

Commercial Aircraft Stacking and Climate Change

Summary

The reorganisation of air traffic over Great Britain should prioritise the reduction of carbon dioxide emissions above other considerations. The arrival of commercial air traffic should be by direct, continuous descent to a point 5 miles distant from the destination runway. There should be no deviation from a straight flight path in British airspace and descent should be without level flight, any form of stacking or delay while airborne.

Clearly, stacking generates unnecessary carbon dioxide as well as other chemical and particulate pollution^{1,2} but, because these aircraft are using flaps and slats for turning³ in level flight at low altitude where the air is warm, high pressure and dense, they are operating at low efficiency⁴. For these reasons stacking aircraft need to use high power settings and are generating more carbon dioxide, noise and other pollutants than they would at cruising altitude⁵. One large stacking aircraft emits as much carbon dioxide as the winter heating for 10 starter homes and far more noise and pollution.

Technological improvements during the next 20 years will decimate the emissions of other large polluters such as energy generation, home heating, terrestrial travel, shipping, steel and construction (Appendix I). But it is the restriction of unnecessary emissions of greenhouse gasses during that period which will determine our ability to control the earth's rise in temperature.

Until a reduction in the rate of production of carbon dioxide becomes possible, it is the volume of unnecessary emissions that may cause an unstoppable, water vapour driven, positive feedback warming cycle on the Earth.. An initial, tolerable limit of 1.5 °C warmer than before industrialisation was set for the planet by the WEF⁶. Last year that limit was exceeded for the first time and the disruption of the climate, the oceans, fauna, flora and mankind - particularly in equatorial regions, is plain for those who care to observe it.

We welcome this review of the air corridors over Great Britain as an opportunity to eliminate commercial aircraft stacking. We demonstrate below (Appendix II) that stacking in all its forms, is among the most unnecessary and damaging of aircraft industry practices and suggest methods by which stacking can be avoided.

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Poor PR

Every business and individual will experience considerable inconvenience and expense in reducing their carbon dioxide emissions to net zero, but the physics of flight dictates that such a step change is not available to the aviation industry. Increasing or, at best unchanging, aircraft emissions, while other industries radically reduce their production of carbon dioxide, will expose commercial aviation as a leading producer of the global warming gas. How will we persuade individuals to spend money and effort on reducing their carbon dioxide emissions when commercial aviation clearly does not?

The largest emitters of carbon dioxide include home heating and cooling, terrestrial transport, the shipping industry, cement and steel production, cryptocurrency and the aircraft industry. Due to technological advances (Appendix I), all of these industries and activities are in the process of a revolutionary reduction of their carbon dioxide emissions, except the aircraft industry.

Lifting up to 500 tons of fuel, airframe, passengers and luggage 7 miles into the air requires a lot of energy; it may require half the fuel onboard, particularly for short haul flights. Nothing can be done to change this and the carbon dioxide emitted from the jet engines can not be collected – it must all add to the concentration of carbon dioxide in the atmosphere. Because of the reduction in emissions by other industries the commercial airline industry could be responsible for 10 to 15% of global carbon dioxide emissions by 2035 – an untenable position. The current hypothesis is that aircraft will be able to use Sustainable Aviation Fuel which will reduce their carbon footprint, but this may not be viable for reasons given below.

The noise from each circulating aircraft alerts millions of citizens to the enormous carbon dioxide emissions of the airline industry and their contribution to global warming, while they themselves struggle to afford heat pumps, insulation and other modifications to warm their homes. This is a public relations disaster.

Sustainable Aircraft Fuel (SAF) is Neither Timely Nor Sustainable

With some justification, airline operators have identified petroleum products as the only fuel that will satisfy their current aviation model. Whether it comes from crude oil or is manufactured from waste products, petroleum fuel and the engine to turn it into thrust have a higher power to weight ratio than any other safe system.

As Michael O’Leary said ^A:

The only solution going forward here is going to be more SAF [Sustainable Aircraft Fuel]. SAF might get to 50% of aviation fuel, hopefully, by 2050.

Currently, aviation fuel is purified from crude oil trapped in the earth’s mantle and using it to power aircraft turns the carbon compounds in the purified oil into carbon dioxide – the gas which causes the greenhouse effect and global warming. The carbon was safely trapped as oily compounds in the ground, but burning and releasing it into the atmosphere has turned it into a threat to human existence.

