POLICY UPDATE

FEBRUARY 2017

INTERNATIONAL CIVIL AVIATION ORGANIZATION'S CARBON OFFSET AND REDUCTION SCHEME FOR INTERNATIONAL AVIATION (CORSIA)

ICCT **POLICY UPDATES** SUMMARIZE REGULATORY AND OTHER DEVELOPMENTS RELATED TO CLEAN TRANSPORTATION WORLDWIDE.

SUMMARY

On October 6, 2016, the International Civil Aviation Organization (ICAO) finalized the details of a market-based measure (MBM) to offset most of the growth in aviation carbon dioxide (CO_2) emissions beginning in 2020. The measure, known as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), was agreed upon at ICAO's 39th Assembly in Montreal and marks the first time an MBM covers an entire international sector.

CORSIA will first be implemented as a voluntary system from 2021–2026 and will be mandatory from 2027–2035, when it will apply to all ICAO member countries, with the exception of some developing countries and small markets. CORSIA excludes domestic aviation activity and the emissions of other climate pollutants from aviation, notably black carbon, nitrogen oxides (NO_x), and the precursors of aviation-induced cloudiness (AIC).

Based on the countries that have opted in thus far, the voluntary phases will offset about 64% of growth revenue tonne kilometers (RTKs) or about 11% of all international RTKs, whereas the mandatory phase will offset about 75% of growth RTKs or 32% of total international RTKs. Between 2021 and 2035, the MBM is expected to cover approximately 73% of growth RTKs and 25% of all international RTKs.

BACKGROUND

The European Union (EU) was the first regulatory body to develop and implement a market-based approach to mitigate CO_2 emissions associated with aviation activity. Since 2012, all air carriers (both EU and non-EU) are required to offset CO_2 emissions from any flight within the European Economic Area, which includes EU member states, Iceland, Lichtenstein, and Norway. To comply with the regulation, air carriers purchase carbon allowances from the EU Emissions Trading System (ETS).

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ICAO, under pressure from the EU to establish a comprehensive international scheme to offset CO_2 emissions from aviation, committed during its 38th Assembly in 2013 to developing a policy to keep aviation CO_2 emissions at 2020 levels. To achieve carbon-neutral growth (CNG) beginning in 2020, ICAO proposed implementing a "basket of measures," which would include improvements in operational efficiencies, advances in aircraft technology, and the use of low-carbon fuels. Any remaining emissions would be addressed through a carbon-offsetting scheme in the form of an MBM.

At ICAO's 39th Assembly in 2016, ICAO's 191 member states agreed to the terms of the MBM called CORSIA.[1,2] Under CORSIA, most air carriers will need to purchase carbon offsets for growth beyond 2020 levels of CO_2 emissions from international flights.

OVERVIEW OF CORSIA

ICAO's CORSIA aims to achieve CNG by mitigating aviation emissions above 2020 levels through the purchase of carbon offsets. Starting in 2021, the system will be implemented in three phases: voluntary pilot and first phases from 2021 to 2026, and then a mandatory second phase for states accounting for approximately 75% of traffic growth from 2027 to 2035. The mandatory phase is implemented through a dynamic approach whereby the offsetting requirement for a given carrier transitions from the industry average to the growth rate of that airline, as detailed in Table 1.

Table 1. Timeline for implementation of ICAO's CORSIA

Phase	Year	Countries Participating	Offsetting approach
Pilot Phase	2021–2023	Voluntary	100% sectoral
Phase 1	2024–2026	Voluntary	100% sectoral
Phase 2	2027–2029	All states whose market share exceeds 0.5% or is within 90% of the aggregate from largest to smallest. SIDS, LDCs, and LLDCs exempt.	100% sectoral
	2030–2032		At least 20% individual
	2033–2035		At least 70% individual

The original measure, developed during the 38th Assembly, proposed a mandatory phase starting in 2021. To address concerns from less developed countries, the finalized measure pushed the mandatory second phase to 2027, adding two voluntary phases: a pilot phase from 2021–2023, and Phase 1 from 2024–2026. As of January 30, 2017, 66 member states,[3] representing about 64% of global traffic as covered by CORSIA, have pledged their participation in the pilot phase. Countries choosing to opt in later may still do so, and any countries participating in the voluntary phases can later choose to opt out with 6 months' notice to ICAO.

