MEMORANDUM IN RESPONSE TO PETITION REGARDING GREENHOUSE GAS EMISSIONS FROM AIRCRAFT

I. Introduction

A. Statutory Provisions

Under Clean Air Act ("CAA" or "the Act") section 231(a)(2)(A), EPA shall, "from time to time, issue proposed emission standards applicable to the emission of any air pollutant from any class or classes of aircraft engines which in [the Administrator's] judgment causes, or contributes to, air pollution which may reasonably be anticipated to endanger public health or welfare." Under section 231(a)(3), EPA is required to finalize such proposed regulations with such modifications as the Administrator deems appropriate.

B. Procedural History

On December 5, 2007, Friends of the Earth, Oceana, Center for Biological Diversity and Earthjustice ("Petitioners") sent a letter to EPA petitioning the Agency for Rulemaking to do the following:

> (1) make a finding that greenhouse gas emissions from aircraft engines may reasonably be anticipated to endanger public health and welfare pursuant to Clean Air Act section 231(a)(2)(A);[1]
>
> (2) Issue proposed standards for greenhouse gas emissions from aircraft engines pursuant to CAA section 231(a)(2)(A); and
>
> (3) Promulgate final regulations within 90 days of the issuance of such proposed standards pursuant to CAA section 231(a)(3).

Petition, at 2.

On July 31, 2008, Earthjustice, on behalf of Petitioners, notified EPA of its intent to file suit against EPA for unreasonable delay in responding to the petition. On June 11, 2010, Petitioners filed a Complaint against EPA claiming that, among other things, EPA had unreasonably delayed because it had failed to answer the Petition and because it had failed to determine whether emissions of greenhouse gases from aircraft engines cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare (an "endangerment finding").

[1] As indicated in section I. A., the actual language of section 231(a)(2) is somewhat different than the language quoted from the Petition. The remainder of this response will use the language of the statute in characterizing Petitioners' request.

On August 20, 2010, EPA filed a Partial Motion to Dismiss claiming in pertinent part that Petitioners' claim that EPA had unreasonably delayed in making an endangerment finding should be dismissed because EPA had no enforceable duty under Clean Air Act section 231 to make such a finding. On July 5, 2011, the court found that while section 231 confers broad discretion to EPA, section 231(a)(2)(A) requires EPA to make a finding with respect to endangerment. *Center for Biological Diversity, et al. v. EPA*, 794 F. Supp. 2d 151 (D.D.C., July 5, 2011).

On June 27, 2011, Petitioners filed a Motion for Summary Judgment. EPA filed a Cross-Motion for Summary judgment on July 27, 2011. In its cross-motion, EPA stated that it was prepared to respond to Petitioners' petition no later than 90 days from entry of judgment. EPA also stated that it had not unreasonably delayed in not making an endangerment finding regarding greenhouse gas emissions from aircraft engines.[2] EPA noted that it was engaged in rulemaking actions that govern air pollution sources responsible for almost 70 percent of U.S. carbon dioxide emissions, the greenhouse gas contributing most significantly to climate change from human activity, and that it had been able to make such strides because it had allocated its limited resources by focusing on the largest contributors of greenhouse gas emissions. EPA also noted that endangerment findings require full notice and comment rulemaking, and thus require considerable resources. Further, an initial EPA endangerment determination under section 202(a)(1) related to greenhouse gas emissions from motor vehicles was currently being reviewed by the U.S. Court of Appeals for the D.C. Circuit and that it was an appropriate allocation of resources for EPA to await the decision of the court before proceeding with an endangerment determination related to the same emissions from aircraft. EPA noted that Petitioners were seeking to reorder EPA's priorities and that EPA had not unreasonably delayed merely because it had not acted in the order preferred by Petitioners.

On March 20, 2012, the Court ordered EPA to respond to the Petition within 90 days of the order, granted EPA's Motion for Summary Judgment, and denied Petitioners' Motion, finding that Petitioners had not shown that EPA had unreasonably delayed in making an endangerment determination regarding greenhouse gas emissions from aircraft. *Center for Biological Diversity, et al. v. EPA*, No. 1:10-985 (D.D.C., March, 20, 2012).

