

Airlines operating within or to or from the EU are required to monitor their fuel burns and RTK traffic figures from the start of 2010 for the implementation of the EU's ETS in 2012. The ETS aviation mechanism and the implications for airlines are explained.

The implications of the EU's ETS

Airlines flying into Europe have spent 2009 scrambling to prepare monitoring, reporting and verification (MRV) plans ahead of the aviation industry joining the European Union's (EU's) five-year-old Emissions Trading Scheme (ETS) on 1 January 2010.

Airlines operating to, from or within the EU must report their annual CO₂ emissions in tonnes, and their annual revenue tonne kilometres (RTKs) during 2010 by the end of March 2011. The European Commission (EC), which runs the scheme, will use these data to allot each airline a share of the total aviation industry CO₂ emissions-free allowance, which is set at 85% of an industry CO₂ emissions 'cap'. The remaining 15% will be made available to airlines via auction.

The total cap for annual CO₂ emissions produced by the aviation industry during 2012 will be 97% of average 2004-6 CO₂ emissions, falling to 95% in 2013-2020. Its total CO₂ emissions will therefore not be allowed to increase; and are expected to be 210-220 million tonnes of CO₂ per year. This quantity is proportional to the amount of fuel burnt by the industry's aircraft fleet. A conversion factor of 3.16 tonnes of CO₂ per tonne of fuel means that the industry's fleet will be limited to consuming 66-70 million tonnes of fuel each year.

Each airline's free allowance from the industry allowance in 2012 will be based on a share of the total RTKs generated by all airlines included in the ETS in 2010. When calculating RTK traffic volume, the distance flown is taken as the great circle distance between points plus 95km. The EC has a list of airlines included in the ETS, from EU and non-EU states.

Each airline's annual allowance will therefore depend on its volume of traffic and RTKs in the previous year, and how this compares to the industry's total.

Airlines will have to buy further CO₂ allowances to cover the rest of their emissions if they are to maintain the size of their operations. The current price of purchased CO₂ allowance is EUR 14 per tonne. This is expected to rise, however.

There is also 3% of the cap, which is held back as a 'Special Reserve' for new and fast-growing operators (from 2013).

Airlines will be able to increase their annual CO₂ quota through an auction of ETS allowances and other ETS and Kyoto-compliant carbon trading schemes. They will be able to buy indirectly from airlines that have downsized or gone out of business, and have allowances to sell. CO₂ quota that becomes available will increase in price, since many airlines will want to grow their operations.

An efficient airline will generate a high volume of RTKs per tonne of fuel, by having high load factors and/or more fuel-efficient aircraft. An airline could increase its RTKs, for example, by acquiring more fuel-efficient aircraft.

The RTK data collected in 2010 will be used as a benchmark to calculate CO₂ allowances from 2012 onwards. From

2011 airlines will have to submit RTK data each year for their share of free allowances to be re-determined. An airline that constantly increases its RTK productivity, or fuel efficiency, will find that its free allowances cover a greater proportion of its operation than if it consumed more fuel for the same total RTKs.

Airlines will also have to submit verified fuel use data, which can easily be converted to give their actual CO₂ emissions, to see how their consumption compares to their allowance.

ETS incorporated into EC law

Aviation will be integrated into the existing EU ETS by Directive 2008/101/EC, which became law on 2nd February 2009. This sits together with 2003/87/EC, which is the ETS 'Mother Directive'. The EC has now released a consolidated version to integrate aviation with other industries, such as power generation and manufacturing.

From 1st January 2012 the ETS will apply to all domestic and international

EU COUNTRIES SUBJECT TO THE ETS

Austria	Germany	Netherlands
Belgium	Greece	Poland
Bulgaria	Hungary	Romania
Cyprus*	Irish Republic	Slovakia
Czech Republic	Italy	Slovenia
Denmark	Latvia	Spain
Estonia	Lithuania	(but not the Canary Islands)
Finland	Luxembourg	Sweden
France	Malta	UK (but not the Channel Islands)

If an operator flies to/from or within any of the following countries they may be subject to ETS regulations and should contact the relevant Competent Authority (a list is available on the EC website).

