* = click to build/transition

[small type] = details not spoken

Framing the Future of Aspen Airport

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Pitkin County Board of County Commissioners
Aspen, 27 June 2023

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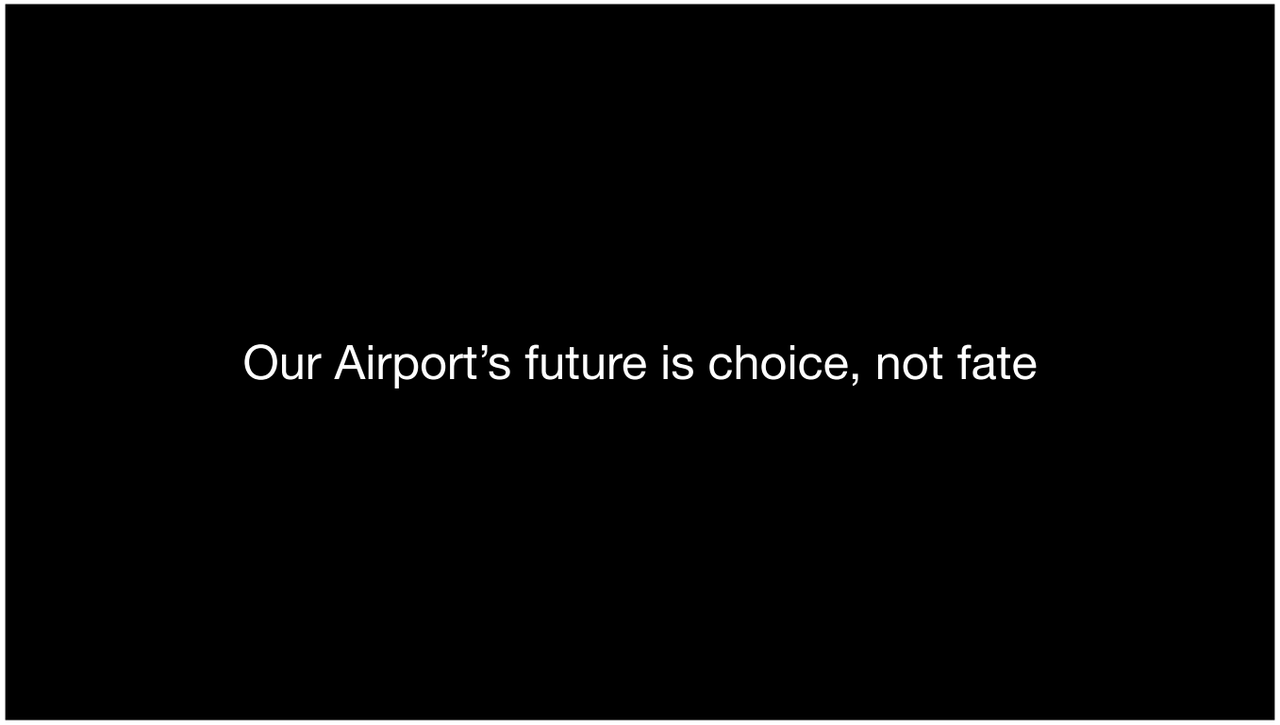
Thank you for this roundtable. After one background slide, I'll summarize Aspen Fly Right's assessment of the draft Forecast and Fleet Mix, and suggest alternatives. *

Who is Aspen Fly Right, what does it do, and how?

- Aspen Fly Right seeks to help inform the community and stimulate an independent, objective, accurate, respectful, inclusive, and constructive conversation about Aspen Airport's airside and the planes operating there.
- We publish ads, documented essays, and background at aspenflyright.org.
- We're independent, scientific, and rigorous, with a robust error correction policy. If you find any errors, please tell us (the County hasn't yet).
- We know of no conflict of interest by our Directors, officers (= de facto staff), or donors. We have no undisclosed relationship with any donor or advisor.
- We're informed by, and cross-check, ~25 uncompensated experts. We pay only a campaign consultant, who pays our designer/webmaster. We're supported by community donations (see website). We're all unpaid volunteers.
- A big thank-you to all who help us learn more and get better.

Aspen Fly Right is an independent volunteer nonprofit organization, formed ten months ago to help our community * understand and improve * Aspen Airport's airside choices. * We're scrupulously independent. We strive to get it right, and ask readers to report any mistakes we missed so we can fix them. * We have no interests at stake, no connection with any other organization, no known conflicts of interest by us or our donors, and no undisclosed relationship with any donor or advisor. * Our community-funded effort cross-checks information from ~25 unpaid informal technical advisors. The financial summary on our website was just updated. Nearly all our donors are local.

We collaboratively support Jacque and the Airport Advisory Board. We helped Barry Vaughan with the safety report. We'll help with the new RFP to characterize the concerning air pollution that we measured downwind of the Airport. Our thousands of hours of research, documented in 231 pages of essays so far, offer clear, solid, unbiased, and previously missing analysis. * We're grateful to all, including our fellow-panelists Bill and Brad, who graciously share their knowledge, and I'm so glad we have this opportunity to dig into the analysis that Bill just capably began. *



Pitkin County is in the chute fixing to climb onto an aviation bull that dreams of 200,000 more enplanements (airline passenger boardings) by 2050, then ever more. FAA-mandated and -supported runaway growth undermines your other goals. This bull takes no account of its rider’s needs or wants. Better to climb off now than crash off later.

Your basic choice is familiar. Bigger roads make more traffic; bigger planes and airports bring more people. Some proclaim we’re fated to have ever more passengers and bigger planes because the FAA demands this if we want more grants, and we’re hooked on grants, mostly to build the infrastructure to make those forecasts come true. Yet three other choices can avoid that hostage-like fate by following facts and common sense. First, as I’ll show, valid analysis demonstrates that this Forecast is severalfold higher than the historic data support. The more realistic lower-range forecast variant can be strongly evidence-based as the FAA rightly requires. It doesn’t need the bigger planes, or the new airside, or most of the grants. Second, your vital and imminent FBO choice can yield big net revenues so we won’t need the FAA’s discretionary grants to finance needed Airport improvements. Regaining financial independence to control our own destiny lets the FAA mind its own safety business and stay out of our growth-management business. And third, whatever your view of bigger planes, that choice is *way* premature. Both kinds of existing regional jets make it unnecessary, and the aviation revolution makes it imprudent, to choose now, or for a decade to come. Understanding our aviation demand buys the time to choose wisely and timely—only when we need to, and can see where aviation is heading. So that’s why we must get this Forecast right. *

Essay #15: Assessing the official Airport Forecast

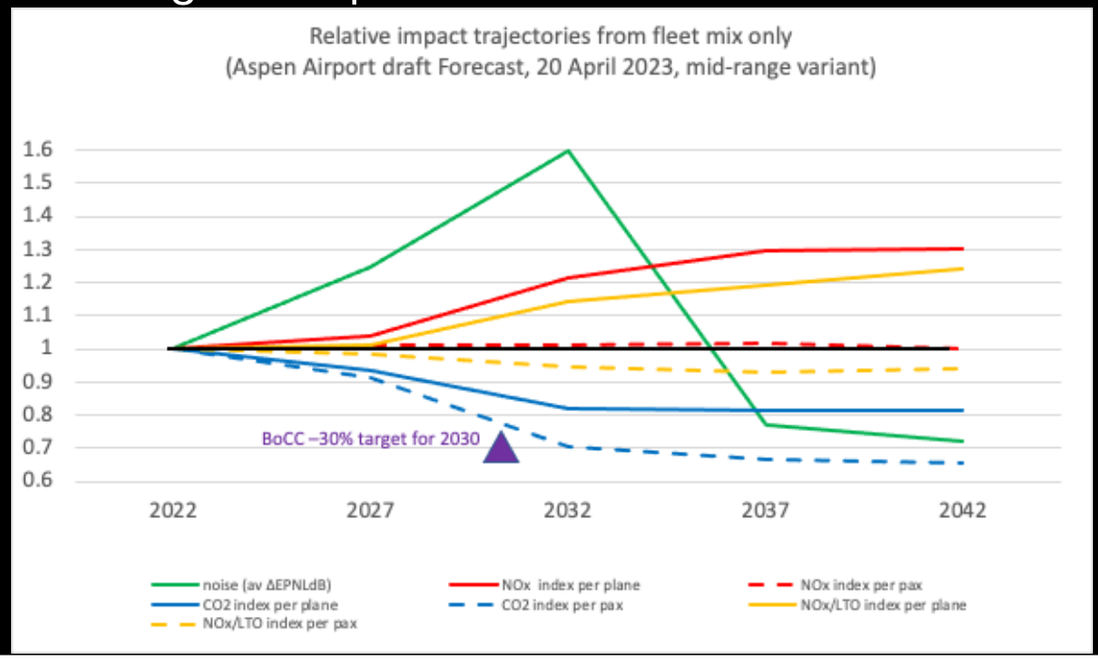
"The Forecast's significant analytic flaws and gaps make it unsound and unreliable."

Our Essay #15 in your packet assessed the Airport Forecast as "unsound and unreliable." The Airport Advisory Board had our assessment three days before voting, but didn't mention or discuss it, so I'm glad we can do that here. I'll focus on just the six biggest of the Forecast's many issues:

- growth in enplanements (passengers boarding airline planes in Aspen) is mismodelled and grossly overstated;
- only a severalfold-lower growth rate fits the historical data when we dig deeper into the issues Bill nicely described;
- that lower forecast would require no bigger airplanes and hence no new airside;
- the bigger planes proposed would meet no community need and satisfy none of your Resolution's six quantitative goals;
- the Forecast confirms there's no reason to choose the airside for another decade or more; and
- whether or not there turns out to be a local public-health imperative that could scramble Airport strategy, *all* fossil-fueled planes are likely to be outcompeted by extremely efficient, clean, quiet, fossil-free models that fit our current airside, even before we could build a new one.

