ALPA WHITE PAPER

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Aviation Sustainability and the Environment

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Aviation Sustainability and the Environment

Executive Summary

ALPA is strongly supportive of reducing aviation's small overall percentage of adverse impact on the environment while concurrently preserving the economic viability of commercial aviation. These two goals are complementary; as fuel and operational efficiency continue to improve, economic viability is enhanced.

Over the past 40 years, the North American airline industry has increased aircraft payload capacity six-fold while concurrently using 60 percent less fuel. Future airframe and engine improvements promise continued fuel efficiency gains. Technological improvements in navigation and surveillance have contributed tremendously to improved capacity and operational efficiency in the National Airspace System (NAS) leading to growth in operations without a corresponding increase in aviation's carbon "footprint." Commercial aviation deserves credit for taking the initiative to implement these past, current, and future improvements that have led to environmental gains. The Next Generation Air Transportation System (NextGen) promises greater operational efficiency thereby providing even further improved fuel efficiency.

Any modifications or improvements in aviation intended to protect the environment must pass the test of cost effectiveness; this includes examinations of alternative fuels, reducing exhaust emissions and noise reductions. The federal government has jurisdiction in this area and should develop a comprehensive national energy policy based on proven science and facts. International activities in this area must not impinge on U.S. or Canadian sovereignty.

Introduction

Airline pilots literally sit at the intersection of new technology, operational measures, air traffic control procedures, and varying aircraft capabilities. This gives us a unique vantage point to see and experience firsthand what well-intended, but unrealistic, operational procedures can do to safety margins. For example, a descent path into a major East Coast airport required pilots to cross closely spaced navigation points at successively lower altitudes. The navigation points were too close together to allow pilots to meet the altitude crossing restrictions using advanced aircraft navigation computers due to the limitations of the computer software, aircraft limitations due to the steep angle of descent required, and constraint of the operator's standard operating procedures put in place for safety. In addition, these unobtainable crossing restrictions greatly increased pilot workload, thus compromising safety. The procedure was revised based on pilot and controller feedback.

A principal reason for our interest in this subject is the need to ensure the ongoing viability, what we call the sustainability, of our airline industry. We recognize all too well that our employers are under tremendous financial stress due to the high cost of fuel and pressures from environmental concerns to reduce fuel consumption and corresponding emissions. If given the proper equipment and ability to use it, pilots can help their airlines safely burn less fuel, and thereby put less noise and tailpipe emissions into the environment. Pilots work with their companies and ATC on a daily basis to safely reduce fuel burn.

Importance of the Aviation Industry

Air transportation provides a significant portion of mass transportation in North America; airlines in 2009 carried almost 770 million passengers and carried over 20 million tons of freight and mail. Even while conducting these operations, aviation arguably has the most successful record of any sector of the economy in limiting its impact on the environment while increasing its productivity. Airlines have greatly reduced carbon-based emissions through several measures and incentives including engine technology that reduces fuel burn and emission of undesirable gases and particulates. Compared to aircraft in use in 1972, the North American airline industry now carries six times more payload using 60 percent less fuel and has reduced by 95 percent the number of people significantly impacted by aircraft noise.

As an example of fuel efficiency improvements, first-generation jet aircraft, such as the Boeing 707, made transcontinental air travel quick and easy, but the fuel efficiency left something to be desired. However, a transcontinental Boeing 777-200 traveling today from New York to Los Angeles will burn less than 10,000 gallons of fuel while carrying 340 passengers. That yields a fuel efficiency of over 75 miles per gallon on the basis of an individual passenger. By contrast, according to the U.S. Bureau of Transportation Statistics of the Research and Innovative Technology Administration, in 2007 the average passenger car fuel efficiency was just 22.5 miles per gallon.

This outstanding record of environmental achievement has resulted almost entirely from the voluntary actions of the airlines who continually demand new aircraft from the manufacturers that burn less fuel, carry greater payloads, and create less noise. Boeing's newest aircraft is the B-787; due to its cutting-edge technology, the aircraft is designed to use 20 percent less fuel—and thereby create 20 percent less greenhouse gas (GHG) emissions—than current aircraft of the same size. This aircraft is just one example of the kinds of investments that the airlines make in a very heavily capitalized industry.

