COMMENTS OF CALIFORNIA (BY AND THROUGH THE CALIFORNIA ATTORNEY GENERAL AND CALIFORNIA AIR RESOURCES BOARD), CONNECTICUT, ILLINOIS, MARYLAND, MASSACHUSETTS, NEW JERSEY, NEW YORK, OREGON, PENNSYLVANIA, VERMONT, WASHINGTON, AND WISCONSIN

NOTICE OF PROPOSED RULEMAKING ON THE CONTROL OF AIR POLLUTION FROM AIRPLANES AND AIRPLANE ENGINES: PARTICULATE MATTER STANDARDS AND TEST PROCEDURES

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I. EXECUTIVE SUMMARY

The States of California (by and through the California Attorney General and the California Air Resources Board), Connecticut, Illinois, Maryland, New Jersey, New York, Oregon, Vermont, Washington, and Wisconsin, and the Commonwealths of Massachusetts and Pennsylvania (together, the Commenting States) submit these comments on the Environmental Protection Agency's (EPA) proposed standards for particulate matter emissions from aircraft, titled Control of Air Pollution from Airplanes and Airplane Engines: Emission Standards and Test Procedures, 87 Fed. Reg. 6324 (Feb. 3, 2022) ("Proposed Rule"). The Proposed Rule understates its severe environmental justice impacts,[1] fails to examine feasible and cost-effective reductions far beyond those achieved by the proposed standards, and elevates an ill-defined, nonstatutory interest in "international harmonization" above EPA's core statutory obligation to protect the public health and welfare against dangerous aircraft pollution. Because the rule as proposed is unlawful, arbitrary, and capricious, the Commenting States urge EPA to issue a revised Notice of Proposed Rulemaking that adequately addresses these core concerns.

First, as explained in Section II, the health and environmental effects of particulate matter (PM) emissions from aircraft—and their disproportionate impact on environmental justice communities that live, work, and go to school near airports—necessitate prompt action to reduce PM emissions from aircraft. While the Proposed Rule acknowledges significant evidence that these communities are inequitably impacted by aircraft PM pollution, EPA understates the environmental justice impacts of this pollution. There is inadequate monitoring data of PM levels in communities near airports, and EPA's county-level analysis does not adequately capture the highly localized impacts of aircraft PM emissions on airport-adjacent communities.

Second, as explained in Section III, the Proposed Rule fails to satisfy EPA's duty to issue protective standards that reasonably respond to the dangers of aircraft PM emissions.[2] The substantive standards that EPA proposes to adopt—the 2017 and 2020 PM standards developed by the International Civil Aviation Organization (ICAO)—are far less stringent than what existing engine technologies already achieve and would result in no PM reductions at all compared to current levels. In fact, EPA apparently has not even *considered* any standard of emission control that would reduce PM, even though the record it has compiled shows how

[1] Environmental justice is defined by EPA as the "fair treatment and meaningful involvement of all people regardless of race, color, national origin or income with respect to development, implementation, and enforcement of environmental laws, regulations and policies." EPA, EPA-300-B-1-6004, EJ 2020 ACTION AGENDA: THE U.S. EPA'S ENVIRONMENTAL JUSTICE STRATEGIC PLAN FOR 2016-2020, at 1 (Oct. 2016) [hereinafter EJ 2020 ACTION AGENDA]. For the purpose of this comment, the term "environmental justice community" refers to a community of color or community experiencing high rates of poverty that is overburdened by environmental pollution, and the accompanying harms and risks from exposure to that pollution, because of past or current unfair treatment.

[2] The Commenting States have no objection to EPA's decision to reformulate PM controls in terms of the proposed PM mass, PM number, and PM mass concentration metrics. *See* 87 Fed. Reg. at 6337-41. However, as set forth below, emission reductions that far exceed the Proposed Rule are technologically feasible and necessary to meaningfully control PM emissions.

aircraft PM emissions endanger public health and welfare and disproportionately burden environmental justice communities. By elevating a nonstatutory policy preference to restrict domestic standards to ICAO standards above the actual factors Congress directed EPA to consider, EPA violates its duty under Clean Air Act section 231 to protect the public health and welfare and acts arbitrarily. Finally, the Proposed Rule suffers additional legal flaws that would render its final adoption arbitrary and capricious, including EPA's failure to accurately evaluate and redress the cumulative and disproportionate impacts of aircraft emissions on environmental justice communities and evaluate federalism implications according to its own stated practices.

Accordingly, the Commenting States request that EPA rescind the Proposed Rule and issue a revised Notice of Proposed Rulemaking that assesses all of the environmental justice implications of aircraft emissions, evaluates the full range of feasible options for effective emissions control, and proposes emission standards that actually reduce dangerous PM emissions from aircraft.

II. AIRCRAFT PARTICULATE MATTER EMISSIONS CREATE AND EXACERBATE ENVIRONMENTAL INEQUITIES IN ENVIRONMENTAL JUSTICE COMMUNITIES

Section 231 of the Clean Air Act directs EPA to regulate dangerous aircraft emissions based on a diligent investigation of these emissions' harmful impacts in air quality control regions across the United States. 42 U.S.C. § 7571(a)(1)(A), (2)(A), (3); *see* Part III.A, *infra*. In evaluating the impacts of pollution, EPA and other executive agencies have committed to studying not just the broadest and most generalized harms, but also the way pollution creates and exacerbates social inequities by overburdening particular communities with pollution and its cumulative associated health and environmental effects. Exec. Order 12,898, "Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations," 59 Fed. Reg. 7629 (Feb. 11, 1994); *see* also Exec. Order 14,008, "Tackling the Climate Crisis at Home and Abroad," § 219 *et seq.*, 86 Fed. Reg. 7619, 7629 (Jan. 27, 2021).

The Commenting States have significant concerns about EPA's failure to conduct a meaningful environmental justice analysis in the Proposed Rule. Although EPA acknowledges the robust evidence that aircraft PM emissions drive serious health and environmental harms in communities located near or downwind from airports, many of which already disproportionately experience environmental and social inequities, the Proposed Rule understates these environmental justice concerns and postpones consideration of the inequitable impacts of aircraft PM pollution to another day. This renders EPA's environmental justice analysis—and thus its analysis of pollution impacts under Section 231—substantively inadequate.

A. Particulate matter from aircraft

Particulate matter pollution is a mixture of substances suspended in air as small liquid and/or solid particles.[3] Particles range in size from those smaller than 1 nanometer to over 100 micrometers (μm) in diameter.[4] Atmospheric particles are divided and grouped in classes based on their diameters. "Generally, the three broad classes of particles include ultrafine particles (UFPs, generally considered as particulates with a diameter less than or equal to 0.1 μm . . .), 'fine' particles ($PM_{2.5}$; particles with a nominal mean aerodynamic diameter less than or equal to 2.5 μm) and 'thoracic' particles (PM_{10}; particles with a nominal mean aerodynamic diameter less than or equal to 10 μm)." 87 Fed. Reg. at 6330.

PM pollution from aircraft is primarily UFP and $PM_{2.5}$. Initially, the bulk of PM emissions released by airplanes are in the ultrafine range.[5] Over the span of a few hours to days, most of the UFP released converts into $PM_{2.5}$ by coalescing with other materials in the atmosphere.[6] Another significant component of UFP will evaporate or diffuse onto surfaces it comes into contact with.[7] As a result, UFP has a typical atmospheric residence time that is measured in terms of hours or a few days.[8] Because of these properties, UFP concentrations are highly localized and disperse much less as compared to $PM_{2.5}$.[9]

$PM_{2.5}$ emissions from aircraft, like other $PM_{2.5}$, will remain in the atmosphere until it is formed into cloud droplets and rained out, falls to the ground due to gravity, or diffuses to surfaces on contact.[10] As a result of these processes, $PM_{2.5}$ has a typical atmospheric residence time that is measured in weeks.[11] Because of these physical properties, $PM_{2.5}$ will tend to the follow the wind and transport over greater distances than UFP.[12]

In addition to its unique physical characteristics, PM released from aircraft is chemically distinct from other sources of PM pollution. Specifically, "jet engine emissions have physiochemical properties similar to diesel exhaust particles."[13] The study EPA cites further explains that emissions from aircraft consist of high numbers of soot particles with associated

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[3] EPA, EPA/600/R-19/188, INTEGRATED SCIENCE ASSESSMENT FOR PARTICULATE MATTER (Dec. 2019) (hereinafter 2019 PM ISA).

[4] A nanometer is 10^{-9} meters and a micrometer is three orders of magnitude larger, at 10^{-6} meters.

[5] 2019 PM ISA at 2-4.

[6] *Id*. at 2-4, 2-94, 3-7.

[7] *Id*.

[8] *Id*. at 2-5, Table 2-1.

[9] *Id*. at 2-4.

[10] *Id*. at 2-5, Table 2-1.

[11] *Id*.

