impact
ON SUSTAINABLE AVIATION

Practitioner's Guide 1.0:

Integrating ***impact's*** Milestone Concept into Aviation Transactions

January 2026

About *impact*

Founded in 2022, impact on sustainable aviation e.V. (***impact***) is a Frankfurt-based non-profit organization. With 30+ institutions i.a. aviation banks, aircraft lessors, asset managers, investors, consultants, law firms, and academia ***impact*** is the largest sustainable aviation-focused industry association.

impact brings together aviation and financial institutions that see the need for clear and simple emissions standards in loan and lease contracts. We promote collaboration and education within our membership to share expertise, insights, and industry best- practices while we facilitate the allocation of funds towards technologies that support decarbonization and net-zero strategies.

impact acknowledges the inherent complexity of aviation's decarbonization challenge. Subsequently, we connect and liaise with relevant stakeholders across the broader decarbonization supply chain, aiding the development of tangible, long-term decarbonization solutions and mobilizing capital.

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EXECUTIVE SUMMARY

The aviation industry stands at the threshold of its transition to net-zero – a shift that also encompasses the lenders, investors, and lessors that support it. To chart ambitious yet feasible pathways and ensure long-term capital availability for this capital-intensive sector, it is essential to assess the current state of the industry's decarbonization efforts.

A successful transition will depend on greater standardization and transparency in emissions reporting from both airlines and lessors. In recent years, we have seen a growing number of aviation loans incorporate sustainability-linked metrics, particularly intensity-based indicators such as CO_2 emissions per traffic unit. While advancements in aircraft and engine technology have driven notable improvements in fuel efficiency - a significant and undisputed achievement - total CO_2 emissions have continued to rise, aside from exceptional periods like the pandemic-induced travel slowdown.

Looking ahead, substantial catch-up demand in growth markets like India and China is anticipated, and the industry broadly agrees on a projected doubling of the global fleet by the mid-2040s. This means that gains in fuel efficiency will likely be outpaced by increased air traffic. Consequently, an exclusive focus on intensity-based metrics risks enabling greenwashing and may obscure the industry's true environmental impact.

The broader aviation sector is therefore strongly encouraged to adopt more meaningful and holistic metrics. To support this transition, we at ***impact*** have developed the **Milestone Concept** - a practical framework that can be seamlessly integrated into loan and lease agreements. It relies on just two core data points: total CO_2 emissions (**CO_2 Emissions**) and traffic production. Crucially, **it avoids dependence on external roadmaps**, which are often subject to change, making it adaptable across a range of contract durations. And, it is a framework that stimulates and **measures gradual, tangible progress** - it is this granular step-by-step approach that delivers tangible results and builds market confidence rather than working towards a distant assumption-heavy target.

Rather than serving as just another reporting obligation, the Milestone Concept should be viewed as a **toolbox** designed to:

i) support the establishment of credible and actionable decarbonization goals while reducing the administrative burden to a bare minimum; and
ii) facilitate informed, transparent discussions between all stakeholders.

FINAL NOTE: The Practitioner's Guide will be updated if and when relevant changes are required.

Content

1. A BRIEF INTRODUCTION: SUSTAINABILITY METRICS IN AVIATION AND HOW THEY CAN REPLACE ROADMAPS

In recent years, the financial sector has embraced climate alignment methodologies and transition roadmaps as tools to guide decarbonization efforts in high-emitting sectors like aviation. These frameworks have played a useful role in raising ambition and shaping dialogue, but they often come with a critical limitation: they are only as stable as the assumptions behind them. The ***impact*** Milestone Concept proposes a return to first principles: measuring what we can directly observe.

This approach builds on well-established metrics – such as CO_2 emissions, nitrogen oxides (NO_x), and aircraft noise - which have been developed through decades of international regulation and technical standardization.

This chapter provides an overview of the most common aviation environmental metrics, the recent rise of sustainability reporting, and how these metrics relate to long-term sustainability roadmaps.

1.1. MOST COMMON AVIATION SUSTAINABILITY METRICS

The International Civil Aviation Organization (ICAO), a specialized UN agency, began using environmental metrics in the 1970s, when it began developing measures to address emissions from aircraft engines. Since then, states and operational stakeholders have expanded the use of these metrics and developed them further. In 2022, ICAO published a report[1] to take stock of the aviation environmental metrics most commonly used with a view to deciding on whether some could be used to describe environmental performance at a global level.

This ICAO report established that energy intensity, such as fuel or CO_2 per revenue passenger kilometre (RPK) or fuel or CO_2 per revenue tonne kilometre (RTK) are "mature and well-established indicators on a global basis." Other energy intensity indicators, such as fuel or CO_2 per available seat kilometre (ASK), are also in widespread use, with the latter particularly common among aircraft manufacturer data. The six most common environmental metrics identified by ICAO are applicable to either individual flights or clusters of flights. They are:

- **Fuel or CO_2/Revenue Passenger Kilometre (RPK)** – applicable to passenger traffic to characterize the relative energy efficiency or CO_2 Emissions with a focus on the amount of revenue passengers carried.

[1] (2022) ICAO: Scoping Report on Environmental Metrics of Relevance to the Global Aviation System. Deliverable of ICAO Committee on Aviation Environmental Protection (CAEP)

- **Fuel or CO_2/Revenue Tonne Kilometre (RTK)** – applicable to passenger and cargo traffic to characterize the relative energy efficiency or CO_2 Emissions with a focus on the amount of revenue tonnes carried.
- **Fuel or CO_2/Freight Tonne Kilometre (FTK)** – an efficiency measure that accounts for fuel used/ CO_2 emitted in relation to the cargo transported.
- **Fuel or CO_2/Available Seat Kilometre (ASK)** – applicable to passenger traffic to characterize the relative energy efficiency or /CO_2 Emission with a focus on the technology level of the aircraft or the density of its seat configurations. A related metric is **Fuel or CO_2 per Available Tonne Kilometre (ATK)**, which is the equivalent efficiency metric used primarily for freight or mixed (passenger + cargo).
- **NO_x/CO/UHC/100 RPK or FTK** - to determine specific emissions of nitrogen oxide (NOX), carbon monoxide (CO), and unburned hydrocarbons (UHC).
- **Total airline fuel consumption/CO_2 Emissions** – also known as absolute fuel consumption or absolute CO_2 Emissions, provides the aggregate amount.

This diversity of aviation emission metrics reflects the sector's widespread engagement with environmental issues but also explains why sustainability reporting in aviation can appear fragmented and overly complex, particularly as reliance on intensity metrics alone can blur real progress on emission reductions and invite scrutiny over potential greenwashing.

1.2. THE NEED FOR FURTHER SIMPLIFICATION

Growing diversity among these metrics and how their underlying parameters are defined or calculated has led to complexity and inconsistency. Aviation firms, regulators, investors, and lenders often rely on a patchwork of overlapping but non-identical metrics, increasing the reporting burden and hindering like-for-like comparisons. To address such complexity ***impact's*** strongly advocates for **metric simplification**, which is at the core of our mission and is reflected in the **Milestone Concept,** as outlined in the Practitioner's Guide.

