

GREENHOUSE GAS

(GHG)

**GUIDANCE FOR CALCULATING CIVIL
AVIATION SCOPE 3 EMISSIONS FOR
CATEGORY 11—USE OF SOLD PRODUCTS >**

SCOPE 3 CATEGORY 11

USE OF SOLD PRODUCTS

The International Aerospace Environmental Group (IAEG) identified that Scope 3, “Corporate Value Chain,” Category 11, “Use of Sold Products,” as defined by the Greenhouse Gas (GHG) Corporate Protocol, is one of the most relevant Scope 3 emissions categories for most aerospace companies.

IAEG developed an industry-specific methodology and guidance materials, for voluntary consideration and use, to promote consistency of reporting approaches within the industry.

This initial version of the guidance focuses on civil aviation applications and is meant to complement the GHG Corporate Protocol Scope 3 emissions accounting and reporting standard and the associated technical guidance for calculating Scope 3, Category 11 emissions.

EMISSION TYPES

DIRECT USE PHASE EMISSIONS

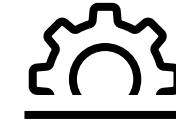
Emissions from products that directly consume energy (fuels or electricity) during use.

Examples: Emissions associated with fuel or electricity consumed by aircraft & engines, and emissions associated with energy (via engine offtakes) directly consumed by systems on board of the aircraft.

INDIRECT USE PHASE EMISSIONS

Emissions from products that indirectly consume energy (fuels or electricity) during use.

Examples: Emissions associated with the use of aircraft interiors, landing gear and other systems. Their weight contributes to the overall fuel burn of the aircraft, and therefore results in indirect emissions for those systems (aircraft interiors, landing gears, etc).



OVERALL PROCESS

Determine organizational boundaries



For products or integrated systems at least partially attributable to activities within the organizational boundaries

Calculate whole aircraft lifetime emissions



Allocate whole aircraft lifetime emissions to relevant products in question based on product lifetime and an allocation method



Report the portion of emissions defined by organizational boundaries

The guidance also provides equations to calculate an intensity metric expressed in gCO₂e per Revenue Passenger Kilometer (**RPK**) or Revenue Tonne Kilometer (**RTK**) in order to show improvements in product performance over time.

CALCULATING AIRCRAFT DIRECT USE PHASE EMISSIONS



Calculating by year then summed over the product lifetime:

$$\sum_{\text{AIRCRAFT TYPE}} \left\{ \text{NUMBER OF DELIVERED AIRCRAFT} \times \sum_{\text{YEAR} = 1}^{\text{EXPECTED AIRCRAFT LIFE}} \left[\text{ANNUAL EMISSIONS PER AIRCRAFT} \right] \right\}$$

3.85 kg CO₂e per kg of fuel, for ICAO baseline Jet-A /Jet-A1.

If a scale-up projection of Sustainable Aviation Fuel (SAF) is assumed by the reporting company over the product lifetime, IAEG recommends to explicitly provide the SAF projection data and the data source cited (e.g., Waypoint 2050, IEA).

$$\text{ANNUAL EMISSIONS PER AIRCRAFT} = \text{ANNUAL FUEL BURN PER AIRCRAFT} \times \text{JET FUEL EMISSION FACTOR} \times \left(1 - \text{PERCENT ALTERNATIVE FUELS} \times \text{EMISSION REDUCTION FACTOR} \right)$$

$$\text{ANNUAL FUEL BURN PER AIRCRAFT} = f \left(\text{UTILISATION, MISSION PROFILE, LOAD FACTOR, AIRCRAFT PERFORMANCE} \right)$$

Depends on the SAF pathway and feedstock. Default lifecycle emission factors are provided by [ICAO for CORSIA Eligible Fuels](#).

Emission Reduction Factor (ERF) = $1 - LSf/LC$ with LSf being the lifecycle emission of the selected SAF in gCO₂e/MJ, and LC representing the baseline life cycle emission (e.g., 89 gCO₂e/MJ for fossil jet fuel).