Sustainable Aircraft Fuel will be made from carbon based waste products such as cooking oil, plastic, wood, straw and farm slurry ^B. Here again the carbon is trapped as solid or liquid compounds in the waste products but, when used as aircraft fuel, it will be released into the atmosphere as carbon dioxide.

Consequently, there is little difference between using crude oil from the earth’s mantle and the waste products to make Sustainable Aircraft Fuel. Both take safely trapped carbon from the ground and release it into the air as the global warming gas, carbon dioxide. Nature does not differentiate between carbon dioxide and morally justifiable carbon dioxide.

Research on how to convert waste products into aircraft fuel on an industrial scale is being funded by aviation industry participants such as IAG who in July 2023 announced an investment in Nova Pangaea Technologies ^C, but it would be more effective to reduce the wastage of the current fuel. Aircraft Stacking is a leading example of such waste and unnecessary carbon dioxide emissions. We offer suggestions as to how to eliminate Aircraft Stacking and other wasteful practices in Appendix II.

The plastic waste products intended for Sustainable Aircraft Fuel can increasingly be recycled as the original plastic ^D and the amount of slurry and other farm and forest wastes will not be adequate to supply the vast quantity of aviation fuel that the aviation industry requires^E, let alone for its projected expansion. The large scale transformation of trees into aviation fuel, such as that recently announced by Drax^F is a particular climate change concern due to the part trees play in absorbing carbon dioxide and methane from the atmosphere. Trees are not ‘waste products’.

The concentration of methane in the atmosphere has more than doubled over the past 200 years, with 60% of the release caused by mankind^G. Methane traps around 120 times as much heat as carbon dioxide^H though it is less persistent in the atmosphere^I. However, a bacterium living ubiquitously in tree bark has recently been reported to oxidise methane to carbon dioxide^J. Consequently, the global stock of trees must be increased over the next 30 years to absorb atmospheric methane and reduce the rate of global warming while technology is discovered and deployed to reduce the output of carbon dioxide. Turning trees into carbon dioxide by aircraft is emissions, is counter productive.

SAF will not be available in quantity or in time to prevent the planet from reaching the crisis point of Global warming. Until then, aviation fuel will be made from crude oil from the earth's crust and nature's methods of counteracting global warming will be destroyed by well-meaning intervention.

The Current Governmental perception:

.....the preferred option as a percentage of total aviation fuel demand from 2025 to 2040. The baseline option starts at 1% in 2025 reaching 1.9% in 2030 and 4.3% in 2040. Option 2 starts at 2% in 2025, reaching 10% in 2030 and 22% in 2040^K

or as Michael O'Leary is reported as saying with uncharacteristic understatement^L:
it would take a "revolution" to hit his target of powering 12.5% of flights with the fuel by 2030.

The sole credible countermeasure to Global Warming by the airline industry in the medium term is a reduction in the wastage of aviation fuel while the technology to reduce carbon dioxide emissions is developed in other carbon dioxide producing applications. Aircraft Stacking is one of the principal ways in which the commercial aviation industry generates unnecessary carbon dioxide.

Re-cycled Sustainable Aircraft Fuel in the Environment (Re-SAFE) can only be made by capturing carbon dioxide directly from the atmosphere and turning it into aircraft fuel. This creates a circular system which mimics nature. The carbon dioxide is removed from the atmosphere and replaced without significant alteration to the overall concentration, whereas the growth of new trees will always lag many years behind the burning of mature trees causing a net increase in atmospheric carbon dioxide.

Research on the production of *Re-SAFE* is progressing ^M and might produce significant quantities of aircraft fuel in a couple of decades, but its production will be energy intensive and the resulting fuel may not be economically viable in the quantities required by the aviation industry.

For all of the above reasons, aircraft operators should concentrate on the economical use of the current fuel with a concomitant reduction in noise and pollution.

Replacement of the National Air Traffic Control System

The age and fragility of the National Air Traffic Control System were exposed by the failure of the system in August of 2023 and by less catastrophic failures previously. No professionally written software has crashed because of a false input since the 1980s; since then, false inputs have simply been rejected.