TIMELINE FOR ETS IMPLEMENTATION

1st February 2009 The EC assigned all operators to Member States (this was delayed).	allocated free of charge. Regulator publishes final allocations.
31st August 2009 Operators submit benchmarking monitoring plans and emissions monitoring plans to their relevant regulators (this had various delays).	1st January 2012 First Actual Reporting Year Starts.
31st December 2009 Deadline for regulators to approve plans.	28th February 2012 Regulator issues Free Allowances.
2010 Benchmarking year - operators monitor their monitor RTKs.	31st March 2012 Deadline for operators to submit 2011 verified emissions data to regulator.
1st January 2010 Monitoring of airline emissions starts.	31st Dec 2012 Operators to write an emissions report, verified by external verifier. Operators to correct any errors before verifiers sign off report.
31st March 2011 Operators submit RTK activity data to the regulator to apply for free allowances. They also submit verified emissions data.	31st March 2013 Operators file report on emissions.
30th June 2011 Regulator submits applications to the EC to calculate benchmark.	30th April 2013 Regulator acknowledges verified emissions report. Operators surrender equivalent number of allowances from registry account for previous year.
30th Sept- 31st Dec 2011 The EC calculates benchmark used to calculate emissions allowances to be	30th June 2013 Regulator reports to EC on application of directive.

flights arriving at, or departing from, EU airports, and will include both EU and non-EU operators. Each Member State of the EU has had to incorporate the Directive into its domestic law.

EU operators will be administered by a designated Competent Authority (an environment agency or national aviation authority) in their home Member State, while non-EU operators are allocated to EU States by the EC. This allocation is included in a list (under EC Regulation 748/2009) which was adopted on 5th August 2009, and published in the EU's Official Journal on 22nd August 2009.

The EC has since realised that some air navigation service providers included on the ETS list are not aircraft operators and airlines. The EC has asked them to produce lists, including legal names and fleets since 2004. The next list of airlines (also including any other corrections) will be published in early 2010, so these operators had to submit declarations by the end of October 2009.

A key point is that an operator on the ETS list may not necessarily be included in the ETS, because inclusion depends on whether the aircraft operator performs an aviation activity as defined by the ETS Directive. Commission Decision 2009/450/EC gives a detailed interpretation of the aviation activities now listed in Annex I of 2003/87/EC.

There is another 'prior compliance' list, which includes all operators currently outside the scheme and not on the main list, but who forecast that they will be covered in 2010 (for example, a carrier that started operations in 2009, or is exempt from the ETS). This allows the carrier to participate in monitoring RTKs and CO₂ emissions in 2010, to avoid missing out on free allowances later.

Exemptions from the ETS include the following:

1. Commercial operators running fewer than 243 flights to/from or within the EU for three consecutive four-month periods in a reporting year (this gives an advantage to overseas operators). This is equal to just 20 flights per month.
2. Commercial operators burning less than 10,000 tonnes of CO₂ per reporting year (this applies mainly to air taxi operators).
3. Aircraft with a maximum take-off mass of below 5.7 tonnes.
4. Aircraft of Non-EU Heads of State.
5. Public Service Obligation flights on specific routes serving the outermost regions of Europe and where capacity

does not exceed 30,000 seats per year. These are small air services that supply remote communities.

6. Training flights, including empty airliners.

As yet there is no exemption for aircraft using biofuels, but the EC is developing special requirements for this. Aircraft using 'sustainable' biofuels still produce CO₂ emissions, because the crops that produce the fuel absorb CO₂ out of the atmosphere as they are grown.

ETS aviation mechanism

Each year airlines that are included in the ETS will have to file certificates for their CO₂ emissions and RTKs. They will then be allocated free allowances based on past emissions, to 85%, but will then have to acquire credits for the rest based on the industry's remaining allocation (15% of the cap), or pay fines.

The overall ETS is currently in its second trading period (1st January 2008 to 31st December 2012), so aviation will effectively join towards the end of that.