INTENSITY METRIC FOR COMMERCIAL AIRCRAFT

To address the concern that products with longer lifetimes can appear to have higher use-phase emissions than products with shorter lifetimes, emissions intensity metrics can be used to demonstrate improvements in product performance over time. Commonly used commercial aviation metrics are therefore suggested.

PASSENGER AIRCRAFT



Sold Products Lifetime Emissions

Sold Products Associated Lifetime RPK emissions

$$\sum_{\text{AIRCRAFT TYPE}} \left\{ \text{NUMBER OF DELIVERED AIRCRAFT} \times \sum_{\text{YEAR}=1}^{\text{EXPECTED AIRCRAFT LIFE}} \left[\text{AVAILABLE SEATS} \times \text{LOAD FACTOR} \times \text{TYPICAL STAGE LENGTH} \times \text{ANNUAL FLIGHT CYCLES} \right] \right\}$$

FREIGHTER AIRCRAFT (OR AIRCRAFT CARRYING BOTH PASSENGERS AND BELLY FREIGHT)



Sold Products Lifetime Emissions

Sold Products Associated Lifetime RTK emissions

$$\sum_{\text{AIRCRAFT TYPE}} \left\{ \text{NUMBER OF DELIVERED AIRCRAFT} \times \sum_{\text{YEAR}=1}^{\text{EXPECTED AIRCRAFT LIFE}} \left[\text{PAYLOAD } (t) \times \text{TYPICAL STAGE LENGTH} \times \text{ANNUAL FLIGHT CYCLES} \right] \right\}$$

$$\text{PAYLOAD } (t) = \text{AVAILABLE SEATS} \times \text{LOAD FACTOR} \times \text{WEIGHT OF PASSENGER AND LUGGAGE } (t) + \text{BELLY FREIGHT } (t) + \text{MAIN DECK FREIGHT } (t)$$

↓
100 kg per passenger (including their checked baggage).

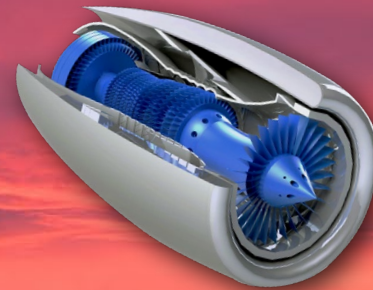
SOLD INTERMEDIATE PRODUCTS VS FINAL PRODUCT

SOLD INTERMEDIATE PRODUCTS

Products that require further processing, transformation, or inclusion in another product before use (e.g., engines, cabin interiors, hydraulic and electrical systems, landing gears, bolts, etc.).

VS

FINAL END-USE PRODUCT



CALCULATING DIRECT & INDIRECT USE-PHASE EMISSIONS (FOR SOLD INTERMEDIATE PRODUCTS)

Consistent with GHG Technical Guidance for Calculating Scope 3 Emissions, companies that sell intermediate products that directly consume energy—fuels or electricity—during use are required to include these direct use-phase emissions in their Category 11 calculations. However, the inclusion of indirect use-phase emissions is optional. The calculation starts with determining

the emissions of the final product (i.e., aircraft) over the expected lifetime of the sold intermediate product. Then, a second calculation is performed to define the percentage of the emissions that should be allocated to the sold intermediate product. The allocation methodology is similar for both direct and indirect use-phase emissions. Two allocations methods are suggested:



Allocation method based on mass ratio for engines and equipment that do not consume energy:

$$\sum_{\text{INTERMEDIATE PRODUCT TYPES}} \left\{ \text{NUMBER OF DELIVERED PRODUCTS} \times \sum_{\text{YEAR}=1}^{\text{EXPECTED LIFE OF INTERMEDIATE PRODUCT}} \left[\text{ANNUAL EMISSIONS PER AIRCRAFT} \times \frac{\text{MASS OF INTERMEDIATE PRODUCT}}{\text{MASS OF AIRCRAFT}} \right] \right\}$$



