



Renewable Energy in Tourism Initiative

Best Practices in the Airline Sector





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EXECUTIVE SUMMARY

The airline industry carries approximately 2.2 billion passengers a year and generates close to 600 million tons of greenhouse gases. Although this represents only an estimated 4-5 percent of global emissions of greenhouse gases, the growth rate, public profile, and the potential impact of these high altitude emissions are substantial. Estimates relay that the airline industry's climate change "footprint" has doubled since 1990, with forecasted growth in passenger numbers and aircraft movement escalating.

Heightened concern with climate change coupled with the airline industry's vulnerability to rising fuel costs have led an increasing number of airlines to aggressively invest in energy efficiency, conservation efforts, and other related renewable energy initiatives.

This **March 2008** edition of the Renewable Energy Tourism Initiative (RETI) *Best Practices in the Airline Sector* draws upon the experiences, insights, and resources provided by five airlines including American, Continental, Virgin Atlantic, British Airways, and Nature Air. Additional input is expected from these and other airlines, as well as airline suppliers, in the coming months.

Researchers reviewed information published on- and off- line, including media reports and information supplied by these airlines and conducted telephone interviews, when possible. Independent verification of claims made were not available to the researchers. Difficulties and challenges in implementing renewable energy practices plus return on investment information may also be currently incomplete. This publication is a work in progress and information will continue to be refined and distilled to enable a quick comparison of renewable energy options in future editions.

Seven major areas of renewable energy investment emerged from this research, each falling into one of two general categories. The first highlights short term efficiency projects that require modest capital investment. The second addresses long term initiatives that involve more structural changes including new

aircraft, green building construction technologies, and renewable fuel.

In all the areas identified below, management focus and staff buy-in are critical. This includes the renewable energy and related conservation efforts being prioritized from the top (e.g.: Virgin Atlantic) and/or emphasized, promoted, and monitored in a major business program (e.g.: American's Fuel Smart Initiative).

The full Best Practice document provides additional detail and links to resources on each of the outlined best practices.

Airline Best Practices at a Glance

Short-term Initiatives

1. **Aircraft Modifications** – American and Continental Airlines, among other airlines, have implemented energy efficiency upgrades to aircraft including upgrades to engine turbo fans and adding winglets. Many airlines, including all those spoken to, have had weight removal programs with aircraft including cabin fittings, catering, and waste management.
2. **Aircraft and Airport Ground Movements** - Airlines have implemented a range of ground initiatives including reduction of idling times, single engine taxiing, or pulling aircraft to gates with high speed tractors combined with the use of Ground Power Units, both of which eliminate the need to start engines.
3. **Aircraft Flight Initiatives, Air Traffic Control, and Navigation Enhancements** – This involves direct approach, reduced (or eliminated) use of engines on descent, air crew training and improvements in air traffic control to reduce flight times and fuel use.



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These initiatives also include modern, more flexible air traffic control management allowing more efficient flight plans such as 'ASPIRE' (the Asia and South Pacific Initiative to Reduce Emissions).

4. **Carbon Off-Set Programs and Corporate Support of Climate Change Initiatives** - Similar to other sectors of the tourism industry, many airlines offer carbon offset programs allowing visitors to offset the environmental impact of their travel. Some companies, notably Virgin Atlantic, have made a substantial corporate commitment to invest in climate change research and technologies in order to bring about long term change to the current fossil fuel use of the industry.

Long-term Initiatives

1. **Modernizing Fleets** – One of the designated areas for significant improvement in fuel economy and emissions is in the use of new commercial aircraft including the Boeing 787-9 Dreamliner, Airbus 350 XWB, Airbus 380, Boeing 747-8 and expanded use of new prop aircraft on shorter routes. These aircraft are typically 20 percent (or greater) more fuel efficient than older aircraft and their greater ranges and lower operating costs allow more point to point travel.
2. **Green Building** – A number of airlines and more significantly, airports, are investing in green building technologies and practices, including renewable energy (solar and wind), improved insulation, water saving or recycling facilities, and energy efficient fittings and appliances .
3. **Bio-fuels** – Even longer term is the shift to renewable fuels. Research is underway by a number of airline, aircraft, and engine manufacturer groups and testing should start this year (2008). However, the size of the technical challenge remains substantial.

Further Questions & Concerns

1. **Quality Information** –*Many of the practices presented in this draft do not contain Return on Investment or other critical metrics to allow rigorous comparison of renewable energy options. Without this type of information or a method of independent, objective assessment it is difficult to distinguish 'PR' speak from substantive progress.*

Q: Are there mechanisms to provide third-party assessments of renewable energy practices within the tourism industry?

2. **Carbon Offset Verification** – *There is no independent verification of carbon offset programs. This includes verification of the calculations of the cost of offsets and the certification that funds are being invested as promised and having the desired effect of offsetting, reducing, or otherwise mitigating CO2 emissions.*

Q: Are independent standards and verification necessary for a robust carbon offset program?

3. **Technical Information** - *Many of the suggested best practices require complex technical and operational information for implementation. There is currently no easy way to share and access the information in these best practices, distinguishing important areas of co-operation from legitimate areas of competitive advantage.*

Q: How does the industry address the issue of information sharing?



BACKGROUND

Best Practice Manuals Overview

The Renewable Energy in Tourism Initiative (RETI) was developed to feature industry leaders that have adopted best practices in renewable energy and energy efficiency, and to provide information and guidance to businesses interested in realizing these benefits. The best practice manuals were designed for tourism businesses of all sizes. Through the use of case studies, each manual highlights and outlines renewable energy adoption and adaptation strategies that maximize energy efficiency, minimize environmental impacts, and result in cost savings or increased profitability across six tourism sectors: accommodations, airlines, cruise lines, public lands agencies, ski resorts, and tour operators.

