



August 27, 2019

Submitted via <http://www.regulations.gov>

Mr. Kevin Welsh  
Executive Director, Office of Environment and Energy  
Federal Aviation Administration  
800 Independence Avenue, SW  
Washington, D.C. 20591

**Re: Aerospace Industries Association comments on *Special Flight Authorizations for Supersonic Aircraft*, Docket: FAA-2019-0451**

Dear Mr. Welsh,

The Aerospace Industries Association (AIA)<sup>1</sup> and the General Aviation Manufacturers Association (GAMA)<sup>2</sup> appreciate the opportunity to provide comments to the Federal Aviation Administration (FAA) on its notice of proposed rulemaking (NPRM) on *Special Flight Authorizations for Supersonic Aircraft*.

Advances in supersonic technology will deliver a future where people can fly to the far corners of the globe faster than ever before, creating new possibilities for how people travel and experience the world. As manufacturers, we are committed to delivering the promise of supersonic flight as part of our larger vision for the future of mobility. AIA and GAMA recognize that for this vision to be realized, supersonic

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<sup>1</sup> Founded in 1919, AIA is the premier trade association representing approximately 340 major aerospace and defense manufacturers and suppliers. Our members represent the United States of America's leading manufacturers and suppliers of civil, military, and business aircraft, helicopters, unmanned aerial systems, missiles, space systems, aircraft engines, materials, and related components, equipment services, and information technology.

<sup>2</sup> The General Aviation Manufacturers Association (GAMA) is an international trade association representing more than 120 of the world's leading manufacturers of general aviation airplanes and rotorcraft, engines, avionics, components, and related services and technologies. GAMA's members also operate repair stations, fixed-based operations, pilot and maintenance training facilities, and manage fleets of aircraft.



aircraft will need to be designed and operated in an environmentally responsible manner, especially as aviation moves toward a sustainable future. We are advocating for a modern regulatory framework that delivers a balance between protecting against significant impacts on people and the environment and fostering an ecosystem where new technologies can thrive.

This FAA proposed rule to modernize flight test authorizations for supersonic aircraft is an important first step toward enabling the next generation of environmentally responsible supersonic aircraft. We support the FAA's leadership in this area – both domestically and internationally – and look forward to the proposed rule on landing and take-off noise standards for supersonic aircraft which we expect next year. While we do not want to prejudge the outcome of that process and those data-driven decisions, we would like to reiterate our commitment to noise regulations that offer appropriate protections to communities from the impacts of supersonic aircraft. In particular, we believe the following two principles are important as we move forward with this technology:

- **Routine flights at supersonic speeds over land should be prohibited until acceptable levels of exposure have been established.** While technology now exists that allows aircraft to operate at supersonic speeds without causing an audible boom on the ground, we support the work being done to further understand how communities will react to such operations and inform appropriate limits. We believe that in addition to the planned tests by NASA's X-59 aircraft, which will provide the data necessary to support industry in producing aircraft that can operate responsibly at supersonic speeds, manufacturer test flights can also provide useful data to inform these decisions. The industry has no intention of creating aircraft that cause loud sonic booms over populations and it supports appropriate rules to prevent this from happening.
- **Manufacturers need to ensure that supersonic aircraft incorporate the latest technology to minimize landing and take-off noise for those living around airports.** Supersonic aircraft have very different performance capabilities and characteristics than subsonic aircraft, which means the noise from them will also differ. Nevertheless, manufacturers are committed to ensuring that these aircraft are no louder than aircraft that currently operate around airports today. As new technology becomes available in the future, noise standards should be reviewed to drive down supersonic aircraft noise in the same way that has been done for subsonic aircraft.



As aircraft manufacturers, we recognize our responsibility to the public to make aircraft as quiet as possible. But we also recognize our responsibilities beyond this and are committed to ensuring our aircraft are compatible with the aviation industry's ambitious carbon reduction goals. The aviation industry has already agreed to offset any increase in emissions above 2020 levels and is working toward a pathway to reduce emissions to 50% of 2005 levels by 2050. Manufacturers are committed to producing the most fuel-efficient supersonic aircraft possible and continue to support other efforts to help us reach this ambitious 2050 goal, including working to make Sustainable Aviation Fuels (SAF) commercially viable for aircraft operators. SAF can deliver CO<sub>2</sub> reductions of up to 80% compared to traditional aviation fuels over the entire lifecycle and have the potential to drastically reduce aviation's carbon footprint. Two U.S. supersonic manufacturers have announced the ambition for their aircraft to be certified to fly on 100% SAF.