In response to Petitioners' request, and pursuant to the District Court ruling of July 5, 2011, EPA intends to initiate a notice and comment proceeding regarding whether greenhouse gas emissions from aircraft engines cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare. EPA expects to undertake the endangerment proceeding in the time frame discussed below. At this time, EPA is not prepared, prior to

[2] Section 231(a)(2)(A) refers to a determination whether emissions from aircraft cause or contribute to air pollution which may reasonably anticipated to endanger public health or welfare. While this involves a two step process, concerning both cause or contribution of emissions from aircraft and endangerment from air pollution, for convenience EPA refers in this document to this as an endangerment finding.

making any determination regarding greenhouse gas emissions from aircraft engines, to commit to rulemaking with regard to controlling greenhouse gas emissions from aircraft engines.

II. Summary of Petition

The Petitioners state that greenhouse gas emissions from aircraft engines are pollutants under the Clean Air Act. More specifically, they assert that pursuant to section 231(a)(2)(A) of the Act, EPA is required to set emission standards for air pollutants from aircraft engines when such emissions cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare. 42 U.S.C. § 7571(a)(2)(A). Also, under section 302(g) of the Act, an "air pollutant" is defined as "any air pollution agent or combination of such agents, including any physical, [or] chemical…substance or matter which is emitted into or otherwise enters the ambient air." 42 U.S.C. § 7602(g). Further, the Petitioners state that the U.S. Supreme Court recently held that carbon dioxide and other greenhouse gases "are without a doubt 'physical [and] chemical…substance[s] which [are] emitted into…the ambient air.'" Mass. v. EPA, 127 S. Ct. at 1460. As a result, the Petitioners request that EPA regulate greenhouse gases from aircraft engines under section 231 of the Act, because in the Petitioners' view they fall within the definition of "air pollutant" under section 302(g).

The Petitioners continue by arguing that pursuant to the requirements of CAA section 231, greenhouse gas emission from aircraft engines must be regulated because they cause or contribute to the endangerment of the public health and welfare. Numerous examples are cited along with several references noting the effects of greenhouse gases on climate change and the resulting negative consequences on public health and welfare.

They also maintain that EPA has broad discretion in promulgating regulations to limit greenhouse gases from aircraft engines, claiming that the flexibility stems from Congress' recognition, in drafting the Clean Air Act, that not all pollutants could be controlled in the same manner. Several examples of this broad discretion are cited, including Mass. v. EPA, 1227 S. Ct. at 1462 (once EPA makes a finding of endangerment regarding greenhouse gas emissions from motor vehicles, it "no doubt has significant latitude as to the manner, timing, content, and coordination of its regulations with those of other agencies").

The Petitioners also claim that EPA's authority to address global warming associated with aircraft is consistent with international law, and that EPA's authority also applies to foreign aircraft operation in the U.S.[3] The support for the first claim centers primarily on the Convention on International Civil Aviation, to which the U.S. is a party. That Convention allows individual member states to adopt programs to address significant environmental issues that are more stringent than those of the International Civil Aviation Organization (ICAO), if justified. (See Convention on International Civil Aviation, Dec. 7, 1944, T.I.A.S. 1591, 61 Stat. 1180.) In

[3] We note this is stated broadly as aircraft and not solely emissions from aircraft engines.

support of the second claim, they argue that the CAA gives EPA unambiguous authority in section 231(a)(2)(A) to set emission standards for "any class or classes of aircraft engines." 42 U.S.C. § 7571(a)(2)(A). The petitioners also argue that it is the United States' obligation to address foreign aircrafts' operation in the U.S. under both the United Nations Framework Convention on Climate Change (UNFCCC) and the Chicago Convention.[4] They claim that the preamble to the UNFCCC, to which the U.S. is a party, states that "States have …the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States…." See UNFCCC art. 4, § 2(a), May 9, 1992, Doc. A/AC.237/18, (Part 11)/Add.1 and Corr.1, 31 I.L.M. 848. Moreover, the Petitioners contend that the Chicago Convention does not constrain EPA's authority to adopt a program to address aviation's global warming impacts that includes foreign aircraft as evidenced by the application of the European Commission's Emissions Trading Scheme to all international flights. See Commission Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC, 2006/0304 (COD), COM (2006)818 final (Dec.20, 2006).

