

Synopsis of Lecture to RAeS Loughborough Branch on 7 Dec 2010

Sustainable Aviation. What on Earth does it Mean? by Prof Callum Thomas FRAeS.

The air transport industry is fast reaching the limits of the Earth's ability to sustain that industry. This is true both from the point of view of atmospheric pollution with "greenhouse gases" and vapour trails and also the ability of the earth to provide aviation fuel from the ever diminishing pool of hydrocarbon reserves.

Air transport may be divided into three separate timescales:

- a) 1903-1950, a period which started with the Wright Brothers first flights in their biplane and included two World Wars during which people's horizons were vastly expanded by the sights of foreign lands.
- b) 1950-2000 when aviation first became a mass market. Notable events were the introduction of the "Jumbo Jet", i.e. the Boeing 747, in the early 1970s and the rise of low cost carriers such as Ryanair and Easyjet in the 1990s. This was the time when the air transport industry (including freight) started to have a significant on world climate. Current estimates suggest that the industry contributes between 2 and 4% to global warming.
- c) 2000-2050 will be a period when environmental issues begin to dramatically affect the air transport industry especially as that industry is so reliant on hydrocarbon based fuels.

During the third timescale it will not be sufficient to improve the efficiency of a hydrocarbon fuelled aircraft. The magnitude of the problem may be illustrated as follows:

- a) During the course of a year an A380 aircraft consumes the same amount of fuel as 250,000 cars. This is despite the fact that, per passenger mile, the A380 is more economical than a moped.
- b) In 1950 20,000 people visited Greece by air. In the year 2000 the figure was 2 million.

Currently the air transport industry is on course to continue to expand as the world gets richer and at rate which is significantly faster than technological improvements can be introduced to counter its effect on climate change and its demand for fuel. At the same time the industry will continue to play a very significant role in regional development throughout the world such that any constraints on its development will have a significant adverse effect on world trade as it is currently structured.

Clearly what is required is for the air transport industry to expand through sustainable development. This means that it must continue to serve the needs of the present generation without compromising the ability of future generations to meet their needs. In such an environment:

- a) Resources, in particular hydrocarbons, must be consumed at a rate slower than the Earth can produce them.
- b) Waste, especially carbon dioxide, must be generated at a rate which is slower than the Earth can absorb it.
- c) The needs for passenger and freight air transport must continue to be met but without producing noise and other forms of pollution in the environs of airports.

One option is of course to reduce the need for air transport. We could stop buying products which are manufactured a long way off and instead buy locally produced products. Certainly there is a case for this if the environmental cost is included in overall transport costs.

The European Union (EU) are tackling the problem by what they call "sustainable mobility". This approach demands a fully integrated transport system which uses air, rail and road transport each in an optimum manner. Airports would become critical nodes in such a transport system and offer full interchange facilities with road and rail transport. This means the airport capacity would be crucial.

All of this applies in an environment where 70-80% of existing airports are already "environmentally constrained", especially by noise constraints. It follows that quieter aircraft could be used to

increase the number of take-off and landing slots at an existing airport and thereby increase its capacity. Airports are also constrained by other factors such as electricity supply and even the availability of water.

The magnitude of the challenge is illustrated by government targets for reductions in carbon dioxide emissions by 2050. Examples are UK 80%, France 75%, Germany 80% and Japan 80%. The IATA long term strategy is for carbon neutral growth by 2020, 50% reduction by 2050 and carbon free aviation within 50 years. With the exception of the 50 year goal, this is heavily reliant on "emissions trading". It is estimated that, if governments were to impose their limits, the air transport industry could expand by only 60% by the year 2050 instead of a currently projected growth of 300%.

The importance of reducing the air transport industry's reliance on hydrocarbon based fuels cannot be overestimated. The Earth's known oil reserves will be exhausted by 2070/80 and even now oil is having to be extracted from ever more difficult sources. These include deep under the sea and extraction from tar sands such as in Canada. The competition for this oil will become ever more intense especially as developing nations such as China and India demand more oil.

Researchers have suggested that algae could be used to produce the oil. The air transport industry would require a pond of algae the size of Belgium to meet its fuel needs.

The use of hydrogen as a fuel would require a complete new fuel infrastructure as hydrogen fuel would have to be generated close to airports rather than being piped in from distant refineries.

In summary therefore we need to crack the air transport industry's environmental problem if we are not to significantly constrain its growth. It may of course be cheaper not to crack the problem and accept the shrinking of our current global society.

Joint lecture with Chartered Institute of Logistics and Transport