When the Kyoto Protocol came into force on 16th February 2005, the EU ETS was already operational. A 'Linking Directive' allowed the use of Kyoto certificates from the flexible mechanism projects, permitting: trading of Emissions Reduction Units (ERUs); the use of Certified Emissions Reductions (CERs) from Clean Development Mechanisms (CDMs); and the use of International Emissions Trading (IET). Reductions achieved through CDM projects are a compliance tool for EU ETS operators.

Airline operators will have three options to get the extra 15% of CO₂ emissions allowances: purchase via EU ETS aviation auction process; purchase from overarching ETS (which includes other sectors, and to which operators with a surplus will be able to sell); and purchase of Kyoto-compliant CERs and ERUs. These may only be surrendered in 2012, however.

In the ETS, EU Member States agree national emission caps that are approved by the EC. One EU Allowance Unit is one tonne of CO₂, the same as the Assigned Amount Unit of CO₂ under Kyoto.

Monitoring & reporting

The EC has produced Monitoring and Reporting Guidelines (MRG) using implementing legislation in Commission Decision 2009/339/EC. These were adopted on 16th April 2009, and allow the EC to require an electronic standard protocol for MRV by Competent Authorities, which are authorised to create customised versions of the four key templates (monitoring & reporting, for



both RTKs and emissions).

The EC worked with Innofactor and PricewaterhouseCoopers (PWC) to develop an automatic data-exchange format ('XML schema'). The EC says this is a computerised, standard template to allow fully automated workflows between operators, verifiers and Competent Authorities. The EC is now developing the criteria to approve the tools for estimating the fuel consumption of small emitters.

Another useful document is the guidance created by the UK and Dutch Competent Authorities in May 2009 to help operators compile their monitoring and reporting plans (with practical interpretation of the legal requirements).

Rasa Sceponavulite of the Clean Air & Transport Unit, DG Environment, EC, says that there was a long meeting with EU Member States in October 2009. "We asked them how implementation and compliance was going. Most said that big airlines have submitted monitoring plans, although some are not of the best quality. The EC has developed some templates that they can use.

"The problem is mainly the small emitters, such as those that rarely fly into Europe. Getting a response from them is difficult," continues Sceponavulite. "There have been lots of discussions about the purpose of the lists; they are changing quite a lot, with airlines coming and going. In the preliminary and second lists we included all operators, but if you are on the list it does not mean you are in the scheme. Airlines have to contact their competent authority to find that out."

She adds that many Competent Authorities in the ETS have had to expand to take on aviation. In most cases

the Competent Authority is the country's environment agency (as in the UK). "If [operators] do not get a plan in place they will miss out on free allowances," she says. "But we are asking Member States whether it is possible to allow them to monitor from later on."

Sceponavulite admits that publication of the emissions cap for aviation has been postponed: "We will try to look at it again in mid-2010." She says that the system is based on EU arriving and departing flights, covering the entire routes whether in the EU or not, to "avoid competition distortions."

There is no fee for joining the ETS, but Sceponavulite acknowledges that operators have to bear the cost of monitoring, reporting and verification.

Help for airlines

Various companies have developed services to assist airlines with managing their inclusion in the ETS. One of these is SITA, whose Aircraft Emissions Manager (AEM) is an MRV tool. Most recently, 10 Middle East airlines, which are members of the Arab Air Carrier's Organisation (AACO), have contracted with SITA: Afriqiya, EgyptAir, Jordan Aviation, Kuwait Airways, Libyan Airlines, MEA, Oman Air, Royal Jordanian, Syrian Arab Airlines and Yemen Airways.

Frederic Felise, SITA environment programme director, says: "At first we noticed that the ETS manager in airlines was not necessarily coming from a flight operations background, but often from finance, environmental planning or legal. In the past 12 months flight operations departments have been getting more involved in implementing the ETS into

Under the ETS, affected airlines are required to report their RTK and fuel consumption figures each year for their free CO₂ allowances to be allocated. The cap on CO₂ emissions will have several effects on airlines. One will be to encourage airlines to make all possible reductions in fuel consumption.

their systems, and in the past six months we have seen software providers in the flight operations area saying that they can report for the EU ETS."