There was no emphasis 40 years ago on reducing carbon dioxide emissions or noise or pollution and the number of aircraft was considerably lower. The failure of the system and its backup show that the basis and principles of the Air Traffic Control System remain unchanged from an entirely different era of commercial aviation. The system should be rewritten so as to minimise the release of carbon dioxide into the atmosphere and this would naturally prioritise a reduction in the wastage of fuel in unnecessary manoeuvres such as stacking. We trust that this will be the case.

Appendix I

Technology will Reduce Carbon Dioxide Emissions by other Industries

Home insulation and the installation of heat pumps will greatly reduce the carbon dioxide emissions from homes. Heat pumps have recently become available which use helium and operate on the Stirling Cycle^N. They can deliver water at 80°C with a coefficient of efficiency of 4 (One unit of electricity is converted into 4 units of heat) or cool with the same efficiency. The pumps can be installed with no modification to existing house plumbing and will function as efficiently as fossil fuel boilers in old or new houses, negating the disadvantages of current heat pumps.

Carbon dioxide emissions from terrestrial transport will drop dramatically with electric and hydrogen fuels. This is already apparent and solid state batteries^O will remove the danger of fires, greatly reduce the weight and expense of electric cars and increase their battery capacity. The limiting factor will be the ability to produce the fuel, but this will apply to every application requiring energy.

The shipping industry is a major emitter of carbon dioxide, but the recently installed sails on the Pyxis Ocean^P showed that a bulk freighter can sail at over 5 knots under wind power alone and this will permit a fuel saving of 30%. Further development should halve the carbon dioxide emissions from shipping,

Pyxis Ocean
under sail at
sea



The production of cement requires the heating of chalk (calcium carbonate) to produce calcium oxide and carbon dioxide. On the scale that cement is produced, this is a large contributor to carbon dioxide emissions, but new technology^Q has revealed a substitute in the form of modified lime mortars which resorb the carbon dioxide on setting, making the process carbon neutral.

Carbon dioxide can now be electrochemically reduced to carbon by a palladium catalyst dissolved in liquid gallium. The carbon is deposited as sheets of graphene which can be added to the final cement increasing its strength and this is being commercially exploited by an Australian firm^R.

The technique can be used for any process, such as steel production, in which the carbon dioxide can be trapped, but the disposal of the carbon may be a limiting factor.

Competitive resolution of cryptocurrency algorithms are consuming the same amount of electricity as a small developed country. A financial system with no collateral, which is principally of use to organised international criminals and autocrats for the illegal transfer of money, may not be tolerated indefinitely.

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Appendix II

Suggestions for the Elimination of Commercial Aircraft Stacking

High Power Settings on Stacking Aircraft

Helions Bumpstead is situated beneath the Abbot Stack for aeroplanes landing at Stansted airport and the aircraft can be seen regularly and, in some summer months, continuously flying out from Stansted Airport before turning over Helions Bumpstead and flying back to Stansted. Clearly, this generates unnecessary carbon dioxide ¹ as well as other chemical and particulate pollution ² but, because these aircraft are using flaps and slats for turning ^{1d} in level flight at low altitude where the air is warm, high pressure and dense, they are operating at low efficiency^{1b,1c}. For these reasons stacking aircraft need to use high power settings and are generating more carbon dioxide, noise and other pollutants than they would at cruising altitude. One large stacking aircraft emits as much carbon dioxide as the winter heating for 10 starter homes and far more noise and pollution.

Aviation – Unreformed Contributor to Global Warming

The fact of global warming is irrefutable (Appendix III), stemming from many orthogonal observations ³ and its damaging effects are widely accepted ⁴ on a global scale. It is of little consequence whether warming is anthropogenic or not, our sole practical means of reversing it is to reduce the concentration of carbon dioxide in the atmosphere.

With the exception of aviation and possibly Mr Trump, major governments are successfully reducing emissions of carbon dioxide by the development of electric and hydrogen fuel cell cars, insulated houses, condensing boilers, renewable energy generation and tree planting, but the aircraft industry does not limit even the most arrant abuse. Due to expansion of the industry, CO₂ emissions by the aviation industry have increased by 80% between 1990 and 2014⁵.

