Monitoring Plan Annual Emissions

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Identification of the Aircraft Operator

EU unique identifier

12345

Name of the aircraft operator

Flying Circus Germany

German representation

Name of the aircraft operator on the EU Commission's list of operators

Flying Circus Ger.

Is there an ICAO designator attributed to your aviation company?

☒ **yes** ☐ **no**

ICAO unique designator

ZYX

Registration marking of the Aircraft (tail number)

1	

(1 row)

Monitoring Plan Annual Emissions

Competent Authority for European Union Emissions Trading Scheme

Assigned administering EU Member State

Germany

Previous administering EU Member State

Do you have a DEHSt reference number?

☒ yes ☐ no

DEHSt reference number

19550-0945

Monitoring Plan

Date of update

14.08.2012

Monitoring plan is valid from

01.01.2013

Version Number

1

Version Number of previous version

Changes in comparison to the previous submitted version

Initial submission for reporting period 2013-2020.

Legal Representative

Firstname

John

Surname

Doe

Monitoring Plan Annual Emissions

About your Operations

Operator status

☒ **commercial** ☐ **non commercial**

Scope of operations

☐ **only intra-EU flights** ☒ **flights inside and outside the EU**

Scheduling of flights

☐ **scheduled flights** ☐ **non scheduled flights** ☒ **both**

Expected annual CO2 emissions (t/a)

1800000

Description of the aviation operations

As a member of Air Alliance, Flying Circus AG has standardised code share agreements with all other members of Air Alliance. (See also our website at http://www.flying-circus-ag.de/info_and_services/partners.html)

We operate a hybrid hub & spoke / point-to-point model with our main hub in Frankfurt (FRA). Our passenger flights are mostly scheduled, with approximately 60% taking place in the EU.
Non-scheduled passenger flights are primarily charter flights to the Asia-Pacific Region operating on a point to point model.
Cargo flights are usually ad-hoc i.e. non-scheduled.

We own a number of aircraft that have been leased out permanently or short-term and are not operated by us.
We also operate a number of leased-in aircraft.

Simplified monitoring procedures

Do you operate fewer than 243 flights in each of three consecutive four-months periods?

☐ **yes** ☒ **no**

Is the amount of the total annual emissions of operated flights lower than 25 000 tonnes CO2/year?

☐ **yes** ☒ **no**

Do you want to use a simplified monitoring procedure for small

☐ **yes** ☒ **no**

Monitoring Plan Annual Emissions

About your Air Operating Certificate

Do you have an Air Operating Certificate (AOC)?

☒ yes ☐ no

Identification Code of the AOC

D-321 AOC

Date of issue

01.01.2000

Competent authority for the AOC

Luftfahrt-Bundesamt

Information about the certificate

Operating Licence

Do you have an Operating Licence?

☒ yes ☐ no

Kind of operating licence

EU operating licence

Identification Code of the operating licence

D-654 EG

Date of issue

01.01.2000

Competent authority for the certificate

Luftfahrt-Bundesamt

Information about the licence

Monitoring Plan Annual Emissions

Contact persons for questions about your Monitoring Plan

1

Firstname

Juergen T.

Surname

Kork

(1 row)

Monitoring Plan Annual Emissions

Ownership structure

Name of the parent company

Flying Circus AG

ICAO unique designator of the parent company

ABC

1 **Name of the subsidiary company**

Flying Circus Bahamas

ICAO unique designator of the subsidiary company

ZYB

2 **Name of the subsidiary company**

Flying Circus Germany

ICAO unique designator of the subsidiary company

ZYX

3 **Name of the subsidiary company**

Flying Circus Austria

ICAO unique designator of the subsidiary company

ZYA

(3 rows)

Description of the ownership structure of your company

Parent company: (see also our website at http://www.flying-circus-ag.de/about_us/organisational_structure.html)

Flying Circus AG, ICAO code: ABC, administered by UK

Subsidiaries: (see also our website at http://www.flying-circus-ag.de/investor_relations/factfile/legal_structure.html)

1. Flying Circus Bahamas, ICAO code: ZYB, administered by UK
2. Flying Circus Germany, ICAO code: ZYX, administered by Germany
3. Flying Circus Austria, ICAO code: ZYA, administered by Austria

Monitoring Plan Annual Emissions

List of attachments

Nr.	Formname	Filename

(0 rows)

Address of the Aircraft Operator

Address of organisation

Organisation (operator / company / authority)

Flying Circus Germany

Department

Street address

Am Flughafen 1

Postcode / ZIP

60549

City

Frankfurt

County / Region

Hessen

Country

Germany

Contact person

Title

Academic degree

Firstname

Surname

Telephone (contact person)

Fax (contact person)

Mobile phone

Email (contact person)

Contact organisation

Telephone (organisation)

Fax (organisation)

Email (organisation)

World Wide Web (URL)

www.Flying-Circus-Germany.de

Address of Legal Representative

Address of organisation

Organisation (operator / company / authority)
Flying Circus Germany

Department
Emissions Management

Street address
Am Flughafen 1

Postcode / ZIP
60549

City
Frankfurt

County / Region
Hessen

Country
Germany

Contact person

Title
Mr

Academic degree

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+49 69 86543XX

Fax (contact person)

Mobile phone

Email (contact person)
John.Doe@Flying-Circus-Germany.de

Contact organisation

Telephone (organisation)

Fax (organisation)

Email (organisation)

World Wide Web (URL)
www.Flying-Circus-Germany.de

Address of Contact Monitoring

Address of organisation

Organisation (operator / company / authority)

Flying Circus Germany

Department

Street address

Am Flughafen 1

Postcode / ZIP

60549

City

Frankfurt

County / Region

Hessen

Country

Germany

Contact person

Title

Mr.

Academic degree

Firstname

Juergen T.

Surname

Kork

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+49 69 12345XX

Fax (contact person)

Mobile phone

Email (contact person)

JuergenT.Kork@Flying-Circus-Germany.de

Contact organisation

Telephone (organisation)

Fax (organisation)

Email (organisation)

World Wide Web (URL)

www.Flying-Circus-Germany.de

Address of Certificate Authority

Address of organisation

Organisation (operator / company / authority)

Luftfahrt-Bundesamt

Department

B 1 - Licensing of Air Carriers / Entry Permissions / Safety
Assessment of Foreign Aircraft

Street address

Hermann-Blenk-Straße 26

Postcode / ZIP

38108

City

Braunschweig

County / Region

Lower Saxony

Country

Germany

Contact person

Title

Academic degree

Firstname

Surname

Telephone (contact person)

Fax (contact person)

Mobile phone

Email (contact person)

Contact organisation

Telephone (organisation)

Fax (organisation)

Email (organisation)

World Wide Web (URL)

www.lba.de

Fuel Type

Fuel type

Source stream number

1

Fuel type

Jet kerosene (Jet A1 or Jet A)

Short description of the fuel

Standard Jet-Fuel

Expected annual fuel consumption (t/a)

Expected annual CO_2 emissions (t/a)

1780000

For the determination of CO_2 emissions: do you deviate from the accuracy requirements of the Monitoring and Reporting Regulation?

no

Required Tier for the determination of fuel consumption according to Monitoring and Reporting Regulation

Tier 2

Chosen Tier for the determination of fuel consumption

Tier 2

Compulsory fuel parameters

Emission factor

3,15 t/t

Biomass fraction

0,0 %

Fuel Type

Fuel type

Source stream number

2

Fuel type

Aviation gasoline (AvGas)

Short description of the fuel

AvGas 100 LL

Expected annual fuel consumption (t/a)

Expected annual CO2 emissions (t/a)

20000

For the determination of CO2 emissions: do you deviate from the accuracy requirements of the Monitoring and Reporting Regulation?

yes, because of being a "low emissions" source

Required Tier for the determination of fuel consumption according to Monitoring and Reporting Regulation

Tier 2

Chosen Tier for the determination of fuel consumption

Tier 1

Compulsory fuel parameters

Emission factor

3,10 t/t

Biomass fraction

0,0 %

Aircraft Fleet

Method to calculate fuel consumption

Chosen method

☐ **Method A** ☐ **Method B** ☒ **Methods A and B**

Exceptional cases

If an aircraft performs an activity other than a flight (e.g. major maintenance involving the emptying of the tanks after a monitored flight), we will substitute the figures in the calculation formula according to Section 1 Annex III Monitoring Regulation.

