Survey Summary

The Use of Electronic Flight Bags (EFB) and Installed Weather Applications to Facilitate inflight Weather Updates to the Cockpit

14 May 2018

EXECUTIVE SUMMARY

The European Aviation Safety Agency (EASA) has gathered evidence in order to better understand the use of Electronic Flight Bag (EFB) with respect to weather-related applications for CAT FW Aircraft.

More precisely the specific objective of this survey is to have a clearer understanding of:

1) the extent of use of weather-related applications in EFB

2) the typology of applications (e.g. dynamic/static)

3) the benefits of using these applications

4) the costs related to the use of these applications.

This information would then feed into the work planned on future actions related to weather related applications on EFB.

The Agency wishes to thank all the respondents who have enabled establishing a deeper knowledge on this safety issue.

In some cases comments have been reported as received, in such cases the wording is indicated in italics.

Disclaimer

The number of answers to this survey cannot ensure that the results are exhaustively representative of the sector. Therefore the interpretation of the results has to be cautious. The Agency strongly recommends that you contact us (impact.assessment@easa.europa.eu) for any questions on the usage of the survey.

Survey map	
Audience:	Airline Operators
Addressees:	Air Ops TEC, SAB
Survey period:	9 February 2018 to 9 March 2018
Tool:	EUSurvey website

Contents

Survey EFB Weather Applications – CAT FW

BACKGROUND

The European Aviation Safety Agency (EASA) has gathered evidence in order to better understand the use of Electronic Flight Bag (EFB) with respect to weather-related applications for CAT FW Aircraft.

More precisely the specific objective of this survey is to have a clearer understanding of:

1) the extent of use of weather-related applications in EFB

2) the typology of applications (e.g. dynamic/static)

3) the benefits of using these applications

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This information would then feed into the work planned on future actions related to weather related applications on EFB.

The questionnaire includes the following sections:

- EFB deployment
- EFB Weather Applications: pre-flight and in-flight
- Functionality of the weather applications on deployed EFBs
- EFB Weather Applications: source of data
- Costs related to Weather Applications in EFB
- Benefits related to Weather Applications in EFB

Remark: a glossary has been added in the annex.

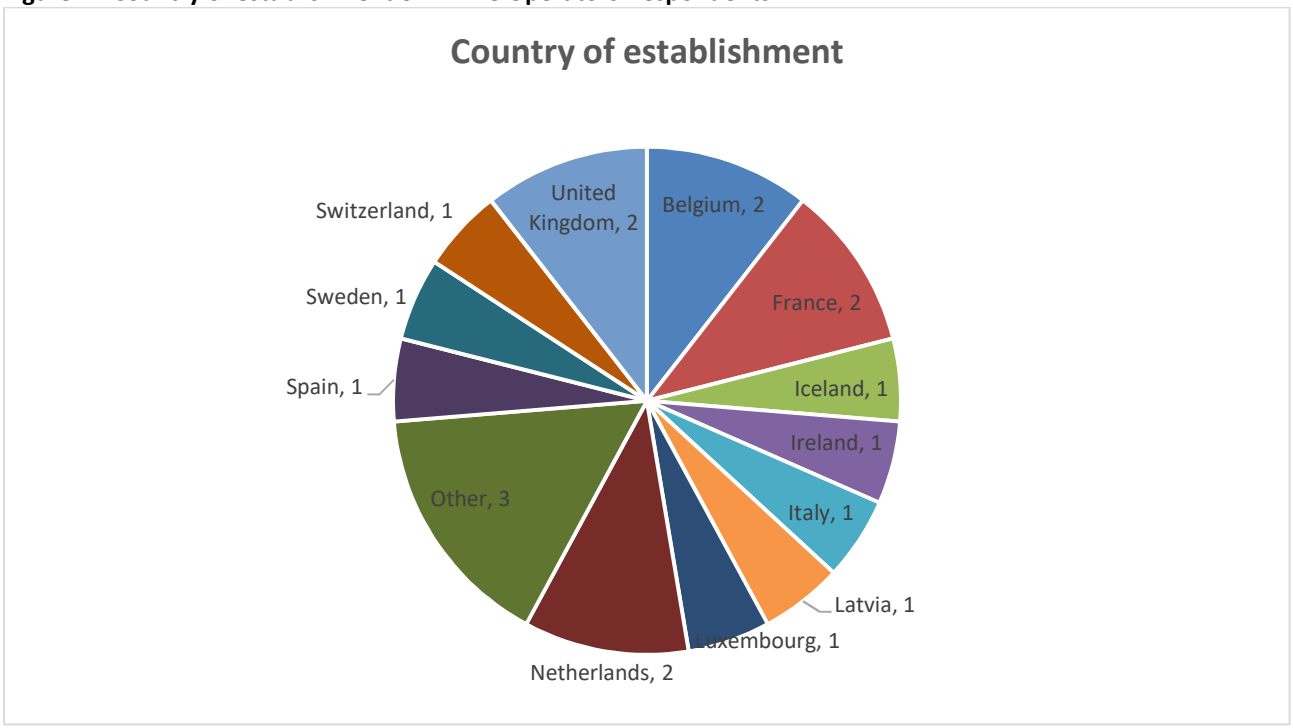
1. General information about the respondent

The Agency received 20 responses from Airline Operators established in 15 countries, more precisely from:

— 12 EASA Member States;

— 3 non-EU Member States (defined as "other" in the below graph): Paname, UAE, USA

Figure 1 - Country of establishment of Airline Operators' respondents



The analysis of the questionnaire took into consideration 19 out of 20 answers. Indeed one respondent did not operate with CAT FW aircraft.

The 3 graphics below show that the airline operators that provided feedback are of different sizes. As follows information on number of employees, passenger flights and cargo flights.

