Center for Growth and Opportunity at Utah State University

Public Interest Comment on the Federal Aviation Administration proposed rule

Noise Certification of Supersonic Airplanes

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Executive Summary

On April 13, 2020, the Federal Aviation Administration (FAA) proposed to create new landing and take-off noise standards for a class of supersonic airplanes. In doing so, they would extend the applicability of 14 CFR 36 to that class of aircraft. The aircraft affected are those that have a maximum takeoff weight no greater than 150,000 pounds and a maximum operating cruise speed above Mach 1 and up to Mach 1.8. The development of this generally applicable standard will provide certainty for investors and executives who otherwise would have difficulty achieving clarity regarding the supersonic regulatory landscape.

The FAA's proposal is based on data from NASA and aircraft manufacturers, which fulfills its statutory mandate to craft noise standards that are economically reasonable, technologically practicable, and appropriate for a class of supersonic aircraft. By basing the proposal on data, FAA maintains its record as an unbiased and credible source of regulatory standards. In addition, FAA's proposal demonstrates continued strong international leadership, as directed by Congress in the FAA Reauthorization Act of 2018.

The proposal is an excellent one, but it could be improved by clarifying the applicability language, modestly expanding the weight criteria, and providing appropriate clarifying language in the preambulatory text of the final rule.

The current state of supersonic aircraft landing and takeoff noise regulation

Per the plain text of the current 14 CFR 36.1(a) as well as FAA's own legal interpretation,[1] existing landing and takeoff noise standards do not apply to supersonic aircraft other than Concorde. This does not mean that new supersonic aircraft cannot be type certified or that applicants for certification are free of noise requirements. 49 USC 44715(a)(3) requires FAA to promulgate applicable noise standards before most aircraft can be type certified,[2] but under current policy and legal interpretation, FAA can create a rule of particular applicability that applies to any individual supersonic aircraft put forward for type certification.[3]

There are no applicable international standards for supersonic aircraft noise. Chapter 12 of Volume 1 of Annex 16 of the Convention on International Civil Aviation contains international noise standards for type certification of supersonic aircraft, with no binding text applicable to applications submitted after January 1, 1975.[4] As with domestic law, this absence of generally applicable international standards does not directly impede type certification and international operation of new supersonic aircraft by American companies. Under Article 33 of the Convention, signatories agree to recognize airworthiness certifications issued by other states, provided that the minimum standards established pursuant to the Convention are met.[5] This means that FAA can type certify a new supersonic aircraft pursuant to a rule of particular applicability, FAA can grant an airworthiness certificate to an American operator, and that operator can fly the aircraft all over the world with the right to land and take off in any country that is a signatory to the Convention, subject, as any aircraft operator is, to local airport noise restrictions. Insofar as other countries do not recognize FAA's noise certification standards, it affects only sales in that country (via a refusal by said country to grant airworthiness certificates), not operations. Given the strong global reputation of FAA, most countries would likely recognize FAA type certifications for new supersonic aircraft and grant their own airworthiness certificates for such aircraft. Any countries that resisted such recognition would be mainly harming their own airlines, as foreign competition would have access to supersonic aircraft and the right to operate globally.

Even without a new general rulemaking for supersonic landing and takeoff noise, then, noise certification does not present a direct impediment to the development of new supersonic aircraft for American companies. Nevertheless, the lack of generally applicable rules can indirectly impede development because investors and senior executives may not have the sophisticated understanding of the regulatory situation expounded in the previous paragraphs. Billions of dollars of investment capital are needed to bring a new supersonic passenger aircraft to fruition. For startup investors, it is often difficult to discern between mere regulatory complexity and genuine regulatory risk. Likewise, senior executives at established aerospace companies may misunderstand the true state of affairs, choosing to direct the company's resources to derivative subsonic programs rather than pioneering a clean-sheet supersonic design that would push the industry forward

A new, generally applicable rule for landing and takeoff noise certification for supersonic aircraft, then, is welcome. Although it is not strictly needed to enable certification of new supersonic aircraft, it will result in more resources directed to supersonic projects. Supersonic and hypersonic technologies have the po-

1 Karen Petronis, "Applicability of Part 36 to New Supersonic Aircraft," February 21, 2018, https://www.faa.gov/about/office_org/headquarters_offices/agc/practice_areas/regulations/interpretations/data/interps/2018/executive%20director-aee-1%20-%20(2018)%20legal%20interpretation.pdf.