These best practice manuals are intended to serve as an inspiration and guide to other businesses interested in realizing the benefits of adopting renewable energy initiatives and supporting a healthy planet. RETI is part of a broader objective of creating a comprehensive set of best sustainable business practices in each designated tourism sector.

Best Practice by Definition

A best practice is a process, technique, or innovative use of resources – such as technology, equipment, personnel, and data – that has resulted in outstanding and measurable improvement in the operation or performance of a tourism business. Each best practice will have demonstrated success by significantly and measurably improving outcomes in one or more of the following three areas of business performance:

- Operational factors;
- Financial objectives; and
- Marketing objectives

In addition to business outcomes, the best practices outlined in the RETI manuals help to eliminate, minimize, or mitigate the environmental impact of the business through pollution prevention, carbon emissions reductions, and/or carbon offsets, etc.

Content Acquisition and Validation

Sustainable Travel International (STI) was responsible for acquiring and validating the content included in this document. To identify industry leaders in each segment, STI made public announcements via its E-newsletter, other online outlets, and through word of mouth, then accepted nominations from various stakeholders and completed a due diligence process. Interviews were then conducted with representatives from each company or organization identified, representatives were asked to review each applicable best practice document, verify the information contained therein, and provide constructive feedback. No on-site verification of researched activities was involved, though many of these activities have been verified through other procedures.

Industry Overview and Sustainability Initiatives

According to the International Air Transport Association (IATA), approximately 2.2 billion people fly each year. In 15 years time, that number will double according to Friends of the Earth. This non-profit organization also estimates that airplanes generate more than 600 million tons of carbon dioxide emissions per annum.

Global warming and the ever-increasing cost of fuels are issues facing the travel and tourism industry as a whole. Therefore, it is critical that the global aviation industry address its carbon dioxide and other greenhouse gas emissions, which have doubled since 1990, and embrace renewable energy and energy efficiency initiatives. It is also critical that the aviation industry – including airlines, airports, air traffic controllers, and governments – work together to increase resource efficiencies and renewable energy. Some industry leaders, for example, Sir Richard Branson, estimate that up to 25 percent of the world's aviation-related greenhouse gas emissions could be cut if and when this happens.¹

Fortunately, the looming reality of global warming has galvanized many airlines to take a proactive approach to



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sustainability and forge a leadership role with their industry's partners. The airline industry and aircraft manufacturers are increasingly focusing on environmental impacts to reduce fuel-related operating costs and address the rising concern and criticism resulting from its contribution to global warming.

In addition, it is likely that mandatory legislation requiring emission reductions will be imposed in Europe in the near future, which will help to further promote innovation within the airline industry. The International Air Transport Association and other aviation organizations are calling for the world's air fleet to be 25 percent more fuel efficient by 2020ⁱⁱ.

Fuel costs are continuing to rise while many commercial airlines struggle to stay financially stable. In fact, U.S. aviation fuel costs exceeded labor costs for the first time in 2006.ⁱⁱⁱ Although addressing increasing fuel costs is a significant issue, most airlines cite a desire to reduce their greenhouse gas emissions and ensuing contribution to climate change as the primary motivation behind their environmental initiatives. Many also note, however, that the financial benefits of these changes have played a large part in enabling them to do so. Climate change has been a growing concern for airlines, in some cases spanning the past 15 years, but more recent increases in public concern, impending regulation, and fuel costs have been the true agents of change. Great strides have been made in fuel and emissions reduction, and most companies are working to attain more aggressive future goals.

These issues are being addressed with a great deal of creativity and mindfulness. Weight reduction has been a major initiative as every little bit counts. Some companies are going so far as to remove disposable cans and plastic bottles used between boarding and takeoff prior to the airplane leaving the ground to minimize weight.

In addition to changes in their fleets and flight practices, many airlines are also addressing the energy consumption of their ground operations by installing building management systems, replacing ground vehicles with electric or higher-efficiency models, and purchasing offsets, to name a few examples.

Case Study Participants

The best practice case studies discussed below include American Airlines, Virgin Atlantic Airways, Continental Airlines, Nature Air, and British Airways.

Some of the most notable initiatives include:

- Comprehensive, multi-faceted initiatives to reduce aircraft fuel consumption, including:
 - development of a prototype carbon-composite jet that consumes less fuel per hour than a Sports Utility Vehicle (Virgin)
 - fleet renewal with more efficient aircraft (All)
 - It should be noted that approximately 90 percent of all orders for the fuel efficient Boeing 787 have been made by international carriers, according to the International Herald Tribune and other sources.*
 - creation of "starting grids" to reduce idling times for incoming and outgoing aircraft (Virgin)
 - retrofits of existing engines with more efficient fan blades (Continental)
 - installation of winglets (American, Continental)
 - replacement of tail cones (American),
 - weight reduction by removing excess equipment (Virgin, Continental)
 - towing aircraft instead of taxiing (Continental),
 - taxiing on one engine (Continental),
 - continuous descent approach (Virgin)
 - flight planning for higher fuel efficiency (American, Continental)
 - using ground power when not in flight (American, Continental), and
 - washing of aircraft and engines (American, Virgin, Continental)
- Providing carbon offset options for passengers (Virgin, Continental) and even offsetting emissions from all company fuel use (Nature Air)
- High-efficiency building management controls (American), energy efficient office equipment (Virgin,) and an entirely new terminal heated mainly by waste heat from the existing airport and power station (British Airways)
- Sustainability reporting guidelines and ISO 14001 environmental certification at airports
- Aircraft manufacturers (Boeing) incorporating renewable energy initiatives^{iv}