Figure 2 Estimated number of employees per respondent

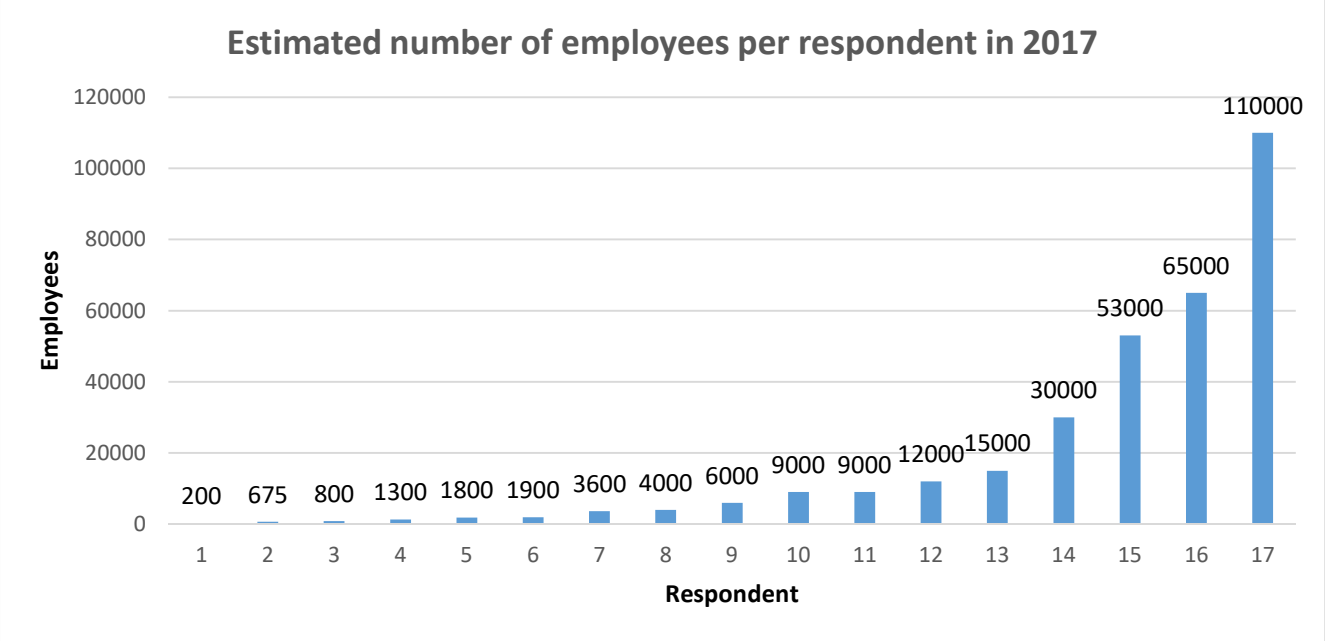


Figure 3 Estimated number of passenger flights per respondent

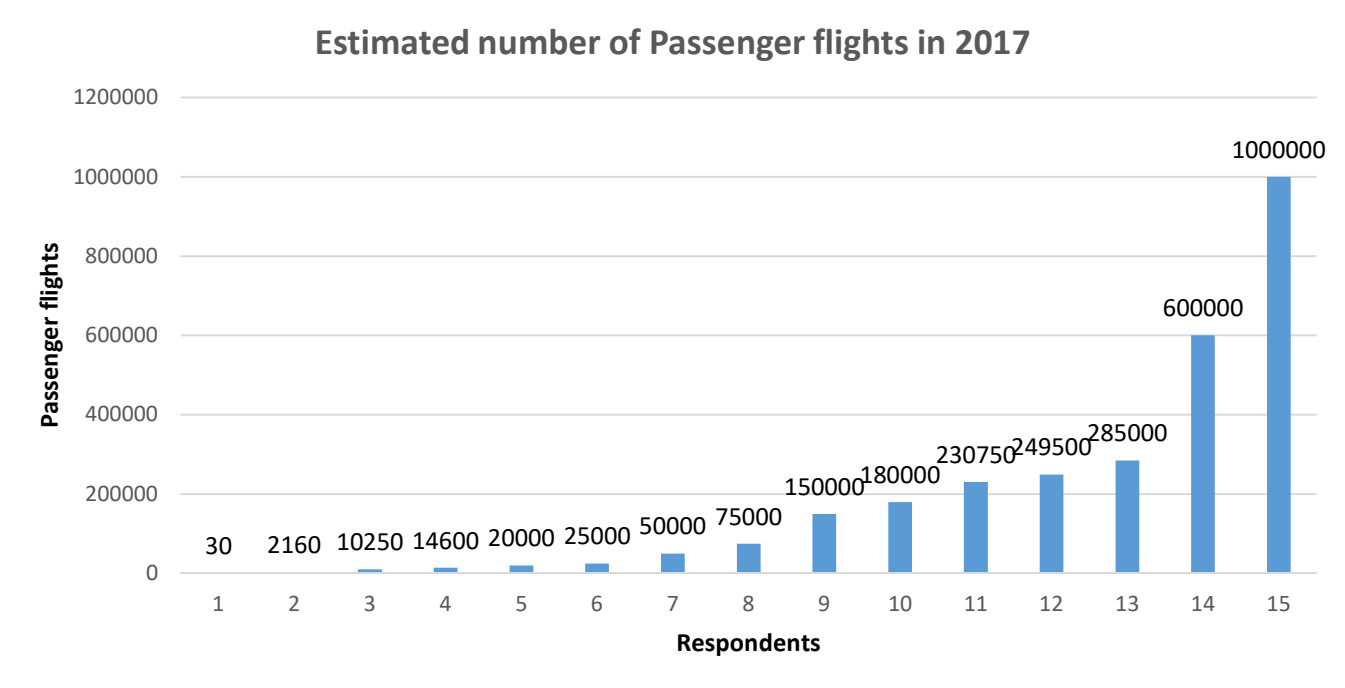
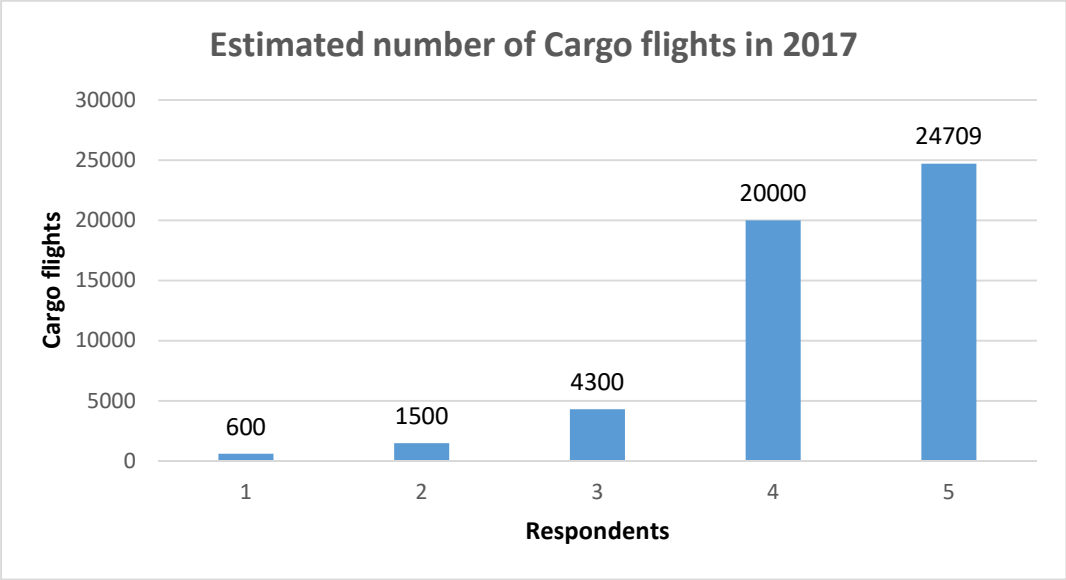
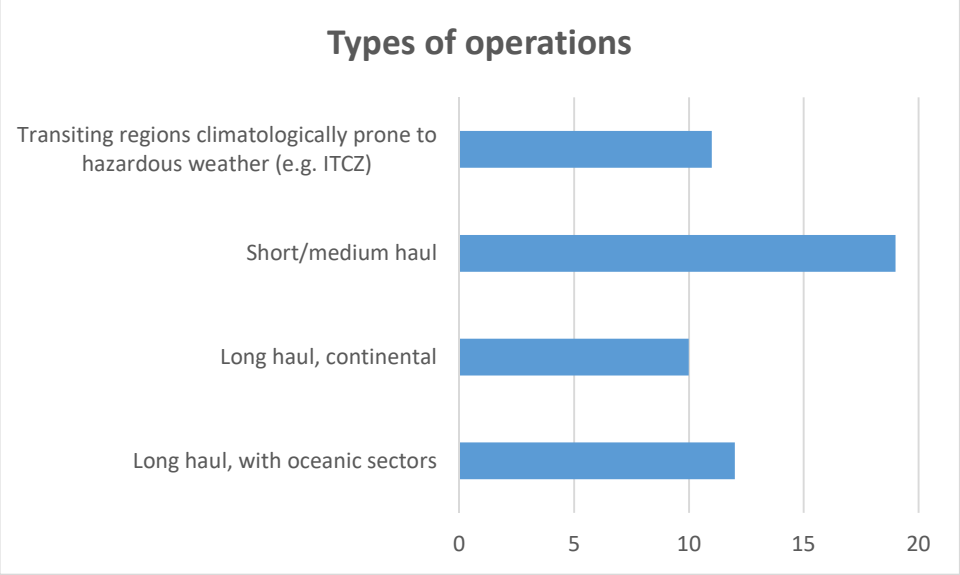