1 Several member states filed reservations against specific provisions of CORSIA and a related Assembly resolution. Within ICAO, reservations denote specific paragraphs of an Assembly resolution that member states disagree with and retain the rights to not implement nationally. Of these, reservations by India, which challenged the formulas that would be used to determine country exemptions when the mandatory phase begins in 2027, and by China, which questioned ICAO's authority to recommend binding guidelines on offset quality, are notable. For further detail, see the following: ICAO, Uniting Aviation, Resolutions. http://www.icao.int/Meetings/a39/Pages/resolutions.aspx

2 ICAO, Environment, Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). http://www.icao.int/environmental-protection/Pages/market-based-measures.aspx

3 ICAO is tracking the member states participating in the voluntary phase at ICAO, Environment, Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). http://www.icao.int/environmental-protection/Pages/market-based-measures.aspx

The mandatory phase, starting in 2027, will apply to all member countries, with exceptions for developing countries and small markets. Small Island Developing States (SIDS), Least Developed Countries (LDCs), and Landlocked Developing Countries (LLDCs) will be exempt from the measure unless they choose to opt in. The same will hold true for countries whose 2018 global aviation activity market share is less than 0.5% of the global total or is not within the 90% cumulative share, from largest to smallest, of all international aviation activity in the form of RTKs.

The offsetting obligation will begin based on the sectoral growth rate, in which all air carriers purchase offsets for emissions that are consistent with the average emissions growth rate of the entire sector since 2020. Starting in 2030, the offsetting obligation will transition to an individual approach, where unique air carriers offset some portion of their own individual growth since 2020. The timeline and approach for CORSIA is summarized in Table 1.

Starting in 2022, ICAO plans to review the measure every 3 years to make adjustments as necessary. A final review will take place in 2032, when ICAO will decide whether to extend CORSIA beyond 2035.

OVERALL COVERAGE

To date, 66 states currently opt in to the voluntary scheme. Based on those countries and the exemptions laid out in Phase 2, CORSIA will offset emissions from about 64% of international growth RTKs or 11% of all international RTKs in Phase 1, and 75% of international growth RTKs or about 32% of all international RTKs in Phase 2. Figure 1 shows the full coverage of the measure from 2020–2035. Base activity (dark blue), calculated as the average of 2019 and 2020 international aviation activity, will not be covered by the measure. The light blue wedge represents exempt traffic to and from countries not covered under the system. The green wedge represents the international air traffic whose emissions would be offset by CORSIA.

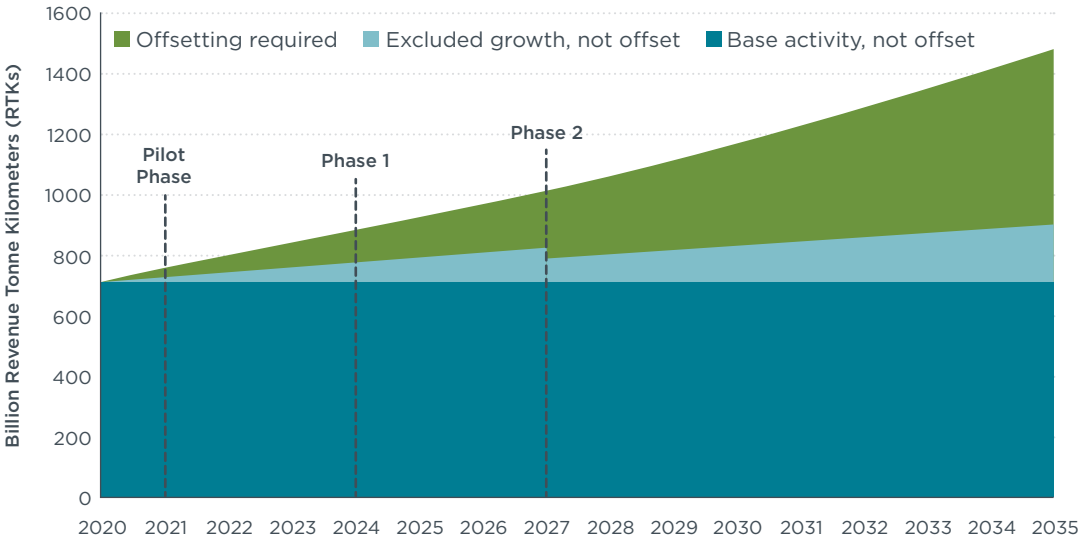

Figure 1. International RTK coverage of CORSIA based on current commitments.