BEST PRACTICE CASE STUDIES

Case Study: American Airlines

Since its inception in 1934, American Airlines (“American”) has been a major player in the airline industry. They are now the world’s largest airline, contributing over US\$150 billion annually to the U.S. economy and employing over 80,000 people. With over 4,000 flights each day, the company serves 250 cities in 40 countries.^v

Background Information on Best Practice

American’s most effective practice is undoubtedly the development of their Fuel Smart Initiative, which incorporates a large number of techniques to mount a collective front against fuel inefficiency. Launched in April 2003, the program has been a largely grassroots initiative, reliant upon employees’ suggestions on how to become more efficient, as well as their participation in following through with the program.



*Pit-stops like these are less frequent under AA’s Fuel Smart Initiative.
 (Photo courtesy of Jim Walsh)*

The Fuel Smart Initiative incorporates a holistic approach to fuel conservation. American has increased the number of Ground Power Units (GPUs), which provide electricity to parked aircraft. American also tows its aircraft from its hangars to airport gates instead of taxiing using high-speed tractors, and when taxiing is necessary, the company uses only one engine.

To aid in in-flight fuel conservation efforts, American selects the most efficient routes and, wherever possible, works jointly with other carriers and air traffic controllers to negotiate the shortest flight paths. In order to further increase fuel efficiency, the most optimal flying speed is selected by a flight-management computer. Other actions taken by American to maximize fuel efficiency focus on limiting the portion of painted surfaces on planes, reducing reserve fuel from 10 percent to 5 percent on domestic and trans-Atlantic flights, and removing unnecessary items from aircraft such as ovens and trash compactors.

American installs winglets on all new aircraft and is implementing the use of composite material tail cones. Winglets are small extensions affixed to the end of an aircraft wing that are designed to reduce drag and thereby increase fuel efficiency. The replacement of tail cones further help to produce lighter, more fuel-efficient aircraft. Older aircraft is being replaced with 737s, which are much more fuel-efficient.

On terra firma, American has implemented a number of strategies to increase energy efficiency. Energy Star-certified computer monitors, which “sleep” faster than others, are used in the company’s offices. Energy-efficient lamps have been installed in cargo and annex buildings, as well as three hangars at Los Angeles International Airport. A new Metasys building automation system has been installed at John F. Kennedy International Airport, which controls the terminal’s heating and cooling systems and is integrated with the fire alarm system, moving walkways, escalators, elevators, lighting systems and emergency generators, as well as providing an automated equipment maintenance management system.^{vi}



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Steps in Implementation

To organize its research efforts, American created a Fuel Conservation Task Force that included members from key departments and internal communications specialists from Weber Shandwick. The team first conducted research to gather data on the financial impact of fuel prices, fuel consumption, and fuel burn statistics, as well as the current and potential impact of each of the top 12 fuel conservation initiatives. Additionally, existing corporate communications channels, as well as those within each of the targeted work groups, were analyzed to determine best avenues for reaching employees across the system. The team evaluated the cost and feasibility of creating new communications channels to supplement the existing ones.

Next, tailored messages were created to reach employees within targeted workgroups who were either frequently in transit or remotely stationed on the ramp at airports across the U.S. The research revealed that different employees relied on, or accessed, various channels to obtain information. To reach targeted workgroups, Fuel Conservation Task Force leaders presented the Fuel Smart program to key departmental communications staff and frequently met with front-line employees in the field. A comprehensive delivery method was initiated to communicate with all employees. To ensure the Fuel Smart messages would reach the company's broad employee base, the communications plan included existing and new corporate communications channels, workgroup-specific initiatives, and union communications. Separate plans were developed, as needed, for each targeted workgroup that included tailored key messages and tactics. Fuel Smart features were posted on departmental Web sites, within workgroup newsletters and emails distributed in the field, and on hotline scripts. Frequently updated key messages and talking points were provided to field managers to share at weekly meetings. With union communications, similar tactics were implemented. First, fuel conservation leaders shared the Fuel Smart program with key union communication officials. Content and talking points were provided to the union

communicators, who in turn shared the messages with its members.

For budgetary reasons, much emphasis was placed on creatively leveraging existing corporate and departmental communications channels and securing sponsorship for new communication initiatives. The strategy was to first inform employees of the financial impact of the higher fuel prices. Although these costs were largely out of American's control, the company was taking active steps to conserve fuel through the launch of Fuel Smart. Second, it was critical to communicate to all employees that they must be "Fuel Smart" by complying with the initiatives and submitting new ideas to achieve fuel savings. Additionally, the Fuel Smart campaign was built around communicating employee success stories to recognize the outstanding achievements of workgroups, teams, and individual employees.

In terms of execution, a Fuel Smart logo with the tag line "You Make the Difference" was developed to reinforce the important role employees played in the success of the company's fuel conservation efforts. And, as mentioned, several new communications channels were created to capture employees' attention. In June 2007, for example, a special issue of American's employee newspaper, *Flagship News*, was distributed and focused exclusively on Fuel Smart. In this edition, employees read an overview of fuel conservation work underway within the company, experienced a day in the life of a "Fuel Smart" aircraft, and learned about employee fuel conservation success stories. In addition, a special section highlighted potential fuel savings for aircraft. Fuel Smart updates are now regularly placed in American's quarterly editions of *Flagship News* and AATV, American's employee broadcast program. And, during the initial launch of the program, short internal emails called Jetwire were sent bi-weekly to employees on a variety of Fuel Smart related topics.