I'll also suggest a potential way forward with the FAA to get the airside and the funding we really need. *

Meeting the requirements of Resolution 105-2020



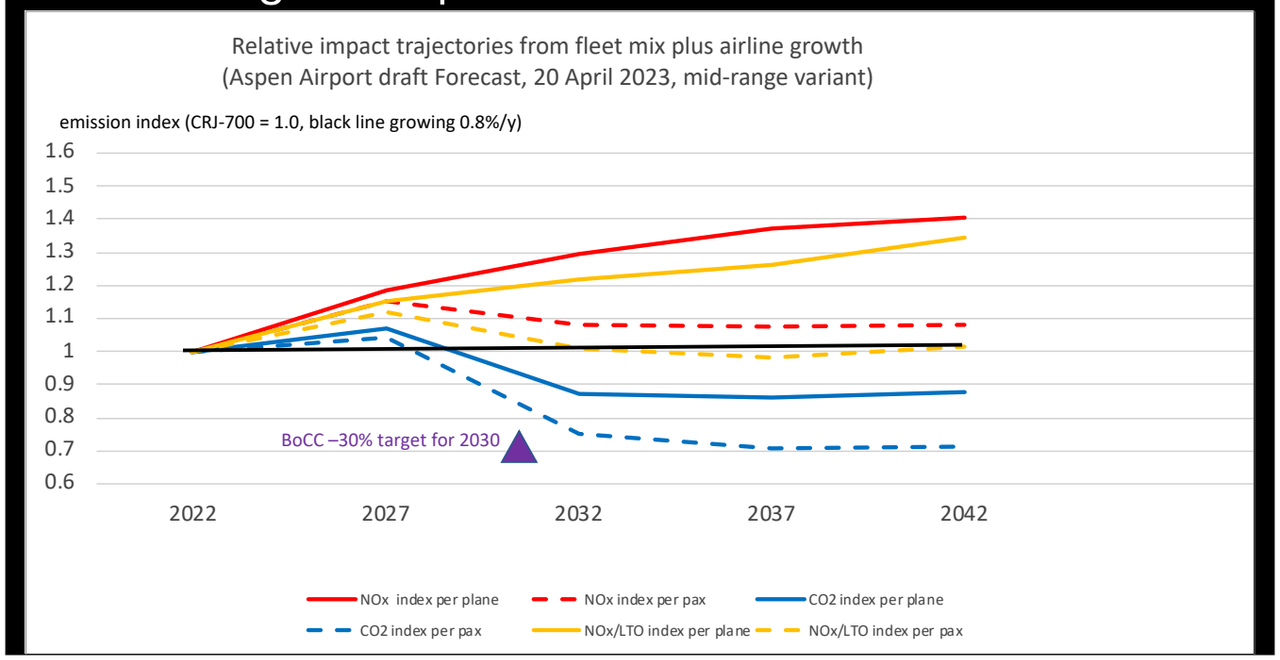
Essay #15 details how the proposed Fleet Mix violates all six of your Resolution's specific requirements. The AAB was told your 0.8%/y Core Community Goal enplanement growth rate wasn't really a goal, just a bargaining chip. To make it look close to the Forecast's 1.3%/y, Staff averages across the whole year, then divides the 2042 value by the 7,300-odd days in the next 20 years to yield a reassuringly small metric called "average passengers per day." Actually, by 2042 the Forecast calls for 91,673 more enplanements, or ~13× Aspen's resident population. /

The FAA's forecast, which our Airport's 10-year forecast must match within 15%, predicts a *half-million* enplanements in 2050—~200,000 more than now—and then will keep rising indefinitely with national economic growth. The FAA recognizes no local constraints, conditions, needs, or desires. It just forecasts aviation growth and funds airport capacity to meet it. All resulting costs and risks, all conflicts with your broader responsibilities, all damage to this Board's half-century of growth-management efforts, will be *our* problem, not the FAA's. /

To claim the Forecast meets your noise, carbon, and pollution goals, Staff ignores your Resolution's [105-2020] emphatic requirements of at least 30% less noise, carbon, and pollution by 2030 (on pages 4 [Core Community Goals] and 5 [#2]), and mentions only the qualitative clause on p 8 [#12]. Staff further ignores your specific requirement, in the preamble to that clause, that "only aircraft which are cleaner [and]…quieter…will serve ASE". All three proposed aircraft fail—the Embraer in noise and emissions, both Airbuses in nitrogen oxides (NO_x) per aircraft. That prohibits you from approving the work in the Airport Layout Plan meant to be based on this Forecast. Finally, Staff switches from your Resolution's per-*airplane* characteristics to per-*passenger* ones. This cuts the impacts in half by doubling passengers per plane. /

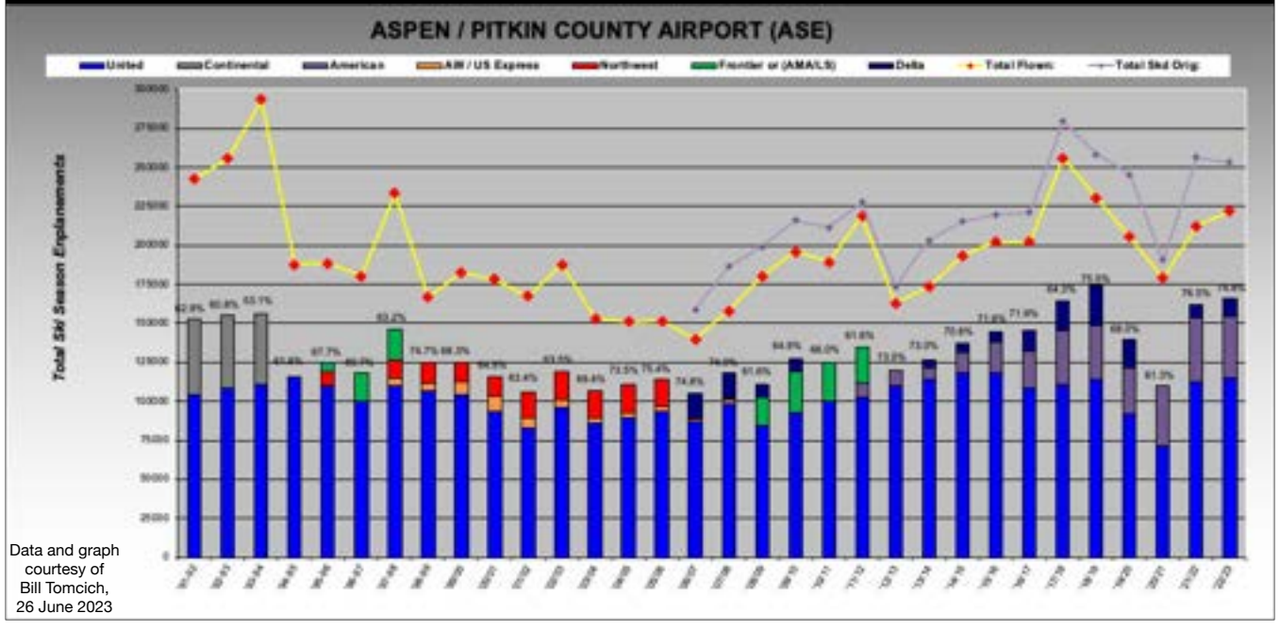
No one analyzed the Forecast's overall impacts, * so we did. This graph shows the next 20 years' evolution of airline emissions from the Forecast's fleet mix. The black line, at an index value of 1, represents the existing CRJ-700 fleet. The green line shows how noise rises with the louder new Embraers, then falls as they're diluted by the bigger but quieter Airbuses. It ends up nearly 0.7 dB lower than now, but would need to drop by nearly 6 dB to meet your 30% goal. The three other solid lines use your clause #12's criterion—impacts per airplane—while the dashed lines show Staff's substituted impacts per passenger. The red lines show NO_x as a proxy for all air pollution, averaged over all phases of a flight; the yellow lines show NO_x per landing-and-takeoff cycle; both keep rising. The blue lines show CO_2 emissions, which fall modestly per airplane. Only CO_2 *per passenger* gets near your Resolution's target—the purple triangle. So the fleet mix flunks all three of your impact conditions, as well as the other three—growth rate, aircraft seats, and aircraft weights. *

Meeting the requirements of Resolution 105-2020



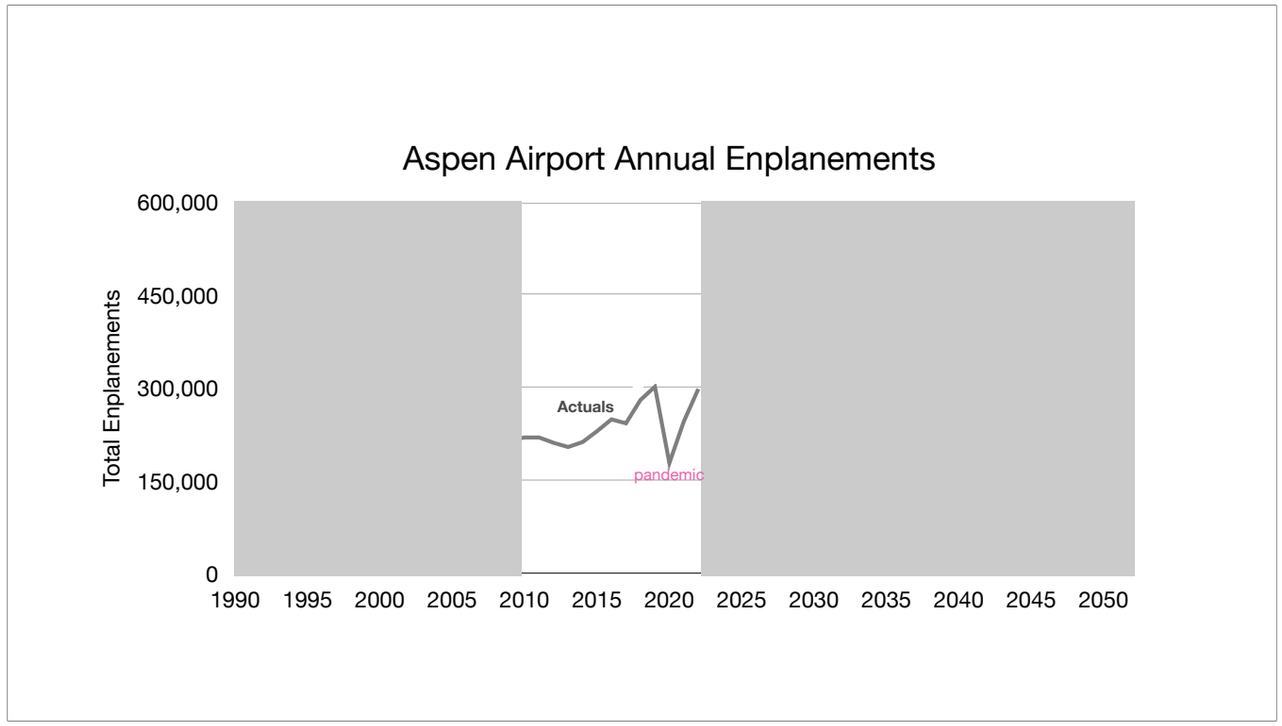
It gets worse when we add the forecasted growth—and, for fair comparison, your 0.8%/y growth goal that tilts the black baseline slightly up. Bottom-line, the proposed fleet mix in 2042 would be imperceptibly quieter, emit ~40% more NO_x, and emit ~12% less CO_2 than today's fleet. Aviation innovation *could* probably meet or perhaps surpass your 30% reduction goal by about 2030, as we'll see, and do much better by 2042, but this forecast excludes and bets against innovation. It doesn't count the likelihood that the Embraers' summer weight restrictions will mean more flights with more impacts. And this graph shows only the proposed *airline* fleet—not the better or worse impacts of the General Aviation aircraft that the new airside needed for the bigger airline planes would let in, like the private 737 that landed on Sunday. And meanwhile, fairweather operations per hour are predicted to rise by a fourth, making noise and pollution events even more frequent. *