Finally, the Petitioners also identify a number of technology and operational emission control measures that they claim could be used to reduce greenhouse gases from not just aircraft engines (e.g., alternative fuels), but aircraft in general (e.g., improved air traffic control).

III. Response to requests

A. Request for endangerment and cause or contribute findings

Petitioners request that EPA make a finding that greenhouse gas emissions from aircraft engines cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare. As discussed above, the District Court that reviewed Petitioners' action found in its July 5, 2011 ruling that section 231(a)(2)(A) requires EPA to make a finding with respect to endangerment, but that EPA had not unduly delayed in not making such a finding. While EPA is not at this time initiating a proceeding with regard to whether aircraft engine greenhouse gas emissions cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare, EPA intends to initiate such a proceeding as described below.

EPA's final section 202(a) Endangerment Finding issued in December 2009 addressed greenhouse gases, the effects of this pollution on climate and the resulting risks and impacts to the public health and welfare. EPA also addressed the contribution of new motor vehicles to this air pollution. See Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act: Final Rule, 74 Fed. Reg. 66496 (Dec. 15, 2009) ("Endangerment Finding"). This Endangerment Finding is currently the subject of multiple

[4] See ICAO, "Convention on International Civil Aviation," Ninth Edition, Document 7300/9, 2006 for more information on the Chicago Convention. Copies of this document can be obtained at www.icao.int.

petitions for review in the U.S. Court of Appeals for the District of Columbia Circuit (Coalition for Responsible Regulation, Inc, et al. v. EPA, No. 09-1322 (D.C. Cir.). EPA believes it is appropriate to wait for the decision of the U.S. Court of Appeals before proceeding with developing a proposal regarding endangerment and contribution for aircraft greenhouse gas emissions. The court's decision in that case is likely to provide the agency with useful input and guidance as it moves forward with its greenhouse gas regulatory efforts, particularly regarding any efforts related to endangerment under section 231(a)(2)(A), and is likely to narrow and focus the issues of concern that will be brought forth in the public comments for an aircraft endangerment finding.

EPA's greenhouse gas-related regulatory actions, including the 2009 section 202(a) Endangerment Finding, have required considerable time and resources to accomplish. Based on its experience, EPA anticipates that a similar proposed determination regarding emissions from aircraft engines would generate extensive public comments, and would therefore likely require significant agency time and resources to develop a proposal and finalize any appropriate determination. As EPA stated in its Motion for Summary Judgment, we estimate that it would take a minimum of 22 months to develop a proposal, publish it for comment, review and analyze comments and issue a final determination with regard to endangerment and contribution from greenhouse gas emissions of aircraft engines. Further, contingencies could arise that affect this general schedule. EPA cannot rule out the possibility that the decision of the U.S. Court of Appeals on the section 202(a) Endangerment Finding could have major implications on the timing of any future endangerment rulemaking regarding aircraft as well as for resources regarding how EPA approaches the science and procedure of a finding for aircraft. Additionally, other unforeseen events regarding Agency budgets or the scheduling of other regulatory actions could also move the schedule back. EPA intends to follow a general approach similar to its section 202(a) endangerment finding for the section 231 inquiries. The basic lines of inquiry for an endangerment finding are two-fold: (1) is the air pollution reasonably anticipated to endanger public health or welfare; and (2) does emission of the air pollutant from the subject source category cause or contribute to the air pollution at issue? Under section 202(a), EPA concluded that "air pollution" consisting of six greenhouse gases may reasonably be anticipated to endanger both public health and welfare.[5] 74 *Fed. Reg.* 66496. EPA further found that emissions of an "air pollutant" consisting of these same six globally well-mixed gases from new motor vehicles and new motor vehicle engines contribute to this air pollution. *Id.* at 66499, 66537-45. EPA anticipates maintaining the same definitions of "air pollution" and "air pollutant," while also evaluating any unique emission and climate change issues raised by aircraft.[6] To this end, EPA

[5] The six gases are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. 74 *Fed. Reg.* 66497.

