curve graphs the evolution of one kind of impact from each of the four forecasted commercial aircraft as their mix evolves, weighted by each type's share of airline operations and then summed. The green line shows the change *in noise (average EPNLdB[31]); the long-run decibel reduction shown is 0.7 dB, but meeting the County's 30% reduction target would require ~~nearly 6~~about 5 dB. The red lines show NO_x emissions averaged over all flight segments (mainly faraway emissions at cruise); the yellow lines show NO_x emissions per landing and takeoff cycle (LTO, emitted on or near the airport); and the solid lines are per airplane, the dashed lines per passenger ("pax")—the metric used by the forecasters. The blue lines show CO_2 emissions per LTO—the solid line per airplane, the dashed line per passenger. The magenta triangle shows the Board of County Commissioners' Resolution 105-2020 goal of cutting CO_2* and *air pollutants (plus ~~and~~ noise, not comparably graphed because dB are logarithmic rather than linear units) by at least 30%[32] by 2030. Against that benchmark, we show the airline fleet here at its 2022 rate of operations, and next (Exhibit 1b) with the forecasted 25% growth in airline flights and 31% in airline enplanements. Those airline fights are forecasted to drop from 21.8% of total Aspen Airport operations in 2022 to 19.0% in 2042; nearly all the rest are General Aviation and air taxis whose enplanements and impacts are unknown and are not constrained by Forecast assumptions.*

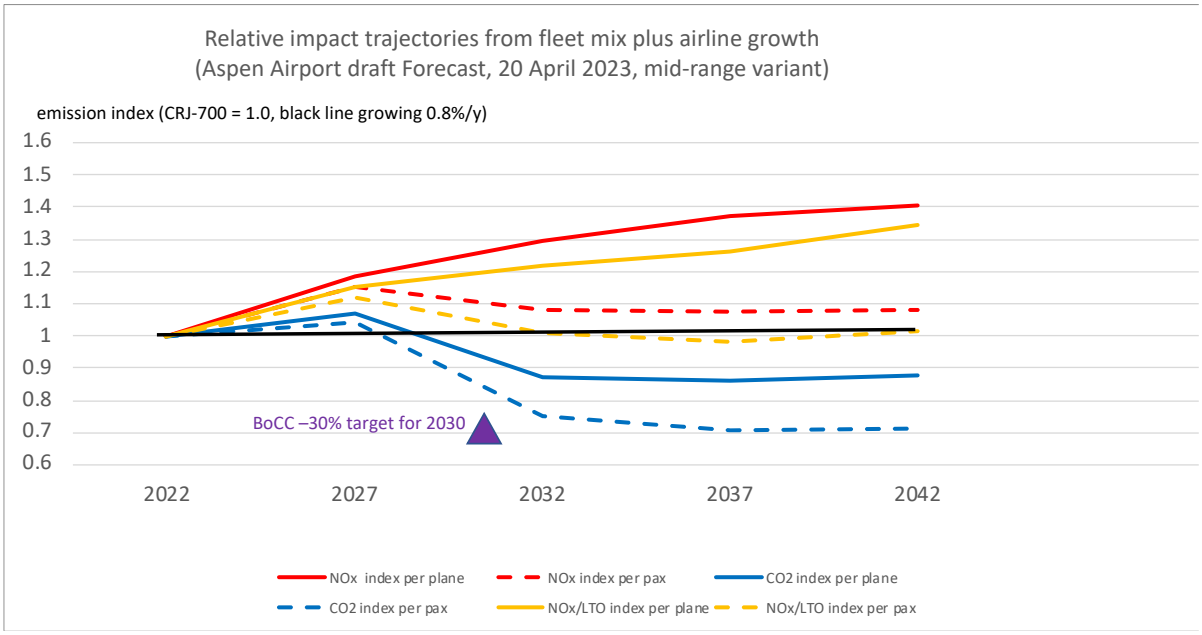


Exhibit 1b. The same graph as Exhibit 1a but adjusted for the forecasted mid-range growth in airline operations. This graph doesn't include noise because its logarithmic decibel scale can't be linearly scaled by the number of aircraft, though more flights would mean more noise events. The graphed lines correspond to those in Exhibit 1a, but are multiplied by each year's forecasted commercial operations growth. This is less than the forecasted 1.3%/y enplanement growth because the planes roughly double in size, growing from 70 to 76 to 109 to 130–140+ seats. For fair comparison, the black line, showing an emissions index of 1.0, shows the impacts of continuing to operate the CRJ700 fleet, scaling its operations at the County's target enplanement

growth rate of 0.8%/y, or 17% growth over 20 years. The colored impact lines don't reflect any net impacts from all the bigger airplanes—some quieter, some noisier, some cleaner, some dirtier—that could land at Aspen if and only if its airside were rebuilt to accept the bigger Airbus A220 aircraft demanded by the Forecast. As we'll see, the forecasters ignored that effect, and didn't present the data needed to analyze it; they forecasted 32 kinds of generally better planes, but not the much worse ones that concern the public, such as private 737s and A319s.

These graphs reveal that adopting the midrange Forecast proposed to be submitted to the FAA would miss all of the County's CO_2, air-pollution (using NO_x as a proxy), and noise criteria, generally by wide margins. Indeed, only CO_2 per passenger would about achieve the 30% goal, for a few years around 2037 before starting to rise again. Using any metric (except per take-off/landing cycle—not the metric the forecasters used—*and* per passenger, not the metric the BoCC used), NO_x would remain higher than current emissions. Per airplane, NO_x would keep on rising. The forecasters' claim that they have met the County's conditions thus depends on (a) changing the denominator from per airplane to per passenger; (b) to support that shift, tacitly assuming, without evidence, that letting in bigger airplanes won't offset the forecasted long-run A220 planes' modestly lower impacts per passenger with higher impacts from dirtier and noisier old private planes that the same airside changes would irreversibly allow; (c) ignoring the E175LR's documented lower summer capacity that would require more flights to carry the same passengers, and (d) counting *any* eventual improvement as compliant, rather than the specific at-least-30%-by-at-latest-2030 targets specified by the Board of County Commissioners.

Of note, if better planes, radars, and other improvements raise airfield capacity from ~32 to ~40 operations per hour in visual meteorological conditions (good weather), as predicted[33], then the intensity or frequency of air pollution, CO_2, and noise experienced around the airport would rise unless the average plane got one-fifth better. This requirement would become even more stringent if the ~5–6× more numerous non-airline planes were included, or with further infill at non-peak times and seasons. Citizens may be alarmed by the prospect of *more and* bigger planes, bringing more total people (often on new routes) plus any newly permissible use of more, larger, heavier, and possibly worse non-airline planes. These outcomes would advance the FAA's goal of maximizing access, but with higher community impacts (Exhibit 1). The greater the access, the greater the burden on operating aircraft to cut impacts per plane, and the wider the already large gap between the BoCC's requirements and the FAA's ambitions.

The forecasters' 20 April 2023 brief to the Airport Advisory Board presented their enplanement growth projections and aircraft choices as already negotiated with the FAA[34], and therefore offered to the AAB and BoCC only to adopt and submit or to reject, not to amend. The ALP process is supposed[35] to "Reconcile community goals with FAA criteria," but the FAA's reportedly rejecting every community goal up front means that "reconcile" must come from the BoCC's abandoning all six of its declared community impact goals. Occurring at the County's two critical decision points (AAB and BoCC), this reported all-or-nothing offer, coupled with the FAA's explicitly coercive use of discretionary funding (even for the urgently needed passenger terminal) to enforce its will on the County[36], is not a promising way to forge a collaborative partnership built on mutual trust and confidence.

The community may well see circular logic in building to meet FAA's growth forecast to get the grants to bring in more people, thus making the Forecast a self-fulfilling prophecy. If that's the FAA's price to help (in some unknown degree) to fund the passenger terminal, it would seem easier, more flexible, and more financially attractive to keep FBO control, redirect FBO revenue into Airport needs rather than remote private-equity-fund shareholders, and carry on at the community's own pace, as our 4 May 2023 Essay #14 showed is feasible[37]. The Forecast brief to the AAB didn't mention[38] this option—only the "need" for major FAA grants. A simplified straw estimate[39] suggests that the County's net costs could *decrease* if it lost FAA discretionary grants by deferring the demanded airside decision. If so, the net cost of achieving the County's goals could be *negative.* The AAB and BoCC should assess and refine that preliminary analysis.

The Airport Advisory Board's review process

The BoCC's Task #12 charges the Airport Advisory Board (AAB) "to evaluate the success of the negotiations and/or the outcome of update[d] fleet mix studies and make an alternate recommendation if necessary." As expected, the instructed airline negotiations did not occur and are no longer proposed. The updated fleet mix study whose draft we assess here has already been conformed to the FAA's demands, based on the FAA's limited information from County Staff and consultants, but uninformed by independent insight or participation. Thus the AAB's original multi-part mandate has now collapsed into just one: evaluating the Forecast and choosing whether to take it or leave it[40]. We'll revisit that choice in our final recommendations (pp 32–34).

In this challenging context, the AAB met on 20 April 2023 to consider whether to transmit and recommend the draft Forecast to the Board of County Commissioners. The forecasters, from County consultant Jacobsen | Daniels, orally presented and discussed their slide brief[41]. Their 78-page Forecast report was not distributed in advance, nor during the brief when requested, nor at any time before the Vice Chair proposed a vote on it right after the brief. Wisely, the AAB declined to vote until they had received and read the underlying Forecast report. Paper copies were distributed to them only in the last five minutes of their two-hour meeting. Further discussion and voting were postponed to the next meeting, on 18 May 2023. That delay made possible this unsolicited Aspen Fly Right assessment to support the AAB's informed evaluation.

However, the AAB is still missing one other element vital to that evaluation, because the FAA is claimed[42] to have prohibited including future uncertified aircraft in the Forecast. The AAB is charged[43] to "evaluate…the outcome of update[d] fleet mix studies and make an alternate recommendation if necessary." Future aircraft are clearly a critical tool in achieving the BoCC's ambitions. Yet the AAB has as yet received no independent information about those technologies.

Aspen Fly Right prepared an extensive technical brief[44] on future aircraft in October 2022 and published a detailed Essay #5 synthesizing it in January 2023[45]. Jacobsen | Daniels and the Airport Director received the brief on 19 October 2022 with notable enthusiasm[46] and no corrections (despite multiple requests for any). Aspen Fly Right was promised that the brief's content would be presented to the AAB. However[47], that promise was not kept: "The sole summary[48] stated to the AAB said in its entirety that Amory Lovins had 'share[d] a great deal of time to walk through his philosophy on where he sees the electric and hydro-electric [misspoken for hybrid-electric] industry evolving to....'" The AAB was told none of the content, nor that the

"philosophy" was a technically rich analysis, undisputed and warmly received, nor that it contradicted the official narrative (now including that of the Forecast itself). Despite several reminders, a longstanding offer to present these findings to the AAB for detailed discussion has so far yielded no scheduled briefing (though the Chair says one will be invited at some point). It seems County Staff have other priorities, and prefer the AAB to evaluate the Forecast before receiving this information. We also do not know if the FAA officials working with the County and its consultants have read our materials on new aircraft or on any other topic. The County, as far as we know, has not cited or mentioned our Essays in any public context (let alone rebutted any), yet is the sole public conduit to the FAA. Perhaps if the FAA were exposed to our technical analyses, its skilled staff might be more receptive to considering—as we know some other parts of the Agency do—the major implications of rapidly emergent and industry-credible aircraft not yet certified. It would be even more important for FAA officials working on Aspen Airport's Forecast to see *this* Essay. It may change the conversation about which forecast is most realistic.

Returning now to the narrower focus of what the Forecast *did* cover, we'll next show that it's analytically flawed, in ways often candidly revealed in the written report (though not characterized as flaws) but seldom clear in the forecasters' slides or brief. This discrepancy leaves the unworthy impression that County Staff hoped to procure the AAB's endorsement of a flawed analysis before becoming aware of its deficiencies. We explain next how the draft Forecast mishandles the choice and use of its modeling tool, systematically exaggerates plausible enplanement growth, assumes unconstrained lodging despite severely constrained actual Aspen-area lodging capacity and growth, and reaches unsound conclusions unfit for policy guidance.

FAA demands vs. community needs and values

Not only must the County's consultants conform their assumptions and methods to the desires of the FAA officials with whom they privately met, but as an extra check, their Forecast must also be within 10% in the next 5 years, or 15% in the next 10 years, of the FAA's own "TAF" forecast[49] of Aspen Airport air-travel demand—or at least, appropriately, any wider divergence must be explained and justified by evidence to the FAA's satisfaction (as this assessment could help to do). TAF is driven by macroeconomic national, regional, and metropolitan economic growth projections—currently set[50] at 2.0%/y for the next 10 years and 1.9% for the next 20 years. Economic growth generates more air travel, which the model assigns to routes, aircraft, and airports without considering any information about any airport community's constraints, conditions, or goals. It's thus not surprising that as forecaster Brad Jacobsen delicately told the BoCC and AAB[51], "the community position [and] the FAA position…did not align perfectly." Indeed, they now seem diametrically opposed. As Mr. Jacobsen told the AAB, the BoCC may set growth management goals to "keep the quality of life…and the magic that is this area," but for the FAA "that's a no-no"[52] and will be ignored. So what would the County be signing up for, now and later, by approving this Forecast (with future updates) and accepting the process that produces it?

By 2050, TAF expects Aspen to enplane a *half-million* passengers (500,406)—two-thirds more than in 2022. The bigger the US economy, the more planes Aspen must build to accept, of every safely landable kind up to 118´ wingspan, up to the expanding limits of the Airport's safe airspace and air-traffic-control capacity (forecasted to rise from 32 to ~40 maximum operations per hour by 2042 in good weather[53]). That's central planning, not home rule. The only FAA-permis-

sible limits our community may impose are on gates, terminal and curb space, and ground parking—constraining arrivals by creating an unpleasant guest experience. *Only because those undesired tools exist* to replace one set of bad outcomes with another, FAA's ex-Chief Counsel reassured ASE Vision that the Airport expansion need not be a growth driver[54]. He offered two ways to manage aviation growth: making the Airport an overcrowded bottleneck that guests are loath to use, or adding "access" for only as many guests as the airspace and Air Traffic Control can fit, even if there's no room for them in town. Neither is an attractive choice.

We already learned that the FAA doesn't care if the community doesn't want 737s, A319s, or A220-300s that could have over twice the seats of current regional jets—overwhelming the unmentioned Valley-wide potential for emergency medical response[55]. So long as County Staff represent bigger planes (of all types below 118´ wingspan) as the community's will, the FAA will require those planes and their often older, dirtier, and noisier private versions to be admitted.

But now we also learn that the ALP decision process puts Aspen Airport into the chute of planning and building our Airport to accept far more people, whether or not they have any place to stay, and turning Aspen into something other than its citizens want. That is not a critter most community members or elected officials will choose to ride. The Aspen area, already near if not beyond its lodging limits, may not be eager to abandon a half-century of increasingly sophisticated growth controls to suit a Federal agency's homogenizing air-traffic goals. The strong assurance to ASE Vision that airside expansion "doesn't dictate growth"[56] is explicitly belied by the forecasted traffic growth that the FAA expects and for which it wants new infrastructure built. Of course, it makes no sense to rebuild our Airport to bring in more people than can stay around Aspen, but the FAA counts no lodging constraint: as much lodging and every other resource as is required to accommodate the projected arrivals will magically appear.

The forecasters showed the AAB[57] a series of comparisons implying that the difference between that Core Community Goal and the forecast isn't very important—by the time it's averaged over the whole year (not mainly in peak periods) and every day of the week (not mainly change day). It's a clever trick, but unconvincing. Five more passengers per average day does not mean five more *on* any specific future day than today, but *adding* five on each and every day. It means today's enplanements will be five more tomorrow, ten more the next day, 15 more the next day, etc. Over the 20-year Forecast, that average 2,005-per-year extra enplanement growth (the Mid-Range forecast minus Common Ground's 0.8%/y) adds up to 40,092 people. Or compared with 2022, it's 4,584 more per year, or 91,673 total. That's a lot of added pillows and other stresses on an already overcrowded community with roughly 6,000 residents. The TAF comparison {45} may further increase local concern.

This brings us back to the AAB. The County Manager told the BoCC[58], "The Airport Advisory was created because they [the Commissioners] understand that there's still going to be some negotiation between what the community wants as part of this Vision process and what the FAA will require, and that we're going to have to come up the smartest compromises, and this body has definitely been taxed with that…." FAA procedures now appear on a lamentable collision course with community conditions, needs, and expectations, with no compromises offered—but some possibly available if the AAB wishes to recommend them and the BoCC is willing to

pursue them. To see how, let's now explore the 78-page Forecast report that the AAB declined to vote on without reading it. The wisdom of their choice will soon become clear.

