Benchmarking Key Success Factors for the Future Green Airline Industry

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Abstract

The airline industry is one of the fastest growing industries as well as transportation modes in the world. Global airline contributes about 2% of global greenhouse gas emissions and supports 8% of the world economic activity in terms of GDP. Along with the rapid growth of the airline service industry, climate change issue is getting more attention due to its increasing adverse effects on human and earth. Competing and winning in today's economy required a strategy that incorporates environment sustainability. In recent decades, airlines and aircraft manufacturers have become increasingly committed to becoming more "green," or environmentally friendly. To close the gaps, a research has been done in order to eliminate as much potential harm to the environment as possible and make air travel as efficient and economical as it can be by identifying the key success factors toward Green Airlines. A research was conducted based on the secondary data from the Green Airlines international data sample to provide airlines and aircraft operators a common framework for identifying and implementing practical and measurable processes, innovative practices, and operations. The operation of Green Airlines only focuses from gate to gate destination with giving impact on the customer experience on the services. Through the benchmarking for high performing green airlines, a green airline framework can be a solution for future Green Airline Industry. The research highlights and demonstrates the need for a degree of understanding of key success factors when comparing airline performance measures with each other.

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1. Introduction

Airline is a critical part of our national economy, providing for the movement of people and goods throughout the world, enabling our economic growth. Because of strong growth in demand, emissions of some pollutants from airline are increasing against a background of emissions reductions from many other sources. In addition, progress on noise reduction has slowed. Millions of people are adversely affected by these side effects of airline. As a result of these factors and the rising value being placed on environmental quality, there are increasing constraints on the mobility, economic vitality and security of the nation (Waitz, Townsend, Cutcher-Gershenfeld, Greitzer & Kerrebrock, 2004). *Green Airline* is a new concept – an initiative to support sustainable social and economic development without forfeiting the local and global environment (Sarkar, 2012). *Green Airline* aims to provide green society with a transport system that reduces carbon footprint, uses renewable energy and produces less CO_2 and other harmful pollutants. Proper planning and design is the key service excellent to make it possible to decrease land use, especially farm land, increase energy efficiency through operational improvements and reduce harmful pollutants by improved energy pricing and socially responsible economic assessment of alternatives (ADB, 2009). The public awareness of the environmental issues surrounding transport is very significant but the air transport sector attracts particular attention. Airline technologies, airport planning (including the supporting transport infrastructure) and air traffic management are all vital components in a complex multifaceted challenge that the air transport sector must address to deliver greener air travel for future generations. According to the Transport and Environment (2013), aviation emissions account for about 5% of cumulative global warming and some 2% of worldwide annual CO_2 emissions.

1.1. Environmental impact of airline on climate change

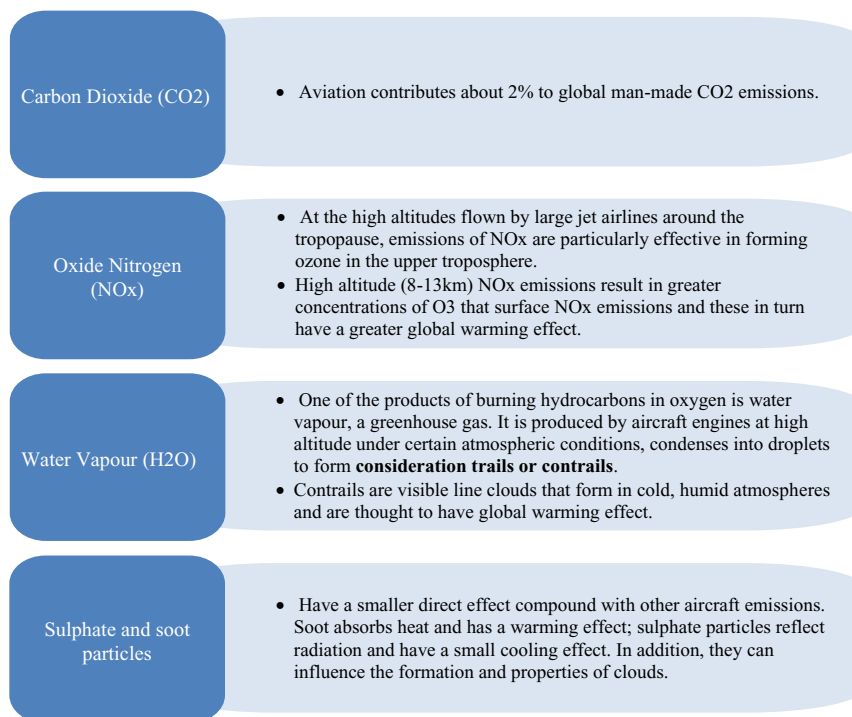|	
Carbon Dioxide (CO2)	• Aviation contributes about 2% to global man-made CO2 emissions.
Oxide Nitrogen (NOx)	• At the high altitudes flown by large jet airlines around the tropopause, emissions of NOx are particularly effective in forming ozone in the upper troposphere. • High altitude (8-13km) NOx emissions result in greater concentrations of O3 that surface NOx emissions and these in turn have a greater global warming effect.
Water Vapour (H2O)	• One of the products of burning hydrocarbons in oxygen is water vapour, a greenhouse gas. It is produced by aircraft engines at high altitude under certain atmospheric conditions, condenses into droplets to form **consideration trails or contrails**. • Contrails are visible line clouds that form in cold, humid atmospheres and are thought to have global warming effect.
Sulphate and soot particles	• Have a smaller direct effect compound with other aircraft emissions. Soot absorbs heat and has a warming effect; sulphate particles reflect radiation and have a small cooling effect. In addition, they can influence the formation and properties of clouds.