Claims of Improvements are Exaggerated

The Direct Descent Programme claims that 90% of aircraft make a continuous descent directly to the airport without stacking or level flight ⁶. However, from our personal observations under the Abbot stack and having witnessed similar activity elsewhere, this claim appears optimistic and designed, with oleaginous publicity ^{6a}, to appease critics. Landing aircraft need only assume a straight, final approach five miles from the airport ⁷ as, indeed, is the case for departing aircraft which set a direct course for their destination within this distance. Helions Bumpstead is 15 miles from Stansted and there is, consequently, no excuse for stacking over the village.

The inexpensive fuel enjoyed by airlines removes management incentive to eliminate stacking and the consequent generation of noise carbon dioxide and pollution are ignored. If taxation of aviation fuel is not practicable⁸ then the stacking of aircraft should become illegal with penalties for non-compliance. For these purposes, stacking would be defined as deviation from a direct approach to a point 5 miles short of the destination runway or level flight below 10,000 foot. Alignment of incoming aircraft with the runway further than 5 miles out is disguised stacking, is unnecessary and should be eliminated.

The computational power necessary to organise this is available and investment in the development and use of robust software efficiently to direct aircraft arrivals and departures would result in a substantial reduction in the emissions of carbon dioxide, noise and other pollutants. It might also be an asset marketable to other busy airports.

Stacking Could Easily be Avoided

Departing Aircraft should Give Way to Arrivals

Flight controllers stack aircraft because it helps them to minimise the time interval between landings and thus maximise the revenue the airport makes in landing fees, albeit to the detriment of the environment and local inhabitants.

Stacking in the air is unacceptable and aircraft at single runway airports should delay take off so as to create immediate slots for incoming aircraft to land. Complaints from passengers waiting on the tarmac about 'nothing happening' should be ignored and stacking on the ground, so as to give preference to landing aircraft, should become the normality.

Under Utilised International Airports further North

Stansted is already exceeding its capacity, while other international airports in Britain, such as Edinburgh, Glasgow, Prestwick, Newcastle, East Midlands, Leeds Bradford, Cardiff and Birmingham, remain under-utilised⁹. Flight paths over southern Britain are also over capacity causing, noise, excessive pollution and a detrimental impact on safety. Yet passengers travel by car, train or air from the north to catch flights from Stansted and other southern airports.

It would make better ecological sense for equivalent numbers of passengers to travel north to catch flights from northern airports. Relocation of transatlantic flights to northern airports, thereby shortening the flight and the distance flown over populated land¹⁰, would alleviate the dangerous, damaging and noisy concentration of aircraft in the south while encouraging jobs and industry which are sorely needed in the northern part of the country.

This is emphasised by a snapshot of flights over Britain (Fig 1). It shows that the airspace over Heathrow, Stansted and Gatwick is easily the most crowded in Europe and this is also over the most densely populated area of ground in Europe. Moving some flights to the north of the country would be the aerial equivalent of creating a Freeport on Teesside, giving the northern areas similar economic benefits. It is also the only way in which the toxic products and accompanying health hazards due to commercial aircraft operation within 100 miles of London (see below) can be diluted to acceptable levels should the Government continue to support the current number of aircraft movements in this country.



Fig1. Flights over Britain at 7.50pm on 1st October 2017 (FlightAware)

Replace Short Haul Flights with More Efficient Trains

On short haul flights, most of the fuel is used in lifting the rest of the fuel and the airframe 7 miles into the air ¹¹. An Airbus A320neo has a maximum take-off weight of 79 tons (max 240 passengers *circa* 17 tons) and a maximum fuel capacity of 19 tons (26,730 litres) ¹².

Though actual values would depend on each flight, this is clearly a wasteful use of fuel and an unwarranted production of carbon dioxide and is only rendered financially viable by the cheap fuel available to airlines.

Sir Richard Branson, who owns both airlines and rail companies, calculates that on a short journey, an aircraft will consume 8 times the fuel of a diesel train ¹³. As the train does not require security checks, collects and delivers passengers at the centre of cities and does not need to circle before landing, there is less of a time difference between the two modes of transport than frequently perceived. Sir Richard Branson has proposed mandating rail travel in place of short haul flights ¹³, such as between Edinburgh and Stansted, and the reduction in traffic would obviously reduce stacking at the airports.

France has recently recognised this and banned flights where the journey could be completed in two and a half hours by train. But French consumer group UFC-Que Choisir called on lawmakers to retain the [previously considered] four-hour limit.