Figure 4 Estimated number of cargo flights per respondent



Airline operators responding to the survey perform different type of operations. Each respondent could select one or more answers, as follows the feedback received:

Figure 5 types of operations per respondent (each respondent could select multiple choices)



2. EFB deployment

Figure 6 "Would your airline/NAA be willing to collaborate with EASA to develop best practise safety and efficiency guidelines in relation to the use of weather applications on EFB?"

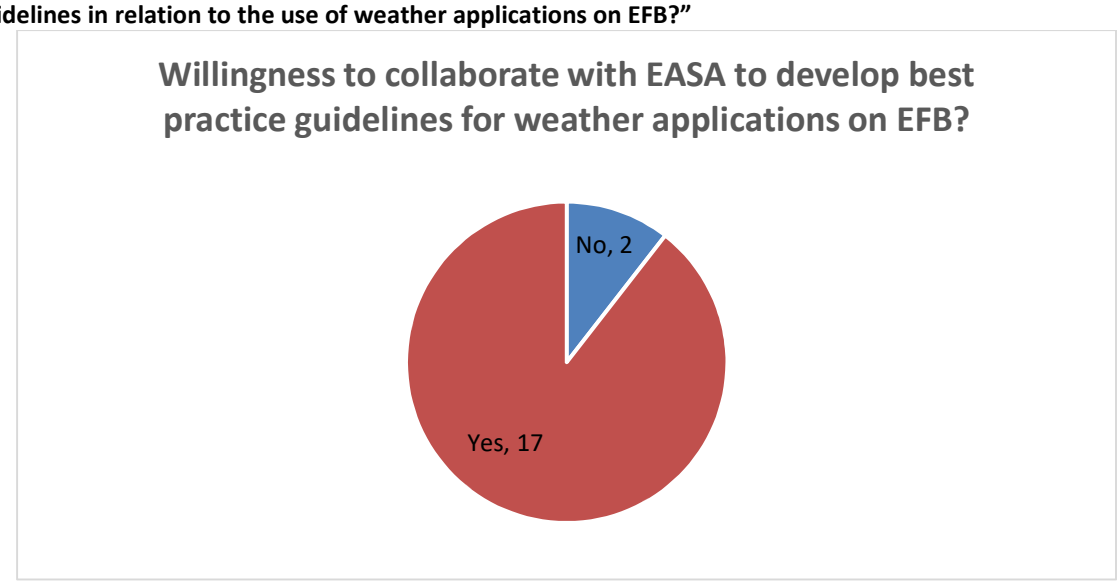


Figure 7 reply to question "Do you currently equip your flight crew with EFBs?"

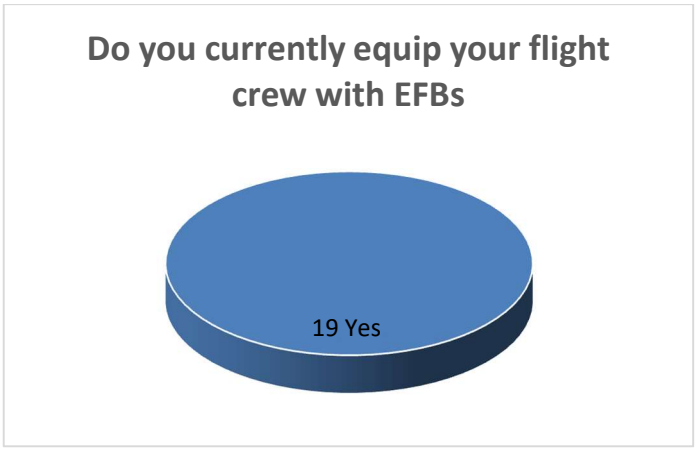
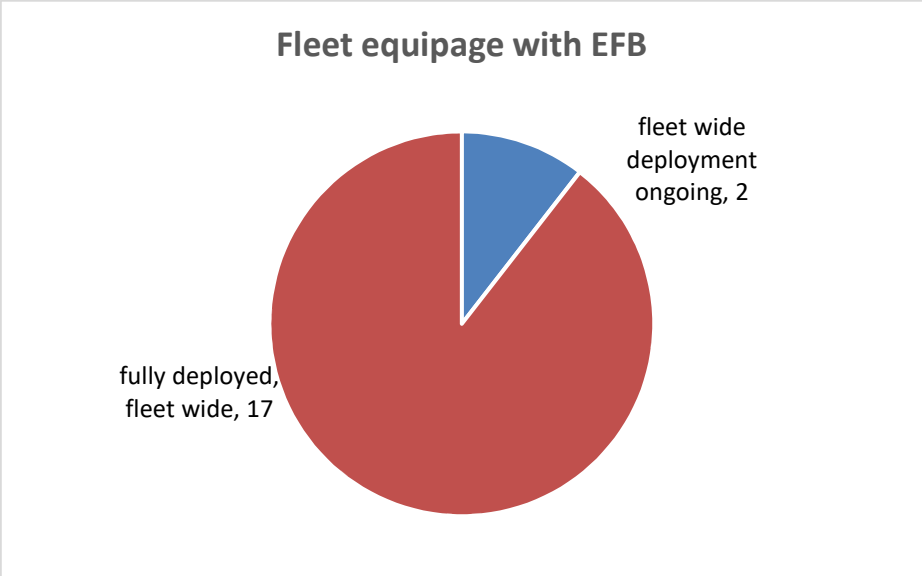


Figure 8 details on fleet EFB equipment



If partial fleet deployment, what reasons influenced your decision?

- Connectivity
- Our implementation is not per fleet but per crew
- We are currently upgrading our EFBs to iPad solutions.

For which aircraft is it installed?

Respondents operated a broad range of aircraft types, listed below. A small number of aircraft types have been excluded from this list to avoid identification of operators, though the list remains representative of the survey responses.

Airbus 318, 319, 320, 321, 330, 340, 380
Boeing 737, 747, 757, 767, 777, 787

In case it is ongoing can you specify by when will it be finalised?

As follows the replies received:

- Summer 2019
- The 2nd generation of EFB will be fitted by 2019.

