BEA
Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile

RÉPUBLIQUE
FRANÇAISE
Liberté
Égalité
Fraternité

Activity report 2023

Safety together


BEA
La sécurité, ensemble.

Contents

A message from the Director

I am very proud to have taken up the post of the BEA's Director on 1st January this year.

Firstly, I would like to pay tribute to all of my predecessors, who, from Maurice Bellonte, who took up the post after the Second World War, to Rémi Jouty, dedicated themselves to building this wonderful institution and developing the strong international reputation it benefits from today.

I would also like to acknowledge the warm welcome extended to me by all BEA staff, the majority of whom are passionate about the work they do. They all take their work seriously and demonstrate exceptional human qualities. I have had the pleasure of meeting them and I very much look forward to working with them. Even though they are not employed by the BEA, I include the Field Investigators as BEA staff as they work regularly for the Bureau throughout metropolitan France and overseas territories.

2023 was recorded as the safest year for air transport globally as, despite activity marked by a strong recovery, there was only one fatal commercial aeroplane accident, that of an ATR 72 in Pokhara in Nepal on 15 January, in which 72 people were fatally injured. This accident mobilised the BEA, which immediately dispatched a team of investigators. The report of the investigation conducted by the Nepalese authorities was published on 28 December and is available on the BEA's website.

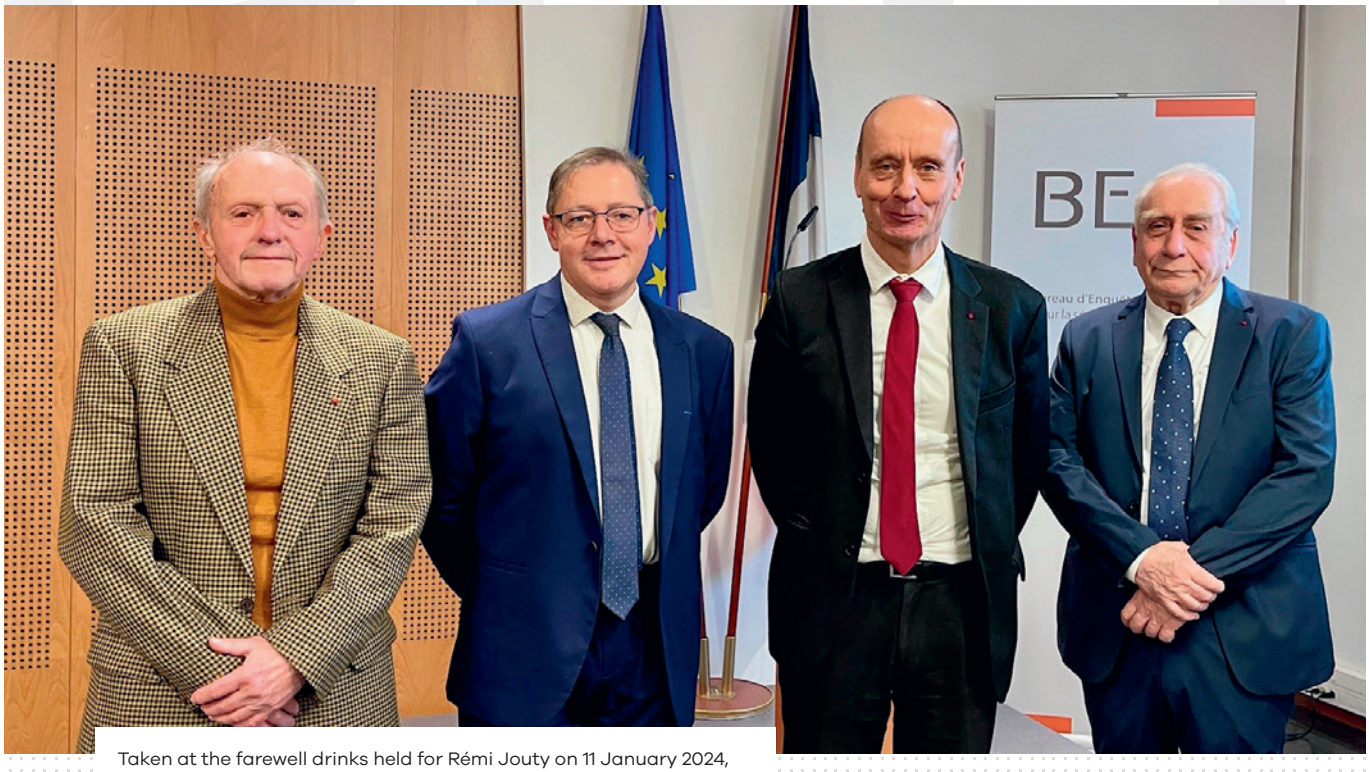
The BEA exists to improve safety, so I am delighted to take over the reins in this context. Of course, investigation authorities are not the only organisations responsible for improving safety, but they play their part in their own way. To some extent, their mission is becoming increasingly difficult, in particular as far as air transport is concerned. We need to keep track, not only through accident investigations, but through investigations and analyses of more discrete events, of hazards that are becoming increasingly difficult to predict. This work involves identifying incidents from which safety lessons can be drawn, as well as conducting the associated investigations, which mobilise a greater number of the BEA's resources.