Hybrid allocation method for equipment that have both direct and indirect use-phase emissions (e.g., Environmental Control System, pneumatic systems, electrical systems, galleys):

$$\sum_{\text{INTERMEDIATE PRODUCT TYPES}} \left\{ \text{NUMBER OF DELIVERED PRODUCTS} \times \sum_{\text{YEAR}=1}^{\text{EXPECTED LIFE OF INTERMEDIATE PRODUCT}} \left[\text{ANNUAL DIRECT EMISSIONS OF PRODUCT} + \text{ANNUAL INDIRECT EMISSIONS OF PRODUCT} \right] \right\}$$

WHERE

$$\text{ANNUAL DIRECT EMISSIONS OF PRODUCT} = \text{ANNUAL EMISSIONS PER AIRCRAFT} \times \left[\frac{\text{FUEL OFFTAKE PER INTERMEDIATE PRODUCT}}{\text{TOTAL FUEL BURN}} \right]$$

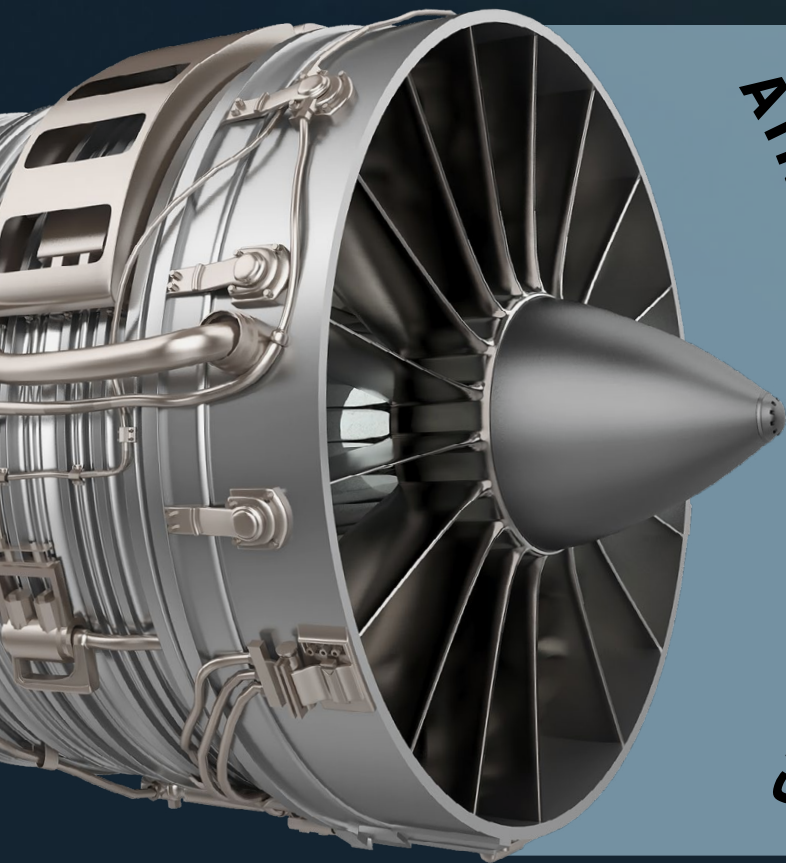
AND

$$\text{ANNUAL INDIRECT EMISSIONS OF PRODUCT} = \text{ANNUAL EMISSIONS PER AIRCRAFT} \times \left[\frac{\text{FUEL FOR PROPULSION}}{\text{TOTAL FUEL BURN}} \right] \times \left[\frac{\text{MASS OF INTERMEDIATE PRODUCT}}{\text{MASS OF AIRCRAFT}} \right]$$

