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Environmental Protection Agency
EPA Docket Center (EPA/DC)
Mailcode: 6102T
Attention Docket ID No. EPA-HQ-OAR-2008-0508
1200 Pennsylvania Ave., NW
Washington, DC 20460

**Re: Docket No. No. EPA-HQ-OAR-2008-0508 Mandatory Reporting of Greenhouse Gases;
Proposed Rule**

The Aircraft Owners and Pilots Association (AOPA) is a not-for-profit individual membership organization of more than 416,000 pilots. AOPA's mission is to effectively represent the interests of its members as aircraft owners and pilots concerning the economy, safety, utility, and popularity of flight in general aviation (GA) aircraft. Representing two thirds of all pilots in the United States, AOPA is the largest civil aviation organization in the world.

On Friday, April 10, 2009 the Environmental Protection Agency (EPA) issued a notice of proposed rulemaking (NPRM) titled "Mandatory Reporting of Greenhouse Gases." The proposed rule would require mandatory greenhouse gas (GHG) reporting from suppliers of fossil fuels and industrial GHG, vehicle and engine manufacturers and a multitude of other entities emitting an excess of 25,000 metric tons of GHG annually.¹ Under the proposed rule mobile sources of GHG emissions (including some aircraft), would be required to report emission rates following existing engine certification and testing procedures.

At this time EPA is electing to exclude *piston* aircraft from the proposed mandatory reporting program. EPA is requesting comments on which mobile sources of GHG emissions should be included or excluded from this potential reporting requirement (i.e. rail equipment, aircraft).

These comments are designed to:

- Provide existing information on GHG inventories for general aviation.
- Provide information on steps general aviation has already taken to increase efficiency and reduce GHG contributions.
- Increase understanding of the cost sensitivities of the general aviation industry.

¹ <http://www.epa.gov/climatechange/emissions/downloads/MRRPreamble.pdf>

General aviation (GA) is estimated to contribute less than one percent of all transportation sector GHG emissions. Piston powered GA aircraft contribute an even smaller amount; slightly more than one-tenth of one percent (*0.13 percent*) of total GHG emissions from the transportation sector and recent technological advancements are decreasing these emissions even further.

Given the incredibly small GHG contribution from piston powered general aviation aircraft AOPA feels the fleet should be exempt from any current or future GHG inventory requirement or follow-on emissions regulations.

EPA specifically asked for feedback on the development of a Federal Test Procedure for piston aircraft engines in this NPRM. Given the incredibly small GHG contributions by these aircraft AOPA questions the overall benefit in developing a Federal Test Procedure for the measurement, recording and reporting of criteria air pollutant or GHG emissions from these aircraft.

General Aviation is an Important Part of U.S. Aviation System

The 600,000 plus pilots flying in the United States experience firsthand the safest and most efficient air transportation system in the world. GA aircraft are an integral part of the air transportation system that supports communities across the United States and provides essential air travel options that allow businesses to operate more effectively and efficiently with access to the over 19,000 landing facilities in the United States.

Communities rely on GA airplanes and airports every day. General aviation provides vital services to individuals, families, churches, hospitals, colleges, small businesses, and tens of thousands of communities throughout America. From airborne traffic reporting to the overnight shipment of the most recent catalog purchases to finding new sources of energy, GA is helping to make it possible for communities to lead better, safer, healthier, and more productive lives.

GA includes both business and personal transportation in aircraft that range from two seat piston-engine propeller aircraft to large business jets (excluding military and airlines flights). GA aircraft are involved in all civilian flight-training operations, medical evacuation and medical transport flights, law enforcement and firefighting operations, wildlife surveying and agricultural operations. Most of the nation's aircraft operate as general aviation aircraft. A typical general aviation aircraft is the Cessna 172, which has four seats, one piston engine, a 115 mph maneuvering speed and a maximum weight of 2200 pounds. Although the Cessna 172 is a typical general aviation aircraft, the fleet varies widely in aircraft size and capacities.

General aviation comprises the majority of total aircraft operations in the U.S. According to the Federal Aviation Administration (FAA):

- General aviation constitutes over fifty percent of the flying done in the U.S. and almost eighty percent of all U.S. departures.
- On average a GA aircraft flies 127 hours annually.
- General aviation transports approximately 166 million passengers annually.