In terms of general aviation activity in France, the statistics that the reader will discover in this report indicate that the number of fatal accidents and victims was largely the same as in previous years, even down slightly, for some types of activities.

In his opening message in the 2022 activity report, my predecessor shared his concerns and worries about the BEA's capacity to pursue all of its activities in a context of declining staff numbers and growing air activity. Although the situation does not seem to have deteriorated in 2023, like him, I am keeping a watchful eye and I will most certainly address this further in subsequent issues.

Happy reading!

Pierre-Yves Huerre,
BEA Director



Taken at the farewell drinks held for Rémi Jouty on 11 January 2024, this photo shows, from left to right:

- **Jean-Paul Troadec,** Director from 2009 to 2013.
- **Pierre-Yves Huerre,** Director since 1 January 2024.
- **Rémi Jouty,** Director from 2014 to 2023.
- **Paul-Louis Arslanian,** Director from 1990 to 2009.

01

Overview of accidents, investigations initiated in 2023 by the BEA

1.1

General context

The obligations of the Member States of the European Union in terms of Civil Aviation safety investigations are defined in Regulation No. 996/2010 of the European Parliament and of the Council on the investigation and prevention of accidents and incidents in civil aviation.

The general principle of this regulation is that every accident or serious incident in the field of civil aviation shall be the subject of a safety investigation in the Member State in which the accident or serious incident occurred. This requirement applies to all manned and unmanned aircraft (drones), except those listed in Annex I of Regulation (EU) No. 1139/2019 (the aircraft listed in this Annex are mainly non-certificated aircraft: microlights, "historic" aircraft, etc.).

Exemptions are however provided for: "the responsible safety investigation authority may decide, taking into account the expected lessons to be drawn for the improvement of aviation safety, not to initiate a safety investigation when an accident or serious incident concerns an unmanned aircraft for which a certificate or declaration is not required [...] or concerns a manned aircraft with a maximum take-off mass less than or equal to 2,250 kg, and where no person has been fatally or seriously injured. "

Furthermore, Annex 13 of the International Civil Aviation Organization (ICAO) specifies that, when a safety investigation is conducted by a State (usually the State of Occurrence), the State of the Operator, the State of Registry and the State of Manufacture of the aircraft involved are invited to participate in this investigation, by naming an accredited representative (ACCREP).

Participation on 19 and 20 April 2023 in a field exercise organised by ATR in partnership with the company Eforsa and Auch Gers airport.

In France, the BEA is the authority responsible for safety investigations. Its procedures stipulate that, in addition to the investigations it has an obligation to conduct in accordance with the European regulations, when its resources allow, it also investigates the following events:

- reported incidents; which are of particular interest for safety;
- fatal accidents involving aircraft listed in Annex I of Regulation (EU) No. 1139/2019;
- accidents involving aircraft weighing less than 2,250 kg, including those where no person was fatally or seriously injured;
- serious incidents and accidents involving drones, including those for which a declaration or a certificate is not required, when these have resulted in significant consequences for other aircraft or for third parties on the ground.

These criteria are assessed at the time of notification. Subsequent developments, in particular the death of an occupant of an aircraft covered by Annex I of European Regulation No. 1139/2019 in the following days, generally do not lead to a reconsideration of the initial decision, mainly because the factual information required for the investigation has not been collected or preserved.

1.2

Accident data and investigations opened

The BEA receives several thousand notifications every year, mainly by telephone and/or e-mail.

The incoming flow of these notifications is processed as follows:

- the operational duty investigator carries out an initial filtering process to select the events likely to meet the criteria for opening an investigation, which will be presented to the daily review;
- during this review, the events selected are studied collectively by investigators and the management team to decide on their classification (accident, serious incident or incident) and their treatment (investigation, collection of additional information, recording in a database or closure without further action).