Fig. 1. Breakdown of emissions and its impact on environment. Source: Maria (2014).

The aviation industry's commitment and action to improve environmental sustainability is essential if the industry is to continue to grow. The industry is united and working in partnership on a comprehensive environmental strategy with tough targets. But the industry still needs governments to step forward with practical policies, particularly on biofuels, infrastructure, and global economic measures. According to the latest UN IPCC report, the transport sector accounted for 27% of global CO_2 direct emission in 2010, with baseline CO_2 emissions projected to approximately double by 2050 (Airportwatch, 2014). Thus far, global aviation contributed to the observed global warming of 0.7°C about 0.02-0.03°C (ca. 3-4 %). Most forms of aviation release carbon dioxide (CO_2) and other greenhouse gases into the Earth's atmosphere, contributing to the acceleration of global warming. There are four types of gas emissions released by the airlines (see Fig.1).

Supported by International Civil Aviation Organization (ICAO) on environmental report 2010, they are estimated to be less than 2% of global human-made CO2 emissions. While projected global aviation fuel consumption and efficiency through the year 2050 reveal that on a per flight basis, fuel efficiency is expected to improve over the period (ICAO, 2010a). Even though there are many types of emissions gases, only CO2 is the highest contributor among greenhouse emission gases. According to International Air Transport Association (IATA), they targeted an improvement in fuel efficiency by about 1.5% per year from 2009 to 2020 and reduction in aviation CO2 emissions of 50% by 2050 relatively to 2005 levels (IATA, 2015a).

2. Literature review

Aviation is a critical part of our national economy, providing for the movement of people and goods throughout the world enabling our economic growth (Waitz et al., 2004). Despite dramatic progress in reducing the environmental effects of aviation and despite the relatively small contribution that aviation currently makes to environmental impacts in our country, environmental concerns are strong and growing. The concept of 'Greening' the airline enterprise in the same breath can be best linked to reduction of emission level in the atmosphere, closest to the point of achieving near carbon neutrality (Sarkar, 2012). Aircrafts emit a variety of greenhouse and other gases, including carbon dioxide which is the most significant greenhouse gas emitted by aircrafts while nitrogen oxides, as well as other substances such as soot and water vapor are believed to negatively affect the earth's climate. Carbon dioxide (CO_2) emissions from aircraft are a direct result of fuel (hydrocarbons) burning and have a strong relation with fuel consumption. In Fig. 2 shows the relative contributions of industry, transportation and all other sources to global carbon dioxide emissions and breaks down transportation's share to illustrate the relative contributions of 74% road traffic, 13% aviation and 13% other transportation sources.
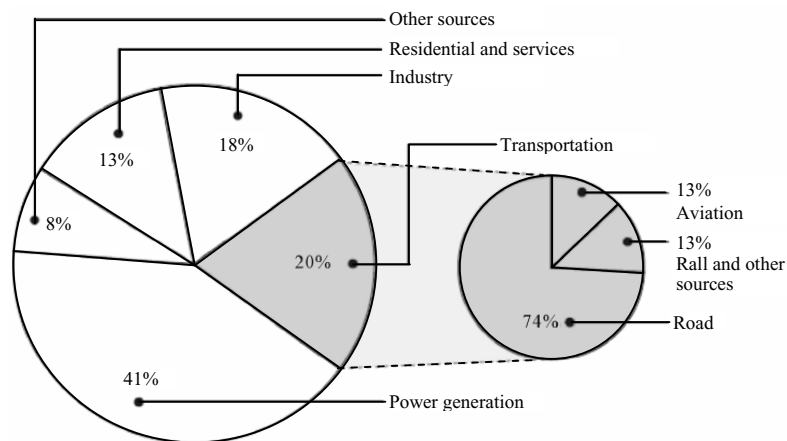