Aspen’s ski-season airline seats flown peaked 30 years ago

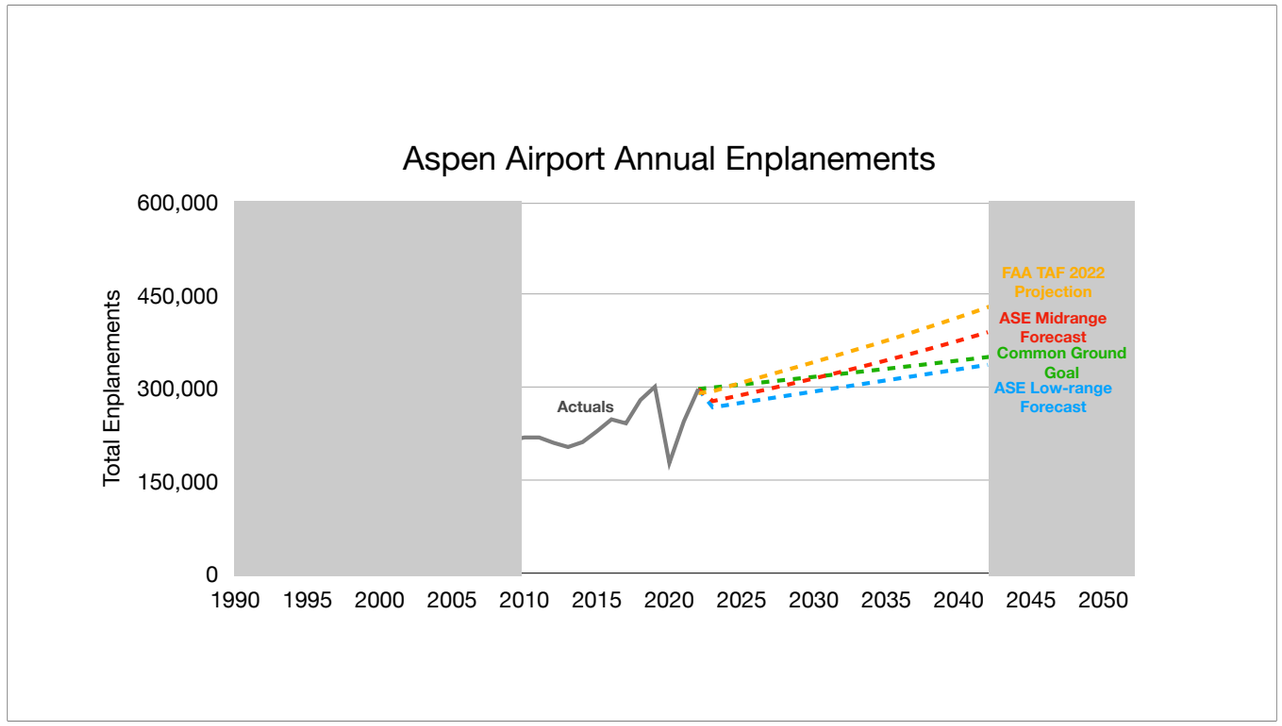


Data and graph courtesy of Bill Tomcich, 26 June 2023

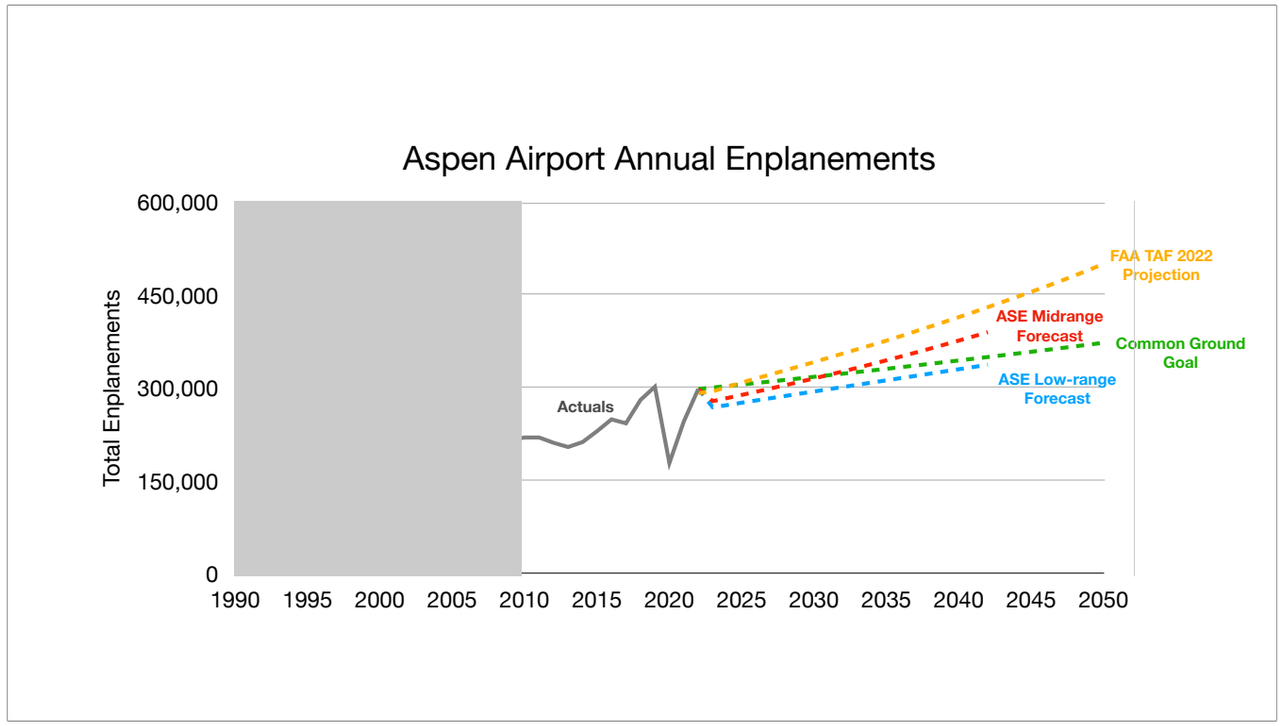
Now let’s examine the forecasted passenger growth. Bill Tomcich’s database shows that the total airline seats flown in ski season (the yellow curve with red dots) peaked 30 years ago, then fell more and longer than they rose. This history of our dominant flying season invites closer scrutiny of forecasted annual growth. *



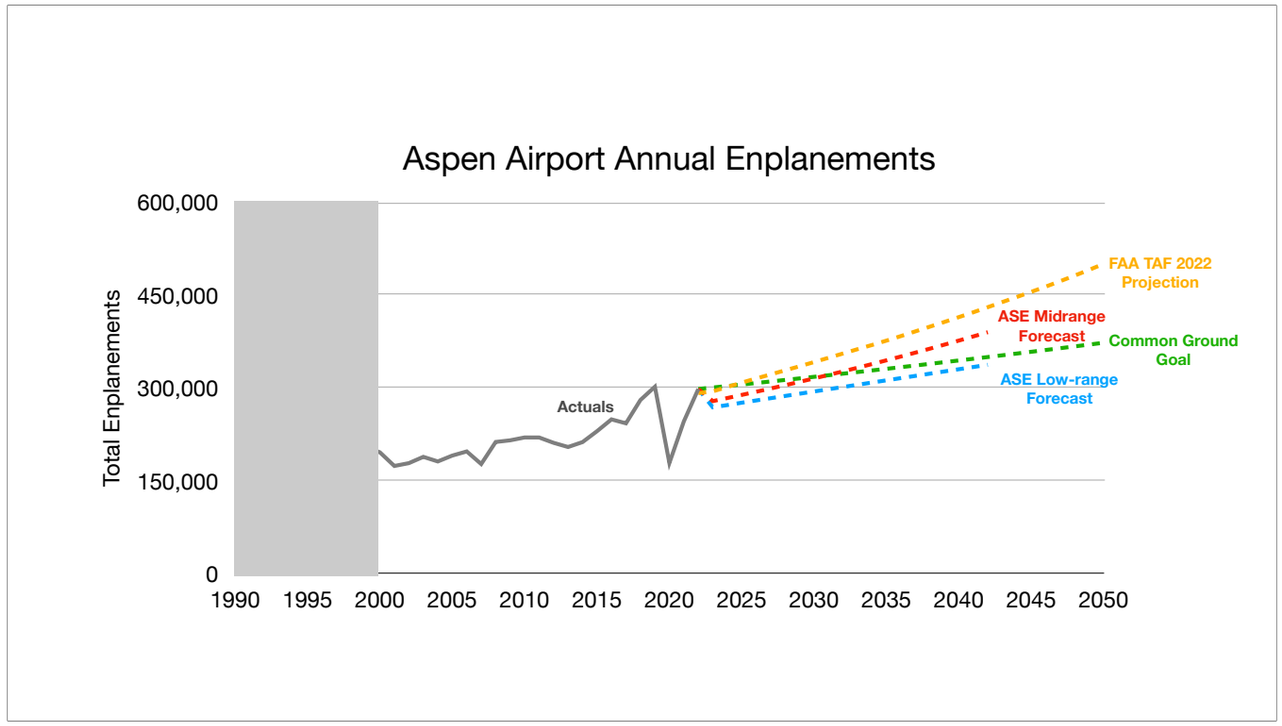
The Forecast emphasizes this Figure [7], which shows only 2010–2022 data (bridging the 2021 pandemic gap); only one graph in the whole report goes back to 2000, and none further. *