[12] *Id*. at 2-4, 3-8.

[13] 87 Fed. Reg. 6333.

polycyclic aromatic hydrocarbons (PAHs), and metals.[14] The PAHs released from aircraft can be released as gas or as particles. 87 Fed. Reg. 6335.

Studies also consistently show that PM emissions from aircraft, especially UFP, are concentrated around airports. *Id.* at 6332. A 2015 report cited by EPA concluded that "existing studies indicate that ultrafine particle concentrations are highly elevated at an airport (*i.e.*, near a runway) with particle counts that can be orders of magnitude higher than background with some persistence many meters downwind (*e.g.* 600 m)." *Id.* Another study performed at Seattle-Tacoma International Airport, and cited by EPA, found that higher levels of UFP remained concentrated near the airport, and impacted an area larger than near-roadway sites. *Id.* The studies EPA cites have also found that UFP from aircraft infiltrate residences and remain concentrated near and downwind from airports. *Id.*

B. Public health and environmental impacts of aircraft PM

The health and environmental impacts of PM are well established and widely acknowledged. EPA first established National Ambient Air Quality Standards (NAAQS) for PM in 1971.[15] Since then, EPA has tightened the PM NAAQS in 1987,[16] 1997,[17] 2006,[18] and 2012.[19] In 2020, EPA issued a final rule to retain the PM NAAQS standards set in 2012.[20] However, EPA initiated a reconsideration of its 2020 decision "because available scientific evidence and technical information indicate that the current [2012] standards may not be adequate to protect public health and welfare, as required by the Clean Air Act."[21]

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[14] K. Bendtsen, A Review of Health Effects Associated With Exposure to Jet Engine Emissions In And Around Airports, Environmental Health 2021 20:10, at 3, https://ehjournal.biomedcentral.com/track/pdf/10.1186/s12940-020-00690-y.pdf (hereinafter *Jet Engine Emissions In And Around Airports*).

[15] Title 42-Public Health, Chapter IV-Environmental Protection Agency, Part 410 National Primary and Secondary Ambient Air Quality Standards, 36 Fed. Reg. 8186 (Final Rule Apr. 30, 1971).

[16] Revisions to National Ambient Air Quality Standards for Particulate Matter, 52 Fed. Reg. 24,634 (Final Rule Jul. 1, 1997).

[17] National Ambient Air Quality Standards for Particulate Matter, 62 Fed. Reg. 38652 (Final Rule Jul. 18, 1997).

[18] National Ambient Air Quality Standards for Particulate Matter, 71 Fed. Reg. 61,144 (Final Rule Oct. 17, 2006).

[19] National Ambient Air Quality Standards for Particulate Matter, 78 Fed. Reg. 3086 (Final Rule Jan. 15, 2013).

[20] Review of the National Ambient Air Quality Standards for Particulate Matter, 85 Fed. Reg. 82,684 (Final Rule Dec. 18, 2020).

[21] Press Release, EPA, EPA to Reexamine Health Standards for Harmful Soot that Previous Administration Left Unchanged (June 10, 2021).

Based on this deep body of scientific evidence, EPA's Proposed Rule acknowledges that human exposures to ambient $PM_{2.5}$ are associated with numerous adverse health effects. 87 Fed. Reg. at 6331. EPA concluded that long-term and short-term exposure to $PM_{2.5}$ has a causal effect on increased mortality and decreased cardiovascular health and is likely to have a causal effect on decreased respiratory health. *Id*. Further, EPA's 2019 review of the science has found that long-term exposure to $PM_{2.5}$ is likely to have a causal relationship to negative nervous system effects and cancer effects. *Id*. The evidence is also suggestive of a causal relationship between $PM_{2.5}$ exposure and a host of other negative health impacts, including male and female reproductive and developmental effects (*i.e.*, fertility, pregnancy, and birth outcomes) from long-term exposure, metabolic effects from long-term and short-term exposure, and nervous system effects from short-term exposure. *Id*. EPA's Proposed Rule further discusses the specific health effects of PM emissions from aircraft. One study cited by EPA found that every year, nearly 14,000 premature deaths across the globe are attributable to $PM_{2.5}$ exposure. *Id*. Occupational exposure studies indicate that airport workers are especially vulnerable to these health impacts, especially ground workers chronically exposed to LTO operations.[22]

Exposure to UFP is also linked to adverse health effects. EPA's 2019 Integrated Science Assessment for Particulate Matter concluded that the evidence is suggestive of, but insufficient to infer, a causal relationship between short-term exposure and negative respiratory and cardiovascular effects, and also between long-term and short-term exposure and nervous system effects.[23] In the specific context of the Proposed Rule, EPA itself discusses several studies that have found a link between UFP from aircraft and negative health effects. One study cited by EPA concluded that UFP emissions from aircraft contribute to pre-term births, independent of noise and traffic-related air exposures. 87 Fed. Reg. at 6332.[24]

There is also evidence that suggests that exposure to UFP is more hazardous than exposure to $PM_{2.5.}$ This is because inhaled UFP are able to penetrate deeper into the respiratory tract.[25] In addition, because of their high ratio of surface area to size, UFPs can transport a variety of toxins causing tissue and cell injury.[26] Further, because of the high concentration of

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[22] *Jet Engine Emissions In And Around Airports*, *supra* note 14.

[23] 2019 PM ISA, ES-9 – ES11, Table ES-1.

[24] The Proposed Rule describes these findings as being related to "emissions from aircraft." However, the underlying study makes clear that these health effects were found to be connected to exposure specifically to UFP from aircraft. S. Wing, et al., Preterm Birth Among Infants Exposed to *In Utero* Ultrafine Particles From Aircraft Emissions, Environmental Health Perspectives, 128(4), 047002-4 (Apr. 2020) ("We found *in utero* exposures to jet-specific UFP emissions . . . to be associated with increased odds of PTB among mothers living within 15 km of LAX.").

[25] M. Ubaid, et al., Pollution Characteristics, Mechanisms of Toxicity and Health Effects of the Ultrafine Particles in the Indoor Environment: Current Status and Future Perspectives, Critical Reviews in Environmental Science and Technology, Vol. 52, No. 3, 436-473, 438 (2022), https://doi.org/10.1080/10643389.2020.1831359 (attached as Exhibit 1).

[26] *Id*.

black carbon and PAHs in aircraft exhaust, these emissions are more likely to pose acute and chronic health problems such as respiratory problems, acute bronchitis, heart problems, lung cancer, aggravation of preexisting heart and lung disease, and asthma. EPA categorizes most PAHs as type 2A or 2B human carcinogens.[27]

C. PM pollution has disproportionate impacts on environmental justice communities

EPA's Proposed Rule acknowledges that "environmental hazards such as air pollution are more prevalent in areas where people of color and low-income populations represent a higher fraction of the populations compared with the general population, including near transportation sources." *Id.* at 6336. However, this acknowledgement understates the overwhelming evidence of the disproportionate impact of PM pollution on environmental justice communities. EPA previously noted, in the context of its review of the current PM NAAQS standards, that "[t]here is strong evidence demonstrating that [B]lack and Hispanic populations, in particular, have higher $PM_{2.5}$ exposures than non-Hispanic white populations'' and "there is consistent evidence across multiple studies demonstrating an increase in risk for nonwhite populations."[28]

Indeed, the evidence EPA relied on included one study showing that the exposure to PM poses a "relative risk for African Americans [that] is three times higher than that of the entire population."[29] Another analysis found that the average exposure of Latin, Asian, and African/Black Americans in the Northeast and Mid-Atlantic regions to $PM_{2.5}$ from cars, trucks and buses exceeded the average exposure in those regions by 42 percent, 40 percent and 31 percent, respectively.[30] Other, more recent, studies not considered by EPA during its review of the PM NAAQS confirm these findings.[31]

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[27] M. Ubaid, et al., Emission Sources and Full Spectrum of Health Impacts of Black Carbon Associated Polycyclic Aromatic Hydrocarbons (PAHs) in Urban Environment: A Review, Critical Reviews in Environmental Science and Technology, Vol. 51, No. 9, 857-96, 859 (2021), https://doi.org/10.1080/10643389.2020.1738854 (attached as Exhibit 2).

[28] Review of the National Ambient Air Quality Standards for Particulate Matter, 85 Fed. Reg. 82,684, 82703 (Dec. 18, 2020) (quoting 2019 PM ISA, *supra* note 3, at 12-38).

[29] Independent Particulate Matter Review Panel, Consensus Responses to Charge Questions on EPA's Policy Assessment for the Review of the National Ambient Air Quality Standards for Particulate Matter (External Review Draft – Sept. 2019), B-29 (citing Di *et al.*, Air Pollution and Mortality in the Medicare Population, New England Journal of Medicine, 376(26): 2513-2522 (2017)), https://ucs-documents.s3.amazonaws.com/science-and-democracy/IPMRP-FINAL-LETTER-ON-DRAFT-PA-191022.pdf (attached as Exhibit 3).