General Aviation's Impact on the Economy

General aviation has an extensive positive impact on the U.S. economy. The direct and indirect effect of general aviation on the national economy exceeds \$150 billion annually.² Activities related to general aviation account for over 1.3 million U.S. jobs. The annual earnings of these employees are over \$53 billion. Economic activity within the general aviation arena includes the purchases of fuel, maintenance services, aircraft and related manufacturing and piloting services. Those employed by the general aviation industry work as pilots, flight instructors, mechanics, line workers and aircraft refuelers, avionics technicians, aircraft salespersons and manufacturers.

GA is Focusing on Fuel Efficiency

The energy conversion process that occurs during engine combustion on jet and piston aircraft is about 99% efficient; therefore, any consideration to reduce GHG emissions from aircraft engines should center on increasing fuel efficiency. New engine and airframe technologies are helping to decrease GA's fuel consumption and emission contributions.

The current use of light weight composite material in airframe construction reduces aircraft weight and increases speed and range over traditional aluminum airframes. A traditional GA four-seat aircraft, such as the Cessna 172, uses 8.6 gallons of avgas an hour and cruises at 140 mph. A similar sized light weight composite aircraft with the same engine, such as the Diamond 40, is lighter and has a cruise speed that is 20 percent faster than the Cessna 172. If these two aircraft went on a 45 mile flight the Diamond 40 with its composite construction would use 11 percent less fuel than the aluminum Cessna 172, thus reducing GHG emissions.

Engine technologies that improve efficiency are slow to emerge due to the stringent FAA certification requirements that are in place to ensure safety. However, new engine technologies promise further increases in fuel efficiency and decreases in GHG emissions. Advancements such as the Full Authority Digital Engine Control (FADEC) offer increased fuel efficiency by automating the fuel delivery. These systems can increase fuel efficiency by 15 percent or more in new aircraft, and therefore decrease CO₂ emissions.

Changes in the GA fleet mix are also resulting in a more efficient fleet. Light sport aircraft (LSAs) are providing a replacement option for some piston GA aircraft. LSAs are very light, weighing 1,320 pounds or less, and burn on average five gallons of fuel an hour. LSAs offer a replacement vehicle for older two seat GA aircraft, such as the Cessna 152. To continue with this example, most LSAs are 20 percent more fuel efficient than a Cessna 152.

The FAA's Next Generation Air Transportation System (NextGen) promises further emission reductions by increasing the efficiency of the air traffic system and allowing more direct routing for aircraft. The cost-sensitive GA industry will have to bear an estimated \$2 billion in cost to transition to this system. Spikes in aviation fuel prices provide a good example of how cost-sensitive the industry is. Flight hours dropped almost nine percent after a twenty-five percent

² Allen, W. Bruce, PhD. Blond, David L., PhD. Gellman, Aaron J., PhD. "General Aviation's Contribution to the U.S. Economy" May 2006. Feb. 25 2008 <<http://www.gama.aero/PUBLIC/GAcontribution.pdf>>

increase in fuel prices from August 2007 to June 2008. Any EPA regulation that results in a direct cost to GA will have a similar negative effect on the industry.

General Aviation Emissions Contributions Imperceptible Through 2050

The results of emissions inventories conducted on a national level by U.S. federal agencies such as the EPA, government appointed research groups such as the Transportation Research Board (TRB) and industry level organizations such as the General Aviation Manufacturer's Association (GAMA) shows that GA's contribution to GHG emissions relative to commercial aviation and other non-road sources is exceedingly minor. Moreover, analysis of statistics directly derived from the Department of Transportation's (DOT) Bureau of Transportation Statistics (BTS) and EPA shows that GA is negligible in the overall fuel consumption from the transportation sector. Data garnered from the Intergovernmental Panel on Climate Change (IPCC) supports these findings on a global scale, showing that GA contributes almost imperceptibly to long-range 2050 forecasts for global fuel consumption and GHG emissions over a suite of scenarios of varying severity. These results are presented and discussed both individually and comparatively as follows.

GA Emissions Compared to Aviation and Other Non-road Sources

CO₂, the principle GHG, is emitted as a "natural by-product" from the combustion of fossil fuel in aircraft engines. The carbon stored in the fuel is oxidized, energy is released in the form of heat, and the aircraft is propelled by thrust (in the case of a jet engine) or rotating propellers (in the case of a piston engine).