How the enplanement forecast was built

Jacobsen | Daniels, chiefly its Director Bill Flock, created three 20-year forecasts from 2022, of which the middle one "is considered the 'best estimate' or base forecast for planning purposes and will be submitted to the FAA as the ALP Update forecast" {29}. Mr. Flock and Mr. Jacobsen (the study director) told the AAB[59] that they consider *all three* forecasts "realistic"; their 2042 range's ratio of 1.41:1 would simply illustrate inherent uncertainty. They gave no reason to believe the middle forecast more, nor to consider it the "most likely," except that the FAA agrees with it and has rejected the lower forecast. But where did these three forecasts come from? Each from a simple regression—an arithmetic calculation that runs in an instant on a laptop or a good hand calculator that can be operated by an intelligent middle-schooler.

This method simply calculates how well the variance[60] in one parameter can be statistically "explained" by the variance in another parameter. But that "explanation" is only about the two parameters' *statistical correlation*, not about whether one parameter *causes* the other. Correlation never establishes causation; that's a classic logical fallacy called *cum hoc ergo propter hoc*. Causality depends on underlying processes, relationships, and feedbacks. Two correlated events may be causally related if either causes the other; or they may share a common cause; or they may have no causal relationship and their correlation may be coincidental; or some combination of these. That two events are statistically correlated, fluctuating in somewhat similar patterns over time, says nothing whatever about the existence or direction of causation between them, nor about the potential (instead or additionally) for them to share one or more common causes.

Causation is a venerable and tangled subject in philosophy, science, and statistics. Causation flows through time, and it can exhibit necessary or sufficient conditions. But conjuring it from mere correlation is an elementary error. A military intelligence analyst's droll website called Spurious Correlations documents 30,000 examples[61] showing, for example, that the 2000–09 divorce rate in Maine was very strongly correlated with the per-capita consumption of margarine ($r^2 = 0.9926$). Avoiding such bloopers and establishing credible *factual causality* requires correlation *plus* three other things: cause preceding effect, a mechanism explaining how cause produces effect, and careful control of confounding variables. The Forecast provides only correlation—probably a spurious one[62]. Yet the FAA's basic guide to forecasting aviation demand[63] begins with this forthright admonition (with emphasis added):

> *Forecast methods used to project airport activity should reflect the underlying causal relationships that drive aviation activity.* Aviation activity levels result from the *interaction of demand and supply factors*. The demand for aviation is largely a function of demographic and economic activity. Supply factors that influence activity levels include cost, competition, and regulations.
>
> The forecast methods discussed in Step 4 should be selected and applied in order to *measure the underlying causal relationships*. Typically, *passenger enplanements can be modeled as a function of variables* such as real personal income and real yield (as a measure of fares). The number of commercial operations, in turn, is a function of passenger enplanements as well as operational factors (including average load factors and average seats per aircraft). General aviation activity is

> largely determined by local population and income levels, the cost of flying, and the number of based aircraft at the airport.

More detailed guidance from the National Academies[64] elaborates these themes. Neither source suggests or endorses the simplistic approach of this Forecast: relying on one [causally remote] variable, without counting economics or competition, causality or constraints.

Unusually, the County's consultants also based each of their three forecasts on projections of a *different* independent variable. Their low forecast calculates Aspen enplanements *solely* from Colorado employment {69}; their middle forecast, from Colorado real income {71}; their high forecast, from US real income {74}. These three datasets are loosely related to each other. Their causal relevance to Aspen enplanements might reasonably be inferred from flights between Aspen *and other Colorado origins/destinations*, but Colorado provided only 3% of Aspen's 2022 O&D passengers {18}, making Coloradans' economic condition an inherently sparse surrogate for predicting Aspen enplanements—one-tenth as important as, say, the combined Los Angeles, New York, and Chicago markets. National income, the basis of the high forecast, should indeed bear some causal (if fuzzy) relationship to total US-originating flights to Aspen; but then why does national income apparently not correlate as well (no comparison is shown) with the two lower forecasts, which instead use Colorado-only independent variables? Why does each growth rate need a different independent variable? Why should one independent variable be preferred to another? And why does the "best estimate" forecast show the tied-for-lowest correlation?

Further modeling issues

All three forecast equations are very simple. Each consists of the independent ("explanatory") variable (employment or income) multiplied by a fixed number ("slope coefficient") to specify how big a rise in enplanements is correlated with a given rise in income or jobs. A second fixed number ("intercept coefficient") is then added to that result make the line-graph start at the right level. That's it: pick an independent variable, find a table of how it varied over time, turn the linear-regression crank to get the two coefficients, apply that equation to someone's forecast of the independent variable, then call the result a "forecast" that "predicts" the dependent variable (enplanements). There is no wizard behind the curtain. There is no causality. The model knows nothing about whether it refers to Aspen or Ypsilanti, to enplanements or elephants.

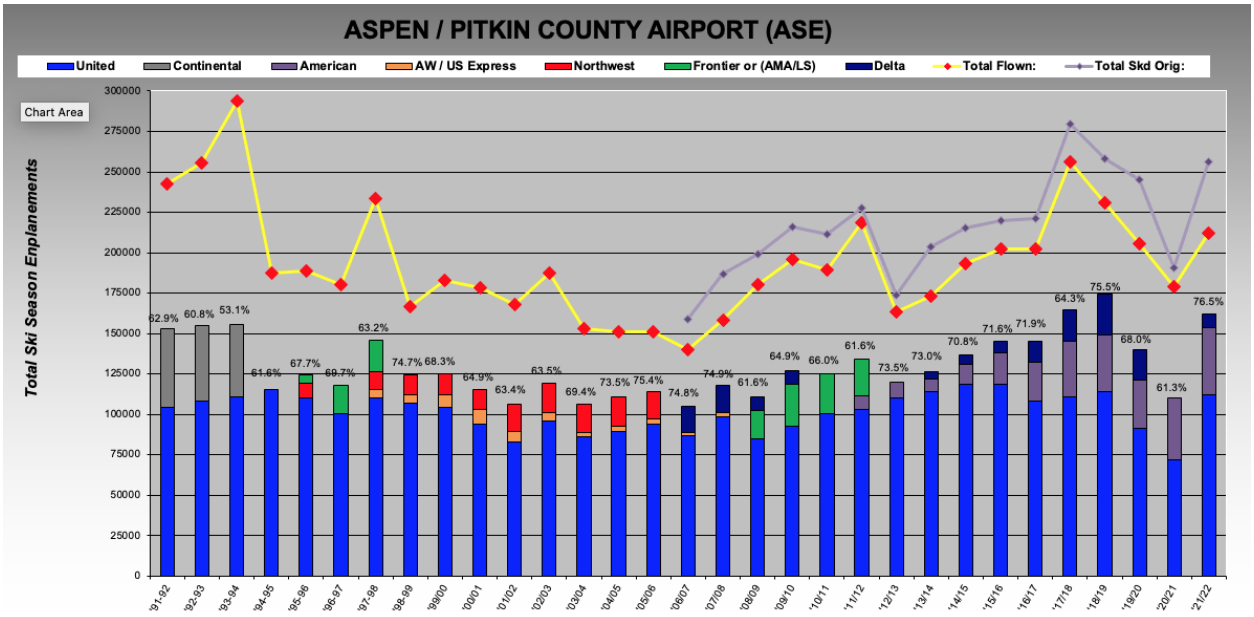
The functional form is assumed to be linear, regardless of the causal mechanisms actually operating. Prices and elasticities are ignored, thus implicitly assumed constant. Passengers are assumed homogeneous, with no cohort analysis (as the FAA guide's pp 13–14 sensibly suggests). There is no analysis of the sources or sizes of uncertainties. There is no backcasting or other test of whether the method used would have accurately predicted observed historic behavior from the data previously available; this seems unlikely, given the many large past shifts observed in both the rate of change and its direction. The lead forecaster, asked if his methods would have predicted ASE's current ~83% General Aviation share of operations, replied[65], "Probably not." If a simplistic method has not previously provided accurate foresight, why keep using it, and why rely on it to determine the County's biggest-ever investment?

The forecasters reassured the AAB that their "industry-standard method"[66] used "the data." Of course. But it was neither a sound method for this important task nor properly applied. (If

someone at the FAA thinks it was, we respectfully invite his or her attention to this Essay.) A half-century of global experience in science, data, technology, business strategy, and energy forecasting feeds this author's deep skepticism that any competent company, like a major airline, would dream of staking its future on a one-variable linear regression about anything. This Forecast thus evoked a reaction somewhat less restrained than that of a famously circumspect scientist (the author of a noted text on scientific tools and methods) who on seeing the Forecast commented simply: "Yikes. This is not a good way for them to analyze these trends."

The forecasters apparently tried various basic macroeconomic data series (none named or shown, margarine probably not included) to see which could best match the 1990–2019 variance in Aspen enplanements, then they picked three that best fitted the bouncing datasets. It's reasonable for them to stop in 2019, missing the pandemic's 2020–21 slump and nearly equal recovery. However, only one of their report's enplanement *graphs* starts in 2000 {31}, the main forecast graphs start in 2010, and no graph shows 1990–99, whose data are in the regression datasets at {70} and {73} and are actually used to generate the three Forecast variants. These discrepant dates make it much harder for readers to visualize and understand the data.

The extra decade of used but ungraphed data for 1990–99 is revealing. In its first half, nearly linear growth averaged 7.5%/y as Continental Express shifted from 50- to 70-seat planes. In the second half, a fluctuating *decline* averaged –0.7%/y[67]. This added decade of context reveals that starting in 1990 (earlier data aren't provided), the "quiet period" of flat enplanements was a full *18 years (1995–2013) averaging essentially zero growth—more precisely, 0.06%/y*. Indeed, the 2013 enplanement, just before the brief 12-fold acceleration in its growth, was 2.6% *below* the local peak in 1998 {70}. Go back a few years further, using the ski-season graphic graciously shared by Bill Tomcich[68], and you discover that *winter* ~~enplanements (bars) and~~ actual winter seats flown (red dots, yellow line) were higher in 1993/94 than in any winter since. So Aspen's ski-season seats flown peaked 30 years ago, then fell more and longer than they rose:



Even 2022/23 had fewer ski-season emplanements than 1991–94. Does this mean that future Aspen winter enplanements should be forecasted as a *declining* trendline for the next two dec-

ades? That depends on where you choose to start your curve, and whether you have a bias toward growth. With so many fluctuations both ways, this causation-free method can yield almost any result you want. Starting the forecasts' graphs in 2010 further conceals the long-term patterns.

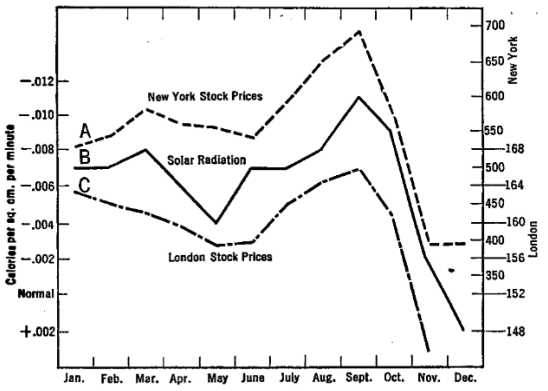
So returning to the Forecast: unstated behavior before 1990, then five years of growth in 1990–95, then 18 years of flat enplanements in 1995–2013, then the huge growth spurt in 2014–19, cannot be validly summarized by a *single average* growth rate, let alone one starting ten years after the regressions begin. Rather, it's what data analysts call a "triphasic" curve, exhibiting three very different behaviors successively. A simple linear regression on triphasic data yields results as meaningless as computing a person's average rate of gaining height over a lifetime that combines the successive phases of infancy, childhood, adolescence, adulthood, and old age, and attempting at any age to forecast future height gains from the average rate so far. After age 40, this method will generally get the sign wrong, predicting further growth as the person shrinks.

The underlying fallacy of tacitly inferring causality from correlation

In the forecasters' three variants, the chosen independent variable respectively "explained"—in the statisticians' special sense of that word[69]—0.71, 0.71, and 0.83 of the variance in 1990–2019 Aspen enplanements. A correlation of 0.71 isn't strong; it means 0.29/1.00 of the enplanement variance is statistically correlated with some unknown factor(s) other than the independent variable. That's better than throwing darts, but it creates an illusion of foresight from zero insight into causality. Strong correlations in the physical sciences are typically at least 0.90. A correlation of 0.71 (actually a few hundredths less in the more-rigorous "adjusted" version) implies a loose association between two sets of numbers, and a need to understand what's missing. "We should not be impressed with a high, or even spectacular, correlation unless there is a logical explanation….[70]"—especially when two variables both grow over time, but for different (though perhaps linked) underlying reasons. Consider the "reported positive correlation between stork nests and human births in northwestern Europe. Few believe that storks bring babies. A more logical explanation is that storks like to build their nests on buildings. Where there are more people, there are usually more human births as well as more buildings for storks to build nests." Another common example of two datasets with a shared cause is that ice-cream consumption and murders are well correlated and are significantly higher in the summer, but without either causing the other.

So how do those job and income data *cause* Aspen enplanements? The link, the causal nexus, is at best tenuous. A bigger Colorado or US GDP or more Colorado jobs can doubtless encourage and enable more trips to Aspen—*and* a zillion other effects anywhere, including some small but nontrivial reverse effects as Aspen trips slightly boost Colorado jobs and income. But you could probably get an even better statistical fit by searching a database of random things historically exhibiting growth—perhaps the sales of your favorite soft drink. Any datasets that happen to have behaved similarly to historic Aspen enplanement data are candidates to fit those data even better than the adopted independent variables did—as some would—yet they'd have scarcely less claim to validity than the Forecast's chosen variables. It's that simple—and that far from real causal relationships. As global data authority Edward R. Tufte wrote[71],

> Of course, statistical graphics, just like statistical calculations, are only as good as what goes into them. An ill-specified or preposterous model or a puny data set cannot be rescued by a graphic (or by calculation), no matter how clever or fancy. A silly theory means a silly graphic:



SOLAR RADIATION AND STOCK PRICES

A. New York stock prices (Barron's average). B. Solar Radiation, inverted, and C. London stock prices, all by months, 1929 (after Garcia-Mata and Shaffner).

It's not silly to assert that a more vibrant economy could be *correlated* with flights to Aspen, but to suppose that it can *predict* future Aspen enplanements in any meaningful sense, substitute for all specific information about Aspen, and justify a huge investment to enable more people to fly to Aspen, is irresponsibly untethered from causal reality. A serious business in Aspen would consider any one macroeconomic series to be at best an early single step in a long analytic journey to understand *what actually causes and influences* a specific result like Aspen enplanements.

The wrong tool for the job

Simple regression is a widely used method, apparently accepted and expected by the FAA, because it's easy to do and creates a superficial impression of rigor. But it's far more simplistic and less reliable than the sophisticated methods used by serious forecasters across the range of science and technology—and far riskier to rely upon, because it's virtually unrelated to what actually makes people more or less likely to fly to Aspen. The Forecast's enplanement analysis has *nothing whatever* to do with anything specific to Aspen or to any other resort community. It's unconnected with snow, weather patterns, flight and lodging availability and prices, event and school and holiday schedules, or any of the other influences on which the marketers and providers of Aspen's offerings focus because they know those variables actually affect Aspen visits.

In contrast, the Forecast seeks one vaguely related Colorado- or national-level macroeconomic parameter that roughly mimics how Aspen enplanements varied in 22 or 29 recent years, then assumes their past correlation will continue, then assumes the independent variable can be and is being accurately forecast (a testable historical proposition), and then assumes that the correlation implies causality supporting a degree of confidence that justifies a nine-figure investment. That's a four-layered nonsense cake. The relationship between Aspen flights and Colorado income is casual, not causal; remote, not direct; tenuous, not tight. The result therefore has limited value for foresight[72], but major risks of systematic bias, erroneous quantity, and even wrong sign.

Misapplying the tool

How the Forecast *uses* its ill-chosen tool creates further analytic problems. Historic Aspen enplanements are a small and rather "noisy" dataset (Exhibit 2), exaggerating the effect of outliers and unusual events. Fluctuations in prosperity, snow, airline prices and offerings, school

and event schedules, public health, and a myriad other factors, known and unknown, make the numbers bounce around. And any dependence *between* these variables can void the mathematics underlying regression analysis.