During the mandatory phase, small markets (countries with less than 0.5% individual market share or that are outside of the 90% aggregate market share, from largest to smallest, of international aviation) and developing countries (SIDS, LDCs, LLDCs) are not required to participate in CORSIA. Despite the 90% aggregate threshold, CORSIA only reaches 75% coverage in Phase 2 due to exemptions and the route-based approach by which it will be implemented.[4] Because the measure includes a non-redistribution clause, the exempt RTKs are not covered by participating members.

Other minor exemptions include new entrants (start-up airlines that are excluded for the first 3 years or until annual emissions exceed 0.1% of total emissions in 2020, whichever comes first); aircraft operators whose international aviation activity emits less than 10,000 tonnes of CO_2 per year; aircraft with less than 5,700 kg of maximum takeoff mass; and humanitarian, medical and firefighting operations.

EXPECTED IMPACT OF CORSIA

CORSIA establishes a framework under which airlines will purchase carbon credits from other sectors to offset most emissions above 2020 levels. Thus, the impact of the system on both net (in-sector emissions minus offsets) and absolute in-sector aviation emissions will depend on the criteria used to determine offsets eligible for use under the system and, correspondingly, the cost of those offsets. Because those criteria are still under development, it is difficult to definitively assess the impact of this system on absolute emissions until the criteria are finalized.

The CORSIA approach could impact absolute aviation emissions if the direct offsetting costs are high enough to promote further fuel efficiency improvements or to raise ticket prices enough to reduce demand.

One approach to estimating the effect of CORSIA on efficiency is to compare the direct costs imposed by CORSIA to the underlying cost of fuel. The cost of the offsetting required by CORSIA depends on the price of offsets, the year of implementation, the growth rate of a given airline, and the fraction of the offsetting obligations based on the individual airline's growth, as opposed to the sectoral growth.

Figure 2 depicts a comparison of the direct offsetting costs for a typical international airline from 2021 to 2035 compared to the U.S. Energy Information Administration's (EIA's) projected fuel prices for several offset price scenarios.[5] The base case, shown as the bars in the chart, is estimated assuming that offset prices are equal to 2016 EU ETS futures with a 4% real price increase per year. The error bars show the low case (current certified emission reduction credits [CERs]; prices inflated by 4% real per year) and the high case (International Air Transport Association's [IATA's] low case, which is based on future emissions trading approaches and the assumption of $15 to $20/tonne offsets in 2035).

4 Two factors explain the gap between the apparent 90% threshold and actual (75%) coverage. First, a country's share of traffic is determined not by all flights to and from the country, but by the traffic of air carriers registered to the country. This means that mid-size countries like South Africa and Brazil, where a large fraction of international traffic is carried by foreign airlines, may be exempt from CORSIA despite accounting for more than 0.5% of global traffic by departure. Second, to avoid competitive distortions once a country is exempt, all flights to and from exempt countries are also excluded regardless of where a carrier is registered. This "route-based approach" doubles the amount of uncovered traffic. For further details, see the following: Olmer, N., & Rutherford, D. (2016). Is carbon neutral growth on the horizon for aviation? That depends on your definition. http://theicct.org/blogs/staff/MBM-carbon-neutral-growth-horizon-for-aviation

5 U.S. Energy Information Administration, Petroleum and other liquids. http://tonto.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMA_EPJK_PTG_NUS_DPG&f=A