Growing diversity among these metrics and how their underlying parameters are defined or calculated has led to complexity and inconsistency. Aviation firms, regulators, investors, and lenders often rely on a patchwork of overlapping but non-identical metrics, increasing the reporting burden and hindering like-for-like comparisons. At the center of ***impact's*** foundational mission is the goal of fostering metric simplification – an objective also pursued through its Milestone Concept, as outlined in this Practitioner's Guide.

impact is not alone in this effort. The International Air Transport Association (IATA), through its Sustainable Finance Taskforce, has also worked to harmonize sustainability data among its member airlines to enable more consistent disclosure. Further, the Rocky Mountain Institute (RMI), through the five-bank Pegasus Working Group, developed the *Pegasus Guidelines* (published in 2024), which provides a standardized approach for measuring and reporting aviation emissions **intensity** performance for financial institutions' lending portfolios.

Each organization contributes a unique capability, and all share a common set of principles: the belief in science-based, observable metrics; the prioritization of transparency and comparability; and the urgency of aligning data with credible decarbonization pathways. ***impact*** actively collaborates with these initiatives and other actors across the ecosystem.

1.3. ROADMAP ALIGNMENT VS METRICS

In the past few years, several international organizations have undertaken valuable work in plotting net-zero transition paths for commercial aviation - both at a global level and in key markets. The resulting roadmaps and scenarios are instrumental in helping stakeholders understand the pace of transition, identify key decarbonization solutions, drive targeted investment, and establish an industry-wide benchmark against which individual climate strategies can be measured and refined.

In 2024, IATA together with the Air Transportation Systems Laboratory at University College London (UCL), the Air Transport Action Group (ATAG), the International Council on Clean Transportation (ICCT) and the Mission Possible Partnership (MPP), released the first publication comparing 14 leading net-zero CO_2 transition roadmaps for aviation, all of which were first published between 2021 and 2023. Several of these roadmaps have become industry references, guiding aviation decarbonization assumptions from within and outside the sector, and assisting financial stakeholders, including banks, in setting aviation emissions intensity reduction targets across portfolios and transactions.

But as the joint comparative review points out, each scenario "may have different background assumptions about factors outside the aviation sector," such as socio-economic and political drivers of air transport demand, while each pathway differs in purpose and scope. "Some may focus on what would be needed for the aviation sector to reach net-zero by 2050 [...] in contrast, other roadmaps may focus on what level of CO_2 Emissions reduction the aviation sector is capable of achieving by 2050."

More importantly for long-term target setting, roadmaps are subject to change. Updated aviation roadmaps - such as the International Energy Agency's *Net Zero Emissions by 2050* (revised in 2023 after its 2021 launch) and *Destination 2050* (updated in 2025) - illustrate how evolving technologies, policies, markets, and societal expectations continually reshape aviation's feasible pathways toward net-zero emissions. Such roadmaps, which are subject to updates, are incompatible with firm covenants in aircraft financing or lease agreements as they risk creating conflicts among the contracting parties.

Against this background, ***impact***'s Milestone Concept presents a simple and immutable method to measure, benchmark, and reward emissions reduction efforts. It replaces uncertain, forecast-based benchmarks with fixed, data-driven thresholds.

1.4. WHAT IS *impact's* MILESTONE CONCEPT?

At its core, the Milestone Concept evaluates how effectively an airline or aircraft financier decouples CO_2 Emissions from traffic volume growth by utilizing only three essential KPIs, which are based on easy, absolute, and final calculations, thereby making the methodology exceptionally robust against greenwashing and immune to subjective interpretations or rule changes:

i) **Absolute CO_2 Emissions**
ii) **Traffic expressed as Available Tonne Kilometres (ATK)**, with less integrative indicators such as ASK, RTK, RSK (any or all referred to as "Traffic Volume", as applicable) being permissible as bridge solutions if no other data are available (see below).
iii) The **decoupling of CO_2 Emissions** trends from those of the Traffic Volume.

Using these three KPIs, the Milestone Concept maps an airline's or portfolio financier's / lessor's performance within a two-dimensional matrix. This matrix translates the relationship between changes in CO_2 and Traffic Volume into a clear scoring system that reflects tangible progress toward decarbonization.

Crucially, the Milestone Concept focuses on granular, measurable progress rather than distant long-term targets. It enables continuous tracking of real-world decarbonization achievements instead of relying on assumptions about future technologies or market developments. Each milestone represents a concrete achievement that can be measured and verified year by year – ensuring that sustainability commitments are continuously substantiated rather than deferred.

A base year (**Base Year**), typically 2019, provides a consistent reference point against which all subsequent developments in CO_2 Emissions and capacity traffic are measured. This fixed reference ensures comparability over time and shields the evaluation from shifting assumptions or external market fluctuations. Importantly, each airline or portfolio of a financier/lessor is assessed against its own performance trajectory, not against an industry-wide benchmark or average. This approach rewards genuine improvement regardless of size, region, or business model, and avoids penalizing early movers that have already achieved significant sustainability gains.

Milestones are defined as progressively more ambitious thresholds within this scoring system. As airlines or financiers/lessors reach higher Milestone scores (**Milestone Scores**), they demonstrate increasing levels of decarbonization - from **relative decoupling** (slower CO_2 Emissions growth than Traffic Volume growth) to **absolute decoupling** (actual CO_2 reduction alongside traffic expansion).

Designed to be transparent, comparable, and resistant to greenwashing, the Milestone Concept enables financiers, lessors, and airlines to integrate measurable sustainability criteria into loan

and lease agreements. It provides a uniform language for assessing, rewarding, and communicating real decarbonization progress across the aviation value chain.

2. APPLYING THE MILESTONE CONCEPT TO AIRLINES AND FINANCIER/LESSOR PORTFOLIOS

2.1. SETTING 2019 AS THE BASE YEAR

2019 is widely used as a Base Year in both scientific and industry studies, as it was the last regular year before the pandemic and its profound disruptions to air traffic in the following years - disruptions that continue to this day. ICAO (the global association of civil aviation authorities), IATA, CANSO (Civil Air Navigation Services Organisationthe international association of air navigation service providers), aircraft manufacturers such as Boeing and Airbus, and many consulting firm studies on the current state of aviation refer to 2019 as a base year when assessing developments in air traffic - whether in terms of demand, capacity, profitability, or emissions.

The Base Year should generally be set to 2019. While the methodological framework of the Milestones does not inherently depend on whether an airline selects 2019 or another year as its base year, inconsistencies could arise in at least three cases:

- If an airline designates different base years for various lease or credit agreements.
- If airlines are to be compared, their Milestone Scores are calculated using different base years.
- After the expiration of a long-term contract using 2019 as the Base Year, a follow-up contract with a significantly later base year could allow an airline to circumvent the 100% growth cap[2].