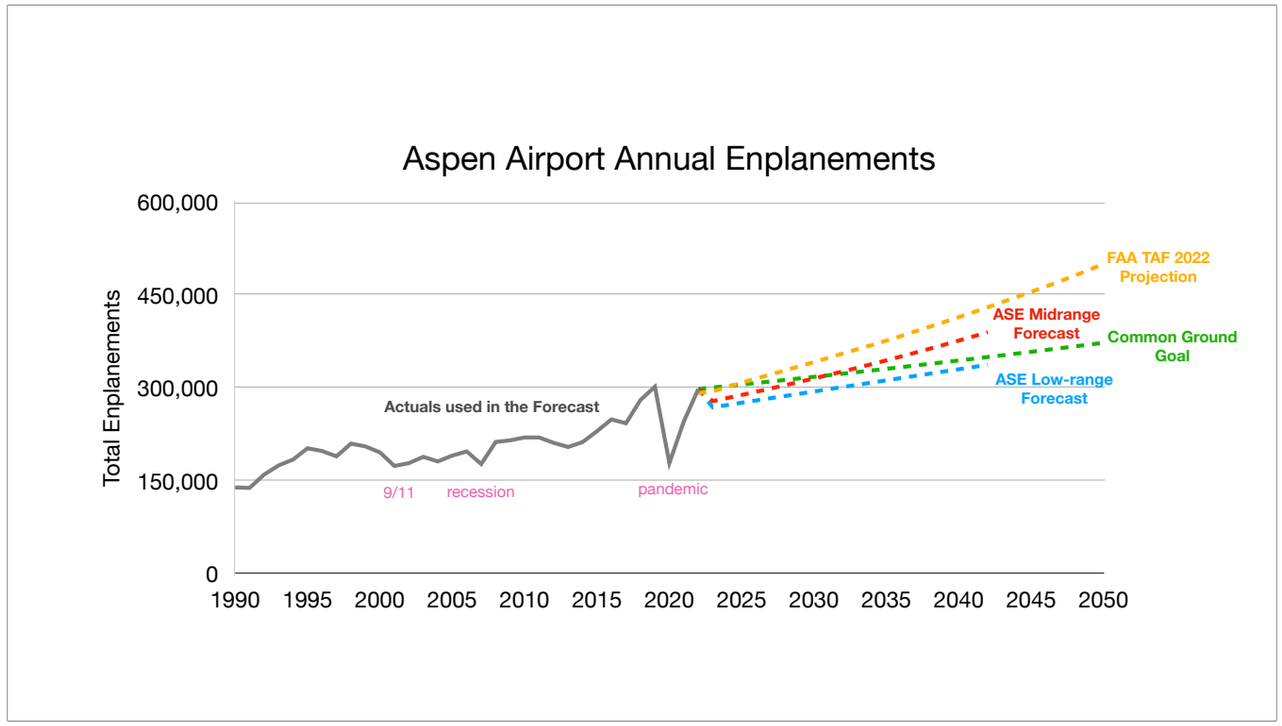
Looking ahead, four competing visions diverge—the * FAA's own forecast in gold, the * red midrange forecast you're being asked to approve, the * aqua low-range forecast that the FAA rejected, and your * green Common Ground recommendation. *



The red curve is close enough to the gold curve to satisfy the FAA, but it's five-eighths higher than the 0.8%/y growth-management Core Community Goal, and it's over twice the growth rate of the aqua low-range forecast. The Forecast runs only to 2042, but * the FAA's forecast goes to 2050 and your goals are timeless.
What about the left side of the curve? History didn't start in 2010…*


Aspen Airport Annual Enplanements
Total Enplanements
600,000
450,000
300,000
150,000
0
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Actuals
FAA TAF 2022 Projection
ASE Midrange Forecast
Common Ground Goal
ASE Low-range Forecast

…nor in 2000…



…nor in 1990, even though the forecasters' actual model uses the 1990–2019 data. The 2006 TAF's FAA data for Aspen began in 1976, and a lot has happened in those 47 years, including * some big surprises, so such curves are seldom smooth. At any rate, after 1976, enplanements grew briskly for a decade as airplane size doubled, then nonstop routes were added. However, I won't show you those older FAA data because during 1990–2005 they average 28% above the forecasters' data, which are cited to "Airport Management Records" and a proprietary database. The FAA data also have a major 2001–02 anomaly I'm querying with the agency. So I can't check the forecasters' enplanement data, but I'll adopt them here. However, they're open to wildly different interpretations. To understand this,…*

Aspen Airport annual airline enplanements: historic Compound Annual Growth Rates

19 numbers: which would you like?

		years	ASE	FAA	
modern fleet, before 2014 spurt	**1987-2013**	*26*	—	-0.91%	
modern fleet, forecasters' data start	**1990-2013**	*23*	1.67%	-0.23%	
forecasters' equations use this period	**1990-2019**	***29***	2.66%	1.26%	
shows sensitivity to start date (vs '90)	**1995-2013**	*18*	0.06%	-0.06%	
forecasters' graphs start in 2000	**2000-2013**	*13*	0.33%	-0.42%	
one more year doubles the growth rate	**2000-2014**	*14*	0.58%	0.03%	
if you want a high growth rate…	**2002-2022**	*20*	2.56%	or shrinkage? -0.06%	(FAA 2001–02 data anomaly?)
Staff and FAA fixate on this "evidence"	**2000-2022**	*22*	1.91%	1.51%	
…which is a bit higher before COVID	**2000-2019**	*19*	2.27%	1.91%	
the key is this brief, intensive spurt	**2014-2019**	*5*	7.01%	7.17%	

described in Forecast as 7.3% "average annual growth rate"—equivalent

Sources: Jacobsen | Daniels 20 April 2023 draft ASE Forecast, p 73, incl 2022e values in FAA column; FAA, 2006 TAF (actuals 1978–2005) and 2022 TAF (actuals 2005–2021)

…let's start in 1987—the first year Aspen had a modern fleet with no 19-seaters. The green FAA data show that *Aspen enplanements shrank at an average rate of 0.9%/y for the next 26 years*. And whosever data you use, there's nothing magic about the magenta 2000–2022 period to which this Forecast and the FAA currently cling. To illustrate this, this table shows ten illustrative choices of data period. The shortest, for five years, shows 7%/y growth. The next-to-longest, for 26 years, shows 0.9%/y *shrinkage* [using FAA data because the forecasters' data start in 1990]. The growth rates differ wildly. In the FAA data, half grow and half shrink. With such a jagged curve, almost any growth rate you want is available from a judicious choice of starting and ending dates. (The forecasters' actual equations pick the orange period, when their data (but not the FAA's) show unusually rapid growth, and stopped just before the pandemic, from which enplanements haven't recovered.)

It's therefore vital to understand underlying causation. That's the FAA's first instruction to forecasters: "Forecast methods used to project airport activity should reflect the underlying causal relationships that drive aviation activity." Yet the Forecast never attempts this. It simply correlates past Aspen enplanements with past Colorado average *income*, then uses forecasted future *income* to forecast enplanements. That's a very tenuous causal link, since only 3% of people flying to Aspen originate in Colorado, but it happens to fit the data slightly better than two other probably spurious variables—the Colorado employment or national GDP used to generate the other two variants. But whatever variable you pick, *correlation is not causality*. Aspen businesses know that visitor counts depend strongly not just on income or GDP, but also on lodging capacity and price, snow, schedules, events, flight prices and routes and schedules, and many other vital details that the Forecast's method doesn't consider. Its method is clear, simple, methodologically wrong, and systematically biased upwards. Bill calls his assumption of no lodging constraints "conservative," adopted to make sure we have enough capacity for more passengers. I call it grossly overstated, forecasting far more passengers than we'll have. To see why, let's focus on the bottom red number during the rapid 5-year growth spurt. *

Why did the airlines suddenly add seven new routes in 2014–19 to bring more people to Aspen?