[30] M. Pinto de Moura *et al.*, Inequitable Exposure to Air Pollution from Vehicles in the Northeast and Mid-Atlantic, at 3 (June 2019), https://www.ucsusa.org/sites/default/files/attach/2019/06/Inequitable-Exposure-to-Vehicle-Pollution-Northeast-Mid-Atlantic-Region.pdf, (attached as Exhibit 4).

[31] *See*, *e.g.*, I. Mikati, *et al.*, Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status, 108(4) *Am. J. Public Health* 480 (Apr. 2018), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5844406/pdf/AJPH.2017.304297.pdf, (attached as Exhibit 5).

D. Aircraft PM pollution has a disproportionate impact on environmental justice communities

Like PM pollution generally, aircraft PM emissions have a disproportionate impact on environmental justice communities. As noted above, the emissions of primary concern are those released during landings and takeoffs (LTO), defined as emissions between ground level and an altitude of about 3,000 feet. 87 Fed. Reg. at 6345. These emissions include those released during departure operations (from taxi-out movement from gate to runway, aircraft take-off run, and climb-out to 3,000 feet) and arrival operations (emissions from approach at or below 3,000 feet down to landing on the ground and taxi-in from runway to gate). *Id.* "These LTO emissions directly affect the ground level air quality at the vicinity of the airport since they are within the local mixing height." *Id.* Accordingly, "concentrations of PM increase with proximity to an airport." *Id*. Further, as discussed above, the scientific literature "consistently reports that particle numbers close to airports are significantly higher than locations distant and upwind of airports, and that the particle size distribution is different from traditional road traffic, with more extremely fine particles. *Id*. at 6332.

This higher concentration of aircraft PM emissions reaching neighborhoods already living with environmental justice concerns is disproportionately impacting communities of color and/or communities with high poverty rates because airports are disproportionately located in these historically marginalized and overburdened communities. *Id*. at 6336. For example, one study cited by EPA found that "the relationship between minority population percentages and aircraft derived PM was found to grow stronger as [PM] concentrations increased."[32] Another study found "that over 65,000 students in California spend 1 to 6 hours a day during the academic year being exposed to airport pollution, and the percentage was higher for those who were economically disadvantaged."[33] Additionally, as noted above, airport workers are chronically exposed to these emissions and especially vulnerable to the resulting health impacts.[34]

Information from California (drawn from the State's environmental justice screening tool, CalEnviroScreen) confirms that airports are often located in or near environmental justice

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[32] Rissman et al., Equity and Health Impacts of Aircraft Emissions at the Hartfield-Jackson Atlanta International Airport, Landscape and Urban Planning 120: 234-274, (2013) https://www.sciencedirect.com/science/article/pii/S0169204613001382; *see also* McNair, A. et al., Investigation of Environmental Justice Analysis in Airport Planning Practice from 2000 to 2010, Transp. Research Part D 81:102286 (2020), https://www.sciencedirect.com/science/article/pii/S1361920919311149?via%3Dihub; Woodburn, A., Investigating Neighborhood Change in Airport-Adjacent Communities in Multiairport Regions from 1970 to 2010, Journal of Transportation Research Board, 2626, 1-8, https://doi.org/10.3141%2F2626-01.

[33] Henry et al., Estimating Potential Air Quality Impact of Airports on Children Attending the Surrounding Schools, Atmospheric Environment, 212: 128-135 (2019), https://www.sciencedirect.com/science/article/pii/S1352231019303516?via%3Dihub.

[34] *Jet Engine Emissions In And Around Airports*, supra note 14.

communities. Several of the busiest airports in California (and in the United States), including Los Angeles International Airport (LAX), San Francisco International Airport (SFO), San Jose International Airport (SJO), and Oakland International Airport (OAK), are surrounded by communities in which residents are predominantly people of color and experience high levels of poverty.[35] The example of LAX is particularly striking. The census tracts due east of LAX include several communities in which people of color and people living in poverty are the majority:

Census Tract	Asian-American	Black	Hispanic	Poverty Rate
6037277200	9.8%	27.5%	34.8%	64%
6037277400	6.6%	48%	32.2%	80%
6037601401	4.1%	33.2%	50.8%	83%
6037601402	1.7%	1.2%	91.1%	64%
6037601501	4.9%	5.1%	88.4%	94%
6037601502	2.9%	0.8%	93.8%	95%
6037601600	10.6%	0.9%	86.1%	79%
6037601700	1.7%	7.9%	87%	90%

Additionally, data shows that the predominant wind direction blows west to east, or from LAX airport directly into these environmental justice communities.[36] Smaller commercial airports in California, including Ontario International Airport (ONT), Fresno Yosemite International Airport (FAT), and Meadows Field Airport in Bakersfield (BFL) have similar demographic patterns in the surrounding areas.[37]

Data from other states show similar land-use patterns with airports located in or near historically disadvantaged and overburdened communities. For example, the Philadelphia International Airport is located in close proximity of neighborhoods which demographically are 88% to 97% people of color and communities with high poverty rates. Given the daily variability in wind direction, all of these communities are likely exposed to aircraft PM emissions.[38]

E. Aircraft PM pollution impacts on neighboring communities is likely underestimated

The impact of PM pollution from aircraft on environmental justice communities is likely underestimated for several reasons. First, there is insufficient monitoring. EPA acknowledges it has not required the creation of an ambient air monitoring network for UFP and as such "there is

[35] Collection of Maps from CalEnviroScreen 4.0 (attached as Exhibit 6.) California Office of Environmental Health Hazard Assessment, CalEnviroScreen 4.0, https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40.

[36] WeatherSpark.com, Chart for Wind Direction at Los Angeles International Airport, https://weatherspark.com/y/145341/Average-Weather-at-Los-Angeles-International-Airport-California-United-States-Year-Round (attached as Exhibit 7).

[37] Exhibit 6, *supra* note 35.

[38] EPA EJ Screen, https://www.epa.gov/ejscreen.

limited information on UFP exposures within the U.S."[39] Further, the nearest $PM_{2.5}$ NAAQS monitor is often too far or not in the right location to register aircraft emissions. For example, the $PM_{2.5}$ monitor closest to LAX is approximately 12 miles away, the $PM_{2.5}$ monitor closest to SFO is over 10 miles away, and the $PM_{2.5}$ monitor closest to OAK is nearly 3.5 miles away.[40] While there is a $PM_{2.5}$ monitor about 2 miles away from Ontario International Airport, it is located due south of the airport and would only detect aircraft emissions on the rare occasion (only 3.9 months in any given year) when the wind is blowing from the north.[41]

Second, though there are some uncertainties regarding the health effects of UFP exposure, the evidence discussed above suggests that exposure to UFP, especially from aircraft, is likely more harmful than exposure to $PM_{2.5}$. In short, in the Proposed Rule EPA likely underestimates the impacts of aircraft PM on communities with environmental justice concerns.

F. EPA's county-level analysis does not adequately capture the impacts of aircraft PM pollution on neighboring communities

EPA's analysis of the contribution of aircraft emissions to ambient PM levels is methodologically flawed, leading to the Proposed Rule understating the impacts of aircraft PM emissions on environmental justice communities. $PM_{2.5}$ and UFP emissions should be assessed at the urban and neighborhood scales.[42] EPA instead analyzed the contribution of aircraft emissions over larger regional areas. 87 Fed. Reg. 6333. The urban scale refers to citywide conditions with dimensions on the order of 4 to 50 km. *Id*. The neighborhood scale refers to an area of a city with dimensions on the order of 0.5 to 4 km.[43] Because $PM_{2.5}$ and UFP is usually emitted from numerous sources within a given area, and because $PM_{2.5}$ and UFP concentrations can decrease steeply with distance from sources, considerable variation in $PM_{2.5}$ and UFP concentrations can occur over relatively short distances.[44]

Despite recognizing the appropriate scale for analyzing $PM_{2.5}$ emissions is at the urban or neighborhood scale due to the highly localized nature $PM_{2.5}$ emissions from aircraft, EPA assessed emissions at the Metropolitan Statistical Area (MSA) Level and the county level. Specifically, EPA estimated the proportion of $PM_{2.5}$ emissions attributable to the 25 busiest airports in the United States in relation to the total mobile source emissions for the MSA and county each of those airports is located in. 87 Fed. Reg. 6333. MSAs are large sprawling areas

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[39] 2019 PM ISA, ES-23.

[40] Collection of maps showing California airports and closest $PM_{2.5}$ monitoring station in EPA's NAAQS monitoring network (attached as Exhibit 8).

[41] WeatherSpark.com, Wind Direction Chart at Ontario International Airport, https://weatherspark.com/y/145385/Average-Weather-at-Ontario-International-Airport-California-United-States-Year-Round (attached as Exhibit 7).