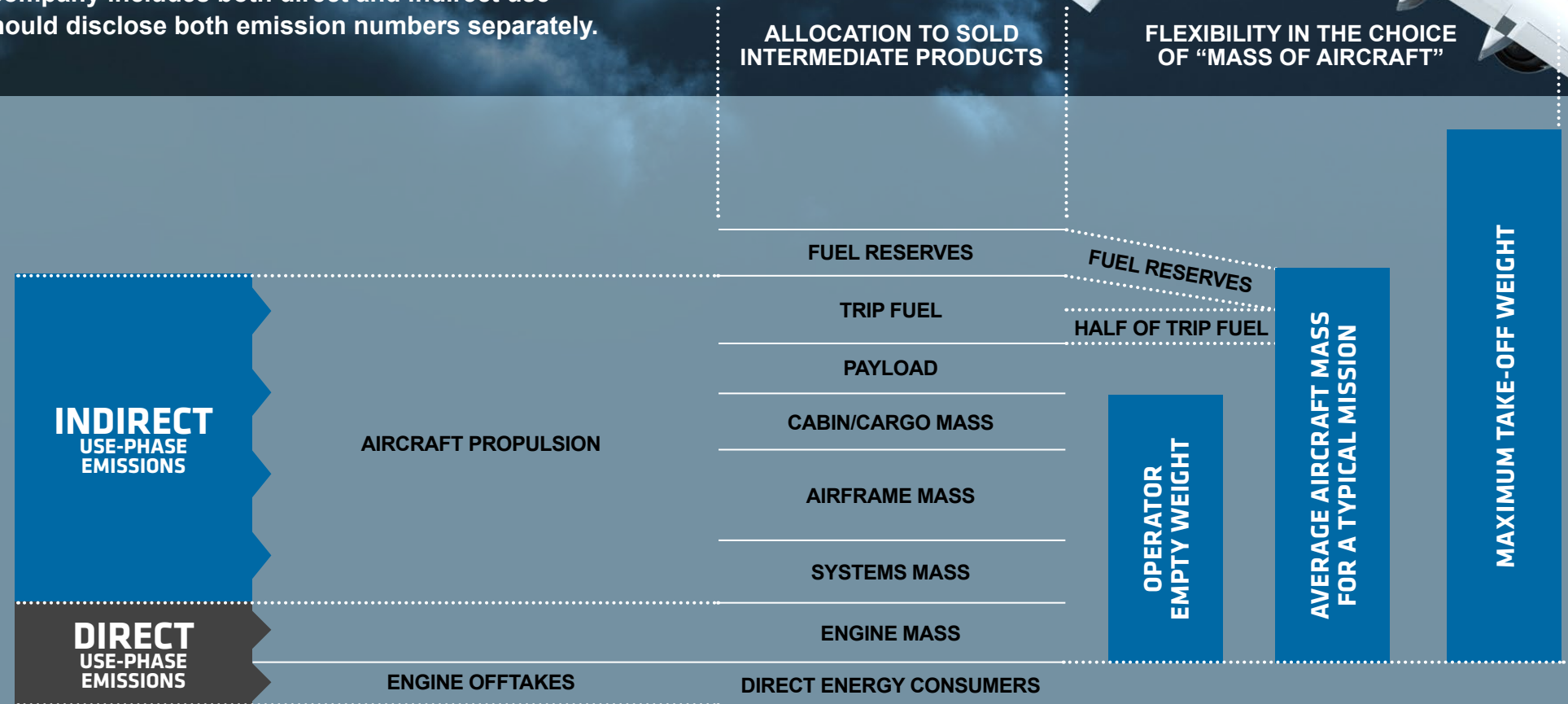


ALLOCATION METHOD FOR SOLD INTERMEDIATE PRODUCTS

The choice of the “Mass of aircraft” shall be clearly stated in the reporting (e.g., Operating Empty Weight, average aircraft mass during the flight). If a company includes both direct and indirect use-phase emissions in its Category 11 calculations, it should disclose both emission numbers separately.



AIRCRAFT EMISSIONS



ALLOCATION METHOD ADAPTATION & EXCLUSION CASES



Companies may adapt the allocation method presented on the previous page based on their specific situation. For example, for products that contribute to the aircraft drag and / or lift compared to their contribution to the aircraft mass, the allocation may quantify this drag and / or lift contribution.