3. EFB Weather Applications - pre-flight and in-flight

Figure 9: EFB Weather Applications at the gate

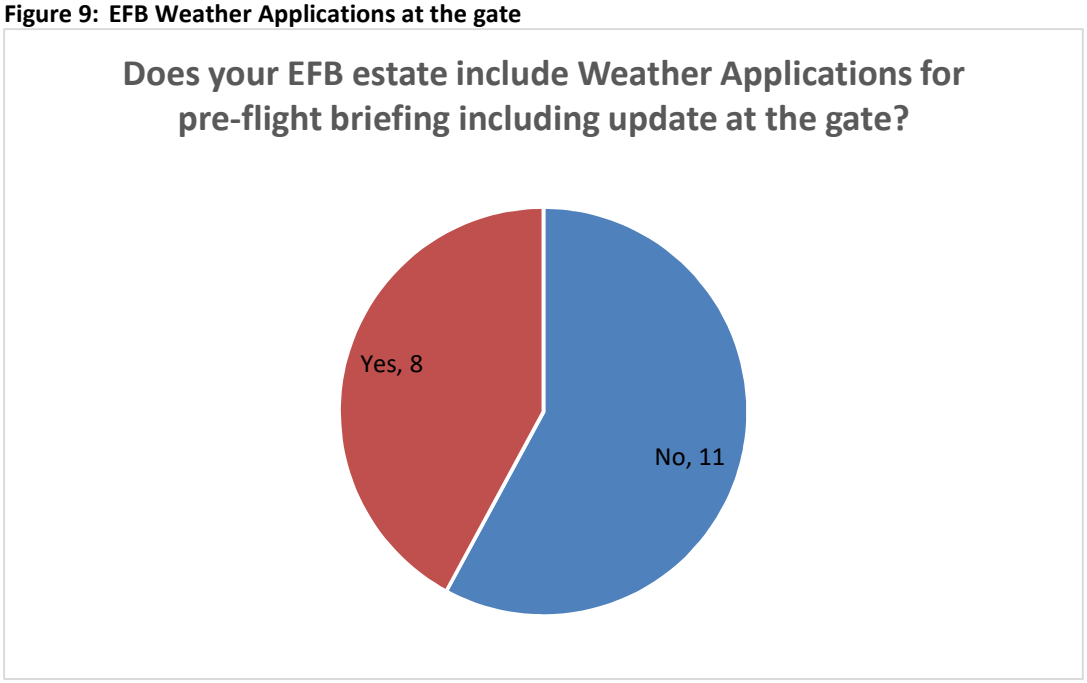
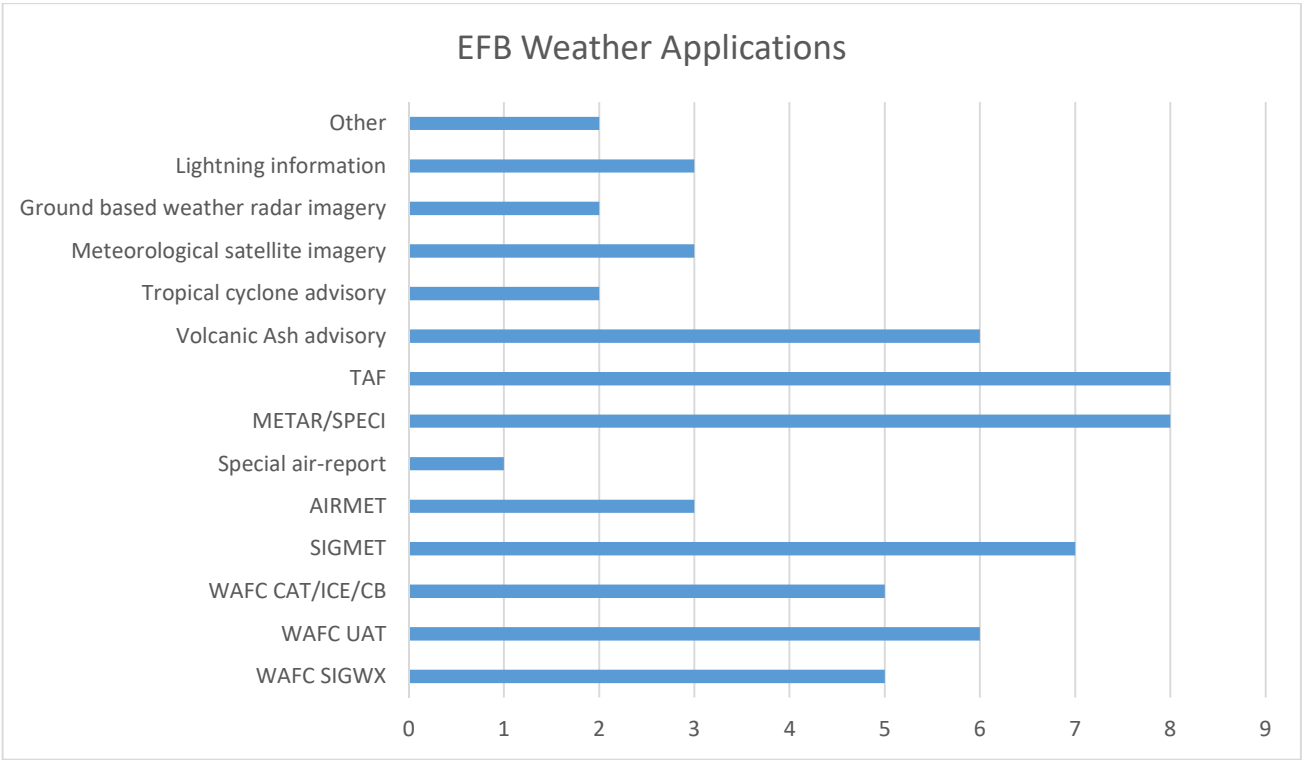


Figure 9 "please identify which of the following are available in your EFB weather application"



WAFC UAT = WAFC Upper air wind/temperature data.
WAFC CAT/ICE/CB = WAFC Upper air forecasts of clear air turbulence, icing and cumulonimbus

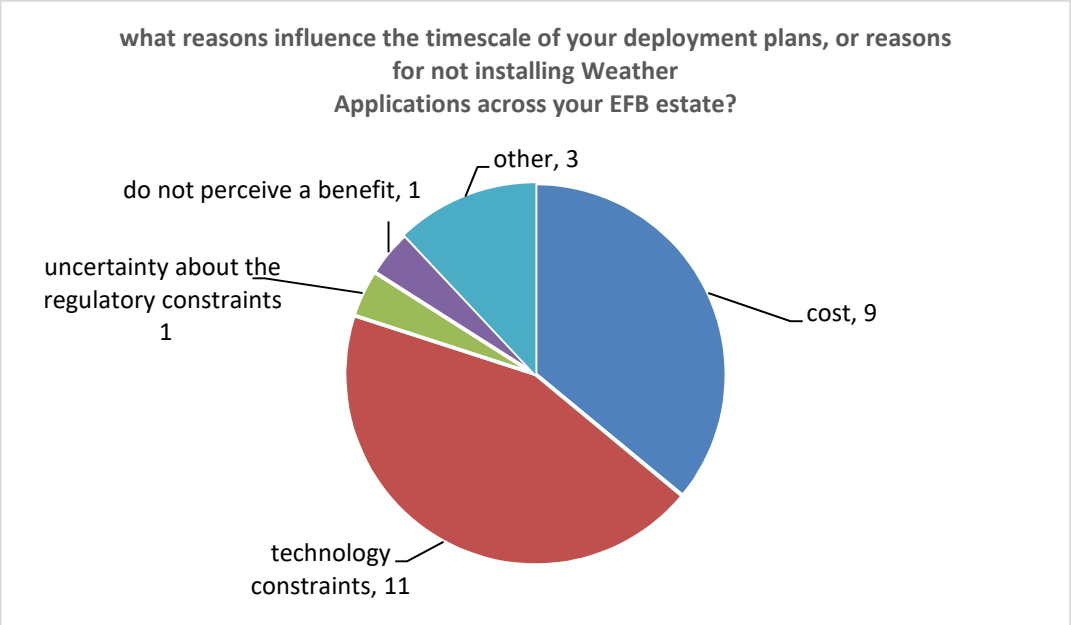
If other please specify:

- Non-WAFC upper air forecast of clear air turbulence, icing and convective clouds ; ice crystals icing ; non-WAFC wind temperature and tropopause ; satellite imagery is provided processed by digital models, not raw
- Turbulence predictions

If no (ref to question "Does your EFB estate include Weather Applications for pre-flight briefing including update at the gate?"), do you have plans to install weather applications across your EFB estate?

The 11 replies[1] received for this question replied "in 5 years".

Figure 10 reasons for not installing or influencing deployment plan's timescale of weather applications across EFB estate



Can you please provide further clarifications on the reasons mentioned above? (reporting replies provided)

- *The current contract associated to the EFB device does not include data roaming*
- *In short.medium haul operations, with flights of 90 mins., not critical changes are perceived between dispatch and in flight.*
- *life update inflight - no internet access*
- *connectivity not installed yet (in progress)*
- *Evaluating suitable solutions*

[1] See figure 9 for background reference.

- *Our fleet doesn't have WiFi connectivity - future plans to provide with data to our EFBs is a mmidle term solution*
- *fully deployed*
- *suitable application not been found/developed*
- *currently investigating several suppliers of WX apps and its IP-connectivity to update the WX data*
- *phased development of Mobile EFB program*
- *Aircraft connectivity needs to be ensured (globally).*

Figure 11 EFB/Weather Applications for in-flight briefing, including in-flight update

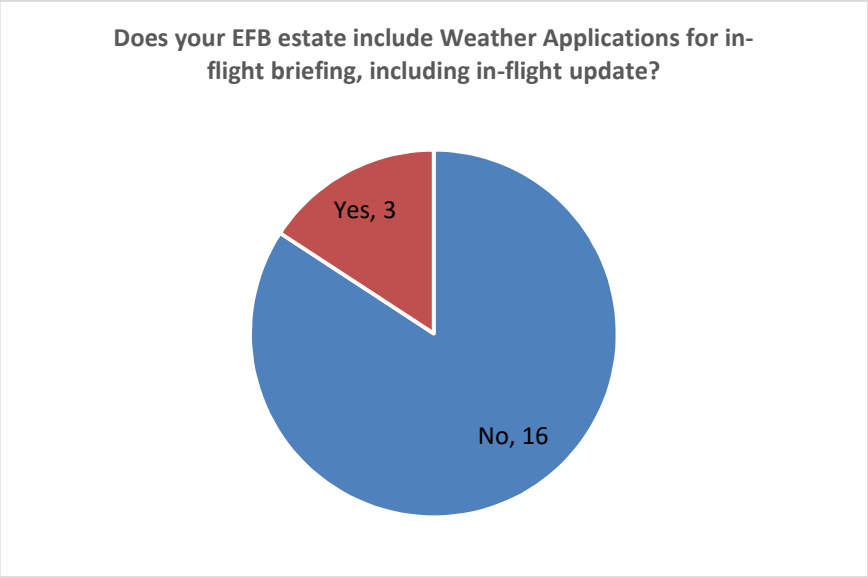
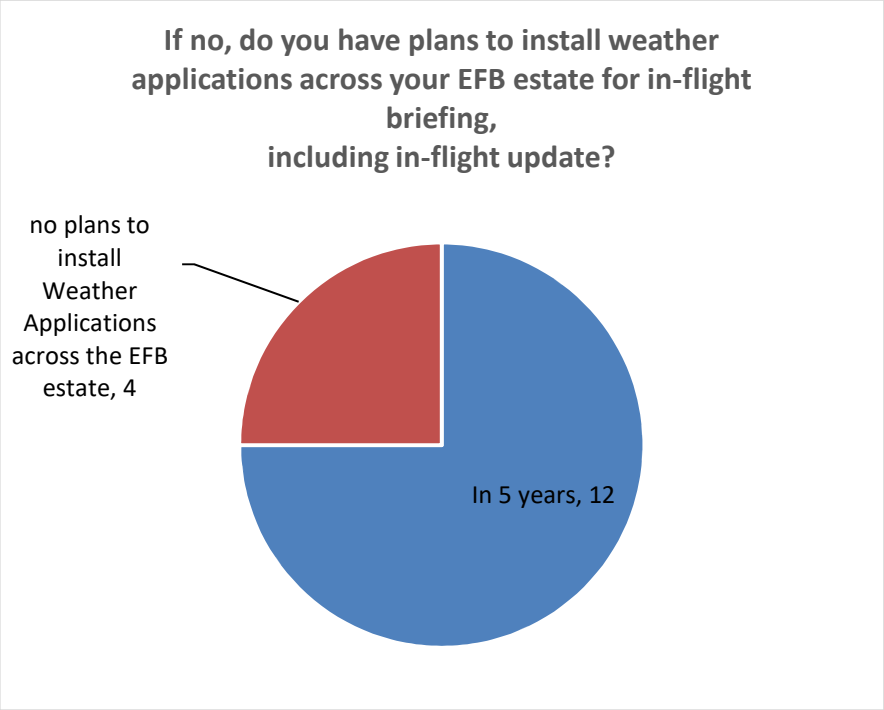


Table 1: answer to the question "Please identify which of the following are available in your EFB weather application for in-flight update and briefing (column B) and indicate how often updates are received (column C)"

Type of weather application (column A)	**Yes (column B)**	**How often updates are received (column C)**
WAFC SIGWX	2 YES	On ground, on request by the crew Once per hour
WAFC Upper air wind/temperature data	2 YES	On ground, on request by the crew Once per hour
WAFC Upper air forecasts of clear air turbulence, icing and cumulonimbus	2 YES	On ground, on request by the crew Once per hour
SIGMET	3 YES	On ground, on request by the crew Once per hour No update inflight
AIRMET	2 YES	Once per hour No update inflight

Special air-report	1 YES	Once per hour, more often if required
METAR/SPECI	3 YES	On ground, on request by the crew Once per hour On demand
TAF	3 YES	On ground, on request by the crew Once per hour On demand
Volcanic Ash advisory	3 YES	On ground, on request by the crew Once per hour No update inflight
Tropical cyclone advisory	2 YES	No update inflight As needed
Meteorological satellite imagery	2 YES	Every 1h + on demand Once per hour
Ground based weather radar imagery	1 YES	Once per hour, more often if needed
Lightning information	2 YES	Every 1h + on demand Once per hour, more often if required.
Other	1 YES	**Application**: Non-WAFC upper air forecast of clear air turbulence, icing and convective clouds ; ice crystals icing ; non-WAFC wind temperature and tropopause ; satellite imagery is provided processed by digital models, not raw. **How often updates are received** → depends