[42] 2019 PM ISA, at 2-44.

[43] *Id*.

[44] *Id*.

delineated by the U.S. Office of Management and Budget to include both a city and its surrounding communities that have a high degree of integration with the city.[45] Examples of some of these areas include the "New York-Newark-Jersey City, NY-NJ-PA MSA," the "Los Angeles-Long Beach-Anaheim, CA MSA," and the "Chicago-Naperville-Elgin, IL-IN-WI MSA." These MSAs cover areas of 8,936 km^2, 12,561 km^2, and 18,633 km^2 respectively. Examples of some of the counties used in EPA's analysis include Queens County, NY, Los Angeles County, CA, and Cook and DuPage Counties, IL (collectively). These counties cover areas of 460 km^2, 12,310 km^2, and 5,104.6 km^2. These areas are orders of magnitude larger than the urban and neighborhood scale that would be appropriate for analyzing the impacts of aircraft emissions. Accordingly, analysis of $PM_{2.5}$ emissions at the MSA or county level is not a meaningful exercise for measuring impacts of aircraft PM emissions on air quality. Instead, it drastically and misleadingly underestimates the impact of aircraft PM emissions on air quality in neighborhoods or communities directly near or downwind from major airports. Therefore, this evaluation of the impact of aircraft PM emissions on the neighborhoods and communities impacted by these emissions is potentially misleading, especially in instances where an airport is located in a large county or MSA.

III. EPA'S FAILURE TO CONSIDER FEASIBLE REDUCTIONS IN PARTICULATE MATTER EMISSIONS IS UNLAWFUL AND ARBITRARY

The Clean Air Act requires EPA to adopt aircraft emission standards to address pollution that endangers the public health and welfare, based on the factors specified in section 231: pollution impacts, the technological feasibility of controlling the emissions, lead time, costs, noise, and safety. 42 U.S.C. § 7571(a)(1), (a)(2), (b), (c). Yet the Proposed Rule grounds its PM emission standards solely in EPA's policy preference to "harmonize" U.S. standards with ICAO's 2017 and 2020 PM standards. Disregarding Congress's mandatory factors in favor of a nonstatutory "harmonization" goal and the wholly ineffectual ICAO PM Standards, as proposed, would violate section 231. Furthermore, such a rule would "run[] counter to the evidence before the agency," "rel[y] on factors which Congress has not intended it to consider," and "entirely fail[] to consider an important aspect of the problem" and therefore be arbitrary and capricious. *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983).

A. Under Section 231, EPA must base its emission standards on the danger of the pollutant and the technological feasibility of control

1. *The plain language of Section 231 requires EPA to base standards on the factors set out in statute, including pollution impacts and technological feasibility*

Section 231 directs EPA to issue "appropriate" emission standards for emissions from aircraft engines that endanger public health and welfare. 42 U.S.C. § 7571(a)(2)(A), (a)(3).

[45] 2020 Standards for Delineating Core Based Statistical Areas, 86 Fed. Reg. 37,770, 37,778 (Notice of Decision July 16, 2021).

Accordingly, those emission standards must represent EPA's reasoned response to the danger posed by the regulated emissions.

In developing its emission standards, EPA must be guided by the statutory factors that Congress set out in Section 231. Subsection (a)(1) directs EPA to study and investigate aircraft emissions, particularly "(A) the extent to which such emissions affect air quality in air quality control regions throughout the United States, and (B) the technological feasibility of controlling such emissions." *Id.* § 7571(a)(1). Subsection (a)(2) requires EPA to issue proposed emission standards for "air pollution which may reasonably be anticipated to endanger public health or welfare" and to consult with the Federal Aviation Administration (FAA) and ensure the proposed standards do not significantly increase aircraft noise or adversely impact safety. *Id.* § 7571(a)(2)(A), (B). Subsection (a)(3) requires EPA to hold hearings on the proposed standards "in air quality control regions which are most seriously affected by aircraft emissions," and then to "issue such regulations with such modifications as [EPA] deems appropriate." *Id.* § 7571(a)(3). In setting the compliance dates for these emission standards, EPA must give enough lead time "to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period." 42 U.S.C. § 7571(b). Finally, the FAA may veto emission standards that "would create a hazard to aircraft safety." *Id.* § 7571(c).

"These provisions, all of which use compulsory language, together create a comprehensive scheme for the regulation of harmful aircraft emissions, of which paragraph 231(a)(2)(A) is the centerpiece." *Center for Biological Diversity v. EPA*, 794 F. Supp. 2d 151, 160 (D.D.C. 2011). EPA and the D.C. Circuit have confirmed that the above provisions set out the factors that EPA must "weigh . . . in arriving at appropriate standards": (1) the impacts of emissions on public health and welfare, including air quality; (2) the technological feasibility of controlling these emissions; (3) lead time; (4) compliance costs; (5) aircraft noise and safety. *Nat'l Ass'n of Clean Air Agencies v. EPA*, 489 F.3d 1221, 1229-30 (D.C. Cir. 2007) ("*NACAA*").[46] EPA's duty to regulate dangerous aircraft emissions under Section 231 is separate and independent of the United States' obligations regarding ICAO standards under the Chicago Convention.[47]

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[46] *See also* Control of Air Pollution from Airplanes and Airplane Engines: GHG Emission Standards & Test Procedures, 86 Fed. Reg. 2136, 2157 (Jan. 11, 2021) ("EPA interprets its authority under Section 231 to be somewhat similar to those provisions that require us to identify a reasonable balance of specified emissions reduction, cost, safety, noise, and other factors.").

[47] The Chicago Convention on International Civil Aviation, 15 U.N.T.S. 295 (Dec. 7, 1944), established the International Civil Aviation Organization (ICAO) to coordinate the regulation and development of international air navigation. Its Committee on Aviation Environmental Protection (CAEP) develops and recommends international standards for noise and emissions from aircraft engines; once ICAO adopts these standards, member nations must adopt domestic standards that are "at least as stringent as" ICAO's "minimum standards" in order to maintain their fleets' permission to fly in other states' airspace. Chicago Convention, art. 33. However, any member nation is free to adopt their own, *more* stringent emission standards. *Id.* art. 38; *see infra* Part III.C.

EPA contends that Section 231 "confers an 'extraordinarily broad' degree of discretion on EPA to 'weigh various factors' and adopt aircraft engine emission standards as the Agency determines are reasonable." 87 Fed. Reg. at 6327 (citing *NACAA*, 489 F.3d at 1229-30). Yet, however broad, EPA's discretion under Section 231 must be exercised according to the factors set out in Section 231, which inform what kind of standards EPA can determine to be "reasonable," *see id.*, and "appropriate" under subsection (a)(3). *See Center for Biological Diversity*, 794 F. Supp. 2d at 160 (finding Section 231 provision authorizing EPA emission standards "cannot be understood without reference to the provisions around it"). Moreover, EPA's discretion is at all times constrained by the broad anti-pollution goals of the Clean Air Act. *Del. Dept. of Natural Res. & Envtl. Control v. EPA*, 905 F.3d 90, 97 (D.C. Cir. 2018) (courts construe provisions of Clean Air Act according to "the language and design of the statute as a whole"). Thus, the impacts of emissions on public health and welfare, including air quality and the technological feasibility of controlling these emissions, must inform the standards EPA adopts.

2. The legislative history of Section 231 confirms EPA's selection of emission standards must be tied to the statutory factors of pollution impacts and technological feasibility

Section 231 as it now reads is primarily a product of the 1970 Clean Air Act amendments, Pub. L. 91-604, 84 Stat. 1676 (Dec. 31, 1970). The history of those amendments confirms that EPA must base its aircraft standards, at minimum, on its reasoned consideration of pollution impacts and technological feasibility.

Most of Section 231's operative language represents a compromise between the 1970 House and Senate bills to amend the Clean Air Act. While the House bill preserved language from a prior version of the statute requiring "appropriate consideration to technological feasibility and economic costs,"[48] the Senate bill deleted this language and instead prioritized pollution reduction needs: as the accompanying Senate report stated, "standards should be a function of the degree of control required, not the degree of technology available today."[49] The conference substitute, which became law, omitted the House language but added three requirements that neither bill had featured: (1) an EPA study of the effect of aircraft emissions on air quality and the availability of emission control technology; (2) public hearings in regions where air quality is most affected by aircraft emissions; and (3) effective dates that provide necessary lead time to develop and apply requisite technology.[50]

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[48] Motor Vehicle Air Pollution Control Act of 1965, Pub. L. 89-272, § 202(a), 79 Stat. 992 (Oct. 20, 1965); *see* H.R. 17255, 91st Cong., § 231(a) (Jun. 3, 1970), *reprinted in* 2 LEG. HIST. OF THE CLEAN AIR ACT AMENDMENTS OF 1970 ("LEG. HIST."), at 935 (1970).