Fig. 2. Global aviation emission on carbon dioxide. Source: GAO (2009).

Based on Kronenberg and White (2008) from Booz and Company Inc., three distinct steps suggested in reducing jet fuel consumption are:

- Invest in upgraded equipment and processes that increase fuel efficiency or reduce fuel consumption by optimizing routes and procedures.
- Transition to alternative sources of fuel (Ex: Biofuels).
- Change the business model and metrics by which performance is measured.

They are more attracted to improve on fuel consumption and change the strategic planning of the organization. From these actions, the impact on CO_2 reduces rapidly and keeps environmental sustainability. Commercial interest in aviation biofuels is moving so quickly that it is difficult to stay abreast of the pace of new developments and new data and research on their potential merits. The potential greenhouse gas benefits are the subject of on-going debate and almost certainly depend heavily on the types of biomass used (OECD, 2012). However, biofuels is capable of absorbing atmosphere carbon and growing the biofuel crop. Only this way the combustion of biofuel has come to be regarded as "carbon neutral" (OECD, 2012; Sarkar, 2012). On the other hand, estimated utilization of biofuel is more than 50% (Djojodihardjo, 2013). To make this action successful, Governments must give the industry the encouragement it needs through a set of legal, fiscal and policy responses that ensure this exciting new energy stream becomes commercialized as quickly as possible. Biofuels could well become a vibrant new industry, providing jobs, inspiring innovation, and assuring an important new fuel source (IATA, 2012). In Fig. 3 shows predictions for further improvement and expected results in cooperation with new technology improvement and biofuels usage.
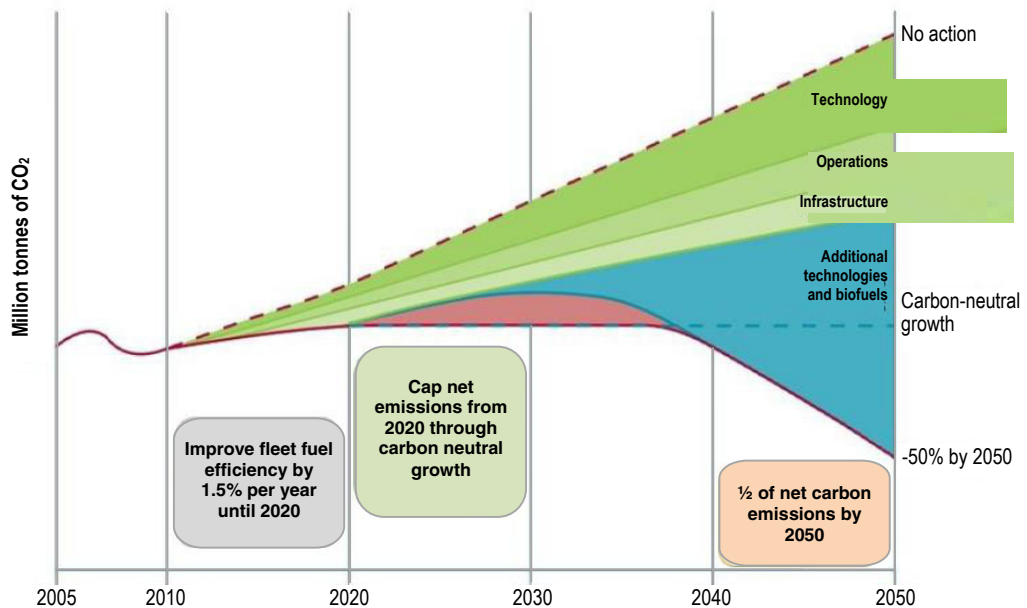

Fig. 3. Diagram of future prediction due to improve technologies and biofuels usage.