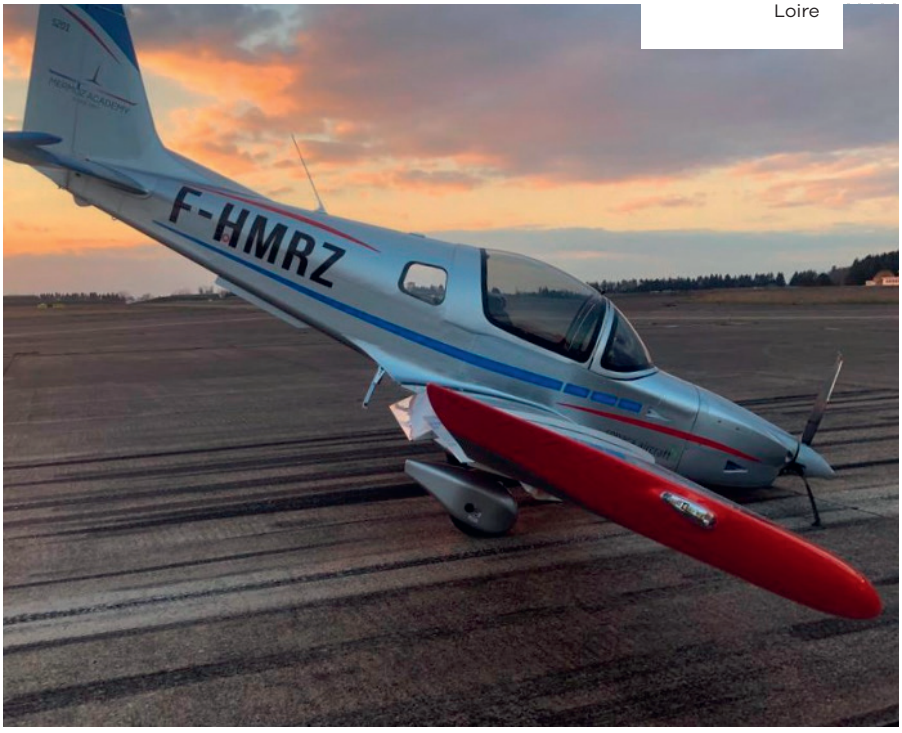
In 2023, as in the previous year, almost 1,200 occurrences were studied during the daily reviews.

1.2.1 Accidents in France in 2023

The data mainly comes from two sources:

- investigations conducted by the BEA;
- information provided by Field Investigators with respect to "Annex I" aircraft accidents that are not the subject of a BEA investigation.

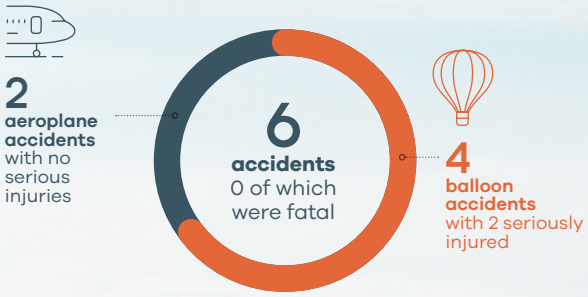
Overall, the number of accidents recorded in France in 2023 was largely the same as in previous years. The number of fatal accidents and the number of victims was down slightly on 2022 (-15 % and -16 % respectively).



Accident to the Sonaca S201 registered F-HMRZ on 28 February 2023 at Tours-Val de Loire

Number of accidents[1] in France in 2023

COMMERCIAL AIR TRANSPORT

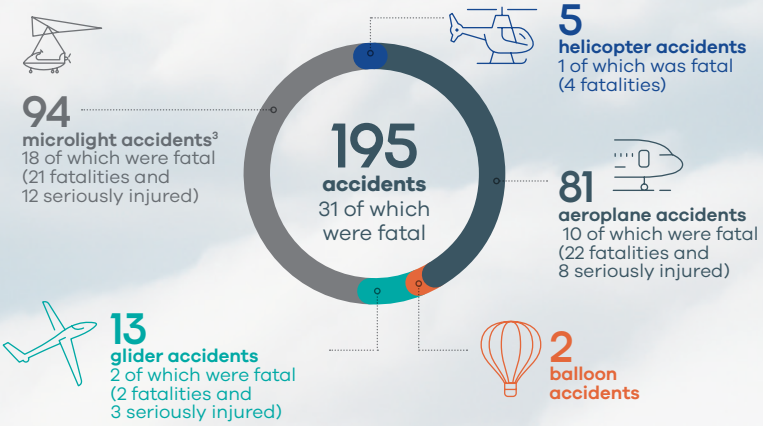


AERIAL WORK / SPECIALISED ACTIVITY[2]

213
accidents in 2023
33 of which were fatal

51
fatalities in 2023 and 29 seriously injured

GENERAL AVIATION



Note: no accident or serious incident involving a drone was reported to the BEA in 2023.