[49] S. Rep. No. 91-1196, at 24, 1 LEG. HIST. at 424; *see* S. 4358, 91st Cong. § 202(a) (Sept. 17, 1970), 1 LEG. HIST. at 575.

[50] H.R. Rep. No. 91-1783, at 55 (Conf. Rep.), 1 Leg. Hist. at 205; *see* Pub. L. 91-604, 84 Stat. 1703-1704 (Dec. 31, 1970).

Because the conference substitute represents a compromise between the House and Senate bills, the only logical way to read these three requirements is that they strike a balance between the House amendments' solicitude for technological feasibility and costs, on the one hand, and the Senate amendments' prioritization of pollution reduction needs, on the other. The final law thus directs EPA to study both air quality impacts and technological feasibility, with the necessary premise that such study should inform the standards themselves. As the Secretary of Health, Education, and Welfare told both houses: "[W]e are conducting and supporting research [on] aircraft emissions and to explore various means of controlling gaseous emissions … . We will seek prompt application of new knowledge that is obtained."[51] The second and third requirements likewise convey a particular attention to the impacts of pollution and the state of emission control technology.

An alternative reading—one that allows EPA, after dutifully studying pollution impacts and the existing and projected state of control technologies, to jettison these considerations and base emission standards on a policy preference never mentioned in the Clean Air Act—not only cuts against the plain text of Section 231 but is also wholly contrary to the manifest intent of Congress in adopting these provisions.

3. Past practice under Section 231 supports basing emission standards on pollution reduction needs and technological feasibility

In the first decade after Section 231 invested EPA with regulatory authority over aircraft emissions, EPA consistently exercised that authority to subject aircraft to "a program of control compatible with their significance as pollution sources," such that "emissions from aircraft and aircraft engines should be reduced to the extent practicable with present and prospective technology."[52] Thus, the very first Section 231 aircraft emission standards that EPA proposed represented its "*best estimates of achievable technology* by 1979," which EPA expected industry to "translate . . . into practice with reasonably aggressive and imaginative research and development programs." 37 Fed. Reg. at 26,488 (emphasis added). Subsequently, EPA has used

[51] *Air Pollution–1970, Hearings on S. 3229, S. 3466, S. 3546 Before the Subcomm. on Air and Water Pollution of the S. Comm. of Public Works*, 91st Cong. 140 (1970) (statement of Hon. Robert H. Finch, Secretary of Health, Educ. & Welfare), 2 LEG. HIST. at 980 (emphasis added); *accord Air Pollution Control and Solid Wastes Recycling: Hearings Before the Subcomm. on Public Health and Welfare of the H. Comm. on Interstate and Foreign Commerce*, 91st Cong. 290 (1969) (statement of Secretary Finch), 2 LEG. HIST. at 1371.

[52] Control of Air Pollution from Aircraft and Aircraft Engines: Proposed Standards, 37 Fed. Reg. 26,488 (Dec. 12, 1972); Control of Air Pollution from Aircraft and Aircraft Engines: Emission Standards and Test Procedures for Aircraft, 38 Fed. Reg. 19,088, 19,089 (July 17, 1973) (final rule); Control of Air Pollution from Aircraft and Aircraft Engines: Supersonic Aircraft, 41 Fed. Reg. 34,722 (Aug. 16, 1976) (final rule); Control of Air Pollution from Aircraft and Aircraft Engines: Proposed Amendments to Standards, 43 Fed. Reg. 12,615, 12,617 (Mar. 24, 1978); *see also* Control of Air Pollution from Aircraft and Aircraft Engines: Emission Standards and Test Procedures, 62 Fed. Reg. 25,356, 25,357 (May 8, 1997) (direct final rule).

similar formulations of controlling emissions to the maximum extent feasible with current and projected technology:

- "Exhaust emission standards … will be based on the *best available combuster design technology* expected in 1979 and later." 38 Fed. Reg. at 19,088.
- Rulemaking for large engines will "ensure that the *best technology available* is reflected in these standards." *Id.*; *accord* 43 Fed. Reg. at 12,617.
- Supersonic aircraft engine standards "are believed to be the *most stringent* that can be imposed by [the Jan. 1, 1980 compliance date]. They reflect the emission control technology currently under development and *expected to be available* to the SST [supersonic transport] engine manufacturers. The standards established here for newly certified SST engines reflect the *best technology expected* for subsonic engines." 41 Fed. Reg. at 34,722.
- Emission levels for new engines were "based on the *best technology available*, short of sector burning," where the sector burning technique was deemed a risk to airworthiness. Control of Air Pollution from Aircraft and Aircraft Engines; Emission Standards and Test Procedures, 47 Fed. Reg. 58,462, 58,467 (Dec. 30, 1982) (final rule).

Thus, in the earliest rules adopted under Section 231, EPA demonstrated its understanding that section 231 required it to set emission standards according to the statutory factors, *e.g.*: "In determining appropriate levels for standards, consideration was given to air quality needs, technical feasibility, and comparative cost effectiveness." 43 Fed. Reg. at 12,618. This practice reaffirms EPA's statutory duty to base aircraft standards on a forward-looking evaluation of air quality needs and technological feasibility, so that emissions are "reduced to the extent practicable with present and prospective technology." 37 Fed. Reg. at 26,488. Nor has EPA renounced these formulations or given a reasoned explanation for its departure from its practice. *Cf. FCC v. Fox Television Studios*, 556 U.S. 502, 515-16 (2009) (agencies must acknowledge and explain reversals in established policy).

B. Failure to adopt or even consider standards that reduce particulate matter emissions violates Section 231 and is arbitrary and capricious

By considering only PM standards that do not reduce PM emissions, EPA has violated Section 231 and failed to consider an "important aspect of the problem." *State Farm*, 463 U.S. at 43. EPA's analysis shows that the Proposed Rule does not result in any PM reductions over current levels, because all currently existing aircraft engines already meet the proposed standards. EPA has embraced these zero-benefit standards despite acknowledging the severe and inequitably distributed health and environmental effects of PM pollution and the existence of current and projected jet engine technology that significantly outperforms the ICAO PM Standards. Moreover, by confining the Proposed Rule to the same constraints that ICAO imposed in developing the ICAO PM Standards, EPA has ignored other, promising approaches to PM control, including fuel burn reductions and alternative fuels.

1. EPA has examined only standards that result in no PM emission reductions

The Proposed Rule's stated purpose is to adopt PM standards that "are equivalent in scope, stringency, and effective date to the PM standards adopted by ICAO." 87 Fed. Reg. at 6326. But because the ICAO PM Standards by design carry no environmental benefits, EPA is proposing to adopt completely ineffectual standards, without regard to whether protective standards are required by Section 231's mandatory factors.

The Proposed Rule consists of a series of emission standards applicable to two different stages of an aircraft's life cycle. "New type" engines are based on new designs certified after January 1, 2023; "in production" engines are those based on already certified designs but manufactured after January 1, 2023. The Proposed Rule does not regulate in-service aircraft engines at all, despite EPA's acknowledged authority to do so.[53] The proposed PM standards are also differentiated according to how PM is measured: *mass* (milligrams (mg) of PM emitted per kilonewton (kN) of thrust), *number* (number of PM particles emitted per kN of thrust), and *mass concentration* (maximum concentration of PM at any thrust setting, measured in micrograms of PM per cubic meter ($\mu g/m^3$)). Thus, the Proposed Rule includes (1) new-type *mass* standards, (2) in-production mass standards, (3) new-type *numerical* standards, (4) in-production numerical standards; and (5) in-production *mass concentration* standards. Each of the five standards is a mathematical formula that produces a "limit line" in which the mass, number, or concentration limit varies as a function of the engine's maximum thrust available for takeoff (called the "rated output"). If tests show the engine emitting PM below each limit line, it complies with the rule. 87 Fed. Reg. at 6337-44.

As EPA's analysis confirms, none of these proposed aircraft emission standards reduces any PM emissions from aircraft. 87 Fed. Reg. at 6347 ("Due to the technology-following nature of the PM standards, the proposed in-production and new type standards would not result in emission reductions below current levels of engine emissions."). This is because the ICAO PM Standards themselves were set at such a lax stringency level that all aircraft engines currently in production already comply. *Id.* The majority of aircraft engines already in production emit significantly less PM per unit of thrust than the "new type" standards for new engine designs. *Id.*; *see also id.* at 6338-39 (Figures IV-1, IV-2).