Table 6
ESTIMATED ASPEN AREA RENTAL ACCOMODATIONS
Aspen/Pitkin County Airport

Survey Year	Traditionally Managed Properties (a)		Short Term Rentals (b)		Total Accomodations	
	Units (c)	Pillows (c)	Units	Pillows	Units	Pillows
2009	3,955	17,476	n/a	n/a	3,955	17,476
2012	4,175	18,857	n/a	n/a	4,175	18,857
2015	3,898	17,739	669	3,525	4,567	21,264
2018	4,003	18,556	4,433	27,307	8,436	45,865
2019	4,003	18,556	4,718	29,545	8,721	48,103
2022	4,372	21,239	4,391	26,955	8,763	48,194
Compound Average Annual Growth Rate						
2009-2022	0.8%	1.5%	n/a	n/a	6.3%	8.1%
2015-2022	1.7%	2.6%	30.8%	33.7%	9.8%	12.4%
Total Growth						
2009-2022	417	3,763	n/a	n/a	4,808	30,718
2015-2022	474	3,500	3,722	23,430	4,196	26,930

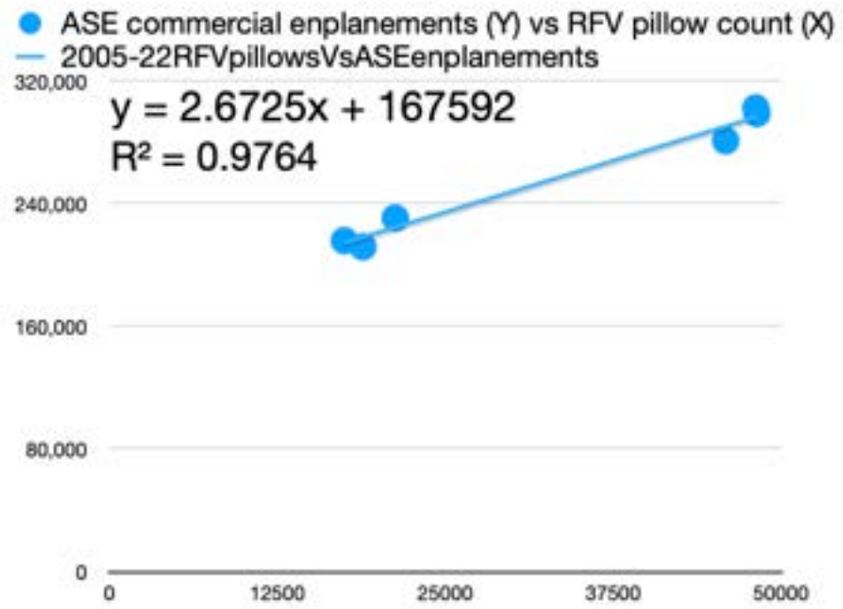
(a) Traditionally managed properties includes hotel/motels/resorts, condos, private homes, and bed & breakfasts. Data sourced from "Stay Aspen Snowmass Transient Inventory Study: July 2022-November 2022" by DestiMetrics.

(b) Short term rentals include rent by owner (RBO) properties offered through online portals like Airbnb and Vrbo. Data sourced from the "Stay Aspen Snowmass Transient Inventory Study: July 2022-November 2022," by DestiMetrics.

(c) Data for Traditionally Managed Properties was not available for 2019 so the the 2018 totals were held constant for 2019.

Source: http://aspenairport.wpenginepowered.com/wp-content/uploads/2023/05/Agenda-Packet-for-5.18-with-Draft-Meeting-Minutes-from-4.20.pdf, p 10.
Unit and pillow-count data for 2009–22 from DestiMetrics, p 34 https://aspenchamber.imagerelay.com/share/70df6457ef4042f790cfce554c697e36, are for Aspen through Carbondale, and are all "short-term" (under 30 days). The slight STR dip in 2022 has since accelerated considerably due to new Upper Valley policies. The survey authors suggest using 90% capacity factor at peak times and 80% at other times to reflect the practical fraction of theoretical maximum capacity.

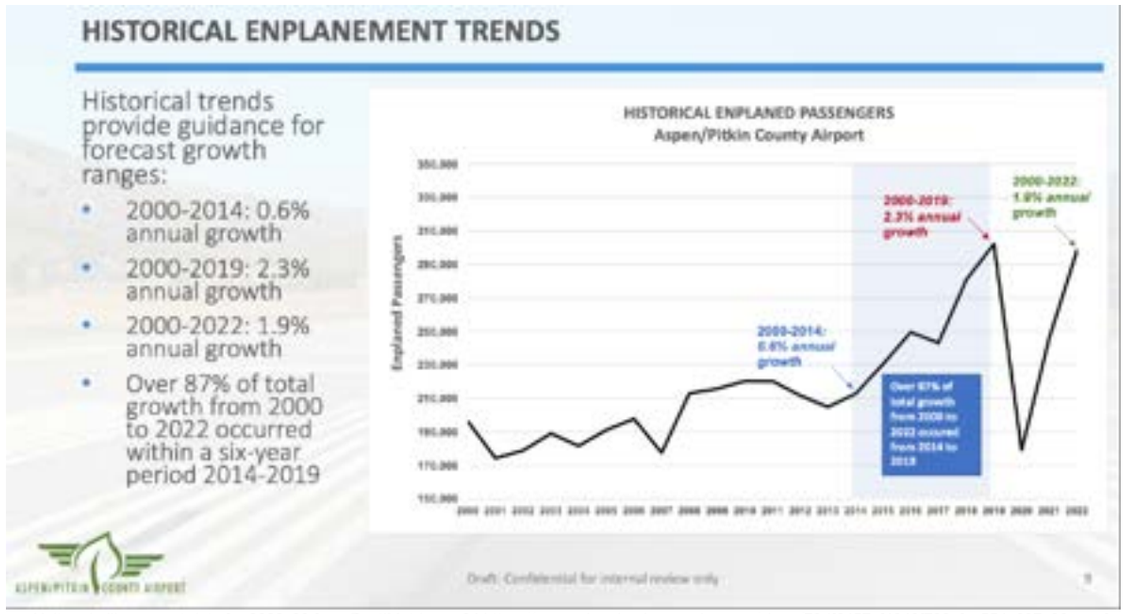
The Forecast [pp 13–14] ascribes the 2014–19 spurt in enplanements to seven new air-service offerings, without explaining why the airlines added them. A likely explanation is hiding in plain sight: lodgings. The Forecast showed, but didn't use, * this graph three pages earlier [pp 8–10], showing a curve with the same shape at the same time. The Aspen-to-Carbondale total pillow count (the heavy black line) more than doubled in just three years, adding ~26,000 pillows * during 2015–18 as online booking platforms added the gray short-term rental [STR] units to the traditionally managed red units. The Valley's pillow count grew 7× more from STRs than from growth in traditional short-term lodgings. *



Pillow-count data for 2009–22 from DestiMetrics, p 34 https://aspenchamber.imagerelay.com/share/70df6457ef4042f790cfce554c697e36, Aspen through Carbondale
ASE enplanements data for 2005–22 from 20 Apr 2023 Draft Aviation Forecast, http://aspenairport.wpenginepowered.com/wp-content/uploads/2023/05/Agenda-Packet-for-5.18-with-Draft-Meeting-Minutes-from-4.20.pdf.

Even in this community with perhaps the nation's strictest growth controls, the Forecast isn't based in any way on our lodging capacity; like the FAA, it assumes no lodging or other constraint, and says only [p 10] that "if a significant shortage of rental accommodation occurred over the forecast horizon, this could restrict further enplanement growth.…" Well, a "shortage of rental accommodation" defines Aspen and, we argued, it constrains airline enplanements. If you can't book a pillow, I doubt you'll buy a plane ticket to Aspen, and airlines, knowing that, probably won't add new seats to try to sell you.

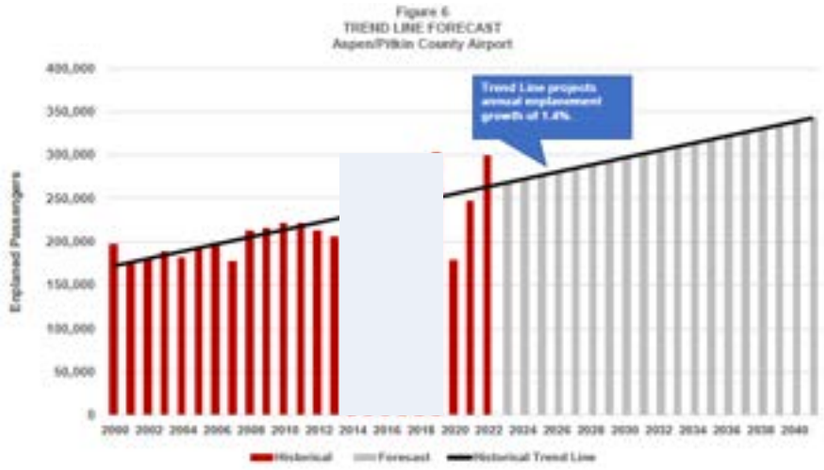
Statistics confirm this intuition, so please indulge me in one technical graph. Last week I took a few minutes to scatter-plot Aspen enplanements, from p 73 of the Forecast, against the DestiMetrics pillow-count it graphed on p 10 for the Valley from Aspen to Carbondale. Using the forecasters' data and their * simple math (linear regression) explains *98%* of the past 17 years' variation in enplanements, while their own Forecast, based on 19 years of Colorado personal income, explains only 71%. A 98% correlation is almost unheard-of in social science and would be considered superb in a physics experiment. Of course, our dataset for pillows is unavoidably sparse, with only six points spanning 13 years. But it still provides a far more powerful and convincing explanation of Aspen enplanements than the Forecast's predictions, and even more importantly, it makes causal sense, because every visitor head needs a pillow to lie on.
By not acknowledging this statistically ironclad link from pillows to passengers, the forecasters incorrectly modeled the passengers. Here's how. *