[6] Petitioners raised concerns with regard to the climatic effects of aircraft emissions of nitrogen oxides and water vapor. These substances are significantly different from the six long-lived and well-mixed gases defined as "air

will review, consistent with its approach for the 2009 finding, peer-reviewed climate change science assessments developed since the 2009 Endangerment Finding, as well as relevant scientific and technical information related specifically to aircraft greenhouse gas emissions. EPA is beginning the process of examining the relevant science. The major steps that EPA will take after receiving a decision in the litigation over the 2009 Endangerment Finding issues under section 202 include: (1) evaluating the scientific and other information relevant to whether emissions from aircraft engines in particular cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare; (2) preparing a proposed determination; (3) conducting intra- and inter-agency review of the draft proposed determination; (4) publishing and providing the public with notice and an opportunity to comment on the proposed determination; (5) reviewing, analyzing and responding to those comments and preparing the appropriate draft determination; and (6) conducting a final intra and interagency review and issuing a final determination.

B. Request for proposal and final rule promulgating standards

The Petitioners describe existing and developing aviation procedures and technologies which they believe can reduce greenhouse gas emissions as well as several potential approaches EPA could consider to reduce greenhouse gases in this sector. Suggestions put forth by petitioners include changes in aviation operations and procedures to reduce fuel consumption, changes in technology such as more efficient aircraft and aircraft engines to improve fuel efficiency and thus reduce greenhouse gas emissions, and the use of jet-kerosene type fuels derived from alternative fuels to reduce life cycle greenhouse gas emissions related to aviation.

At this point it is premature to address potential pathways or options for greenhouse gas emission standards or any related requirements with regard to aviation. EPA intends to make the endangerment and cause and contribute finding as discussed above prior to engaging in any standards-setting rulemakings. If such endangerment and contribution finding are made, EPA would then commence the rulemaking process and in that setting consider all approaches to reducing greenhouse gases from aircraft available and within its statutory authority.

EPA agrees that technical progress can be made regarding potential methods for reducing aviation greenhouse gas emissions from aircraft. In fact, preliminary but important work is underway. As part of its participation with the Federal Aviation Administration (FAA) in the International Civil Aviation Organization/Committee on Aviation and Environmental Protection (ICAO/CAEP), EPA is involved in and helps to lead an effort to develop a carbon dioxide emission standard for aircraft. Work within ICAO/CAEP on developing a carbon dioxide emission standard for aircraft has been underway for more than three years, and the key technical

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pollution" in the 2009 Endangerment Finding. The issues related to these substances will be carefully examined as part of this proceeding and discussed in the scientific and technical documentation associated with this effort.

working group recently reached an important milestone involving an agreement on the appropriate metric to be used in assessing fuel efficiency.[7]

It is important to emphasize that EPA's technical work within ICAO/CAEP has very significant potential future implications as well. The aviation enterprise is unique and very different than any other transportation source. Aircraft operations and flight control procedures are very complex and evolving as measures are being taken to improve system efficiency. In the U.S. alone, there are literally millions of aircraft operations each year from air carriers, air taxis, and general aviation which fly passenger and cargo over routes of various lengths, at different altitudes and with various payloads.[8] There is no "typical flight." Understanding these aircraft operations and how each of the many flight-specific variables affects greenhouse gas emissions through models and other investigations is essential to a successful national regulatory program. Furthermore, aircraft and aircraft engines are very complicated and intricate machines with many critical system interdependencies. Major aircraft manufacturers and aircraft engine manufacturers, offer a wide variety of products to passenger and cargo airlines that are built to provide the performance needed to meet existing emission requirements.[9] With fuel costs representing about thirty percent of overall aviation operating costs today, fuel efficiency specifications are one of the key engine design requirements.[10] An understanding of how all of the various aircraft and aircraft engine design factors interact to affect fuel efficiency and greenhouse gas emissions is essential to the development of a well constructed program that achieves the desired environmental outcomes.

