

PERSPECTIVES FROM THE FIELD

Air Transportation: An Environmental Paradox

Alan R. Bender

Commercial air transportation has long since lost its luster as the sophisticated, intelligent way to move around the nation or across the globe, yet that reality has little to do with aviation's controversial impact on the environment. Flying has largely deteriorated into an affordable ordeal, made bearable only by the allure of the destination, or the family, friends, and business associates at the other end. Cheap air travel is a paradox that is seemingly becoming more politically incorrect by the day. Its detractors are not lacking for ammunition, and aviation's unique environmental issues only make matters worse.

The case against air transportation is pretty strong. Only the relatively affluent use airplanes to get to and from their daily jobs, and no one outside of Alaska, Hawaii, or other isolated locations needs aircraft to deliver basic food and other necessities of living. Airplanes, it can therefore be argued, do not constitute "do or die" transportation for most people. In the aftermath of 9/11, when no one in the United States (US) could fly for several days, people not only made do, but their quality of life actually improved, at least in some cases. A nationwide shutdown of highways or pipelines, on the other hand, would rapidly become an economic and social disaster, perhaps of epic proportions.

It is essential for those in the air transportation industry to understand how politically weak their sustainability argument is, despite the fact that all of aviation contributes only a paltry 2%–3% to global car-

bon dioxide emissions. That figure is roughly 50% of what the maritime industry contributes and only 10% of what cars and trucks produce. One problem, as anti-aviation groups in Europe have made loud and clear in recent years, is that bargain basement airlines constitute one of the fastest growing segments of the air travel business—and those carriers "dirty the air" taking passengers on cheap nonessential family and holiday trips. While carbon-trading schemes can somewhat mitigate the environmental consequences of holiday-makers jetting here and there on inexpensive tickets, the sustainability case for "needless" air travel is weak at best.

Thus, the seemingly intractable paradox. Aviation's contribution to transportation-related greenhouse gas (GHG) emissions is small, but is growing quickly in the international travel market and the discount carrier market, as well as domestically in rapidly growing nations such as China and India. Notwithstanding that modern commercial aircraft are becoming more fuel efficient and less polluting practically each and every year, aviation related GHG emissions are still on the upswing because air passenger and air cargo revenues are growing faster still. Even the most optimistic predictions show no more than 5%–10% penetration of biofuels into aviation by 2020, yet international airline traffic (passenger and cargo) will likely grow by that proportion every year or two. Moreover, aviation's GHGs are mostly released in the upper atmosphere, where the potential for causing long-term environmental damage is likely greatest.

While emergency shipments "absolutely, positively" have to reach their destinations overnight, air express saves little or no time on short hauls; however, air "absolutely, positively" saves significant time on long hauls. But immense quantities of jet fuel must be burned on long trips. Rail is far more energy efficient, and oceangoing ships are dramatically friendlier to the environ-

ment: for example, container vessels produce only 2%–3% of the GHG emissions per ton-mile as do long-range cargo jets. Time may be money, but with air freight the environmental cost is high today and may be even higher tomorrow.

Aviation advocates' arguments are equally compelling. Noted earlier is that commercial aircraft produce less than 5% of the world's transport related GHGs, yet aviation is fundamentally responsible for creating what is generally considered the world's largest single industry in terms of both revenues and employment: travel and entertainment. Let me rephrase that: Airlines don't pollute very much, yet are the undergirding for the world's largest industrial sector.

As anyone who has flown recently understands all too well, planes are absolutely packed. High-load factors and the latest airframe and engine technologies mean fuel economy in the range of 65–75 passenger-miles per gallon for mainline jets and large turboprops. This is far better than any mass-produced car on the road today carrying only the driver; in fact, it is equivalent to many fuel-efficient models carrying two passengers. While a hybrid vehicle loaded with four passengers has better fuel economy than any airliner, a newer aircraft such as the Boeing 737-800 beats essentially any car with a typical load. The even better news is that the very latest airliners such as the Airbus A380 and Boeing 787 are even more fuel efficient.

What's more, most carriers are generally pulling their smallest, least fuel-efficient aircraft from their fleets; in addition, long-promised improvements to the US air traffic control system will mean more direct air routings between origins and destinations. In comparison, highway trips are often circuitous because of obstructions such as water and terrain. The upshot is that new airliners will likely reach the 100 passenger-

miles per gallon marker long before new automobiles do.

Problem is, most people fly to faraway destinations . . . or they will not travel long distances at all. In other words, the selection is not usually between an airplane and a car but between an airplane and the living-room sofa. Such, at least, is the case in the US. On the other hand, where high-speed passenger rail exists (which is most of the industrialized world except for the US and a few other advanced nations), people do have viable options. High-speed rail achieves far better fuel economy and produces far fewer GHGs per seat-mile than air transportation. In terms of fuel economy, for example, high-speed rail is on the order of 500% more efficient. And yet for one-way trips over approximately 900–1,000 miles, jetliners do save considerable time over high-speed rail, which will likely never play a major role on true long hauls.

For such trips, the jet airliner is, and will undoubtedly remain, king.

The *regional jet* (RJ) is another vexing environmental thorn. Although the smaller of these pint-size commercial jets are being phased out gradually, RJs waste precious takeoff and landing slots at congested airports and burn significantly more fuel per seat-mile than like-sized modern turboprops such as the Bombardier Q400. While nearly ubiquitous these days, RJs are a major blemish to aviation's attempt to achieve sustainability.

On balance, air transportation is a paradox, a victim of its own success. Though still exhibiting strong growth, particularly in international markets, commercial aviation has lost nearly all of its political and social luster. Although a natural for long-distance and overwater journeys, airliners

waste energy resources and save little time for many short and medium-length trips.

Are the halcyon days of America's fly-drive culture numbered? Should they be? And who on Earth likes flying on the airlines these days? In the final analysis, these questions will make the aviation industry an easy target for those who challenge its surprisingly small—but nonetheless increasing—environmental footprint.

Affiliation of author: Alan R. Bender, PhD, Professor of Aeronautics, Embry Riddle Aeronautical University—Worldwide, Daytona Beach, Florida.

Address correspondence to: Alan R. Bender, 145 Almond Street, Ashland, OR 97520; (phone) 916-719-9506; (fax) 541-488-4411; (e-mail) alan.bender@erau.edu.