

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.

Method	AD	EF	Key Category
T1, T2, T3	NS, M	CS, D, M	no key category

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

Activity Data

Specific jet kerosene consumption during LTO-stage is calculated within TREMOD AV as described in

TSP³															
CO															

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 x 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 %

	= 1990	= 1995	= 2000	= 2005	= 2006	= 2007	= 2008	= 2009	= 2010	= 2011	= 2012	= 2013	= 2014	= 2015	= 2016	= 2017
~ Submission 2020	> 8.31	> 7.84	> 8.21	> 8.02	> 7.98	> 7.96	> 7.92	> 7.87	> 7.91	> 7.82	> 7.95	> 8.05	> 8.15	> 8.24	> 8.26	> 8.28
~ Submission 2019	> 7.52	> 8.50	> 7.72	> 7.49	> 7.41	> 7.48	> 7.58	> 7.50	> 7.94	> 8.77	> 8.01	> 7.73	> 8.16	> 8.47	> 8.14	> 7.60
~ absolute change	> 0.79	> -0.66	> 0.49	> 0.53	> 0.57	> 0.48	> 0.34	> 0.37	> -0.03	> -0.95	> -0.07	> 0.32	> -0.01	> -0.23	> 0.13	> 0.68
~ relative change	> 10.5%	> -7.80%	> 6.37%	> 7.03%	> 7.65%	> 6.37%	> 4.45%	> 4.88%	> -0.39%	> -10.8%	> -0.84%	> 4.15%	> -0.10%	> -2.77%	> 1.54%	> 8.89%

... 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

	= 1990	= 1995	= 2000	= 2005	= 2006	= 2007	= 2008	= 2009	= 2010	= 2011	= 2012	= 2013	= 2014	= 2015	= 2016	= 2017
~ Submission 2020	> 13,676	> 15,973	> 21,785	> 25,168	> 26,381	> 27,295	> 27,439	> 26,538	> 26,256	> 24,701	> 27,164	> 28,075	> 27,274	> 27,546	> 29,875	> 32,999
~ Submission 2019	> 12,419	> 17,315	> 20,352	> 23,432	> 24,422	> 25,597	> 26,193	> 25,189	> 26,243	> 27,570	> 27,317	> 26,897	> 27,305	> 28,246	> 29,301	> 30,226

~ absolute change	> 1,257	> -1,342	> 1,434	> 1,736	> 1,959	> 1,699	> 1,246	> 1,349	> 13	> -2,870	> -154	> 1,178	> -31	> -700	> 575	> 2,773
~ relative change	> 10.1%	> -7.75%	> 7.05%	> 7.41%	> 8.02%	> 6.64%	> 4.76%	> 5.36%	> 0.05%	> -10.4%	> -0.56%	> 4.38%	> -0.11%	> -2.48%	> 1.96%	> 9.17%

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

[illegible]

~ Submission 2019	> 1.04	> 1.04	> 1.04	> 1.04	> 1.04	> 1.04	> 1.04	> 1.04	> 1.04	> 1.04	> 1.04	> 1.04	> 1.04	> 1.04	> 1.04	> 1.04		
~ absolute change	> 0.17	> 0.16	> 0.16	> 0.16	> 0.16	> 0.16	> 0.16	> 0.16	> 0.16	> 0.16	> 0.16	> 0.16	> 0.16	> 0.16	> 0.16	> 0.16		
~ relative change	> 15.9%	> 15.1%	> 15.1%	> 15.7%	> 15.7%	> 15.7%	> 15.7%	> 15.7%	> 15.7%	> 15.7%	> 15.7%	> 15.7%	> 15.7%	> 15.7%	> 15.7%	> 15.6%	> 15.6%	
< Carbon monoxide - CO																		
~ Submission 2020	> 225	> 214	> 209	> 192	> 192	> 188	> 186	> 181	> 186	> 185	> 188	> 187	> 182	> 186	> 182	> 183		
~ Submission 2019	> 245	> 222	> 235	> 224	> 220	> 215	> 212	> 208	> 202	> 201	> 197	> 194	> 191	> 188	> 184	> 184		
~ absolute change	> -20.1	> -8.0	> -26.5	> -31.5	> -28.0	> -27.3	> -25.8	> -26.4	> -15.5	> -15.2	> -9.07	> -6.71	> -9.32	> -1.36	> -2.21	> -0.68		
~ relative change	> -8.20%	> -3.59%	> -11.2%	> -14.1%	> -12.7%	> -12.7%	> -12.2%	> -12.7%	> -7.70%	> -7.58%	> -4.60%	> -3.46%	> -4.87%	> -0.73%	> -1.20%	> -0.37%		



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

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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)