However, Felise says that SITA does not believe this is the best approach: "We believe that the issue is not one of compliance and reporting data. It's being able to automatically collect that data."

He says that with flight operations, improvements are based on sampling data. "There is a regulatory requirement for 100% of the data, and it must be correct. Airlines have therefore realised that to collect fuel and RTK data they still need an intensive manual process. There is a completely different level of complexity to usual flight operations information gathering," says Felise.

"This," he continues, "is why SITA has focused on using its worldwide IT network to help collect the data required automatically from the sources, so that we do not have to prove that the data are unmodified. For example, our system takes weight and balance information, tank levels and fuel uplift, and then uses the aircraft communication and reporting system (ACARS) or electronic flight bags (EFBs) to capture and send the data when aircraft arrive and depart."

With some airlines SITA is manually and automatically drawing data from techlogs so that it can cross-check values and spot issues. Felise says that many airlines are interested in going straight to the fully-automated process.

AEM is a hosted system, whereby airlines purchase the service and access it online. When they join, their account is configured to their fleet and the data structure and message types they are using. "We extract feeds for various purposes and ETS is one," says Felise. "Then we run reports for the airline to manage operating efficiency, including quotas, fuel burn status, sources of trouble, root cause analysis, and EU ETS reports."

The advantage for operators is quick and easy implementation, since there is no need to change an airline's IT system and, Felise notes, most airlines already extract the right data. This approach allows them to focus on EU ETS management and not on encoding data.

"We have many customers," says Felise, "in Europe and the Middle East, and we are tracking a couple of hundred



flights a day already; which is over 1,000 messages. We are also building the necessary management and regulatory reports. Customers that have signed up already are all going through the implementation phase.”

Verification is done independently, not by SITA, but it has included a function to help verifiers crunch the data differently, since they will want to ensure that they are correct. The verifier may check all flights on a specific route for a specified period. “We are working with verifiers to ensure checks like this can be done at the click of a button,” says Felise. They will also be able to display the raw messages to check individual flight records.

“We have submitted about 13 monitoring plans so far,” Felise adds. “The Competent Authorities are busy reading these and trying to understand how airlines have put them together.

Felise says that the RTK report is key, and requires the collection of useful payload data, but many airlines are not equipped to collect such data. “The information is on the load-balance and departure control system, which SITA can link into since most airlines are already linked to the SITA network,” says Felise. “The added advantage is that they do not have to pay for the transmission of data.”

Distance information can be looked up, since it is simply great circle plus 95km. The 95km is from the Eurocontrol average extra distance when airlines operate in or to/from Europe, so all possibilities are taken into account.

Felise adds that the cost of SITA’s AEM is about \$2 per flight, and any costs incurred in changing the system (given that ETS is still in a certain state of flux) are borne and managed centrally. Airlines

do not have to assign lots of staff to it, or worry about IT, changes to the regulations, or re-running reports if things change, because the AEM system does that all for them. SITA also manages the storage of information for 10 years, in compliance with ETS regulations.

Felise admits that other companies’ fuel optimisation systems tend to justify their price based on potential savings. SITA’s price is based on the number of flights subject to ETS regulations. Users can link into existing fuel management systems or use SITA’s system for operational improvement. “We focus on collecting operational data, and you can do many different things with that,” concludes Felise.

Importance of RTK figure

SITA is stressing the importance of getting the RTK data right from the start (1st January 2010), because it will be used to allocate shares of the total industry allowance. It emphasises the importance of maximising RTKs in 2010 to the potential benefit of the carrier.

Some airlines have brought forward plans to increase flight frequencies or start new routes to the EU. The choice of payment method can significantly affect the RTKs that can be reported. This is made less clear, while interpretations of the detail of the EU ETS Directives differ between EU Member States.

