Gatwick –
destroying climate change targets

A study of the emissions caused by aircraft using Gatwick Airport

Contrails over Gatwick

Gatwick Area Conservation Campaign

Full version

Lapwing frequently used to be seen in the Gatwick area but are now rare. They have been deliberately scared away from the airport, their habitat has been diminished by development, and now global warming droughts are drying up the boggy grasslands which they need for food and nesting.

GACC and Climate change

The majority of scientists and politicians believe that global warming is occurring, and that it is mainly caused by man-made CO_2 emissions. Others believe that it is mainly due to natural causes. It is not for the Gatwick Area Conservation Campaign to engage in the scientific debate, but it is legitimate for us to point out that the growth in air travel from Gatwick is undermining Government targets.

GACC has repeatedly pressed BAA (now owned by Ferrovial) to publish the amount of CO_2 emissions caused by aircraft from Gatwick, but BAA have adamantly refused. It has therefore been necessary to do the calculations ourselves. Fortunately it is not too difficult. The dramatic results show why BAA are so reluctant to publish.

This is the full version of our study. A shorter version, designed to present the results to Ministers, civil servants, MPs, local authorities and – through the press – to the public, has been printed as an illustrated booklet, and is available from GACC.

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Photos
Aircraft contrails over Gatwick: GACC member Margaret Garber
Lapwing: GACC member Jeremy Early

We now have sufficient evidence that human-made climate change is the most far-reaching - and almost certainly the most threatening - of all the environmental challenges facing us. … it is the poorest members of the [world] community - those most dependent on the natural world for their survival, and those with the fewest resources to buy their way out of unhealthy environments - that suffer the most.
Gordon Brown. 15 March 2005

Wrecking climate change targets

Most people think of Gatwick as a place to start a happy holiday with the opportunity to fly to ever more exotic and distant places. But this new study by GACC shows that aircraft from Gatwick are helping to undermine the Government's climate change targets.

We are all encouraged to walk or bicycle more, to turn down the thermostat, or to install energy saving bulbs. Less attention is given to flying. Aviation has been excluded from all government CO_2 targets, and is not included in the Climate Change Bill.

The growth in aircraft emissions is threatening to cancel any success achieved elsewhere. Aircraft are the fastest rising source of CO2 emissions. The Government has stated that aviation accounts for 13% of UK climate change damage.[1] Gatwick is the second largest airport in the UK.

As the main environmental group concerned with Gatwick, GACC has undertaken this study in order to bring the debate about climate change home at a local level.

The A380, which can carry up to 880 passengers, is due to start operating at Gatwick within the next few years, subject to planning permission. Airbus claim it will create less pollution *per passenger*, but in fact each aircraft will cause more climate change damage than any other commercial aircraft now operating.

The GACC study

There is no international agreement on how to allocate responsibility for aircraft emissions on flights outside national borders.

One method, favoured by the UK government, is to calculate the carbon dioxide emitted in flight by all aircraft departing from UK airports, but not that emitted by arriving aircraft.

One simple way to get an approximate estimate is to start from the figure given by the Department for Transport that all aircraft departing from UK airports emitted 9.8 million tonnes (Mt) of carbon in 2005.[2] That includes take-off, climb, cruise and landing. Taking account of the growth in air traffic, the figure in 2007 would be around 10.5 Mt of carbon, equivalent to 38.5 Mt of CO_2.

Gatwick handles 17% of UK passengers.[3] The distance flown by planes from Gatwick is probably about equal to the national average – less than from Heathrow but more than from other airports. **That would indicate that aircraft from Gatwick on their outward journeys emit about 6.5 Mt of CO2.**

A second method of calculation is to start from the amount of aviation fuel taken on board aircraft at Gatwick. In 2006 this was around 2.6 billion litres[4] which would weigh roughly 2.2 million tonnes. Every tonne of aviation fuel produces 3.15 tonnes of CO_2.[5] Thus the fuel taken on board at Gatwick produces 6.9 Mt of CO_2. That figure needs adjusting to allow for the fact that some aircraft fill up at Gatwick for both the outward and for the return journeys, and conversely that some aircraft may fill up abroad for both journeys.