Justification if one method is not applied for the whole aircraft fleet

Except for the DC-6 we use Method B to determine flight specific fuel consumption. For the DC-6 Method A is in use. This aircraft has been incorporated in our fleet in connection with a merger with airline ABC in 2002. The standard procedure of fuel consumption determination within ABC has been Method A and has not been changed since then. We do not intend to change the method for our DC-6 because Method B meets the typical operations of an oldtimer.

Conditions for choosing method A or B

Except for the DC-6 we use Method B to determine flight specific fuel consumption.
For the DC-6 Method A is in use. This aircraft have been incorporated in our fleet in connection with a merger with ABC airline in 2002. The standard procedure of fuel consumption determination within ABC has been Method A and has not been changed since then.

Aircraft Type

Information about the aircraft type

Consecutive number

5

Aircraft manufacturer

DE HAVILLAND CANADA

Model

Dash 8 (400)

ICAO aircraft type designator

DH8D

In operation

☒ **at the moment** ☐ **in the future**

Number of owned aircraft

10

Number of leased aircraft

5

Total number of aircraft

15

Used fuel types

1

Fuel type

Jet kerosene (Jet A1 or Jet A)

Short description of the fuel

Standard Jet-Fuel

Number of aircraft

15

(1 row)

Calculation Method per Aircraft Type

Identification of the emission source

Consecutive number

1

ICAO aircraft type designator

DH8D

Aircraft manufacturer

DE HAVILLAND CANADA

Model

Dash 8 (400)

Subsequent classification

Not necessary

Number of aircraft

15

Method to calculate fuel consumption

Chosen method

☐ **Method A** ☒ **Method B**

Time of measurement and corresponding documentation for the chosen method

To calculate the fuel consumption of a specific flight (e.g. Flight B) according to Method B, three different measured data have to be available:

1) Fuel onboard at the time of On-Block of the predecessor flight (Flight A)
After "Shutting down the engines following the arrival at the parking position" the remaining fuel in the tanks is read on the onboard instruments (kilograms). This value is written in the appropriate box "On-Block Fuel" of the Flight Log of Flight A by the crew.

2) Fuel Uplift (after Flight A and before Flight B)
The uplifted fuel is being measured in units per mass (kilograms). Please see details of this procedure in the field "Method to determine fuel uplift".

3) Fuel onboard at the time of On-Block of Flight B
After "Shutting down the engines following the arrival at the parking position" the remaining fuel in the tanks is read on the onboard instruments (kilograms). This value is written in the appropriate box "On-Block Fuel" of the Flight Log of Flight B by the crew.

The fuel consumption of Flight B is determined by calculating 1 +2 -3.

Method to determine fuel uplift

Data source

☐ **measurement by fuel supplier** ☒ **onboard measurement**

Time of measurement and corresponding documentation for the chosen method

The value 2) described in the field "Method to calculate fuel consumption" is determined by two different measured values (a and b):

a) Fuel onboard measured directly before uplift (kilograms)
b) Fuel onboard measured immediately after uplift is completed (kilograms)

Subtracting (b-a) leads to the uplifted amount of fuel. Value a) and Value b) is being recorded in the Flight Log (box "Fuel Onboard before Uplift" and "Fuel Onboard after Uplift"). The crew calculates the uplift and records the resulting value in the Flight Log as well (box "Uplift").

Explanation for choosing the method

All DH8D are equipped with onboard fuel measurement devices that automatically display fuel in terms of mass.

The digital display allows for readings with an accuracy of rounded X kilograms.

Calculation Method per Aircraft Type

Method to determine fuel uplift

Description of data flow

1. Fuel uplift determined by onboard-measurement devices (automatic conversion from litres to kg, the correlation between density and temperature that is measured is inbuilt into the equipment).

2. Data is recorded in the Flight Log by the crew.

3. The Flight Log is sent (e.g. mail/ fax/ email) to our headquarters in Frankfurt. The data is entered manually into OMS by the Operations Management Department.

4. The following data is recorded in the OMS per flight number: fuel levels (according to the formula for Method B) and uplifts per flight (instantly before and after uplift).

5. Finally the Flight Log is being scanned and stored digitally for a period of 10 years.

List of deviations

Because we will always use onboard fuel readings for measuring fuel contained in the tank and fuel uplift, we do not expect any special circumstances as described in the Monitoring Regulation, Annex I, Section 2 (2c) for DH8D.

Onboard Measurement of fuel amounts

Data source for onboard measured fuel amounts

other

Short description of the data source

Flight Log

Calculation Method per Aircraft Type

Method to determine density

Chosen method

actual density measured by onboard measurement devices

Justification for choosing the standard density factor

Description of data flow

See description in "Method to measure fuel uplift".

List of deviations

We will always use onboard devices for measuring fuel uplift and fuel contained in the tank, so we do not expect any special circumstances for DH8D as described in the Monitoring Regulation, Annex I, Section 2 (2c).

Onboard Measurement Device

Consecutive number

1

Type of onboard measurement device

capacitive fuel level measurement device

Description of measurement device

The measurement principle relies on different capacitances at different fuel levels. So the capacitance is proportional to the height of fuel, the level of fuel can be determined automatically.

Individual device uncertainty (%)

2,50 %

Source of individual device uncertainty

manufacturer's specification

Calibrations based on national or international standards?

☐ **yes** ☒ **no**

Which standards are used?

Interval of calibration

Location and responsible department (or role of person) for the information

The responsible department is the aircraft maintenance in Frankfurt.

Aircraft Type

Information about the aircraft type

Consecutive number
3

Aircraft manufacturer
AIRBUS

Model
A-320

ICAO aircraft type designator
A320

In operation
☒ **at the moment** ☐ **in the future**

Number of owned aircraft
10

Number of leased aircraft
6

Total number of aircraft
16

Used fuel types

1

Fuel type
Jet kerosene (Jet A1 or Jet A)

Short description of the fuel
Standard Jet-Fuel

Number of aircraft
16

(1 row)

Calculation Method per Aircraft Type

Identification of the emission source

Consecutive number

1

ICAO aircraft type designator

A320

Aircraft manufacturer

AIRBUS

Model

A-320

Subsequent classification

Data transmission with Flight Log (OMS Crew Access)

Number of aircraft

10

Method to calculate fuel consumption

Chosen method

☐ **Method A** ☒ **Method B**

Time of measurement and corresponding documentation for the chosen method

To calculate the fuel consumption of a specific flight (e.g. Flight B) according to Method B, three different measured data have to be available:

1) Fuel onboard at the time of On-Block of the predecessor flight (Flight A)
After "Shutting down the engines following the arrival at the parking position" the remaining fuel in the tanks is read on the onboard instruments (kilograms). This value is written in the appropriate box "On-Block Fuel" of the Flight Log of Flight A by the crew.