"On average, the plane emits 77 times more CO₂ per passenger than the train on these routes, even though the train is cheaper and the time lost is limited to 40 minutes," it said.

Use Larger Planes and Fewer Movements

Airlines like to operate frequent services to their chosen destinations so as to provide the most comprehensive and convenient service for their passengers. This generates a large number of flights which are responsible for the crowding and the consequent stacking of aircraft. It is a luxury that the planet can no longer afford, but the same number of passengers could be transported slightly less conveniently were the airlines to cooperate to fill their planes and to use larger planes and less frequent connections so that aircraft are full to all destinations. Once again, inexpensive fuel encourages airlines to prioritise their roster over carbon dioxide emissions ¹⁴. A reduction in movements would reduce the chronic aircraft overcrowding and stacking and noise.

Reduce the Number of European Control Centres

Europe has many more aircraft control centres (35)¹⁵ than north America (22)¹⁶ because each European country wants to control aircraft movements in its own airspace. The EU has done little to resolve this problem but talk^{6c} and the delays and poor communication between these centres result in aircraft entering British airspace without adequate warning.

Ensuring that there is sufficient runway capacity to land these unexpected aircraft directly, becomes a problem and they have to be stacked until a space can be found. America has landed men on the moon with the tiniest fraction of the computing power cheaply available to us today, but the commercial aircraft industry makes little effort to employ computing power to solve the problem because it is cheaper to fly aircraft around in circles. A concerted and Government enforced international effort to organise European flight management in a manner that reduces emissions of carbon dioxide may be being discussed, but is sorely overdue.

Pollution Damage to Health and Environment

Dangerous Distribution of Particulate Pollution

Similar hydrocarbon fuels in jet engines and diesel engines generate similar chemical pollutants and soot particles albeit in different proportions due to the different conditions of combustion². Higher temperatures cause a predominance of 2.5 micron (PM_{2.5}) particles in jet exhausts¹⁷ which are the most damaging as they enter deep into the lungs carrying pollutants which cause cumulative physiological injury¹⁸.

Terrestrial dissemination of soot is relatively ineffective as the particles stick to the ground, surrounding buildings, hedges and tree leaves by electrostatic attraction, but aerial distribution is not reduced by these obstructions and the particles fall freely on those below having been mixed with surface air by the downward vortex of each stacking aeroplane. DEFRA has neglected to collect relevant data for the affected areas¹⁹.

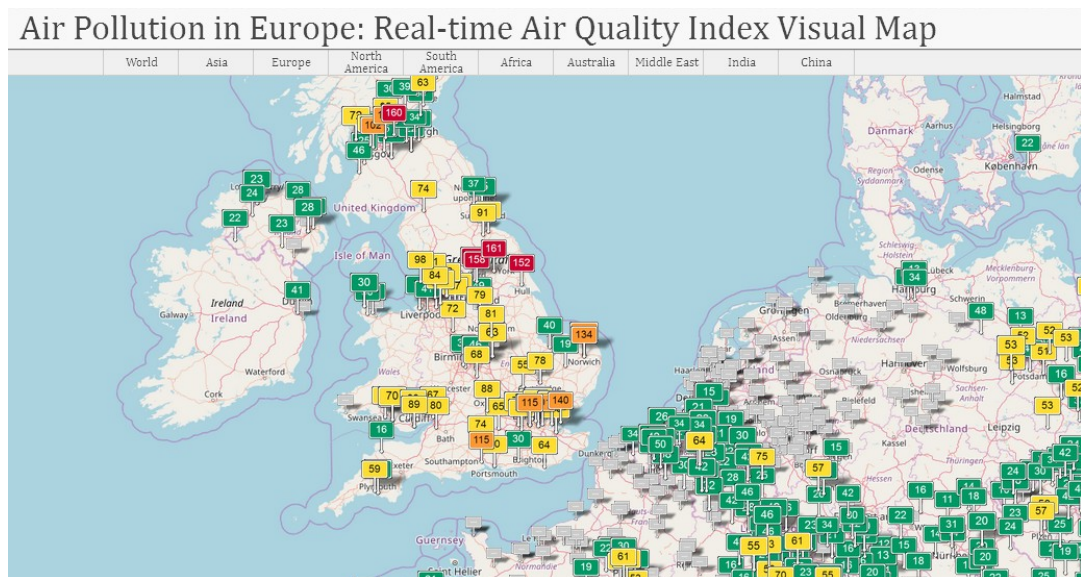
In addition to soot particles distributed by aircraft, magnetite nanospheres generated on high temperature metallic surfaces such as combustion chambers have recently been implicated in Alzheimers disease²⁰ - now the predominant cause of death in Britain²¹. These highly reactive particles have been found in human brains which they enter directly through the olfactory bulb and then destroy by their redox activity. The extremely small solid particles behave in a similar fashion to soot in that they will persist