EXCLUSION CASES:

In certain cases, the eventual end use of sold intermediate products may be unknown or the sold intermediate product may be further manufactured within the value chain (leading to potential mass decrease of the intermediate product once fitted on the final product). This is typically the case for suppliers that are several tiers away in the supply chain of the aircraft and it may be very difficult for them to obtain information on product use, to a point where calculation is not possible or at least

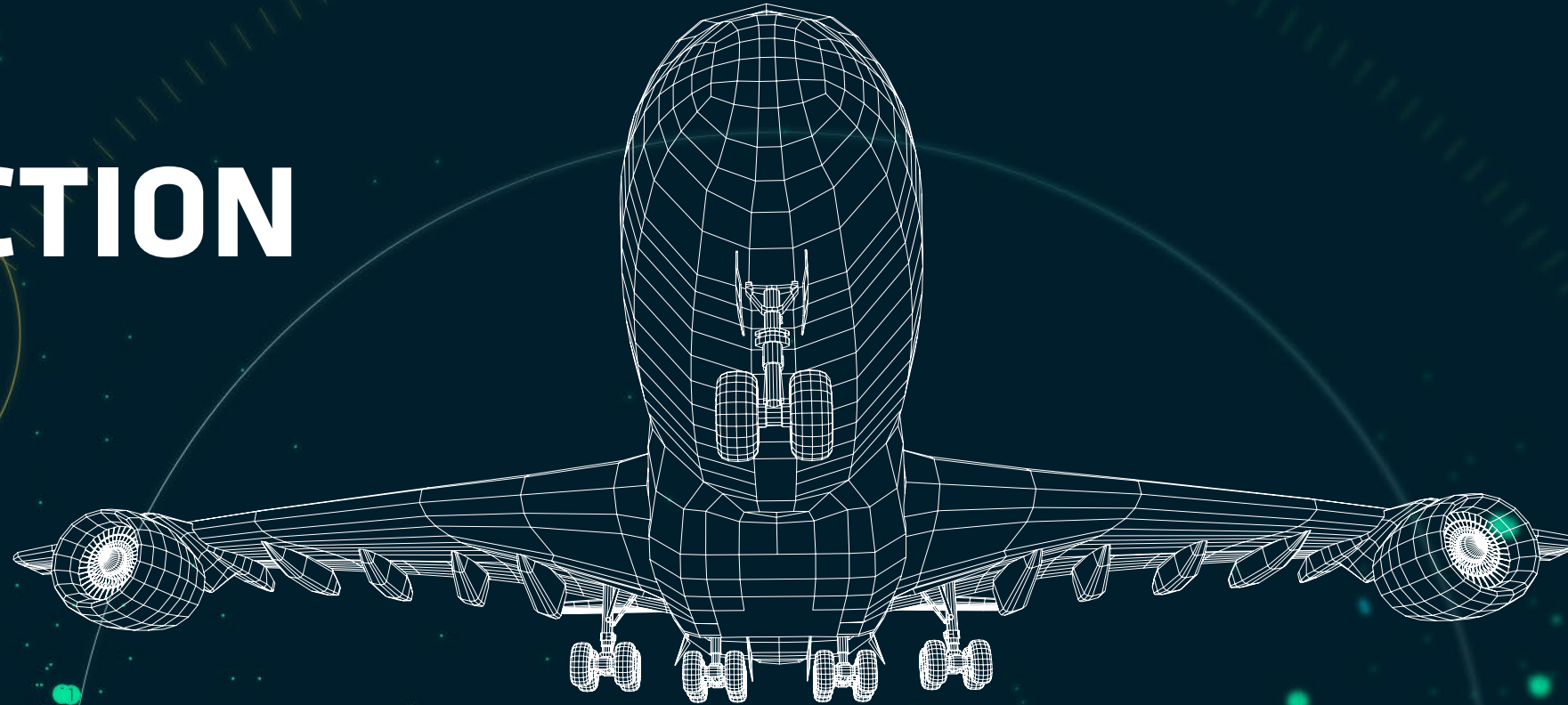
extremely difficult. A similar situation may exist for intermediate products that have several end-use applications. In such instances, and consistent with the GHG Corporate Protocol Scope 3, Category 11 guidance, companies may disclose and justify the exclusion of all downstream emissions related to these sold intermediate products. **For more information, see section [6.4 of the Scope 3 Standard](#) (accounting for downstream emissions).**

GREENHOUSE
GAS PROTOCOL

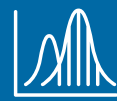
Corporate Value Chain (Scope 3) Accounting and Reporting Standard

Supplement to the GHG Protocol Corporate
Accounting and Reporting Standard

DATA COLLECTION



Companies can use internal aircraft utilization data (such as yearly number of flight hours, average mission range, payload).