Although these discrepancies can, in principle, be accounted for relatively easily, they leave room for accusations that such inconsistencies serve as deliberate loopholes for greenwashing. To preemptively and effectively counter such claims, two measures appear essential:

i) All lease and credit loan agreements using the Milestone Concept should use 2019 as the Base Year.
ii) Airlines have the right to overwrite the estimates from third parties with certified actuals.

[2] The Milestone Concept rewards growth, but only up to a maximum of 100%. Any growth beyond 100% relative to 2019 is treated the same as 100%. The intention is to build up increasing pressure in the direction of sustainable growth, not growth for the sake of growth. When an increasing number of airlines have reached the threshold of 100% growth compared to the base year they cannot achieve additional scores solely from further growth.

2.2. BASE YEAR FOR INDEPENDENT START-UP AIRLINES

For independent start-up airlines founded after 2019, the starting value for the Base Year is at the discretion of the contracting parties; parties need to disclose the starting point to make sure that any forthcoming contract sticks to the same regime and is consistent with its assumptions.

2.3. DATA REQUIREMENTS – CO_2 AND TRAFFIC VOLUME

2.3.1. EMISSIONS

Emissions data are to be reported for **CO_2.** CO_2 equivalents (CO_2e) for greenhouse gases other than CO_2[3] should be assessed and incorporated as soon as sufficiently reliable scientific data becomes available.

To ensure robustness, integrity, and completeness in reporting climate-damaging effects, CO_2 data should be reported on a **Well-to-Wake (WtW)** basis, encompassing all upstream Scope 3 emissions. Therefore, we use IATA's standard multiplier of 3.84[4] for WtW CO_2 Emissions calculation.

The airline provides actual CO_2 Emissions data verified by an ICAO-accredited verification body, reporting annual changes in CO_2 Emissions relative to 2019 as the base year (**Base Year**). If this is not feasible for technical or other reasons, the contracting parties may agree on third-party **carbon calculator** models (see Chapter 3 for details). If the contracting parties agree on a single third-party carbon calculator for the duration of the contract, any deviation from this source's estimates will require mutual approval by both airline and financier. If the parties agree to use multiple third-party carbon calculators, the contract should establish a reference mean and explicitly define how this mean value is determined (i.e., arithmetic, median, or other). Both of the above-mentioned options require strict standards, along with transparent and verifiable compliance to preempt accusations of greenwashing.

CO_2 removal credits from technological carbon removal, such as carbon capture – whether by filtering and securely storing or utilizing it – can be accounted for when calculating the airline's WtW CO_2 Emissions for the year in which the removal occurs. It is paramount that such credits are verified through appropriate and legally recognized certificates (jurisdiction to be specified).

[3] This refers, in particular, to non- CO_2 effects like contrails and nitrogen oxides.

[4] Since the Milestone Concept measures relative change, it is practically and for the foreseeable future irrelevant whether the 3.84 multiplier is used for calculating CO_2 or CO_2e (as done by IATA). For multiplier see IATA Sustainable Aviation Fuel (SAF) Accounting & Reporting Methodology, p. 9

For the time being, nature-based solutions, including biological carbon sequestration, afforestation, and reforestation, shall not be considered when calculating effective CO_2 Emissions due to prevailing uncertainties associated with such.

2.3.2. TRAFFIC VOLUME

ATK, ASK, RTK, and RPK are widely used metrics for measuring traffic volume. Among these, ASK is by far the simplest and most accurate to calculate. The primary driver of an aircraft's emissions, all else being equal, is its weight – and ASK provides a reliable approximation of this factor. However, ASK has the drawback that it does not allow for direct comparison between passenger and cargo flights.

To calculate the ATK for passenger operations, ASK must be multiplied by the standard weight assigned to one passenger[5]. After this conversion, passenger ATK can be directly compared to the ATK values of dedicated freight operations and therefore makes **ATK the preferred metric**.

The malleability and imprecision of metrics such as RPK and RTK can give rise to allegations that the degrees of freedom involved may be, or already are, used inappropriately for greenwashing purposes. The reputational risk associated with this, combined with the additional effort required to calculate RPK and RTK without yielding meaningful analytical value, makes a strong case for excluding these metrics from covenants in loan and lease agreements. In principle, airlines are expected to provide audited ATK actuals as part of their contractual contribution[6].

2.4. TIMING FOR MEASURING AND PUBLICATION

- **Reporting period:** To support standardization and aid like-for-like comparison, it is recommended to consider alignment on the calendar year for determining both CO_2 and Traffic Volume.
- **Reporting date:** Many airlines publish their emissions data for the entire previous calendar year at the end of the first quarter of each year. This timeline should also apply to the reporting deadlines for the corresponding data (CO_2 Emissions and Traffic Volume) under financing loan and lease agreements based on the ***impact*** standard. Any deviations from financial reporting deadlines should be irrelevant in this context of non-financial reporting, as emissions and traffic data are collected separately and can be reported independently of financial figures.

[5] (2024) ICAO Carbon Emissions Calculator Methodology, p. 7f.

[6] Subject to contracting parties and in the case of unavailable data for ATK, other metrics such as RTK and RPK can be considered.

By using the simple and fixed Milestone Matrix as a lookup table, the parties can immediately and transparently determine their respective applicable Milestone Scores.

2.5. THE 2035 HURDLE

The Milestone Concept embodies and advances sustainability in a complementary sense: it is not only about reducing, eliminating, and removing CO_2 but also about enabling necessary growth as an essential component of financing sustainability. Both objectives are interdependent, and neither can be disregarded. Therefore, growth for its own sake should not be incentivized when viable sustainable technologies are available but not adequately utilized.

According to relevant international regulations and funding programs, particularly those of the EU and the UK, by 2035 sufficient fuels, technologies, and operational procedures will be available to enable significant reductions in emissions below 2019 levels. For this reason, Milestone Scores achieved up to and including 2035 should be temporarily put on hold at this level until the airline's CO_2 Emissions fall below 2019 levels.

Once again, for the reasons outlined above, this hurdle should be applied consistently across contracts, as a deviation would inevitably lead to incomparable results.

2.6. RATIONALE FOR A 16×16 MATRIX

The percentage changes in CO_2 Emissions and Traffic Volume are plotted within a coordinate system where both axes range from -100% to +100% relative to the 2019 Base Year. To ensure transparency and eliminate the need for complex calculations, each axis is divided into discrete categories. This categorization allows for the assignment of a simple score to each category, reflecting the degree of traffic growth or decarbonization, much like a rating score.

The optimal number of categories is determined by balancing two competing objectives. A finer resolution ensures that airlines receive timely and precise recognition for progress, allowing for incentives to be granted accordingly. Conversely, a less granular resolution enhances confidence in the reasonableness of scores, strengthens their robustness against green-washing, and improves their applicability by making the system easier to understand and implement in practice.