The Air Transport Association of America (ATA) quantifies these commercial aviation fuel efficiency improvements. Between 1978 and 2008, fuel efficiency was improved approximately 110 percent, resulting in 2.7 billion metric tons of carbon dioxide (CO_2) savings, which is roughly equivalent to taking more than 19.5 million cars off the road each year. Between 2000 and 2008, U.S. airlines reduced GHG emissions by 5.5 percent while transporting 17 percent more passengers and cargo.

General Guiding Principles

In a joint-signature document issued by nearly two dozen U.S. stakeholders in 2009, which included ALPA, the industry clearly stated its view that public policy debate over aviation and emissions should be guided by the following overarching principles:[1]

Cost-benefit analysis is vital—Any proposed measures to address aviation's impact on the environment should include a rigorous analysis of the expected benefits weighed against the cost to the economy, industry, jobs, communities, and the transportation infrastructure, and should take account of the costs and benefits of intermodal substitution. Likewise, they should address possible tradeoffs between environmental effects, such as between emissions and noise.

A central framework—The federal government has exclusive jurisdiction over U.S. aircraft regulations. This process should continue to be informed by U.S. participation in international aviation standards and recommended practices set by the International Civil Aviation Organization (ICAO). It is critical that this international approach and federal preemption be maintained in aviation regulatory matters, as it would be impracticable to subject aircraft to different environmental rules in different jurisdictions. This is why the Federal Aviation Administration (FAA) and Environmental Protection Agency (EPA) retain authority over aviation environmental regulations, and why local limits on airport access such as noise restrictions can be implemented only if they meet strict federal criteria consistent with ICAO standards.

The international dimension—Aviation is a global industry and requires global solutions. Any environmental measures affecting aviation should be in conformity with the policies being developed cooperatively by the 190 contracting states of the Chicago Convention through ICAO, including the prohibition against taxing fuel used in international operations. The integrity of the international aviation system is based on the establishment of limits on the ability of any one country to impact the flying rights of another country.

Need for a comprehensive energy policy—Any artificial caps on energy use or emissions must be developed in the context of a comprehensive national energy policy that expands environmentally responsible access to domestic energy supply, accelerates development of alternative fuels, and promotes conservation and efficiency.

In 2008, ALPA adopted new policy regarding energy policy, which reads as follows:

> ALPA shall promote the expedited adoption of national energy policies by the governments of the United States and Canada, which shall include the following provisions:
>
> 1. Regulate oil commodities trading to eliminate loopholes, increase transparency, and reduce the potential for rampant investor speculation that may lead to artificially higher prices;
> 2. Oppose any new taxes, charges, or fees on fuel used by airline operations;

[1]Aviation and Climate Change, The Views of Aviation Industry Stakeholders, February 2009; ALPA is an industry signatory.

3. Encourage the development of new technologies and operational concepts that reduce transportation energy consumption and minimize environmental impacts;
4. Increase domestic production of energy sources focusing on clean energy and environmentally responsible oil production;
5. Promote greater use of non–oil-based energy sources within the aviation industry and transportation modes that can use alternative types of energy;
6. Provide government-funded research and development of a low-cost, renewable, low- or non-emitting alternative fuel(s) for use by commercial aviation and other transportation modes.

Debate based on facts and science—The public policy debate over aviation and the environment should be informed by science and facts. Aircraft release only one of the six GHGs currently covered by international climate treaties, carbon dioxide (CO_2), but more needs to be known about the effects of water vapor from aviation and of oxides of nitrogen released at altitude. What is known about the atmospheric effects of aviation is the result of the only IPCC industry-specific study, *Aviation and the Global Atmosphere*, in which the aviation industry played a critical role in providing guidance, data, and technical expertise. The aviation industry is strongly supportive of and proactive in continued research to improve scientific understanding of the effects of non-carbon aviation GHGs and the nature of the nitrogen cycle.