2.1. Key success factors for Green Airline

Which airlines are the 'greenest airlines'? Travelers, businesses and passengers are becoming increasingly discerning and becoming aware of t carbon footprint in the airline industry. With 'green' approaches, they feel greater safety, health and convenience. A greener future for airlines holds the promise of new life in airlines because people will be able to enjoy the convenience and commercial benefits of living near an airport without enduring the racket and fumes that are so aggravating today (NASA, 2013). According to IATA Environment Assessment

(IEnVA), there are two implementation phases to poses full Environmental Management System (EMS) (IEnVA, 2015):

    a) Stage 1 allows the airlines to set the framework for its EMS and identify and comply with its legal requirements and other obligations.

    b) Stage 2 allows the airlines to determine the significance of its environmental aspects, set objectives and targets. It also provides the framework for monitoring requirements, internal assessments and management review.

Based on the requirement of IEnVA, there are two third party consultancies established to evaluate and rank the Green Airline and indirectly become the key success factors to acknowledge as Green Airline. The environmental standards and recommended practices for the programme have been specifically designed for the sector and are based on recognized EMS principles such as ISO 14001. The parties involved in sustainable environmental assessment are Greenhorizon Aviation (GreenAir, 2011) and Fly-360-Green (WorldGAC, 2013) where benchmarking and evaluating for high performance airlines based on their environmental initiatives in daily operational activities, corporate environmental management practices, corporate policies and strategic planning. The certification provide the airline industry and airports with a concise framework for identifying and implementing collaborative and measurable green aviation designs, innovations, and operations solutions (AirTransat, 2011). Both parties have similarities but Fly-360-Green evaluated aircraft operators as an additional measures. In Table 1 summarize the benchmarking items for Green Airline.

Table 1. Green Airline Rating System based on three key criteria.

No.	Main Items	Specific Items
1	Daily Operational Activities	Fuel Management Program
		Aircraft Weight Reduction Incentives
		Flight Planning
		Greening on Board
		Ground Operation
2	Corporate Environment Management Practices	Corporate Social Responsibility (CSR)
		Environment Management System (EMS)
3	Corporate Policies / Strategic Planning	Fleet Renewal
		Commute Option Program

2.1.1. Daily operational activities

Airlines are challenged to perform efficiently and effectively on the day of operation that occurs 365 times each year. Airlines face myriad operational challenges – schedule disruptions, limited resources such as aircraft, crew and maintenance personnel and increasing customer expectations (Sabre, n.d.). Daily operations of an airline consist of the following initiatives:

- Fuel Management Program
  According to Sabre (2015b), the airline industry may increase fuel savings by as much as 8% through optimization of flight planning to reduce fuel burn, loading and balancing processes create an optimal center of gravity for every aircraft and avoided from the irregular operations.

- Aircraft Weight Reduction Incentives
  Changes in aircraft design provides the opportunity to reduce aircraft weight (Kronenberg & White, 2008). According to OECD (2012), there are two opportunities to reduce aircraft weight: a) retrofitting of existing aircraft, and b) building new aircraft, for example, lightweight composite materials. With the reductions from composites also result in lower fuel consumption during an aircraft's operational time incorporated

with CO_2 reductions (Agarwal, 2012; Lee et al., 2010; Maria, 2014). Improvement on an aircraft's design may achieve 3% emissions reductions by 2020 (Sarkar, 2012).

- Flight Planning
Flight planning is operational flight plans that need to completed for each intended flight. A flight plan provides the pilot with direction on the route of flight from departure city to destination city, altitude to fly, speed to fly, fuel to carry and aircraft performance factors such as takeoff power and flap settings (Sabre, 2010). Flight planning can impact the economics of the flight utilizing on selecting the most economical route and altitude considering weather and air traffic control constraints, controlling flight schedule, managing fuel load to account for fuel allocations, availability and price differential between airports, controlling departure time based on destination weather to avoid unnecessary diversions and maximizing payload capabilities (Sabre, 2015a).