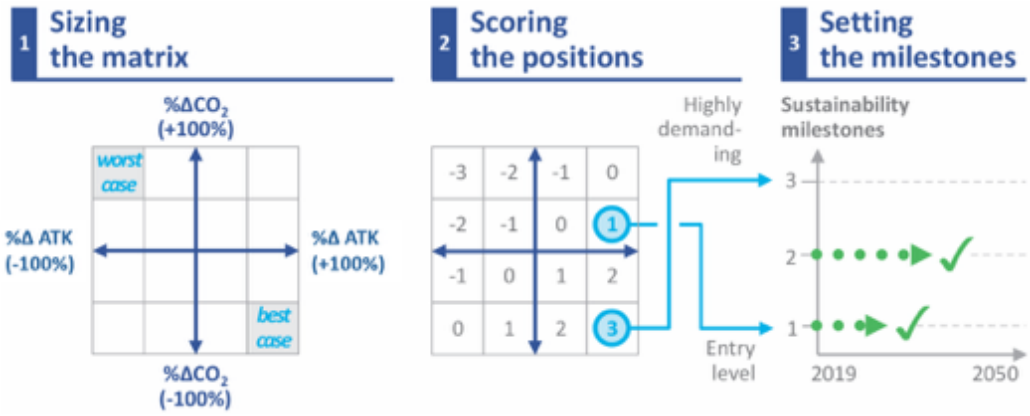

Image 1: The chart on the left describes the coordinate system from the measure of changes in CO_2 and ATK, each relative to the Base Year, in principle 2019. The center chart describes how single Milestone Scores can be derived from the position in the coordinate system. On the right, the Milestone Scores are used as increasingly demanding thresholds in a milestone system that assesses the sustainability of an airline in absolute terms and relative to other airlines. Note: Charts above are simplified – refer to Image 2 for relevant chart sizing.

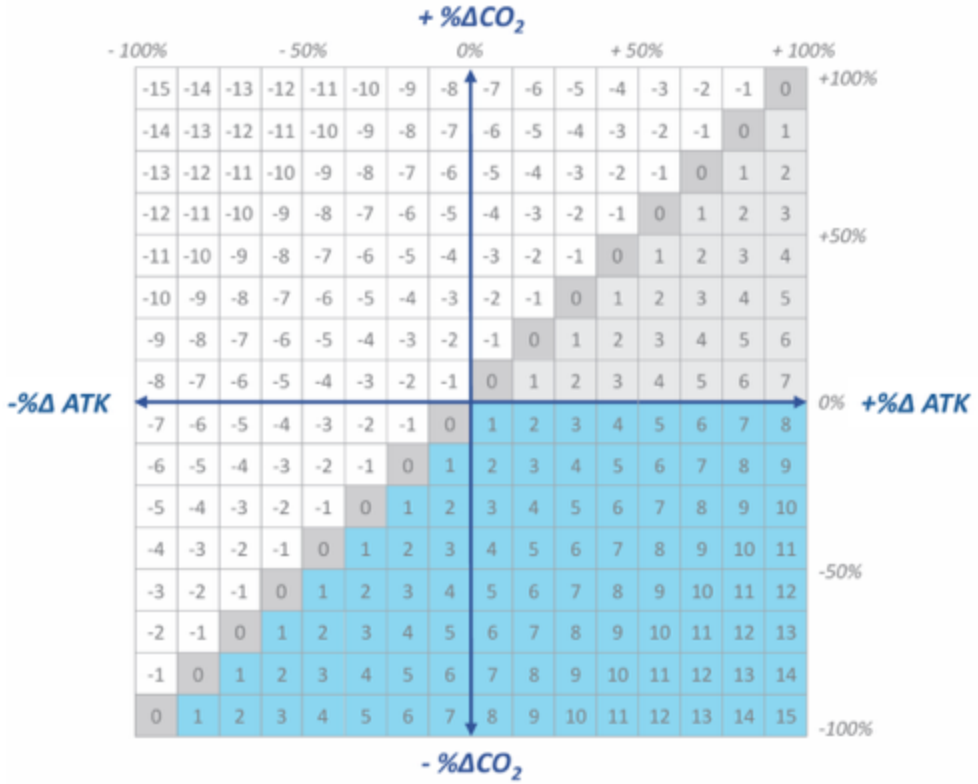

*Image 2: The conceptual 4*4 matrix in Image 1 is expanded to 16*16 categories on each axis to measure smaller development steps. White: CO_2 Emissions actually worsen compared to capacity growth. Dark grey: CO_2 Emissions and Traffic Volume growth are tightly coupled. Light grey: Relative decoupling of CO_2 Emissions and Traffic Volume growth. Blue: Absolute decoupling of CO_2 Emissions and Traffic Volume growth.*

3. INPUTS: FROM THIRD-PARTY CALCULATIONS TO PRIMARY DATA

3.1. INTRODUCTION

The ability to measure aircraft emissions performance or forecast decarbonization trajectory is wholly dependent on accurate and consistent data. Primary data, i.e., flight operations data which airlines have access to, is not widely shared externally, and where it is shared, there is a lack of standardization in its reporting. Furthermore, airlines typically publish headline-level data, presenting a challenge for aircraft fleet owners managing subsets of aircraft across several different airlines.

In the absence of timely and standardized access to airline-reported emission data, third-party emission calculators play a crucial role in bridging the gap, and in many cases, bridging the entire chasm. This enables financial stakeholders to access near-real-time emission data at various levels of granularity. The sub-sections in this chapter outline how third-party emission calculators are filling this void today.

3.2. THE AIRLINE REPORTING LANDSCAPE

Airlines around the world employ a variety of emissions intensity metrics, which creates a diverse patchwork of data. While some extol transparency and have been reporting these data points for many years, others are inconsistent, and some do not disclose emissions data at all. Analysis carried out on data published over the past decade has found that approximately 5% of airlines published data in 2022, which was significantly less than had reported in 2017, as illustrated in the table below. This presents a significant gap in airline-reported data, which can be filled by third-party calculators such as PACE or Cirium.