EPA has provided no alternative analysis that considers any more stringent version of the PM standards. Thus, the only analysis of the Section 231 factors in the Proposed Rule consists of measuring the ICAO PM Standards under these factors. And because *all* existing aircraft engines already comply with these standards, this analysis is trivial: zero emission reductions, zero technology response from manufacturers, zero lead time needed, zero costs, zero effect on noise or safety. *See* 87 Fed. Reg. at 6347-49. This is far from the analysis that Section 231 envisions, in which the full range of technologically feasible emission standards are explored and a balance struck based on the statutory factors. The proposed standards, if adopted, would thus be contrary

[53] *See* Regulating Greenhouse Gas Emissions under the Clean Air Act, 73 Fed. Reg. 44,354, 44,473 (July 30, 2008).

to Section 231 and arbitrary and capricious. *Cf. Sw. Elec. Power Co. v. EPA*, 920 F.3d 999, 1022 (5th Cir. 2019) (finding EPA's "choice of an outdated and ineffective technology" in setting Clean Water Act standards was arbitrary and capricious).

2. By failing to consider any technologically feasible alternatives likely to result in meaningful emission reductions, EPA is proceeding in a manner "untethered to Congress's approach"

Despite its failure to conduct any meaningful analysis of the statutory factors, the Proposed Rule itself shows that more stringent standards are feasible. Figures IV-1 to IV-3 of the Proposed Rule show a large number of jet engines already in production perform better than the ICAO PM Standards by orders of magnitude, whether measured by mass, number, or mass concentration. 87 Fed. Reg. at 6338-41. And EPA itself identifies several of the jet engine technologies supporting these superior levels of PM emission performance, including lean-burn technologies and advanced rich-quench-lean (RQL) combustion designs. *Id*. at 6348.[54]

The record shows that not only are more stringent PM standards technologically feasible, they are imperative to protect the public health and welfare and advance EPA's environmental justice commitments. As described above, the Proposed Rule itself acknowledges the significant health and environmental effects of PM and cites compelling evidence that these effects disproportionately fall on the communities of color and low-income communities that live, work, and go to school near major airports, where aircraft PM emissions tend to concentrate. *Id.* at 6331-33, 6335. Yet not only does the Proposed Rule offer ineffectual standards; EPA does not even evaluate whether alternative, more stringent standards were appropriate. This failure is arbitrary and completely "untethered to Congress's approach" in Section 231. *Nat. Res. Def. Council v. EPA*, 777 F.3d 456, 469 (D.C. Cir. 2014).

Further, it is particularly irrational—and contrary to Section 231—to defer so heavily to ICAO's technological review, because ICAO explicitly limits its deliberations to technology-following standards, based on its particular view of "technical feasibility." 87 Fed. Reg. at 6329. In fact, the Independent Expert Assessment cited by EPA identifies a number of promising control strategies while deeming them insufficiently advanced to study.[55] However, Section 231 directs EPA to set its standards according to technology expected to be developed

[54] EPA appears not to have performed its own review of PM reduction technology—there is no technical support document—but rather relied on ICAO's technology review, most of which is confidential and based on data presented by the aviation industry. *Id.*; *see also* ICAO, Independent Expert Integrated Technology Goals Assessment and Review for Engines and Aircraft, Document 10127, at 50 (2019) ("Independent Expert Assessment") (noting limits on information and access provided by industry to confidential PM data).

[55] Independent Expert Assessment, p. 49 ("The IE review of the research program covered multi-point lean direct injection (LDI), active combustor control, fuel composition optimization, improved diagnostics and design tools, and combustor materials. All but the first of these technologies were judged to be at too low a [technology readiness level] and firmly outside of the scope of the review.").

and proven in the future, provided that EPA allows manufacturers sufficient lead time. 42 U.S.C. § 7571(b). By limiting its own consideration to ICAO's narrower scope of technical feasibility, EPA has failed to apply Section 231's factors to the record rationally and in accordance with the statute.

Finally, by restricting its analysis to the ICAO PM Standards, EPA has failed to evaluate forms of PM emissions control beyond the jet engine technologies favored by ICAO. Thus, EPA did not study whether changes to fuel composition—either fossil-based jet fuel with reduced aromatics content,[56] or alternative aviation fuels such as biofuels,[57] hydrogen,[58] or battery-stored electricity[59]—could secure better PM emission reductions cost-effectively. Because the PM mass and numerical standards measure PM emissions per unit of thrust, the ICAO PM Standards fail to measure the total PM emitted over a flight and thus fail to reward absolute reductions in PM achieved by technologies or operational methods that reduce fuel burn, especially during LTO operations.[60] And by restricting itself to standards for new-type and in-production engines, EPA

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[56] *Id.* at 32 ("The formation of PM and soot is very dependent on the nature of the fuel used. Flight experiments with alternative fuels (with low aromatic content hydrocarbons or bio-fuels) reveal significant reductions in soot production."); *see also* A.J. Beyersdorf et al., "Reductions in aircraft particulate matter due to the use of Fischer-Tropsch fuels," Atmos. Chem. Phys., 14, 11-12 (2014) (discussing dramatic reductions in PM from alternative fossil-based jet fuels with lower sulfur and aromatic content), https://acp.copernicus.org/articles/14/11/2014/acp-14-11-2014.pdf (attached as Exhibit 9).

[57] *See, e.g.*, Durdina et al., "Reduction of Non-Volatile Particulate Matter Emissions of a Commercial Turbofan Engine at Ground Level from the Use of a Sustainable Aviation Fuel Blend," Environmental Science and Technology (Oct. 2021), (finding a 32% blend of sustainable aviation fuels reduced non-volatile PM mass and number measures by 20% and 25%, respectively, during LTO thrusts), https://pubs.acs.org/doi/pdf/10.1021/acs.est.1c04744 (attached as Exhibit 10).

[58] *See, e.g.*, J. Mukhopadhaya & D. Rutherford, "Performance analysis of evolutionary hydrogen-powered aircraft," at 1 (Jan. 2022) (finding hydrogen-fueled aircraft could fly 31-38% of passenger air traffic), https://theicct.org/wp-content/uploads/2022/01/LH2-aircraft-white-paper-A4-v4.pdf (attached as Exhibit 11). In September 2020, Airbus unveiled designs for a hydrogen-fueled, zero-emission aircraft, but notes that the success of such alternative-fuel aircraft depends on government regulators incenting the aviation sector to retire older aircraft and install the necessary infrastructure. Energywire, "Airbus unveils hydrogen designs for zero-emission flight" (Sept. 22, 2020), https://www.eenews.net/energywire/stories/1063714307 (attached as Exhibit 12). The present rulemaking is precisely one such opportunity to steer the industry toward cleaner fuels.

[59] In addition to fully electrified commercial-sized aircraft, which are still being developed, hybrid electrification technologies can decrease emissions by powering on-board systems and can even support jet engines during certain phases of flight. *See* Airbus, "Micro-hybridisation: the next frontier to electrify flight?" (Sept. 21, 2021), https://www.airbus.com/en/newsroom/news/2021-09-micro-hybridisation-the-next-frontier-to-electrify-flight (attached as Exhibit 13).

[60] The Proposed Rule's failure to consider any PM control measures based on reduced fuel burn is particularly glaring given EPA's recent aircraft greenhouse gas standard, which is premised exclusively on technologies that reduce fuel burn. *See* 86 Fed. Reg. at 2167. As pointed out in relation to the aircraft greenhouse gas rule, numerous operational methods can reduce fuel burn during LTO operations. *See*

disregards the immediate and cost-effective reductions achievable through regulating in-service aircraft—*e.g.*, through a declining fleetwide average standard. *See* 73 Fed. Reg. at 44,473 (discussing a fleetwide average standard to control greenhouse gas emissions from in-service aircraft).

EPA has offered no explanation for failing to even examine these demonstrated and effective methods of controlling emissions beyond the ICAO PM Standards, contrary to Section 231 and the principles of rational decision-making.[61]

C. The United States' obligations under the Chicago Convention do not excuse EPA's failure to protect the United States from dangerous pollution

The Chicago Convention does not restrict EPA's authority under the Clean Air Act to regulate PM emissions from U.S. aircraft; nor does it replace EPA's responsibility under the Clean Air Act to protect the public from dangerous pollution. Nonetheless, EPA proposes to ignore its own scientific and technical record and adopt PM emission standards with zero environmental and public health benefits, based solely on a vaguely defined interest in "international harmonization." 87 Fed. Reg. at 6326. EPA explains this harmonization interest as uniformity in regulation, protecting U.S. manufacturers' competitiveness abroad, preventing backsliding, gaining experience with the new mass, numerical, and mass concentration metrics, and building international consensus. *Id.* at 6337. But none of these interests hold up on examination, and none counter the compelling need for aggressive action by EPA to curb aircraft PM emissions pursuant to its duty under the Clean Air Act.