[1] The number of accidents recorded may differ from the number of damaged aircraft or aircraft involved in accidents, in particular because an accident may involve several aircraft. [2] Accidents occurring during the aerial activities listed under GM1 SPO.GEN.005 associated with Regulation (EU) No. 965/2012 are counted under the "Aerial work/Specialised activity" heading even if the flights involved do not formally meet the requirements of PART SPO of this Regulation. [3] Local microlight flights for remuneration are included in the "General aviation" category.

More information about accidents in France in 2023

COMMERCIAL AIR TRANSPORT

Aeroplanes

For aeroplanes operated in commercial air transport, two accidents were recorded:

- the first involved the De Havilland DHC6 registered F-OMYS on 24 August in Saint-Barthélemy. During the landing run on runway 28, the aeroplane veered off the runway and collided with a panel then a helicopter parked in the apron;
- the second involved the collision of the Airbus A330-900 registered N411DX operated by Delta Air Lines while running on a taxiway at Paris-Charles de Gaulle airport (Val-d'Oise) with the stationary Boeing 777-300 registered F-GSQT operated by Air France on 30 August. **Read the report.**

These two accidents only resulted in material damage.

Balloons

For balloons operated during commercial flights, four accidents were recorded, three of which involved a collision with a power line during landing (in two of these three cases, a fire broke out).

SPECIALISED ACTIVITIES / AERIAL WORK

Fatal accidents

For accidents occurring during a specialised activity or aerial work, two fatal accidents were recorded:

- the first involved the Bell 47 registered F-GKTR on 7 April in the commune of Sainte-Marthe (Lot-et-Garonne). The collision with the ground occurred while the pilot, alone on board, was transiting between two spraying sites;
- the second involved the Cessna C208 registered F-HSLE on 15 October in the commune of Monetier Allemont (Hautes-Alpes). The collision with the terrain occurred after the parachute drop.

Non-fatal accidents

Non-fatal accidents occurring during a specialised activity or aerial work (or related activity):

- three aeroplane accidents were recorded. These constituted three runway overruns during landing. Two concerned aeroplanes operated to tow gliders and one aeroplane operated for a parachute drop;
- three accidents to helicopters operated for agricultural spraying;
- three balloon accidents that occurred at the same air show. In each accident, one occupant was injured during the hard landing and/or landing with bounce;
- one glider accident involving a loss of control during take-off during a competition.

MICROLIGHT FLIGHTS FOR REMUNERATION

Four microlight accidents among those referenced in general aviation were made in the context of sightseeing flights offered for remuneration. Two of these were fatal accidents:

- the first involved the JMB VL3E identified 49ADC on 30 July on final approach to Cholet (Maine-et-Loire);
- the second involved the Air Création Bionix 13 Skypper identified 21ANN on 5 October in Vignoles (Côte-d'Or).

A more detailed description of the types of accident in general aviation is included in **paragraph 3.2**

The number of investigations opened by the BEA indicated opposite is significantly fewer than the number of accidents, due in particular to the fact that "Annex I" non-fatal aircraft accidents are only investigated in certain specific cases.

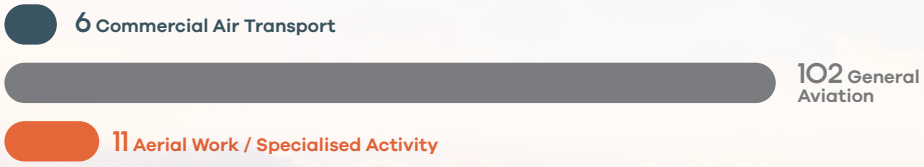
Four of the investigations opened by the BEA in 2023 involved one or more high-capacity aeroplanes: in addition to the aforementioned collision at Paris-Charles de Gaulle **(see paragraph 1.2.1)**, we note one serious incident and two incidents **(see paragraph 3.1)**.