One can ignore such issues and make a scientific wild-assed guess (SWAG in military parlance) that whatever was happening in the past will keep happening at the same rate. But what if something stops it? The forecasters skipped that possibility and simply drew a straight line that best fitted past jitters, as in Exhibit 2—the Forecast's Fig. 6 {31}, which extrapolates 22 past years into 20 future years using the same average linear growth rate. This method heroically assumes that any factors that change the linear long-term trend or its appropriate functional form (linear or some other shape) will cancel each other out. Not surprisingly, this 2000–22 linear trendline analysis based on no correlation with any independent variable turned out to yield a result similar to that of the 1999–2019 linear regression based on Colorado income (despite their different periods that make the curves noncomparable), so the forecasters adopted the regression.

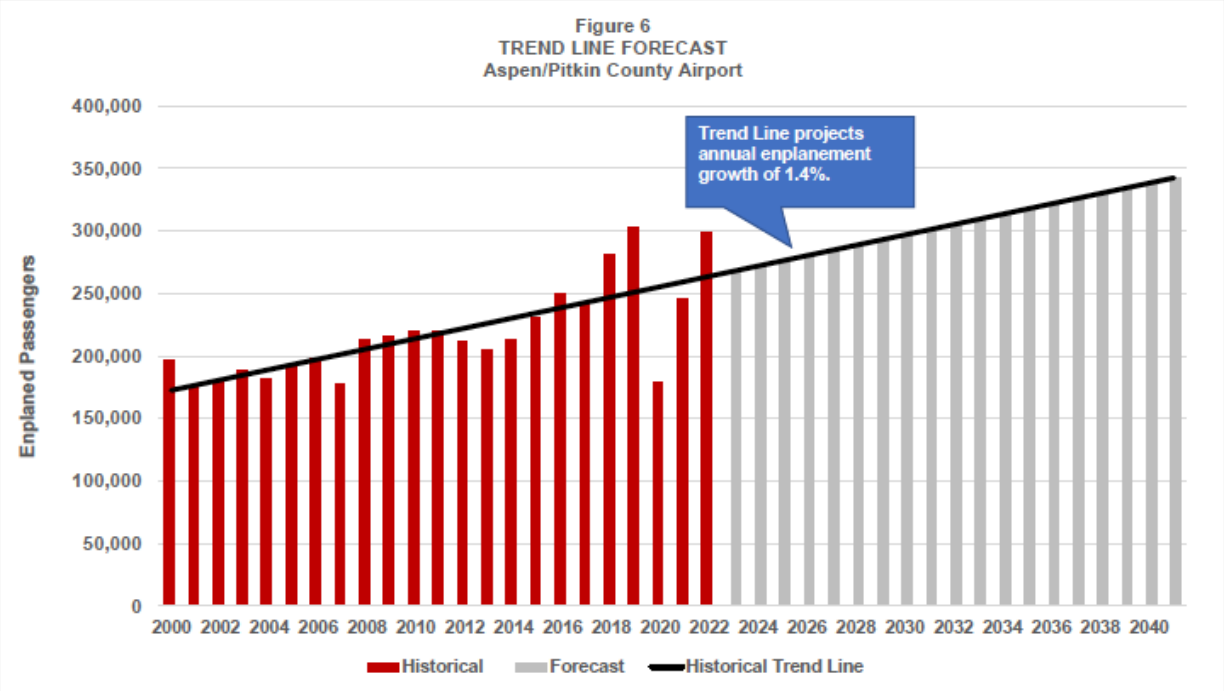


Exhibit 2. Extrapolating 2000–22 enplanements to 2042 by a simple linear trendline.

But the simple linear extrapolation yielded a result quite sensitive to past patterns, in ways that merit a deeper look. If we ignored the relatively sedate first decade in the red bars in Exhibit 2 and looked just at 2010–22, we'd see what might seem like pretty steady growth in 2010–19, especially in 2014–19, followed by the pandemic's slump and near-recovery (which forecasters understandably and rightly tend to skip or treat as a dummy variable but which if included would have reduced the trendline's slope). That's what shows in the Forecast's core prediction graph {33} in Exhibit 3. So then what? Just do the simple-regression magic based on a single selected macroeconomic variable, and out pop three forecasts to 2042, of which the heavy red line is the "best estimate" meant to go to the FAA:

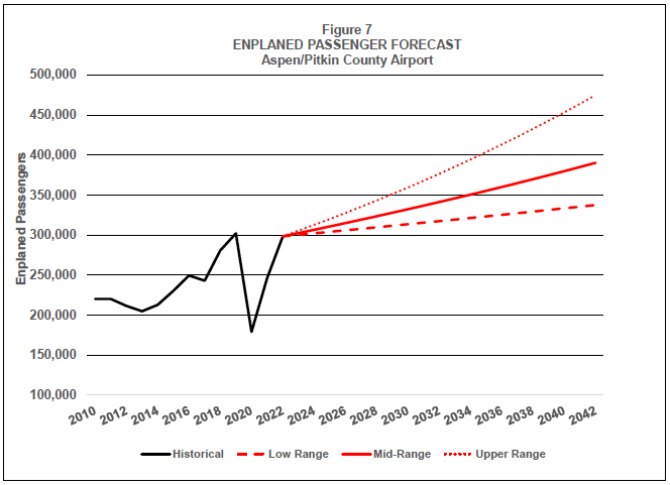


Exhibit 3. The three red enplanement forecasts, continuing from 2010–22 data shown in black.

Misapplying the wrong tool conceals a vital causal hypothesis

But the regression's math is trying to fit or statistically "explain" past data. To make sure the explanation isn't misleading, shouldn't we check if some of their dips and bulges might have had specific causes that we need to understand better? Might something not shown in Colorado income data have shaped those past fluctuations—perhaps something Aspen-specific and temporary that shouldn't necessarily be interpreted as a long-term trend? Yes—and a potentially key causal candidate is hiding in plain sight. Magnifying the black curve just above, and starting it in 2000, creates the most striking slide in the forecasters' 20 April 2023 AAB brief[73] (Exhibit 4):

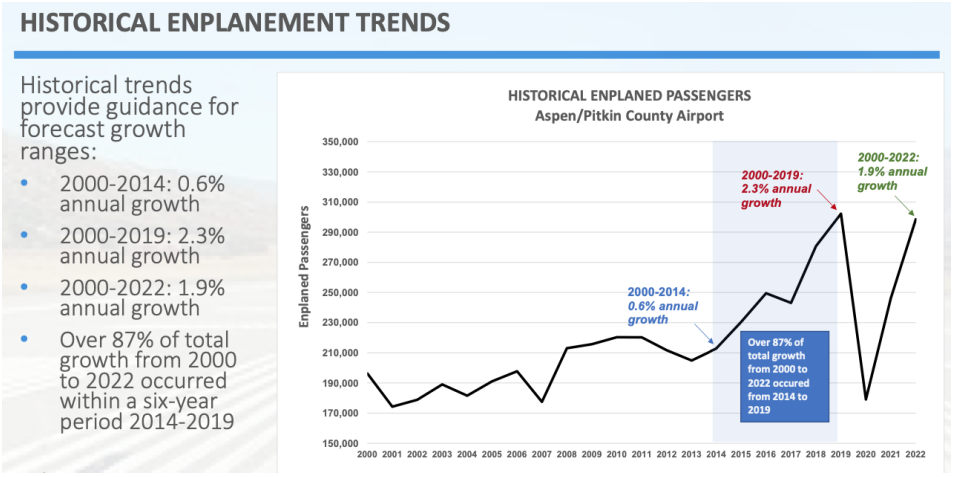


Exhibit 4. Over 87% of the 2000–22 enplanement growth was from a five-year period (with 49% from no more than three years during 2015–18~~, and 89% during 2014–19~~). The forecasters and the FAA apparently assume that including this artificially 3–4×-inflated growth reflects the true long-term trend—not extrapolation of a one-time anomaly that local regulation, acknowledged but unanalyzed, has already begun reversing, thus reducing its likely future effect.

Let that sink in: history shows 14 years averaging 0.6%/y growth—or 18 years (1995–2013) averaging 0.06%/y growth—then suddenly another five years averaging *7%/y* growth. That's a

dozen times faster than 2000–14, as if suddenly boosted by a rocket, reaching an all-time high of 302,200 annual enplanements before the pandemic. The forecasters and County Staff apparently consider the *combined* 2000–22 growth rate or trendline as both trend and destiny, benchmarking what the FAA is prepared to believe and accept. As the Airport Director wrote on 2 May 2023[74]:

> Given that annual enplanement growth at ASE from 2000 to 2019 was 2.3% (1.9% between 2000 and 2022, however, COVID years are considered outliers), anything significantly lower than that expressed by the actual historic trend would require empirical justification to garner FAA concurrence. Anything artificially lower would be considered constrained. Therefore, anything submitted to the FAA (such as submitting the low-range forecast as the selected forecast…) would be rejected by the FAA.

We'll return to this point later, because the only way we see to try to reconcile the conflicting community and FAA views of Aspen's aviation future is for the FAA to realize that 2000–19 or –22 *average* growth represents not a durable trend but a misanalysis—an artifact of an overly simple model form. The pre-anomaly history of 1995–2014 or 2000–14 may more realistically reflect not just community preferences but also actual Aspen conditions and prospects. Consensus on this point could shrink the growing mismatch between FAA and County goals.

So what might have caused that precedent-shattering enplanement growth around 2015? Multiple factors should be tested and may apply; for example, new Delta and American services were ramping up around 2014–15. But that may have been, in substantial part, a smart and agile market response to a clearer and deeper explanation that emerges from another curve, showing a dramatic acceleration with the same shape at the same time. That's the forecasters' own Fig. 1 {10} shown in Exhibit 5, but strangely absent from the forecasters' AAB slides and brief[75]. It graphs Aspen-to-Carbondale total lodging capacity both in traditional accommodations (red) and in the new post-2012 category of Short-Term Rentals (gray, for 30 days or less), abruptly doubling the Valley-wide total pillow count shown by the heavy black line:

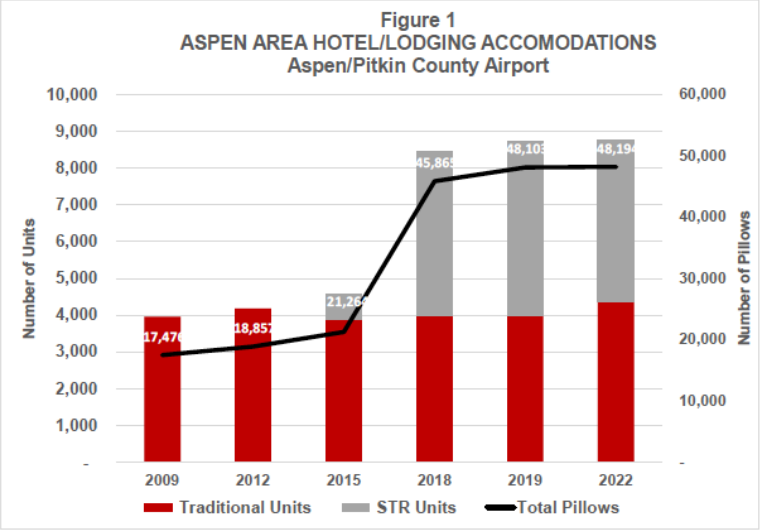


Exhibit 5. A stunning explosion of Airbnb, Vrbo, and similar short-term rentals in the Roaring Fork Valley added more lodging capacity within three years than the Valley had added cumulatively in all previous time; more than traditional lodgings' entire 2022 inventory; and 36× more than traditional lodgings' units growth in the same three years. This revolution temporarily, but

not replicably, *reduced longstanding lodging constraints. That plausibly drove more Aspen flights, upended real-estate markets, and elicited stringent new local regulations. The Forecast considers none of this; it assumes unconstrained lodging capacity for the resort with arguably the tightest lodging constraints and strictest growth controls in the United States.*

Exhibit 5 shows the most profound, rapid, and consequential shift in Aspen-area visitor capacity and real-estate markets since the transformational Pitkin County downzoning of 1974. In 2015–18, the upper-and-mid-Valley pillow count *more than doubled in three years*, from 21,264 in 2015 to 45,865 in the next Resort Association survey in 2018. In that three-year period, traditionally managed properties added just 819 pillows[76], but Short-Term Rentals (STRs), chiefly through Airbnb, Vrbo, etc, and half within the City of Aspen (matching its share of conventional lodgings), added ~~24,601~~ 23,782 pillows—*~~thirty~~ 29 times more, or more than the entire 2022 inventory of all traditionally managed properties from Aspen to Carbondale.*

The more granular underlying analysis[77] provides year-by-year data. It shows that the number of Airbnb/Vrbo pillows in Aspen rose 296% in 2016–19 or *284% just in two years, 2016–18*, then steadily fell (by 6% in 2019–21, and by 19% for Jan–May in 2019–22). Thus Aspen SRT offerings soared in 2–3 years, but peaked three years before the City's crackdown formally began. (The decline in Snowmass Village, the #2 market, didn't occur until 2022, and in the small markets, it began in mid-2021 in Basalt and mid-2020 in Carbondale, but they're less important than Aspen's SRTs.) Therefore the dynamics were even faster than Exhibit 5 shows.

For the Roaring Fork Valley from Aspen to Carbondale, Exhibit 5's new STR gray bars more than duplicated in short-term rental capacity the red lodging inventory built up over more than a half-century. To be sure, the cited lodging survey suggests counting only 90% STR occupancy at peak and 80% offpeak—modest discounts from a huge number—to predict actually available capacity, but the STR growth was indeed, as a forecaster briefly mentioned, "astronomical." The Forecast admits {9} that "if a significant shortage of rental accommodations occurred over the forecast horizon, this could restrict future enplanement growth and aircraft operations." Well, anyone who lives around Aspen knows that this has been the reality for decades; the STR boom temporarily popped the cork; and now new rules have hastily stuffed it back in.

In both built-up and rural/remote areas, STRs' disruption, road congestion, noisy partying, and other impacts caused a swift and intense backlash {9}. The State of Colorado authorized STR licensing and regulation in 2020. The City of Aspen declared an emergency residential construction moratorium in 2021. In 2022, all three upvalley governments passed STR restrictions, fees, and taxes, including Aspen's 10% surtax. These major regulations choked off nearly all the STR growth by 2022 and are triggering significant shrinkage, despite the post-pandemic recovery[78].

Importantly, the new STR restrictions brought in license fees that will help fund enforcement staff to find and crack down on the many unlicensed STR renters. The incentive to cheat is high: stories abound of folks who go to the islands for two weeks at Christmas (more enplanements!) while their house earns enough to cover months if not a whole year of mortgage payments. But now fewer residents will be able to do that, far less often, with hefty fees, significant regulatory burdens, and tighter restrictions, because community impacts and outrage are off the charts.

The resulting regulation and its new 2023– enforcement aim to *shrink* the overexpanded STR inventory and impose further constraints. The City of Aspen—which contains 88% of the City-plus-unincorporated-Pitkin-County STR inventory—intends to shrink its residential-zone STR capacity by 25% through attrition from the grandfathered 2021 permit level. In unincorporated Pitkin County, which now plans a complete STR ban in its large rural/remote zone[79], the first six months of new rules, fees, and taxes shrank 206 STR properties to fewer than 100; the rest have left the short-term market, switched to rentals for 30 days or longer (doubtless the next regulatory target if abused), or kept on renting illegally, risking a $1,000-a-day fine[80]. But the broad reversal of the STR spurt is clear. After mapping every City and County STR licensed property[81] and analyzing the new rules, taxes, and fees, Aspen Journalism concluded[82]:

> It's clear that the new permitting regimes have put some significant brakes on the local short-term rental industry, with residential-neighborhood caps in the city [Aspen] and a freezing of the market in Pitkin County. In the city, we found that outside the downtown core where there are no limits, most neighborhoods have already hit their maximum STR quotas and there is now a waitlist over 50 deep. In Pitkin County, multimillion-dollar homes must pay hefty fees for a maximum of 120 rental nights a year, and properties that do not have a documented rental history prior to June of 2022 cannot get a permit. The permit review process is also turning up irregularities such as additions built or special events held without a permit.

This backlash illustrates the community's aversion to Airport growth's driving still more growth in visitors and their needs. STRs upended the real-estate market and created a political emergency. Elected officials responded vigorously. We wonder if the FAA's staff knew all this. They didn't learn it from the Forecast.