“Only time will tell how the verifiers and Member States will interpret this critical area of carbon allocation, and the financial impact of this on the airlines,” says Felise. “In the meantime we are advising airlines that it is essential that they focus on counting all relevant

Airlines that make the most of their CO₂ emissions allowances will be those that achieve the highest ratios of RTKs to fuel burn. This can be realised through higher load factors and improved fuel burn efficiency.

payload, including re-positioning crew and their baggage, while also ensuring that they have effective mechanisms for excluding the tare weights of unit load devices (ULDs) to avoid being penalised.”

SITA’s point is that any change in payload during 2010 will have a long-lasting effect on the level of free carbon allowances handed out by the EU, so careful financial assessment is required.

One source of confusion is that two fuel calculation methods are permitted.

Method A:

Actual fuel consumption for flight = Amount of fuel in the tanks once fuel uplift is complete LESS the fuel in tanks once uplift for subsequent flight is complete PLUS fuel uplift for that subsequent flight.

Method B:

Actual fuel for each flight = Amount of fuel remaining in aircraft tanks at block-on at end of previous flight LESS fuel in tanks at end of flight PLUS fuel uplift for the flight.

While the two fuel calculation methods appear to be entirely equal in their calculation of fuel consumption, SITA believes that in some cases there are potential advantages to an airline of using one method versus the other. They also note that there may be significant differences in fuel measurement accuracy depending on when readings are taken.

“With airlines facing annual carbon bills of perhaps tens of millions of Euros, even hundreds of millions in some cases, it is important that airlines get to grips with this issue immediately,” says Felise. “We have seen how an increase in fuel burn of 3% can translate into an increase of allowance shortage of more than 10%, because a smaller share of the CO₂ allowance will be free. We can show that the increase in the cost of CO₂ quota between 2012 and 2013 could be as much as 45% for a traditional airline.”

MRV implementation

David Marks, business development manager of UK-based Bytron, says that the basic principle of ETS is to record fuel uplifts to calculate total fuel and CO₂ emissions. “This is not difficult,” he says. “Fuel is routinely metered, and on modern aircraft the captain simply has to input an amount and the aircraft’s systems tell the fuel pump when to stop. Route distances are based on the co-

ordinates of the origin and the destination, and fuel burn is multiplied by the number of tonnes of CO₂ produced per tonne of fuel, to calculate a total annual tonnage of CO₂ emissions.

“The whole thing is in quite a state of flux, although the principle is fairly simple,” continues Marks. “The great circle calculation is about trying to make it easy. The reality is that you might zig-zag a bit, but the difference [from great circle distance] is relatively small.”

Marks says it is fascinating that the EC is charging overseas carriers for the parts of their flights outside EU airspace.

He says that Bytron is managing the data process for its clients, such as easyJet, which has 200 aircraft flying an average of 3.5 sectors a day. “Our system allows the airline to access the data and generate reports to EC requirements. The ETS is a bolt-on to our existing system.”

In July 2009 Bytron enhanced its Skybook fuel analysis application with a carbon accounting tool, for monitoring, reporting and verification that can be added to its EFBs.

Marks says the EC has suggested a ‘full-tank to full-tank’ approach to take out errors between sectors over the year in question, before applying the CO₂ conversion.

He says that many operators are not sophisticated in the way they operate. “Receipts are put in a brown envelope which goes back to the operator’s HQ,” says Marks. “The flightdeck is just like an office, but it is not usual to have a computer in the cockpit that is at the end of a company network. EFBs and laptops are not integrated, and tend to be used for performance calculations, rather than management of expenditure. People are still experimenting.”

While many larger carriers are forging ahead with their IT systems, others still use manual methods to provide accurate ETS data.

“To report the CO₂ component for ETS, operators need to measure actual fuel use,” says Marks. “The calculation is based on the great-circle distance between two points and a fuel-use table. We can incorporate this into airlines’ flight planning processes, but the more complex part is getting the actual fuel burns into the system, because most airlines do not have very joined-up systems.”