First, "uniformity in international aviation regulations and standards" is not a goal of the Clean Air Act. Indeed, in the context here, it actively undermines the Clean Air Act's purposes. It is unlawful and arbitrary to substitute this uniformity goal for the factors Congress actually specified in Section 231. *See Indep. U.S. Tanker Owners Comm. v. Dole*, 809 F.2d 847, 854 (D.C. Cir. 1987) (EPA "is not free to substitute new goals in place of the statutory objectives without explaining how these actions are consistent with [its] authority under the statute."). An agency may not simply rubber-stamp international standards in lieu of its mandate in the name of "harmonization." *Natural Res. Def. Council v. EPA*, 808 F.3d 556, 570 (2d. Cir. 2015) (EPA's adoption of International Maritime Organization's (IMO) standards for certain discharges was arbitrary, where EPA failed to explain "why standards higher than the IMO Standard should not be used given available technology"); *see also U.S. Telecomm Ass'n v. FCC*, 359 F.3d 554, 565-66 (D.C. Cir. 2004) ("[D]elegation to outside entities increases the risk that these parties will not

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Comments of California et al., EPA-HQ-OAR-2018-0267-0176, at 19 (Oct. 19, 2020) (attached as Exhibit 14); 73 Fed. Reg. at 44,471 (discussing single-engine taxiing, use of gate or ground-based electricity, and air traffic control improvements as operational methods to reduce fuel burn).

[61] EPA does not assert that its adoption of the ICAO PM Standards is urgent, but to the extent EPA asserts any lack of time as reason not to consider more protective standards, the Commenting States note that EPA's own delay in issuing the Proposed Rule, *five years* after the 2017 ICAO PM standards, cannot excuse its thorough and rational evaluation of the statutory factors under Section 231.

share the agency's 'national vision and perspective,' . . . and thus may pursue goals inconsistent with those of the agency and the underlying statutory scheme.").

An independent EPA review is all the more critical because ICAO's policy window is explicitly narrower than the Clean Air Act's. ICAO is not an environmental protection body like EPA—not even CAEP is charged with protecting the public health and welfare. ICAO limits its consideration to "technology-following" options, while EPA considers both technology-forcing and technology-following regulations. 87 Fed. Reg. at 6327, 6347-48. If EPA were to adopt only what ICAO adopts, or consider only what ICAO considers, it would fail to exercise the discretion Congress gave it and fail its mandate to reduce pollution to the full extent practicable and necessary. Moreover, ICAO shares none of the important democratic checks on policymaking that EPA has: it is not democratically accountable, nor bound by rational decision-making on a record, nor open and transparent to the public. Were EPA to continue its apparent commitment to never exceeding ICAO standards in stringency, no matter how grave the harm to public health and welfare, and no matter how feasible, safe, and cost-effective the means of doing so, it would severely compromise the mandate Congress gave it in Section 231.

Nor does EPA's uniformity interest make sense on the record. Although the Chicago Convention obligates the United States to adopt PM standards "at least as stringent" as ICAO's, *id*. at 6337, it explicitly recognizes that member nations may adopt standards that are *more* stringent than the "minimum standards" agreed upon by ICAO—the Convention requires only that they notify the ICAO of their decisions. Chicago Convention, arts. 33, 38; *see also* 87 Fed. Reg. at 6328. All of the Proposed Rule's justifications for "uniformity" apply only to meeting this global regulatory "floor," not to EPA's decision to treat ICAO standards as a regulatory "ceiling" as well. Thus, PM standards that meet or exceed ICAO's "ensure[] that passengers and the public can expect similar levels of protection for safety and human health and the environment regardless of manufacturer, airline, or point of origin of a flight" and "help ensure … acceptance of U.S. manufactured engines worldwide." *Id*. at 6337. But EPA identifies no reason why PM standards that exceed ICAO's would not also serve these interests. EPA certainly cannot mean that U.S. passengers and the public should be limited to the "levels of protection for safety and human health and the environment" that only the worst-performing fleets in the world can achieve—yet that is exactly the limitation the Proposed Rule enforces.

Second, EPA has not offered any evidence or even reason to believe that zero-benefit standards are necessary for the U.S. aviation industry to "remain competitive in the global marketplace." *Id.* Again, EPA's reasoning makes sense only insofar as it justifies adopting PM standards no *less* stringent than ICAO's: if the United States did not do so, it "would not be able to certify aircraft engines to the PM standards" and aircraft engine manufacturers might be forced to seek foreign certifications to market and sell their products. *Id.* But EPA offers no evidence that if the United States certified to *more* stringent standards, manufacturers would

need to seek foreign certification, or would face any other competitive disadvantage.[62] And ultimately, EPA's mission is to protect the public against dangerous pollution from aircraft (and other sources), not to protect the competitiveness of U.S. aircraft engine manufacturing. While EPA must take into account the impact of its regulations on industry, any consideration of harm to industry must be based on actual evidence and must be weighed against the very real, concrete harms to public health and the environment acknowledged in the Proposed Rule.

Third, the Proposed Rule has no actual anti-backsliding benefits, since most in-production engines perform far better than any of the ICAO PM Standards. *Id.* at 6338-41 (Figures IV-1 to IV-3). Manufacturers thus have considerable room to backslide on PM emissions even while complying with the Proposed Rule. Thus, the Proposed Rule fails to "capture the technological advances made in the control of emissions" or "reflect[] the current state of technology," and its purported anti-backsliding benefits are illusory. *Id.* at 6337.

Fourth, EPA argues vaguely that it should "gain experience from the implementation of these [PM] standards before considering whether to adopt more stringent [PM] mass and/or number standards" but does not explain what this means, or why such experience is needed. *Id.* There is no question the PM standards are technologically feasible. *Id.* at 6347-49. The test and measurement procedures are sufficiently well defined for EPA to apply them to industry with less than a year of lead time. *Id.* at 6325 (proposing Jan. 1, 2023 compliance date for PM standards). If EPA intends to use any element of uncertainty about the feasibility of the proposed PM standards to counterbalance the overwhelming health, environmental, and technical evidence favoring protective standards, it must identify that uncertainty and explain how more experience could resolve it.

Fifth, and finally, EPA claims that limiting its consideration to the ICAO PM Standards would have benefits for future international cooperation on aircraft emission standards because, "[h]aving invested significant effort to develop these standards and obtain international consensus for ICAO to adopt these standards, a decision by the United States to deviate from them might well undermine future efforts by the United States to seek international consensus on aircraft emissions standards." *Id.* at 6337. Again, this rationale is a sound basis for adopting *at*

[62] In a statement reported by Reuters, explaining why EPA decided not to revisit the 2021 aircraft greenhouse gas rule, an EPA official suggested tightening aircraft standards beyond ICAO's stringency would be a "Pyrrhic victory" if the aviation industry "avoided complying by certifying their engines via other governments." D. Shepardson, "U.S. EPA will not rewrite airplane emissions rules finalized under Trump," Reuters (Nov. 15, 2021), https://www.reuters.com/business/environment/us-epa-will-not-rewrite-airplane-emissions-rules-finalized-under-trump-2021-11-15/. To the extent EPA intends to rely on any such rationale, it is obligated to give clearer notice of it than the Proposed Rule does, and to offer evidence to support the rationale beyond speculation. Given that the Proposed Rule identifies certain costs that engine manufacturers would face in seeking foreign certification and the potential delays and lack of resources faced by foreign certifying authorities, 87 Fed. Reg. at 6337, it is far from certain that manufacturers would choose this route and evade compliance with standards that are demonstrably feasible and cost-effective.

least the ICAO PM Standards, but EPA offers no reason why exceeding such standards would undermine future efforts. To the contrary, more stringent domestic standards enhance the United States' credibility in negotiations for tighter ICAO standards, since they demonstrate such standards' feasibility, their effectiveness on a major part of the global aviation industry, and U.S. leadership on reducing harmful aviation emissions.

D. The Proposed Rule's environmental justice analysis fails EPA's own stated environmental justice principles

EPA's analysis of the environmental justice implications of the proposed rule is inadequate according to its own environmental justice commitments, including Executive Orders 12,898 and 14,008. This self-contradictory approach to evaluating the pollution impacts of aircraft PM emissions on historically marginalized and overburdened communities renders the Proposed Rule arbitrary and capricious. First, EPA fails to analyze the key questions and issues its own environmental justice guidelines identify as the relevant inquiry. Second, EPA fails to consider the cumulative impacts of PM emissions from aircraft on environmental justice communities near airports. Third, EPA's conclusion that its "action does not have disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, and/or indigenous people," 87 Fed. Reg. at 6354, is irrational and unsupported by the record, and thus likewise arbitrary and capricious.

1. EPA's failure to perform an environmental justice analysis of aircraft PM pollution in accordance with its own policies is arbitrary and capricious

Under Executive Order 12,898, each federal agency has committed, "to the greatest extent practicable and permitted by law" to "make achieving environmental justice part of its mission by identifying and addressing as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories . . . ." 64 Fed. Reg. 7629 (Feb. 16, 1994). Additionally, EPA recently committed to "make achieving environmental justice part of [its] mission[] by developing programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts."[63] Exec. Order 14,008 § 219, 86 Fed. Reg. at 7629. The goal of achieving environmental justice includes the mitigation of existing disparities through regulation, not just an avoidance of aggravating disparities through regulatory action.[64]

Under these principles, EPA must analyze "the actual or potential lack of fair treatment or meaningful involvement of minority populations, low-income populations, tribes, and indigenous peoples in the development, implementation and enforcement of environmental laws,

[63] Exec. Order No. 14,008.