A third method would be to add up the mileage of all the routes flown, and assess the emissions caused by each type of aircraft both on take-off, cruising and landing. This is beyond our resources.

BAA have recently (and reluctantly) published figures for the CO_2 emissions of aircraft from Stansted. This information is buried in the proof of evidence of an expert witness appearing on their behalf at the public inquiry into the Stansted expansion proposals.[6] It is forecast that CO_2 emissions caused by aircraft from Stansted in 2014, if the airport is then handling 35 million passengers a year, roughly the same as Gatwick at present, will amount to 4.04 Mt. The average distance of flights from Gatwick is, however, considerably greater than those from Stansted.

Thus both the calculation based on fuel, and the BAA figures for Stansted, broadly confirm our estimate for Gatwick of 6.5 Mt. We recognise, of course, that our calculations can only be rough approximations. We do not have the information to make a detailed calculation. But we are satisfied that our results show the scale of the problem. If BAA wish to quibble, it is open to them to publish their own figures.

More damaging at high altitude

Greenhouse gas emissions from aircraft, because they take place at high altitude, are more damaging than similar emissions at ground level. Moreover, the global warming impact is increased by aircraft contrails, as shown in our front cover photo. The UK government, and most scientists, agree that CO_2 emissions by aircraft are between 2 and 4 times more damaging than CO_2 emitted from other sources, such as power stations or cars, at ground level.[7] The government frequently use a figure of 2.7 for this radiative forcing effect, but to avoid any accusation of exaggeration, we use a figure of 2.0.

Thus, using the Government method of calculation -

Aircraft departing from Gatwick are responsible for the equivalent of over 13 million tonnes of CO2 emitted by other energy uses.

In Crawley over 1,500 people have signed up to the Crawley Climate Pledge, pledging to buy green electricity, fit low energy bulbs, do more cycling and walking, recycling rubbish and fitting water savers.

But Gatwick, (which is in Crawley Borough) creates 17 times as much CO_2 as the total caused by the whole of Crawley - industry, vans and lorries, private cars, and the heating and lighting of houses and offices – which in 2003 amounted to 735,000 tonnes.[8]

Count return flights too ?

Only counting departing flights underestimates the responsibility of the UK, and of Gatwick, because it ignores return flights. A high proportion of passengers at Gatwick are UK citizens. An alternative method of allocating responsibility for international flights, favoured by some other countries, is based on the nationality of the passengers; that is to count the emissions caused by the return flights of British citizens, but not the inward or outward flights by foreign citizens.

Gatwick check-in area

Counting only departing flights produces some silly results. For example it means that half the responsibility for the emissions caused by tourist flights to Bermuda is allocated to that small island (population 67,000). Allocating responsibility according to the nationality of air passengers is more accurate, but would be administratively arduous to calculate for each flight. Fortunately it is possible to make a broad brush estimate for Gatwick as a whole.

If departing flights create 6.5 Mt of CO_2, then departing and arriving flights create 13 Mt. 80% of Gatwick flights are made by UK citizens.[9] If it is assumed that on average UK citizens fly the same distance as foreigners, then they are responsible for

10.4 Mt of CO_2. This figure needs to be multiplied by at least 2 in order to take account of the more damaging effects of aircraft emissions at high altitude. Thus

UK citizens on return flights from Gatwick each year are responsible for emissions equivalent to over 20 million tonnes of CO_2 at ground level.

That is more than the total emissions from all of Surrey and all of West Sussex - industry, vans and lorries, private cars, and the heating and lighting of houses and offices – which in 2003 amounted to 13 million tonnes. [10]

Plans have recently been published for the biggest wind farm in the world. It would cover an area, in the Bristol Channel, larger than the Isle of Wight, and would save 2.3 million tonnes of CO2 a year.[11] This would be a small fraction of the damage caused by Gatwick flights.