- Greening on Board
This active program may increase environmental values through waste elimination on board. A useful example of greening on board is onboard recycling programs. The wastes generated from food and drink containers, uneaten food, newspapers, magazines, computer printouts and other paper generated at ticketing counters (Larsen, Kreha, Williams, & Greenia, 2010). Airline industry discarded 9,000 tons of plastics, enough aluminum cans a year to build 58 Boeing 747 jets and enough newspaper and magazines to cover up 230 feet depth of football field (Hershkowitz & Hoover, 2006). Through this program, airlines could result more fuel-efficiency and increase passengers perception regarding green image to reduce environmental impact.

- Ground Operation
Ground Operations involves all aspects of aircraft handling at airports as well as aircraft movement around the aerodrome are safely on board the aircraft prior to departure, except when on active runways (SKYbrary, 2013). This department covers the ground handling activities which include passenger, baggage and cargo handling, aircraft loading and handling, mass and balance, ULD/ baggage preparation for loading, ground support equipment, pushback and headset, de-icing, staff training and etc. (IAA, n.d.). Ground handling operations are paid to reduce environmental impacts through recycling, waste management and community partnership (ICAO, 2010b). IATA (2015b) has recently begun to promote their IATA Safety Audit for Ground Operations (ISAGO) which aims to extend the IATA Operational Safety Audit (IOSA) concept to aircraft ground service provision in the belief that it will help raise overall safety standards amongst the large numbers of service providers involved.

2.1.2. Corporate environmental management practices

Better management practices play a major role in addressing many environmental problems. On the one hand, they are influenced by a variety of external pressures (e.g. from customers, socially concerned investors, environmental interest groups and regulators) while on the other hand firms' own stakeholders increasingly expect 'their' company to behave in a socially responsible manner. Consequently, an increasing number of companies have taken steps to assess, monitor and report on their environmental performance. Corporate environmental management practices include Corporate Social Responsibility (CSR) reporting and having an Environmental Management System (EMS) in place. Environmental protection has become an important part of corporate social responsibility. Environmental Management System (EMS) is a corporate approach based on auditing procedures, similar to the *Plan-Do-Check-Act* model of quality management, which involves setting objectives, measurable targets, a detailed program and a monitoring and evaluation process to achieve a firm's continual improvement of its environmental behavior and performance (Chen, 2013) and obtained ISO 14001 certification. CSR is most commonly defined as "economic, legal, ethical, and discretionary expectations that society has of organizations at a given point in time" and a business obligation to protect and improve the welfare of both society and business as a whole by taking proper legal, moral ethical, and philanthropic actions (Anttila & Kretzschmar, 2010).

2.1.3. Corporate policies / Strategic planning

Corporate policies and strategic planning is the combination of plan to achieve goals and with policy guidelines to lead an airlines business more environmental sustainability and improve green image among passengers and carried near environmental future.

- Fleet Renewal
  As part of ongoing commitment to passengers to constantly improve operations and reduce environmental footprint, an airline had embarked on an ambitious fleet renewal through the introduction of more fuel efficient aircraft (Johnson, 2009). According to AirFrance (2011), modern airplanes are more fuel efficient on the basis of their performance calculated in liters of kerosene per passenger per 100km and yet are able to reduce the production of CO_2, NO_x and noise.

- Commute Option Program
  Commute options relate with healthy transportation choices. Commute option offer shuttle program to create efficiencies while reducing carbon emissions and easing the employees' commuting challenges (EMC, 2015). This program encourages wellness of individuals, a clean environment and strong economy (Bryce, 2015). The program focuses on providing information on commuter options, including active transportation, public transit, carpooling, vanpooling, bike and teleworking for any workplace (Canada, 2014).

3. Conclusion

Much of the work being carried out to 'green' the industry and reduce its impact on climate change is generally undertaken by the larger airlines that can afford to staff environment and CSR departments. But through the key success factors in Green Airlines, it may help the airline benchmarking their green activities based on three criteria (1) Daily Operation Activities, (2) Corporate Environment Management Practices and (3) Corporate Policies and Strategic Planning. On the other hand, this benchmark helps in identifying and implementing practical and measurable process, innovative practices and operations in the airlines as well as promoting sustainable environmental management throughout an airline organization on a regular basis.

Acknowledgements

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