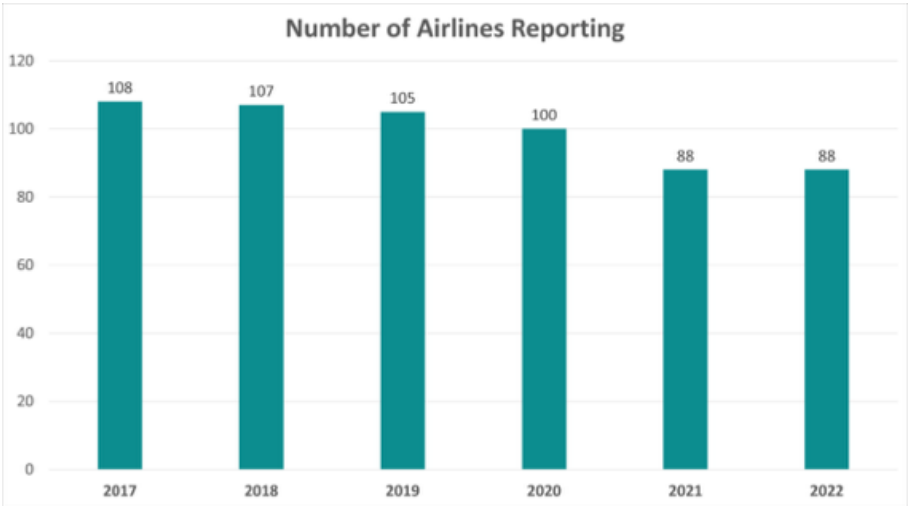

Image 3: PACE analysis of airlines reporting emissions data since 2017

3.3. *impact* MILESTONE CONCEPT IMPLEMENTATION WITH THIRD-PARTY CARBON CALCULATORS

Third-party calculators allow the application of the ***impact*** Milestone Concept without the overhead of analysing airline annual reports or manually collecting flight operational data for non-reporting airlines. Further, calculators featuring the ***impact*** Milestone Concept enable near real-time access to the evolving ***impact*** Milestone Score of an airline or lessor without any dependency on external emissions disclosures, and it allows for simulation of future scores subject to an airline's share of SAF and technological carbon removal.

The ***impact*** Milestone Concept has been incorporated into the PACE emissions calculator and Cirium's *EmeraldSky* flight emissions methodology, removing the requirement for offline manual calculations in spreadsheets.

3.4. PACE'S CARBON CALCULATOR

PACE tracks aircraft utilization via flight transponder (ADS-B) data, the same kind of real-time altitude, speed, and location data used by flight tracking services. It then applies a proprietary fuel burn model unique to each aircraft type.

Aircraft-level data, such as seat configurations and payload capacity specific to each registration or MSN (Manufacturer Serial Number), is then applied to provide traffic analysis per seat kilometre (ASK). Passenger load factors are then applied to determine a passenger-based metric per kilometre (RPK). The source of passenger load-factors can vary for each third-party calculator; PACE obtains airline-supplied load-factor data from ICAO. PACE also incorporates ATK and RTK metrics to provide airline and aircraft type level analysis, which can be especially useful where not published by airlines, or to enable a like-for-like comparison between different airlines using normalized data.

This normalized data can then be viewed through the airline or lessor/financier asset portfolio lens, by aggregating the emissions calculations of various MSNs.

PACE regularly benchmarks flight and emissions calculations with available airline and industry primary data to ensure the variance remains at a single-digit % level.

Traffic Volume metric	Method
ASK	Seats x Flight Distance
RPK	ASK x Passenger Load Factor
ATK	Max Payload x Flight Distance
RTK	ATK x Weight Load Factor (Passenger & Belly cargo)
ACTK	Max Cargo Payload x Distance (Dedicated Freighter Aircraft)
RCTK	ACTK x Weight Load Factor (Dedicated Freighter Aircraft)

Image 4: Common traffic volume metrics available and underlying calculations.

Example: impact Milestone Concept calculation with PACE carbon calculator

The example below from PACE shows the comparison of Traffic Volume (measured in terms of ATK) and absolute emissions (measured in terms of CO_2) between the 2019 Base Year and the complete calendar year of 2024 for the carrier Air France, and how they translate into the ***impact*** Milestone Concept. For the purpose of this exercise, the scope is passenger aircraft only.

- Step 1 – Obtain the necessary traffic volume and emission figures for each respective year from PACE.
- Step 2 – Calculate the ATK delta % relative to the Base Year
- Step 3 – Calculate the CO_2 delta % relative to the Base Year
- Step 4 – Apply the decoupling calculation
- Step 5 – In this example, the decoupling value is – 8.25, resulting in an ***impact*** Milestone Score of '1'

Operator	Period	Traffic Volume (ATK)	Absolute Emissions (CO_2)
Air France	2019 (Base Year)	29,524,813,482	15,978,209
	2024	28,058,425,029	13,521,704
	% Change to Base Year	-5%	-15%

In this example, the carrier has operated a reduced Traffic Volume vs the Base Year, however, it has reduced absolute emissions at a faster rate and therefore achieved relative decoupling (blue section). Plotting the ATK and absolute emissions variances onto the ***impact*** Milestone Matrix results in a Milestone Score of '1' for 2024.

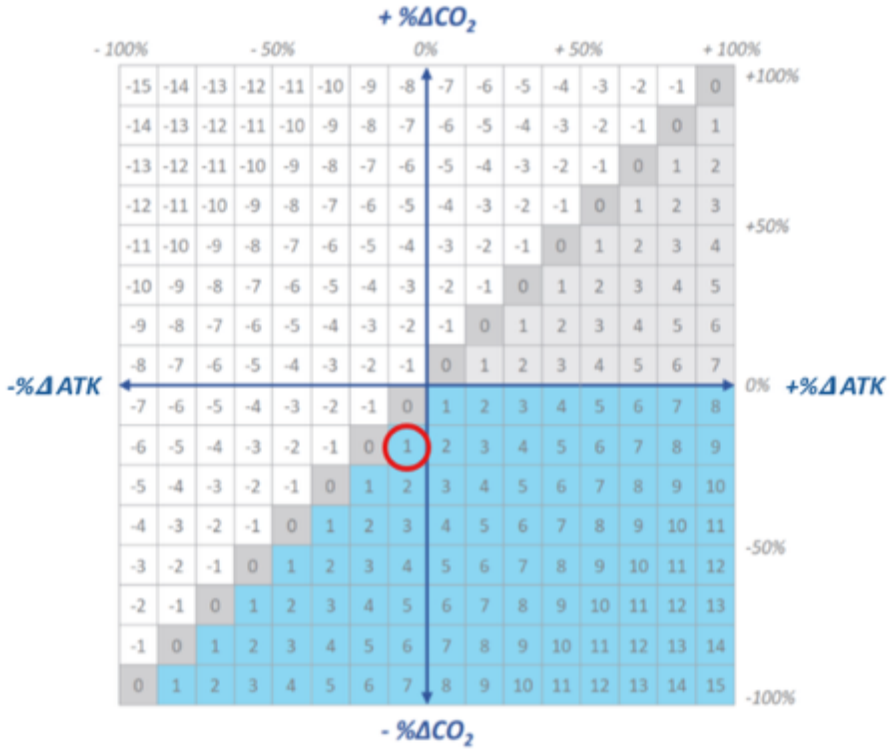

*Image 5: PACE application of the **impact** Milestone Score for Air France 2024 vs 2019.*

3.5. Cirium's CARBON CALCULATOR

As aviation and specifically aviation finance embraces the ***impact*** Milestone Concept, the need for accurate, transparent, and independently assured emissions data has never been greater. For this purpose, Cirium – like PACE – has incorporated ***impact***'s Milestone Concept into its EmeraldSky platform. Cirium's EmeraldSky methodology sets a new benchmark for aircraft, flight and seat-level CO_2 measurement.

