Response to:
Discussion Paper 01:
Aviation Demand Forecasting

Jointly from:
Cirencester People and Planet
Plane Stupid

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Summary of document

This document responds to "*Discussion Paper 01, Aviation Demand Forecasting"*[1] It is prepared in accordance with the document "*Submitting evidence and proposals to the Airport Commission."*[2]

It will consider the implications of climate change on future aviation demand. The ethos of the discussion paper is that climate change will mainly impact aviation through the carbon price that is subsequently set, this dangerously underestimates the effect climate change will have on demand.

The document will also argue developing aviation is incompatible with achieving the reductions in CO_2 necessary to stabilise the environment. The corollary is that if CO_2 emissions are not stabilised the economy will collapse suddenly and dangerously in a non-linear fashion. Most likely the true reality is that so much unsustainable loading has been built into the economic and environmental systems governing us a non-linear collapse is now inevitable. It is incumbent on the Aviation Commission to acknowledge this and develop plans accordingly.

Aviation has a significant part to play in the build-up of greenhouse gases in the atmosphere. This comes from four main sources:

1. The CO_2 directly associated with the engine exhausts gases.
2. The radiative forcing from other greenhouse gases such as NO_x.
3. The embedded energy in constructing aircraft, sustaining the aviation industry, running the operating infrastructure such as airports and securing fuel supplies.
4. The secondary effects caused by enabling unsustainable industries such as long haul tourist destinations and other unsustainable aspects of globalisation.

The dire situation on climate change has not been acknowledged in the discussion paper. Instead the impression given is that climate change can be addressed by minor efficiency improvements while aviation growth can continue irrespective.

This is dangerously playing to the palliatives of big aviation industry which are:

1. Aviation emissions can be reduced through the introduction of new technology
2. Aviation emissions can be reduced through the use of biofuels
3. Aviation emissions can be ameliorated through the concept of carbon trading.

The first two of these palliatives form the basis of the DfT model in (ref fig 3.3 of the Discussion Paper), and thus they are largely accepted without equivocation by government and opposition parties alike. The third is related to the concept of setting a carbon price which has a brief mention in the discussion document.

This document will demonstrate that aviation's greenhouse gas emissions will be increased rather than reduced by the above initiatives. It will also demonstrate that climate change will have a far bigger impact on demand than considered in the discussion document. Furthermore, in the face of the extreme planetary emergency brought about through climate change, planning a managed retreat

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/73143/aviation-demand-forecasting.pdf
[2] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/70285/submitting-evidence-airports-commission.pdf

from aviation must be the overarching objective of the Aviation Commission.

It is therefore extremely concerning that Climate Change merely gets a token mention in the both the Discussion Document and the Guidance document. This continues the on-going trend of ignoring climate change in government policy in favour of economic growth. If the arguments put forward in this paper are ignored again, then organisations such as Plane Stupid will have no option but to significantly increase the level of direct action.

The document has been prepared jointly by the following organisations:

- Plane Stupid – anti aviation campaigners
- Cirencester People and Planet

Plane Stupid has been instrumental in developing the environmental argument against the expansion of aviation in the UK. It worked with the local residents of Heathrow to campaign against the third runway and was a key agent in the Climate Camp that was set up at Heathrow in 2008. The high profile campaigning of Plane Stupid has set the template for other countries across Europe and now the United States.

Cirencester People and Planet Group have been active lobbyists and worked to oppose highly damaging developments. They are primarily college students, in the age range of 16-19 and represent the interests of the younger generation. This is the section of society which will lose the most in the face of the escalating danger of climate change. As such their voice should carry weight in the consultation process.

The document is co-ordinated by Kevin Lister. He has a degree in Aeronautical Engineering, an MBA and an MSC in Mathematics. Kevin Lister has been involved with Plane Stupid and other environmental pressure groups.

The status of climate change

James Hansen of NASA has demonstrated that the safe level of atmospheric CO_2 to avoid runaway climate change is 350 ppm[3]. As of February 2013 (time of preparation of this document), the level of atmospheric CO_2 stands at 395 ppm[4], considerably above the safe level.

To make matters worse, atmospheric CO_2 continues to increase, and the current rate of increase of 3.4% per annum[5] is exceeding the worst case scenario of the IPCC report. The graph below shows the trend from the Manua Loa CO_2 recordings which have been on-going since 1957. Relatively straight forward mathematical modelling shows that within 10 to 22 years global CO_2 levels will be at 450 ppm. At this level runaway climate is unavoidable.[6]

[3] http://droyer.web.wesleyan.edu/Target_CO2_(Hansen_et_al).pdf
[4] http://www.esrl.noaa.gov/gmd/ccgg/trends/
[5] http://www.whoi.edu/page.do?cid=63506&ct=162&pid=7545&tid=282
[6] The revenge of Gaia, James Lovelock