To compliment written communications, an e-mail address was set up to capture employee ideas, comments, and questions about the new conservation program, and was included in all communications. A Fuel Smart Web site was launched on American's employee intranet, Jetnet, highlighting current fuel



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facts, daily oil and jet fuel prices, employee success stories, and departmental features. Five video clips were streamed and posted on the site as well. A special message from American's Chairman and CEO, Gerard Arpey, was also posted on the site to reinforce top-level executive support for the program. To reinforce the messages with employees through external channels, media outreach was conducted immediately following the internal launch of Fuel Smart.

Resources Required

To a great extent, American used existing resources and dedicated them to the Fuel Smart Initiative, particularly in the way of manpower. "We didn't add any department heads or other positions, or bring in any consultants that I know of; we just dedicated time to the project because we knew it was worth our efforts," said Jim Walsh, Managing Director of Environmental Affairs. "It was largely a homegrown effort."^{vii}

As for the capital expenses and operational costs, each practice requires different resources. The sum total of expenses was not available at the time of this report; however, some examples of projects requiring capital investments include winglets, new ground power units, and high-speed tractors.^{viii}

American's concrete, tangible results are a reduction in fuel use, and therefore fuel costs, as well as energy use and energy costs. They measure their fuel savings in terms of the number of gallons not burned by employing these techniques. In 2006, American reduced fuel consumption by 95 million gallons and American Eagle by 15.7 million gallons. Estimated combined savings in 2007 were 96 million gallons for American and 21.4 million gallons for American Eagle. Since 2003, these projects have resulted in a combined annual greenhouse gas emission reductions of 908,000 metric tons of carbon dioxide equivalent. These numbers have grown steadily since the inception of the program and are expected to continue to do so in the future.

American's goal is to reduce their fuel consumption 20 percent by 2020, but they communicate their progress in terms of gallons for ease of understanding and

greater impact.^{ix} A partial list of specific results featuring annual savings as they relate to each practice is detailed below:

- High-speed tractors for towing aircraft: 4.5 million gallons
- Winglets: 100,000-200,000 gallons per aircraft
- Reduction of paint on aircraft: 11.9 million gallons fleet wide
- Taxiing on one engine: 30 percent fuel reduction, equivalent to US\$4 million
- Reduction of reserve fuel: US\$10.6 million
- Optimal flying speed as determined by flight-management computer: 18 million gallons, equivalent to US\$30 million
- Selection of the shortest route possible: US\$4 million
- Weight reduction by 50 pounds per flight: US\$1 million
- Replacement of 105 high-drag tail cones: US\$3 million^x



*This engine-washing machine improves fuel efficiency.
(Photo courtesy of Jim Walsh)*

Monitoring and Evaluation

The program was evaluated in terms of fuel consumption reduction, reach, and employee response. As the program continues, more value and successes are added. Results show the program has been enormously successful. American and American Eagle saved 117,000,000 gallons of fuel in 2007, saving approximately US\$248,000,000 at an average fuel cost of US\$2.12 per gallon. 93,385 issues of the Fuel Smart *Flagship News* were sent to American employees across



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the country. The newspaper was extremely well received by employees. One flight department executive shared, "I've never seen an issue of the *Flagship News* actually being studied, but this one is being studied for the content. It's a hit with the pilots." Through the use of all internal communication outlets (AATV, *Flagship News*, Jetwire, and on the Jetnet homepage) Fuel Smart messages and employee success stories were woven into every part of the enterprise. More than 13,000 employees visited the Jetnet Fuel Smart web site, and more than 500 employees sent ideas, questions, and success stories to the Fuel Smart Web site.^{xi}

Replicability

Anyone could easily replicate this practice, but as Walsh says, they have to have the drive. "There isn't an awful lot of this that is unique; it's a matter of developing the will. That means changing the way you've done things in the past and being able to break those molds. For an old, established company like ours, you'd think there would be a lot of resistance. But that wasn't the case at all, if for no other reason than the fuel savings that would come as a result."^{xii}

American's advice to aspiring fuel savers: stick with it. There are a lot of little ideas and a lot of big ideas, but look for the whole spectrum and get everyone engaged. Anyone can do this – the fact of the matter is that every airline knows how to save fuel. It's just a matter of getting their employees to help them do it.^{xiii}

Success Factors:

"You Make the Difference." The Fuel Smart program was formed with the purpose of re-engaging American employees in the company's fuel conservation efforts.

American Airlines, like other carriers in the industry, has been struggling with the rising cost of jet fuel. A one-cent increase in the price of a gallon of fuel translates into an additional US\$33 million annual cost for AMR.

Fuel now represents more than **28 percent of expenses**, compared to 2002, when it constituted just 12 percent of the airline's annual expenses.

American is re-engaging with its employees through a program called "Fuel Smart." The "Fuel Smart" program is a continuous improvement process designed to streamline fuel conservation efforts across all employee workgroups at American. The idea is to allow employees to engage and inspire employees to share and help implement ideas that can further reduce fuel consumption.

Challenges and Pitfalls

The challenges faced by American include the current high price of fuel, the lack of alternative fuels in the market, and the long lead times inherent in new engine and aircraft design.

Lessons Learned

American has involved every employee in their efforts to become more energy efficient and to cut costs. Also, through their leadership roles in IATA and the ATA, they continue to work towards industry solutions to the energy problems facing airlines worldwide.