The Petitioner also raises the use of alternative fuels as a means to reduce greenhouse gas emissions. EPA has no direct authority on setting jet fuel specification by regulation. Rather, FAA has authority to prescribe standards for the composition or chemical or physical properties of aircraft fuels to control or eliminate aircraft emissions.[11] However, under current practice, these specifications are not set directly by government regulation. Rather, FAA indirectly regulates jet fuel by specifying that jet fuel meeting specifications identified by the aircraft engine manufacturer as part the engine type certificate (usually ASTM D1655-11b) must be used by the operator as a condition of operating the aircraft under its type certificate.[12] While there is some interest in bio-derived jet fuel blends in the aviation community, any greenhouse gas reductions from "alternative aviation fuels" would be mostly from overall reductions in life

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[7] See ICAO paper entitled CO2 Task Group Future Work, CAEP9_WG3_CO2-9_WP23

[8] See the FFA website http://www.faa.gov/airports/northwest_mountain/planning_capacity/taf_guidance/

[9] See discussions for various airframes in "Jane's All the World's Aircraft,"2009-2010.

[10] http://www.iata.org/pressroom/airlines-international/february-2012/Pages/special-report-fuel.aspx and the IATA briefing note at http://www.iata.org/whatwedo/economics/Pages/industry_outlook.aspx

[11] 49 U.S.C. 44714

[12] FAA regulations require that the aircraft operator must use the fuel specified in the airplane flight manual (14 CFR 91.9) which must be supplied with the aircraft (14 CFR 23.1581). The fuel specified in the airplane flight manual is in turn specified in the engine type certificate (14 CFR33.7).

cycle greenhouse gas emissions as opposed to basic differences in fuel chemistry.[13] Thus, while EPA has an interest in environmentally compatible fuels, our direct role here is limited.

If EPA's proceeding leads to an affirmative finding on endangerment and contribution, EPA would pursue the development of standards and potentially other requirements regulating greenhouse gas emissions from aircraft engines.[14] It is not clear at this time exactly what schedule would be appropriate for such a rulemaking. EPA has limited resources and has concentrated its efforts on regulation of the largest sources of greenhouse gases. Since issuing its final section 202(a) endangerment finding in December 2009,[15] EPA has undertaken a number of important and complex rulemakings to address the largest sources of greenhouse gas emissions. EPA has: (1) proposed and taken final action on standards regulating emissions of greenhouse gases from cars and light-duty trucks;[16] (2) proposed and finalized standards regulating emissions of greenhouse gases from heavy duty trucks;[17] (3) proposed a second round of standards for passenger cars and light-duty trucks in December 2011;[18] and (4) proposed standards regulating greenhouse gases from new electric generating units.[19] Beyond finalizing and implementing the greenhouse gas standards discussed above, the agency has committed to major follow-up actions requiring significant resources. These include a mid-term technical review for the greenhouse gas standards for model year 2022-2025 passenger cars and light-duty trucks, and a rulemaking to set a second phase of greenhouse gas standards for heavy-duty trucks beyond 2018, to include an evaluation of expanded use of vehicle compliance models and complete vehicle dynamometer testing.

These source categories represent approximately 55 percent of the total 2010 U.S. emissions of greenhouse gases. In terms of mobile source emissions, the light- and heavy-duty motor vehicles we are now addressing represent more than 73 percent of 2010 U.S. mobile source GHG emissions.[20] EPA has been concentrating its resources on the largest sources of

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[13] In July 2011, ASTM updated the specification through ASTM D7566 11a (Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons to allow for up to 50 percent blending using specified bio-derived components.