2) Fuel Uplift (after Flight A and before Flight B)
The uplifted fuel is being measured in units per mass (kilograms). Please see details of this procedure in the field "Method to determine fuel uplift".

3) Fuel onboard at the time of On-Block of Flight B
After "Shutting down the engines following the arrival at the parking position" the remaining fuel in the tanks is read on the onboard instruments (kilograms). This value is written in the appropriate box "On-Block Fuel" of the Flight Log of Flight B by the crew.

The fuel consumption of Flight B is determined by calculating 1 +2 -3.

Method to determine fuel uplift

Data source

☐ **measurement by fuel supplier** ☒ **onboard measurement**

Time of measurement and corresponding documentation for the chosen method

The value 2) described in the field "Method to calculate fuel consumption" is determined by two different measured values (a and b):

a) Fuel onboard measured directly before uplift (kilograms)
b) Fuel onboard measured immediately after uplift is completed (kilograms)

Subtracting (b-a) leads to the uplifted amount of fuel. Value a) and Value b) is being recorded in the Flight Log (box "Fuel Onboard before Uplift" and "Fuel Onboard after Uplift"). The crew calculates the uplift and records the resulting value in the Flight Log as well (box "Uplift").

Explanation for choosing the method

All A320 are equipped with onboard fuel measurement devices that automatically display fuel in terms of mass.

The digital display allows for readings with an accuracy of rounded X kilograms.

Calculation Method per Aircraft Type

Method to determine fuel uplift

Description of data flow

1. Fuel uplift determined by onboard-measurement devices (automatic conversion from litres to kilograms, the correlation between density and temperature that is measured is inbuilt into the equipment).

2. Data is recorded in the Flight Log by the crew.

3. After the flight data from the Flight Log is (together with other data concerning the same flight) entered in the OMS by the crew (use of a Remote Crew Access, e.g. in the hotel via internet).

4. After the flight the Flight Log is sent (e.g. mail/ fax/ email) to our headquarters in Frankfurt. Data already transmitted by the crew is crosschecked by the Operations Management Department (corrections on basis of the actual Flight Log).

5. Consequently, the following data is recorded in the OMS per flight number: fuel levels (according to the formula for Method B) and uplifts per flight (instantly before and after uplift).

5. Data Backup of the Flight Log (10 years)

List of deviations

Because we will always use onboard fuel readings for measuring fuel contained in the tank and fuel uplift, we do not expect any special circumstances as described in Monitoring Regulation, Annex I, Section 2 (2c).

Onboard Measurement of fuel amounts

Data source for onboard measured fuel amounts

other

Short description of the data source

Flight Log
These A320 are not equipped with ACARS. Therefore, data is transferred in the OMS manually.

Calculation Method per Aircraft Type

Method to determine density

Chosen method

actual density measured by onboard measurement devices

Justification for choosing the standard density factor

Description of data flow

See description in "Method to measure fuel uplift".

List of deviations

We will always use onboard devices for measuring fuel uplift and fuel contained in the tank, so we do not expect any special circumstances for A320 as described in the Monitoring Regulation, Annex I, Section 2 (2c).

Onboard Measurement Device

Consecutive number

1

Type of onboard measurement device

capacitive fuel level measurement device

Description of measurement device

The measurement principle relies on different capacitances at different fuel levels. So the capacitance is proportional to the height of fuel, the level of fuel can be determined automatically.

Individual device uncertainty (%)

2,00 %

Source of individual device uncertainty

manufacturer's specification

Calibrations based on national or international standards?

☐ yes ☒ no

Which standards are used?

Interval of calibration

Location and responsible department (or role of person) for the information

The responsible department is the aircraft maintenance in Frankfurt.

Calculation Method per Aircraft Type

Identification of the emission source

Consecutive number

2

ICAO aircraft type designator

A320

Aircraft manufacturer

AIRBUS

Model

A-320

Subsequent classification

Data transmission with ACARS

Number of aircraft

6

Method to calculate fuel consumption

Chosen method

☐ **Method A** ☒ **Method B**

Time of measurement and corresponding documentation for the chosen method

To calculate the fuel consumption of a specific flight (e.g. Flight B) according to Method B, three different measured data have to be available:

1) Fuel onboard at the time of On-Block of the predecessor flight (Flight A)
After "Shutting down the engines following the arrival at the parking position" (ACARS Trigger) the remaining fuel in the tanks is measured (kilograms) automatically and is transmitted by an ACARS-Message to the headquarters. This value is transferred to the OMS automatically. At the same time the remaining fuel is being read manually by the crew on the onboard instruments as well and written in the appropriate box "On-Block Fuel" of the Flight Log.

2) Fuel Uplift (after Flight A and before Flight B)
The uplifted fuel is being calculated in the OMS. Please see details of this procedure in the field "Method to determine fuel uplift".

3) Fuel onboard at the time of On-Block of Flight B
After "Shutting down the engines following the arrival at the parking position" (ACARS Trigger) the remaining fuel in the tanks is measured (kilograms) automatically and is transmitted by an ACARS-Message to the headquarters. This value is transferred to the OMS automatically. At the same time the remaining fuel is being read by the crew manually as well and written in the appropriate box "On-Block Fuel" of the Flight Log.

The fuel consumption of Flight B is determined by calculating 1 +2 -3.

Method to determine fuel uplift

Data source

☒ **measurement by fuel supplier** ☐ **onboard measurement**

Time of measurement and corresponding documentation for the chosen method

Explanation for choosing the method

All A320 are equipped with onboard fuel measurement devices that automatically display fuel in terms of mass. These A320 frequently fly to airports where the fuel supplier is not always in the position to deliver a density information. The monitoring procedure laid down here combines the accurate determination of the volume by the fuel supplier with the density measurement by the aircraft itself.

The digital display allows for readings of the fuel onboard with an accuracy of rounded X kilograms. The digitally indicated density of the Fuel Quantity Indication (FQI) System uses the unit X/X and has X positions after decimal point.

Calculation Method per Aircraft Type

Method to determine fuel uplift

Description of data flow

1. The crew generates a manual ACARS message to the headquarters. This message contains the uplifted volume (litres) from the Fuel Slip and the actual density measured by the aircraft itself (given by the Fuel Quantity Indication (FQI) system). This density is read directly after fuel uplift is completed and is manually transferred in the above mentioned ACARS message. Both values are recorded in the Flight Log as well.

2. The fuel uplifted (kilograms) is determined by multiplying volume by density.

3. Measurement and transmission of fuel in tanks according to "Method to determine fuel uplift".

4. The following data is stored in the OMS (ACARS-Messages): fuel levels (according to the formula for Method B) as well as uplifts per flight (calculated with the volume and density).

5. For data backup purposes and for availability of secondary data the Flight Log and the Fuel Slip are being scanned and stored digitally for a period of 10 years.