Case Study: Virgin Atlantic Airways

In 1984, Sir Richard Branson, then CEO of Virgin Records, founded Virgin Atlantic Airways. Virgin Atlantic is currently the second largest long haul airline in the UK and the third largest trans-Atlantic European carrier, with destinations in the U.S., Caribbean, Far East, India, and Africa. The airline has been co-owned by Singapore Airlines since 2000, when Branson sold 49 percent of his stake in the company.^{xiv}



Virgin Atlantic's new fuel-efficient Dreamliner aircraft.
 (www.virgin-atlantic.com)



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Background Information on Best Practices

Virgin Atlantic employs many effective energy-saving techniques, including creating “Starting Grids” for all aircraft departures. A starting grid is a holding area, close to the runway, consisting of several parking bays for aircraft. It allows aircraft to be towed closer to a runway before take-off, substantially reducing the time that engines need to be running. After being towed by a small tug from its stand, an aircraft can start its engines once on the starting grid, around 10 minutes before actual take-off. This practice substantially reduces the amount of time aircraft need to taxi with their engines running and the time spent queuing before take off. Starting grids also reduce congestion around stands, allowing aircraft that has recently landed to get onto the stand more quickly, thereby lessening time spent with engines running. Aircraft arriving can also turn off their engines after five minutes and be towed to their stand, reducing a considerable amount of carbon dioxide emissions as an added benefit. The company is also utilizing a Continuous Descent Approach whenever possible, a method that is designed to reduce fuel burn and noise, which involves maintaining a constant three degree angle during descent, until meeting the Instrument Landing System.



Awaiting take-off in the starting grid (www.abtn.co.uk)

To save additional fuel, there has been a strong focus on reducing weight on aircraft, including utilizing lighter-weight paint, lighter onboard fittings, replacement of metal with carbon-fiber when possible (oxygen tanks, cargo bins, etc.), reduction of potable water onboard, and removal of unnecessary items prior

to departure, such as newspapers and magazines, unopened drink bottles, and empty bottles and cans produced between boarding and takeoff. The company also regularly washes its aircraft and engine compressors. A Fuel Panel has been created, comprised of pilots, engineers, and other experts from the Flight Operations Team, to focus on additional improvements and efficiencies.

To complement energy-saving techniques, the company has ordered 15 787-9 Dreamliners, with options to order another eight 787-9s and purchase rights to an added 20 aircraft. The Dreamliner burns approximately 27 percent less fuel per passenger than the Airbus A340-300 – the aircraft it will replace in the Virgin Atlantic fleet. Virgin Atlantic has taken a leadership role in testing bio-fuels for jet engines, in conjunction with Boeing and GE Aviation, with a demonstration on the Boeing 747-400 to take place in 2008. Branson has pledged to commit all profits from his transportation businesses over a 10 year period to combat global warming – profits that he estimated would reach US\$3 billion. Recently launched by Branson, Virgin Fuels will invest up to US\$400 million in green energy projects and invest in developing renewable energy technologies. The profits will be invested in discovering renewable, sustainable energy sources in an effort to wean the world off of oil and coal and other fossil fuels that contribute to carbon dioxide emissions

In its ground operations, Virgin Atlantic is using renewable energy at UK office sites, as well as energy-saving equipment and appliances.^{xv} The Company is also now offering an onboard Gold Standard carbon offset option for passengers that is an industry first. Endorsed by 49 non-governmental organizations worldwide, including many environmental groups, Gold Standard offsets offer a quality label for CDM (Clean Development Mechanism) projects under the Kyoto Protocol that are independently validated, adhere to best practice methodology, and support renewable energy or energy efficiency technologies. Branson comments: “Virgin Atlantic is offering the world’s first ever scheme enabling passengers to offset their air travel during their flight. This effective carbon offsetting option is unique as it supports only Gold Standard projects. We hope our passengers will be



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keen to become members of our Gold Standard Mile High Offset Club!^{xvi}

The company also calculated exactly how much carbon dioxide (CO₂) is produced from each of its flights. These calculations were independently verified through CICS (Complete Integrated Certification Services Ltd). The airline then calculated how much CO₂ each passenger would be responsible for, taking into account the variances in each class of travel and the amount of cargo on each route. Upper Class passengers pay more than Premium Economy and Economy passengers because their seat and In-flight Entertainment monitors are significantly heavier.

In September, 2006, the growing issue of climate change spurred Branson to call on the global aviation industry to develop a shared solution to reduce both the current and future impact airlines have on the environment. By initiating practices and programs such as towing planes, offsetting carbon emissions, reducing the weight of aircraft, Continuous Descent Approaches, bio-fuel research, and purchasing fuel efficient planes, the company estimates that they will reduce carbon emissions by over 150 million tons a year.

Virgin Atlantic's goals are not only to reduce their own emissions by improving fuel efficiency 30 percent by 2020, but also to act as a leader in the aviation industry, in the hopes that other airlines will follow suit and do their part in the fight against climate change.^{xvii}

Steps in Implementation

Every employee at Virgin Atlantic believes that they can reduce their impact on global warming. Pilots receive additional training sessions on efficient flying, cabin crew learn different means to reduce the weight onboard prior to takeoff, and both the UK and the U.S. headquarters maintain extensive sustainability procedures and practices. Virgin Atlantic employees are committed to seeing the company's existing and upcoming plans of action through, and to moving towards a greener aviation industry.^{xviii}

Monitoring and Evaluation

The use of starting grids reduce fuel consumption and on-the-ground carbon dioxide emissions by over 50 percent ahead of take-off at London's Heathrow airport for Virgin Atlantic aircraft, and by nearly 90 percent for Virgin Atlantic flights at JFK International Airport in New York. It also means that an aircraft flying from JFK to Heathrow can carry around two tons less weight from reduced fuel needs in the air, allowing fuel burned to be considerably less, thereby reducing CO₂ emissions even further. Tests of these towing grids have experienced nearly seamless executions at Heathrow (one of the world's busiest airports), London Gatwick, and San Francisco Airport. Additionally, towing aircraft versus taxiing aircraft affords communities within close range of the airport a benefit from reduced noise levels associated with planes.