Manufacturers have made huge advances in reducing aviation's environmental impact from subsonic aircraft, with the latest models now 85% more fuel efficient and 75% quieter than the first generation of jetliners. With the continued research and development efforts of industry and public bodies such as NASA, we expect to see similar improvements in supersonic aircraft performance over time. This FAA NPRM lays the groundwork for tests that will enable this future, and AIA and GAMA look forward to continuing to work with the FAA to make this a reality.

### **AIA and GAMA Response to NPRM**

This NPRM is an important first step in creating a modern regulatory framework for supersonic flight. For manufacturers, testing at supersonic speeds will allow them to better understand the environmental impacts supersonic flight will have and inform decisions on the future design and operation of supersonic aircraft. We therefore welcome the FAA's attempts to streamline the authorization process for such flights. We appreciate the greater clarity the FAA has sought to add to the existing application process and believe this will improve outcomes for manufacturers, as well as communities and the environment, by setting clearer expectations of what is required. While we are pleased with the direction the FAA is moving with this proposed rule, we believe there are further enhancements that



would ensure the final rule delivers the appropriate balance between protecting communities and the environment and enabling the development and success of this new technology.

A key point we wish to emphasize in our response is that the terms ‘no sonic boom overpressure’ and ‘no measurable sonic boom overpressure’ used within the proposed rule - as the implied standard which any supersonic test flight overland would have to meet - are absolute prohibitions and do not represent a suitable standard for conducting test flights in an appropriate test area. This standard would be unduly restrictive and one that an applicant would be unable to guarantee during a test flight. To achieve the stated intent of the FAA’s NPRM of supporting the growth of the civil supersonic industry, a more appropriate standard by which the agency should assess an application for a special flight authorization would be to ensure that no significant impacts on the environment or communities resulted from the granting of such an authorization.

The FAA should therefore consider the environmental impact of any supersonic test flights – in particular the sonic boom impacts - using the agency’s policies and procedures for complying with the National Environmental Policy Act (NEPA), as set out in FAA Order 1050.1F<sup>3</sup>. We believe strongly that the FAA should ensure that the impacts of such flights are evaluated in the same manner, and according to the same standards, as the impacts from other forms of transportation activity, such as subsonic aircraft flight noise and sonic booms associated with commercial space transportation operations. While we recognize the different authorities that apply to the FAA’s regulation of supersonic flight, and that Order 1050.1F does not provide specific guidance on evaluating sonic boom noise from such flights, we believe that transportation impacts on communities and the environment should not be assessed differently because of the source of those impacts. We believe that the sonic boom impacts associated with a small number of supersonic test flights in an appropriate test area should not be considered as creating a significant impact on the environment.

Furthermore, the terms ‘no sonic boom overpressure’ and ‘no measurable sonic boom overpressure’ ignore the fact that it is possible for a sonic boom-related event to occur which, while detectable by

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<sup>3</sup> FAA Order 1050.F, Environmental Impacts: Policies and Procedures, (July 16, 2015).



some form of measurement, is not audible as a boom on the ground. NASA has demonstrated through extensive flight testing that it is possible to measure overpressure wave remnants at ground level that do not have the sharp-edged characteristic of a sonic boom<sup>4</sup> and are roughly of similar magnitude to many common ambient noise sources. Wave remnants at these levels would not be considered to cause a significant impact on the environment or communities – for example, this would be noise comparable to moderate rainfall or a large office. We believe this distinction between a sonic boom and sonic boom overpressure should be made within the final rule.

The FAA should explicitly recognize that the impact of a supersonic test flight will vary greatly depending on the extent of the overpressure to which a test area will be exposed. With the ability to now accurately predict and control an aircraft's sonic boom footprint, the FAA should exercise appropriate judgement when determining whether the expected sonic boom exposure resulting from a test flight or series of test flights will entail a significant impact. This should be done in accordance with the agency's policies and procedures as set out in FAA Order 1050.1F and with reference to impacts associated with other forms of transportation activity.

Aside from the suitability of the 'no sonic boom overpressure' and 'no measurable sonic boom overpressure' language included within the proposed rule, we also believe the criteria included in the draft rule at §91.818 (c)(1) are ambiguous, as this subsection states an authorization will not be granted 'if the Administrator finds that such action is necessary to protect or enhance the environment'. This wording suggests that the Administrator could be required, or able, to deny an authorization on the basis that approving the application in question would not lead to an *enhancement* of the environment. Instead, the final rule should explicitly state that an application to conduct a supersonic test flight would not be denied if the applicant could demonstrate that such flights would not have a significant impact on communities or the environment – as well as meeting the other criteria required under the rule.