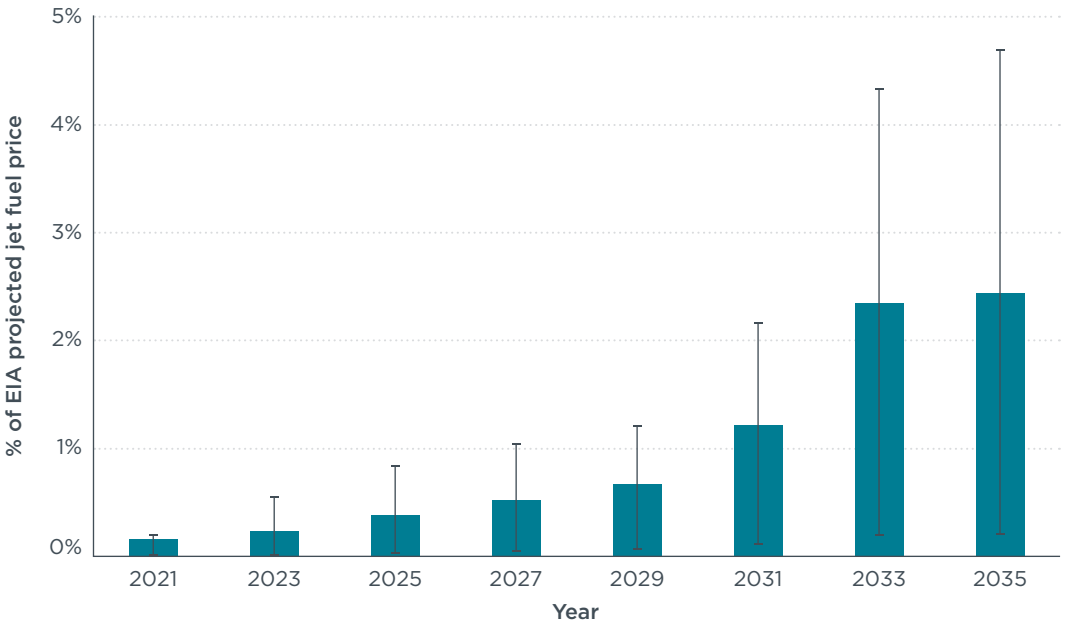

Figure 2. Direct offsetting costs as a share of projected jet fuel prices, 2021 to 2035.

As the diagram shows, the direct costs of the CORSIA requirements for a typical carrier is dependent on offset costs, but they are expected to be small relative to the projected cost of fuel. The direct cost of CORSIA offsetting for airlines is projected to be 0.4% (0.03% to 0.9%) of fuel prices in 2025, rising to 1.1% (0.1% to 2%) and 2.4% (0.2% to 4.6%) of fuel costs in 2030 and 2035, respectively. The increase in direct costs to airlines over time is primarily a function of the shift from a sectoral to an individual approach, under which airlines are required to offset a larger fraction of their own emissions growth, rather than that of the sector as a whole.

These costs are significantly less than the underlying price volatility of jet fuel, shown in Figure 3. In this graph, the mean offsetting costs (depicted as bars in Figure 2) are added to the projected price of jet fuel after 2021, when CORSIA will take effect. Relative both to future projected fuel prices (blue dotted line) and historical fuel price volatility (solid blue line), direct costs to airlines should be low. Consequently, it is unlikely that CORSIA will provide a significant incentive for airlines to improve their fuel efficiency above and beyond that already achieved in response to fuel prices alone.

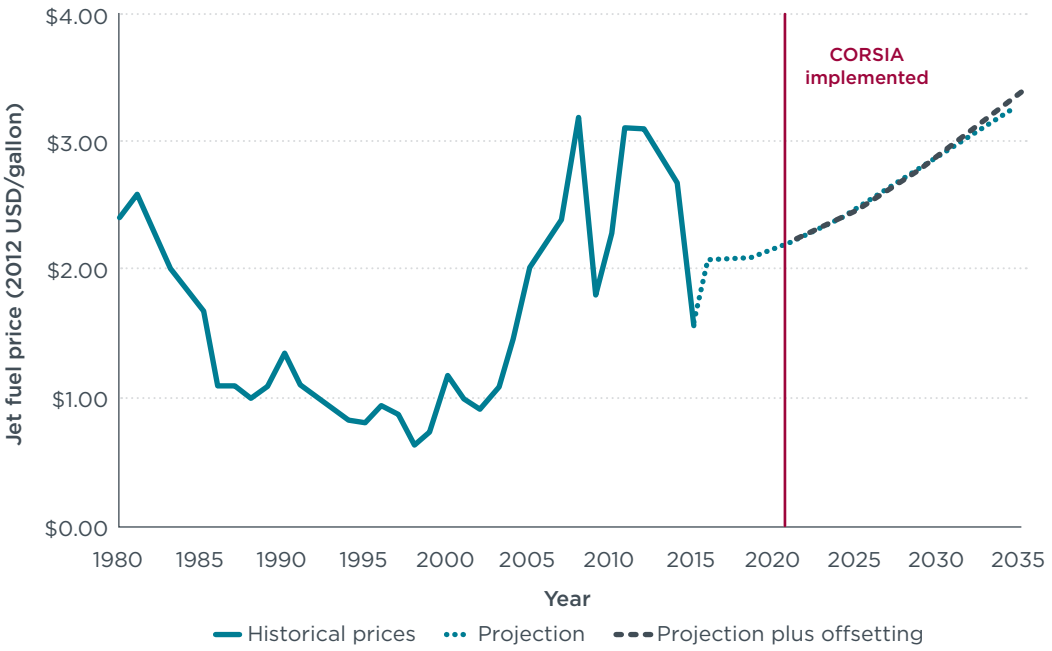

Figure 3. Comparison of direct offsetting costs vs. projected fuel prices.