The Short-Term-Rental boom deeply distorts the entire Forecast

What does this have to do with Aspen enplanements? Well, the STR capacity is about *actual causality*. The big rural barn whose national advertising reputedly brought hundreds of people to Aspen for a giant wedding almost every weekend for over a half-year, with none of the required permits and fees, frustrated Pitkin County (which didn't yet have any enforcement staff), but it also gave many thousands more guests a reason to fly to Aspen, and they could stay in STRs. So did that affect actual enplanements? In other words, did the sudden doubling of lodging capacity boost enplanement growth rates? The Forecast offers no analysis of that question, but just look at the graphs[83]. The 2015–18 STR lodging boom could go far to account for:

- the unique 5.3%-point (5.9%) 2016 jump in summer all-lodgings occupancy rate {12},
- the near-record 15.5% 2018 enplanement growth {14}, accounting in one year for 37% of the total 2020–22 growth, and
- the all-time-record enplanement in pre-pandemic 2019 (Exhibit 4 above).

The step-function doubling of the pillow count could be reasonably inferred to help *cause* the steep enplanement growth phase shown in Exhibit 4. As the forecasters' slide says, "Over 87% of total growth [in enplanements] from 2000 to 2022 occur[r]ed from 2014 to 2019." So how did the Forecast treat this anomaly and the causality it reveals? It didn't. It forecasted enplanements only from one state- or national-level macroeconomic variable. It ignored Aspen-area lodging. It ignored every Aspen reality. Instead, it fitted its forecast equation to enplanement growth during 1990–2019. During those 29 years {73}, 55% of the total enplanement growth occurred during

the 2014–19 STR explosion, and most of that in just a few years. Thus the majority of the regression period's slope was associated with an anomaly. The model implicitly treats this extraordinary STR spurt as replicable, permanent, organic, and scaleable, rather than unique, transient, anomalous, and temporary. This mismodeling seriously overstates future growth. Adopting it would drive airport investment for imaginary future visitors who may have nowhere to sleep.

Mismodeling then compounds that error. Head forecaster Bill Flock agreed[84] that the lodging jump from STRs would be unlikely to recur without a major service addition like a new airline, so it doesn't indicate a long-term trend. *Yet he combined 0.6%/y growth in 2000–14 with ~~2.3~~ 6.8%/y growth in 2015–19 to obtain a composite 2000–19 growth rate of 2.3%/y, or for 2000–22, 1.9%/y, and said "We think's probably more in line with the long-term growth rate here."*[85] That breathtaking leap beyond the evidence acts precisely as if the 2015–19 spurt *were* the long-term trend he'd just said it wasn't! Of course, the growing share of American and Delta flights, plus the dominant United share, linked Aspen to the world via the hubs of the three biggest US commercial carriers. But it would be surprising if the sudden doubling of Aspen-area pillows at the same time didn't markedly encourage this simultaneous market growth: new lodging supply caused aviation demand that elicited aviation supply. Enplanement growth flowed from Aspen-specific travel demand driven by diverse local stimulative or restraining market forces.

AAB member and world-class carbon analyst Rick Heede asked Mr. Flock[86] if the consultants had analyzed beds. He replied that beds "will eventually limit" air traffic, but implicitly assumed that "eventually" must be after 2042. There is no evidence for that assumption. Indeed, adding emphasis, *the Forecast "does not attempt to estimate future hotel/lodging accommodations (including STRs) and is not constrained by projected availability"* {9}. Mr. Flock gave no reason to believe that lodging availability has not already affected current *or past* enplanements; neither was analyzed because Aspen lodging wasn't ~~considered at all~~in the model. Nor is any other causality. This would astonish any local real-estate developer or Realtor struggling daily with constrained supply, limited inventory, and strict growth controls. But assuming local lodging is unconstrained doesn't make it so; it only guarantees exaggerated enplanement forecasts.

A causal hypothesis about the causes of Aspen's aviation demand

A plausible causal explanation of Aspen enplanement dynamics, fitting all the evidence and contradicted by none, could look like this:

- Aspen aviation demand has long been constrained by chronically tight lodging supply: the area has uniquely stringent land-use controls, making it famously hard, costly, and slow for developers to get permits, and complicated by specific historic-preservation and community-character concerns deeply rooted in local culture and political economy.
- By exploiting loopholes in regulations meant for traditionally managed rental properties, the Airbnb-led online-rental revolution more than doubled the Aspen area's *total* lodging supply in a few years starting in 2015. Regulators were caught flat-footed.
- Residents rose up. Short-term rentals spooked Aspen real-estate markets, scrambled politics, and evoked dramatic crackdowns by all three key local governments, led by the City of Aspen and Pitkin County, choking and reversing the short-term rental boom starting in 2019–22 in different parts of the Valley.

- Also starting around 2015 for American and 2017 for Delta, these competitors, already itching to compete with United and feed their hubs, began opportunistically expanding their Aspen services {15} to seek share in the sudden and rapid market growth.
- Then from summer 2020 as pandemic lockdown ended through 2021, COVID-19 sparked a huge spike in urban and suburban pandemic refugees, flying in (often on private planes) to seek shelter in supposedly safer Aspen and its rural environs. Buyers walked up to downtown front doors with huge cash purchase offers. This gold rush poured gasoline on the flames of property prices already soaring to reflect potential short-term rental income. During 2020–21, a perfect storm of rich outsiders fleeing the pandemic, piled on top of STRs' value inflation, nearly doubled single-family homes' new building permits in Aspen and raised existing homes' value by 127%[87]. Four years later, the resulting price spiral has not fully abated, though Aspen's sales volumes have lately fallen by half, and single-family median home sale prices by 21%[88]. (Pitkin County was long said to be the wealthiest rural county in the United States, with ~100 billionaires, but now it's probably far richer, driving more paper millionaires out of town and far downvalley.)
- Just as sellable houses got snapped up and short-term rental lodging capacity began shrinking, throttled by new local regulations, COVID fears and restrictions cut Aspen enplanements by 42% in 2020. They rebounded partly in 2021 and nearly the rest of the way in 2022, but remained below 2019 levels—consistent with renewed lodging scarcity, driven both by price (even in this largely inelastic market) and by scant inventory.
- In effect, short-term rentals popped the lodging-capacity cork, champagne splattered the ceiling, but then the cork was forcibly reinserted, throttling the flow just as rich COVID refugees further inflated prices, inducing more owners to sell their homes rather than rent them out. STR capacity in Aspen began declining in 2019, continues decreasing, and is set to shrink more in most of the Valley as new short-term rental restrictions bite. Growth in conventionally managed lodgings remains slow, difficult, and even costlier.
- In one of the world's most beautiful and exciting resort and cultural destinations, virtually flat (+0.06%/y) average enplanements in 1995–2013—despite strenuous business efforts to add Aspen events in summer and in low season and to boost off-season occupancies {11}—are readily explicable *only by a constraint*—most obviously in lodging capacity. If a pillow shortage is the prime governing causality, then adding capacity once can raise enplanements once but not keep raising them further. Re-restricting capacity will trim them back again, because if more pillows bring more guests, fewer pillows should mean fewer guests: causality should be bidirectional, with scant ratchet-like hysteresis.

A more fundamental modeling error than omitting the likely single biggest constraint on the subject airport's aviation demand is hard to imagine. Unlike random errors, it can make forecasted demand only too high, not too low, so it's a built-in bias. It makes the Forecast unreliable, and calls its intent, design, communication, and management processes into question.

Misframing and misapplying the forecasting model

Summarizing some main methodological flaws in the Forecast:

1. The forecasters should have done a multiple (not a single) regression, testing many Aspen-specific variables best known to the SkiCo and Resort Association and to local

lodging proprietors and real-estate developers. Any Aspen business leader who told a Chamber meeting she was forecasting her firm's 20-year demand and investment based solely on predicted Colorado income would be laughed out of the room.

2. The Forecast should have shown sensitivity tests and residuals, so readers can assess the robustness of the model against changes in variables, especially plausibly important ones not analyzed (i.e. nearly all of them).
3. They should have demonstrated the mathematical validity of the four core assumptions underlying their linear-regression approach[89].
4. They should have used a dummy variable for the years of the lodging explosion, to see if separately accounting for that 2015–18 phenomenon better explains the historic data[90].
5. The one-off lodging explosion should not have been used to inflate the base enplanements from which the forecast was then extrapolated into trend and thence into destiny. Such a singular event is not a continuing process that drives further growth; it only moderated, for a time, the longstanding lodging constraint that had made Aspen visits harder.
6. The new STR rules should have been analyzed—starting with the three governments' data, goals, and forecasts for their new regulations {9}—to help foresee how that relief-of-constraint may partly, perhaps largely, reverse during the forecast period as inventory declines again. That reversal has already begun. The extraordinary backlash to STRs' intensive impacts would lead any analyst of the Valley's political economy to expect STR capacity to moderate and shrink, not persist or grow—let alone keep growing without limit, as the Forecast's lack of lodging constraints tacitly assumes.

Therefore 2022 STR capacity cannot be validly assumed to persist, let alone to expand. Including its aviation effects in—as most of—the long-term enplanements trendline overstates its slope.

Crowded by design

In 2003 after some down years, the Aspen Skiing Company marketed its uncrowded lift lines and other community services as a virtue and a valuable asset, under the motto[91] "Uncrowded by design." In contrast, the Forecast is a blueprint for making Aspen "Crowded by design"—just like everywhere else from which Aspen astutely draws guests seeking a distinctively better resort experience. We may therefore ask: How much more lodging would the Aspen area need if the "best estimate" Forecast were right? The answer is sobering.

The midrange forecast proposed to go to the FAA posits 91,673 more enplanements in 2042 than in 2022 {73}. Some of those visitors may come in low season when there's more spare capacity than in high season {11}: the region's traditionally managed lodgings in 2022 had >73% occupancy in winter, 69% summer, 38% off-season. Even so, the already acute overcrowding of many critical resources across the Aspen area makes this projection unrealistic. Where will all those people sleep, eat, shop, drive, park, recreate—especially in peak season when the whole area is already maxed out and the workforce seriously stressed? Who will support these added guests? Where will those workers live when some Aspen Valley Hospital doctors must already commute two hours each way from Rifle and Silt? Will that future Aspen be worth visiting and living in? Will local citizens vote for that future, and for elected officials who enable it? These are not theoretical speculations. The Forecast's Aspen-free, economics-free, causation-free method is. It produces less a forecast than a fantasy—for many locals, a bad dream to wake up from.

It's 2042. Do you know where your pillow is?

Asking local experts on lodging and STRs reveals that no one knows how many additional rental pillows (traditionally managed or short-term-rental) are needed to lodge 100 additional itinerant visitors or total visitors flying into Aspen. (No one even knows how many people fly into Aspen Airport—because the General Aviation arrivals aren't measured[92]; nor how many fly into another airport like Eagle/Vail, Grand Junction, or Denver and drive to Aspen; nor how many travel entirely by surface.) Some Aspen Airport fliers live here, perhaps in the rapidly infilling areas of the mid-Valley. Some own or time-share their own local housing. Some stay with friends. Recent enplanements are roughly six times the total Aspen-to-Carbondale pillow count, so these arrivals needing no rental lodging dominate historical behavior. However, lodging needs for *marginal* arrivals are apparently unknown and can't even be roughly estimated. Potential constraints on aviation are extremely sensitive to that number, which thus merits close attention.

Thus 91,673 additional Aspen enplanements by 2042 would be equivalent to 4.3× the 2022 pillow count between Aspen and Carbondale in traditionally managed properties, *if they all needed to rent lodging.* How much smaller is *actual* rental lodging demand, and how well does it match likely supply? Limited relief is in sight: two Aspen lodgings offline in 2022 are reopening, plus a new one each in Aspen, Willits (122 rooms), then reportedly Carbondale, but there's no available central forecast of Valley lodging supply or demand. Public sources don't say how many of Aspen's forecasted new airborne arrivals will need to rent lodgings to stay here. Private developers (and probably some public officials who track approval processes and inquiries) do take the market's pulse, but don't appear to have been asked. It's therefore hard to assess the realism or unrealism of the Forecast's disregard for any Aspen-area lodging constraints for the next 20 years.

That is, the Forecast's middle and upper forecasts (the FAA having already rejected the lower one) foresee 91,673 or 176,375 more Aspen enplanements by 2042 than in 2022. How many extra pillows will they need to rent? Where will that capacity come from? No one knows, and the Forecast saith not. But it does extrapolate[93] whatever aviation demand was associated with the abrupt and enormous STR growth in 2014–19, *as if that growth process were permanent and continuing and any needed capacity unlimited.* Neither assumption is credible. Both drive a supposed need for infrastructure to bring in more visitors. The result is substantial upward bias.

The bigger picture

Aspen's topography and land-use are even more constraining in much of the town and its environs than on the Airport. In our topography, with our slope and geological and land-use limits, even modest incremental lodging would be very hard, slow, and costly to site, permit, and build. The midrange forecast's 31% or the upper-range forecast's 59% rise in enplanements over the next two decades tacitly imply some degree of new lodging built on usable land (plus other requisites). Yet that land may not exist. Aspen is already essentially full. Very little more will go in, and that only at the cost of what makes it Aspen. The Forecast's growth projections contradict the character and the governmental controls that this community has been methodically and tenaciously cultivating for 50 years.

More broadly, the Forecast, like FAA's TAF forecast, ignores all Aspen-specific circumstances except the technical details of the Airport itself. Yet Aspen is not some random place. It is not just a town with air travel that happens to correlate modestly well with statewide employment or income. It is not everywhere else. It is a globally unique, world-class, extremely complex resort community with specific attractions and challenges, benefits and costs, constraints and freedoms. To have a hope of understanding how many people are likely to fly here, such complexities must be understood and analyzed with at least the sophistication that the SkiCo, other leading Aspen businesses, and the Resort Association bring to their responsibilities. That's orders of magnitude more depth than the Forecast applies, even in the short term.

Over 20 years and beyond, bigger issues are likely to come into play. Have the forecasters, for example, noticed that Aspen has already lost more than a month of winter[94], and the SkiCo is deeply concerned about losing so much of the rest that Aspen's basic viability as a resort dominated by winter sports could come into serious question within the forecast horizon? Did they know America's $50-billion skiing industry considers climate change an existential threat, so Aspen SkiCo's 2021 *Sustainability Report* says[95], "Business as usual is putting us out of business"? Did they think about our water and wildfire issues? our intolerable Highway 82 traffic jams? our workers' 3–4 hours of daily commutes on jammed highways, often through harsh mountain weather, to find a semi-affordable place to live one or two counties away?

Of course not: they're simply producing a numerical forecast for the Airport. But that forecast is meant to drive a half-billion-dollar infrastructure investment that could intensify the already deep stresses on this community and undermine the foundations of its prosperity and livability. The local people behind the numbers are unlikely to stand hitched for that. They may well conclude that the FAA is making them an offer they *can* refuse, and should. If the FAA were seeking a way to make the achievement of its Airport goals lastingly unlikely, it may have found the key.

Other ahistorical and unsubstantiated growth projections

General Aviation operations are lately ~83% of ASE operations—a fraction not explicitly shown in the Forecast but implicitly projected not to change much. Historically, General Aviation had a 4.5%/y *drop* in operations 2000–14 and a 1.7%/y *drop* in operations 2000–22, dropping further *in* 2022 after the 2020–21 surge of pandemic refugees. Yet the Forecast predicts GA will turn around and grow 0.7–0.8%/y for the next 20 years (Exhibit 6), despite assuming no GA increase due to the 2032 removal of the 95´ wingspan limit[96] {40}. The rationale given is unpersuasive.

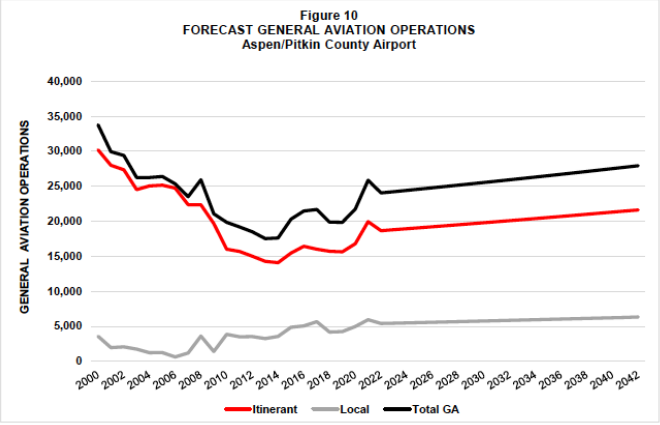


Exhibit 6. General Aviation grew markedly in and just after the pandemic as rich passengers avoided potential exposure in commercial air travel and sought refuge in Aspen-area properties. But now GA operations are "projected to" rise inexorably from 2023 onward by 0.7–0.8%/y—without assuming any increase in General Aviation due to the assumed 2032 lifting of the 95´ wingspan limit—despite their steeper and longer historic declines (continuing in 2022). Why?