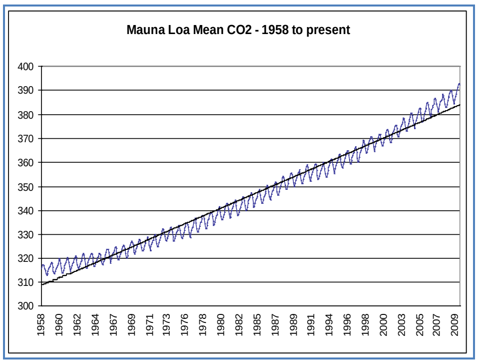

Figure 1Atmospheric CO2 trend

The situation is exacerbated by non-CO_2 greenhouse gases such as NO_x, Fluoride and CH_4 gases. These have a significant global warming impact and have also been increasing. The IPCC reports shows the CO_2 equivalent was already at 455 ppm[7] by 2005 when these additional greenhouse gases are included, putting us far above the safe level of the 350 ppm level and well into uncharted territory. Climate modelling evidence now suggests the only thing preventing runaway climate change is the cooling effect from the large amount of sulphide gases in the high atmosphere as a result of coal burning. The danger now is that if countries burning substantial amounts of coal such as China and some Eastern European nations clean up their emissions through flue gas desulphurisation we could immediately tip into runaway climate change.

The situation with non-CO_2 greenhouse gases has now reached a critical phase where methane hydrates are now being released from the Arctic sea bed as a result of the significant warming in the higher latitudes[8]. Unless this is somehow constrained, it will trigger for runaway climate change.

It is against this background that the aviation industry continues to argue that it should be able to grow because they contribute only 2% of total anthropogenic greenhouses gases. This is both wrong and deliberately misleading.

The 2% refers to 1990 data[9] and thus is hopelessly outdated. Since 1990, the aviation industry has been growing between 5% and 9% per annum which is far higher than world economic growth and acknowledged in Boeing's forecasts[10]. Applying this rate of growth to aviation's 2% contribution to anthropogenic emissions, it can be conservatively calculated that as of 2010 aviation's contribution to anthropogenic CO_2 will have risen to approximately 4% of total emissions. This ignores the NO_x emissions which have up to 400 times the warming effect of CO_2.

The second major flaw is that by continually claiming to be contributing only 2% of anthropogenic carbon dioxide, the aviation industry skirts round the fact that anthropogenic CO_2 has itself been increasing at an unsustainable rate. Thus, the as claimed 2% is a percentage of an increasing total and thus is increasing.

To put the debate in perspective, the EU reported[11] in 2006 that aviation emissions had increased by 87% since 1990. This equates to an annual growth rate of 4% and a doubling time of 17 years. The EU report stated that,

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7 http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdfhttp://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf

8 http://arctic-news.blogspot.co.uk/2013/02/dramatic-increase-in-methane-in-the-arctic-in-january-2013.html

9 http://www.ipcc-nggip.iges.or.jp/public/gp/bgp/2_5_Aircraft

10 Boeing, Current Market Outlook, 2012 – 2031 http://www.boeing.com/commercial/cmo/pdf/Boeing_Current_Market_Outlook_2012.pdf

11 http://europa.eu/rapid/pressReleasesAction.do?reference=IP/06/1862

“*Without action, the growth in emissions from flights from EU airports will by 2012 cancel out more than a quarter of the 8% emission reduction the EU-15 must achieve to reach its Kyoto Protocol target. By 2020, aviation emissions are likely to more than double from present levels.* “

It is important the Aviation Commission acknowledges the dire situation on climate change and the unacceptable increase in aviation emissions.

Exposing the palliatives of big aviation

The following subsections challenges the assumptions of the DfT model for forecasting CO_2. These are new technology and biofuels will deliver significant reductions in greenhouse gas emissions.