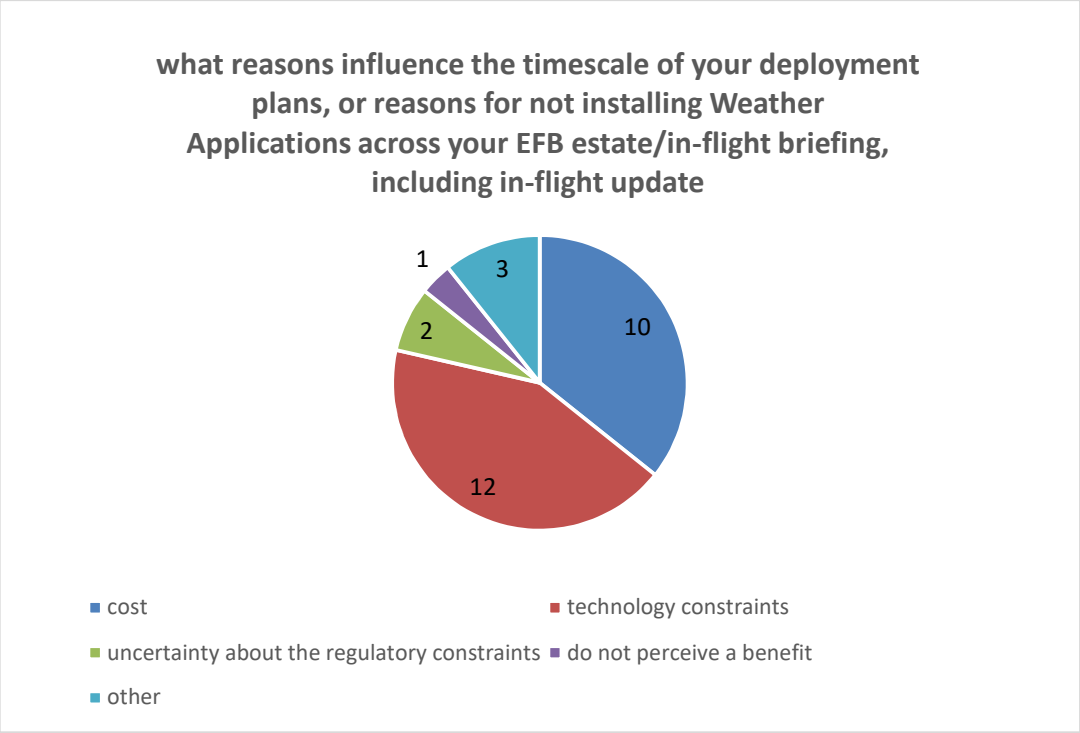
Figure 12 "if not, do you have plans to install weather applications across your EFB estate for in-flight briefing, including in-flight update?"



If you have plans what types of weather data and what functionality do you foresee using?

- *Weather Charts*
- *turbulence, significant weather, TS*
- *TAF/METAR/SIGMET pull as an option (presently via ACARS). Enroute WX display on Enroute Charts*
- *Up to date winds / turbulence / volcanic ash / thunderstorm activity / sigmet areas*
- *wind updates aloft*
- *In-Flight Updates*
- *Turb, Pireps, icing cristals, etc.*
- *Real-time weather and updated forecasts on moving map, METAR, TAFs*

Figure 13 reasons for not installing or influencing deployment plan timescale of weather application across EFB estate with respect to in-flight briefing, including in-flight update



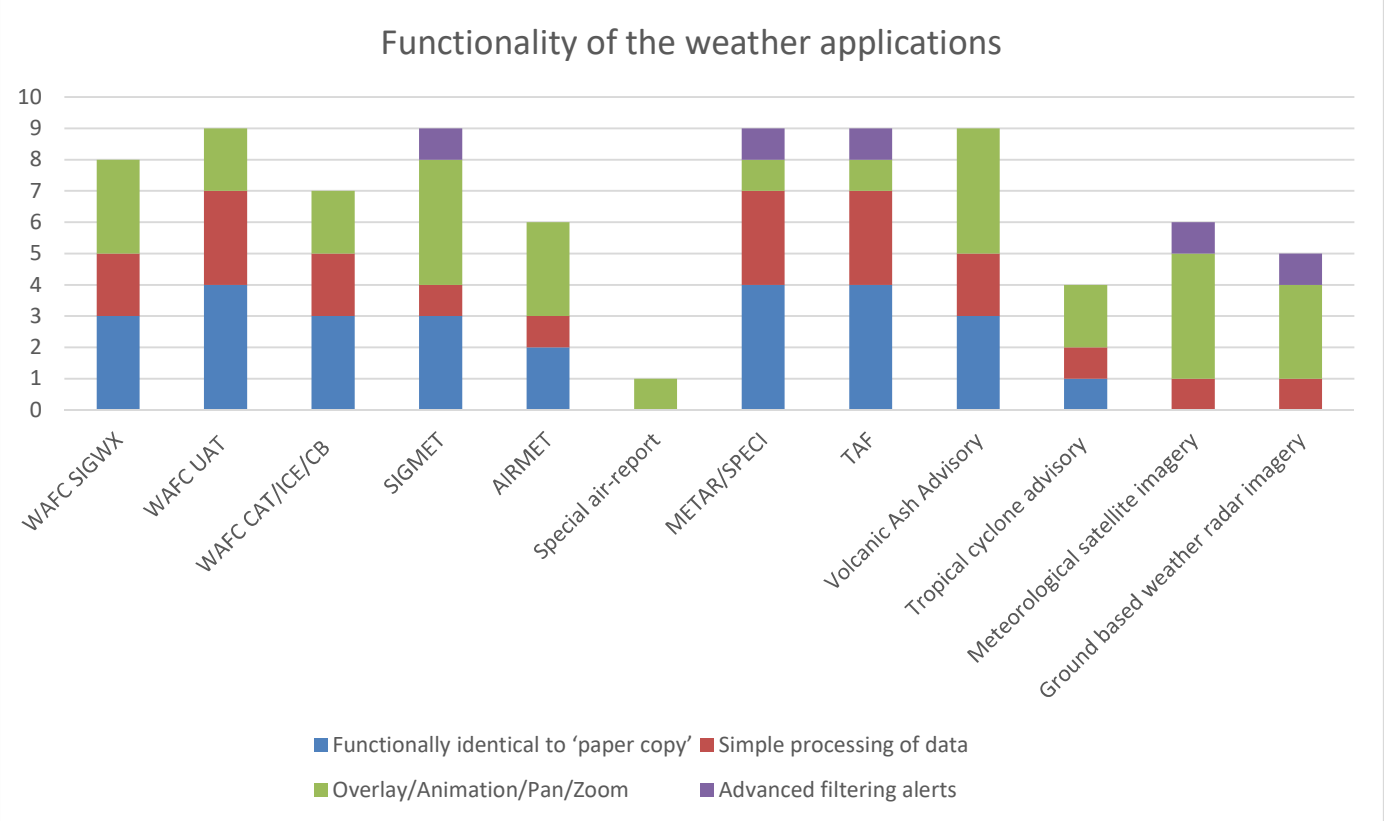
can you please provide further clarifications on the reasons mentioned above?