List of deviations

For these A320 we will always use onboard instruments for measuring fuel in the tank and density. To determine the uplifted volume we use the Fuel Slip. This data is always available. Consequently, we do not expect any special circumstances as described in Monitoring Regulation, Annex I, Section 2 (2c).

Onboard Measurement of fuel amounts

Data source for onboard measured fuel amounts

electronic transmission

Short description of the data source

ACARS

Calculation Method per Aircraft Type

Method to determine density

Chosen method

actual density measured by onboard measurement devices

Justification for choosing the standard density factor

Description of data flow

See description in "Method to measure fuel uplift".

List of deviations

For these A320 we will always use onboard instruments for measuring fuel in the tank and density. To determine the uplifted volume we use the Fuel Slip. This data is always available. Consequently, we do not expect any special circumstances as described in Monitoring Regulation, Annex I, Section 2 (2c).

Onboard Measurement Device

Consecutive number

1

Type of onboard measurement device

capacitive fuel level measurement device

Description of measurement device

The measurement principle relies on different capacitances at different fuel levels. So the capacitance is proportional to the height of fuel, the level of fuel can be determined automatically.

Individual device uncertainty (%)

2,00 %

Source of individual device uncertainty

manufacturer's specification

Calibrations based on national or international standards?

☐ yes ☒ no

Which standards are used?

Interval of calibration

Location and responsible department (or role of person) for the information

The responsible department is the aircraft maintenance in Frankfurt.

Aircraft Type

Information about the aircraft type

Consecutive number
1

Aircraft manufacturer
AIRBUS

Model
A-300F4-600

ICAO aircraft type designator
A306

In operation
☒ at the moment ☐ in the future

Number of owned aircraft
0

Number of leased aircraft
12

Total number of aircraft
12

Used fuel types

1 **Fuel type**
Jet kerosene (Jet A1 or Jet A)

Short description of the fuel
Standard Jet-Fuel

Number of aircraft
12

(1 row)

Calculation Method per Aircraft Type

Identification of the emission source

Consecutive number

1

ICAO aircraft type designator

A306

Aircraft manufacturer

AIRBUS

Model

A-300F4-600

Subsequent classification

Not necessary

Number of aircraft

12

Method to calculate fuel consumption

Chosen method

☐ **Method A** ☒ **Method B**

Time of measurement and corresponding documentation for the chosen method

To calculate the fuel consumption of a specific flight (e.g. Flight B) according to Method B, three different measured data have to be available:

1) Fuel onboard at the time of On-Block of the predecessor flight (Flight A)
After "Shutting down the engines following the arrival at the parking position" the remaining fuel in the tanks is read on the onboard instruments (kilograms). This value is written in the appropriate box "On-Block Fuel" of the Flight Log of Flight A by the crew. In addition, this value is being sent manually as ACARS-message to the headquarters in Frankfurt. It is transferred automatically into the OMS.

2) Fuel Uplift (after Flight A and before Flight B)
The uplifted fuel is being measured in units per mass (kilograms). Please see details of this procedure in the field "Method to determine fuel uplift".

3) Fuel onboard at the time of On-Block of Flight B
After "Shutting down the engines following the arrival at the parking position" the remaining fuel in the tanks is read on the onboard instruments (kilograms). This value is written in the appropriate box "On-Block Fuel" of the Flight Log of Flight B by the crew. In addition, this value is being sent manually as ACARS-message to the headquarters in Frankfurt. It is transferred automatically into the OMS.

The fuel consumption of Flight B is determined by calculating 1 +2 -3.

Method to determine fuel uplift

Data source

- [ ] **measurement by fuel supplier**
- [x] **onboard measurement**

Time of measurement and corresponding documentation for the chosen method

The value 2) described in the field "Method to calculate fuel consumption" is determined by two different measured values (a and b):

a) Fuel onboard measured directly before uplift (kilograms)
b) Fuel onboard measured immediately after uplift is completed (kilograms)

Subtracting (b-a) leads to the uplifted amount of fuel. Value a) and Value b) is being recorded in the Flight Log (box "Fuel Onboard before Uplift" and "Fuel Onboard after Uplift"). The crew calculates the uplift and records the resulting value in the Flight Log as well (box "Uplift").

Explanation for choosing the method

All A306 are equipped with onboard fuel measurement devices that automatically display fuel in terms of mass.

The digital display allows for readings with an accuracy of rounded X kilograms.

Calculation Method per Aircraft Type

Method to determine fuel uplift

Description of data flow

1. After calculating the uplifted fuel according to "Method to determine fuel uplift" this value is manually transmitted via an ACARS-Message to the headquarters by the crew. The value is automatically transferred into the OMS.

2. Measurement and transmission of fuel in tanks according to "Method to determine fuel uplift".

3. The following data is stored in the OMS (on the basis of the corresponding ACARS-Messages): fuel levels (according to the formula for Method B) as well as uplifts per flight (instantly before and after uplift).

4. For data backup purposes and for availability of secondary data the Flight Log and the Fuel Slip are being scanned and stored digitally for a period of 10 years.

List of deviations

Because we will always use onboard fuel readings for measuring fuel contained in the tank and fuel uplift, we do not expect any special circumstances as described in Monitoring Regulation, Annex I, Section 2 (2c) for A306.

Onboard Measurement of fuel amounts

Data source for onboard measured fuel amounts

electronic transmission

Short description of the data source

ACARS

Calculation Method per Aircraft Type

Method to determine density

Chosen method

actual density measured by onboard measurement devices

Justification for choosing the standard density factor

Description of data flow

See description in "Method to measure fuel uplift".

List of deviations

We will always use onboard devices for measuring fuel uplift and fuel contained in the tank, so we do not expect any special circumstances for A306 as described in the Monitoring Regulation, Annex I, Section 2 (2c).

Onboard Measurement Device

Consecutive number

1

Type of onboard measurement device

capacitive fuel level measurement device

Description of measurement device

The measurement principle relies on different capacitances at different fuel levels. So the capacitance is proportional to the height of fuel, the level of fuel can be determined automatically.

Individual device uncertainty (%)

3,50 %

Source of individual device uncertainty

manufacturer's specification

Calibrations based on national or international standards?

☐ **yes** ☒ **no**

Which standards are used?

Interval of calibration

Location and responsible department (or role of person) for the information

The responsible department is the aircraft maintenance in Frankfurt.

Aircraft Type

Information about the aircraft type

Consecutive number

7

Aircraft manufacturer

AIRBUS

Model

A-380-800

ICAO aircraft type designator

A388

In operation

☐ **at the moment** ☒ **in the future**

Number of owned aircraft

5

Number of leased aircraft

0

Total number of aircraft

5

Used fuel types

1 **Fuel type**

Jet kerosene (Jet A1 or Jet A)

Short description of the fuel

Standard Jet-Fuel

Number of aircraft

5

(1 row)

Calculation Method per Aircraft Type

Identification of the emission source

Consecutive number

1

ICAO aircraft type designator

A388

Aircraft manufacturer

AIRBUS

Model

A-380-800

Subsequent classification

Not necessary

Number of aircraft

5

Method to calculate fuel consumption

Chosen method

☐ **Method A** ☒ **Method B**

Time of measurement and corresponding documentation for the chosen method

To calculate the fuel consumption of a specific flight (e.g. Flight B) according to Method B, three different measured data have to be available:

1) Fuel onboard at the time of On-Block of the predecessor flight (Flight A)
After "Shutting down the engines following the arrival at the parking position" (ACARS Trigger) the remaining fuel in the tanks is measured (kilograms) automatically and is transmitted by an ACARS-Message to the headquarters. This value is transferred to the OMS automatically. At the same time the remaining fuel is being read manually by the crew on the onboard instruments as well and written in the appropriate box "On-Block Fuel" of the Flight Log.