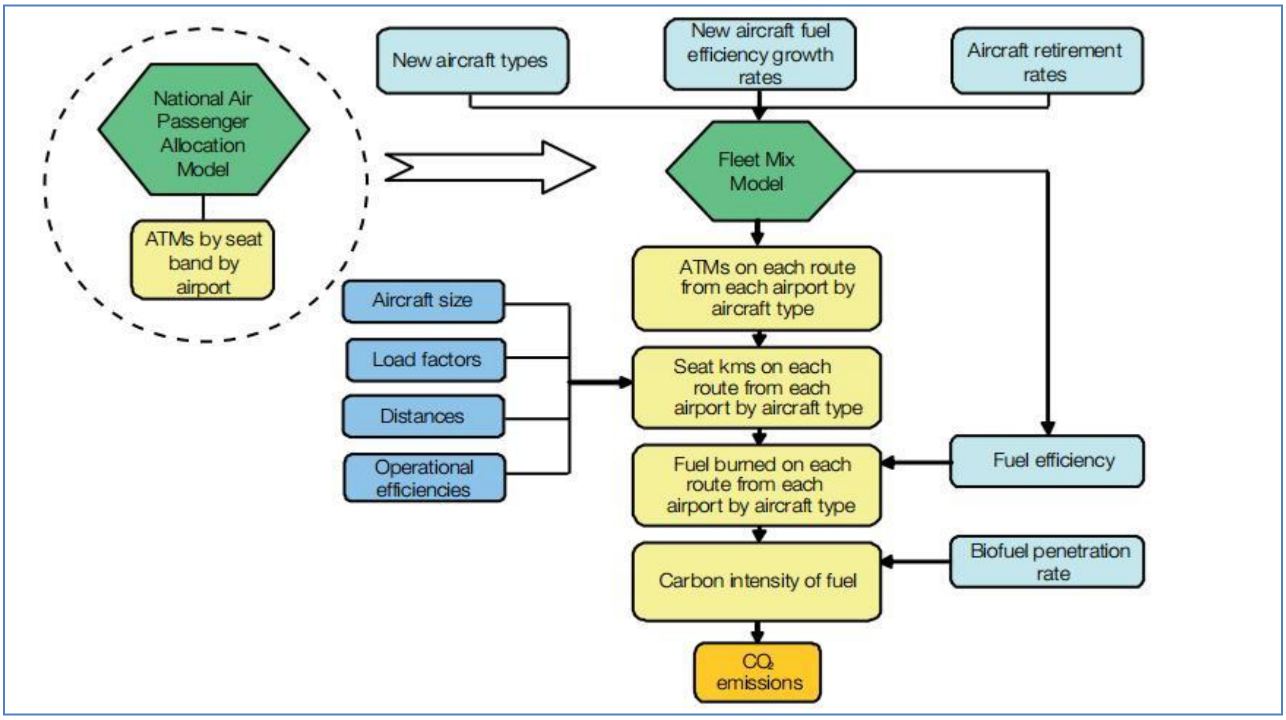

Figure 2 DfT Model

The failure of new technology to deliver CO_2 reductions.

Since the Wright Brothers flew their first plane, the aviation industry has continued developing and improving technology. Every major technical advance that has been introduced since that date has resulted in performance improvements to planes. As a result, aircraft can fly faster, fly further or fly more economically per passenger kilometre. But, at no time since the first powered flight has there ever been a time when the growth of the total greenhouse emissions curve slowed due to the introduction of new technology.

The reverse is true. As new technologies are introduced their utility is either allowing planes to fly faster, further or more frequently leading to steady increases in emissions. It is an unimaginably large risk to assume that from now on technology will reverse a trend of rising greenhouse gases that it has enabled for over 100 years.

A brief history of aviation demonstrates this argument.

The first step change improvement in technology after the Second World War was the introduction of jet engines and swept wings on passenger planes. The Boeing 707 led the way. However, this was significantly less fuel efficient than the Lockheed Constellation of the 1940s which it replaced. It is only now with the very latest aviation technology that we have returned back to the level of fuel efficiency of the Constellations. The new technology was not used to improve fuel efficiency per passenger; it merely allowed passengers to be flown further, faster and more frequently. Table 1 below takes the maximum fuel capacity of a plane, the maximum passenger load and the range to calculate the efficiency in terms of litres per-passenger kilometre.

Table 1: Aviation efficiency since the 2nd World War

	First flight	Number of passengers	Fuel, litre	Range (km)	Number flying	fuel per passenger	fuel per passenger/ km	Development cost
Lockheed Constellation	1943	90	23,974	7,950	525	266	0.034	N/A
Boeing 707	1957	202	90,160	6,920	1,010	446	0.064	$185 million
Boeing 747	1969	600	216,840	9,200	1,418	361	0.039	$ 1 billion
Boeing 777	1994	500	181,283	11,120	949	363	0.033	$ 5 billion
Boeing 787	2011	350	138,700	14,000		396	0.028	$10 billion

It is clear from the table that for many years nothing could match the economy of the Lockheed Constellation. The figures quoted are adversely impacted when a plane is fitted out with large numbers of business class and 1st class seats. This can negate all the efficiency improvements. The extreme case is the Airbus A380 Super Jumbos being sold as private jets. The scenarios assumed for the analysis in the table are based on planes being fitted out for maximum passenger capacity.

It also becomes increasingly difficult to improve efficiency once designs have optimised aerodynamics, thermodynamics and the structural strength to weight ratios. The law of diminishing returns always prevails. This is where we are today. The improvement of the Boeing 787 over the B777 is only of the order of 10-15%. In no way will this provide the reductions in greenhouse gases needed to avoid runaway climate change. To do so requires breaking the laws of thermodynamics and physics.

Figure 3 The most fuel efficient plane of modern time – Lockheed Constellation

Today's high level of optimisation makes further improvements increasingly costly to achieve resulting in exponentially increasing research and development budgets, while the risk exposure to cost and delay increases. This is shown in the development costs of new passenger planes which are listed in the table above.

These development costs can only be offset with huge orders. This defeats the efforts to reducing fuel consumption by relying on technological development.

The outstanding example is the new Boeing 787. This is billed by the aviation industry as "green." Its development costs sky rocketed and these have had to be matched by the largest

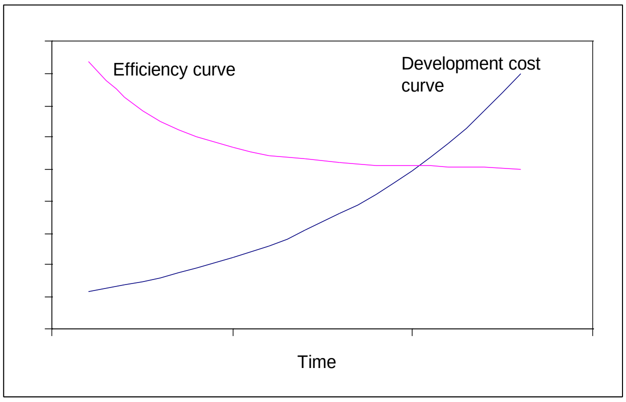

Figure 4 Exponentially increasing developments costs versus diminishing efficiency improvements

order book for any new plane. This already stands at 850. Boeing needs to rely on the final build to be in the order of thousands to make the necessary returns on investment.