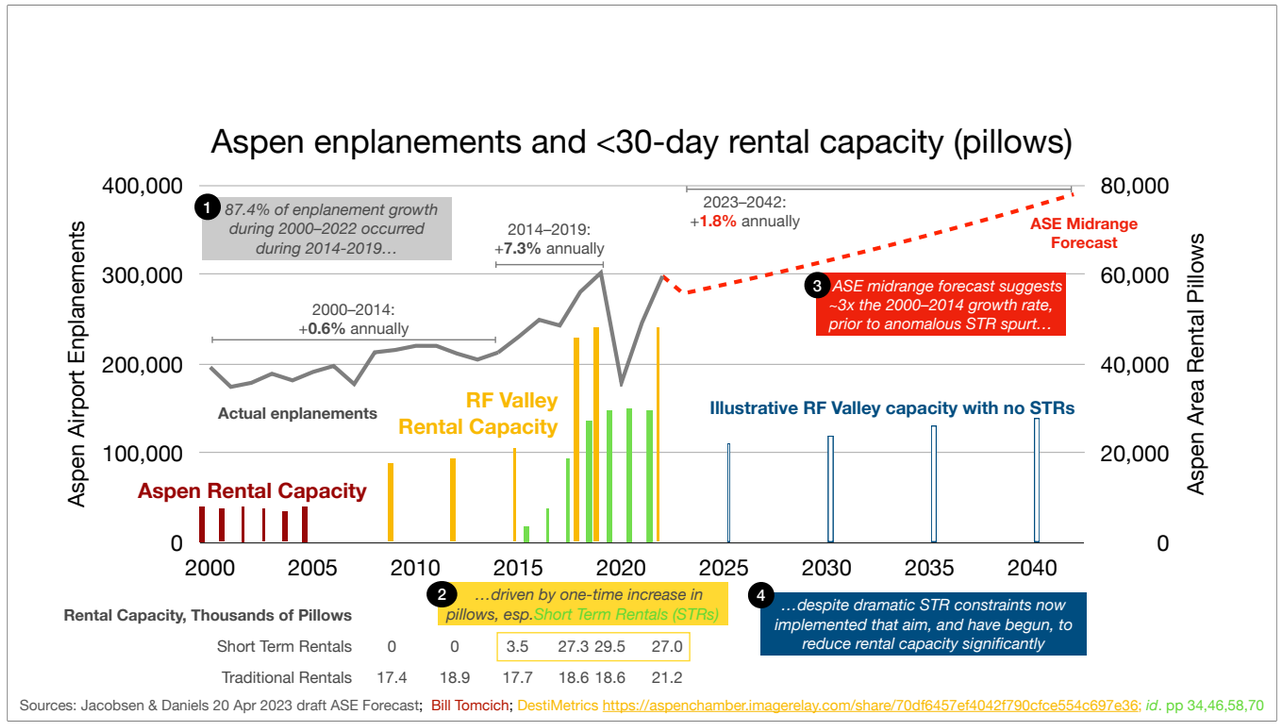
Unit and pillow-count data for 2009–22 from DestiMetrics, p 34 https://aspenchamber.imagerelay.com/share/70df6457ef4042f790cfce554c697e36, are for Aspen through Carbondale, and are all “short-term” (under 30 days). The slight STR dip in 2022 has since accelerated considerably due to new Upper Valley policies, as reported by Aspen Journalism, 19 April 2023, https://aspenjournalism.org/new-short-term-rental-rules-limit-supply-restrict-future-growth/

This slide from two Staff presentations to the AAB, in your packet but not in the Forecast, makes an astonishing and correct statement. It says the 7%/y 2014–19 spurt caused in five years over 87% of the 22 years’ growth that Staff represent as “the historical trend.” (Indeed, 37% of that 22-year growth occurred in one year, 2018.) *But that spurt was a singular event, not a continuing cause that keeps on operating and driving growth for another 20 years.* Extrapolating it is thus a fundamental error. Those extra 27,000 STR pillows were added just once. More huge batches of pillows won’t go on being added every few years after that. But averaging this one-time addition into a supposed trend triples the apparent growth rate, predicting well over 100,000 imaginary fliers who’ll sleep on imaginary pillows. So anyone at the FAA focusing on the slope of a 22-year overall curve hasn’t yet understood what happened. Before and after 2014 are two different worlds—the first durable, the second transient—and they can’t be validly combined. / Without STRs’ temporarily relaxing Aspen’s longstanding lodging constraint, the growth rate should roughly continue the 2000–14 period’s 0.6%/y to the left of the light-blue zone—matching the forecasters’ rejected lower-range variant. The growth rate was also 0.*06*%/y for the *18*-year period 1995–2013. Either might be plausible—but both are probably too high. That’s because the dramatic STR constraints adopted by this Board, Aspen, and Snowmass Village are all meant to *reduce* STR capacity from its 2021 peak. The Forecast mentions those policies, but doesn’t analyze their effects, and it should have. Aspen Journalism reported on 29 April that STR capacity is already falling briskly. Thus even the 0.6%/y forecast could be too high. If your policies work, the most realistic forecast might even be negative, because many imaginary airline passengers won’t have real pillows and won’t come. That’s obvious to anyone who lives here. I think it would be obvious to the FAA if explained to them. *

Aspen Airport Annual Enplanements:
Alternative Method (Straight-Line Extrapolation)



The Forecast's graph on p 31 is the only one starting before 2010. It extrapolates by the simpler method of just fitting a straight line to the red actual data, then running it forward for another 20 years. The result is nearly identical to the linear-regression method they adopted. The fallacy here becomes visually obvious if you * edit out the light-blue zone on the previous slide—the 2014–19 one-time anomaly. (Proper regression analyses uses what's called a "dummy variable" so anomalies like an STR gold-rush or a pandemic don't distort the underlying trend.) Redrawing the line to match the earlier behavior, without that anomaly, makes the line rise threefold less steeply, slashing the 20-year future growth —as the forecasters gently acknowledge on the same page. [p 31, "potential reduction in available hotel/lodging supply" would support a conservative (lower) forecast] *



Sources: Jacobsen & Daniels 20 Apr 2023 draft ASE Forecast; Bill Tomcich; DestiMetrics https://aspenchamber.imagerelay.com/share/70df6457ef4042f790cfce554c697e36; *id*. pp 34,46,58,70

Let's build up a single slide summarizing the story of this basic flaw in the * enplanement forecast. As Staff's previous slide showed, * the 22-year period that Staff and the FAA consider the historic * trend to match bolted together two ill-fitting parts: the first 14 years with just 0.6%/y growth, * then the next five years with 7%/y growth, causing 87% of the total growth in the whole 22 years. That 12×-faster growth spurt * didn't happen while * Aspen's pillow count (dark red) was stagnant, but it has an airtight statistical association with the one-time burst of total pillows (yellow bars). The * red forecast you're being asked to approve * triples the 14 years of pre-STR growth rate, from 0.6 to 1.8%/y. Yet the upvalley governments' clampdown is now * *shrinking* STR capacity. Even if STRs held steady and lodging grew organically like * traditionally managed properties, the red midrange curve would grow several times faster than the pillows tightly tied with it, violating the historic trend. When Aspen pillows (half the market) were stagnant—the dark red bars at the left—so were enplanements. When the Valley's STR pillows soared—* the green bars—so did enplanements. So if STR capacity *falls,* as you intend and is now happening, traditional lodging growth could struggle to sustain a constant total pillow count, making a realistic forecast even lower—perhaps zero growth or less. Another hint that enplanement and pillows may indeed rise and fall together is that last winter's terrific snow came with 2.5% *lower* enplanements. /

Lodging constraints should scarcely affect General Aviation traffic, but our assessment also finds the GA forecast overexu-berant. Page 40 shows key Aspen GA metrics plummeting from 2000 to 2014, yet the rebounding forecasts on the next page show only data starting in 2019. The one-time rush to private planes for pandemic refugees is again unconvincingly extrapolated into substantial future growth from a higher base [p 40], helping approach the FAA's target. /

Our assessment documents many other problems with the demand forecast, but these big issues alone should lead you to reject it and to prefer the low-range forecast consistent with the historical evidence spanning 26 years. *

Technical brief 19 Oct 2022

48-slide, 80-minute technical brief to Dan, Brad, Bill, & Abe, 19 October 2022, requested by Dan 31 Aug 2022 as input to ALP process, 04:16 to 1:24:16 in taken-down 2h55m County video available from Aspen Fly Right; slides and narration at https://aspenflyright.org/wp-content/uploads/2023/01/PitcoFleetMixBrief19Oct2022r.pdf; an abridged and somewhat simplified Stanford student seminar 24 May 2023 will be posted at https://energy.stanford.edu/events/classseminar/paths-flying-fossil-free.

Forecast
20 Apr 2023

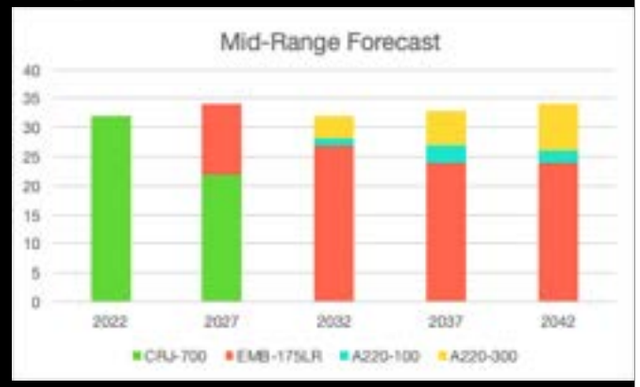
http://aspenairport.wpenginepowered.com/wp-content/uploads/2023/05/Agenda-Packet-for-5.18-with-Draft-Meeting-Minutes-from-4.20.pdf (starts at p 2)

Assessment
17 May 2023
(corr'd 25 Jun)

https://aspenflyright.org/wp-content/uploads/2023/05/ABL-essay-15_Forecast_dr11.pdf

Turning to the fleet mix, a little history: Dan requested last August, and I presented to him and our Jacobsen | Daniels friends last October, an 80-minute technical analysis of super-clean-and-quiet aircraft. I compared the evolution of electric vehicles, EVs, with electric planes, EPs, which are moving faster, with high ambition and almost unlimited capital. EVs and EPs strongly reinforce each other with shared skills, technologies, and supply chains. Both are greatly sped by military, drone, and e-racing innovations. But unlike early EVs, EPs have outstanding economics: capital cost, fuel, and maintenance all start well below today's aircraft, helping them spread quickly even if they had no carbon, noise, or health benefits. With those benefits too, they could soon grab a big share in every market segment they compete in. /
Our discussion of these technical opportunities recorded strong alignment. I solicited corrections or criticisms four times and got none. Yet the promised next-day debrief to the AAB was one sentence saying I'd discussed my "philosophy" of new airplanes—not mentioning that I'd given a detailed technical brief disproving the official position. For the next eight months, I've offered that brief to the AAB, but Staff had other priorities, so the AAB still hasn't yet seen or discussed this evidence, and had to evaluate the * Forecast without it. They did have our Essay #15 * assessing the Forecast, but seem not to have considered it. The AAB is tasked to advise you on "long-term planning efforts and aviation improvements" [Bylaw III, Ordinance 002-2022], but for now, that task falls to you. So let me help you glimpse the gamechangers that the Forecast's Fleet Mix didn't include but is assumed to withstand. *

Fleet Mix Study, airline planes, 95’ wingspan limit removed in 2032



A decade after bigger planes can come in, 71% of the airline flights are still regional jets.

Even the bigger planes’ getting 29% share by 2042 requires strong passenger growth.

This assumes zero competition by 2042 from clean, quiet, fossil-free planes that cost less to buy and to operate but aren’t considered in this or the FAA’s forecasts.