If such internal data are not available, generic industry data are provided in the guidance (aircraft lifetime, Aircraft utilization per category of aircraft [flight cycle duration, annual flight hours], links to aircraft performance calculators).



Where possible, equipment manufacturers may contact their customers to obtain emissions value per aircraft family for mass and offtakes allocation.

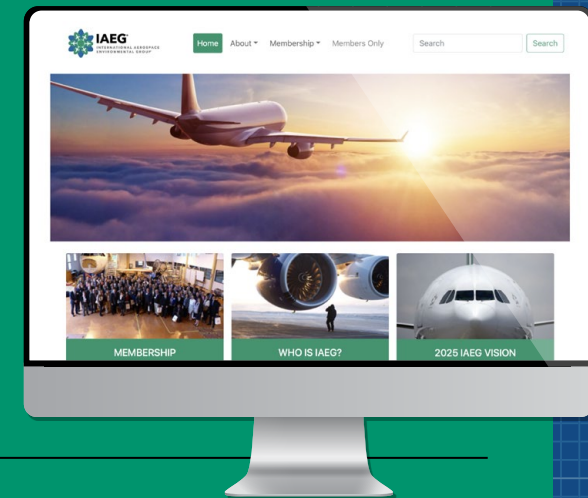
SUMMARY

GUIDELINE INCLUDES

- | | | |
|---|---|---|
| ✓ Formula for the computation of GHG emissions and intensity metric | ✓ Fossil jet-A/A1, Jet-B, fossil Aviation Gasoline (AvGas) emission factors | ✓ Incorporation of Sustainable Aviation Fuel (SAF) or alternative energy (hydrogen, ammonia, electricity) |
| ✓ Allocation methodology for sold intermediate products | ✓ Generic aircraft utilisation data per aircraft category (excluding business jets) | ✓ Practical examples to illustrate the application of the guidance |
| ✓ FAQ section | | |

This guidance is the result of the work of representatives from various manufacturers in the civil aviation supply chain—including manufacturers of parts, components, engines, and aircraft. It was enriched following a pilot phase completed at the start of 2023.

**AVAILABLE
AT IAEG.COM**



PLEASE CONTACT
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if you have any feedback to provide
on this first version of the guidance.

> Questions@IAEG.com

The background of the slide is a front-facing view of a fighter jet's cockpit. The canopy is clear, revealing a green-tinted display screen in the center. The jet's nose and canards are visible on either side, set against a clear blue sky.

MILITARY GUIDANCE

Given the unique considerations for military products, including limited public data, variety of products, and mission objectives, specific guidance is in-work for military applications.

COMING SOON



LEADING EDGE
SOLUTIONS
ACROSS THE
VALUE CHAIN



RESPONSIBLE &
SUSTAINABLE
AEROSPACE
INDUSTRY

A RECOGNIZED GLOBAL BODY FOR AEROSPACE & DEFENSE

56 MEMBER
COMPANIES

70% OF GLOBAL AEROSPACE AND DEFENSE
INDUSTRY ARE IAEG MEMBERS

\$518B COMBINED ANNUAL 2022 REVENUES
FOR IAEG (FULL) MEMBERS

\$740B TOTAL GLOBAL AEROSPACE
INDUSTRY 2022 REVENUES

IAEG Full Members

Airbus SAS
ATR
BAE Systems
Boeing
Bombardier
CAE
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Henkel
Hexcel Corporation
Honda Aircraft Company, LLC
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Lockheed Martin
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