The record order book of the 787 is complemented by record orders for other classes of planes. Recently American Airlines announced the largest orders ever of the latest generation Boeing 737s and Airbus A320s. At best these are only able to offer savings of 15% over previous generation planes. The emissions sales from these additional planes will dwarf any savings from efficiency improvements.

More ominously for the aviation industry, the new planes being introduced such as the B787 are increasingly looking like representing the end of the line for aviation rather than a grand new nirvana of green aviation. Despite their huge development costs, they offer diminishing utility over their predecessors. In a highly competitive industry operating on tight margins and with high fixed costs, a cross over point can be quickly arrived at where profitability is impossible.

The history of the A340 offered a dramatic warning. This came into service in the mid 1990s so represented modern technology. However, the increase in oil price quickly destroyed its commercial viability with operators discovering they needed 120% load factors to break even. The A340 was taken out of service and production was cancelled. Similar problems are being faced today with other aircraft; Quantas are delaying A380 purchases for similar reasons[12].

This requirement to maintain increasingly large order books to offset the increasing development cost needed for operational efficiency improvements further exposes the aviation industry to the impact of carbon pricing. If an effective carbon price mechanism was introduced which constrained emissions by constraining available fuel purchases, the larger fleets of planes needed to offset development costs would force operators to bid each other out of business.

This tight interrelationship between development costs to improve efficiency, high sales to offset development cost and subsequent increased exposure to carbon prices at a time of rising fuel prices is not captured in the DfT model.

The fallacy of biofuels

The supporters of Biofuel claim it is carbon neutral and this proposition is being used by the aviation industry to provide a mechanism for continued growth. However, even in a perfect world, where biofuel could be converted into petrol or diesel, with no energy required and no CO_2 emissions from the associated land use change, then biofuels would still be an environmental and economic disaster. The fundamental failure of biofuel as an environmentally sound solution to our energy needs is that it inherently reduces the ability of the global climate control system to recover from perturbation by reducing the amount of carbon that can be sequestrated from the atmosphere.

In reality, almost as much energy is needed for processing and shipping as is produced[13] thus further destroying its claim as an environmentally effective alternative. A fundamental assumption the proponents of biofuel make in advocating the fuel source on the basis of carbon neutrality is that the current level of CO_2 in the atmosphere is sustainable. It is not. We know that both CO_2 levels and global average temperatures are rising at dangerous rates and that we are exceeding the planet's photosynthetic ceiling. This determines how quickly the solar energy being globally absorbed can remove the build-up of greenhouse gases and stabilise the climate.

[12] http://kevsclimatecolumn.blogspot.co.uk/2012/05/open-letter-to-theresa-villiers-mp.html
[13] http://www.uni-klu.ac.at/socec/downloads/Pressetext2007_11_IPCCLetter.pdf

The photosynthetic ceiling is determined by two things, the amount of carbon is converted into CO_2 and the amount of vegetation available to sequestrate CO_2. This balance had been maintained for millions of years and formed a stable feedback control system that is essential to the preservation of life. It is not possible to fundamentally alter this balance in any way and still maintain a habitable planet. Deciding to obtain energy from biofuel rather than fossil fuels is just another way of continuing to destabilise the balance.