Without delving into all the complexities of other operator categories, the same "Why?" question arises for total forecasted operations, which are projected to grow even faster after 20 years of net shrinkage {43}. Like the GA forecast, this essentially linear forecasted trend takes off from a 2021–22 starting-point reflecting the rapid 2014–18 growth but none of the previous history of stagnation and decline (including during the earlier ungraphed period 1995–2000) (Exhibit 7):

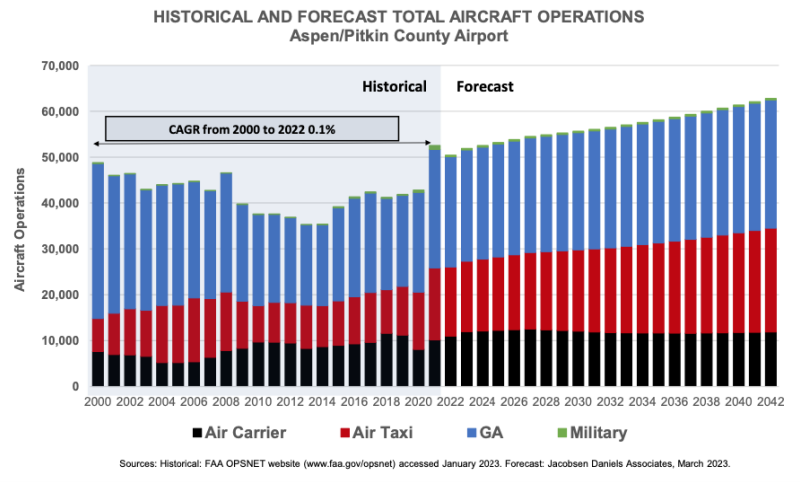


Exhibit 7. Total ASE operations averaged just 0.1%/y growth during 2000–22, and would have shrunk but for the extraordinary post-COVID rebound in 2021 (which the Airport Director rightly says shouldn't be counted). Yet total operations are then forecasted to rise 1.1%/y from now on, with each year from 2024 onward predicted to set a new record. Why?

As a third example, air taxis' operations {21} grew at an average rate of 2.0%/y during 2000–19[97]. But that long-term average, fluctuating with carrier changes {24}, is misleading: starting just two years later would decrease that 2002–19 average growth rate by sixfold, to 0.33%/y, including six years of shrinkage. The 2.1%/y assumed for 2022–42 (mid-range variant, {38}) is thus extremely sensitive to the exact starting year assumed. This is obvious from Fig. 9 {38}: the 2000–19 history could justify a very wide range of trends, with positive or negative slope. The prediction is thus highly unreliable. Air taxis aren't a huge term, but the consistent tendency for dubious forecasts to be relatively high, and for ambiguous histories including long periods of decline to be uniformly interpreted as foretelling future growth, hint at confirmation bias.

Other forecasting issues

Geographical statistical basis: The extensive boilerplate data in section 1 of the Forecast report are scarcely used in the analysis; presumably they're there to give comfort to the FAA. Nonetheless, the "Edwards-Glenwood Springs Combined Statistical Area" or CSA used to assess Aspen Airport is inappropriate. It spans three very large and very different counties spanning over half

Colorado's width, including Eagle County, served by Eagle/Vail (EGE), and vast Garfield County, served mainly by Grand Junction (GJT) and running to the Utah border. Population and economic growth (much of Garfield County's is driven by the volatile and challenged hydrocarbon sector) are highly heterogeneous: for example, the CSA's 2022–42 population growth is given as 1.04%/y, but the Colorado State Demographer forecasts 2.4%/y in Garfield County for the next 25 years[98]. Moreover, locally based population is probably less relevant for a high-end resort's support community, or at least for the portion of it likely to afford much air travel; and many downvalley residents prefer the less weather-sensitive service from EGE and GJT, which are also often closer to their homes.

Peakiness and route architectures: Fig. 15 {51}, like the very similar but unspecified Fig. 16 {53}, is remarkable not only for the paucity of morning flights but also for the major dip around 1300 MT. Perhaps this is to offer a timing-fluctuation reserve between the 1200 and 1400 peaks, but it could also reflect hubs' pulse timings. If so, it illustrates how the costs of hub-and-spoke route architecture can propagate systemwide, inducing high capacity costs that incur low load factors, all in the service of hub-dominating carriers' monopoly rents rather than the time-efficient movement of people and goods. However, route architectures—one of the most important influences on aviation patterns—are nowhere mentioned in the Forecast, let alone analyzed. Shifts to point-to-point as more-efficient and potentially smaller aircraft make it more economical could profoundly shift operational needs and capabilities—perhaps making the forecast high growth for air taxis more plausible after all. Mr. Bauer told the BoCC and AAB on 11 April 2023 that the FAA has "no idea" about such shifts in route architecture. It should—at least as a sensitivity test, showing whether TAF's built-in routing assumptions are important.

Ranges: The aircraft ranges discussed in the AAB brief and on the Forecast's Map 3 {58} have been criticized by a senior local pilot as overstating E175LR and perhaps A220 ranges *from ASE* as stated {57}, especially in summer. Perhaps Fig. 5 needs correction for density altitude: the ranges shown appear to be nominal for low-altitude operations, but may be invalid for hot-and-high takeoffs, or may be feasible in summer only with significant payload reductions. The legend should also say that the range is [apparently] in statute miles, not the usual nautical miles.

Based planes: The AAB brief's remark[99] about FAA's noting apparently unjust discrimination against local pilots (at least in the February Forecast draft, and many pilots would say currently) is welcome and appropriate. However, while clearing the based-plane tiedown waitlist is long overdue, freezing capacity at 126 beyond 2032 may imply a new round of unjust discrimination, so long as itinerants continue to be welcomed to held-open accommodations while based planes are yet again shunted to a waitlist. If that practice is wrong now, it's wrong in the future too.

Graphics: Figs. 12–14 break the vertical axis without so marking, potentially misleading readers.

We now turn more briefly to the second main part of the Forecast—the Fleet Mix Study.

Fleet mix study: issues involving specific aircraft

The Forecast has two main parts: aviation demand, and what mix of aircraft is expected to meet it, particularly for airlines' commercial planes, even though they're only about one-fifth to one-sixth

of ASE operations. We next summarize three kinds of factual flaws in the Fleet Mix study, three methodological defects, two major omissions, and the resulting implications and conclusions.

Fleet ages and shifts: Statements {58} about the age of existing CRJ700 fleets need checking. The three US airlines' fleet ages should be differentiated—Delta in the low 20s of years, United ~13, American reportedly ~18–19. The SkyWest statement "range in age from about 24 years" is confusing and probably far too high: our December 2022 tail-by-tail online analysis of the entire CRJ700 fleet found an average of 13.2 years[100]. The "12–15 years or perhaps longer" further life stated is highly conservative even if no life extension or renewed production are assumed; the evidence in our Essay #4 shows it's probably a major understatement. That is corroborated by the Forecast's reference 6. That strong endorsement by the aircraft's manufacturer would be usefully complemented by adding our Essay #4's references 60 and 62, whose credible trade-press reports indicate a logic and likelihood that the CRJ700 will re-enter production.

Another flaw is rejecting the excellent, proven superior for and well accepted in Aspen, and readily available Dash-8/Q400 even as a CRJ700 insurance policy because it's "no longer in the US airline fleet." That ignores 95% of its world market, starting with more than 100 in Canadian fleets. We have repeatedly rebutted the several layers of fallacy in this claim, both factually and conceptually, most recently on p 8 of Essay #4[101]. The dismissive briefing remark "It's unlikely that we're going to see that aircraft serving Aspen in the near term"[102] is irrelevant to its insurance value in ensuring commercial service if some catastrophe suddenly strikes the CRJ700 fleet. The insurance cost of this optionality would be orders of magnitude less than rebuilding the ASE airside for that purpose.

E175LR status: Conversely, assessments and ASE tests of the E175LR's performance, especially hot-and-high, are reportedly quite discouraging, but are nowhere mentioned or addressed. The 2022 test results have not been released but were reportedly unimpressive. It's unclear how this significantly heavier airplane can consistently make money at ASE. A deeply experienced ASE commercial pilot acknowledges its value in many low-altitude fleet applications but calls it "a terrible airplane for Aspen," due to its (a) limited summer payload capability, (b) ungraceful crosswind yaw response (risking aft flight-attendant injuries in Aspen's strong crosswinds), (c) potential emergency one-engine-out climb-and-bank issues with outboard engines' stronger yaw moment[103], and (d) potential for a long-run mismatch between this aircraft's high degree of automation, including auto-throttle, and the prospects of thinner pilot experience, which could make it less likely that the next generation of pilots will have gained the ripe judgment to know when not to try to land at ASE, where this aircraft's automation may not rise to all difficult occasions. The Forecast claims {59} that this aircraft "has the operating performance capabilities to operate at ASE," but the cited Lean Engineering reference is more equivocal[104]. A balanced discussion should treat these issues. It should not pretend that this aircraft, however useful and valued in the low flatlands and at medium elevations, is already proven and economic as a viable and worthy CRJ700 replacement for Aspen's uniquely demanding high-mountain conditions.

To discuss only the highly anomalous situation of Delta with its 3% Aspen market share, as the forecasters' AAB brief did, does not credibly address the divergent needs and preferences of United and American. To say that the changeover to the E175LR will *start* in 2023/24 gives no reason to suppose it has the rationale to proceed in that other 97% of the ASE market at any significant pace within the forecast horizon. If there is evidence supporting that forecast, it should

be presented. This replacement extent and schedule are unvalidated and may prove uneconomic. It seems to us plausible that the E175LR may disappoint, especially in summer. If that concern proved valid, airline service could simply continue in CRJ700s (largely or wholly) until they're replaced by superefficient and/or non-fossil-fueled aircraft, leapfrogging over the Embraer and Airbus options. A realistic low forecast would test this option—not assume 75% E175LRs by 2037.

A220-300 status: The lack of a statement that the A220-300 has been found safely operable at ASE {60} is conspicuous and troubling. Our industry informants note potentially serious issues with its safe ASE operability (especially in summer) due to a combination of density altitude, crosswinds, topography, engine-out approach or takeoff, and accelerate/stop calculations for takeoff. Should this type even be in the Forecast, let alone be the critical design aircraft, if its ASE safe operability is not yet firmly established? Is there a precedent for choosing a critical design aircraft not yet qualified to operate at the subject airport? Wouldn't it be embarrassing if the FAA insisted[105] on designing a stronger and costlier runway for an aircraft that proved unable to land here?

Fleet mix study: three broader methodological problems

First, it appears that the Forecast's and AAB brief's comparisons of CO_2, other air pollutants, and noise between the E175LR and CRJ700 may not have been adjusted (renormalized) for the larger number of less-fully-loaded flights that the Common Ground recommendations (p 10) warn, and the Lean Engineering study quantitatively confirms[106], would be needed for the recommended dominant use of the E175LR at Aspen. If so, then this near-term recommended aircraft's impacts—already greater than those of the CRJ700s it is now forecasted to replace promptly—would appear have been more seriously understated. That understatement could grow even further if each added E175LR triggered scope-clause removal of a cleaner and quieter CRJ700 from the fleet[107]. The methodology used for assessing the absolute and relative impacts of the E175LR should be clearly presented and, if appropriate, corrected. Otherwise it may appear that the forecasters are arbitrarily but inconsistently adopting an impact-per-passenger, impact-per-flight, or impact-per-airplane-LTO metric—whichever favors a client-desired conclusion.

Second, the assumed 2032 removal of the 95´ wingspan limit is required by the Forecast's assumption of A220 aircraft. Yet this type's calculated impact reductions (subject to the other issues raised here) *do not acknowledge, include, or estimate the impacts resulting from ASE operations of >95´–<118´ types previously prohibited*, both commercial and with other operators (notably General Aviation and air taxis). No one knows whether full ADG-III compliance would raise or lower total net impacts at and near Aspen Airport, because no one knows whether newly admitted types described in the Forecast as cleaner and quieter would be partly, wholly, or more than wholly offset by dirtier and noisier ADG-III aircraft that under current rules and incentives must also be admitted, such as older private 737s and A319s. If the consultants feel unable to estimate these net-impact effects, they should at least scope them, provide sensitivity tests (probably best in graphs), and discuss their implications. Otherwise they are ignoring the central dilemma of the airside upgrade, long identified by the ASE Vision process and BoCC.

That is, any *marginal* environmental benefits of A220s should be offset against the *total net* impacts of private—and often older, dirtier, and noisier—737s, A319s, etc. that could not have landed at Aspen Airport but for the airside upgrade required to serve the A220s, and therefore are

a direct consequence of choosing them. Unfortunately, the older, dirtier, noisier kinds of business jets that create this concern are all lumped into the forecasted fleet mix's "Business Jets—Other" category {67} with unstated composition. That category's annual operations (4,652 in 2042, *vs. e.g.* 300 G650s) therefore cannot be compared with the 367 A220-100 and 2,796 A200-300 operations, nor their relative impacts estimated. If the evidently granular model that listed 31 other kinds of business jets could detail which high-impact types are in the "Other" bin, with how many forecasted operations, then that information could illuminate or dismiss the concern. Big newer jets like the G650, G700/800, Bombardier Global 8000, and Falcon 10X—four types/groups, each with 300 projected 2042 operations—may be less worrisome than fewer but older ones, since the "Other" category's 2042 operations are 4× as numerous as those four categories' total.

It would also be very helpful if the forecasters commented on the potential for smart regulation and siting, explicated at their request in our brief and summarized in our Essay #12 (13 April 2023)[108], to help mitigate any increases in net impact. The less the forecasters address this opportunity, the more the AAB and BoCC will need to consider it.

Third, the most serious flaw in the Fleet Mix Study is that its midrange and upper forecasts of rapid regional-jet turnover to the E175LR, then its considerable early adoption of the A220-100 and A220-300 (after assumed full ADG-III conversion in 2032), are not credible without strong analytic support. *None whatever is presented: the numbers are pulled out of thin air.* If there is evidence justifying these shifts, it should be cited and presented. Qualitatively, the newer aircraft do offer attractions, including modern avionics that could improve operations. But could those gains justify quickly retiring a uniquely ASE-suited, well-performing, and rugged CRJ700 fleet with strong pilot training, aviation capabilities, support logistics, life expectancy, life-extension potential, and mature amortization? With no evidence, this core part of the Forecast seems arbitrary and is likely to be ascribed more to client and regulator pressure than to reasoned and independent professional judgment. The uncertain ASE operability of the A200-300 and unproven spring/summer economic viability of the E175LR further expand this gap in the Forecast's credibility. What we have here is not a convincing fleet mix study or analysis, but a tabulation of unsupported assertions and unfounded assumptions. It may meet the FAA's procedural goals, but can hardly meet the FAA's—or the Airport Advisory Board's—standards of analytic rigor and credibility and the County Commissioners' heavy burden of prudence.

Fleet mix study: two major omissions

Emergency management: The FAA's primary safety focus makes it extraordinary and inexplicable that the Forecast doesn't mention or consider Aspen's severe constraints on emergency medical response to an aviation accident. The Roaring Fork Valley's exceptional medical resources, including two excellent hospitals and strong emergency-management capabilities, might at full stretch barely cope with the crash of one 70-seat regional jet[109]. But to manage an accident involving a plane with twice as many souls on board, or perhaps two such aircraft in collision, is inconceivable. Who would then take responsibility for this planning oversight and the potentially disastrous economic and reputational damage via global headlines? Isn't post-crash emergency management an essential part of any integrated safety-and-efficiency analysis? The best medical minds in the Roaring Fork Valley have thought hard about this quandary for many years and found no solution, as researched by the County's former Emergency Coordinator (a cofounder of

Aspen Fly Right). Can the FAA do any better? How can our nation's aviation safety leader approve a Forecast that never mentions this critical safety issue and potential show-stopper? Ignoring it won't make it disappear.

Aviation innovation: Strategy is the art of minimizing regret at what you did that you wish you hadn't, or what you didn't do that you wish you had. The Forecast's failure to justify its client's objective (full ADG-III airside expansion) by clear and convincing fleet-mix evidence, or any evidence whatever, is amplified by omitting one of the most crucial strategic dimensions: innovation. The Forecast aims to commit a half-billion dollars of real societal resources (including at least $0.2 billion for the airside excluding FBO), and their opportunity costs of other investments foregone, on the explicit assumption that the future it envisages, based on predictions for one 1990–2019 non-causal non-aviation variable, *will not materially depend on any changes in aviation occurring after 2016*, when its newest aircraft entered commercial service. That's not a "forecast"; it's simply the past writ large. It drives faster while looking only in the rear-view mirror. It bets against the next quarter-century of innovation at the swiftest pace in aviation history. Anyone placing that bet must be prepared to lose much money, time, and credibility. And even if the FAA makes that bet, the AAB and BoCC are not obliged to concur: their independent judgment can complement the FAA's expertise, temper any FAA rigidity, and offset any FAA oversight, capability gap (e.g. in forecasting), or unduly narrow decision context.