Thus the case for needing bigger airline planes is not robust; it’s flimsy, even fanciful.

The lower-range forecast uses only existing regional jets whose assumed mix shifts from the green CRJ-700s to the louder and dirtier (but <95’) red Embraer 175LRs. Some CRJ-700s keep flying to at least 2042, as Bill Flock and the manufacturer agreed they can. The Embraers may start flying here next year in unknown numbers (I think small) for unstated carriers on unstated old or new routes. But whatever the mix, *it needs no bigger planes and no new airside*. The FAA rejected this forecast as below historic trends—understandably, since its staff lacked the corrective evidence you just saw. /
The mid-range forecast you’re being asked to approve also substitutes Embraers, but very quickly: all the CRJ700s inexplicably retire by 2032, when the dominant United fleet will still be at midlife. Bigger planes can fly here starting in 2032, but those Airbuses, both smaller (blue) and bigger (yellow), enter only slowly. * A decade later, they’re still just 29% of the airline flights; 71% remain regional jets. * Lower-than-forecast passenger growth would further shrink the unimpressive Airbus share. [Even the extreme passenger growth in the upper-range forecast doesn’t drop the regional-jet share below 63%.] Operators base airplane choices on very complex system- and airport-specific cost analyses. But importantly, the Forecast’s Fleet Mix *offers zero evidence or source*s; its results were simply dictated by FAA staff in Denver. I doubt this reflects a plausible business case or a likely outcome for Aspen, * especially against the unexamined competition I’ll summarize next. But the big takeaway here is that *the Forecast itself, despite its grossly exaggerated growth, cannot make a robust case that Aspen urgently needs bigger planes:* * once let in, they still show weak demand a decade later, so there was no rush to decide now. And well within these two decades, aviation will transform beyond recognition, putting at risk of early retirement most or all of the bigger fossil-fueled planes for which we’d just spent $200+M building a new airside.*

The Forecast and FAA require we design for a bigger plane [A220-300] that isn't yet certified to land here and might not be able to. Yet the Forecast excludes any airplane or propulsion system not yet certified. The Forecast's newest plane in 2042 will use at best 2016 technology. The Forecast also doesn't consider whether fossil-free planes could be available sooner than a new airside for bigger fossil-fuel planes. It only says fossil-free planes are years away—but of course so is a new airside. The Forecast doesn't compare these timescales, so I will in a moment. The Forecast implicitly divides the future into too soon to change anything and too far off to speculate about, with nothing in between. But the in-between part is crucial, because aviation is now undergoing the deepest and swiftest revolution I've ever seen in a major sector—a race to * fossil-free flight, involving an enthusiastic but *different* part of the FAA. Setting our Airport's future for decades to come needs you to understand this utterly new competitive landscape.

My eight-month-old technical brief, long on our website [https://aspenflyright.org/wp-content/uploads/2023/01/PitcoFleetMixBrief19Oct2022r.pdf], can't be summarized here. So let me just highlight its Aspen implications by slightly updating two six-month-old slides in our Essay #5 [https://aspenflyright.org/wp-content/uploads/2023/06/ABL-essay_5.New-fleet_11Jan2023r.pdf].

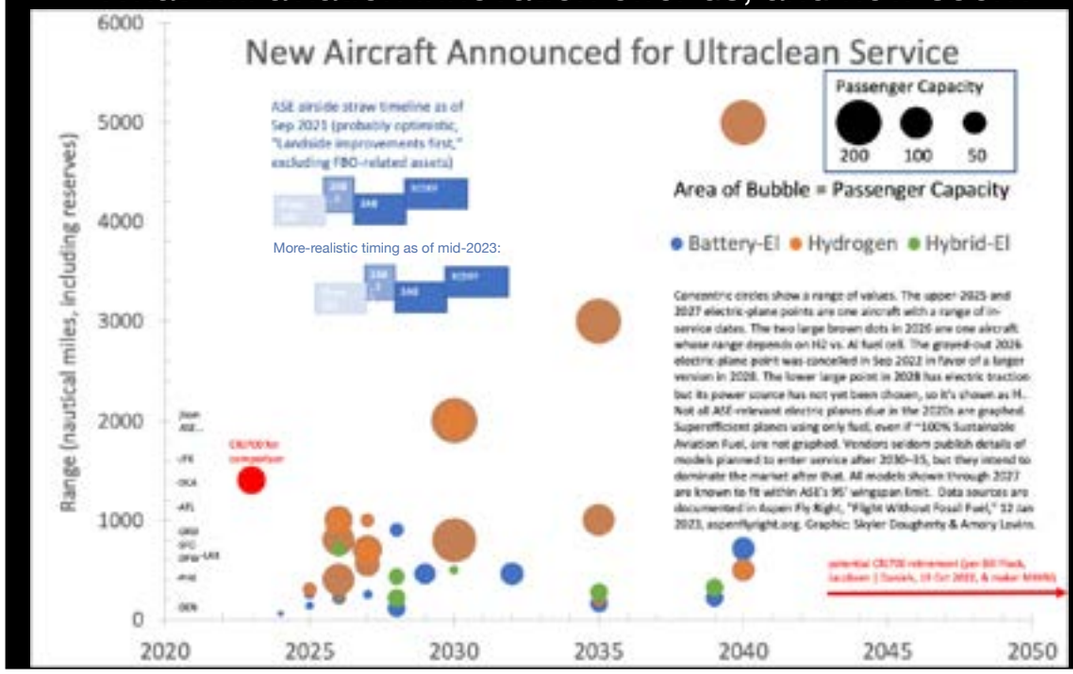
County advisors have long said that new kinds of very clean and quiet aircraft would be small, slow, short-range, and far off. Our County-invited analysis last October found the opposite, blowing away the expectations in my 2019 Doerr-Hosier talk. Today there are scores of capable developers with ~1,000 orders from >50 operators. Here are nine examples of their speed and ambition, most backed by solid performance tests and supply chains. There are many more. / In the top row, the left and middle images show a thoroughly flight-validated air taxi with stubby wings but extraordinary aerodynamics that can scale to regional-jet size and probably to 737 size. This version burns any liquid fuel, including pure SAF, at *8*× normal efficiency. A 9–19-seat, 1000-nautical-mile hydrogen version is expected in service in 2027. Larger electric versions relevant to and specified for Aspen are expected in this decade. The upper right image is a 76-seat Dash-8/Q400 turboprop that the #5 US airline donated for a hydrogen retrofit test next year. (This airplane served Aspen well until seven years ago, but you were told it's longer flying in the US; in fact, late last year 1,160 were in global service, including >160 in the US and ≥175 in Canada.) This hydrogen retrofit targets a roughly San Francisco range [700 nm] with 40–80 seats by 2027. The maker has $10b in pre-orders from big global airlines, and announced ten days ago that a 60-seat, nearly Dallas-range [560 nm] hydrogen retrofit *of the CRJ700* is also feasible with zero emissions and low noise. I conservatively estimate it could be in service around 2027—three years after Universal Hydrogen targets for a competing version. /

The middle row shows three new electric planes: on the left, a 30-seater due in 2028; in the middle, a 19-seater due in 2025–27; on the right, a 19-seater due in 2028. (Many makers start at 19 seats because staying below 20 makes initial certification ~6× cheaper.) /

At the lower left is a 9-seat hybrid-electric Embraer for 2030, starting late but launching a series rising to 300 seats and 500 nm in 2040. The lower middle image is an *electric retrofit* of the 100-seat BAe146 jet that served Aspen until 2006. It's now due back in electric service in 2026 with a range to Phoenix or nearly to Chicago [400–800 nm], depending on its source of electricity, rising to 186 seats [800 nm] in 2030. On the right is Airbus's hydrogen 100-seater for 2035 service entry. /

To be sure, these and scores of other ultraclean and very quiet planes are still targets promised to investors, not yet fully developed and certified realities. Some specs and dates will slip. But so many and so capable firms are unlikely all to fail; these are only one-fourth of the industry plans we analyzed, which are in turn a fraction of the total; and many competitors aren't yet announced. Thus this little petting zoo is just one corner of a large bestiary. So when can we expect what new aircraft to come fly here? I'll show this in one eyechart that's simpler than it looks. *

What will aviation innovation offer us, and how soon?



The Airport Forecast includes no technologies after 2016, so here are a few dozen examples of the omitted technologies. Each bubble represents one new kind of advanced airplane. Each plane's passenger capacity matches the area of its bubble, as in the black-box legend at the top right. Each bubble's color shows its propulsion system: battery-electric in blue, hybrid-electric in green, hydrogen in brown. Today's CRJ-700 is shown in red for comparison. Its maker and Bill Flock expect its routine retirement could start in the red date range at the lower right—2–3 decades hence, plus any life extension. / Each new plane's announced in-service date is shown on the horizontal axis. How far it can fly is on the vertical axis, whose little scale at the lower left shows city distances from Aspen. / Importantly, *this graph doesn't include superefficient fueled planes like those at the top of the previous slide, nor some interesting electric planes very relevant to Aspen*. *All planes shown through 2027 fit Aspen's current wingspan and other constraints. All are well suited to more frequent direct service connecting Aspen with far more airports at similar or lower ticket price.* Most planes planned for after 2030, when the industry expects to be taking over the market, aren't shown either. Only three of numerous electric vertical-takeoff-and-landing (eVTOL) air taxis are shown for comparison (the tiny bubbles in the next few years). By about 2025, some eVTOLs should be able to carry ~9 passengers between Aspen and Denver without needing our runway or airport. At several major airports, United and Delta have announced eVTOL service for 2025, including from your home. American is close behind. Some eVTOLs exceed 200 mph and 10,000'. Size, range, and altitude ratings will rapidly improve. First type certifications are expected next year, commercial service a year later. Already, a flyover 500 m overhead can be barely audible./

So many ultraclean airplanes are expected in commercial service *in this decade*—some bigger and longer-range than the CRJ-700. Now compare their timing with the two blue construction timelines at the upper left for Aspen's proposed new airside, aiming two years ago for 2030 completion or now for ~2032. [Both schedules exclude the FBO rebuild and assume landside improvements are done first.] But by then, a swarm of ultraclean, superquiet, cheaper-to-buy-and-fly planes that fit our existing airside will probably be flying into Aspen, even if they're years delayed. When the Forecast ends in 2042, its aircraft will be as antique as a 1997 Buick is today—and at least as unlikely to compete with a Tesla. / Global airlines, including Aspen's, have invested heavily in the electric plane industry. United wants them to serve smaller airports, like Aspen, at lower cost. The new planes' lower costs, zero emissions, and low noise will, I believe, prove potent competition for all the fossil-fueled planes that the Forecast says we need to build for. The view through the wind-shield, not the rear-view mirror, says our community can crush its environmental goals and sustain vibrant commercial service *without rebuilding the air-side*: just be patient, let the innovators carry on, save the new-airside cost, and use FBO revenues—plus FAA grants if offered—to fix the landside. *

What does aviation innovation mean for Aspen?