2) Fuel Uplift (after Flight A and before Flight B)
The uplifted fuel is converted in a per unit mass (kilograms). Please see details of this procedure in the field "Method to determine fuel uplift".

3) Fuel onboard at the time of On-Block of Flight B
After "Shutting down the engines following the arrival at the parking position" (ACARS Trigger) the remaining fuel in the tanks is measured (kilograms) automatically and is transmitted by an ACARS-Message to the headquarters. This value is transferred to the OMS automatically. At the same time the remaining fuel is being read by the crew manually as well and written in the appropriate box "On-Block Fuel" of the Flight Log.

The fuel consumption of Flight B is determined by calculating 1 +2 -3.

Method to determine fuel uplift

Data source

☒ **measurement by fuel supplier** ☐ **onboard measurement**

Time of measurement and corresponding documentation for the chosen method

Explanation for choosing the method

All A388 are equipped with onboard fuel measurement devices that automatically display fuel in terms of mass. The aircraft operates from airports with given density on the Fuel Slip only.

The digital display allows for readings with an accuracy of rounded X kilograms.

Calculation Method per Aircraft Type

Method to determine fuel uplift

Description of data flow

1. The density (kilogram/ litre) and volume (litres) is taken from the Fuel Slip and manually transmitted via ACARS-Message to the headquarters by the crew.

2. The fuel uplifted (kilograms) is determined by multiplying volume by density. This calculated value is written in the corresponding box "Fuel Uplift" of the Flight Log.

3. Measurement and transmission of fuel in tanks according to "Method to determine fuel uplift".

4. The following data is stored in the OMS (on the basis of the corresponding ACARS-Messages): fuel levels (according to the formula for Method B) as well as uplifts per flight (calculated with the volume and density).

5. For data backup purposes and for availability of secondary data the Flight Log and the Fuel Slip are being scanned and stored digitally for a period of 10 years.

List of deviations

The A388 operates from airports with available density on the Fuel Slips only. Therefore, it is very unlikely that density information for a specific fuel uplift is not available. However, in this case we replace the actual density with the standard density of 0.8 kilograms/ litre. According to our estimates this applies to less than 0.1% of all flights (performed with this aircraft type).

In addition, we will always use onboard fuel readings for measuring fuel contained in the tank. Therefore, we do not expect any special circumstances as described in Monitoring Regulation, Annex I, Section 2 (2c).

Onboard Measurement of fuel amounts

Data source for onboard measured fuel amounts

electronic transmission

Short description of the data source

ACARS

Calculation Method per Aircraft Type

Method to determine density

Chosen method

actual density measured by the fuel supplier

Justification for choosing the standard density factor

Description of data flow

See description in "Method to measure fuel uplift".

The density used is based on the actual uplifted fuel with the corresponding temperature at the time of uplift. We receive the density from our fuel supplier written on the Fuel Slip.

List of deviations

The A388 operates from airports with available density on the Fuel Slips only. Therefore, it is very unlikely that density information for a specific fuel uplift is not available. However, in this case we replace the actual density with the standard density of 0.8 kilograms/ litre. According to our estimates this applies to less than 0.1% of all flights (performed with this aircraft type).

In addition, we will always use onboard fuel readings for measuring fuel contained in the tank. Therefore, we do not expect any special circumstances as described in Monitoring Regulation, Annex I, Section 2 (2c).

Onboard Measurement Device

Consecutive number

1

Type of onboard measurement device

capacitive fuel level measurement device

Description of measurement device

The measurement principle relies on different capacitances at different fuel levels. So the capacitance is proportional to the height of fuel, the level of fuel can be determined automatically.

Individual device uncertainty (%)

1,50 %

Source of individual device uncertainty

manufacturer's specification

Calibrations based on national or international standards?

☐ yes ☒ no

Which standards are used?

Interval of calibration

Location and responsible department (or role of person) for the information

The responsible department is the aircraft maintenance in Frankfurt.

Aircraft Type

Information about the aircraft type

Consecutive number
6

Aircraft manufacturer
DOUGLAS

Model
DC-6

ICAO aircraft type designator
DC6

In operation
☒ **at the moment** ☐ **in the future**

Number of owned aircraft
1

Number of leased aircraft
0

Total number of aircraft
1

Used fuel types

1

Fuel type
Aviation gasoline (AvGas)

Short description of the fuel
AvGas 100 LL

Number of aircraft
1

(1 row)

Calculation Method per Aircraft Type

Identification of the emission source

Consecutive number

1

ICAO aircraft type designator

DC6

Aircraft manufacturer

DOUGLAS

Model

DC-6

Subsequent classification

Not necessary

Number of aircraft

1

Method to calculate fuel consumption

Chosen method

☒ **Method A** ☐ **Method B**

Time of measurement and corresponding documentation for the chosen method

To calculate the fuel consumption of a specific flight (e.g. Flight A) according to Method A, three different measured data have to be available:

1) Fuel onboard at the time of "Uplift Completed" (for Flight A)
Immediate after fuel uplift is completed for Flight A, the amount of fuel onboard (kilograms) is being read on the onboard-instruments by the crew. This value is written in the Flight Log (box "After Uplift") of Flight A.

2) Fuel Uplift (for Flight B)
The fuel uplifted is converted in a per unit mass (kilograms). Please see details of this procedure in the field "Method to determine fuel uplift".

3) Fuel onboard at the time of "Uplift Completed" (for Flight B)
Immediate after fuel uplift is completed for Flight B, the amount of fuel onboard (kilograms) is being read on the onboard-instruments by the crew. This value is written in the Flight Log (box "After Uplift") of Flight B.

The fuel consumption of Flight A is determined by calculating 1 -3 + 2.

Method to determine fuel uplift

Data source

☒ **measurement by fuel supplier** ☐ **onboard measurement**

Time of measurement and corresponding documentation for the chosen method

Explanation for choosing the method

Because DC6 is an old-timer, the existing onboard equipment cannot be made any more accurate than 7%. So the measurement by fuel supplier is the most accurate method.

The analogue display allows for readings with an accuracy of rounded X kilograms.

Calculation Method per Aircraft Type

Method to determine fuel uplift

Description of data flow

1. The density (kilogram/ litre) and volume (litres) is taken from the Fuel Slip.

2. The fuel uplifted (kilograms) is determined by multiplying volume by density. This calculated value is written in the corresponding box "Fuel Uplift" of the Flight Log.

3. Measure fuel in tanks according to "Method to determine fuel uplift".

4. The Flight Log and Fuel Slip is sent (e.g. mail/ fax/ email) to our headquarters. The following data is entered manually into OMS by the Operations management department: fuel levels (according to the formula for Method A) as well as uplifts per flight (calculated with the volume and density).

5. Finally the Flight Log and the Fuel Slip are being scanned and stored digitally for a period of 10 years.

List of deviations

See description in "Method to determine density".