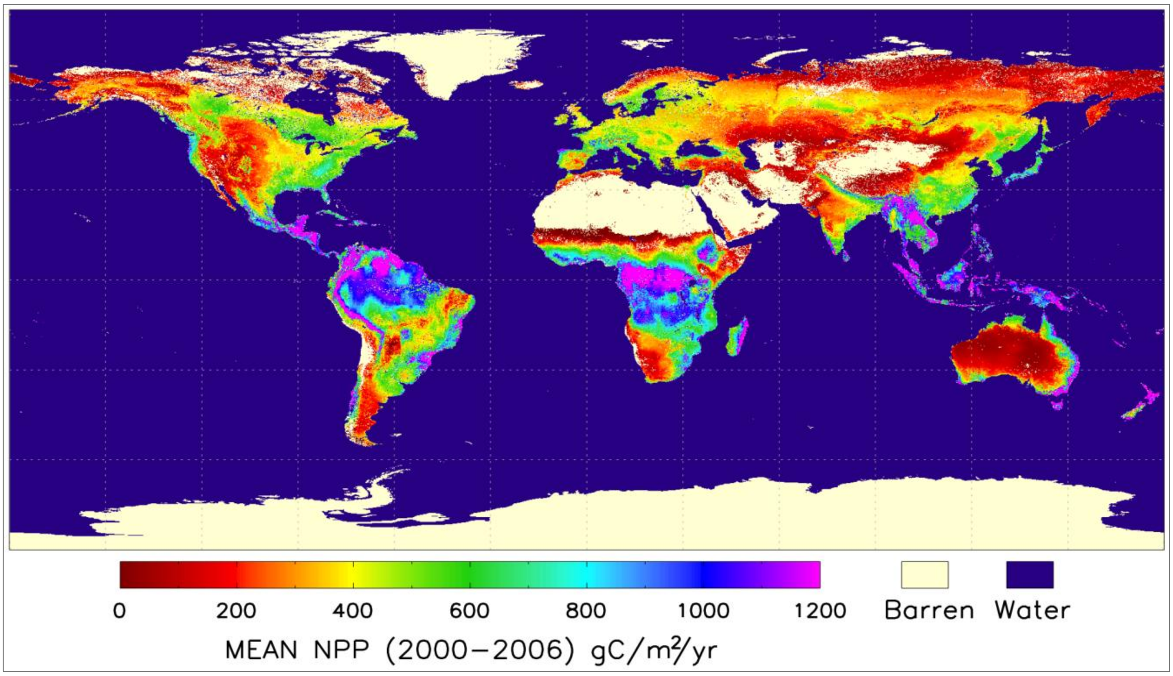

Figure 5 Net Primary Productivity

The illustration above shows the Net Primary Productivity of the planet. This is a measure of the amount of CO_2 converted by plant photosynthesis to biomass minus the plant respiration. It is a fundamental measure of the planet's ability to absorb CO_2 gases. Purple indicates high productivity, red indicates low productivity. It shows that the most productive part of the planet is the tropical belt, thus most of the CO_2 absorption takes place in these regions. This also is where much of the biofuel is either being grown or proposed to be grown in the future. Thus biofuel is displacing the most critical parts of the planet's control system for restoring its CO_2 levels.

As a result, two arguments regularly used by biofuel supporters and manufactures are false: The argument that the tropics are the ideal place to grow biofuels is false because it reduces the planet's most productive area for sequestration of CO_2, and the idea that there is abundant waste ground where biofuel can be grown is false because we need all our land to be reducing our excessive CO_2 emissions.

To maintain the myth that biofuels can be grown without destabilizing the control systems that have inherently sustained life on earth for billions of years is to argue that the Earth can provide infinite and instantaneous supplies of pure air, fertile soil, clean water and all necessary nutrients, whilst at the same time feeding 7 billion people and satisfying all their demands for travel, entertainment and consumer products.[14]

The recent heat wave and drought in the USA which collapsed food production has illustrated the futility of biofuel as a solution. Droughts and disruptive weather events are to become the norm in the near future further depleting food reserves. The idea that we have millions of square acres

[14] http://www.hubbertpeak.com/Patzek/CanWeOutliveOurWayOfLife20070809.pdf

available to divert to fuel production is nonsense.

The proponents of biofuel will continue to argue that the problems being evidenced around the world today will be resolved with second and third generation biofuels, or through careful selection of appropriate biofuel crops. These claims are without foundation.

Jatropha was hailed by biofuel companies as a wonder crop that could be grown on marginal lands across the tropics. The reality of the crop yields has caught up with common sense, and crops grown on marginal land yield only marginal crops. As Jatropha is a poisonous and invasive weed then land converted to Jatropha production cannot be easily converted back to food production. As a measure of the danger of Jatropha, it is classified as an invasive weed and is banned in Australia and attempts are being made to have it banned in New Zealand despite it being a key part in the biofuel strategy of Air New Zealand.

Having failed with Jatropha, the industry is pushing the idea of algae and genetic modification, but there is no large scale proven production process. Many of the schemes propose using the CO_2 emitted from power stations as a feedstock. This is not carbon neutral, as aviation simply delays by a couple of weeks the time it takes for dangerous power station gases to be released into the atmosphere. Furthermore, recent evidence is emerging that the energy needed to produce algae based fuels is far higher than initially thought and even worse than corn ethanol[15]. The economics have become so marginal that companies such as Shell have withdrawn their investments in this field[16]. This is supported by the RAND Corporation which concludes that the US Military will not be able to rely on biofuel as a future fuel as yields will be far below requirements[17].

In conclusion there is no evidence that biofuel will be able to provide significant reductions in carbon emissions for the aviation industry. On the contrary there is overwhelming evidence that biofuels will exacerbate food insecurity and environmental devastation, leading to economic collapse and major political instability by fuelling food price rises while simultaneously increasing greenhouse gas emissions.

It is therefore incumbent on the Aviation Commission to challenge the contention in the DfT model that the carbon intensity of aviation fuel can be reduced through biofuels and to ensure that the aviation industry does not start endangering food supplies.

The limitations of Carbon Trading and the impacts of Carbon Pricing

The basic premise of carbon trading and carbon pricing is that if it is impossible for aviation to make significant cuts in emissions through technological development, then emission savings can be bought from other companies that do reduce emissions. There is no evidence to support this contention.

The proposition of carbon trading is based on the argument put forward by Nicholas Stern and referenced in the guidance document2. Nicholas Stern has now acknowledged that he got his arguments wrong[18]. It is now clear to him that climate change is tracking the scientific evidence that was available to him when he prepared his report in 2006 and that things are far worse than he initially thought. When he prepared his report he chose to ignore this in favour of conventional

[15] http://www.dailytech.com/Report+Blasts+Algae+Biofuel/article17567.htm

[16] http://www.fastcompany.com/1723391/shell-ditches-algae-biofuel-during-year-of-choices

[17] http://www.nytimes.com/cwire/2011/01/25/25climatewire-biofuels-of-no-benefit-to-military-rand-11643.html

[18] http://www.guardian.co.uk/environment/2013/jan/27/nicholas-stern-climate-change-davos

market based economic models. It would be a pity if the Aviation Commission repeated the same mistake today.