1.2.2 Investigations opened by the BEA in 2023

The BEA opened 124 investigations in 2023. As an indication, the average number of investigations opened each year over the period 2019-2023 is 128.

Investigations opened by the BEA in 2023, by types of operation

119
accidents
compared with 123 in 2022



3
serious incidents
compared with 13 in 2022

- 3 Commercial Air Transport
- General Aviation
- Aerial Work / Specialised Activity

2
incidents
compared with 3 in 2022

- 2 Commercial Air Transport
- General Aviation
- Aerial Work / Specialised Activity

Investigations opened by the BEA in 2023, by main categories of aircraft




	Fixed-wing aircraft		Rotary-wing aircraft		Drones	Other	Total
	< 5,700 kg *Light aeroplanes, gliders and fixed-wing microlights*	**≥ 5,700 kg** *High-capacity aeroplanes*	**< 3,180 kg** *Light and ultralight helicopters, gyroplanes*	**≥ 3,180 kg** *High-capacity helicopters*		*Balloons, paramotors and flex-wing microlights*	
Accidents	91	1	12	0	0	15	**119**
Serious incidents	1	1	0	0	0	1	**3**
Incidents	0	2	0	0	0	0	**2**
Total	**92**	**4**	**12**	**0**	**0**	**16**	**124**

More information about opened and delegated investigations

Delegation of investigations by the BEA to foreign authorities

In 2023, the BEA delegated two investigations to foreign authorities. They concerned the following events:

- the movement of a cargo load on board the Boeing 737-400 registered TF-BBL on 10 February, which destabilised the descent path to Paris-Charles de Gaulle. The event was reported to the BEA by the Icelandic investigation authority, to which the investigation was delegated;
- take-off from the wrong intersection of the Airbus A320 registered G-EJCI on 30 July at Toulouse airport. The event was reported to the BEA by the UK investigation authority, to which the investigation was delegated.

Delegation of investigations by foreign authorities to the BEA

No investigations were delegated to the BEA by foreign authorities in 2023.

Coordination with the BEA-É

The BEA regularly coordinates with the BEA-É (Bureau Enquêtes Accidents pour la sécurité de l'aéronautique d'État - State Aviation Accident Investigation Bureau) on the subject of events likely to concern both authorities. Among the events for which an investigation was conducted by the BEA-É in 2023 after a two-authority coordination, were:

- the fatal accident of a paratrooper jumping from the Cessna 2008 registeredOY-PBK on 29 September at Pamiers - Les Pujols aerodrome;
- the collision with a bird of the Aermacchi MB339 registered N343EM on 10 October during take-off from Nîmes-Garons, that resulted in the ejection of the occupants undertaking a military flight;
- the forced landing in a field of the DR400-140B registered F-HBSL on 16 October at Rion-des-Landes following a decrease in engine power during an instruction flight within the context of military pilot training.

Fatal accident not investigated

In 2023, one fatal accident was not investigated by the BEA, in compliance with the BEA's investigation policy and regulations. In this accident, the pilot was struck by the propeller of his Yak-52 historic aeroplane during its check.

More information about investigations into incidents and serious incidents

Serious incidents

The BEA opened three investigations into events classified as serious incidents:

- the first concerned loss of radar contact - and the ensuing hazardous proximity - of the Boeing 737-800 registered EC-NGC operated by Albastar on 21 July, en route between London-Stansted and Tarbes-Lourdes-Pyrénées (Hautes Pyrénées);
- the second involved the Cameron Z105 registered F-HOFA on 25 June at Saint-Christoly-Médoc (Gironde): during the landing and ensuing bounce, the envelope collapsed onto the load frame. One of the cables wrapped around the pilot's neck before becoming taut again. The pilot successfully freed himself; **Read the report;**
- the third concerned the landing with front landing gear retracted as the result of a malfunction of the Cessna 525 A registered F-HMSG on 28 October at Paris-Le Bourget (Seine-St-Denis).

Incidents

The BEA opened two investigations into incidents involving:

- the Airbus A350-900 registered F-HTYO operated by Air France on 28 May en route (malfunction of the radome and multiple system failures);
- the Airbus A380-800 registered A6-EOM operated by Emirates on 18 August during the approach to Nice (Alpes Maritimes) (damage to a slat during approach).

These two incidents are described in **paragraph 3.1** below.