Aviation Fuel

Kerosene (i.e., Jet A) is the "life's blood" of aviation; for the industry to survive, it must be available in large quantities and at a reasonable price. Fuel is a depleting resource with extreme price fluctuations; fuel costs account for a significant part of an airline's operating budget. Stable energy prices are critical for a secure and viable airline industry. The industry is seeking to develop and deploy commercially viable, environmentally friendly alternative aviation fuels. Enormous amounts of capital, as well as committed research and development, are required to advance science and technology, all of which are essential to new sources of energy, further fuel efficiency gains, and GHG reductions.[2]

ALPA is supportive of the work of the Commercial Aviation Alternative Fuel Initiative (CAAFI), which involves the airlines, aircraft manufacturers, and the scientific community collaborating to find new and better sources of fuel for aviation. CAAFI's goal is to promote the development of alternative fuel options that offer equivalent levels of safety and compare favorably with petroleum-based jet fuel on cost and environmental bases, with the specific goal of enhancing security of energy supply.

Experiments and demonstration flights are being conducted in both commercial and military aircraft using both biofuels and synthetic jet fuels. Research will continue to examine the feasibility of these alternative fuel sources.

[2]ATA Issue Brief, 21st Century Aviation – A Commitment to Technology, Energy and Climate Solutions.

As we move forward on development of alternative fuels for aviation, it is important to consider the use of these fuels in other transportation modes. Doing so may help speed development but, more importantly, may result in lowering the cost of the fuel due to a greater volume of production.

NextGen's Impact on the Environment

The FAA and industry is in the process of transitioning to the Next Generation Air Transportation System (NextGen). This modernized NAS is planned to be fully implemented by 2025 and will transform the current ground-based air traffic navigation and surveillance system to a state-of-the-art, satellite-based system. While the projected cost of $40 billion is certainly significant, the projected benefits in safety, operational efficiency, and environmental improvements will be even more significant. The FAA, in its NextGen Implementation Plan issued March 2010, estimates that by 2018 NextGen will reduce total flight delays by about 21 percent while providing $22 billion in cumulative benefits to the traveling public, aircraft operators, and the FAA. In the process, more than 1.4 billion gallons of fuel will be saved during this period, cutting carbon dioxide emissions by nearly 14 million tons. These estimates assume that flight operations will increase 19 percent at 35 major U.S. airports between 2009 and 2018.

The FAA has already achieved a number of critical NextGen milestones. They have initiated and expanded satellite-based surveillance, improved airport runway access, increased safety and efficiency on the ground, and enhanced airspace safety and operations. NextGen technologies and procedures, along with airspace redesign, have enabled more direct routes and more efficient operations while using less fuel and reducing emissions.

Following are examples of procedural and technological improvements that have been put into place already and have a significant impact on operational efficiency, with the understanding that safety considerations are paramount and the captain has ultimate authority to determine aircraft operation:

- ***Single-engine outbound taxi***—Under certain conditions, it is not necessary that all aircraft engines be operated to taxi on the ramp or taxiways. When conditions permit, only one engine on twin-engine jets or less than all engines on multi-engine jets may be started until reaching the end of the runway for takeoff.
- ***Engine shutdown during inbound taxi***—Once the aircraft has departed the landing runway and is headed to the gate or parking stand, one or more operating engines may be shut down, either in the taxiway environment or on the ramp.
- ***Use of auxiliary power units (APUs)***—The APU on board an aircraft is an auxiliary engine that provides supplemental power to the aircraft, usually while on the ground. Procedures have been developed to minimize the use of these units, thus reducing both emissions and fuel consumption.

- ***Technology-enhanced departure procedures***—New procedures are being developed with the aid of Area Navigation (RNAV) and Required Navigation Performance (RNP) technology that permit shortening the distance and time traveled during approach and departure.
- ***Optimal altitude***—Each jet aircraft, based on weight and ambient conditions, has an optimum altitude where fuel burn is minimized. To the extent that conditions and circumstances permit, pilots may request an optimal altitude in order to conserve fuel, which also reduces emissions.
- ***Optimal speed flight plans***—Planning and operating a flight at an efficient speed can save fuel. Pilots can optimize fuel burn based on aircraft weight, winds, and atmospheric conditions, given ATC restraints and safety considerations.
- ***Continuous Descent Arrival (CDA)/Optimized Descent Procedure (ODP)***— Normal approach and landing procedures require an aircraft to reduce power, descend to a new altitude, and then add considerable power to level off and fly straight and level; that process may be repeated several times during approach and landing. A new approach procedure, the CDA, or what may also be called an ODP, is being developed that permits pilots to reduce power on all engines and not use significant thrust until safety concerns dictate establishing a stabilized approach configuration prior to landing. This procedure cannot work at all airports at all times due to operational constraints, but at those locations where it can be used, it can save substantial fuel on a single approach.
- ***Reduced Vertical Separation Minimum (RVSM)***—Taking advantage of improved technology, appropriately equipped aircraft can now fly at 1,000 feet of vertical separation—compared with 2,000 feet previously—at higher altitudes. This operational change added six additional useable altitudes, increasing the opportunity for pilots to fly their aircraft at the optimal, most fuel-efficient altitude, in addition to permitting much greater airspace utilization.