The Forecast's innovation §1.6.12 {60–61} has four paragraphs on eVTOLs, five on new propulsion technology (but none on the whole integrated airframe, like Otto Aviation's), no references, little sense of the rich timing analysis available (especially in the detailed technical brief[110] that Aspen Fly Right delivered seven months ago to the forecasters and Airport Manager at the County's request—see Essay #14, p 14), and no comparison of the timing or riskiness of innovative aircraft *vs.* the Forecast's suggested course of action. It is highly regrettable that County Staff does not wish to avail itself of the forecasters' insights on this impending aviation revolution. But the BoCC should do so, encouraged and advised by the AAB, and others will continue to seek to inform them both. Years of cordial offers to brief the BoCC on this topic have so far elicited no response, but Aspen Fly Right remains ready to help if asked, starting with the AAB on which the BoCC relies to evaluate such technical input.

The Forecast's important remark {57} that "some critical advances in aircraft technology…will likely have a significant influence on the national fleet mix's long-term future" underscores why the Forecast's exclusion of all such advances~~,~~ makes it unreliable. We continue to think (and have advised the consultants) that with aviation in such deep and rapid flux, scenario planning is a far better tool than simple extrapolation from a rapidly obsolescent past. We hope the FAA may in due course come to share this view and unhobble the County's capable consultants. Though they and County Staff assert that the FAA has already said what Forecast terms it will accept or reject, FAA practices actually provide instead that divergent proposals must be justified by evidence and may then be accepted. Not having that conversation, or conducting it through parties who may not be fully committed to its success, doesn't test our strong hypothesis that the sorts of evidence offered here may persuade the FAA to reconsider. That could open important doors.

Meanwhile, only the AAB and BoCC can exercise the sort of strategic judgment that could best manage risks, compare potential timelines, and seize opportunities. That's harder when County

Staff apparently don't want and won't pay the forecasters to apply their expertise in that way, but instead apparently continue to block our independent analysis from informing the AAB timely.

Even if valid, the Forecast does not justify the proposed airside expansion

Even without considering all these major methodological weaknesses and topical omissions, a startling conclusion now emerges: *If the Forecast were valid and persuasive, it would still not support the thesis that Aspen Airport needs urgently, if at all, to accept bigger planes.* All airline flights in the low forecast through 2042, and in the mid-range variant 84% in 2032 (falling only to 71% in 2042), *continue on regional jets; the only question is which type*—CRJ or Embraer.

There is no forecasted stampede to today's A220s for which the new airside is assumed to be urgently needed in 2032. The forecasters bashfully said they "slightly inflated" the A220-330s to fit the FAA's targets[111]. Actually, they *nearly tripled* the bigger A220s' 2042 share. Their mid-range variant raised 2032, 2037, and 2042 flights[112] from 0, 2, and 4 for the A220-100 in their February draft to 2, 4, and 5 {65} in their April draft, and for the A220-300, from 0, 0, and 0 to 4, 7, and 9. Nonetheless, *just 16% of those daily departures in the April draft for 2032, rising to 27% in 2042, would shift from regional jets to the narrowbodies requiring the airside upgrade, vs.* 0%, 5%, and 10% in the February draft. And despite that tripled A220 share, 24 of the 34 daily departures would still be regional jets. (The enthusiastic upper-range April forecast's fleet mix[113] reached 17% and 37% A220s, with 24 regional jets out of an enlarged 38 departures.)

A realistic assessment of CRJ700s, plus whatever one believes of the Forecast's E175LR assessment, implies that *longer and fuller use of regional jets could still ensure robust commercial service without the new full-ADG-III airside to 2042 or beyond*. This indicates that the A220s are an optional shift driven by at best a small marginal economic difference (from an undisclosed analysis or none)—not a necessity driven by a clear operational need. There's no urgency. In the February draft, before the FAA required more A220-100s and enormously more A220-300s, 34 of the 38 flights in 2042 were on regional jets, 4 on A220-100s, and 0 on A220-300s. Regional jets alone could serve that 4-operation/day need with small, no, or negative operational cost penalty—and avoid a $0.2-billion airside upgrade and whatever its net impacts might turn out to be.

Thus if the County executed the mid-range forecast and looked back from 2042, it'd wonder what all the rush was about to cement an ADG-III deal in 2023, at least a decade sooner than needed. The Forecast's narrative skates over these inconvenient implications of its own findings. The AAB should not. We have no reason to think the operators would forego substantial profits, nor even any. With no trace of actual analysis justifying the forecasted fleet mix, it's impossible to tell.

Conclusions and recommendations

If the suggested reanalysis of ASE aviation demand shows something close to (or perhaps below) the low forecast, as one might expect, then there's no case for deciding to rebuild the airside for at least another decade, or more—especially if advanced super-clean/quiet aircraft (Essay #5) are meanwhile entering Aspen service, presumably displacing the highest-impact and highest-cost aircraft. The CRJ700s can simply continue as long as needed, using life extension if necessary. If E175LRs prove viable too, they can try to compete, at least in the colder seasons. Reanalysis

may well show that the low case is more realistic than the currently preferred mid-range case, hence is a more credible "best estimate": the low forecast is not artificially "constrained," but is actually the case most consistent with the facts on the ground when properly analyzed. The low forecast also happens to be near the Core Community Goals target, so seriously reconsidering it could remove a major source of friction with the BoCC and increase the chances of the FAA's collaboratively achieving its own ASE goals in due course.

If the AAB concurs, it could recommend submitting the low forecast to the FAA *and* walking the FAA through this Essay's logic. (We'd be glad to help in that conversation.) The FAA's reported pre-rejection of the low forecast comes, we suggest, not from superior knowledge but from inadequate appreciation of the Forecast's deficiencies and gaps. If, having understood that new evidence, the FAA still insisted on a TAF-like outcome, that would strengthen growing local sentiment for deferring the airside decision and switching from dependence on FAA discretionary grants to self-reliance on FBO revenues. Meanwhile, the County should be rebudgeting the Airport project to examine how that self-financing approach could combine with lower project costs from the Commissioners' preferred landside-first and airside-upgrade-deferred phasing.

The Forecast's capable consultants are in the unenviable position of an advisor asked around 2012–15 to produce a 20-year forecast of where the US would sell how much gasoline to how many of what kinds of autos, so they could ensure proper disposition of filling stations and infrastructure. They're now being asking a similar question about Aspen aviation. Does that feel useful? comfortable? worthwhile? We doubt it. Should we figure out together some better questions and better ways to respond to them? Yes, but County Staff seem to have no interest in authorizing or funding them to do such work, nor to collaborate further with Aspen Fly Right to share our complementary knowledge. The narrow confines of the FAA's standard *pro forma*, homogenized, turn-the-crank forecasting thus unfortunately define what these seasoned professionals are being allowed to contribute to the AAB's deliberations. Not by the forecasters' choice, it falls far short of what informed, defensible evaluation requires and what wise County policy needs.

Aspen Fly Right normally confines its analysis and commentary to technical and strategic issues. However, we would be remiss not to note here, with the candor that our uniquely independent status permits, an important, troubling, and unhealthy dynamic we discern in County decision-making, especially about the Airport. Our impression from observing years of behaviors is that some County Staff are not disinterested in the outcome, faithfully executing the will of the people as expressed by fully informed BoCC decisions free of undue influence. Rather, some County Staff appear to be the main parties driving the bigger-planes agenda. Inconspicuously but pervasively and consistently, structures and processes are designed, information flows controlled, and decisions deferentially shaped to achieve that goal. Occasionally these discreet actions come to light. For example, emails we recently obtained reveal that in 2017, the then Aspen Airport Director organized an airlines-and-business-leaders campaign to lobby the County Commissioners (for whom he worked) against the views of a citizen group opposed to Airport expansion[114]. In 2023—with Forecast consultants under intense pressure to support Staff's agenda, and Staff controlling all communications with the FAA—only the Airport Advisory Board has enough independence, however partial and constrained, to have a chance of injecting fresh thinking and shifting the outcome.

In discharging that responsibility, the central conclusion seems to us clear. The AAB has not received the BoCC-mandated "clear and convincing evidence" that "*only aircraft which are cleaner, quieter, and of certain size…will serve ASE*"—let alone meet the County's quantitative impact reductions. On the contrary, the Forecast and the FAA's reported attitude make clear that the proposed plan will make the commercial fleet and its constituent aircraft types dirtier and noisier for the next decade, then perhaps slightly cleaner per passenger—but not cleaner or much quieter per airplane, up to about twice as big and heavy, and not demonstrably offsetting the dirtier and noisier airplanes that the new airside built to meet the Forecast will let in—while abandoning the growth-management Core Community Value. The BoCC's six specific criteria for proceeding with Goals #12–15 in Resolution 15-2020 therefore cannot be met by approving this Forecast, so the AAB should not recommend its approval by the BoCC.

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[1] *2023 ALP Update / Aviation Demand Forecast / Aspen/Pitkin County Airport*, report [by unnamed consultant Jacobsen | Daniels to unnamed client Pitkin County or its Airport], "Draft: Work in progress for review only," 20 April 2023. This document was handed out to Airport Advisory Board members and public participants at the end of the 20 April 2023 AAB meeting. The meeting's recording was posted at https://drive.google.com/file/d/10vyIQ-p1MLLCQ9CXdyAs4kn8W4dg1tSO/view. The 78-page Forecast document was posted in mid-May, with the Agenda of the 18 May 2023 AAB meeting, at http://aspenairport.wpenginepowered.com/wp-content/uploads/2023/05/Agenda-Packet-for-5.18-with-Draft-Meeting-Minutes-from-4.20.pdf. This assessment focuses mainly on the Forecast's larger structural and executional issues; we didn't check its math in {29–67}.

[2] Conveyed by the FAA's John Bauer to the BoCC, AAB, and public at the 11 April 2022 special meeting recorded at https://www.youtube.com/watch?v=d2Sp9S8RRIM&t=640s and discussed in Aspen Fly Right's Essay #14, "Fact-checking Airport claims: over half are false," 4 May 2023, https://aspenflyright.org/wp-content/uploads/2023/05/Essay-14_Fact-checking-claims_rev5May2023.pdf.

[3] P 449 of the March 2023 *Pitkin County Budget* (https://drive.google.com/file/d/1obQgmvx-KOhZo8M_qOGxF0cCnbfU6Tl0/view) states: "The Airport will likely need to make allocations for larger wingspan regional jet aircraft as airlines begin to introduce the E-175 aircraft into high elevation airports as a means to supplement aging CRJ-700 aircraft with a more fuel-efficient fleet. This transition is anticipated to commence within the next 12 to 18 months. The facility will need to adjust aircraft parking positions at the gates and/or work with airlines to optimize schedules in order to accommodate these aircraft. The introduction of these aircraft will not impact passenger volumes since the seating capacity of these aircraft are [*sic*] similar to that of the existing CRJ-700s currently serving the facility." It's unclear how many airlines would "commence," when, or how—perhaps just Delta's subscale operation. United's early retirement of its ~13-year-old CRJ700s seems especially implausible.

[4] The entire Resolution is conveniently reposted at https://aspenflyright.org/wp-content/uploads/2022/12/BoCC-revision-adoption_bocc.res_.105.2020-2-1.pdf. Its official posting is at http://aspenairport.wpenginepowered.com/wp-content/uploads/2022/04/bocc.res_.105.2020-2.pdf. It is described (Attachment, top of p 2) as "a blueprint for the County and community to achieve the BOCC aspirational goals for the Aspen/Pitkin County Airport over the next 30 years." It did not actually use a 30-year horizon, and the current Forecast uses 20, fitting FAA norms for an Airport Layout Plan but hardly informing strategic prudence.

[5] Ref. 40, initial slide 2 ("Core Community Goals for the Pitkin County-Aspen Airport / Resolution 105-2020"). These goals feature prominently on p 6 of the Common Ground recommendations, which are reposted for convenience at https://aspenflyright.org/wp-content/uploads/2022/12/ASE-VC-Final-Recommendations-1.pdf. They note on p 6 that the 30% reduction goal for "greenhouse gas and other pollutant emissions" includes "both the emissions from the airport itself and from the aircraft flying to and from ASE."

[6] This apparently refers to both greenhouse gases and criteria pollutants "such as volatile organic compounds (VOCs) and particulates," plus impliedly NO_x, which p 10 calls to be monitored along with greenhouse gases "etc."

[7] "Accommodate limited growth [Airport Commercial Enplanement Target of . 8%]," p 10 ("Guiding Principles," Community Character [Working Group] Meeting #1 presentation by County Staff, ASE Vision, 29 Aug 2019, https://aspenairport.wpenginepowered.com/wp-content/uploads/2020/09/Meeting-1-Community-Character-Meeting-1-Presentation-PDF.pdf. P 6 of the Common Ground recommendations notes that the 0.8%/y compound growth rate "is an aspirational goal": "airport growth cannot be 'tuned' to any precise number, but the goal represents a commitment to a reasonable level of managed growth" and that General Aviation growth too "should be managed."

However, 0.8%/y may not command consensus. As described in the citation in Ref. 10, the ASE Vision Community Character Working Group's ignored 27 Dec 2019 resolution appended Continua participant-voting diagrams showing strong sentiment for maintaining *or shrinking* current overall ASE operations. Decreased General Aviation operations were favored 10–1 over slight growth. Reduced local air pollution was voted entirely into the strictest category, and its most stringent end was favored by 8–3. We infer from this County-selected group that community sentiment may well favor enplanement growth slower than 0.8%/y, and quite possibly operations growth around or less than zero. If so, the reported FAA target of 1.3%/y could prove more controversial and politically difficult. We have not fully traced the origin of the 0.8%/y figure, but think it reflects growth projected from then-new routes.

[8] Goals #12 (Airport Layout plan for bigger planes), #13 (don't move runway, move other airfield elements), #14 (construction phasing), and #15 (Airport map).

[9] Ref. 41, initial slide 4 ("Common Ground Recommendations"), discussing negotiations, removes "airlines and" from the checklisted discussion partners, leaving only the FAA. This seems to be the latest status report available.

[10] Aspen Fly Right, "Aspen aviation and climate change," Essay #7, 9 Feb 2023, gives this history with references in n 70: "Encourage use of next generation regional aircraft…as close as possible to those we have now that are more consistent with community character," and "Avoid the unintended consequences of a new class of [General A]viation aircraft."

[11] As also in the draft Recommendations of the ASE Vision Airport Vision Committee's Work Session #7 ("at least **30%**"), 27 Feb 2020, https://aspenairport.wpenginepowered.com/wp-content/uploads/2020/09/Work-Session-7-DRAFT-Recommendations-Table.pdf. Further confirming the quantitative goals, "CO_2 and *Other* Air Pollution" (emphasis in original) and "Noise" were both described as "Substantial reduction (30%)", along with "Limited Growth (~.8%)," as the "High Level Airport Planning Goals" in "Completing Our Work: Developing [ASE] Vision Committee Recommendations to BOCC (DRAFT)," presented 9 Jan 2020 to Work Session #1 of the controlling Airport Vision Committee, https://aspenairport.wpenginepowered.com/wp-content/uploads/2020/09/Work-Session-1-Presentation-PDF.pdf.

[12] The "+EW" refers to this 2014 submodel's extended winglets or wingtips. Those names both refer to the same feature and the same aircraft, which for simplicity we'll hereafter call simply the E175LR, though it's up to ~5% more fuel-efficient than the original E175LR base model. Our E- manufacturer prefix is also often written EMB-.

[13] The Commercial Aircraft Data underlying the ASE Vision Technical Working Group's deliberations, citing ICAO's August 2019 Certification Database as adjusted by consultant Kimley-Horn to a per-passenger basis, is at https://aspenairport.wpenginepowered.com/wp-content/uploads/2020/09/Meeting-4-Aircraft-Data-and-Characteristics-PDF.pdf. It says fuel burned *per passenger* per Landing and Takeoff Cycle (LTO) is 3.35 kg for the 70-seat CRJ700, 3.2~~93~~ for the 76-seat E175LR, 2.71 for the 109-seat A220-100, and 1.98 for the 140-seat A220-300. *Per aircraft*, these figures imply 234.5 kg/LTO for the CRJ700, but higher for all its replacements: 2~~45.550.0~~ for the E175LR, 295.4 for the A220-100, and 277 for the A220-300. Total CO_2 emissions would depend on the number and length of routes flown: the longer-range A220s were chosen mainly to permit more new and longer routes, so assuming that fewer but larger planes will bring the same number of passengers seems unrealistic.