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<sup>4</sup> The NASA Armstrong Fact Sheet: Sonic Booms (August 15, 2017) defines a sonic boom as "*a thunder-like noise a person on the ground hears when an aircraft or other type of aerospace vehicle flies overhead faster than the speed of sound ... The shock wave forms a "cone" ... [that] spreads across the landscape along the flight path ... The sharp release of pressure, after the buildup by the shock wave, is heard as the sonic boom. ... It is the rate of change, the sudden changing of the pressure, which makes the sonic boom audible.*" <https://www.nasa.gov/centers/armstrong/news/FactSheets/FS-016-DFRC.html>



Finally, the proposed rule as it is written does not cover the full set of circumstances for requesting an application to exceed Mach 1 required by manufacturers to fully develop and test a supersonic aircraft. The final rule should therefore make clear that all supersonic flights required for development and production testing are covered by this authorization process, including those required to test the airworthiness and operational capabilities of aircraft. This would also include tests required to understand wider environmental impacts of these aircraft that are not explicitly mentioned in the text of the proposed rule, such as CO<sub>2</sub> and other emissions during supersonic flight.

In addition to these enhancements to the rule we have suggested, we also have comments on specific aspects of the NPRM.

### **Comments on proposed changes to *Special Flight Authorizations for Supersonic Aircraft***

#### (1) Format of the rule text and (2) Form and submission of application materials

- We welcome the FAA's proposed changes to clarify the requirements from an applicant and how they should be submitted.

#### (3) Time of day

- We acknowledge that while supersonic test flights at night may be necessary for testing or demonstration purposes in temperature or climactic conditions that are only present after sundown, it is appropriate for these to be subject to justification specifically supporting the applicant's request for doing so.

#### (4) Reasons for Authorization

- The proposed rule as it is written does not cover the full set of circumstances for requesting an application to exceed Mach 1 required by manufacturers to fully develop and test such aircraft.
- The final rule should make clear that all supersonic flights required for development and production testing – including those required to test the airworthiness and operational capabilities of aircraft – should be covered by this authorization process.

- This would also include tests required to understand the wider environmental impacts of these aircraft which are not explicitly mentioned in the text of the proposed rule, such as CO<sub>2</sub> and other emissions during supersonic flight.

#### (5) Flight tests over the ocean

- The FAA should clarify that a special flight authorization is not required if a test can be performed “over the ocean at a distance ensuring that no sonic boom overpressure reaches any land surface in the United States.”
- The term ‘no sonic boom overpressure’ that the rule references in this section however is an absolute prohibition. At best, it is ambiguous as to whether it refers to within the primary or secondary boom carpets and such a prohibition makes no distinction as to the level of impacts associated with the sonic boom overpressure. As we note in our introduction to this response, it is possible to measure overpressure wave remnants at ground level that do not have the sharp-edged characteristic of a sonic boom and are of roughly similar magnitude to common ambient noise sources.
- We do not, therefore, believe this is an appropriate threshold for determining whether an authorization for supersonic flight overland would be granted. As noted above, a more appropriate requirement would be to avoid any significant impact on the environment.
- There should be a provision and process in place to allow supersonic flight testing to move from over the ocean to overland. This should involve various stages of modelling, along with testing and validation through flights over the ocean, to demonstrate with appropriate confidence that there would be no significant sonic boom impacts on communities and the environment.
- If it can be reliably demonstrated that supersonic test flights overland will not cause a significant environmental impact in the atmospheric conditions they will operate in, an application to do so should generally be granted.

#### (6) Environmental Analyses

- The wording of the proposed rule suggests that the Administrator would be required or able to deny an authorization on the basis that approving an application would not lead to an *enhancement* of the environment.

- The final rule should explicitly state that an application to conduct a supersonic test flight would not be denied if the applicant could demonstrate that such flights would not have a significant impact on communities or the environment – as well as meeting the other criteria required under the rule.
- The FAA should consider the environmental impact of any supersonic test flight using the agency’s policies and procedures for complying with the National Environmental Policy Act (NEPA) as set out in FAA Order 1050.1F.
- We recognize the different authorities which apply to the FAA’s regulation of supersonic flight, and that Order 1050.1F does not provide specific guidance on evaluating sonic boom noise from such flights. However, we believe strongly that the FAA should ensure that the impacts of such flights are evaluated in the same manner and according to the same standards as the impacts from other forms of transportation activity (e.g. subsonic aircraft flight noise and sonic booms associated with commercial space transportation operations).
- We also point to existing precedent for commercial space transportation operations and military aviation activity. We believe that transportation impacts on communities and the environment should not be assessed differently because of the source of those impacts.
- The rule should explicitly recognize that a requirement to avoid significant impacts on the environment is not equivalent to ‘no sonic boom overpressure’.
- We believe that the sonic boom impacts associated with a small number of supersonic test flights in an appropriate test area should not be considered as creating a significant impact on the environment.
- Furthermore, with the ability to now accurately predict and control an aircraft’s sonic boom footprint, the FAA should exercise appropriate judgement when determining whether the expected sonic boom exposure resulting from a test flight or series of test flights will entail a significant impact. This should be done in accordance with the agency’s policies and procedures as set out in FAA Order 1050.1F and with reference to impacts associated with other forms of transportation activity.
- The FAA should explicitly state that where an Environmental Assessment indicates that the approval of an application will not result in significant impacts, or that any impacts can be