Some of the flaws inherent with Carbon Trading are listed below:

1. It is not only the aviation industry that is struggling to make major reductions in CO_2 emissions, all other energy intensive industries are finding it equally difficult. For example, the world wide collapse of carbon capture and storage projects[19] means there will be no effective carbon saving that the aviation industry can trade.
2. The aviation industry lobbied the EU into being allowed to purchase unused carbon credits within the EU ETS. Initially the intent was that the aviation industry would only be able to trade internal savings. This concession allows the aviation industry to continue to grow by purchasing carbon credits from other industries. There is little to stop additional carbon credits being created to allow industry to continue polluting[20].
3. The EU ETS allows carbon credits to be brought from other countries that are operating in the carbon market. This is open to abuse and fraud[21]. Credits can be claimed for efficiency and renewable energy projects that would have been implemented anyway, carbon savings can be overstated, and projects can be deliberately set up to exploit loopholes such as the Indian companies that produced highly dangerous refrigeration gases just to destroy them and claim the carbon credits[22]. These are billion pound frauds. It is inconceivable that carbon trading could be implemented in a way that did not leave itself wide open to massive fraud. The introduction of aviation into this market simply adds further opportunity for dishonest fortunes to be made.
4. Big aviation sought to overturn the EU ETS with legal action and was backed by the US, Chinese and Indian governments. Though they eventually lost, it is likely that if there is any further significant clamp down on CO_2 emissions through the same mechanism it would initiate similar actions.
5. If a carbon market could be implemented fraud free and if it was successful in forcing down carbon emissions through a market mechanism then the only outcome is that the right to pollute would progressively transfer to the wealthiest in society. Ultimately, those on lower incomes would be priced out of all staple resources from electricity, basic transport and even food as their rights to the carbon allowances were effectively bought up by the rich and powerful in society

The paradox of the Independent Aviation Commission

The Independent Aviation Commission was set up following the failure of the Public Consultation on Sustainable Aviation, which in turn was set up following the failure of BAA and New Labour to progress the 3rd runway at Heathrow.

The fundamental reason for theses failures is that limits to growth have been reached. Heathrow could not be expanded for a multitude of reasons such as noise pollution, local environmental issues, surface access limitations and the immorality of displacing entire communities. Each one of these taken alone was a show stopper. However, the ultimate limit to growth is climate change, from which there is no escape.

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[19] http://www.guardian.co.uk/environment/2011/sep/22/carbon-capture-and-storage-energy?newsfeed=true
[20] http://corporateeurope.org/sites/default/files/sites/default/files/files/resource/lafarge_arcelor_mittal_jackpot.pdf
[21] http://www.deloitte.com/assets/Dcom-Australia/Local%20Assets/Documents/Services/Forensic/Carbon_credit_fraud.pdf
[22] http://www.dailymail.co.uk/home/moslive/article-1188937/The-great-carbon-credit-eco-companies-causing-pollution.html

It does not matter how the debate is framed and what platitudes are used, the limits to growth are inviolate and will be become more so with the passage of time. If these are ignored the result will be severe social unrest, environmental destruction and bankruptcy.

It is therefore inconceivable the Aviation Commission will be any better at finding ways for the aviation industry to grow than its predecessors. It if tries to do this, it will be attempting to reconcile the irreconcilable. This juggling act it needs to perform can only be done while the current democratic deficit exists where both the Labour and Conservative parties have given the commission their support. This is sets a dangerous precedent for democracy in this country.

Violation of the Durban Platform Agreement

The discussion paper made no reference to the commitments made in the Durban Platform[23]. Clause 4 of this document states *"[Conference of the Parties] Decides that the Ad Hoc Working Group on the Durban Platform for Enhanced Action shall complete its work as early as possible but no later than 2015 in order to adopt this protocol, legal instrument or agreed outcome with legal force at the twenty-first session of the Conference of the Parties and for it to come into effect and be implemented from 2020."*

It is therefore possible that developments such as new airports may be illegal post 2020. Up until 2020, if not illegal then high carbon developments would be on dangerous moral grounds and would signal to the rest of the world that the UK was not interested in developing legal frameworks to combat climate change.

The Commission should look carefully at the implications of violating international law and treaties. Almost all violations of international agreements in the past have led to sequences of events running out of control, such the inability of parties agreeing military budget constraints in the 1899 Hague Convention ultimately leading to the First World War.

Taxation and consumer expenditure

Figure 6 Drivers for aviation demand, from discussion document

[23] http://unfccc.int/files/meetings/durban_nov_2011/decisions/application/pdf/cop17_durbanplatform.pdf

The discussion document1 identifies UK Consumer Expenditure as a key driver for aviation demand. The diagram above suggests that this is independent of other variables such as carbon prices, oil prices and Airline costs. In reality the variables are all closely correlated. UK Consumer expenditure will collapse if oil prices remain high, likewise high carbon prices feed through to all aspects of life by inflating food and utility costs. Even airline costs are likely to rise and correlate with consumer expenditure as the underlying economic drivers that determine household bills will also determine airline expenditure. To ignore the correlation between these variables is naïve and will significantly underestimate the risk of a step change collapse in aviation demand.

