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In the next decade, the Asia Pacific region will witness the largest air traffic growth in human history, with more than 12,000 new planes required to support projected 7% annual growth. This tremendous expansion raises significant concerns for sustainability, and while the region's major carriers have plans for meeting sustainability targets and setting a sustainability strategy, each reflects varying degrees of capability for implementation.

However, most of the focus of research on sustainability in the aviation industry has been on Europe and the United States, with very little investigation of Asia. This research examines the status of sustainability issues facing the aviation industry in APAC, with particular focus on the environmental element. The research method was qualitative and based mostly on interviews with three key APAC airlines, which represent almost 40% of the region's passenger traffic. Interviews made it possible to establish how each carrier views the future in terms of its sustainability challenges and opportunities, and to propose recommendations and proposals that airlines could adopt within a broader sustainability framework.

Sustainability in aviation covers three dimensions: environmental, economic and social concerns. The biggest issues in the environmental dimension include noise, air and ground-level emissions and the overconsumption – and waste - of such resources as food, water and energy. Economic issues cover direct and indirect employment opportunities, innovation and trade competitiveness. The social dimension includes benefits to the public from travel and benefits to local communities.

With the world facing a 5% impact on global GDP due to climate change and significant environmental implications, the airline industry is in the middle of this development, even though it contributes no more than 2% to global emissions. Consider that jet fuel, the single-biggest cost of operations in a flight, also is a flight's single-biggest source of waste and emissions. That's why most of Qantas Airlines'

sustainability initiatives, which are driven primarily by cost reduction, are focused on jet propulsion. However, jet fuel is not only an environmental issue when it is used in planes. Emissions produced during its production and transportation to airports also needs to be considered part of the sustainability picture.

Waste management is another major issue, and one that is becoming a concern to Asian governments. Cathay Pacific has increased its commitment to reducing waste on board its aircraft, as well as on the ground, through sophisticated methods of recycling and reuse. Since 2006 Cathay Pacific has recycled about 30,000 cans, 34,000 plastic bottles, and about 20,000 plastic cups that otherwise would have gone to landfills each year. To curb the waste associated with in-flight over-consumption, Singapore Airlines has deployed a more efficient way of managing in-flight amenities and food demand by using smarter systems for demand forecasting. Singapore Airlines was the first carrier in the world to measure the implications of providing variable in-flight service across its routes depending on length of flight, demographics, and time of arrival and departure – a move that eliminated wasted food and drinks thrown away at the end of flights and reduced costs.

Finally, there is the significant matter of water management. For an airline, this issue goes beyond the concern of wasted water on flights. It involves safety, weight management and ground operations. Said one Cathay Pacific executive: *"For every extra 100ltr of water that we take on board we have to load almost the same amount of fuel—but then again, more fuel means we need to add even more fuel to carry the extra fuel added."* Recently, there has been a focus by aircraft manufacturers on developing new airplanes to ensure efficient use of water management systems, as well as new innovative ways to carry water on board and manage it across the different points of usage differently as it travels within the airplane.

Key findings

Indeed, the aviation industry is addressing sustainability in a number of important ways, starting with the design of aircraft and structures that are smarter, lighter and carrying advanced technology. For example, revolutionary designs such as the "double bubble" concept developed by the Massachusetts Institute of Technology (MIT) in early 2012.will come into play. Another trend with implications on sustainability: as passengers bring on board their own personal devices, airlines find it unnecessary to invest in expensive in-flight entertainment systems.

However, while new aircraft and structures will help address some of the mounting sustainability issues, the impact of those advances will not be as significant in APAC as it will be in other regions, where new technology will be adopted much faster. It will take about 30–40 years to see the significant updates and changes that will really improve efficiency and reduce cost and energy usage. Among the issues: airlines across the region are at very different stages of maturity and evolution. Also, while all major regional carriers are heavily investing in current airplanes to meet growing demand, there is no evidence that this level of investment is sustainable over time and repeatable in the future, when more advanced aircraft and structures will be available.

On the other hand, there are concerns about the need for trained personnel to work with the new technology. The rate of technological development in the airline industry is relatively fast and some Asian carriers jump straight into the latest generation of aircraft when their crews or ground handling personnel may or may not be adequately trained.

In aircraft propulsion, technological advances have significantly reduced noise levels and fuel consumption. However, fuel remains a major concern. Today's engines are still consuming vast amounts of fuel: on average, 15–18 hours a day. The industry will need to take significant brave steps towards adopting other types of fuel such as bio-fuel for propulsion, in order to make significant impact to reducing emissions levels.