According to the GHG emissions inventory conducted by the EPA³ the total amount of CO₂ emitted from the U.S. transportation sector in 2005 was 1874.5 Tg CO₂e⁴. The entire aviation sector, a subset of transportation, contributed 248.7 Tg CO₂e to this total. GA, a further subset of the transportation sector, contributed very little to CO₂ emissions – a total of 13.8 Tg CO₂e⁵ in 2005, 11.4 Tg of which resulted from jet-fueled GA aircraft and 2.4 Tg of which was emitted from avgas-fueled (piston) GA aircraft. To get a sense of perspective on GA's CO₂ emissions a comparison to other non-road sources is helpful. Locomotive contributions totaled 45.1 Tg CO₂e and marine sources⁶ contributed 42.4 Tg of CO₂.

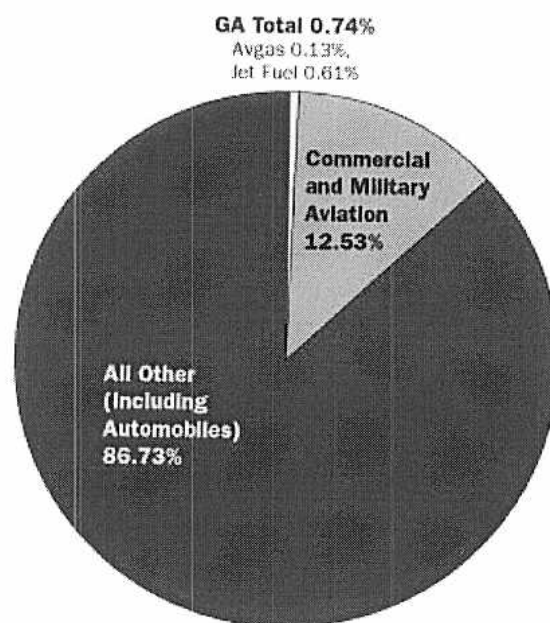
Based on these data GA comprised only 5.54 percent of the aviation sector's contribution to CO₂ emissions in 2005, and only 0.74 percent of the overall total for the transportation sector. Of this 0.74 percent, 0.61 percent was from jet fueled GA aircraft operations and only 0.13 percent was from avgas (piston) fuel GA operations, slightly higher than one tenth of one percent of total CO₂ emissions for the transportation sector. The general aviation industry transports approximately 166 million people annually and contributes less than one percent of the transportation sector's total CO₂ emissions.

³ *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006*. United States Environmental Protection Agency USEPA #430-R-08-005. April 2008

⁴ Value does not include bunker fuels.

⁵ Teragrams of CO₂ Equivalent, the measure by which carbon dioxide is usually reported in greenhouse gas inventories. One teragram equals 1,000,000,000,000 grams, or 1,102,311 tons

⁶ Including recreational marine vehicles



EPA's Transportation Sector Greenhouse Gas Inventory for 2005

A comparison of the aviation sector to other non-road sources in the inventory shows that locomotives contributed 2.4 percent to the total CO₂ emitted in 2005 while marine vessels contributed 2.26 percent to the total. Individually, these other non-road emissions sources emitted three times as much CO₂ in 2005 than GA. This information is summarized in **Table 1** below:

Table 1 – Results of EPA's Transportation Sector Greenhouse Gas Inventory for 2005

Emissions Source	Tg CO ₂ e	% Contribution to Total
On-road Motor Vehicles	1,524.5	81.33
Commercial and Military Aviation	234.9	12.53
Locomotives	45.1	2.4
Marine Vessels	42.4	2.26
General Aviation Jet	11.4	0.61
General Aviation Piston	2.4	0.13
Total Transportation Sector	1,874.5	100

The values reported in the EPA's GHG emissions inventory also shows strong agreement with values from 2003 reported by the TRB⁷. According to this study, the transportation sector emitted 1702.5 Tg CO₂e in 2003, of which the aviation sector contributed 169.0 Tg CO₂e. Again, it is shown that GA contributes only a small amount to this total, equaling 9.4 Tg or 5.56

⁷ U.S. Transportation Sector Greenhouse Gas Emissions: Trends, Uncertainties and Methodological Improvements. 86th Annual Meeting of the Transportation Research Board, November 14, 2006.

percent of the aviation sector's emissions. Of the overall total CO₂ emissions reported in this inventory, *GA's contribution is only 0.55 percent.*

Another GHG inventory compiled by the TRB also shows GA's negligible impact when compared to other non-road mobile emissions sources. Locomotives added 39.6 Tg CO₂e to the reported total while marine vessels emitted 28 Tg, corresponding to 2.33 percent and 1.64 percent respective contributions. Similar to the results reported by the EPA, these sources in the TRB report emit 3 to 4 times as much CO₂ as GA sources. For ease of comparison, these results are reported in **Table 2** below:

Table 2 – Results of TRB Transportation Sector Greenhouse Gas Inventory Report for 2003

Emissions Source	Tg CO ₂ e	% Contribution to Total
Motor Vehicles	1,462.7	85.91
Commercial Aviation	122.8	7.21
Locomotives	39.6	2.33
Marine Vessels	28.0	1.64
General Aviation (Jet and Piston)	9.4	0.55
Transportation Sector	1,702.5	100

Additionally, results from a recent GHG inventory conducted by GAMA suggest that GA has an equally negligible effect on total GHG emissions⁸. In this inventory *turbine-powered* GA aircraft contribute a scant 0.2 percent to GHG emissions in the U.S. annually, and burn approximately 1.6 billion gallons of fuel per year.

International Level Emissions and Fuel Consumption Data

Similar results are attained when evaluating global GHG and fuel consumption forecasts for the worldwide aviation sector. In their 1999 report⁹, the IPCC presented aviation sector GHG emissions and fuel consumption forecasts for the year 2050, including five different scenarios of varying severity. It is concluded in this report that, depending on the scenario chosen, GA fuel consumption will comprise 1.14 percent to 3.28 percent of the global total for the aviation sector in 2050. Additionally, emissions forecasts derived from these fuel consumption estimates suggest that GA aircraft will emit between 1.14 percent and 3.30 percent of the global CO₂ for the aviation sector in 2050. An important characteristic to take into account when interpreting these forecasts is that as the forecast scenario worsens, GA's contribution to the aviation sector total decreases; the lower values in the ranges reported above correspond to the worst-forecast scenarios. This implies that other aviation-related sources amount to at least 96 percent of aviation fuel consumption and GHG emissions, not GA. **Table 3** illustrates this relationship.

⁸ "The Greening of Business Aviation", *Aviation Week*

http://www.aviationweek.com/aw/generic/story_generic.jsp?channel=bca&id=news/bca0508p1.xml, June 2, 2008

⁹ *Aviation and the Global Atmosphere*. Intergovernmental Panel on Climate Change, prepared in collaboration with the Scientific Assessment Panel to the Montreal Protocol on Substances that Deplete the Ozone Layer. Cambridge University Press, UK, 373 pp., 1999.

**Table 3 – General Aviation Contributions to the Global Aviation Sector based on 2050
IPCC Aviation Forecast Scenario**

Metric	Worst Scenario Contribution (%)	Best Scenario Contribution (%)
Fuel Consumption	1.14	3.28
CO ₂	1.14	3.30

Nationally, GA operations contribute 0.55 to 0.74 percent to the CO₂ emissions and 0.19 percent to the total fuel burn of the transportation sector, or less than one percent. When compared solely to the rest of the aviation sector, GA accounts for approximately 5.5 percent of aviation sector CO₂ emissions. It is shown that locomotives contribute between 3 and 4 times as much CO₂ and burn approximately 3 times as much fuel annually. Marine vessels have been shown to emit 3 times as much CO₂ as GA aircraft and burn as much as 6 times the fuel annually.

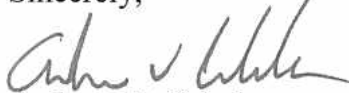
It is estimated that GA will only contribute between 1 and 3 percent to the worldwide aviation sector's fuel consumption and CO₂ emissions in 2050. As is apparent in the national level data, this contribution to the global total is likely to be orders of magnitude smaller when accounting for all transportation-related sources. Overall, it is inherently obvious when evaluating the data that GA's impact on the global climate is currently and will continue to be exceedingly small.

Summary

Existing greenhouse gas inventories show that GA comprises only 5.54 percent of the aviation sector's contribution to CO₂ emissions in 2005, and only 0.74 percent of the overall total for the transportation sector. Of this 0.74 percent, 0.61 percent was from jet fueled GA aircraft operations and only 0.13 percent was from avgas (piston) fuel GA operations.

Based on what we currently know about the GHG contributions from the piston GA fleet, it would be very hard to justify developing a Federal Test Procedure (FTP) for piston GA aircraft and measuring, recording and reporting these emissions to the EPA. AOPA believes piston GA aircraft should be exempt from any currently proposed or future GHG inventory requirement or follow-on emissions regulations.

Sincerely,



Andrew V. Cebula

Executive Vice President
Government Affairs