Flying backwards into the future

The BAA Gatwick Master Plan predicts that between 2005 and 2015 passenger numbers will rise by 20%, mainly through the use of larger aircraft, such as the A380. So, even allowing for some improvement in aircraft efficiency, the growth of Gatwick is likely to cancel all the hard won reductions in CO2 emissions achieved by the whole of Surrey and West Sussex.[12]

Crawley Council will therefore need to think carefully before granting any planning permission for further airport expansion, such as the pending retrospective application to widen the runway to enable the giant A380 to land at Gatwick.

[In 2005 BAA undertook work to widen the runway, and consulted Crawley Borough Council, on the grounds that planning permission was not required. GACC objected and suggested that permission was required. Crawley agreed. BAA submitted a planning application. Crawley asked for more information. BAA withdrew the application. Full details are given on the Crawley Borough Council website, which also provides an opportunity to comment.] [13]

Emissions from all activities in London, Surrey and West Sussex

Emissions from a two runway Gatwick

A second runway at Gatwick is unlikely ever to be built because the site is so small, but is still included in government and BAA plans, after the legal agreement runs out in 2019 – if a new runway at Heathrow cannot meet EU pollution standards. The runway would be designed to double the number of passengers. Even if airlines manage to achieve a 1% a year improvement in aircraft efficiency, it would still mean a huge increase in CO_2 emissions.

By 2050, even after allowing for improvements in aircraft efficiency, a second Gatwick runway would mean that UK citizens on return flights from Gatwick would be responsible for emissions equivalent to about 30 million tonnes of CO_2 a year.

Calculation. Increase in passengers 34 million to 80 million = + 135%
Efficiency gains. 1% a year for 43 years = 43%
Increase in emissions = + 64%
Gatwick emissions due to UK citizens in 2007 equivalent to over 20 million tonnes CO_2 (see page 7)
Two runway Gatwick emissions in 2050 = approx 33 million tonnes

In 2003 the total CO_2 emissions from Surrey, West Sussex and Greater London (not including Heathrow) were 64 million tonnes.[14] By 2050, if they are reduced in line with the 60% target, they will have shrunk to 26 million tonnes. Therefore -

Gatwick with two runways would cause more climate change damage than all the industry, vans and lorries, private cars, and the heating and lighting of houses and offices in all Surrey and all West Sussex, plus all Greater London (not including Heathrow).

Each Gatwick passenger carries a heavy responsibility

Because CO_2 is invisible, many Gatwick passengers give no thought to the damage they are causing. On average each passenger on a return flight from Gatwick is responsible for putting about 765 kg of CO_2 into the upper atmosphere.

Calculation. Aircraft departing from Gatwick, and returning to Gatwick, emit 13 million tonnes of CO2 a year, see page 6. This excludes the fact that aircraft emissions at high altitude are more damaging as those at ground level.
34 million passengers a year = 17 million return flights.

Per passenger return flight = 765 kg of CO2.

It is, however, difficult to visualise 765 kg of an invisible gas. One way of illustrating the impact of aircraft emissions is to work out how many ordinary party balloons it would fill, as shown on the back cover.

The balloon calculation

Per passenger return flight = 765 kg of CO2.
1 kg CO_2 = 509 litres by volume [15] = 0.509 cubic metres.
Thus 765 kg CO_2 = 390 cubic metres.
A typical party balloon has a diameter of say 25 cm. Its volume = 0.0082 cu m [16]
Thus the average passenger on a return flight from Gatwick is responsible for emissions of CO_2 sufficient to fill over 47,000 party balloons.
If we assume that the average flight, from take-off to landing, is two hours, then on average each passenger is responsible every airborne minute for CO_2 emissions sufficient to fill 195 party balloons.