Climate change is already having significant adverse impacts on consumer expenditure and this will increase rapidly. As climate change intensifies, three things will simultaneously happen. (1) Funding will have to be diverted to climate change mitigation such as constructing flood defences, relocation of major infrastructure, catering for displaced populations, etc. This will have to be funded through increased taxes and insurance premiums as well as increased property costs that individuals and businesses will be exposed to as they are forced to move and abandon existing homes and business. (2) There will be an increasing demand to move to low carbon energy supplies which will require huge investment. This will be funded by increased taxes and utility bills. (3) As these factors start increasing public expenditure, tax receipts will simultaneously decrease as excess consumption dries up in the economy due to rapidly rising food and fuel costs. Without increased tax receipts (1) and (2) will not happen, without (1) and (2) taxes will not be raised. This is a downward spiral which is impossible to reconcile and will result in a collapse in demand.

Closely related to the issue of taxation is the build-up of debt, both public and private. This has fuelled economic growth since the Second World War and is now at unsustainable levels. The downgrading of UK debt by Moody’s is the result and a warning of much harder times to come.

Chapter 5 of the discussion paper1 is about “Dealing with Uncertainty.” This is a misnomer. Never in the history of humanity have we had such certainty about our future. We know that we have exceeded the safe limit of atmospheric CO_2 to avoid climate change. We know that a step change in environmental conditions will occur in the very near future making much of the planet inhospitable. Uncertainties simply are limited to two things. The first is that we do not know the exact timing of events, though it is safe to say that major changes are likely to start occurring in the next 10 years. The second is that we do not know exactly what final temperature the planet will stabilise at, though it is safe to say that we are on target to exceed a 6 degC global temperature increase by this century’s end which will wipe most life off the face of the earth.

The Aviation Commission should not use uncertainty about the timing and size of the forthcoming environmental collapse as an excuse to avoid to making the correct decisions on climate change which is to set in place plans to significantly reduce aviation activity

Specific answers to the commissions questions on demand modelling

Section 6.4 asks questions about the DfT model with a view to ascertaining how it can be improved and used to support the Commission’s decision making process. These questions are irrelevant as they assume a “business as normal” scenario and ignore the combined realities of climate change, peak oil and unaffordable debt in the public and private sectors.

Section 6.5 of the Discussion Document1 lists questions of interest and we respond to these as follows:

- **Do you agree with the source of the input data and assumptions underpinning the DfT model?**

  No – The DfT model does not capture any correlation between input variables, i.e.

increasing investment for improved fuel efficiency requires increasing numbers of planes to be sold and operated making the CO_2 savings impossible to achieve. The model also implies biofuels are cost free solutions that do not lead to further CO_2 emissions and food price hikes.

- **Do you agree with the choice of outputs modelled?**

  No – The models do not consider how increasing atmospheric CO_2 level will impact taxation policies or the ability for public and private debt to be paid off.

- **Do you consider that the DfT modelling approach presents an accurate picture of current and future demand for air travel? If not, how could it be improved?**

  No - the model does not represent the real world for the reasons stated above. Its underlying assumption is that the growth and economic drivers of the past 50 years will continue and that the extreme global warming now forecasted universally by all credible scientific bodies will have no impact on the economy.

- **Is the DfT model suitable to underpin an assessment of the UK's aviation connectivity and capacity needs?**

  It is probably only suitable for a very short time period, perhaps 1 or 2 years. It does not seek to understand how rising food and fuel costs brought about by climate change will impact UK demand for aviation in the medium to long term.

- **What alternative or complementary approaches could be used to assess the impact of international competition?**

  This is not relevant. Our international competitors will face the same environmental and economic drivers. To this extent, international competition will probably correlate quite closely with the UK consumer demand and GDP.

- **What factors, if any, are missing from the DfT's modelling approach? How can these be more effectively analysed?**

  The models should be focused on understanding the triggers for instability and large scale change rather than attempting to predict actual numbers in given future years. Actual numbers and demand in the future is inherently unpredictable given the changing face of the economy and environment.

- **Is the DfT model granular enough to underpin the Commission's assessment of future demand?**

  The issue is not about it being granular enough; it is about it not being general enough to capture all the real world drivers.

- **Does the DfT approach to demand uncertainty capture a reasonable range of uncertainty? Could the approach be improved?**

  No. The approach needs to consider the feedback mechanisms and interconnectivity of the variables. Mathematical techniques are available for this such as the use of "transfer functions" as used in control theory. Failing this, sophisticated modelling tools such as GoldSim[24] can be used to capture the more complex relationships and feedbacks.