EmeraldSky

The EmeraldSky methodology addresses common limitations in traditional emissions models, which often rely on generic aircraft profiles, great circle distances, and static assumptions. By integrating multiple data sources covering the actual operations, it calculates estimated CO_2 emissions for individual flights. The fuel burn models target results within +/-1% of reported OEM data for a specific set of mission, aircraft and payload inputs.

- **Satellite flight tracking:** Cirium ingests actual gate-to-gate flight operations data via global ADS-B tracking through a partnership with Aireon (the only ATS grade surveillance data provider). Cirium matches the advanced flight data with its proprietary tracked aircraft utilization data. The global match rate for tracked flights is approximately 99.8% for widebodies, 98.6% for narrowbodies, and 94.5% for regional types. Compared to models which use great circle distances, this means it differentiates between, say a 1,000km route flown on a direct path versus one with holds, detours, or weather impacts.

- **Aircraft-specific characteristics:** Cirium applies the exact airframe and engine model configuration, the presence of winglets/sharklets, and the aircraft's age. Specific age-based and airline validated efficiency-deterioration models are applied to single-aisle and twin-aisle aircraft models.

- **Dynamic weight and load modeling:** Rigorous estimates of the weight payload carried on each flight are applied. EmeraldSky calculates a flight's Zero Fuel Weight by summing the aircraft's typical operating empty weight plus estimated payload. Cirium has also developed a carrier-specific monthly passenger load factor model derived from years of airline traffic data.

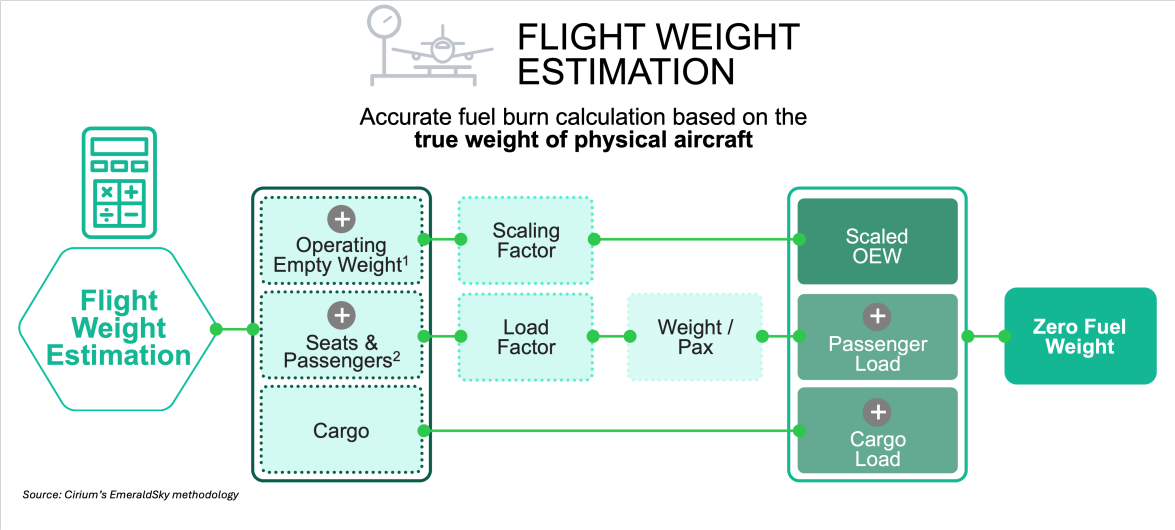

Image 6: Cirium's EmeraldSky flight weight estimation methodology. Dynamic weight and load modelling.

- **Proprietary non-linear fuel burn model:** Armed with the above inputs, EmeraldSky runs a tailored fuel consumption simulation for each flight. The model (developed with an independent aerospace engineering consultancy) recognises that an aircraft's fuel burn rate is non-linear over the course of a flight. It uses an advanced model fitted for each aircraft-engine combination, with high goodness-of-fit (R^2 ~0.99), to compute total fuel burned given the flight time and initial weight. Crucially, it also adds specific fuel for the measured taxi-out and taxi-in minutes (using coefficients recommended by Cirium's consultancy for each

aircraft type). The result is a **per-flight fuel burn estimate** that closely matches what pilots see, because it accounts for all phases of operation.

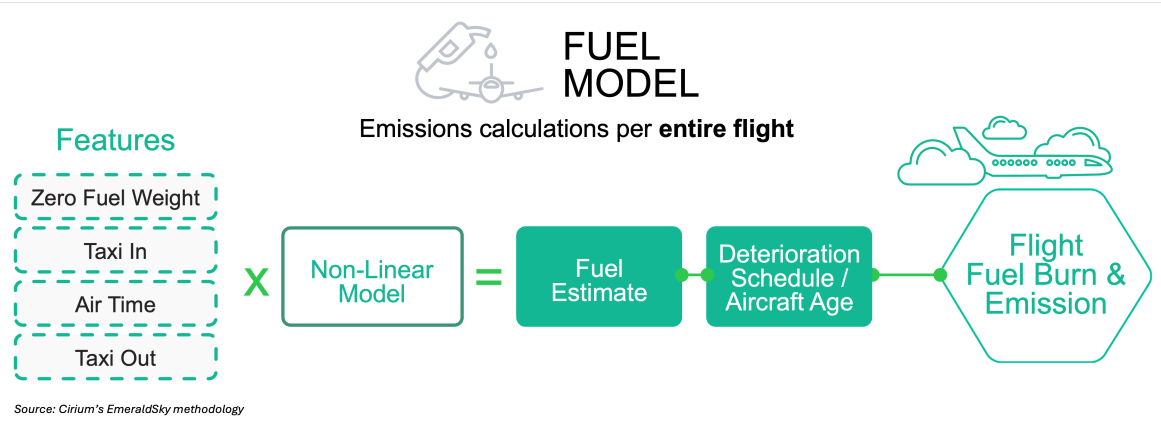

Image 7: Cirium's EmeraldSky fuel burn estimation methodology. Proprietary non-linear fuel burn model.

- **High-resolution emissions output:** EmeraldSky converts the fuel burn to CO_2. It can report the total CO_2 for the flight and also break it down per passenger or per cargo tonne, as well as allocating portions of a flight's emissions to each travel class in the cabin to generate a CO_2 per seat estimate.