The airline has its flight plans and the pilots fill in actual flight details as they go, calculating fuel uplift based on what is left in the tanks. “We also offer ways to capture these data,” says Marks. “Our system can create a datafile to send to the verifier, which will be done monthly.

“We are looking at better ways for airlines to manage flights. Our EFB software allows the pilot to use a Class II device to enter fuel figures electronically, so there is less error,” says Marks. “We

ESTIMATED COST OF ACQUIRING CO₂ ALLOWANCES FOR AIRCRAFT TYPES

Trip distance (km)	Aircraft type	Annual Carbon Cost Euro
300	ATR 72	28,000
700	A320	230,000
2,000	737	460,000
6,000	777	4.1 million
10,000	A340	5.6 million

Source: Sustainavia.

are also in the early stages of talking about integrating data straight from the aircraft database into the Skybook carbon accounting module upon return.”

Sustainavia

Julien Dufour, founder and chief executive officer of Paris-based Sustainavia, started the company in February 2009 when he realised how long it took to understand ETS, and that 3,000-4,000 operators needed to do just that. He has 23 clients, including most recently Pakistan International Airlines.

“It is not that complex once you understand it. The RTK plan is optional, only for those who want to apply for free allowances. It is only worth doing for airlines with efficient operations, high load factors and highly efficient aircraft.

“In early 2011 the Competent Authorities will add up the airlines’ RTK data and calculate their share of RTKs. The Lufthansa Group, for example, will have a 9% share. It is expected to report a lot of RTKs compared to its CO₂ emissions because it has a fuel-efficient fleet.” An airline with inefficient aircraft will have a higher rate of fuel consumption per RTK. An airline’s allowance will be higher where its payloads are high.

Dufour says that the baseline overall cap is expected to be 210-220 million tonnes of CO₂. At the bottom end of the fuel efficiency scale is a business-jet operator, using 6kg of fuel per RTK, because small aircraft are relatively fuel-inefficient, and are operated with low load factors, thereby generating small volumes of RTKs. The CO₂ allowance, based on RTKs, will be small compared to fuel consumed. At the top end of the fuel efficiency scale, Lufthansa would consume 0.3-0.4kg of fuel per RTK, because of its fuel-efficient fleet and high load factors.

Dufour adds that operators which already have efficient aircraft have an advantage. Basing free allowances on RTKs, rather than actual fuel consumption, stops operators trying to overstate their emissions in 2010 so that


they can get a larger allowance going forward. He estimates that an efficient operator, which is growing fast and has been able to purchase quota, will end up with 60% free allowances (since it is based on 85% of historic emissions) and 40% for an inefficient carrier.

Dufour has surveyed airlines about ETS and says he has had lots of feedback. “People are saying that they want to see a global approach to aviation emissions.” Meanwhile European airlines are more in favour of the ETS than non-EU ones, but both tend to think that they are being discriminated against. Dufour says one overseas carrier saw it as “a thinly veiled attempt by EU airlines to get more free allowances and to try to get subsidies.” Others think that market distortions have been ignored and that it is just a way for the EU to generate revenue, which will not be used for the environment.

“In theory,” says Dufour, “airlines with hubs just outside Europe, such as in the Middle East and North Africa, will get an advantage. The ETS model could go global, but it is very unfair to developing countries who contribute little [overall] in terms of emissions.”

Dufour has calculated examples of the total carbon cost for several aircraft (see table, this page). This assumes daily flights and a cost of EUR 30 per tonne of purchased CO₂ allowance.

Dufour estimates that if this cost is passed on to passengers, it would be EUR 5 per passenger for short-haul and EUR 30 per passenger for long-haul trips.

Niall Duffy at UK carrier Flybe says: “We have been calling for years for aviation to be included in the ETS. On paper it should be a fair and transparent way to pay our fair share, but it’s not yet clear if it will make a practical difference. Also, even though we have invested in an efficient fleet, the system is not rewarding us for it. It is frustrating that an airline with old aircraft is getting the same share of free allowances, when our average aircraft age is 2.7 years.” 

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