[14] A potential exception is that nonstops to/from ASE are more time, fuel-, and carbon-efficient than one-stop hub routes, as shown on p 9 of the Common Ground recommendations (Ref. 5, "Nonstop Flights"). Such savings would need to be offset against increased passenger volumes on such new and more-convenient routes. No such analysis has been presented or, as far as we know, performed. A converse issue identified on p 10 of the recommendations is that "Because the E-175 is heavier than the CRJ-700 and lacks sufficient power to serve ASE year-round with a full load of passengers and fuel, it would have to carry fewer passengers than the CRJ-700, be limited to a shorter range, and serve fewer destinations. This is why the E-175, despite being one of the most popular regional airliners today, has not been used for ASE. The E-175 is also a noisier and more polluting aircraft than the CRJ-700."

[15] Ref. 13.

[16] For volatile organic compounds or particulates emitted by the forecasted aircraft, no data appear to be available, but the E175LR uses virtually the same engines as the CRJ700. The A220's geared-turbofan engines are up to 25% more fuel-efficient—Pratt & Whitney's online data don't say *vs.* what—but produce 33–65% more thrust.

[17] Aspen Fly Right, "Flight Without Fossil Fuel," 12 Jan 2023, https://aspenflyright.org/wp-content/uploads/2023/01/ABL-essay_5.New-fleet_11Jan2023r.pdf.

[18] Lean Engineering's 25 Aug 2018 KASE report *Airspace Impact and Aircraft Feasibility Assessment Update* (https://aspenairport.wpenginepowered.com/wp-content/uploads/2020/09/Meeting-1-Airspace-Impact-and-Aircraft-Feasibility-Assessment-Update-August-25-2018-PDF.pdf) show ~~CRJ700~~ EPNLdB Lateral/Full Power, Approach, and Flyover noise data of 89.5, 92.6, and 82.4 for the CRJ700, and for the E175LR, respectively 90.4, 95.2, and 84.7. The "Commercial Aircraft Data" table provided to ASE Vision's Technical Working Group's fourth meeting on 16 Oct 2019 (https://aspenairport.wpenginepowered.com/wp-content/uploads/2020/09/Meeting-4-Aircraft-Data-

and-Characteristics-PDF.pdf) shows E175LR data of 91.8, 95.1, and 93.0—an average of 5.1 dB higher than the CRJ700. Continuing chronologically, Ref. 41, slide 5 shows the August 2019 ICAO data modified by Bill Tomcich "with new data from September 2022" (source and content unstated) to yield 92.0, 94.5, and 83.2—averaging only 1.7 dB above the CRJ700, mainly due to the 9.8 (!) dB lower flyover rating, ~~which merits rechecking~~later validated for ICAO's 3 Sep 2021 LL variant (thanks to Bill Tomcich). The forecasters thus presented and apparently relied upon this newer, undocumented noise comparison. We nonetheless adopt this newest dataset because the forecasters briefed it to the AAB on 20 April 2023, not because it's traceable or necessarily correct. All three datasets show that the E175LR is noisier than the CRJ700.

[19] As shown on p 6 of the 20 Apr 2023 AAB brief, with respective ratings of 88.0, 91.5, and 78.8 (again cited to ICAO 2019 after unstated modifications by Mr. Tomcich), consistent with Lean Engineering's 2018 study (Ref. 18).

[20] Assuming that "30% quieter" refers to perceived loudness, the ordinary meaning of the words. Interpreting it as sound pressure level or sound intensity would yield very different results, as explained in our Essay #9 (see its n 2, p 2).

[21] Ref. 41 recording at 1:01:40 and 1:05.

[22] The A220-100 weighs 139,000 lb and has 109 seats, just complying with both criteria.

[23] For example, in item 11 of the Recommendations redline by the Vision Committee's Work Session #9 (10 Mar 2020) at https://aspenairport.wpenginepowered.com/wp-content/uploads/2020/09/Work-Session-9-CGR-Table-Redlined-PDF.pdf.

[24] Mr. Bauer reportedly (Ref. 41, slide 3) "saw [the 0.8%/y goal as a 'Constrained' forecast," even though numbered slide 7 to the AAB on 20 April 2023 says that word means restrictive to any specific type of user or aircraft—not to all aircraft in the >95´–<118´ wingspan range under an existing FAA MoS. Our 27 April 2023 Colorado Open Records Act request for County Staff's interpretation of what Mr. Bauer might have meant by 'Constrained' in this instance elicited this 2 May 2023 reply from Airport Director Dan Bartholomew: "The FAA was very clear at the April 10, 2023 meeting that they will not accept a forecast that is artificially constrained. Since historical trends are a key element in developing a rational forecast, the FAA would view means to artificially reduce a forecast as a 'constraint'. Given that annual enplanement growth at ASE from 2000 to 2019 was 2.3% (1.9% between 2000 and 2022, however, COVID years are considered outliers), anything significantly lower than that expressed by the actual historic trend would require empirical justification to garner FAA concurrence. Anything artificially lower would be considered constrained. Therefore, anything submitted to the FAA (such as submitting the low-range forecast as the selected forecast, in this case) would be rejected by the FAA." Note that this does not exclude the possibility that "empirical justification" clearly presented to the FAA may change the Agency's mind—if County Staff allowed it.

[25] The forecasts show a linear growth equation in all three variants, but are summarized as exponential growth rates, so we use that common convention here, with continuous compounding to make the math simpler.

[26] As the briefer next states, with slide data, at 28:26 (and repeats at 30:16). The noise data are stated in fine print to have been updated by Bill Tomcich "with new data from September 2022" from an unstated source, but are still noisier than the CRJ700; the NO_x comparison is shown only per passenger (reversing the result); and no CO_2 comparison is shown. Those slides' noise data ~~cannot be validated without knowing the revisions' source and content~~ apparently come from ICAO's complex 9 Sep 2022 v2.31 update at https://noisedb.stac.aviation-civile.gouv.fr/bdd.

[27] Jacobsen | Daniels brief to Airport Advisory Board, 20 April 2023, Ref. 41, at 27:06–27:12, and slide "Common Ground Recommendations."

[28] Ref. 41 at 27:58.

[29] Ref. 5.

[30] Ref. 41 at 29:53.

[31] Effective Perceived Noise Level, measured in the logarithmic scale dB (decibels); a change of 10 dB doubles or halves the perceived noise. This metric, noise measurement, and noise perception and annoyance are discussed on pp 2–6 in Aspen Fly Right, "Aircraft noise and the Aspen community," 9 March 2023, https://aspenflyright.org/wp-content/uploads/2023/03/Essay-9_noise_6Mar2023.pdf.

[32] All air emissions are to be reduced from airplanes plus the airport itself, but the airplanes currently account for virtually all the total CO_2 (97% in the 2006 and 89% in the 2017 inventories), and probably for a similar or larger fraction of the NO_x and (not shown here) particulates.

[33] Ref. 41, numbered slide 27.

[34] The FAA has guided several stages of evolution in the ASE Draft Forecast and Fleet Mix. For example, on 24 Feb 2023, John Sweeney (FAA) wrote to Dan Bartholomew and John Bauer: "We have started our review of the forecast and fleet mix and based on our preliminary look at things we are a long way from being able to approve. Based on this we would like to focus our attention on getting the forecasts to [a] point where we are more comfortable and to a point where we could actually approve them. I know you are planning on taking the forecast to the [Airport]

advisory board on March 16th [later postponed to 20 March]. Our office does not think it would be the right time for us to come and answer questions [from the BoCC and AAB, later rescheduled for 11 April] and have discussions on the future of the airport when we are so far apart on the forecast." Aspen Fly Right has requested Mr. Sweeney's February comments and any later FAA comments on the draft Forecast and Fleet Mix, to help the public understand FAA's role in guiding the analysis and results. So far, the County is saying that no such written comments exist, but we have requested records of any comments not provided in writing.

[35] Ref. 41, numbered slide 4.

[36] As John Bauer's 11 April 2023 FAA brief made brutally clear to the BoCC and AAB, Ref. 2 or https://pitkincounty.ompnetwork.org/embed/sessions/266309/04-11-2023-bocc-work-session-special-meeting-04-11-2023.

[37] Aspen Fly Right, "Fact-Checking Airport claims: over half are false," 4 May 2023, https://aspenflyright.org/wp-content/uploads/2023/05/Essay-14_Fact-checking-claims-1.pdf.

[38] Ref. 41, 35:00–36:07, when Mr. Jacobsen states the Airport will "require discretionary grants."

[39] Based on Essay #14's (Ref. 37) #5–6 on pp 11–12.

[40] Ref. 18, initial slide 3 ("AAB Role and Responsibility"), emphasis in original: "*Note: We know alterations that lower the growth rate or fleet mix forecasts will not [be] accepted by the FAA for approval.*"

[41] The slides are at https://pitkincounty.com/DocumentCenter/View/30817/AAB-Aviation-Forcast-Meeting-42023. The recording of the 20 Apr 2023 AAB meeting is at https://drive.google.com/file/d/10vyIQ-p1MLLCQ9CXdyAs4kn8W4dg1tSO/view?usp=sharing.

[42] The Forecast states {56}, "The FAA may allow the inclusion of aircraft in the future fleet mix that are not current operating today. Still, generally, these aircraft must have obtained their FAA standard airworthiness certificate." Though the FAA reasonably expects infrastructure-investment-critical forecasts to be based on more than speculation, we have not been able to find any written FAA instructions specifying what level of certainty is required. Prudent modeling would seem to require at least a sensitivity test to help illuminate forecasting risk.

[43] By the BoCC's Preface to Goals 12–15 of Resolution 15-2020, https://aspenflyright.org/wp-content/uploads/2022/12/BOCC-revision-adoption_BOCC.res_.105.2020-2- 1.pdf, as noted above.

[44] Ref. 109.

[45] Aspen Fly Right, "Flight without fossil fuel," 12 Jan 2023, https://aspenflyright.org/wp-content/uploads/2023/01/ABL-essay_5.New-fleet_11Jan2023r.pdf.

[46] For example, at 2:27:40–50, continuing to 2:29:45, in https://aspenflyright.org/wp-content/uploads/2023/01/ABL-essay_5.New-fleet_11Jan2023r.pdf. On 21 Oct 2022, Mr. Jacobsen emailed Mr. Lovins, "…we found it [the brief] immensely beneficial in understanding what is truly possible in the coming years."

[47] Aspen Fly Right, "The airlines' planes aren't vanishing," Essay #4, n 33, 5 Jan 2023, https://aspenflyright.org/wp-content/uploads/2023/04/ABL-essay_4.-Fleet_01Jan2023corr29Apr2023.pdf.

[48] https://drive.google.com/file/d/1l2__1SScBHeXRn4J87bKWSM0F5AAPHG7/view, at 1:40:00–1:41:09.

[49] Ref. 41, numbered slide 7 ("FAA FORECAST REQUIREMENTS (CONT'D)"). The FAA's Terminal Area Forecast or TAF, last updated 1 March 2023 (https://www.faa.gov/data_research/aviation/taf), produces US-wide airport-by-airport quarterly forecasts of enplanements and operations. Its method (https://www.faa.gov/sites/faa.gov/files/Forecast%20Process%20for%202022%20TAF.pdf) is trend extrapolation from past origin & destination market data, regressing on fares, regional demographics, and metropolitan-level economic factors. "The TAF assumes a demand driven forecast for aviation services based upon local and national economic conditions as well as conditions within the aviation industry. In other words, an airport's forecast is developed independent of the ability of the airport and air traffic control system to furnish the capacity required to meet demand. However, if the airport historically functions under constrained conditions, the FAA forecast may reflect those constraints since they are embedded in historical data. In statistical terms, the relationships between economic growth data and data representing growth in aviation activity reflect those constraints."

[50] https://taf.faa.gov/Home/RunReport for ASE as of 30 Apr 2023.

[51] Introductory statement to 11 April 2023 BoCC/AAB/FAA meeting, ref. 41.

[52] Ref. 41 at 37:50–38.06; also 43:55.

[53] Ref. 41, numbered slide 27.

[54] G. Walden at 57:50 in ASE Vision 2nd Meeting, 20 Mar 2019, https://archive.org/details/ASE_Vision_Meeting_-_2nd_Meeting_on_March_20_2019.

[55] Ref. 109.

[56] G. Walden at 57:25–58.23 in ASE Vision 2nd Meeting, 20 Mar 2019, https://archive.org/details/ASE_Vision_Meeting_-_2nd_Meeting_on_March_20_2019.

[57] Starting in Ref. 41 at 56.

[58] At 1:25 in BoCC Work Session, 3 Jan 2023, https://pitkincounty.ompnetwork.org/embed/sessions/259746/bocc-work-session-01-03-2023.
[59] Ref. 41 at 45:45–46:16, emphasizing that the forecasters began their FAA conversation on the low side but were rebuffed. That's understandable if the evidence shown to the FAA were of the quality we assess here. We hypothesize that presenting this Essay's evidence to the FAA might have changed that outcome, and still may.
[60] Loosely speaking, variance measures how far a set of numbers is spread out or scattered from their average value. Technically, it's the expectation of the squared deviation of a random variable from its population mean or sample mean. It's therefore not strictly correct to express a correlation coefficient (r^2) as a percentage, but for simplicity, we'll do so here anyway.
[61] At tylervigen.com, augmented by Tyler Vigen's book cited there, *Spurious Correlations*.
[62] An expert analyst well versed in statistics, commenting on the Forecast, concurs: "I agree that simple regressions for enplanements based on CO employment, CO income, and US income are likely to be spurious and have no obvious causal relationship to local air travel needs. I also agree that the trend in local lodging accommodations [discussed below] suggests a likely causal explanation for recent increases in enplanement that is transient rather than one that justifies an expectation for sustained increases."
[63] GRA Inc., "Forecasting Aviation Activity by Airport," 2001 guidance document prepared for FAA Office of Aviation Policy and Plans, Statistics and Forecast Branch, https://rosap.ntl.bts.gov/view/dot/16475, at p 3.
[64] Airport Cooperative Research Program Synthesis Program, "Airport Aviation Activity Forecasting: A Synthesis of Airport Practice," 2007, https://nap.nationalacademies.org/download/23192.
[65] At 2:50:50–2:51:06 in the recording at https://drive.google.com/file/d/1I8-LR-uA6jvN0yRs-VERgB_m9FMGfuzj/view.
[66] Ref. 41 at 42:17.
[67] Aviation marketing consultant Bill Tomcich (personal communication, 4 May 2023) also notes the importance of Continental's Sep 1994 Denver hub shutdown, and says that in winter 1997/8, he recruited five airlines to serve ASE, but ptwo of them went bankrupt in 1998, ushering in relatively stable service by United, Northwest, and American West.
[68] Ref. 67. The ski season is recorded from 1 Dec to 30 April.
[69] What statisticians call a model's ability to "explain" variance refers solely to correlation, not underlying causality. It is not the answer to a "Why" question.
[70] Gary Smith, "The Art of Regression Analysis," Ch. 9 in *Essential Statistics, Regression, and Econometrics*, 2nd ed., pp 261–299, Academic Press, 2015, https://doi.org/10.1016/B978-0-12-803459-0.00009-1/.
[71] Graphic and caption (citing the authors of the original out-of-print source) from p 15 of *The Visual Display of Quantitative Information*, Graphics Press (Cheshire CT), 2d ed., 2001. The original graphic, in three variants summarized at https://time-price-research-astrofin.blogspot.com/2017/02/solar-and-economic-relationships-garcia.html, is from the drily hilarious classic article "Solar and Economic Relationships: A Preliminary Report" by Carlos Garcia-Mata and Felix I. Shaffner, *The Quarterly Journal of Economics* **49**(1):1–51 (Nov 1934), Oxford University Press, https://doi.org/10.2307/1883875.
[72] [UK] Airports Commission, "Discussion Paper 01: Aviation Demand Forecasting," 2013, https://assets.publishing.service.gov.uk/government/uploads/system/ploads/attachment_data/file/73143.aviation-demand-forecasting.pdf, provides a usefully clear summary of simple forecasting methods at §2.5–2.7 and 2.13, pp 6–8. In the event, while Britain's third Heathrow runway (proposed in 2006) survived in 2020 a Supreme Court challenge to its breaching government obligations to abate climate change, falling passenger numbers and rising costs had stalled the project by 2023—a sobering reminder that trend is not destiny, and that narrowly framed extrapolations from history may not predict well.
[73] Ref. 41, numbered slide 9, "Historical enplanement trends."
[74] Quoted more fully in Ref. 24 above.
[75] Starting around 47 in the brief was an obvious place to explain this likely causal factor, but it wasn't mentioned.
[76] From 2012 to 2018, traditionally managed lodgings lost a total of 299 pillows' capacity.
[77] The cited underlying analysis—DestiMetrics' *Stay Aspen Snowmass Transient Inventory Study, July 2022–November 2022*—explores in detail the complexities of differentiating overlapping traditional and STR categories: https://aspenchamber.imagerelay.com/share/70df6457ef4042f790cfce554c697e36.
[78] The Aspen-area real-estate market continues to ring like a bell: a page-one headline features a couple, both MDs, who've resigned from Aspen Valley Hospital and moved away because their single-family-house rental just doubled to $25,000 a month and they can't afford to live here (R. Carroll, "Physician couple leaves after rent doubles," p. 1, *Aspen Daily News*, 1 May 2023). Pitkin County property-tax value assessments soared by an average of 85% in two years to mid-2022 (S. Condon, "Pitkin County property value soared 85% in reappraisal," *Aspen Daily News*, p 1, 3

May 2023), though market values then dipped from that peak. Runaway real-estate inflation seems driven by the pandemic, STRs, and other mutually reinforcing factors.