mitigated so that they are not significant, a Finding of No Significant Impact (FONSI) can be issued, and an Environmental Impact Statement is not required – as per FAA Order 1050.1F.

#### (7) Duration of Authorizations

- We welcome the FAA's indication that an environmental review would usually be considered sufficient for subsequent tests in the same flight area and recognize the need for the FAA to retain the ability to review each application.
- However, the rule should include a streamlined process or expedited approval process for subsequent applications where it can be shown that there have been no meaningful changes in the expected environmental impacts.

#### (8) Test area descriptions

- The FAA should implement a procedure to qualify a new area for a flight test without an application for a specific flight test campaign. The proposed rule does not include such a provision, but this would enable industry to make advanced preparations for eventual test flights – including by multiple manufacturers if desired.

#### **Comments on proposed changes to *Supersonic Operations Outside of a Test Area***

We appreciate that the FAA has sought feedback from industry and others ahead of proposing any changes or removal to the text in the existing rule, which allows the operator of a supersonic aircraft to perform flights in excess of Mach 1 (including non-test flights) outside of a test area – if various pre-conditions have been met.

As the FAA is aware, multiple U.S. manufacturers are currently exploring technological solutions – including the use of low boom technology and exploitation of the Mach cut-off phenomenon – which would enable the possibility of supersonic operations overland without exposing communities to significant sonic boom impacts. We acknowledge and agree with the FAA's observation that the increase of air traffic within the National Airspace System since the existing rule was first introduced means this provision would not be the most efficient way of managing routine supersonic flights that were able to meet the requirements set out under this part of the rule. However, at this stage, this remains the only



mechanism for allowing such flights and, in any event, we do not foresee a large number of such requests in the immediate near-term future. We therefore request that this aspect of the current rule be maintained, with appropriate modifications, until such time that an alternative mechanism for allowing such flights can be properly developed and implemented.

As with the proposed rule's requirements for exceeding Mach 1 in a test area, we also believe the requirements set out in §91.818 (b) are overly restrictive and unnecessary to meet the goal of protecting against significant impacts from sonic booms. As we have explained in our introductory comments, the requirement for no 'measurable sonic boom overpressure to reach the surface' does not recognize the possibility for a sonic boom-related activity to occur which is barely – if at all – noticeable on the ground but can still be detected by some measurement method. Consistent with our proposed revision to the criteria regarding authorizations for test flights, a more appropriate requirement would for an applicant to demonstrate that no significant environmental impacts would result.

With regards to how significant impacts should be determined for flights outside of a test area, we would again urge that the FAA should use the agency's policies and procedures for complying with the NEPA, but acknowledge that the FAA's determination of what constitutes a significant impact may differ within and outside of a test area – with the decision dependent on the particular environment in which an aircraft would be operating at supersonic speeds, among other factors. To this effect, we would like to refer the FAA back to the originally proposed language for the current rule, published in the Federal Register dated 16 April 1970 in §91.55(c)<sup>5</sup>. This language would have allowed an applicant to exceed Mach 1 outside of a test area if they were able to "show conservatively that the flight will not cause a sonic boom to reach the surface of the United States". This language was changed in the final rule published in 1973 due to the belief that no OEM would be capable of providing such information based on the level of predictive technology available at the time<sup>6</sup>.

As we have explained above, this technology has now been repeatedly demonstrated. Restoration and adoption of the original language, to reflect the distinction between a sonic boom and sonic boom

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<sup>5</sup> NPRM proposing supersonic operating prohibition and appendix B, 35 FR 6189 (April 16, 1970).

<sup>6</sup> Preamble to final rule adopting appendix B, 38 FR 8054 (March 28, 1973).



overpressure, should be made within the final rule. This would enable OEMs to conduct supersonic testing outside designated test areas if it can be demonstrated that the overpressure that would reach the surface would not expose communities to unacceptable sonic boom impacts. Such testing could materially supplement test data to be collected by the NASA X-59 Low Boom Demonstrator Program. The FAA would still be required to determine whether the applicant was able to “show conservatively that the flight will not cause a sonic boom to reach the surface of the United States.”