in the atmosphere until mixed with surface air. Having established the presence of magnetite nanospheres in those exposed to diesel engine exhausts, Professor Maher is examining airport staff, who are closest to the metals in jet exhaust, to establish the extent of their ingestion of magnetite nanospheres ²².

Extensive testing ²³ has shown that spray from low flying aircraft is an effective method of disseminating involatile liquids and solids uniformly over a community. Stacking aircraft are doing exactly that, relentlessly spraying innocent communities with toxic soot and particles. The hazard caused by these pollutants should not be increased by an increase in aircraft overflying Helions Bumpstead.

Chemical Pollution Worse than Old Diesel Vehicles in Cities

Air quality in the south east of England is poor and the EU has issued a final warning for the worst affected areas, although they mostly remain outside the legal limits set by the EU ²⁴. Real time mapping persistently shows that, unless there are adequate winds, England is the dirty man of northern Europe as shown on the map below taken from Ref 13 at midday on the 6 November 2017.



AQI	Air Pollution Level	Health Implications
0 - 50	Good	Air quality is considered satisfactory, and air pollution poses little or no risk
51 -100	Moderate	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
101-150	Unhealthy for Sensitive Groups	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
151-200	Unhealthy	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects

The Airbus A380 holds 320,000 litres (270.5 metric tons) of aviation fuel – 50% of its maximum take off weight ²⁶, much of which is used to lift it into the air and when landing. Consequently, aircraft generate large quantities of exhaust fumes ² close to the ground and these are rich in toxic nitrogen oxides (NO_x) due to the high temperature and pressure of combustion ¹⁷. NO_x emissions from aircraft have doubled between 1990 and 2014 and are forecast to grow by a further 43% by 2035 ^{5, 27}. Nitrogen oxides are also responsible for the formation of surface ozone on sunny days which has well established detrimental health effects especially on the young, the old and the ill ²⁸.

Old diesel engine vehicles have received the brunt of the blame for pollution associated early death in the western world, but jet engine exhausts are likely to contain a wider range of toxins than those of terrestrial diesel engines, because their fuel requires substantial quantities of additives to allow the engine to operate under extreme conditions. These include antioxidants, corrosion inhibitors, detergents, biocides, temperature stabilizers, metal deactivators, fuel system icing inhibitors and static electricity dissipaters. The constitution of some of these chemicals is a trade secret and the combustion products ²⁹ are not fully characterised so their toxicity is unknown. Jet engines can not be detoxified in the same way as diesel engines using catalysts, filters and reductants and so will continue to pollute the air of communities under flight paths and stacks in a manner which is now considered unacceptable in cities.

Amenity, Anxiety and Health

In an attempt to maintain the rural nature of the less overbuilt parts of the Essex, Braintree District Council has designated Tranquil Areas (Appendix 2) which include Helions Bumpstead and a large part of northern Essex. People who most require peace and open air – and this is rapidly becoming recognised as beneficial to the mental outlook of most of the population ³⁰, gravitate to these areas.

Unfortunately, controllers stack aircraft over these green spaces, in the hope that a lower population density will produce fewer complaints. Since they are otherwise tranquil, stacking aircraft produce an intolerably prominent racket which destroys the

beneficial effect of the 'green space' although it might be less noticeable in areas with greater background noise³¹. Stacking aircraft are a perpetual interruption of conversation and thought outdoors and an annoying reminder of the damage flying does to the environment³².

The danger of accident with drones or other aircraft, which is most acute during landing and take off due to crowding and low level flight, and the awareness of several hundred thundering tons directly above, are a source of anxiety for many people. For those who require an open window at night, stacking aircraft in an otherwise quiet environment disturb sleep³³.