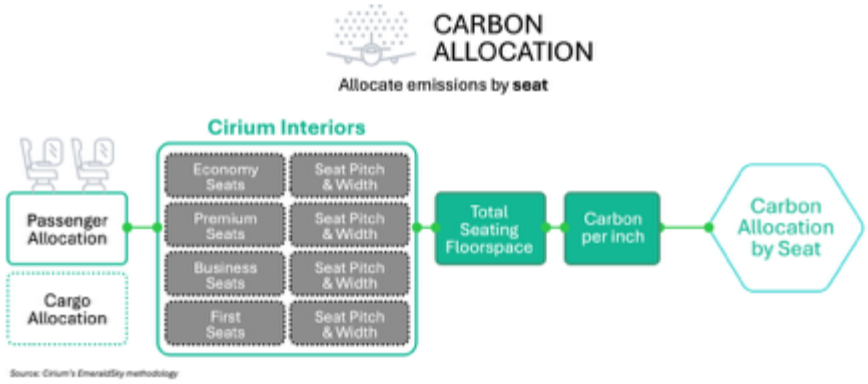

Image 8: Cirium's EmeraldSky carbon allocation by conversion of fuel burn to CO_2 and allocated to cabin classes for per seat model.

Independent assurance and accreditation

The EmeraldSky fuel burn and CO_2 emissions have:

- passed an **ISAE 3000 Type 1 Report reasonable assurance audit from PwC**, which confirms that Cirium has controls in place to ensure that EmeraldSky is created accurately and consistently;

- earned **accreditation from the Rocky Mountain Institute (RMI)** as a qualified data provider for the **Pegasus Guidelines;**
- been **audited and certified by Ernst & Young (EY)** for Cirium's parent company, RELX, to adopt for corporate ESG reporting on business travel emissions. Cirium's emissions data replaced DEFRA estimates in the FTSE 100 company's annual reports.

impact's Milestone Concept calculation with Cirium's EmeraldSky emissions

Note: Cirium adopts as a more precise unit of capacity for passenger aircraft fleets, due to the lack of consistently applied industry standards for estimating/reporting ATK.

The below example from Cirium shows the comparison of ASK and absolute emissions (measured in terms of CO_2) between the Base Year of 2019 and the most recent complete calendar year of 2025 for the carrier Iberia, and how these translate into an ***impact*** Milestone Score.

Operator	Year	ASK (bn)	ASK change vs Base Year	CO_2 (mt)	CO_2 change vs Base Year	Decoupling calc.	*impact* Milestone Score
Iberia	2025	78.4	+21.1%	5.3	+1.9%	19.2	1

In this example, Iberia has operated significantly more AKSs vs the Base Year, however, it reduced absolute emissions grew at a slower rate and therefore achieved relative decoupling (light grey section). Plotting the ASK and absolute emissions variances onto the ***impact*** Milestone Matrix results in a Milestone Score of '1' for 2025.

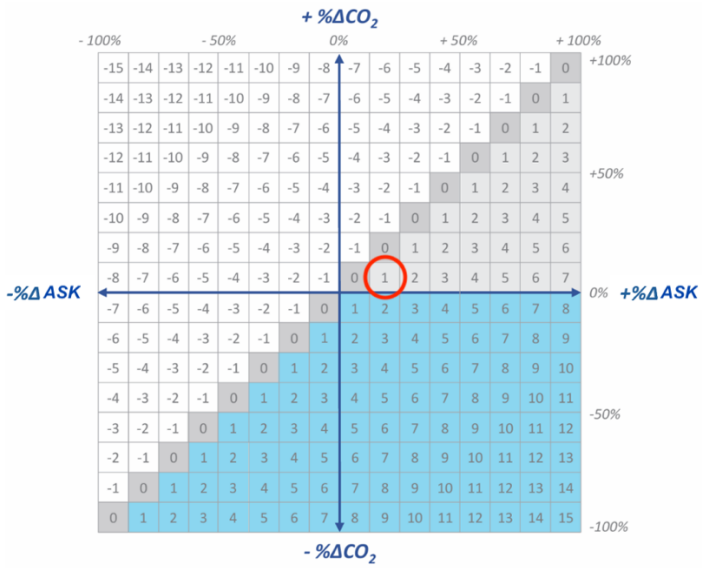

*Image 9: Cirium application of the **impact** Milestone Score for Iberia 2025 vs 2019*

4. INTEGRATING THE impact MILESTONE CONCEPT INTO FINANCE AGREEMENTS

By Emma Giddings (*Norton Rose Fulbright*) & James Collins (*Stephenson Harwood*)

4.1. INTRODUCTION

The Milestone Concept should be integrated into loan or lease agreements (a) a to encouraging transparency on measuring decarbonization and (b) to incentivize progress towards overall decarbonization. be noted that the Milestone Concept is not, and does not purport to be, a stand-alone green or sustainability-linked finance product.

This note summarizes some of the key factors for lenders and lessors to consider when integrating the Milestone Concept into aviation lease or loan agreements with an airline counterparty.

4.2. MILESTONE CONCEPT METHODOLOGY

As noted above, it will be necessary to agree the following with the airline at the outset of the transaction:

(a) **Base Year** – Guidance on establishing the Base Year is set out in Chapter 2.1. It would normally be 2019.

(b) **The Matrix** – Guidance on setting out the Matrix is set out in Chapter 2.6. this Practitioner's Guide.

(c) **Determine the data** which will be used to calculate the Milestone Scores. As noted in Chapter 2.3. of this Practitioner's Guide there are two key metrics which determine the relevant Milestone Score:

i) Percentage increase or decrease in **WtW CO_2 Emissions** (see 3.2.1.) relative to those in the Base Year; and

ii) Percentage increase or decrease in Traffic Volume with a preference for ATK. If reliable ATK data is not yet available, the contracting parties may agree on ASK, RTK, or RPK, with decreasing preference in the order given, (the Traffic Volume) relative to the Base Year. For purposes of transparency and benchmarking, ***impact*** and third-party data providers may choose to convert data, including retrospective data, to ASK according to the ICAO standards defined above.

(d) **Metrics** – The lease or loan should set out in detail how the above metrics will be derived and the sources of information that will be used in their determination. Chapter 2 of this Practitioner's Guide contains guidance for this; however, the following should be considered:

The credibility of the Milestone Score will be affected by the quality of the data used to calculate the above metrics.

i) For the calculation of the percentage increase or decrease in CO_2 Emissions, best practice requires the relevant airline to provide audited figures annually based on the ICAO methodology. If this cannot be provided, then Chapter 3 of this Practitioner's Guide sets out how carbon calculators can be used to determine this figure. Care should be taken to understand the data and methodology employed by the carbon calculator, and the identity of the carbon calculators used should be specified in the documentation.

ii) For the calculation of the percentage increase or decrease in Traffic Volume figures from the airline's own audited annual reports can be used.

(e) **Baseline Reporting** - At the outset of the transaction:

- The airline's CO_2 Emissions and Traffic Volume figures will need to be provided by the airline for the Base Year and certified by the airline as true and accurate;
- The airline's CO_2 Emissions and Traffic Volume figures will need to be provided by the airline for the most recent financial year and certified by the airline as true and accurate;
- On the basis of the above, information on the current Milestone Score for the airline should be capable of being ascertained.

i) Note that each set of figures should also be independently verified by an accredited third party.

ii) Note that the reference for the determination of Traffic Volume figures – namely, ASK, ATK, RPK or RTK – should remain consistent throughout the Reporting Period of the transaction **unless** the parties agree to amend that reference (for example, from ASK to ATK) and to adjust the Milestone calculation for the Base Year accordingly, as described below.