- *The current contract associated to the EFB device does not include data roaming*

- *Timeline to implement all the changes related to EFB*
- *No onboard connectivity*
- *connectivity not installed yet (in progress)*
- *Suitability of the solutions and benefit of use*
- *Our fleet doesn't have WiFi connectivity - future plans to provide with data to our EFBs is a mmidle term solution*
- *Availability of UAID to provide ownship position ; heavy ACARS costs (all models will be updated real time when inflight WIFI is available)*
- *implementation in the existing software has a cost*
- *suitable application not been found/developed*
- *currently investigating several suppliers of WX apps and its IP-connectivity to update the WX data*
- *Potential high ACARS costs, IP connectivity, post-flight data storage*

4. Functionality of the weather applications on your deployed EFBs

Figure 14 functionality of EFB Weather Applications



Other functionalities:

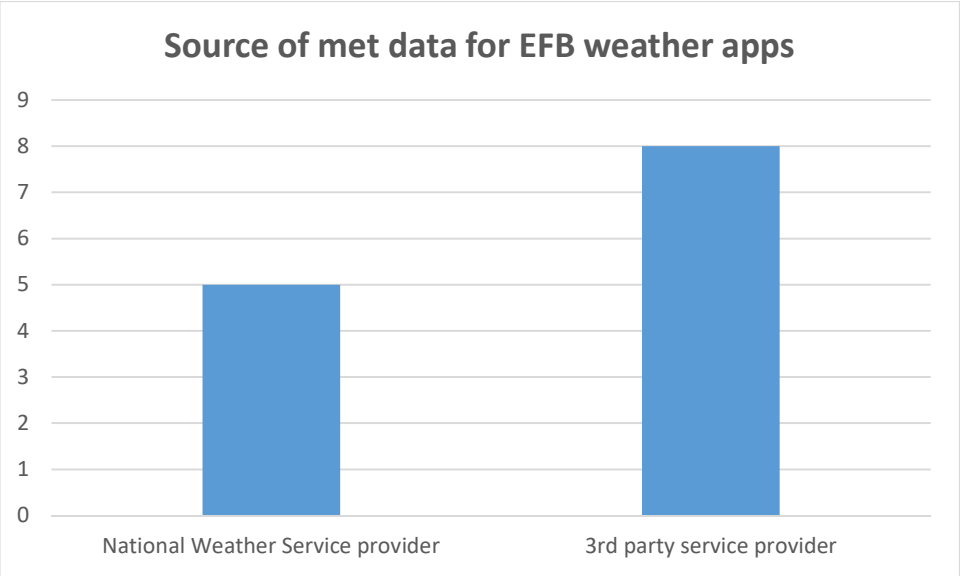
- Time based display including projected "ghost" aircraft position ; vertical profile → **Overlay/Animation/Pan/Zoom**

Table 2: For the previously selected functionality of weather applications, explain if customisable to your particular operational needs (column B) and if so how (column C).

Type of weather application (column A)	**Yes (column B)**	**How often updates are received (column C)**
WAFC SIGWX	2 YES	On request to the provider Pilot selection inside application
WAFC Upper air wind/temperature data	2 YES	On request to the provider Pilot selection inside application
WAFC Upper air forecasts of clear air turbulence, icing and cumulonimbus	2 YES	On request to the provider Pilot selection inside application
SIGMET	2 YES	On request to the provider Pilot selection inside application
AIRMET	1 YES	Pilot selection inside application
Special air-report	1 YES	Pilot selection inside application
METAR/SPECI	3 YES	On request to the provider Pilot selection inside application Only airports authorized for aircraft type are displayed
TAF	3 YES	On request to the provider Pilot selection inside application Only airports authorized for aircraft type are displayed
Volcanic Ash advisory	2 YES	On request to the provider Pilot selection inside application
Tropical cyclone advisory	1 YES	Pilot selection inside application
Meteorological satellite imagery	1 YES	Pilot selection inside application
Ground based weather radar imagery	1 YES	Pilot selection inside application
Lightning information	1 YES	Pilot selection inside application
Other		*N/A*

5. EFB weather applications: source of data

Figure 15 source of meteorological data for EFB weather application



Respondents further identified the source of their weather data. For confidentiality reasons the answers are not repeated here.

6. Costs related to weather applications in EFB

Respondents provided some basic information regarding the costs. However very few answers have been provided. As follows the feedback provided (range of values is provided in some cases):

Initial cost to set up EFB to receive weather data per aircraft (one-off)

500 - 5000 EUR

License extensions

1000 EUR

Figure 17: licence extension cost/periodicity

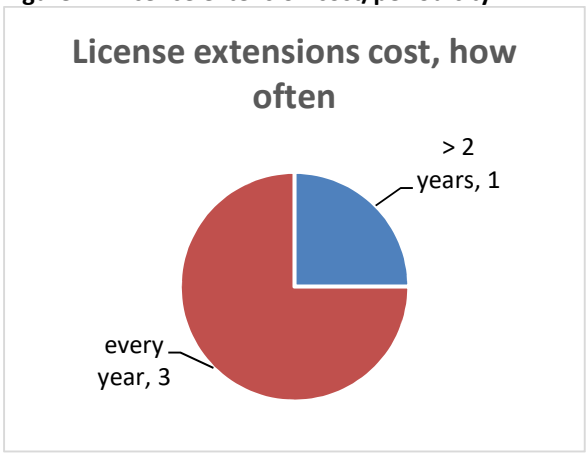
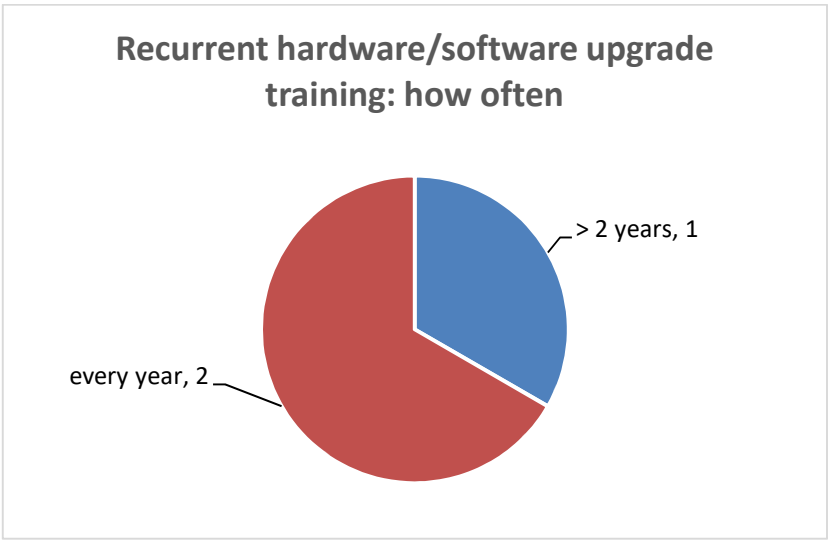