[14] In the past it has generally been EPA practice for aircraft engines to propose and finalize endangerment and gaseous emission standards simultaneously. However, in those cases there were no open related litigation issues regarding endangerment for the air pollutant at issue, the question of endangerment for the pollutants was not controversial (e.g., HC, CO, NOx) and we were adopting emission standards developed in the ICAO process.

[15] 74 Fed. Reg. 66496 (Dec.15, 2009)

[16] 75 Fed. Reg. 25324 (May 7, 2010)

[17] 76 Fed. Reg. 57106 (Sept. 15, 2011)

[18] 76 Fed. Reg. 74854 (Dec. 1, 2011)

[19] 77 Fed. Reg. 22392 (Apr 13, 2012)

[20] These figures were calculated using data from Tables ES-2, 3-12 and A-111 of the EPA report, "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010", April, 2012; see http://www.epa.gov/climatechange/emissions/usinventoryreport.html. They include emissions from international bunker fuels. If calculated without international bunker fuels, the contributions are 56% and 77% of total U.S. and mobile source GHGs, respectively

greenhouse gas emissions in the United States because this approach of ordering its actions generates the greatest environmental return for its investment of agency time and resources. By contrast, the U.S. aviation sector generated only 3 percent of total 2010 U.S. greenhouse gas emissions, and about 10 percent of 2010 U.S. mobile source greenhouse gas emissions.[21]

For the reasons discussed above, the development of an appropriate proposal regarding standards regulating greenhouse gases from aircraft engines would be a very complex undertaking. Many complicated questions related to the basic nature of any proposed control program would have to be carefully considered and addressed. While EPA has developed emission standards for aircraft and aircraft engines in the past,[22] key areas of assessment for greenhouse gas emission standards would include questions such as scope, applicability, stringency, lead time and timing of potential requirements and flexibilities. Issues such as test procedure and certification are important, and would have to be closely coordinated with FAA. EPA expects that much of the knowledge and experience gained in the ICAO/CAEP process currently underway would inform these considerations. EPA would also consider any ICAO standards which might come out of this process.

It is difficult to specify at this time how long the development of a proposal for greenhouse gas standards would take to complete. While EPA would build upon its involvement in the ICAO/CAEP carbon dioxide work to accelerate its work and inform judgments and facilitate decision making, rule development would still require full assessment of the technical, policy, and program design questions required under CAA section 231 and completion of appropriate studies and assessments, as well as full coordination with FAA regarding noise and safety implications would also be required. This work would be done against the backdrop of ongoing regulatory efforts within EPA related to controlling greenhouse gas emissions from source categories such as passenger cars, light trucks, and heavy-duty vehicles. Under normal circumstances development and review of a rule of this magnitude and complexity would take about two years.

IV. Conclusion

For the reasons discussed above, EPA is responding to Petitioners' requests as follows. 1) EPA will initiate a proceeding in order to determine whether greenhouse gas emissions from aircraft engines cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare. EPA will proceed in the time frame discussed above. 2) EPA will not initiate any rulemaking action at this time to establish standards concerning greenhouse

[21] If calculated without international bunker fuels: 2% and 7% of total U.S. and mobile source GHGs, respectively..
[22] See for example: "Emission Standards and Test Procedures for Aircraft," (38 FR 19088, July 17, 1973), "Control of Air Pollution from Aircraft and Aircraft Engines; Emission Standards and Test Procedures," (62 FR 25356, May 8, 1997) and "Control of Air Pollution from Aircraft and Aircraft Engines; Emission Standards and Test Procedures,"(70 FR 69664, November 17, 2005).

gases from aircraft engines. Such action would be premature at this point, given the lack of an affirmative endangerment or contribution finding for such emissions, the ongoing technical work EPA is currently engaged in on the subject, and EPA's current direction of its resources to regulatory action on the largest emitters of greenhouse gases. However, if EPA's endangerment and cause and contribute proceeding results in affirmative findings, EPA would pursue the development of standards and potentially other requirements regulating greenhouse gas emissions from aircraft, in a timeframe consistent with its other priorities and the continuing technical activities regarding such emissions.