This is exacerbated in the case of Helions Bumpstead by the aircraft circling which means that they create noise as they approach, turn and as they return to Stansted, each aircraft disturbing the peace for between 2 to 5 minutes. This pollution and noise can be continuous when the aircraft circle individually every 5 minutes throughout the day and sometimes at night. It is particularly unpleasant with EasyJet aircraft, as their elderly, small diameter jet engines produce high velocity air which results in a resonant scream which is exceptionally obnoxious to those with impaired hearing.

Microwave Radiation

Tracking of stacking aircraft requires the use of high powered RADAR so close to ground level that a wind turbine near Helions Bumpstead would cause false images on the RADAR receiver by reflection of the microwaves from the turbine blades. Microwaves are not normally a threat to health since they are absorbed by water vapour in the air³⁴ and the natural background is therefore low. However, in the sixties, synthetic microwave radiation from RADAR was proposed to be the cause of posterior subcapsular cataracts³⁵ and since then several inconclusive studies have been published³⁶. In the rat, acute doses of microwave radiation have undoubtedly been shown to cause cataracts and it is possible that a sufficiently large cohort of humans has yet to be exposed to a large enough or long enough dose for microwave damage to be statistically significant.

The frequency of stacking aircraft is such that the reflection of microwaves from the underside of overflying aircraft onto people on the ground is a cause for concern. and would be in addition any refracted radiation and to the increase in microwave radiation of various wavelengths from other unrelated and recently developed applications. For safety, we would prefer not to be used as a vanguard in this human experiment by enforced exposure to cumulative doses of microwave radiation in excess of that of the general public.

A detailed survey of the impairment to the mental and physical health of all residents living below stacks and low altitude flight paths in the south of England would be of interest. An approach to this has been the recent study showing a 40% rise in childhood cancers over the past 16 years attributed predominantly to pollution amongst other factors ³⁷.

Conclusion

The aviation industry should consider that the era of high speed passenger jet travel is drawing to a conclusion, particularly for short haul, because of the noise, pollution and the contribution to global warming. Progress will be similar to that of terrestrial transport where political pressure has suddenly emerged to replace fossil fuelled motor vehicles, despite their popular appeal, with vehicles powered from renewable sources thereby stimulating a leap forward in the technology. The urgency will become apparent even to air travellers as climate change induced air turbulence places increasing stress on airframes and passengers ³⁸.

Replacements for jet air travel are being developed and in some cases are ready for use. Energy efficient Hyperloop trains ³⁹ will be faster and in direct competition to short haul aircraft on popular routes. Hybrid airships such as the Airlander are slower, but have enormous lifting capacity, safety and stability and flights are soon to be offered to paying passengers ⁴⁰. They are also potentially carbon free and need not require a runway ⁴¹. The return of helium filled buoyant aircraft is reminiscent of the return of improved electric cars from the 19th century ⁴² and demonstrates how advances in circumstantial technology can reactivate sophisticated concepts whose development was limited at the time of their invention. The first solar powered aeroplane has recently circumnavigated the earth ⁴³. Other linear developments, such as 'electric aircraft', imitate the hybrid car concept and offer a maximum of only 10% reduction in emissions and pollution despite the published hyperbole ⁴⁴.

Under such circumstance, you might expect the aviation industry to clean up its act and attempt to behave like a responsible citizen so as to generate some positive publicity before the political spotlight turns onto them, but they continue to burn fossil fuel as if the level of carbon dioxide in the atmosphere were irrelevant and pollution did not apply to them.

The commercial aircraft industry may protest that they are already taking action to curb carbon dioxide emissions caused by stacking, in which case they should explain why up to 120 aircraft a day are still flying in circles around Helions Bumpstead.

Reports such as the EU European Aviation Environmental Report ⁴⁵ eulogise pedestrian progress from a low base while admitting the rising pollution from expanding commercial

aviation and the increasing release of carbon dioxide, nitrogen oxides and damaging particulates into the atmosphere. We demand a real and continuing reduction in the total output of carbon dioxide by commercial flights, a reduction in the emission of chemical pollutants and particulates, especially in the most polluted areas and an end to blatantly wasteful practices such as deviating from a direct route to waste time in the air.