Onboard Measurement of fuel amounts

Data source for onboard measured fuel amounts

other

Short description of the data source

Flight Log

Calculation Method per Aircraft Type

Method to determine density

Chosen method

actual density measured by the fuel supplier

Justification for choosing the standard density factor

Description of data flow

See description in "Method to measure fuel uplift".
The data flow is displayed at the attached document "fuel_method_A_supplier-uplift.pdf".

The used density refers to the actual uplifted fuel at the moment of uplift at the current temperature. We receive this density on the Fuel Slip by the fuel provider.

List of deviations

In some Airports the actual density is unavailable because the fuel supplier cannot supply actual density nor temperature.

The deviation applies to the following Airports:
- GHI Airport in country X
- JKL Airport in country Y
- MNO Airport in country Z

If the actual density is unavailable our operations manual currently requires the pilot to use a standard value of 0.8 kilogram / litre. We estimate that the usage of this standard value only applies to less than 2% of all flights (with this aircraft type). The pilot also use the standard value to convert fuel level.

Onboard Measurement Device

Consecutive number

1

Type of onboard measurement device

capacitive fuel level measurement device

Description of measurement device

The measurement principle relies on different capacitances at different fuel levels. So the capacitance is proportional to the height of fuel, the level of fuel can be determined automatically.

Individual device uncertainty (%)

7,00 %

Source of individual device uncertainty

other

Calibrations based on national or international standards?

☐ **yes** ☒ **no**

Which standards are used?

Manufacturer's specification not available (old-timer). According to the judgement of our MRO-Division, level of uncertainty of onboard measuring devices for the determination of fuel (volume in litre) is below +/- 7%, there is no systematic bias.

Interval of calibration

Location and responsible department (or role of person) for the information

The responsible department is the aircraft maintenance in Frankfurt.

Data Management and Control System

Data acquisition and handling

Do you operate a data management system for Emissions Trading purposes?

☒ **yes** ☐ **no**

Is this data management system an integrated part of a certificated quality or environmental management system?

☒ **yes** ☐ **no**

Name of the quality or environmental management system

DIN EN ISO 9001

Kind of integration and adaption

We have a certified integrated process-oriented management system (DIN EN ISO 9001). We checked the existing procedures (needed for monitoring) if they meet the EU-ETS requirements and if necessary we made appropriate adjustments. There are also newly defined procedures for the EU ETS, where new roles/capacities and responsibilities have been defined and documented in amendments to our existing manuals (e.g. new processes: definition of the monitoring methodology for additional aircrafts, determination of flights covered by Annex I of the Directive and compliance with the requirements of the selected tier in our operations manual).

Data Management and Control System

Record keeping and documentation of all relevant information

Details of procedure

Title of procedure

Procedure "Record keeping and documentation"

Reference for identification

Chapter 4 of Flying Circus Germany ETS-Manual

Version of procedure

2.2

Responsibilities

Procedure: Quality Management Department in co-ordination with Emissions Management Department

Action: Accounting in co-ordination with Emissions Management Department and Operations Management Department

Description of procedure

Flight Logs, Fuel Slips and Fuel Purchase Records are getting digitalised after each flight and are sent electronically together with the CRCO bills to the responsible department as named above. All files are being archived for at least 10 years.

Location of records

Intranet, files archived by date, scanned image file

Name of IT-system used

-

Which standards are used?

-

Data Management and Control System

Data flow

Details of procedure

Title of procedure

Procedure "Data flow"

Reference for identification

Chapter 6 of Flying Circus Germany ETS-Manual

Version of procedure

1.2

Responsibilities

Procedure: Quality Management Department in co-ordination with Emissions Management Department

Action: Depending on the aircraft type, see particular form "Calculation Method per Aircraft Type"

Description of the data flow

The data flow depends on the specific calculation method used for each aircraft type. Hence, we illustrated the process chain separately for each aircraft type in the corresponding form "Calculation Method per Aircraft Type".

A diagram of the different data flows can be found in attachment xy.

Data Management and Control System

Explanation of risks

The risks also depend of the calculation method used per aircraft type, because different process chains exist. Generally, there are risks concerning technical errors (e.g. at the electronic transmission of data) and manual input data errors.

Location of records

Intranet

Name of IT-system used

See particular form "Calculation Method per Aircraft Type"

Description of IT-system used

See particular form "Calculation Method per Aircraft Type"

Which standards are used?

-

Data Management and Control System

Control activities

Details of procedure

Title of procedure

Procedure "Control activities"

Reference for identification

Chapter 24 of Flying Circus Germany ETS-Manual

Version of procedure

2.3

Responsibilities

Procedure: Quality Management Department

Action: see following explanations

Descriptions of procedures of quality assurance of data

Data from the Operations Management Software is carried over to a data base. We operate a strict 4-eyes-principle for this step. Furthermore, there are several validity checks in our data base detecting possible irregularities (e.g. disproportionate high or low fuel consumption).

Other validity checks are:
...

Description of the control procedure (internal review)

We amended our quality assurance procedures/control system with (e.g. new defined responsibilities and new control procedures, documented in our operations manual).

The responsibilities are listed below by title.

Operations Management Department - completeness of emission sources and flights, data input OMS, cross-checks (fuel uplift)

Emissions Management Department - extract reports from OMS and collate emissions data, validate emissions data and submit report to / communicate with competent authority

Fleet Management Department- maintenance of aircraft list

Controlling Department - control of operational and financial risks

IT Department - security, backup, software-updates etc.

Aircraft Maintenance Department- control of onboard measurement systems

Pilot - onboard measurement, recording and transmission of fuel consumption, cross-checkes fuel uplift

Fuel Management Department - Fuel Invoice checking, communication with fuel suppliers, cross checks (Fuel Slips with Fuel Invoices)

Data Management and Control System

Explanation of control risks

Errors in the design of the validity checks. Based on our experiences from the validations of our last two emission reports, we continuously adjusted our validity checks and now expect them to meet the necessary data quality claims.

Description of implemented improvement routines

Manual correction according to the procedure.

Data Management and Control System

Location of records

Intranet

Name of IT-system used

ETS data base with validity checks, in-house development

Which standards are used?

-

Risk analysis

Results of risk analysis

Procedure to maintain information about owned and leased aircrafts and their technical specification
Key risk: Failure to update the OMS master data, leading to aircraft not being monitored, even though they are flying under the ICAO designator "ZYX". This risk applies particularly to leased-in aircraft and is considered to be low.

Procedure to maintain information about single flights and approached aerodrome pairs
Key risks: If manual input into OMS: (i) Flight Logs sent to the main office could get lost, so that flights under our ICAO designator "ZYX" are not registered in OMS; (ii) manual input error when typing in data could lead to wrong identification of airport. This risk is considered to be medium.

Procedure to distinguish between EU-ETS flights and non EU-ETS flights
Key risks: Operations Management Department mistakenly sets a special flight marker (service type), so that this flight is filtered out even though it should not be. Type of flight is wrongly marked in OMS, leading to the mistaken exclusion of a flight that does not fall under the Annex I exceptions.
This risk is considered high, thus we meet it by the measures described at the section "Aerodrome pairs and ETS flights".

Data Management and Control System

Data gaps

Description of available secondary sources

In case of ACARS transmission: Flight Log

In case of loss of Flight Log: Technical Log and/or copy of Flight Log at stations

In case of loss of Fuel Slip: Fuel Invoice (volume)

Do data gaps occur, while secoundary sources exist?