[79] J. Taris, "County lines up ban on rural STRs," *Aspen Times*, 15 May 2023, https://www.aspentimes.com/news/pitkin-county-lines-up-ban-on-short-term-rentals-in-rural-remote-zones/.

[80] Ref. 87.

[81] Ref. 87.

[82] Curtis Wackerle, "The Roundup: Letter from the newsroom," "Six Top of the Rockies awards and a new window into short-term rentals," 4 May 2022 email blast from Aspen Journalism. https://aspenjournalism.org/new-short-term-rental-rules-limit-supply-restrict-future-growth/?utm_medium=email&utm_source=The%20Source&utm_campaign=36c87c1e3b-EMAIL_CAMPAIGN_2023_05_04_06_39&utm_term=0_-36c87c1e3b-%5BLIST_EMAIL_ID%5D/.

[83] The 20 Apr 2023 AAB meeting (Ref. 41) includes a remark by Bill Flock around 52 that the long-term Aspen hotel/enplanement correlation was "not very strong," explaining "only" 57% of the scatter in the data. It's not clear what exactly was tested for what period with what skill and diligence, but whatever was tried or found, it didn't affect the models' content or structure as it should have. Why should any effects of this rental-market earthquake be assumed immaterial for the next 20 years when they had such pronounced apparent effects in the first five years? Saying "we couldn't pinpoint it exactly, so we didn't use it as a specific factor" (53) summarizes analytic failure. Yes, regression analysis is "a forecast based on a forecast," and the consultants lacked a forecast of Aspen-area hotel rooms (54–55), but that gap would be far easier to fill using the hospitality industry's standard toolkit and sources—including interviewing local developers—than conjuring enplanement forecasts from whole cloth.

[84] Ref. 41 recording at 48.

[85] Ref. 41 recording at 48:00–48:16.

[86] Ref. 41 recording at 51:30.

[87] Laurine Lassalle, Aspen Journalism, "New short-term-rental rules limit supply, restrict future growth," 29 Apr 2023, https://aspenjournalism.org/new-short-term-rental-rules-limit-supply-restrict-future-growth/ and, in video, https://www.youtube.com/watch?v=uocmItUbyIc. The locally published versions were 30 Apr 2023, *Aspen Daily News*, https://www.aspendailynews.com/news/aspen-journalism-new-short-term-rental-rules-limit-supply-restrict-future-growth/article_7a4383bc-e730-11ed-8497-33b16ee1e899.html, and *Aspen Times*, https://www.aspentimes.com/news/aspen-journalism-regulatory-spigot-tightens-flow-of-strs-in-aspen-and-pitkin-county/.

[88] Lori & William Small, "Perfect storm of bad tax news for Pitkin property owners," *Aspen Daily News*, 15 May 2023, pp 22–23, https://www.aspendailynews.com/opinion/smalls-perfect-storm-of-bad-tax-news-for-pitkin-property-owners/article_2096c1f0-f372-11ed-93ca-afa05b5ccbb8.html.

[89] These are "Linearity between the dependent and independent variables; statistical independence of the errors;…constant variance of the errors; and normality of the error distribution." ICAO, Ref. 90, p 21. If any one of more of these conditions is not met, the model "may not be appropriate for the purposes of inference or prediction/forecasting." The Forecast reports no test for any of these fundamental conditions, nor does it show that its independent variables meet any of the four tests required to indicate causality (p 11 above, just before inset quote).

[90] Technically, the model was "misspecified"—fitting data by the wrong method or using the wrong kind of curve, or omitting salient potential influences that needed careful checking to see which mattered and which were anomalous or recurring. Dummy variables are a common method used, for example, by the International Civil Aviation Organization's forecasters to improve their modeling of temporary and anomalous events such as major terrorist events, epidemics, or economic disruptions: ICAO, "Developing a Long Term Air Traffic Demand Forecast Model," p 8, n 15, www.icao.int/sustainability/Documents/RTK%20ranking/ICAO_LTF_MODEL_DOC.pdf. The expert quoted in Ref. 62 suggests another practical option: "I suppose you could try a dummy variable approach, but I wonder if the more direct and useful analysis would be to regress enplanement against (1) traditional [lodging] units and (2) STR units as independent time series. I'd also extend that approach by separately modeling both of those variables along with each of the three likely spurious variables (CO emp, CO inc, US inc). That way you'd control for housing's effect on enplanement and have a reasonable test for whether the correlation with the three standard variables (CO emp, CO inc, US inc) is spurious or not. / If the new regression has reasonable explanatory power, you could then project future trends for (1) traditional units and (2) STR units to contrast with projected enplanement forecasted from the three legacy variables. That would require some scenarios for how both unit counts would change over time, but it sounds like you have a grounded intuition for how to talk about that in a way that is distinct from the trends in state employment and state/US income (which for reasons mostly unrelated to local air travel demand are likely to experience steady increases)."

[91] S. Condon, "'Uncrowded by design'? Not if SkiCo can help it," *Aspen Times*, 8 May 2003, https://www.aspentimes.com/news/uncrowded-by-design-not-if-skico-can-help-it/.
[92] See p 2 of Essay #3, "Runway robbery?," 20 Dec 2022, https://aspenflyright.org/wp-content/uploads/2023/01/ABL-essay_3.-FBO_dr21_29-Dec-2022rev5Jan2023.pdf/
[93] Because the regression seeks to fit a trend very substantially inflated by the 2015–19 growth spurt.
[94] C. Lutz, "Degrees of warming in Aspen," *Aspen Daily News*, 22 Dec 2019, https://www.aspendailynews.com/news/degrees-of-warming-in-aspen/article_d089629e-2453-11ea-a00a-3ffdea573610.html.
[95] S. Condon, "Aspen Skiing Co. sends strong message to critics of its actions on climate change," *Aspen Times*, 30 Dec 2021, https://www.aspentimes.com/news/aspen-skiing-co-sends-strong-message-to-critics-of-its-actions-on-climate-change/.
[96] No doubt "there is a strong demand for access to ASE with new yet-to-be-delivered Gulfstream jets"—the 650s whose owners hoped to fly in more than a decade ago, the 700s due in 2023, and the 800s due in 2024, not to mention the Bombardier Global 8000 and Dassault Falcon 10X. Yet it's still older, often noisier private jets that would do most of the GA operations (p 67) that will continue to dominate total operations (brief p 25).
[97] Cited on {23} to the nonexistent section §1.3.20.
[98] https://www.postindependent.com/rifle/population-jobs-forecast-met-with-skepticism/#:~:text=The%20number%20of%20jobs%20in,jobs%20by%202040%2C%20she%20said.
[99] Ref. 41 recording at 1:29:10.
[100] Ref. 101, n 28.
[101] Aspen Fly Right, "The airlines' planes aren't vanishing," 5 Jan 2023, p 8, https://aspenflyright.org/wp-content/uploads/2023/04/ABL-essay_4.-Fleet_01Jan2023corr29Apr2023.pdf.
[102] Ref. 41, recording at 59.
[103] The ASE Vision table (Ref. 13) shows "ASE Missed Approach Capable? Summer" as "Marginal."
[104] Ref. 18. Its summary chart on p 4 shows "Arrival" feasibility as "Charter" (not "Scheduled"—see also p 116 but compare pp 55, 68, and 81, where the language is typically "appear to be feasible"). Its p 3 Summary says the winglets will "potentially" permit ASE operation using the 2018 CAFM/SCAP modules (p 115). P 2 says it "appears capable… [but] operations are limited by stage length and climatic conditions." P 113 cites inbound wet-runway payload restrictions. P 13 and p 24 predict springtime substitutions or cancellations. P 71 says the aircraft "will struggle to comply with the departure procedures requiring climb gradient in excess of 500 ft/nm (but can comply with the milder 465 ft/nm LINDZ 9 departure procedure). P 73 notes the risk of "loss of both scheduled and charter operations" due to "reliance on a single approach procedure [Special LOC/DME RWY 15], which utilizes multiple ground based NAVAIDS." P 76 describes landing-weight limitations. P 85 §8.8.2.2 shows dismal summer load factors ASE/ORD, and p 89 (§8.8.2.4) shows significant summer weight restrictions, up to 20% ASE/DEN, and 25% ASE/SLC (p 101, §8.8.2.11), plus up to 39% capacity loss ASE/DFW on p 92 (§8.8.2.6), 43% ASE/LAX (p 94, §8.8.2.7), and 33% ASE/PHX (p 112, §8.8.2.18). None of this is surprising: p 85's datasheet says this aircraft's maximum pressure altitude for takeoff and landing is 8000´ (increasable to 10,000´ but not yet used then by Envoy), but a cool spring morning at Aspen Airport can be 9,555´ and a summer midday pressure altitude could rise to 11,000´ (Aspen Airport, "High Altitude Safety," https://www.aspenairport.com/operation/operating-procedures/high-altitude-safety/). The aircraft is also a couple of tons heavier than the CRJ700—an inherent payload disadvantage. And its reportedly awkward aft yaw response to crosswinds may indicate an aerodynamic design issue for which extra flight-attendant padding is hardly a full response, especially for ASE operation.
[105] As recounted by Bill Flock in Ref. 41 recording at 1:04:35–1:05:31.
[106] Ref. 104 cites typical capacity-loss simulations in §8.8.2.
[107] Or an older E175, but that fleet is very young.
[108] Aspen Fly Right, "Using smart regulation and siting to cut Airport impacts," 13 Apr 2023, https://aspenflyright.org/wp-content/uploads/2023/04/Essay-12-Regulation-dr-7.pdf.
[109] Aspen Fly Right, "Have a safe flight," 22 Dec 2022, https://aspenflyright.org/wp-content/uploads/2023/01/ABL-essay_2.Safety_22-Dec-2022r.pdf, details local emergency management capacity at p 5 and n 45. Normal casualty capacity totals up to four ICU and 21 other patient beds in Aspen, many normally occupied; 70 assumes full surge adaptation of both hospitals, plus the ability to reach both. The current, upgraded mass casualty plan is designed for up to 70 victims. "Worst case" training scenarios assume up to 150, but that would exceed the Valley's total hospital capacity and require mass transportation to other centers, by means and routes that may be unusable due to the accident or high-mountain weather or both.

[110] Amory Lovins, "The clean-aviation revolution and Aspen Airport's evolution," invited technical brief for Aspen/Pitkin County Airport Director and Jacobsen | Daniels, 19 Oct 2022, https://aspenflyright.org/wp-content/uploads/2023/01/PitcoFleetMixBrief19Oct2022r.pdf.

[111] Ref. 41, recording at 1:05:31–54, Bill Flock: "We don't expect a flood of Airbus A220-300s coming into the market. I think in the outer year [2042] it would represent-again, this is slightly inflated to meet the FAA's target—we're talking about 5% of total enplanements."

[112] Jacobsen | Daniels, p 49 (p 85 of Pitkin County's 3,762-page 7 Apr 2023 data download in response to Aspen Fly Right's 27 Jan 2023 CORA request), *2023 ALP Update / Aviation Demand Forecast / Aspen/Pitkin County Airport*, Draft: Work in progress for internal review only, 7 Feb 2023, showing mid-range variant, Peak Month Average Day Schedule Daily Departures. The listed sources are "Cirium's Airline Schedule database and T-100 database, Airport Management Records, individual airline Annual Reports." There is no indication or citation of any of the complex operator economic analyses that actually underlie decisions to retire or introduce an aircraft type.

[113] Upper Range is mislabeled as Mid Range in Table 35 {65}.

[114] Emails we obtained on 7 April 2023 through a 22 January 2023 Colorado Open Records Act request to Pitkin County show that on 7 Nov 2017, then Aspen Airport director John Kinney wrote United, Delta, American, and SkyWest officials an email entitled "Time sensitive – ASE's EA vote next week." Its full text was: "Good morning Aspen Airlines! / Please see the email below I sent to the Aspen Chamber of Commerce Board of Directors. The Board of County Commissioners is making their final recommendation / vote - hopefully to adopt the Environmental Assessment which will cleared [*sic*] the environmental way with the FAA to start the design of a new terminal building and to relocated [*sic*] the existing runway 80' to the West allowing the larger regional jets to operate into ASE and preserve schedule[d] service as Aspen knows and enjoys it to be today. These projects once cleared by the FAA - after the FAA receives the document from the BOCC and conducts their respective internal reviews and decisions - requires ASE to begin within 3 - 5 years of the EA date of adoption. / The second email below is the grass roots effort by a community group soliciting persons [to] appear at the BOCC meeting and oppose the adoption of the EA and submission to the FAA[.] / Any local or regional representation or letters to the BOCC - this would be the time [for] expressing your perspectives or proprieties [*sic*]. / Please call me if you have any questions and / or comments[,] / John"

Mr. Kinney attached the following 7 Nov 2017 email he'd just sent to Debbie Braun at aspenchamber.org, Rose Abelio at snowmasstourism.com, Clint Kinney at the Town of Snowmass Village, and Bill Tomcich: "Subject: Support the ASE EA at the BOCC." Its full text was: "Debbie / Please see the email below distributed widely to Woody Creek's Caucus membership; requesting all members to write letters of concern or show up to the BOCC meeting and oppose moving the airport's EA onto the FAA. The ACRA Staff and Board of Directors have asked several times, to be notified when opposition arrived so as to provide a counter perspective. I think next week's BOCC meeting on Wednesday November 15th at 12:00 is that time. The airport's EA is the 4th item on the agenda. / If you have any questions, please do not hesitate to contact me @ [phone number redacted by Aspen Fly Right]. / Regards / John"

Mr. Kinney attached this 6 Nov 2017 email from the Woody Creek Caucus to its Executive Committee: "Subject: IMPORTANT NOTICE FROM THE WOODY CREEK CAUCUS
To: Executive Committee [address redacted by Aspen Fly Right]
The BOCC's second reading of the Airport EIS will be onWednesday, November 15 and we think that it would be advantageous to have as many people as possible present at that hearing, to protest the acceptance of the EIS or at the very least to ask the BOCC to TABLE a decision until an independent EIS can be made. All surrounding neighborhoods should be interested as it certainly will affect all fly-by areas.
THE FOLLOWING ARE MAJOR ISSUES THAT SHOULD BE ADDRESSED IN AN INDEPENDENT EIS:
· NOISE - The newer aircraft are supposed to be quieter however, if 737 type aircraft are allowed in this valley, the noise will be horrendous!
· POLLUTANTS – From unburned fuel that is released which contains volatile organic compounds
· SAFETY ISSUES - in this narrow mountain valley
· DISASTER STUDIES - our infrastructure cannot handle a major catastrophe
· Note: Other airports in the country have special restrictions as not every airport is "one size fits all"…, which is why we require a special independent unbiased EIS
Please come to the BOCC meeting on November 15, and send personal comments to each of the county commissioners personally, see addresses below [redacted by Aspen Fly Right], stating your own concerns about the airport expansion. The notes Should be sent this week before the meeting.
Thank you all as this is of great importance.
Linda Waag, Secretary"

We don’t know whether such activities by a County official are legal, but they hardly seem proper or worthy. We wonder whether any similar practices might persist today.