Virgin Atlantic has also received positive feedback from their carbon-offsetting program, and they are beginning to see success in their efforts to lead the industry in global innovations and sustainability programs, as many airlines are now adopting their own policies and programs to combat global warming.^{xix}

Case Study: Continental Airlines

Continental Airlines began its long and distinctive history on July 15, 1934 in the American Southwest. Since that first flight from Pueblo, Colorado to El Paso, Texas over 70 years ago, Continental, including Continental Express and Continental Connection, has expanded its services to more than 2900 daily flights serving 144 domestic and 139 international destinations, and over 69 million passengers per year. In 1982, the airline merged with Texas International and moved its headquarters to Houston, Texas.^{xx}

Background Information on Best Practices:

To maximize energy efficiency and minimize fuel consumption and emissions, Continental operates only twin-engine aircraft as opposed to the less efficient three- and four-engine planes. In addition, the company has committed to invest in additional new,



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fuel-efficient aircraft and ground equipment with cleaner technology. Continental is securing 25 Boeing 787s equipped with GE's emissions-reducing GENx engine, making it the most environmentally advanced aircraft in the world. The company has also installed advanced-technology GE90 3D Aero Blades – a more efficient fan blade – on their Boeing 777 engines, reducing emissions and fuel consumption on their longest-range aircraft. At the end of 2007, Continental had equipped more than 200 aircraft in their fleet with winglets, wingtip extensions that lower aircraft drag and result in up to a five percent reduction in emissions and noise.



Drag-reducing winglets (www.Boeingmedia.com)

Continental is actively partnering with their more than 45,000 employees and other stakeholders to further enhance energy efficiency initiatives. For example, the company is working with governments around the world to identify more efficient air traffic routes and airspace configurations, has implemented changes in procedures and operations that enable pilots to maximize their fuel usage, and invested in technology and personnel in the company's System Operations Coordination Center to improve flight planning. They have enhanced their flight planning system to minimize fuel burn and will be implementing a new flight planning system with next generation technology to further reduce emissions and fuel usage. The new system will accomplish this by better predicting the effects of weather conditions, altitude, geographical features, and airport congestion, enabling the flight plan to be adjusted accordingly.

Other initiatives include the reduction of the use of fuel-driven thrust reversers on landing, the employment of one-engine taxiing when possible, the towing of aircraft instead of taxiing when feasible, routinely washing aircraft and engines to reduce drag and emissions, and the continued reduction of emissions through aircraft weight reduction initiatives, such as removing unnecessary service equipment and transitioning from steel brakes to lighter carbon brakes. Wherever possible, Continental also provides aircraft parked at the gate with air conditioning and electric power via alternative, energy-saving methods, rather than using the aircraft's own auxiliary power units.^{xxi}



Electric Ground Support Equipment (photo courtesy of Roy Conn)

Continental has seen some of its greatest results due to pilots' increased ability to control the many variables that effect fuel efficiency. This increase has come as a result of pilot training, as well as enhanced communications that enable pilots to conserve as much fuel as possible by turning off their engines seconds after planes are connected to the terminal's power. Roy Conn, Air Compliance Manager for Continental, said that they have systems in place that ensure pilots and other employees are taking every opportunity to conserve energy and fuel, but they do not often have to employ these systems.

Conn explains: "Most of our employees are very happy to work with us on these kinds of initiatives. They recognize that their bonuses are connected to the profits of the company, but more importantly, they have a genuine interest in flying green. It's a great thing



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that we have people who are really interested in having a sound environment for the future for all of us.”^{xxii}

Resources Required

Over the past decade, Continental has invested more than US\$12 billion in more fuel-efficient aircraft and related equipment and more than US\$200 million in more efficient and cleaner technology in their ground support equipment. They have also committed to invest over US\$9 billion in additional aircraft and equipment with even cleaner, more efficient technology through 2013.

It is estimated that ongoing project expenses will be offset as a result of energy and fuel savings, though the exact amounts of these costs and savings were not available at the time this report was published. Since the variables in calculating these figures are both complex and quite numerous, the company is currently evaluating tools to help them better identify what they are achieving so that they can then place a value on their energy and resource efficiency initiatives.

All departments are involved in Continental’s energy initiatives, and contribute to the energy conservation efforts of the company. Though no department has taken on additional hires as a direct result of their new sustainability practices, there has been an increase in various support staff to assist in their implementation.^{xxiii}

Monitoring and Evaluation

This impact of Continental’s various renewable energy practices is measured by using annual fuel usage reports, improved revenue per ton/mile statistics (which indicate the revenue per ton carried and per mile traveled), available seat/mile statistics, energy bills, and other reports.