Role of Government

There is need for government support in order to build upon progress that has already been made:

- Provide sufficient and timely funding for necessary improvements to the National Aviation System (NAS). Funding the national airspace system modernization components needed to enhance aircraft efficiency, safety, and capacity will help in reducing delays, fuel consumption, and emissions. Implementation of NextGen could eliminate as much as 15 percent of today's delays, increase safety and capacity, and concurrently reduce emissions. Funding important studies like wake vortex investigations will also help. More information and understanding of wake vortex patterns around runways will allow spacing of traffic on the runway based on real hazards—a more accurate standard than the currently used mileage separation.

- Continue funding for important infrastructure improvements including runway and taxiway additions and improvements. Poor airport design, including those with intersecting runways, increases taxi time and increases fuel use. Adding high-speed taxiway exits from runways can reduce runway occupancy time thus increasing airport capacity. Additional runways reduce fuel wasted in holding patterns and long lines of aircraft waiting for takeoff.
- Give greater support to research for alternative, renewable fuels that pollute less or not at all, and are less expensive than today's fuels. Because of aircraft engine design and extreme atmospheric conditions at altitude, the airline industry relies entirely on petroleum-based fuels; it cannot currently substitute ethanol or other fuels as some industries are able to do.
- Avoid adding economic burdens, in the form of market-based measures, to an already crippled industry. Carbon cap-and-trade schemes are designed to provide an economic incentive to reduce emissions; our industry already has that incentive and is continually searching for more ways to reduce fuel use and emissions. Diverting funds needed for new, more fuel-efficient aircraft and alternative-fuels research will only slow these efforts.
- Work with ICAO to establish emissions standards and operating measures for uniform application across this global industry.

Role of ICAO

ICAO is looking at more stringent requirements to combat climate change. At a high-level ICAO meeting in October 2009, states representing 93 percent of global commercial air traffic reached agreement on the following: further reducing aviation's impact on the environment, in cooperation with the air transport industry, through such initiatives as a goal of 2 percent annual improvement in fuel efficiency globally until the year 2050; a global CO_2 standard for aircraft; a framework for market-based measures in international aviation; measures to assist developing states and to facilitate access to financial resources, technology transfer, and capacity building; and continued further work on the development and implementation of alternative fuels for aviation worldwide, which could lead to aviation being the first sector to use sustainable alternative fuels on a global basis.[3]

It is extremely important for U.S. and Canadian representatives to work closely with ICAO to ensure that any measures adopted are reasonable and attainable without reducing safety margins or imposing undue hardship on the aviation industry.

Harmonization of ICAO Standards and Recommended Practices (SARPS) with U.S. and Canadian aviation regulations and environmental legislation is an essential element of progress toward environmental improvements in aviation.

[3] ICAO News Release PIO 16/09, ICAO Forging Ahead with Plans to Curb Greenhouse Gas Emissions for International Aviation, 21 December, 2009.

Conclusion

Aviation is a good news story; we safely move hundreds of millions of passengers annually around the world in comfort, at great speed, and with less impact on the environment than any other mode of transportation in history. However, aviation is a visible target and has drawn the attention of numerous groups around the world who condemn the industry for being a driver of projected climate change.

As pilots, we deal with facts, and the facts clearly show that while aviation is a contributor of greenhouse gas and other emissions, it plays only a very small role in the overall issue. The industry is poised to make even greater strides in reducing emissions through technology and operating procedures. We believe that the best way to achieve those results is the same way that we have made such great advances thus far, namely, through industry's investments in increasingly advanced technology.