☐ **yes** ☒ **no**

Explanations of data gaps for which existing secondary sources cannot be used

Data Management and Control System

Do you use a tool approved by the European Commission?

☒ yes ☐ no

Which tool approved by the European Commission is used to estimate fuel consumption?

Small Emitters Tool by Eurocontrol

Name of the system used

Evidence or reference that this system is approved by the European Commission

Description of the procedure to close data gaps

If there are data gaps in our fuel consumption, we will use the tool listed above. Before we will first try to find the source of the data gap and correct wrong data with secondary data.

Description of the procedure to close data gaps regarding other parameters than fuel consumption

Special Concerns

Owned and leased aircrafts

Details of procedure

Title of procedure

Procedure "Own and leased aircrafts"

Reference for identification

Chapter 9 of Flying Circus Germany ETS-Manual

Version of procedure

2.0

Responsibilities

Procedure: Quality Management Department in co-ordination with Fleet Management Department

Action: Fleet Management Department

Procedure to maintain information about owned and leased aircrafts and their technical specification

The master data of the OMS contains information on all owned and leased-in aircraft operated under ICAO code ZYX. This information comprises amongst others the type of aircraft and an unique identifier (registration markings).

Data input of master data: The Fleet Management Department is responsible for keeping an updated list of aircraft in the fleet management system which contains a system for leasing contracts and one for asset accounting. Newly acquired aircraft are added to asset accounting as soon as they are on our balance sheets; leased-in aircraft with our lessors are added as soon as the contract is made or, if they are leased in on an ad-hoc basis, they are added as soon as the first flight is made.
This information is transmitted to the Fleet Management Department, where it is manually fed into the OMS as part of the master data.

The master data is being kept up to date. Note that we keep a record of historical data in OMS, such that information on aircraft no longer in use is retained in OMS to guarantee the completeness of the list of emission sources for each reporting period.

Location of records

Intranet

Name of IT-system used

OMS

Which standards are used?

-

Special Concerns

Aerodrome pairs and ETS flights

Details of procedure

Title of procedure

Procedure "Aerodrome pairs and ETS flights"

Reference for identification

Chapter 15 of Flying Circus Germany ETS-Manual

Version of procedure

1.1

Responsibilities

Procedure: Quality Management Departmentin co-ordination with Operations Management Department and Emissions Management Department

Action: Operations Management Department

Procedure to maintain information about single flights and approached aerodrome pairs

All flights we operate under our ICAO designator are stored in our central IT system OMS. Flight-related information in OMS with ETS relevance:
- date
- flight number
- type of flight (e.g. training, test, etc.)
- aerodrome of departure and arrival (ICAO code and full name)
- aircraft registration markings

Note that we do not generally collect per-flight data in OMS for leased-out aircraft that do not fly under our ICAO designator. In case we do collect per-flight data (as happens regularly with our DC6 aircraft), the per-flight data sets also contain the ICAO designator of the lessee, which allows us to filter them out.

Input into system:
Flight data is recorded per flight in onboard systems (if an aircraft is equipped with these) and Flight Logs (in all cases).
- aircraft with ACARS: direct datalink into OMS. Data is usually transmitted electronically at block-on and after take-off block-off.
- aircraft not equipped with ACARS: flight data is transferred manually from the (paper) Flight Log into OMS. This manual input is done by a member of the Operations Management Department at our main office in Frankfurt or directly through the crew after flight (Remote Crew Access). In the first of these two cases, the flight documentation (including Flight Log) is existent at the main office in Frankfurt.

Other OMS interfaces include:
- electronic interface with planning data - for flight plans (aircraft types and aerodromes of departure / arrival) and booking information. This data will be replaced with actual data (either from ACARS or manually) if actual data is different from planning data. However, planning data is not completely overwritten such that deviations can be traced.
- "master" data: airports, aircraft.
The master list of airports includes more airports than we fly to regularly, to cover also redirected landings (e.g. if unforeseen weather conditions prevent landing at our planned arrival airport). This master list is updated at regular intervals by the Operations Management Department, and immediately if a new destination is opened.

Extraction of data from OMS:
After the reporting period, data is retrieved from the OMS. We filter flights by airport pair to exclude non-EU flights. This is done by the Operations Management Department.

Special Concerns

Procedure to distinguish between EU-ETS flights and non EU-ETS flights

Flight information (aircraft type, aerodrome of departure/arrival, flight type/etc.) is recorded per flight and transmitted into OMS either electronically or manually as described for each aircraft type. For the annual emissions report, an export from OMS provides a list of all flights under our ICAO designator "ZYX" in the reporting period. Non-Annex I flights will be excluded using filters within the database. Filters are selected manually following the definitions laid out in our operations manual:
- aircraft type: We own a number of small aircraft (e.g. Piper P28A, MTOW < 5.7 t) used for training pilots.
- geographical boundaries: non-EU to non-EU, using information on aerodrome of departure and arrival
- circular flights: using information on aerodrome of departure and arrival.
- type of flight (marked on flight plan, marker set by Operations Management Department): By using different service types, we distinguish government-, test- and training flights also within one category, that means e.g. test flights subject to emissions trading get a different service type than test flight not subject to emissions trading. Employees at Operations Management Department received a special training course from the Emissions Management Department in order to make sure that the classification is correct.

At the course of this training, there was a special emphasis on the fact that an exemptions is only valid if it applies exclusively to the flight, e.g. a maintenance flight combined with a ferry flight is subject to emissions trading.

No further Annex I exceptions apply to our operations. Note that we do not generally collect per-flight data in OMS for leased-out aircraft that do not fly under our ICAO designator. In case we do collect per-flight data (as happens regularly with our DC-6 aircraft), the per-flight data sets also contain the ICAO designator of the lessee, which allows us to filter them out.

Extraction of data from OMS:
After the reporting period, data is retrieved from the OMS. We filter flights by flight type to exclude exempted flights. This is done by Operations Management Department.

Location of records

Intranet

Name of IT-system used

OMS

Which standards are used?

-

Special Concerns

Additional aircraft types

Will new aircraft types always be monitored in identical accordance with an aircraft type defined in this plan?

☒ **yes** ☐ **no**

Details of procedure

Title of procedure

Reference for identification

Version of procedure

Responsibilities

Details about the procedure for defining the monitoring methodologies for additional aircraft types

Location of records

Name of IT-system used

Which standards are used?

Special Concerns

Fuel consumption

Details of procedure

Title of procedure

Procedure "Fuel consumption"

Reference for identification

Chapter 18 of Flying Circus Germany ETS-Manual

Version of procedure

2.8

Responsibilities

Procedure: Quality Management Department in co-ordination with Operations Management Department

Action: Operations Management Department

Procedures to record and maintain information on fuel consumption

The data flow and thus the collecting and processing of information concerning fuel consumption depend on the specific calculation method operated per aircraft type. Hence, we illustrated the process chain separately for each aircraft type in the corresponding form "Calculation Method per Aircraft Type".

Location of records

Intranet

Name of IT-system used

OMS

Which standards are used?

-

Special Concerns

Density

Details of procedure

Title of procedure

Procedure "Density"

Reference for identification

Chapter 11 of Flying Circus Germany ETS-Manual

Version of procedure

1.3

Responsibilities

Procedure: Quality Management Department in co-ordination with Operations Management Department

Action: Operations Management Department

Procedures to record and maintain information on density

FUEL UPLIFT
See description on "Calculation Method per Aircraft Type" for aircraft types DC6 and A380: The density is captured on the fuel purchase records together with the volume. The uplift is then calculated by multiplication and entered into the Flight Log.