The Government also expresses climate change damage in terms of carbon, instead of carbon dioxide. 1 kg of carbon is equal to 3.67 kg of carbon divide.. So 765 kg of CO_2 = over 200 kg carbon.

Thus each Gatwick passenger on a return flight is responsible for the emission of over 200 kg of carbon. In everyday terms that is equal in weight to each passenger carrying on board 200 bags of soot each weighing 1 kg (we are all familiar with a 1 kg bag of sugar) and scattering them out of the window.

When GACC asked BAA for permission to take a photograph of a passenger in the Gatwick check-in area carrying bags of sugar to represent the 'soot' created by each flight, BAA refused permission. When our request was repeated by Dr Caroline Lucas, Member of the European Parliament, BAA again refused.[17]

That was in a public area, where photographs are normally permitted. The only reason we requested permission was not to cause a security scare. BAA are only too pleased to welcome TV cameras showing happy holiday makers but not to show the amount of carbon attributable to each passenger.

A disgraceful campaign

The airlines have been running a campaign emphasising that 'aviation only accounts for 2% of global CO_2 emissions.' BAA at Gatwick go one absurd step further: they claim that UK aviation only accounts for 0.12% of global CO_2.[18]

The reason why global aviation is only a small proportion of global emissions is, of course, that few people in countries such as India or China fly. That is no excuse for the UK to go on increasing our emissions.

The reason why UK aviation is an even smaller proportion of the world total is, of course, that the UK only has a small proportion of the world population. Such percentages are irrelevant. The correct figure to use is UK aviation emissions as a proportion of UK total emissions.

The Government has stated that in 2005 aviation accounted for 13% of UK climate change damage.[19] That is for departing aircraft only, but does include the extra damage caused at high altitude. If the figure is brought up to date, and adjusted to reflect the proportion of UK citizens on all departing and arriving flights, the figure is nearer 20%.

Emissions trading

The aviation industry and the Government claim that air travel can continue to grow because all the climate change problems will be solved when aviation is brought into the EU emissions trading scheme. The theory is that airlines will purchase permits to pollute from other industries.

The target agreed by the Government and by the EU is that all CO_2 emissions should be cut by 60% by 2050. If Gatwick were to expand at forecast rate, emissions trading would mean that by 2050 Gatwick airlines would need to buy up all permits for London, Surrey and Sussex.

£900 a year for local residents

if Gatwick tax subsidy removed

Air travel is encouraged by generous tax exemptions.

- No tax on aviation fuel.
- No VAT on air tickets.
- Duty free sales in Gatwick airport shops.

The tax concessions are worth about £10 billion a year to the aviation industry.[20] Air passenger duty will yield about £2 billion in 2007-8. Thus air passenger duty, even after the increase in February 2007, represents only a fifth of the revenue lost from these tax concessions.

If the aviation fuel used at Gatwick paid duty at the same rate as fuel for cars, the extra revenue would be sufficient to give each and every man, woman and child in Surrey and West Sussex £900 per year.

Calculation
Aviation fuel used at Gatwick = 2.6 billion litres a year. Tax on petrol (including VAT) about 63p per litre
Revenue if aviation fuel taxed at same rate = £1.64 billion
Population of Surrey and West Sussex 1.81 million[21]
Extra per head = £900

Technological Progress

The aviation industry suggests that technological progress will reduce the level of aircraft emissions. This claim is of doubtful validity. The best that can be expected is an improvement of around 1% a year,[22] and even that may be counter-balanced by the trend for people to fly longer distances especially if, as predicted, low cost airlines enter the long haul market.

The aviation industry claims that a 50% improvement in fuel efficiency (and thus in CO_2 emissions) will be achieved by 2020.[23] But -

- Richard Branson's proposal that aircraft should be towed to the end of the runway, with a trial at Gatwick, is making slow progress.

- It is now realised that the production of bio-fuels for aircraft will endanger the rain forests.