Success Factors & Benefits:

Continental initiated their push toward energy efficiency in 1997. Investment in a new fleet at a time when the air travel industry was seeing significant loss of revenue was very difficult and required a great deal

of commitment by employees and shareholders. This risk has been rewarded. Over the last decade, the company has realized a 35 percent increase in fuel efficiency for every mile a passenger flies. Much of the time implementing these various practices has been spent tracking the large number of intense operating procedures that are required prior to finalization. Safety is the primary reason for this approach, but staff education has also been a factor, as Continental desires to ensure awareness of new procedures and proper operation of new technology.



In terms of carbon offsetting, Continental introduced the first initiative whereby carbon dioxide emissions are calculated based on the specific aircraft used on each of its individual flights. In contrast, other airlines offering offset programs typically utilize calculations based on the average aircraft emissions generated from either short- or long-haul flights. In another industry first, Continental is giving customers who choose to participate in a carbon offset program the opportunity to select from one of the four of the highest quality offset project portfolios available in the marketplace: 1) Gold Standard emission reduction projects, which are renewable energy and energy efficiency projects validated, registered and verified following Clean Development Mechanism principles under the Kyoto Protocol; 2) international reforestation projects that preserve and/or create critical forests and that are designed using the standards set forth by the Climate, Community, and Biodiversity Alliance; 3) U.S. Green-e certified renewable energy projects, such as wind farms; or 4) a combination of these projects. In addition to offering a carbon offset project for individual customers, Continental now has the ability to provide its contracted corporate customers with detailed reports providing total carbon emissions associated with their business travel with the company.



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Although the company has received a number of awards for its efforts toward sustainability, Continental is now receiving recognition and appreciation from their customers as well as their local and international communities.^{xxiv}

Challenges and Pitfalls

Continental continues to work with national and international governments to improve air traffic control systems so that aircraft routings will result in fewer greenhouse gas emissions. This has proved to be a challenge in the past, as many countries require payment for utilizing their airspace, which at times is less economical than rerouting the flight hundreds of miles. Conn says that they are beginning to experience a change in this area. "I've seen more cooperation among various governments and air traffic controllers than ever before. There's so much interest in the green movement that everyone seems to be willing to come to the table with open minds and fresh perspectives, and they're not afraid to rework the rules to help do the right thing."^{xxv}

Beta Box: Nature Air

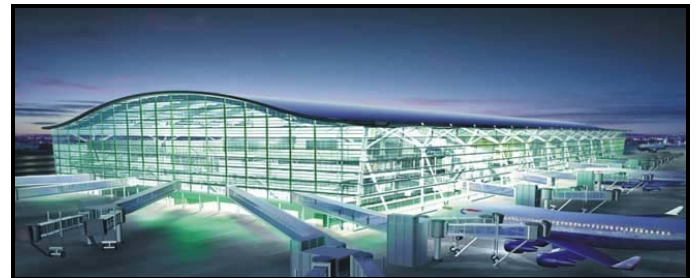
In 2000, Nature Air was launched in Costa Rica with just one aircraft. Since then, the airline has grown to accommodate over 110,000 passengers, making 74 daily flights to 17 destinations in Costa Rica, Nicaragua, and Panama. It has recently achieved carbon neutrality through the purchase of carbon offsets that support both solar and wind farms, as well as forest conservation in Costa Rica's Osa Peninsula.



Nature Air's Twin Otter aircraft. (www.treehugger.com)

To reduce their energy use, the company provides bus service for their flight crew and other staff, uses energy-saving light bulbs, and employs one-engine taxiing. Nature Air's fleet is mostly comprised of DeHavilland Twin Otters, which are acclaimed as the quietest and most fuel-efficient airplanes in their class. Nature Air is currently researching alternative fuel sources for their fleet, which include ethanol and pig waste.^{xxvi} The company recently announced that it will also be launching an inter-company bio-fuel station for company and employee cars.

Beta Box: British Airways



Heathrow's energy efficient Terminal 5 (tpa.typepad.com)

British Airways is participating in a number of significant activities to improve efficiency and reduce emissions. Since 1990, the company has achieved a 28 percent reduction in fuel consumption, and has, consequently, set a new target to reduce consumption a further 25 percent by 2025. The airline's ground operations have improved energy usage drastically by installing energy-efficient lighting and water coolers at the company's terminal at JFK International Airport. In addition, their new Terminal 5 at Heathrow Airport is heated mostly by waste heat from the existing airport and power station. The company is currently investing heavily in newer, more efficient vehicles for ground staff and operations, and actively pursues providing customers the option of calculating and offsetting their carbon emissions.^{xxvii}

Beta Box: Airports Reduce Environmental Impacts

Estimates of air travel during the 2007 holiday season suggest that airports worldwide handled approximately five billion passenger trips. Reducing the associated



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environmental impacts proves to be a challenge for all but the most progressive airports. Airports in Athens, Frankfurt, and Munich have joined together to create sustainability reporting guidelines.