See description on "Calculation Method per Aircraft Type" for aircraft type A320 (data transmission with ACARS): The density is determined through the airplane independently.

FUEL IN TANK:
Conversion of volume into kilograms through density is integrated in the onboard measurement system.

Location of records

Intranet

Name of IT-system used

OMS

Which standards are used?

-

Special Concerns

Particular aerodromes

List of known deviations for particular aerodromes

In some Airports the actual density is unavailable because the fuel supplier cannot supply actual density values

The deviation applies to the following Airports:
- GHI Airport in Country X,
- JKL Airport in Country Y,
- MNO Airport in Country Z

If the actual density is unavailable our operations manual currently requires the pilot to use a standard value of 0.8 kilograms / liters. The pilot also use the standard value to convert fuel level.

Measurements and Uncertainty Assessment

Maintenance and calibration

Details of procedure

Title of procedure

Procedure "Maintenance and calibration"

Reference for identification

Chapter 13 of Flying Circus Germany ETS-Manual

Version of procedure

3.1

Responsibilities

Procedure: Aircraft Maintenance Department

Action: Aircraft Maintenance Department

Procedures to ensure the maintenance and/or calibration of measurement equipment in owned and leased aircraft in regular intervals

Onboard systems are checked regularly during maintenance cycles. They are replaced during D checks. The equipment manufacturers guarantee a maximum uncertainty as stated in description of the aircraft types, keeping in check the systematic error. We also have certificates of routine checks of the operation of
onboard measurement systems as approved by the competent civil aviation authority as part of airworthiness requirements.

Also for the leased-in aircraft the procedures described for our own aircraft will be used.

Location of records

Intranet

Name of IT-system used

Aircraft Maintenance- (MRO-) Software XYZ

Which standards are used?

-

Measurements and Uncertainty Assessment

Cross checks between fuel uplift quantities

Details of procedure

Title of procedure

Procedure "Cross checks between fuel uplift quantities"

Reference for identification

Chapter 16 of Flying Circus Germany ETS-Manual

Version of procedure

2.0

Responsibilities

Procedure: Quality Management Department in co-ordination with Operations Management Department

Action: Operations Management Department in co-ordination with Controlling Department

Procedure to ensure regular cross-checks between fuel uplift quantity provided by invoices and uplift quantity indicated by onboard measurement

For the aircraft types A320 (without ACARS), DH8D and A306 the uplifted fuel is calculated by subtraction as it is measured with onboard instruments (please see corresponding calculation method per aircraft type). Consequently, reading and writing errors may occur (filling in the Flight Log/ OMS).

The Controlling Department strictly performs an automatic check between Fuel Invoices and uplifted fuel in OMS for ALL flights (notwithstanding of the type of determination of fuel uplift). If a deviation of more than 0.5% is discovered, the corresponding fuel uplift is checked. For this purpose the Flight Log and Fuel Slip of the flight where the discrepancy occurred is compared as well. If we find a typing error, we trigger the process to manually change the fuel uplift entry in OMS. Such changes are traceable. If needed we contact the supplier to resolve the problem. If we fail to find a source for the discrepancy, the fuel uplift will be manually flagged in OMS, and if fuel consumption could be underestimated we will reconstruct the fuel consumption from this flight leg using the Small Emitters Tool.

Location of records

Intranet

Name of IT-system used

Controlling-Software XYZ

Which standards are used?

-

Measurements and Uncertainty Assessment

Compliance of the total uncertainty with the requirements of the Monitoring and Reporting Regulation

Details of procedure

Title of procedure

Procedure "Total uncertainty"

Reference for identification

Chapter 21 of Flying Circus Germany ETS-Manual

Version of procedure

1.9

Responsibilities

Procedure: Quality Management Department in co-ordination with Emissions Management Department

Action: Emissions Management Department

Description of the procedure to ensure that total uncertainty of fuel amount and fuel density measurements will comply with the Monitoring and Reporting Regulation requirements

To ensure the accuracy of individual measurements (onboard systems), the following apply:

- To ensure that onboard measurement equipment functions properly, we have twin devices. If one of the two is not working properly, onboard systems give an automatic error message. Whenever this happens, they are replaced with new ones.

- Onboard systems are checked regularly during maintenance cycles. They are replaced during D checks. The equipment manufacturers guarantee the described maximum uncertainty, keeping in check the systematic error. We have certificates of routine checks of the operation of onboard measurement systems as approved by the competent civil aviation authority a part of airworthiness requirements.

According to Article 55 of the Monitoring Regulation, a specific monitoring method per aircraft type was chosen in order to minimize uncertainties in determining the fuel consumption. According to manufacturers¿ specifications, we expect a maximum deviation of 3.5% (A306) if the fuel uplift is not measured by the fuel supplier. All other aircraft have significantly lower deviations of 2% (A320) and 2.5% (DH8D). The A306-fleet is responsible for nearly 30% of the total fuel consumption. The expected value and the variance of the normal distribution of the fuel measurement indication of the A306 suggest hereby an extremely low probability of indicating a fuel value with an actual deviation of 3.5%. Due to the high amount of individual measurements, we expect the total uncertainty being lower than 2.5% for the A306-fleet and all other aircraft in our fleet.

Location of records

Intranet

Name of IT-system used

-

Which standards are used?

-

Measurements and Uncertainty Assessment

Main sources of uncertainty

1 **Source of uncertainty**

DC-6 and A380 (density)

Level of uncertainty (%) 2,50 **%**

When choosing the monitoring methods have you considered this source of uncertainty?

☒ **yes** ☐ **no**

Explanation

Estimation (DC-6 generally flies in central Europe, therefore we assume that the use of standard density does not cause higher uncertainty. The use of standard density for the A380 is an extremely rare event.)

2 **Source of uncertainty**

Measurement by Fuel supplier (only DC 6, A380 and A320 (ACARS))

Level of uncertainty (%) 0,50 **%**

When choosing the monitoring methods have you considered this source of uncertainty?

☒ **yes** ☐ **no**

Explanation

Fuel supplier accuracy standards for fuel volume in litre must meet the standards for allowable errors of the European measuring instruments directive (MID).

3 **Source of uncertainty**

Onboard measurement of fuel uplift (kilograms). See also chapter "Compliance of the total uncertainty with the requirements of the Monitoring Guidelines". Level of uncertainty from 1,5 - 3,5 %, depending on aircraft type.

Level of uncertainty (%) 2,50 **%**

When choosing the monitoring methods have you considered this source of uncertainty?

☒ **yes** ☐ **no**

Explanation

According to manufacturers' specifications for the determination of fuel in mass (including density) and judgement from aircraft maintenance experts for uncertainty of measurement of fuel remaining in the tank.

4 **Source of uncertainty**

DC-6 (onboard measurement of fuel remaining in the tank, volume in litre)

Level of uncertainty (%) 7,00 **%**

When choosing the monitoring methods have you considered this source of uncertainty?

☒ **yes** ☐ **no**

Explanation

According to judgement from aircraft maintenance experts, level of uncertainty of onboard measuring devices for the determination of fuel is below +/- 7%, and there is no systematic bias. This source of uncertainty applies only to fuel left in tanks

Measurements and Uncertainty Assessment

4 rows