Fuel costs typically account for approximately one third of an airline's overall operating costs. A linear regression of real fuel prices vs. operating costs of U.S. airlines using Airlines for America data from 1978 through 2008 suggests that fuel should account for 27% and 39% of total operating costs in 2021 and 2035, respectively.[6] Combined with the information summarized in Figure 2, the average direct cost of the CORSIA requirements imposed on airlines will be negligible before 2030, reaching 0.9% of total operating costs in 2035. Assuming these costs are passed along to the consumer, it is unlikely that travel demand will be affected.

IMPLEMENTATION

To ensure that emissions are properly offset, ICAO intends to establish standard and recommended practices governing the types of offsets allowed along with simplified monitoring, reporting, and verification (MRV) procedures by 2018. Individual member states are required to set up more detailed MRV procedures, including the establishment of an emissions registry by 2019. Although it is each member state's responsibility to establish and implement its MRV system, ICAO pledges to support members through seminars and trainings starting in 2017. As part of the MRV system, each member state must report annual emissions from international aviation activity by air carrier to its own registry, which is then reported to ICAO's consolidated central registry. Every 3 years, air carriers are required to reconcile their offsetting requirements, with the first cycle occurring from 2021–2023. To comply, air carriers must gain credits in the form of emissions units (1 unit equals 1 tonne of CO_2) by buying valid offsets or credits through a carbon market, such as the EU ETS.

6 Airlines for America, A4A Quarterly passenger airline cost index: U.S. passenger airlines. http://airlines.org/data/a4a-quarterly-passenger-airline-cost-index-u-s-passenger-airlines/

COST ESTIMATE

IATA estimates that CORSIA may cost air carriers $2.2–$6.2 billion U.S. in 2025, $4.3–$12.4 billion in 2030, and $8.9-$23.9 billion in 2035.[7] This corresponds to a total of $59.3–$165.3 billion from 2021 to 2035, assuming carbon costs ranging from $15 to $35 in 2025 and $20 to $40 in 2035. These assumed carbon prices are based on projections of carbon costs under future emissions trading systems, not offsetting, and are relatively high compared to the current costs of offsets and emissions credits under existing emissions trading systems. An alternative analysis, using current (2016) EU ETS carbon prices as a guide, suggests that CORSIA would cost airlines about $23 billion, or about 3% of their total climate damages, over the first 15 years of the system.[8]

IMPLICATIONS

ICAO has no formal implementation authority and relies on member states to implement its recommended policies under national legislation. CORSIA is explicitly non-binding during the voluntary phases of implementation, meaning that any member can choose to opt out of the system after giving 6 months' advance notice. From 2027, ICAO member states not qualifying for the exemptions outlined above will be expected to enforce the offsetting requirements upon their carriers, although the penalties imposed on a country for failing to do so are unclear. Within ICAO's approach to reduce CO_2 emissions from international aviation, which includes promoting operational efficiency improvements, more efficient aircraft and engine design, and low-carbon fuels, CORSIA is meant to act as the final "gap filler" to offset any remaining post-2020 emissions growth. With current exemptions, however, CORSIA will cover, at most, 75% of traffic growth not reduced by the other measures. Because the coverage gap resulting from these exemptions will not be redistributed to participating carriers, the CNG 2020 goal is not expected to be met, regardless of low-carbon fuel use or operational and design improvements.

CORSIA applies to CO_2 emissions growth from international aviation only. It does not apply to domestic aviation, which was responsible for 30% of aviation traffic in 2014.[9] CORSIA also does not address the non-CO_2 climate impacts of aviation, notably methane, nitrous oxides, black carbon, and the precursors of AIC.

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7 International Civil Aviation Organization (2016). Comments on the cost impact of a global carbon offsetting mechanism. http://www.icao.int/Meetings/a39/Documents/WP/wp_153_en.pdf

8 Rutherford, D. (2016). Brother, can you spare three cents (for the climate)? http://www.theicct.org/blogs/staff/brother-can-you-spare-three-cents-climate

9 ICAO, Appendix 1. Tables relating to the world of air transport in 2014. http://www.icao.int/annual-report-2014/Documents/Appendix_1_en.pdf