- the 50% improvement only applies to new aircraft in 2020. Since Gatwick has a comparatively new fleet, many of the aircraft using the airport today will still be flying in 2020. The A380 will probably still be flying in 2050.

- the claim that big increases in fuel efficiency have been achieved in the past is misleading since it is based on comparison with the early gas-guzzling jets such as the Comet. A study by the Dutch National Aerospace Laboratory shows that today's aircraft are no more fuel efficient than the Lockheed Super Constellation of the mid 1950's.[24]

- the hopes of technological progress depend on inventions which have not yet been made. The 50% target is based on a report by ACARE (Advisory Council for Aeronautical Research in Europe) in 2002 which stated that it would "require the employment of novel concepts and breakthrough technologies into commercial service. ... The consensus view is that the rate of progress for conventional engines will slow down significantly in the next 10 years. To maintain the same rate of progress as today to 2020 and beyond will require breakthrough technologies and consequently higher risk approaches." [25]

An unmanned solar-powered aircraft set a world altitude record of 96,500 ft. in August 2001.

Unfortunately there is no prospect of such an aircraft being used for normal commercial passenger flights

Wreck the sky when you fly

On average each passenger on a return flight from Gatwick is responsible for the emission of sufficient CO_2 gas to fill 47,000 party balloons. Calculation see page 9.

For every minute that each passenger is airborne they cause the emission of sufficient CO_2 gas to fill about 195 party balloons.

Aircraft emissions (or balloons) are at least twice as damaging as the same amount at ground level.

CO_2 remains is the atmosphere for up to 100 years, so each year more and more accumulates.

Notes

[1] Answer to Parliamentary Question by Peter Ainsworth MP 2 May 2007.
[2] Answer to Parliamentary Question. 8 December 2005.
[3] Gatwick Airport Interim Master Plan. October 2006. page 33.
[4] Private information.
[5] Aviation and the Environment: Using Economic Instruments. HM Treasury. March 2003.
[6] http://www.stopstanstedexpansion.com/documents/BAA_Air_Quality_Volume_3a_Appendix.pdf http://www.stopstanstedexpansion.com/documents/BAA_Air_Quality_Evidence.pdf
[7] The Future of Air Transport Progress Report. page 19. Department for Transport . 2006.
[8] DEFRA - http://www.defra.gov.uk/environment/statistics/globatmos/regionalrpt/laregionalco2rpt20051021.xls
[9] Gatwick Airport Interim Master Plan. October 2006. page 20.
[10] DEFRA. See internet reference in note 8.
[11] The Times 18 May 2007
[12] Assuming that the two counties are on course for a 60% reduction by 2050.
[13] http://www.crawley.gov.uk/stellent/idcplg?IdcService=SS_GET_PAGE&ssTargetNodeId=560&ssDocName=PLA_25370&pageCSS=&pApplicationNo=&pDayFrom=01&pMonthFrom=04&pYearFrom=04&pDayTo=31&pMonthTo=05&pYearTo=07&pWard=&pLocation=gatwick%20airport&pPostcode=&pDateType=received&pProposal=runway%20widening&pAppealsOnly=
[14] DEFRA. See internet reference in note 8.
[15] http://www.climatepartner.com/1_tn_carbon.php
[16] http://www.abe.msstate.edu/~fto/tools/vol/sphere.htm
[17] Full details available on request from GACC.
[18] Gatwick Airport Interim Master Plan. October 2006. page 33.
[19] See note 1.
[20] The Hidden Cost of Flying. Sewill. AEF 2003
[21] 2001 census. ONS.
[22] Aviation and Global Warming. Department for Transport. 2004.
[23] See www.sustainableaviation.co.uk
[24] See http://www.t-e.nu/docs/Press/2005/2005_12_07_aircraft_fuel_efficiency.pdf
[25] Quoted by DfT in Aviation and Global Warming. 2004