- Many uncertainties about timing—chiefly FAA certification, but already well underway
  - Many will retrofit certified electric/H_2 powertrain into long-established airframes
- The plausible (but perhaps too-high) lower-range forecast says we have at least two decades in which to deploy these new clean planes—mostly due in *this* decade
- Their technologies continue to evolve rapidly, but the key ones are well proven
- Better new planes normally cost more to buy, but these will cost markedly *less*
- All fossil-fueled aircraft will start to feel fossil-free competitive pressure in this decade
- The 2–3 decades' longevity (plus any life extension) of existing CRJ-700s—& longer for the still-in-production EMB-175LRs—ensures strong and durable airline service, so *deferring airside choices does **not** require us to make any bet on advanced aircraft*
  - United (72% of the 2022 Aspen market) flies CRJ-700s averaging <14 years old; American (25%), <19; the only EMB-175LR enthusiast, Delta, has 3% Aspen share
- The swarm of increasingly capable eVTOL air shuttles due in the next few years will open many important options to bypass, decongest, and decentralize Aspen Airport

The emerging superefficient, electric, and hydrogen fleet has * uncertain composition and timing, more for regulatory than technical or commercial reasons: many certifications are underway, the FAA is having to write new rules, but many use existing airframes already certified. * Weighing the various risks, I suspect Aspen will have ample, capable, fossil-free planes before we could build a new airside, let alone a decade later when this Forecast ends. * I still hope to brief the AAB on the pace of innovation: for example, the best electric motors for airplanes now produce ten times the propulsion per pound that a typical EV motor does. The new planes are in general not technically speculative. Some seem to me no riskier than assuming that in Aspen summers, Embraers can compete here and A220-300s can safely fly here—or that you can prudently plan for 130–160-passenger planes when our whole valley's maximum-stretch best-case emergency medical capacity could barely handle the crash of a 76-seater like we fly today. That's not mentioned in the great new safety report, and the Public Safety Council hasn't been asked. It should be. * Major airlines are very excited about these new planes' lower costs. Some are ideally suited to diverse nonstop routes to thousands of airports—more choices needing less time, hassle, and money. * Fossil-fueled planes (especially bigger ones) and their makers will come under severe competitive pressure, like gasoline cars and automakers today. * A common claim is that not immediately building a new airside requires a risky bet on quickly getting fossil-free planes. That's not true. They're not related. Bill Flock said last year, the CRJ-700's maker confirmed in the Forecast's ref. 6, and we documented in Essay #4 that the existing CRJ-700s, now in their prime, can fly *for another 20–30 years* (without assuming life extensions). The Forecast's Embraers should fly for even longer because they can start brand-new. So if a new airside for bigger planes takes a decade, we still have have another decade or two *to decide whether we need it,* without any risk of running out of viable commercial aircraft. / Meanwhile, the need for traditional air*ports* will morph and erode. The eVTOLs coming to major airports in the next two years, and soon to ours, will let us fly from park-and-rides, flat downtown roofs, or little vertiports to airports like Rifle, Eagle, and Denver, making Aspen's runway less congested and less needed. *

A five-track strategy for prudent Airport decisions—probably the most consequential you'll ever make

1. Full speed ahead on needed safety & landside improvements, especially terminal
2. Submit the low-range forecast to the FAA—with compelling, well-presented new evidence showing that it best fits the historic data, but mid-range does not
   - Brad, Bill, Dan, and Rich have all confirmed the FAA is open to sound evidence
   - Defer airside choice; if FAA accepts, partner; if not, step 3 can replace grants
3. Regardless, keep control and revenues of FBO—to retain financial flexibility, improve service, and make your safety & environmental goals far easier to achieve
   - Consider hiring an experienced operator (at least one already applied, others could); check analogous experiences (e.g. invite Jackson Hole); get independent pro-forma analyses, test weak arguments (e.g. liability), invite public scrutiny
4. Form task force to explore coordination with neighboring jurisdictions and airports, and check promptly for potential integrative collaborations to be sure we're asking big enough questions: cursory early dismissals (Rifle) may be wrong
5. Form independent legal/policy task force to explore the rich Airport policy menu

Your Airport choices are probably the most important this Board will ever make. My last two slides respectfully suggest a five-part agenda. * First come the Safety Task Force recommendations, Public Safety Council consultations, air and noise measurements and abatements, and fixing the decrepit landside. This community wants and needs a great terminal, not bigger planes. * Approving this Mid-range Forecast would trigger rebuilding the airside to let in bigger planes that we don't need, bringing two-thirds more passengers in 2050 than we can't manage now. That doesn't meet the community's agreed goals nor fit its values. But the * low-range forecast solves all these problems and prudently tables the airside choices until the aviation fog clears. It should be acceptable to the FAA if resubmitted with the new evidence you now have. You've been told the FAA will flatly reject any changes, but * all your key advisors have clearly stated that the FAA simply requires to be convinced by sound analysis (which they haven't yet seen). That's their process, it's reasonable, it may well work, and I'd be glad to * help you grasp this opportunity for more-fruitful FAA conversations and creative collaborations. * Even if the FAA did prove rigid, we can still pay for the airport we want, and develop it in our own way at our own pace, by retaking control of the FBO and running it professionally in the public interest, just as you successfully chose to run the landfill and keep that money home. * More than 1,500 US public airports run their own FBO; three-fourths of them are local governments. Jackson Hole, with many similarities to our Airport, bought out and runs its FBO to earn juicy financial returns and improve service. Jackson Hole's airport manager (a former ASE Director) and his Board President have offered to come here and share their experience with you if you'll invite them. Please do. Learning more about such cases helps test your financial and policy options and improve your FBO choice. That's your most pivotal decision, because keeping or losing the FBO's big net revenues can open or close all other doors. The buck starts here. /
Fourth, * pp 15–18 of Essay #12 suggest closer airport coordination with other local governments, including Rifle and Eagle. The Garfield County Commissioners told us four years ago they'd love to be at the airport-strategy table with you but hadn't been invited. They're off and running on a regional economic development strategy with the Aspen Institute, focused on aviation innovation. Now Aspen's opportunities seem even bigger, and so do the questions we should be asking. Aspen Airport is very conveniently sited for Aspenites, but if it weren't already there, would we build it there today? If not, should we consider evolving it as a vertiport, agrivoltaics hub, and precious affordable housing mecca amid recreation and wildlife, while migrating some aviation functions to a safer and lower midvalley site or beyond, linked by eVTOLs and ultralight rail? Could that be a better use of 573 open acres that you already own, right on Aspen's doorstep? / At Stanford I teach that all the important design mistakes are made on the first day, when we bound out what we won't consider. Thus we four-laned 82 without seriously considering a great Valleywide transit option 8× cheaper than light rail, and still retrofittable. Let's not repeat that pattern by planning our renewed Airport in isolation, dis-integrated from Lumberyard and Entrance to Aspen, forever reliant on the 82 umbilical, not integrated into a comprehensive mobility concept. Tough design challenges typically get easier when we enlarge them, as General Eisenhower advised—moving the boundary out until it embraces everything the solution requires. To find creative solutions to many problems at once, we must consider them as a whole, and focus not just inward but also outward. I'd bet Aspen City Council would love to play. * Finally, Essay #12 also explores a rich menu of fiscal and other policies, potentially including so-called "localization," to influence which planes fly here, when, with what impacts. So let me end with a slide about that unexamined policy slate. *

#12: Can smart regulation and siting cut Airport impacts?

- The FAA regulates all aviation safety. Yay!
- Most people believe the FAA's strict rules for public-use airports prohibit local regulation of emissions, noise, planes, operators, passengers. *But exceptions!*
  - Many probably or certainly acceptable local policies can *influence* ASE operations, including by General Aviation, such as two-part landing fees, and congestion pricing to land/park airplanes: the FAA loves safety and efficiency
  - Rationally based distinctions and discriminations can be just and permissible; may influence air pollution (some unregulated), CO_2, noise, and other impacts
  - Noise standards and performance are improving; abatements on the ground are available; we can petition the FAA for tighter local controls; + fiscal tools…
  - The highly permissive Airport Investment Partnership Program offers vast white space to explore creative solutions eligible for old and new grants
  - Pitkin County has so far explored virtually none of these rich opportunities
- Downvalley, esp. Rifle, dialogue could reveal big scope for fair collaboration

The old assumption that local governments have no say, and the FAA preëmpts all aviation policies, turns out to be wrong. * The FAA does control safety, and we're grateful it does. * But our Essay #12 found ~20 novel, local, unexplored policy options that look promising for reducing local impacts. * Some are already explicitly approved by the FAA. We're welcome to try some others in expansive white space the FAA deliberately created. We needn't mandate or prohibit specific outcomes, as the FAA does, in order to influence operators' choices and * our outcomes substantially. * There are ways we can legally discriminate between planes and operators by doing so fairly and rationally to advance * legitimate public goals. This could get * even more interesting with * new structures and * neighboring airports.

County officials kept asking me for this policy synthesis, we published it ten weeks ago, and we'd love to hear a reaction and discuss next steps. *

Together, the five-part agenda I've outlined could sustain robust Aspen airline service while meeting community goals for safety, noise, air, public 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 our existing 95´ wingspan limit, and fund the Airport design we want from our own FBO income at our own pace. None of this is easy. It will take vision, courage, and hard work. But I think we can do it together. *