(f) **Reporting Frequency -** The documentation should specify the future dates (**Reporting Dates**) on which the relevant airline will be required to provide its CO_2 Emissions and Traffic Volume figures together with the reporting period to which those figures should relate (**Reporting Period**). The Reporting Period would usually be an annual period corresponding to the airline's financial year; while more frequent testing can theoretically be agreed in contract careful thought should be given to the relevant metrics and outputs for any shorter reporting period, for example the impact of seasonal demand upon metrics. Lenders and lessors should consider how stub periods between the airline's reporting period and the lender's / lessor's reporting period would be treated for the lender's / lessor's own emission reporting requirements.

4.3. WAYS IN WHICH THE MILESTONE CONCEPT CAN BE IMPLEMENTED IN LEASE OR LOAN DOCUMENTATION

(a) **Reporting only –** It may be the case that the inclusion of the Milestone Methodology in a Lease or Loan Agreement is limited to a reporting obligation to facilitate the more standardized comparison of data regarding the progress of aviation towards decarbonization and to assist lenders and lessors with their own emission reporting obligations.

(b) **Financial Incentive / Disincentive –** Alternatively, it may be the case that the relevant lender or lessor wishes to provide a financial incentive by way of a margin or rental decrease where progress has been made to improve a Milestone Score over the preceding Reporting Period(s). The parties would be free to elect in contract how the financial incentive would be applied – for example, by way of a rent or interest discount for the current Reporting Period or as a lump sum credit against rent or interest already paid for the prior related Reporting Period. If it is agreed to provide a financial incentive to an improved Milestone Score, then the following should also be considered:

i) **Rewarding progress** – Only significant and ambitious progress in improving a Milestone Score should be rewarded. If a more granular Matrix is agreed upon than the recommended 16x16 format, then care should be taken to ensure that less consequential improvements in Milestone Scores are not rewarded with decreases in rent or margin.

ii) **Lack of progress –** If, over a period of two or more consecutive reporting years, a Milestone Score has decreased by reference to the previous year(s), then the parties may elect to include a margin or rental increase mechanism. Where this concept is agreed, it may be subject to an overall threshold, so that the margin or rental cannot increase above an agreed capped figure.

iii) **Lack of reporting –** The documentation should also provide consequences if the airline fails to provide its CO_2 Emissions and Traffic Volume figures or if the information provided is incomplete or otherwise unsatisfactory. Measures may include a "snap back" mechanism to return discounted rental or interest rates to pre-discounted figures, mandatory prepayment or supplemental rental requirements, or, in the extreme, lease termination or loan acceleration rights.

iv) **Trajectory –** Lenders and lessors may wish to consider the overall trajectory of the progress of the airline towards decarbonization when considering the application of any incentive framework and whether a reward should only be applied where consistent progress is made over consecutive Reporting Periods.

v) **Review –** Depending on term length of the lease or loan facility, it is recommended that the lease or loan documentation contains a provision for reviewing and updating the Milestone Concept Methodology during the course of the transaction

for example (i) to reflect any accepted developments in calculation of CO_2 Emissions – such as any new reporting standards, changes to binding climate targets or changes in regulation, (ii) to reflect any developments in calculating the impact of other emissions and how those could be built into the Milestone Concept Methodology, and (iii) to reflect any developments in the reporting of the Traffic Volume reference and, in time, a methodology for calculating ATK in lieu of ASK as the preferred reference point.

4.4. RISK FACTORS

(a) **Greenwashing –** The Milestone Concept Methodology has been developed on the basis of current scientific evidence, however lenders and lessors will need to bear in mind their own obligations under anti-greenwashing regulations when implementing the Milestone Concept Methodology in lease and loan documentation. In particular thought and care needs to be given (i) when considering the quality of (and ability to independently verify) data to be provided to determine the Milestone Score and (ii) the structure and implementation of any incentive scheme (such as the level of improvement in Milestone Score that is rewarded). It is recommended that where any compromise is made as to the standard of data informing a Milestone Score (for example, the use of one or more accredited carbon calculators rather than the use of audited data from the airline) then that is explicitly referred to in the loan or lease with a reference to any risk of a lack of reliability in that information.

(b) **Use of carbon calculators –** There is an additional risk related to the use of carbon calculators, which may arise in circumstances where the airline does not provide audited data but contests the veracity of the data derived from a carbon calculator. To mitigate this risk, care should be taken in contract to ensure that the parties each clearly agree to accept the data provided by a carbon calculator (or the arithmetic average or other metric of two or more carbon calculators) for the purposes of determining the Milestone Score.

(c) **References to the inclusion of Milestone Concept Methodology –** It should be noted that the Milestone Concept Methodology and the above guidelines have not been developed to reflect the Green Loan Principles, Sustainability Linked Loan Principles or Transition Loan guidance. Instead of target setting and then assessing progress against that target, the Milestone Concept Methodology is designed to assess actual progress towards overall decarbonization over a series of Reporting Periods through the life of a loan or a lease. As such, it is recommended that references to loans or leases incorporating the Milestone Concept Methodology are not referred to as “Sustainability-Linked Loans” or “Transition Loans” unless the relevant loan or lease would otherwise qualify as a Sustainability-Linked Loan or Transition Loan due to its conformity with the Sustainability Linked Loan Principles or (as the context requires) Transition Loan guidance.

(d) **EU Taxonomy Regulation** – The Milestone Concept Methodology does not reflect the criteria for the inclusion of a lease or financing as a sustainable activity within the EU Taxonomy Regulation. However, the inclusion of the Milestone Concept Methodology does not preclude the inclusion of other terms in the lease and the loan which would enable the transaction to benefit from inclusion within the EU Taxonomy Regulation.

(e) **Transferability** – Use of the Milestone Concept Methodology is in its infancy. The contractual terms agreed by one set of lenders with an airline counterparty may or may not be appropriate for an incoming participant to the deal and would likely to be subject to in-depth diligence by any new party. Agency roles and responsibilities in administering the application of the Milestone Concept would also need to be clearly documented in the loan documentation.

In the operating lease market, the use of emissions efficiency incentives is, in our experience, less well established than in the loan markets. Use of the Milestone Concept Methodology in an operating lease context may result, in the short-term at least, in creating relatively bespoke terms which could in practice impact the transferability of the lease to third parties.

(f) **Regulation re ESG Rating Activities –** Lenders, lessors and other participants will need to bear in mind their obligations under legislation impacting ESG Rating Activities (such as EU Regulation 2004/3005 (EU) of 27 November 2024 on the transparency and integrity of Environmental, Social and Governance (ESG) rating activities, and amending Regulations (EU) 2019/2088 and (EU) 2023/2859). The impact of such legislation will depend on the use made of the Milestone Score (and in particular whether it is to be published externally in any way).

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