We also believe the requirement in *§91.818 (b)(3)* for the conditions and limitations determined by previous tests to represent all foreseeable operating conditions is unreasonably restrictive. This requirement should be changed to reflect the technological capabilities we have already alluded to which allow reliable prediction of sonic boom formation and the ability to adapt operations to manage and mitigate any sonic boom impacts. We discuss this further below.

While we believe the current requirements for receiving authorizations outside of test areas are too restrictive, we do acknowledge that it is imperative that any process to approve such flights is sufficiently robust in order to protect communities and the environment from the possibility of any significant sonic boom impacts. Just as we have proposed for the transition from over the ocean to overland testing, there should be a process in place to transition from a flight authorization within test areas to outside these areas that ensures the FAA can be confident no significant environmental impacts would occur. This process should involve various stages of modelling, over the ocean and then overland flights in test areas, as well as the proposed operator’s demonstration of their capability of monitoring and predicting, to a sufficiently high degree of confidence – over the full range of conditions the operator plans to operate in – the likely sonic boom impacts on communities and the environment.

To ensure there are appropriate safeguards in place for communities and the environment from supersonic flights outside of test areas, we acknowledge it will be necessary for the FAA to impose reasonable and practicable conditions on how these flights are operated. This may include an appropriate speed tolerance to ensure there is sufficient confidence that the resulting sonic boom exposure is within an appropriate range of the predicted exposure, and that there are no unintended significant impacts on communities or the environment. We would also support the FAA developing



suitable enforcement measures to apply to such authorizations in order to deter attempts to operate outside of any such restrictions the FAA may impose.

We would like to reiterate our support for keeping this provision within the new rule with the appropriate modifications. In the longer term, AIA, GAMA, and our respective member companies would welcome further dialogue with the FAA on future ways to enhance the process for authorizing and conducting supersonic flights outside of test areas, beyond the changes being considered in this specific rulemaking.

#### **Other comments related to the NPRM**

In addition to our comments above on the content of the FAA's proposed rule, we also would like to offer comments on the FAA's burden assessment for this NPRM which we hope will prove helpful when decisions are reached regarding the final rule. The burden assessment in its current form states that it is expected the industry will not be required to carry out any new environmental assessments for the Administrator to be able to make the necessary determination of no significant environmental impact under NEPA. This is based on the FAA's assumption that industry will make use of existing locations where supersonic flights already occur, such as military test ranges. This assumption may not always be correct given that the range size and the current level of activity on military ranges may necessitate applications for supersonic flight testing outside of these areas – as would, for instance, the need to test in a full range of varied weather conditions. The rule should therefore state that applications for testing outside of such military ranges areas may occur, and the analysis of the economic and paperwork burdens posed by the proposed rule should be revised accordingly.

#### **Conclusion**

AIA and GAMA appreciate the FAA's leadership in this area and support its efforts to streamline the application process for special supersonic flight authorizations. To further support the growth of the civil supersonic industry in an environmentally responsible manner, the FAA's final rule should ensure that decisions on whether to approve an application are based on a thorough consideration of the expected impacts. For this reason, we do not believe the terms 'no sonic boom overpressure' and 'no measurable sonic boom overpressure' currently used within the rule are appropriate for the FAA to base a decision



on. To support manufacturers in developing the next generation of environmentally responsible supersonic aircraft, the FAA should instead consider any impacts in line with its own policies and procedures in a way that is consistent with impacts from other forms of transportation activity. The FAA should also acknowledge the distinction between a sonic boom and sonic boom overpressure within the final rule.

Along with these modifications, the FAA should also preserve the provision allowing an applicant to request authorization to fly at supersonic speeds outside of test areas if various criteria are met. These enhancements will help deliver a modern regulatory framework that delivers a balance between protecting against significant impacts on people and the environment and fostering an ecosystem where this new technology can thrive in an environmentally responsible way. AIA and GAMA would be pleased to provide more information or clarification of our comments. We look forward to continuing our engagement with the FAA in the future as we work towards our shared vision of sustainable supersonic travel and the opportunities this will enable.

Respectfully,

A handwritten signature in black ink, appearing to read "D. Silver", with a long horizontal line extending to the right.

**David Silver**

Vice President, Civil Aviation  
Aerospace Industries Association

A handwritten signature in black ink, appearing to read "Walter Desrosier", written in a cursive style.

**Walter Desrosier**

Vice President of Engineering & Maintenance  
General Aviation Manufacturers Association