

1.A.3.a i (i) - International Civil Aviation: LTO

Short description

In NFR category 1.A.3.a i (i) - International Civil Aviation: LTO emissions during LTO stage (Landing/Take-off: 0-3,000 feet) are reported. In the following, information on sub-category specific AD, (implied) emission factors and emission estimates are provided.

Category Code	Method					AD					EF				
1.A.3.a.i.(i)	T1, T2, T3					NS, M					CS, D, M				
Key Category	SO ₂	NO _x	NH ₃	NMVOC	CO	BC	Pb	Hg	Cd	Diox	PAH	HCB	TSP	PM ₁₀	PM _{2.5}
1.A.3.a.i.(i)	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-	-/-	-	-/-	-/-	-/-

T = key source by Trend **L** = key source by Level

Methods

D	Default
RA	Reference Approach
T1	Tier 1 / Simple Methodology *
T2	Tier 2*
T3	Tier 3 / Detailed Methodology *
C	CORINAIR
CS	Country Specific
M	Model

* as described in the EMEP/CORINAIR Emission Inventory Guidebook - 2007, in the group specific chapters.

AD - Data Source for Activity Data

NS	National Statistics
RS	Regional Statistics
IS	International Statistics
PS	Plant Specific data
AS	Associations, business organisations
Q	specific questionnaires, surveys

EF - Emission Factors

D	Default (EMEP Guidebook)
C	Confidential
CS	Country Specific
PS	Plant Specific data

Methodology

[illegible]

¹ estimated via a f-BCs (avgas: 0.15, jet kerosene: 0.48) as provided in ⁷⁾

² EF(PM_{2.5}) also applied for PM₁₀ and TSP (assumption: > 99% of TSP from diesel oil combustion consists of PM_{2.5})

³ also including TSP from lead: $EF(TSP) = 1.6 \times EF(Pb)$ - see road transport



For the country-specific emission factors applied for particulate matter, no clear indication is available, whether or not condensables are included.

Discussion of emission trends

NFR 1.A.3.a i (i) - International Civil Aviation - LTO is **no key category**.

Recalculations

As mentioned in the superordinate chapter on 1.A.3.a, the LTO fuel consumptions applied in TREMOD AV have been adapted to the the EMERP/EEA Guidebook 2019.⁸⁾

Hence, the percentual annual shares of kerosene consumed during L/TO for international flights have been re-estimated...

Table 3: Revised percentual share of kerosene consumed during L/TO for international flights, in %

[illegible]

... and the amounts of kerosene allocated to sub-category 1.A.3.a i (i) were revised accordingly:

Table 4: Revised kerosene usage in 1.A.3.a i (i), in terajoules

[illegible]

[illegible]

In parallel, the majority of **country-specific emission factors** has been revised within TREMOD AV based on information available from the 2019 EMEP/EEA Guidebook ⁹⁾ and Eurocontrol's AEM model ¹⁰⁾. Here, among others, the EF for SO₂ from jet kerosene has been replaced by new and more reliable data showing no sulphur reduction since 1990.

Table 5: Revised country-specific emission factors applied for jet kerosene

[illegible]

relative change																	
CARBON MONOXIDE - CO																	
Submission 2021																	
Submission 2020																	
absolute change																	
relative change																	



For more information on recalculated emission estimates for Base Year and 2018, please see the pollutant specific recalculation tables following chapter [8.1 - Recalculations](#)].

Uncertainties

For uncertainties information, please see [main chapter](#) on civil aviation.

Planned improvements

For information on planned improvements, please see [main chapter](#) on civil aviation.

FAQs

bibliography : 1 : Knörr, W., Schacht, A., & Gores, S. (2010): Entwicklung eines eigenständigen Modells zur Berechnung des Flugverkehrs (TREMOT-AV) : Endbericht. Endbericht zum F+E-Vorhaben 360 16 029, URL:

<https://www.umweltbundesamt.de/publikationen/entwicklung-eines-modells-zur-berechnung>; Berlin & Heidelberg, 2012. : 2 : Knörr et al. (2019c): Knörr, W., Schacht, A., & Gores, S.: TREMOD Aviation (TREMOT AV) 2019 - Revision des Modells zur Berechnung des Flugverkehrs (TREMOT-AV).

Heidelberg, Berlin: Ifeu Institut für Energie- und Umweltforschung Heidelberg GmbH & Öko-Institut e.V., Berlin & Heidelberg, 2019. : 3 : Gores (2019): Inventartool zum deutschen Flugverkehrsinventar 1990-2018, im Rahmen der Aktualisierung des Moduls TREMOD-AV im Transportemissionsmodell TREMOD, Berlin, 2019. : 4 : EMEP/EEA, 2019: EMEP/EEA air pollutant emission inventory guidebook 2019,

<https://www.eea.europa.eu/publications/emep-eea-guidebook-2019/part-b-sectoral-guidance-chapters/1-energy/1-a-combustion/1-a-3-a-aviation/view>; Copenhagen, 2019. : 5 : Eurocontrol (2019):

Advanced emission model (AEM); <https://www.eurocontrol.int/model/advanced-emission-model>; 2019 **bibliography**

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- 1) (bibcite 2)
 - 2) (bibcite 3)
 - 3) (bibcite 2)
 - 4) (bibcite 3)
 - 5) (bibcite 1)
 - 6) (bibcite 2)
 - 7) (bibcite 4)
 - 8) (bibcite 4)
 - 9) (bibcite 4)
 - 10) (bibcite 5)