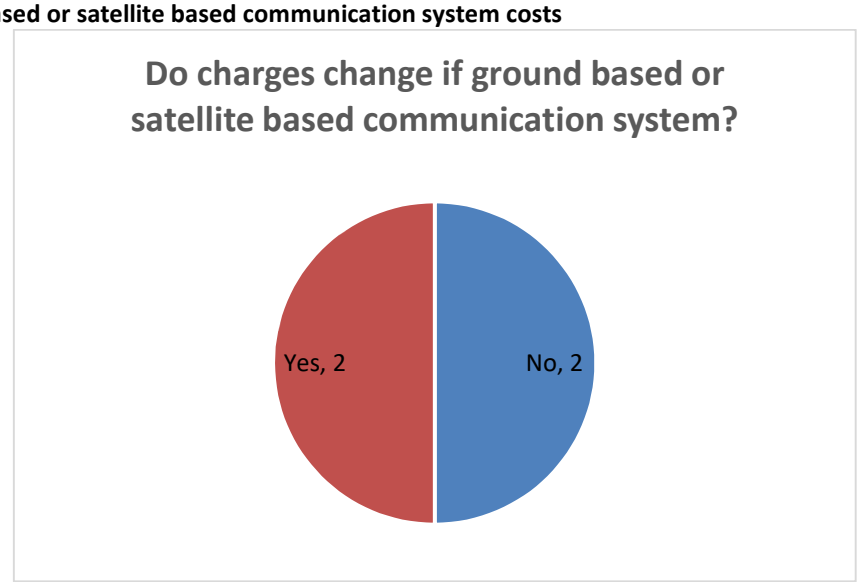
Figure 18: recurrent hardware/software upgrade training



Data usage (where based on a data rate)

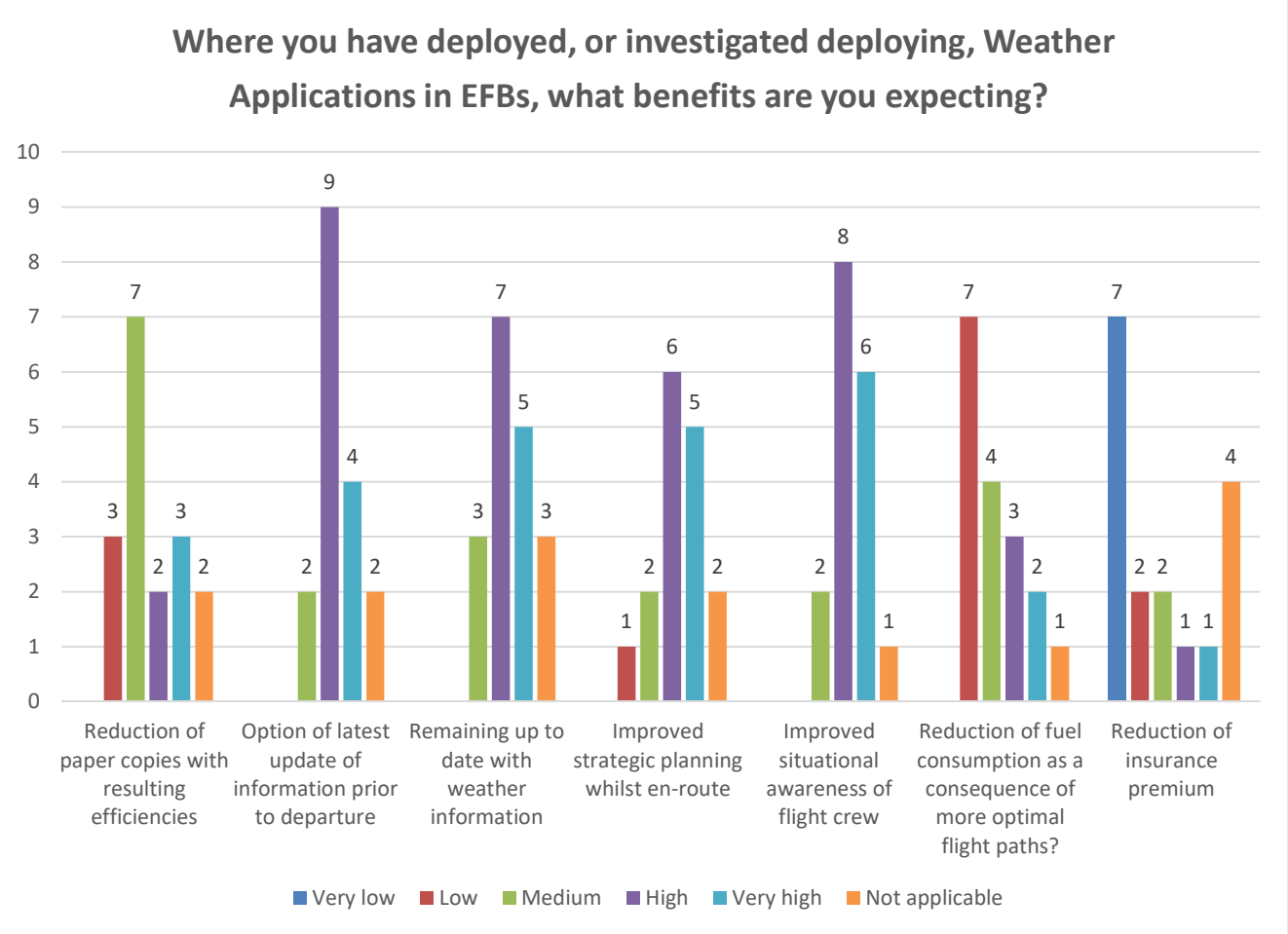
10000 EUR

Figure 19: ground based or satellite based communication system costs



7. Benefits related to weather applications in EFB

Figure 20 Benefits related to weather applications in EFB



Other

Reduction of maintenance fees (ex. flying through lightning, hail, ice crystals icing...). In this case it was indicated "medium benefits"

In case of reduction of fuel consumption, can you quantify (percentage)?

Respondents further identified some basic information regarding the fuel reduction. However very few answers have been provided and to ensure confidentiality the details are not published.

Annex 1 Glossary

METAR: Aerodrome routine meteorological report (with or without trend forecast)

SPECI: Aerodrome special meteorological report (with or without trend forecast)

TAF: Aerodrome forecast

AIRMET: information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of low-level aircraft operations and of the development of those phenomena in time and space, and which was not already included in the forecast issued for low-level flights in the flight information region concerned or sub-area thereof

SIGMET: information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of aircraft operations and of the development of those phenomena in time and space

HEMS: Helicopter Emergency Medical Service

VFR: Visual Flight Rules

IFR: Instrument Flight Rules

Pax: Passenger(s)

NVIS: Night Vision Imaging System

NAA: National Aviation Authority

Functionally identical to 'paper copy': means that the image on the display is equivalent to a black and white paper printout, with no means of overlaying with, or interacting with, any other data on the EFB.

Simple processing of data, such as colouring: For example, simple colour coding of data to draw attention to important information. No other functionality (overlays, interaction with other data etc).

Overlay/Animation/Pan/Zoom: More advanced processing. animations; pan and zoom control; overlaying of other data types [map modes], identifying – for example – the location of METAR/TAF for a particular aerodrome on a map.

Advanced filtering alerts including customisation: Processes to filter information in order to actively alert of important information, and including any customisation of alert thresholds