The aviation industry has been a major supporter of recycling for many years, and airlines repeatedly have shown their commitment to recycling, whether it is waste, or onboard equipment, or end-of-life airframes. However, despite this impressive track record, efforts have not met their full potential and airport operations remain a huge challenge, especially in waste management. For example, the lack of recycling infrastructure at airports across China may mean that if any airline wants to pursue a holistic recycling programme, it will have to be done at its own expense. This seems quite unlikely given the cost pressures facing China's major carriers.

Air Traffic Control (ATC) operations are under stress and trying to cope with increased flights and aircraft. Airlines in the region will need to make heavy investments in systems that will allow air traffic management to be seamless, so airlines can operate more efficiently. For example, within China an upgraded ATC system and the opening of more airspace will enable airlines to reduce their flying times to popular destinations by up to 20%, hence using less fuel in the air and on the ground. An upgraded ATC system will bring benefits on the ground, too. Many regional airports today are highly congested, which translates into either long delays on the ground prior to take-off or during taxiing, or long "hold" sessions in the air prior to landing.

Recommendations

Flight emissions should be managed as an input cost rather than an inevitable output of flight operations. In the APAC region, and particularly in China, new regulations will be introduced in the next five years to reduce airline emissions footprint and improve aircraft efficiency. Now is the time for Asian airlines (especially the Chinese airlines that are most behind in development) to plan for improved emissions management and measurement. The biggest changes will occur when they begin managing flights as costs rather than an inevitable output of flight operations. For example, as soon as Asia Pacific carriers start paying higher duties to authorities for using dirty or old aircraft, high emissions suddenly become very expensive and the benefits of operating an older aircraft disappear.

To reduce emissions, airlines need to take specific steps in three key areas. First, they need to invest in new technology. The most efficient way to reduce emissions levels is by procuring new and modern aircraft that have low emissions and meet strict regulations. Some currently launched aircraft have almost 20% less emissions than a similar aircraft of older technology. A second way to reduce emissions: developing smarter operations, both in the ground and in the air. As APAC passenger traffic grows, airports and airways become congested; therefore, a smarter operation can reduce emissions and unnecessary use of resources. A final way to lower emissions: airlines can partner with suppliers and customers for innovative solutions. Airbus recently introduced a smart baggage system that requires less time and fuel and also brings more accurate weight information to the cockpit for better flight fuel planning.

Waste management requires high levels of investment in infrastructure to reach high levels of recyclability. Numerous studies have proven that up to 50% of aircraft waste can be recycled. Airlines can partner with local governments to improve recycling infrastructure, including the development of recycling facilities near airports. The introduction of new catering techniques, changes in passenger habits and overall passenger awareness could raise on-board recycling and reusability of waste to 80-90%. Due to space and time pressures, cabin crews typically collect materials all in one bag instead of collecting recyclables and non-recyclables separately. However, most flights within the APAC region are longer than two hours, providing adequate time for collecting recyclable waste separately.

Air Traffic Control systems need long-term planning for infrastructure upgrade in collaborative effort with airline operators. Managing the skies of the APAC region has been challenging, particularly as the level of technological capability varied across countries. Now APAC countries can develop a common vision for the future of ATC systems to serve increasing passenger volumes while also delivering multiple benefits to the environment – and their own bottom lines. Governments must prioritize ATC investments and work collaboratively to bring up countries that are critical to a basic level. For example, airports such as Vietnam's Hanoi airport or Cambodia's Phnom Penh would benefit themselves, and there would also be significant benefit for over-passing traffic, which is significant in that area. Also, Federal Aviation Authorities must make it compulsory for airlines to follow CDA procedures. The only costs are those associated with pilot training - costs which are minimal compared to the benefits. A wide adoption of the CDA procedures would not only reduce fuel usage and emissions, but also improve congestion in the skies, a major issue in China, especially at Shanghai's Hongqiao airport.

As it races through its development and growth, the aviation industry in the APAC region cannot neglect these major sustainability issues. This research found that passengers in the region are currently not very concerned about the sustainability of aviation growth. In China, the majority of the population has still not been aboard an airplane, nor have they experienced the "travel fatigue" that many developed nations have. Therefore, the vital issues on their agenda related to air travel are price, availability, duration and frequency. As a result, most airlines also just seek to tackle these vital issues one by one, leaving sustainability issues to be dealt with at a later

date. There are also challenges related to the implementation of some of the ideas and recommendations. Most of these challenges lie both in the culture and priorities for the region but also around infrastructure and availability of talent. The hope is that it is not too late to take serious action, and that we haven't reached the point at which the pursuit of greater market share or higher margins hasn't delivered irreversible damage to the environment and society.