  The Aviation Commission should seek to understand the general limitations of modelling complex systems and investigate recent high profile failures. In the financial world standard models of financial forecasting assessed[25] the recent stock market crashes as 1 in 10^{50}, yet

[24] http://www.goldsim.com/Home/

[25] The (Mis)behaviour of Markets, Benoit B Mandlebrot ISBN 978-1-84668-2962-9

they happened. The IPCC models used for climate change totally failed to predict the Arctic Ice Cap collapse,[26] yet it happened. The common problem of these models is that they do not capture in the interconnectivity and feedback between variables and thus significantly underestimate the risk of extreme events.

- **Would a probability based approach to dealing with uncertainty help the Commission to test the robustness of the model's outputs?**

  No – unless the key feedback relationships and interconnectivities are captured, it does not matter if probability techniques such as Monte Carlo are used or not.

- **We have reviewed four alternative forecasts. Do you consider that there are others we should be looking at and why?**

  Yes - All the models reviewed are by organisations (i.e. Boeing and DfT) that have a vested interest in the maintaining the perception the aviation industry will grow indefinitely. The Commission should take cognisance of a wider range of reports and evidence, e.g. IEA World Energy Outlook[27], which states "*No more than one-third of proven reserves of fossil fuels can be consumed prior to 2050 if the world is to achieve the 2°C goal*," or the Copenhagen Diagnosis report or wait until the IPCC Assessment Report 5 is published later this year.

The danger of direct action in a contracting economy

The above arguments demonstrate a wilful disregard of climate change by the Aviation Commission. Despite the evident disaster awaiting us all there is no debate by government or the media in the direction which this consultation is going. This follows the pattern of previous government policy which is to ignore calls to reason by environmentalists of all types. Instead governments allow ignorance to prevail for the justification of destructive short term thinking. The results illegal or immoral actions that penalise society's weakest.

This comes at a dangerous time. European economies are collapsing or in recession and unrest is spreading. The UK government is facing serious problems with its energy supply and hard pressed consumers will be paying significantly more for basic utilities in the fight against climate change. Any government that ignores the implications of this and pursues policies that aggravate existing problems by simultaneously increasing national debt, personal debt and destroying what is left of the environment for the benefit of society's most powerful will be de-legitimised in the minds of the majority.

It is against this dangerous background that environmentalists will be forced to take increasingly disruptive direct action to halt the proposals for aviation growth that the Commission is implicitly supporting in its documents. As well as significantly increasing the cost of infrastructure development their unassailable arguments will de-legitimize not just government, but the process of governance.

The unpalatable conclusions

1. The strategies of introducing new technology, biofuels and carbon pricing will not deliver any reduction in aviation greenhouse gas emissions and are more likely to exacerbate the situation. This is an unacceptable position given the critical risk that humanity faces due to the unsustainable build-up of greenhouse gases.

2. Aviation emissions can only be reduced by imposing a strict ceiling on plane movements or

[26] Copenhagen Diagnosis report, Figure 13, http://www.ccrc.unsw.edu.au/Copenhagen/Copenhagen_Diagnosis_LOW.pdf
[27] http://www.iea.org/W/bookshop/add.aspx?id=433%20

aviation fuel sales. This ceiling must then be reduced in line with the objective of reducing CO_2 emissions by 80%.

3. The principle objective of the Aviation Commission should be to develop strategies to reduce demand for aviation.
4. The aviation industry will lobby to subvert any appropriate action on climate change and the Aviation Commission must resist this by using the full weight of the law. In particular the fraud act should be considered against the directors of companies that make deliberately false claims about their environmental credentials.
5. The forced reduction in aviation will fundamentally change the economic model and philosophies that our society has been built on by forcing a clear acknowledgement that economic growth cannot continue indefinitely and limits have been reached. As such, this consultation must be integrated with the debate on the introduction of individual carbon rations[28] or the imposition of a carbon tax[29], where the receipts are distributed directly to the population as advocated by James Hanson.

28 http://www.teqs.net/

29 http://www.carbontax.org/blogarchives/2010/04/25/scientist-james-hansen-proposes-%E2%80%9Cpeople%E2%80%99s-climate-stewardship-act%E2%80%9D-a-simple-carbon-fee-with-revenue-returned-to-americans/

Statement from the generation of tomorrow to Sir Howard Davies

(This statement has been prepared by the young people (16-19 year olds) of Cirencester People and Planet.)

Our concerns are eloquently analogised with the voyage of the Titanic: the unsinkable ship that sank. Your generation represents the boarding passengers; convinced by the claim that the ship is unsinkable. Even when the ship hit the iceberg and the consequences were laid bare, many of you still held onto the claim it could not sink. We are the generation who have witnessed it hitting the iceberg and have been told the ship will survive; the truth is that the ship is sinking and we know it. Would you passively listen to the jazz band as the ship falls, would you selfishly clamber for the life boat for your own escape or would you try to find ways to save as many lives as you could?

This is the choice we must all now make.

Our generation is fully aware of the problems our climate will face in the oncoming years. Our fear is that the continual disregard for our future in favour of short-term thinking will continue to take precedence, leaving us with little hope.

We cannot afford for you to ignore the prognosis on climate change. Your decision will directly effect our generation and the generations that follow. This reply document highlights the issues we will face in the years to come, issues we cannot afford to dismiss. If ignored, the demise of our generation is inevitable. We implore you to make the right decisions when considering our future and to leave us with more than just a condemned ship.