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Appendix III

The fact of warming is irrefutable, stemming from such orthogonal observations as satellite temperature measurements, rising sea levels and temperatures together with shrinking ice packs and glaciers and the increasing occurrence of unprecedented or 'once in a century' events such as the season of 21 hurricanes in the Caribbean in 2017 whose number and ferocity were caused by high surface water temperatures. Refugees from southern states stream into Europe to escape the poverty and conflict caused by summer temperatures of 50°C. and the Sahara has moved half way up Spain in the last 30 years so that the south now survives on piped water from the mountains in the north.

As the planet warms to 2 degrees Centigrade above pre-industrial temperatures, positive feed back cycles, such as the release of carbon dioxide from melting tundra and loss of white snow cover, which reflects light and heat back into space, will increase the rate of warming. Thereafter, the higher temperature will raise the concentration of water vapour in the atmosphere – a powerful greenhouse gas and the heating will become unstoppable.

Atlantic hurricane names 2017

Arlene	Harvey	Ophelia
Bret	Irma	Philippe
Cindy	Jose	Rina
Don	Katia	Sean
Emily	Lee	Tammy
Franklin	Maria	Vince
Gert	Nate	Whitney

Reinsurance giants Swiss Re and Munich Re will post a combined third quarter loss of £4billion due to what the governor of the British Virgin Islands, Gus Jaspert, described as the 'completely unprecedented' occurrence of two category 5 hurricanes following each other.

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Appendix 2

Tranquil Areas

http://www.essex.gov.uk/AnalyticsReports/CB_LCA_Essex_2002.pdf

5.2.8

Nationally, extensive tracts of tranquil and undeveloped countryside are becoming an increasingly limited resource: maintaining extensive areas of tranquil countryside largely free from the influence of urban intrusion and major transport corridors is of critical concern to the protection of the essential character of the county.

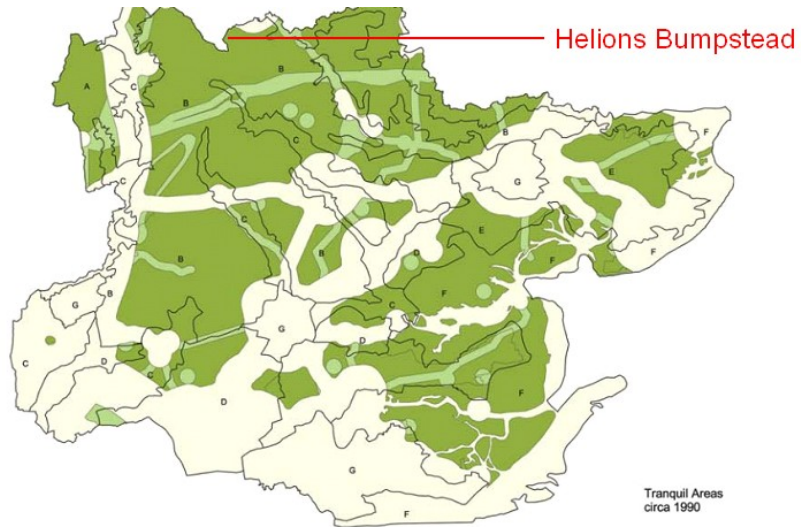
Figure 9 shows how the pattern of tranquil areas in the county has changed dramatically between the 1960s and 1990s. Only the most remote northwest and eastern parts of the county now contain extensive tranquil areas. The lack of tranquillity associated with the urban landscapes of South Essex has been exacerbated by the effects of traffic along the M25/M11/A12/A13 road corridors.

5.2.9

The key issues include:

Fragmentation of tranquil areas by major road transport corridors.

Threats from various developments to existing extensive tranquil areas and remaining 'islands' of tranquillity.



Produced by Chris Blandford Associates
 Data sources:
 Landscape type boundaries based on Ordnance Survey Mapping
 Tranquil Areas provided by HTS Consultants Ltd & ASH Consulting Group

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 Essex County Council 0776619 2001
 n:\gis\projects\117990\scaps_1w_apr (fig 9 Tranquil Areas II) 07/18/2002

<ul style="list-style-type: none"> Semi Tranquil Areas Tranquil Areas Landscape Types 	<p>Landscape Types</p> <ul style="list-style-type: none"> A Chalk Uplands B Glacial Till Plateau C River Valley Landscapes D Wooded Hill Ridges E London Clay Landscapes F Coastal Landscapes
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Figure 9 Tranquil Areas