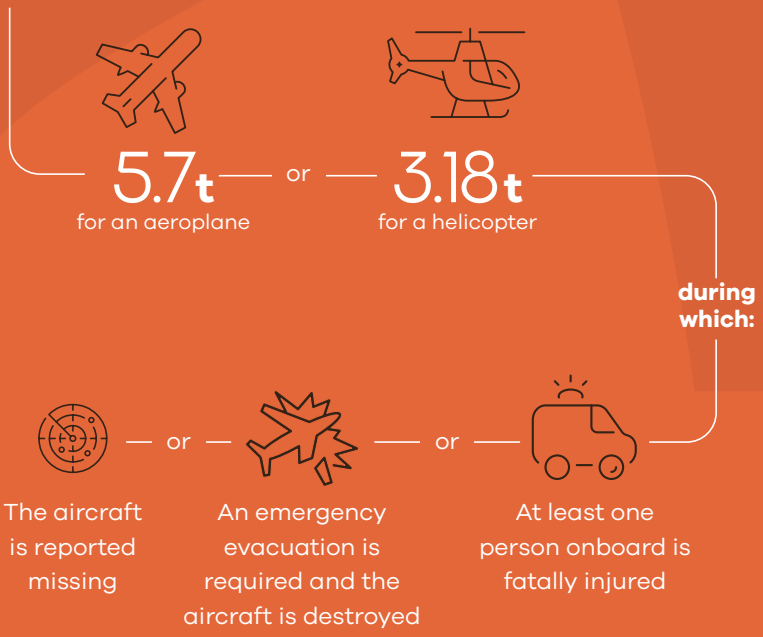
More information about different investigation categories managed by the BEA

The BEA adapts its investigative resources and the type of report issued based on the perceived level of risk, the envisaged lessons to be learnt and the target public. On this basis, the BEA has established three categories for investigations and associated reports, based on the criteria detailed below.
The following image shows the breakdown of the investigations opened by the BEA in 2023 based on investigation categories.

Breakdown of the number of opened investigations, by category

Classification criteria
for investigations led by the BEA

> **Category 1 investigation:** investigation requiring several areas of organisational and/or systemic analysis and which leads to the writing of a report using the full structure proposed by ICAO Annex 13. Category 1 investigations generally give rise to safety recommendations. They are "major" investigations into accidents involving an aircraft operated under an air operator's certificate with a maximum certified take-off weight of more than:



> **Category 2 investigation:** this category is for investigations where the areas of in-depth examination and analysis are limited, giving rise to a "simplified report": the structure of these reports may differ from the template provided in ICAO Annex 13 in order to adapt to the circumstances of the occurrence and the priorities of the investigation. These investigations apply for all types of operations. They primarily aim to provide operational feedback, but can also lead to the issuing of safety recommendations.

> **Category 3 investigation:** "Desktop" Investigation. During these investigations, information is mainly obtained through statements from the parties directly involved. This information is not generally validated by the BEA, and there is no development of an analysis, conclusions or lessons. With this investigation category, the BEA wants above all, to ensure that personal experience is shared throughout the community in question. This investigation category is generally reserved for light aircraft and types of occurrences which, based on past experience, do not lead to serious bodily injury.

1.2.3 Investigations opened by a foreign body and officially notified to the BEA

Foreign investigations opened in 2023 about which the BEA has been officially notified

	Commercial Air Transport	General Aviation	Aerial Work	State Aircraft	Other or undetermined	Total	*Reminder of total in 2022*
Accidents	33	32	12	5	27	**109**	*135*
Serious incidents	69	6	2	1	12	**90**	*107*
Incidents	30	0	0	0	0	**30**	*26*
Total	**132**	**38**	**14**	**6**	**39**	**229**	*268*
Reminder of total in 2022	*146*	*58*	*12*	*10*	*42*	*268*	

The number of occurrences for which, in compliance with the criteria of Annex 13, a foreign authority opened an investigation and notified the BEA, was down 14 % in 2023, compared with 2022.
This drop does not obscure the fact that the accredited representation continues to rely heavily on the BEA's resources.

For several years now, the BEA has adapted the allocation of its resources to foreign investigations based on the stakes associated with the reason for the proposed accredited representation. The classification criteria for foreign investigations for which the BEA appoints an accredited representative (ACCREP) are described below.