According to Matthias Linde, Head of Environmental Strategy for the Munich Airport operating company, Flughafen München GmbH (FMG), establishing a common framework for reporting is important because "we want to transport our passengers in the safest and most secure way possible, while also maintaining high environmental and social standards that we can easily communicate through globally understood and accepted sustainability reporting guidelines."^{xxviii}



Athens, Frankfurt, and Munich Airports have chosen to work with the Global Reporting Initiative (GRI) – the creator of the most widely used reporting framework for sustainability reporting – to create customized reporting indicators specifically for airports. The sector indicators will be developed in a consensus seeking process involving airport stakeholders (employees, investors, customers, communities, and others) and interested parties from all corners of the globe. Peter Marx, Vice President Environmental Management at Fraport in Frankfurt said: "As Fraport owns quite a few airports around the world we would like to be able to use sector specific reporting guidelines that are globally applicable. Stakeholder concerns are similar around the world but in some countries emphasis on certain concerns lay differently."^{xxix}

Pakis Papademetriou, Manager, Corporate Quality at Athens International Airport added that "GRI is the global language of sustainability. We need to work on adapting these GRI guidelines on the particularities of our business so that we effectively manage, measure and communicate our impact on the natural and social environment. It is not about charity, it is not about boosting the corporate image. It is about applying sound business practices that help ensure our long term success in all aspects of our operation. The best way to strike a balance among stakeholder expectations is to ensure that all the people involved are around the table."^{xxx}

Sustainability reports based on the GRI reporting guidelines enable users to compare company performance, and have been used in other sectors as more than a communications platform but also a management tool for the integration of sustainability strategies into overall business processes. The airport industry becomes the latest segment of the global transportation infrastructure to take up the sustainability challenge behind others such as logistics and automotive which have already worked with GRI to create sector specific reporting guidance.^{xxxi}

Beta Box: Air Traffic Control

The International Air Transport Association has predicted that 12 percent of global aviation carbon dioxide emissions could be saved if air traffic control systems were more efficient. The basic design of the U.S. air traffic control system, for example, dates back to the 1950s. Because the design is dated, it is anticipated that as demand for air travel and greater environmental responsibility continues to increase, the need to update the system becomes more paramount. To help expedite the process of enhancing efficiencies and optimizing the use of air space, air traffic control systems should to be consolidated. In Europe, for example, there are currently 35 different air traffic control organizations while in the U.S. there is just one – the Federal Aviation Administration (FAA), which is helping to expedite the process of increasing efficiencies. Case in point, FAA Assistant Administrator, Daniel Elwell, recently outlined a five-point plan to address aviation greenhouse gas emissions through operational and technological environmental performance improvements, coupled with market measures where necessary.^{xxxii}

Given the magnitude of the challenge of addressing global climate change and the fact that peak oil production is looming, airlines and air travel associations need to continue to pressure stakeholders and governments around the world to identify efficient air traffic routes and airspace configurations and implement more efficient, technologically advanced air traffic control systems.



ADDITIONAL RESOURCES

- Airbus - Ethics & Commitments – Environment: www.airbus.com/en/corporate/ethics/environment
- Air Transport Action Group – Member Publications:
<http://www.atag.org/content/showpublications.asp?folderid=441&level1=4&level2=441&>
- American Airlines – Our Commitment to the Future: www.aa.com/content/images/amrcorp/amrerr.pdf
- Boeing – Environment and Safety: www.boeing.com/aboutus/environment
- British Airways – 2006-2007 Environmental Report:
http://www.britishairways.com/cms/global/pdfs/environment/Environmental_overview_report.pdf
- British Airways – 2005-2006 Corporate Responsibility Report:
http://www.britishairways.com/travel/corpresp06fwd/public/en_gb
- British Airways 2004 Social and Environmental Report:
http://www.britishairways.com/travel/corpresp06envt/public/en_gb
- CICS, a greenhouse gas verification company: www.cicsltd.com
- Continental Airlines – Commitment to the Environment Brochure:
http://www.continental.com/web/en-US/content/company/profile/continental_environment_2007.pdf
- Continental Airlines – Commitment to the Environment web page:
<http://www.continental.com/web/en-US/content/company/profile/environment.aspx>
- Continuous Descent Approach: http://en.wikipedia.org/wiki/Continuous_Descent_Approach
- Energy Star: www.energystar.gov
- Friends of the Earth – Climate Change: www.foei.org/en/campaigns/climate
- GE Aviation – Environment, Health and Safety: www.geae.com/ourcommitment/ehs
- GreenAir Online: www.greenaironline.com
- The International Air Transport Association: www.iata.org
- The International Air Transport Association - Airline Environmental Reporting 2001 Survey:
www.iata.org/ps/publications/aer2001.htm
- Johnson Controls, manufacturer of the Metasys automated building systems: www.johnsoncontrols.com
- Nature Air – Corporate and Social Responsibility: www.natureair.com/aboutus/corporate.html
- Rolls-Royce – Environment Report 2007: <http://www.rolls-royce.com/community/environment/default.jsp>
- The Society of British Aerospace Companies – Sustainable Aviation Board: www.sbac.co.uk/pages/66912478.asp
- Sustainable Aviation: www.sustainableaviation.co.uk
- Virgin Atlantic’s Sustainability Challenge: <http://www.virgin-atlantic.com/en/us/allaboutus/environment/index.jsp>
- VA’s Environment Policy 2007: http://www.virgin-atlantic.com/tridion/images/environmentpolicy_tcm4-540700.pdf



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Credits

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Sustainable Travel International was subcontracted by the above partners as the lead author of the RETI best practices series, with guidance provided by an industry advisory board. Board members include Mr. Chris Adams, Director of Online Marketing, Miles Media, Inc. and Mr. Tim King, Program Manager, Colorado State Parks. Coordination for the RETI project has been provided by Tara Low and Wendy Kerr, Leeds School of Business, University of Colorado at Boulder. Principle Investigators for the project include Dr. Patrick Long, Director, NCCST and David Corbus, Senior Mechanical Engineer, National Wind Technology Center, NREL.

The best practices are a collaborative effort, and final information reflects consensus from the editorial board and contributors. Further contributions are welcomed from all industry members, should be merit- and science-based, with participation being nonexclusive.



*New airport terminals are being built to utilize passive solar
 (Photo courtesy of Roy Conn)*



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