[64] EPA, Technical Guidance for Assessing Environmental Justice in Regulatory Analysis, 1 (2016), https://www.epa.gov/sites/default/files/2016-06/documents/ejtg_5_6_16_v5.1.pdf.

regulations and policies."[65] EPA's analysis must likewise address any (1) preexisting concerns regarding pollution in the communities that would impacted by the action, (2) disparate impact that the rule would have on environmental justice communities in comparison to the population at large, and (3) potential for the action to exacerbate or create new environmental justice concerns.[66]

In this Proposed Rule, however, EPA has not answered or even attempted to answer these questions. Instead, EPA merely states that going forward it is "committed to conducting environmental justice analysis for rulemakings based on a framework similar to what is outlined in EPA's technical guidance." 87 Fed. Reg. at 6335. EPA goes on to state that, apart and separate from the Proposed Rule, it "is conducting a demographic analysis to explore whether populations living nearest the busiest runways show patterns of racial and socioeconomic disparity" to help it "characterize the state of environmental justice concerns." *Id.* at 6336. However, EPA's statement that it will analyze existing environmental justice concerns separate from and in parallel to the rulemaking does not satisfy its duty to do so *in this rulemaking*. This is especially the case when, as here, there is already substantial evidence showing that impoverished and communities of color are disproportionately located near airports and are thus disproportionately impacted by PM emissions from aircraft. In light of this evidence, EPA's failure to evaluate and address these very real current environmental justice problems in this rulemaking is arbitrary and capricious.

2. EPA's failure to consider the cumulative impacts of aircraft PM emissions on environmental justice communities is arbitrary and capricious

Under Executive Order 14,008, EPA has acknowledged that environmental justice communities have already been disproportionately burdened by polluting sources, including PM polluting sources, and has committed to "secure environmental justice" for those communities "by address[ing] cumulative impacts" in its "programs, policies, and activities." *Id.* § 219, 86 Fed. Reg. at 7629-32. EPA has previously emphasized the importance of cumulative impact assessments in Strategy #1 of its EJ 2020 Action Agenda and its overall Draft FY 2022-2026 EPA Strategic Plan:

> EPA must make significant and urgent progress in fundamentally grounding its work in addressing disproportionality, which includes understanding of and reacting to issues of cumulative impacts and cumulative risks, and rapidly advance its ability to analyze for disproportionate impacts.[67]

However, the Proposed Rule fails to conduct a cumulative impact analysis that addresses the health impacts of aircraft PM to airport-adjacent environmental justice communities already

[65] *Id*. at 4.

[66] *Id*. at 11.

[67] EPA, DRAFT FY 2022-2026 EPA STRATEGIC PLAN – OCTOBER 1, 2021, at 27; see also EJ 2020 ACTION AGENDA, *supra* note 1, at 33-34.

burdened with a disproportionate amount of polluting sources, including PM sources. This failure falls short of EPA's repeated commitments. Health equity and environmental justice cannot be achieved through an approach that siloes the consideration of impacts from different polluting sources. Failure to perform any cumulative impacts analysis renders the Proposed Rule insensitive to the environmental inequities faced by many this country's marginalized and overburdened communities. A more holistic approach, one that considers the totality of exposure to PM from polluting sources on communities near airports, is necessary to achieve the goals Executive Order 14,008, the EPA's EJ 2020 Action Agenda, and environmental justice more broadly.

EPA acknowledges in its Proposed Rule the need to conduct a demographic analysis that explores whether populations living nearest the busiest runways show patterns of racial and socioeconomic disparity. 87 Fed. Reg. at 6327. To be sure, this is an important analysis to undertake. But EPA does not—because it cannot—explain how a future demographic analysis cures its failure in this rulemaking to conduct a cumulative human health or environmental impact analysis. A demographic assessment may further highlight the disproportionate burden of aircraft PM emissions on historically marginalized communities, but it would not address the cumulative impacts that aircraft PM emissions left unmitigated by the Proposed Rule have on these neighborhoods.

3. EPA's conclusion that its proposed rule will not exacerbate environmental inequities is arbitrary and capricious

Contrary to EPA's conclusion, EPA's failure to set stronger standards *will* have disproportionate impacts on environmental justice communities. *See* 87 Fed. Reg. at 6354 (concluding "this action does not have disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, and/or indigenous people"). While the Proposed Rule has failed to adequately conduct an environmental justice analysis, the evidence already gathered and discussed above demonstrates that communities of color and people experiencing poverty are more likely to live adjacent to and downwind from airports and disproportionately suffer the negative health and environmental effects of aircraft PM emissions. Further, EPA has elsewhere collected clear evidence that the airport traffic driving these emissions will increase in the near- and long-term.[68] Without stronger standards, communities near airports will suffer ever increasing levels of PM pollution from aircraft as these sources remain underregulated, even as communities further from airports will benefit from improvements in ambient PM levels from implementation of the PM NAAQS and vehicle emission standards. Accordingly, EPA's proposal not to reduce aircraft PM emissions will prolong and exacerbate longstanding inequities in environmental justice and the disproportionate exposure environmental justice communities have to aircraft emissions. EPA's conclusion otherwise is irrational, contrary to the record, and thus arbitrary and capricious.

[68] *See, e.g.*, EPA, Airplane Greenhouse Gas Standards: Technical Support Document, pp. 97-106 (Jan. 2021) (modeling significant increases in fuel consumption from greater air traffic through 2040).

E. EPA arbitrarily disregards the Proposed Rule's federalism implications

Executive Order 13,132 instructs agencies, before promulgating a rule with "substantial direct effects on the States, [or] on the relationship between the national government and the States," to ensure "meaningful and timely input" from State and local officials in the rule's development. Exec. Order 13,132 §§ 1(a), 6(a), 6(b)(2)(A), 64 Fed. Reg. 43,255, 43,256-58 (Aug. 4, 1999). The agency must also include in the rule preamble a "federalism summary impact statement" describing "the extent of the agency's prior consultation with State and local officials, a summary of the nature of their concerns and the agency's position supporting the need to issue the regulation, and a statement of the extent to which the concerns of State and local officials have been met." *Id.* § 6(b)(2)(B). Here, however, EPA includes nothing more than a bald assertion that the Proposed Rule "will not have substantial direct effects on the states, [or] on the relationship between the National Government and the states," and thus provides no impact statement under Executive Order 13,132. 87 Fed. Reg. at 6353.

EPA's assertion is inaccurate and troubling. In fact, as described above the Proposed Rule, if adopted, would have substantial direct effects on the States, particularly the Commenting States, and would disrupt the cooperative relationship between the Commenting States and the federal government. Because the Clean Air Act prohibits States from adopting aircraft emission standards unless they are identical to federal standards, 42 U.S.C. § 7573, they depend on the federal government to adopt effective aircraft standards and are injured when EPA shirks this duty. *See Massachusetts v. EPA*, 549 U.S. 497, 519-21 (2007) (having surrendered their "sovereign prerogatives" to the Union, the States are harmed when the federal government refuses to regulate greenhouse gas emissions). These negative effects extend beyond the grave harms to the health and welfare of their residents detailed in Part II. First, by failing to reduce dangerous pollution within the federal government's exclusive jurisdiction, the Proposed Rule strains the resources of state health and environmental programs treating the avoidable health effects and ecological damage that EPA declines, in the name of international harmonization, to prevent. Second, the Proposed Rule frustrates the Commenting States' efforts to meet national ambient air quality standards for PM, because "when EPA allows higher [] emissions from aircraft engines, state agencies have no choice but to impose greater restrictions on other sources." *NACAA*, 489 F.3d at 1227.

The Clean Air Act is a hallmark of cooperative federalism, as EPA and state air agencies partner to protect public health from the harmful effects of air pollution. The Proposed Rule—which fails to reduce PM emissions and thereby fails to mitigate the danger to public health and welfare from these emissions—poses a risk of significant public health, economic, and quasi-sovereign harms to the Commenting States. The relationship between the States and the federal government suffers when the States cannot trust the federal government to fulfill its obligations to protect the public health and welfare as required under federal law. The Proposed Rule's inefficacy thus gravely burdens the States' quasi-sovereign interests and the relationship between the national government and the States. EPA's failure to recognize these serious federalism implications undermines the rationality of the entire Proposed Rule.

IV. CONCLUSION

For the foregoing reasons, the Commenting States request that EPA rescind the Notice and initiate a proper Section 231 rulemaking. That rulemaking must be based on the full range of technologically feasible control technologies and other measures for aircraft PM emissions, and must result in reductions that address the significant impacts on environmental justice communities nationwide.

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