2 There is an exception for aircraft for which substantial noise abatement cannot be achieved.

3 Ibid.

4 International Civil Aviation Organization, "Annex 16 to the Convention on International Civil Aviation, Environmental Protection, Volume 1, Aircraft Noise," eighth, July 2017.

5 "Convention on International Civil Aviation," *International Civil Aviation Organization*, April 4, 1947, https://www.icao.int/publications/Documents/7300_cons.pdf.

tential to unlock large global productivity increases, generating trillions of dollars of additional trade and income. The proposed rule contributes to that prosperous future.

The importance of data-driven decision making

Among other requirements, 49 USC 44715 directs the FAA Administrator to consider whether a new noise standard "is economically reasonable, technologically practicable, and appropriate for the applicable aircraft." These considerations are important, ensuring that aircraft noise regulation neither hinders technological progress nor compromises aircraft safety. FAA's practice of requiring its regulatory process to be data-driven is not only a means of complying with this statutory requirement, but it also gives the agency a great degree of credibility that its resulting regulations reflect maximum public benefit while protecting innovation and safety.

In developing these regulations, FAA used data, models, and methodologies developed by NASA that implemented the most advanced physics-based scientific and engineering methods. In addition, these were supplemented with 2- and 3-engine supersonic design concepts and data from industry developers. The proposed rule therefore reflects the best available data on economic reasonability, technological practicability, and appropriateness.

Two of FAA's conclusions from the data are worth highlighting. First, supersonic aircraft are different from subsonic aircraft. In order to fly efficiently, they have higher aspect ratios (and therefore lower low-speed lift-to-drag ratios), and lower engine bypass ratios (and therefore higher takeoff jet velocities). As a result, supersonic aircraft will generally have more difficulty meeting any particular noise target than subsonic aircraft of the same weight that apply the same noise-reduction technologies.

Second, supersonic aircraft of higher Mach numbers are different from those the FAA has proposed to classify as Supersonic Level 1 (SSL1). The data from aircraft that meet SSL1 criteria cannot be extrapolated with validity to higher-Mach design points. In part, this is for the same reasons that supersonic aircraft differ from subsonic aircraft. High-Mach supersonic aircraft, for instance, can be expected to have yet-higher aspect ratios and lower bypass ratios than low-Mach supersonic aircraft. In addition, higher-Mach design points may utilize new technologies such as variable or combined cycle engines that make existing limits or procedures unreasonable, infeasible, or inappropriate.

FAA's approach, recognizing these facts based on the data, is to be applauded. By creating a limited, cruise speed-defined class of supersonic aircraft, it ensures that the proposed rule adheres closely to the best available data and evidence.

The need to show international leadership in supersonic aviation

Section 181 of the FAA Reauthorization Act of 2018, Public Law 115-254, directs the FAA Administrator to exercise leadership not only in the creation of Federal policies, regulations, and standards relating to supersonic aircraft, but also in *international* policies, regulations, and standards. While the United States leads the world in the development of the current generation of supersonic technology, certain foreign companies[6] would prefer to block progress rather than compete in a new market. These companies have lobbied their governments to engage in a vulgar form of mercantilism, slow-rolling the development of appropriate international standards for the benefit of their domestic companies. In advocating for grossly inappropriate standards in a data-free manner, these countries and companies put the safety of the global public at risk by incentivizing aircraft manufacturers to push the performance of their equipment beyond safe levels.

6 Airbus and Dassault.

For evidence of this behavior, one need look no further than the comments filed on this very docket by the European Commission, with ID number FAA-2020-0316-0021. The Commission notes that subsonic and supersonic aircraft compete for the same passengers. Despite acknowledging technical differences between the two classes of aircraft, it insists that "[a]ny supersonic aircraft project must comply with the most recent acoustic standards governing subsonic aircraft," a safety-compromising position arrived at without a data-driven process. Finally, the Commission concludes with its concern that the proposed rule would enable supersonic aircraft to "unfairly compet[e] with subsonic aircraft." The Commission's concern is only to protect its own manufacturers, not to supply data that might move the standards development process forward.

It is indeed important for FAA to continue to show strong leadership internationally as Congress requested. This rulemaking does that, sending a strong signal that although we desire international cooperation, the United States will not wait on the sidelines while other countries play negative-sum games. The United States and other willing countries can move forward even as some governments block global progress.

Suggestion to clarify the applicability text

Under the proposed rule, a new subparagraph (6) is added under §36.1(a) to indicate that Part 36 prescribes noise standards for the issue of the following certificates: "(6) Type certificates, changes to those certificates, and standard airworthiness certificates, for supersonic airplanes." Since nothing in the proposed definition of supersonic airplane limits applicability to those in the SSL1 class, §36.1(a)(6) would be a good place to limit applicability. Without this change, Part 36 would apply to all supersonic aircraft, not just those in the SSL1 class, which is not what seems to be intended.

Suggested change to §36.1(a): "(6) Type certificates, changes to those certificates, and standard airworthiness certificates, for supersonic airplanes that have a maximum takeoff weight no greater than 150,000 pounds and a maximum operating cruise speed up to Mach 1.8."

Suggestion to modestly expand the SSL1 class in the weight dimension

Although the proposed rule has been crafted through a data-driven process, the meeting record in the docket shows that the industry data that was used may be more than two years old. Aircraft programs tend to result in increases in aircraft weight as they mature. Two years on, it's possible that one or more of the aircraft programs used to inform this rulemaking may have added maximum takeoff weight. My suggestion is to consult with manufacturers whether any modest expansions of the weight dimension of the SSL1 class would capture more aircraft. If so, I would support such a modest expansion, as it would not result in extrapolation beyond the validity of data. Such an expansion would naturally require slight numerical changes to §C36.5 to extend the line in the direction of higher weight, although the placement and slope of the line need not change.

Suggestions for the framing of the final rule

I propose two modest but important suggestions for framing of the final rule. These suggestions could be adopted with appropriate preambulatory text.

Explicitly state that there is a regulatory path for aircraft outside the SSL1 class

As discussed in the first section of this comment, although there is a regulatory path to type certification for all supersonic aircraft that is clearly visible to specialists, non-specialist investors and executives may have difficulty understanding it. The proposed rule eliminates that difficulty for projects that meet the SSL1 criteria. However, the difficulty remains with respect to supersonic projects that fall outside SSL1 class. It could spur greater investment in higher-Mach supersonic projects if FAA were to explicitly state

that its legal interpretation with respect to these projects remains the same as it is now—namely, that FAA's requirement to create an applicable standard before type certification could be met through a standard that applied to as little as one aircraft model. Such an explicit affirmation of that possible path could drive supersonic innovation forward without any further changes in FAA policy or regulation.

Explicitly state that other correlating structures could be considered in the future if the data warrant it

In its analysis of the regulatory text in the preamble of the proposed rule, FAA states that, "The FAA does not propose to deviate from this [subsonic] paradigm for supersonic aircraft. Weight remains the correlating factor, without reference to the shape or thrust or other capacity of an individual model." In fact, both the proposed rule and the existing subsonic rule use *two* correlating parameters—weight and number of engines—not weight alone. Given that SSL1 encompasses such a limited range of Mach numbers, the proposed rule seems appropriate. As the FAA does follow-on rulemakings expanding the SSL1 class or adding new classes of supersonic aircraft, it may be appropriate, based on the data, to add maximum operating speed or another aircraft characteristic as a third correlating parameter for landing and takeoff noise. If that is a possibility, it would be wise to explicitly state that in the preamble to the final rule so that FAA is not interpreted as stating that it will keep the same correlating structure as the subsonic rule if the data leads in a different direction.

The proposed rule protects the public and provides certainty for investors

In sum, the FAA's proposal is an excellent one that is based on data, shows international leadership, protects the public from excessive noise without impeding technological progress or aircraft safety, and provides certainty for investors. I congratulate the agency on an important milestone in the ongoing renaissance of supersonic technology.