Classification criteria
for investigations opened by a foreign body and notified to the BEA

> Category 1 accredited representations:
These concern accidents or incidents to aeroplanes with a maximum take-off weight of more than 5.7 t where:
- at least one person on board is fatally injured (excluding injuries from natural causes), or
- an emergency evacuation is carried out and the aircraft is destroyed, or the aircraft is reported missing,

Or accidents and incidents to helicopters of more than 3.18 t where:
- at least one person on board is fatally injured (excluding injuries from natural causes), or
- an emergency evacuation is carried out and the aircraft is destroyed, or the aircraft is reported missing.

> Category 3 accredited representations:
These concern accidents and incidents to aeroplanes of French design of less than 2.25 t where:
- the BEA, in theory, does not provide any added value during the investigation,
- there is no clear link with the reason for accreditation,
- there is no specific request from the authority in charge,
- they would be the subject of BEA Category 3 investigations,
- listed in Annex 1,

Or accidents and incidents to aeroplanes of French design of more than 2.25 t where:
- the BEA, in theory, does not provide any added value during the investigation,
- there is no clear link with the reason for accreditation,
- in theory, there are no benefits or stakes for the manufacturer and/or the BEA,
- they would not give rise to the opening of a BEA investigation in France,
- there is no specific request from the authority in charge,
- there is no justified request from the manufacturer,

Or accidents and incidents to helicopters where:
- there are no victims,
- there is no specific request from the authority in charge,
- there is no clear link with the reason for accreditation,
- there is no justified request from the manufacturer,

Or accidents or incidents involving aircraft equipped with engines of French design or manufacture where:
- no component manufactured by the French manufacturer contributed to the occurrence,
- there is no clear link with the reason for accreditation,
- there is no justified request from the engine manufacturer.

> Category 2 accredited representations: These concern aircraft accidents and incidents that do not meet the criteria of category 1 and 3 ACCREP.

The participation of the ACCREP is:
- > active for category 1 ACCREP cases (major event);
- > active depending on the needs of the foreign authority for category 2 ACCREP cases;
- > on standby, pending a request from the foreign authority for category 3 ACCREP cases: this category mainly includes events that occurred to aircraft of French design, for which no safety issues directly related to design characteristics have been identified at first sight.

The image opposite shows the breakdown of the accredited representations of the BEA in 2023 based on commitment levels (ACCREP categories).
Category 1 accredited representation concerns the accident to the ATR 72-212A registered 9N-ANC on 15 January on approach to Pokhara airport (Nepal). A team of four BEA investigators was immediately dispatched to the accident site, accompanied by ATR and EASA technical advisers. At the end of 2023, the Nepalese authority published the final report on this accident, which highlighted the erroneous operation by the crew of the front propeller controls that caused them to feather, resulting in a loss of thrust, and ultimately stall of the aeroplane.

The distribution between categories of ACCREP cases can change depending on the requests of foreign safety investigation authorities. On the date this report was drafted, the proportion of accredited representations classified as "category 2" and "category 3" in 2023 was broadly equivalent to that of 2022, around 60 % and 40 % respectively.

Breakdown of the number of ACCREP in 2023, by category:

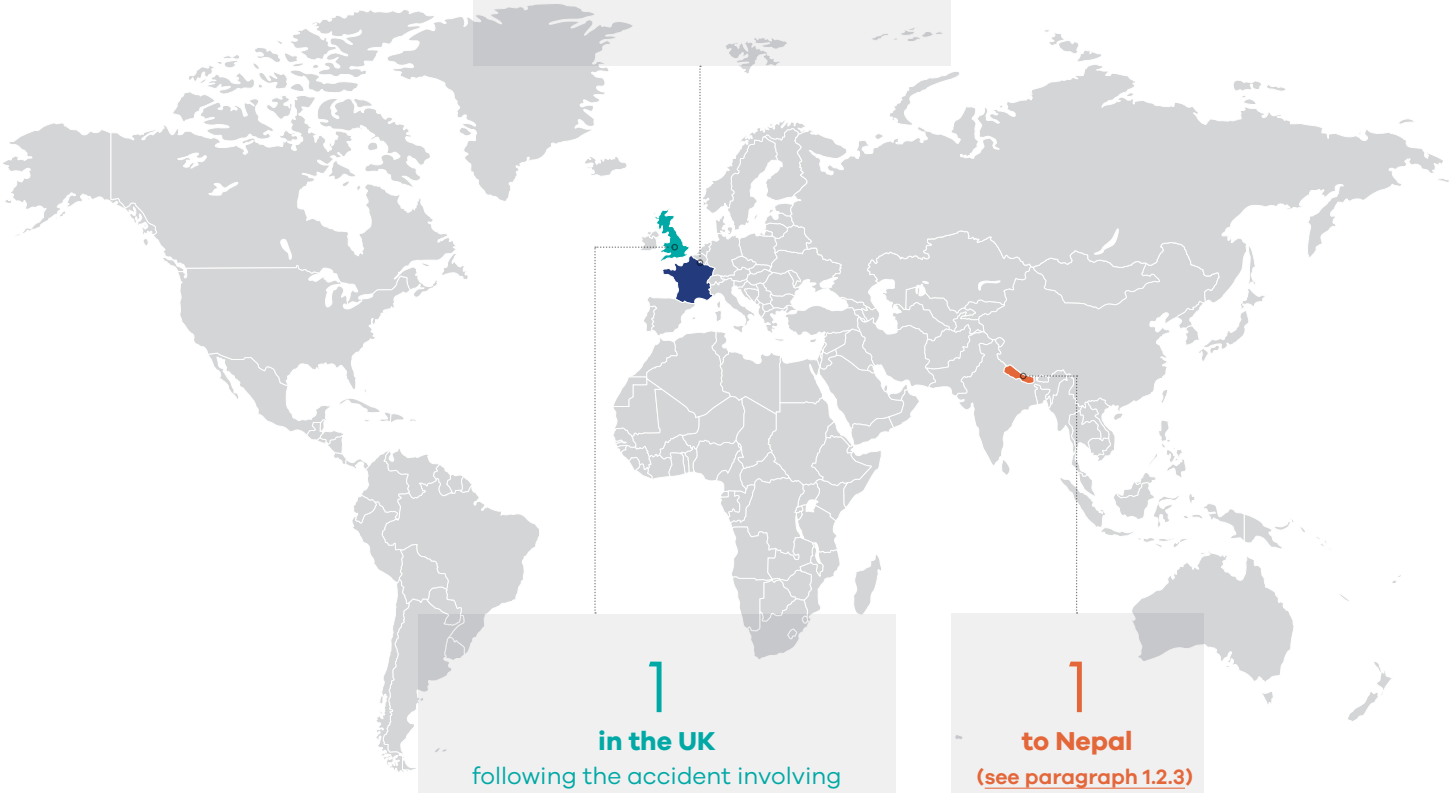
1.2.4 Go-Teams

In the case of a particularly important occurrence (in France or abroad), the BEA sends a team of investigators to the site without delay. The size and composition of this "Go-Team" are defined on a case-by-case basis.

38
Go-Teams
dispatched in 2023

Breakdown of Go-Teams dispatched in 2023

33
in Metropolitan France
+ 3 in overseas departments or regions



1
in the UK
following the accident involving an Airbus A321 on 4 October (in-flight separation of windows following their damage by high-power lights during the shooting of a film on the ground).

1
to Nepal
(see paragraph 1.2.3)

1.2.5 Field Investigators

The BEA uses the services of Field Investigators, who are French civil aviation authority (DGAC) staff, mostly posted at the headquarters of the different Inter-Regional divisions, or in the French civil aviation safety directorate (DSAC) Delegations, and in overseas services. Some Field Investigators also come from the French Air Navigation Services Provider (DSNA).
These Field Investigators are trained by the BEA and have been approved by the BEA Director in accordance with the provisions of the Code of Transport.

On request by the BEA and under its authority, they carry out the initial investigation actions (often on site) immediately after the accident and exclusively on French territory. They are mainly called on for general aviation occurrences, but sometimes they are also called on for commercial air transport occurrences, particularly in overseas territories.

According to the occurrence, BEA investigators will join them on-site, or not. In all cases, the rest of the investigation is carried out by BEA investigators. One hundred and thirty-five Field Investigators are currently available. A tripartite service contract between the BEA, the DSAC and the DGAC Secretary General specifies the terms of their training, approval and use by the BEA.
Maintaining the number and skills of Field Investigators is a major challenge for the BEA in order to ensure rapid and effective operations France-wide and all year round.

Nearly fifty operations by Field Investigators were recorded in 2023, of which 20 were coordinated with a BEA Go-Team.

Investigations closed

reports published
in 2023

2.1

Investigations closed and investigation reports published

European Regulation No. 996/2010 specifies that each safety investigation must be concluded with a report in a format suitable for the type of occurrence. As described in **paragraph 1.2.2**, the BEA has defined three investigation categories.

In 2023, the BEA closed 144 investigations and published as many final reports, broken down as shown in the following table.

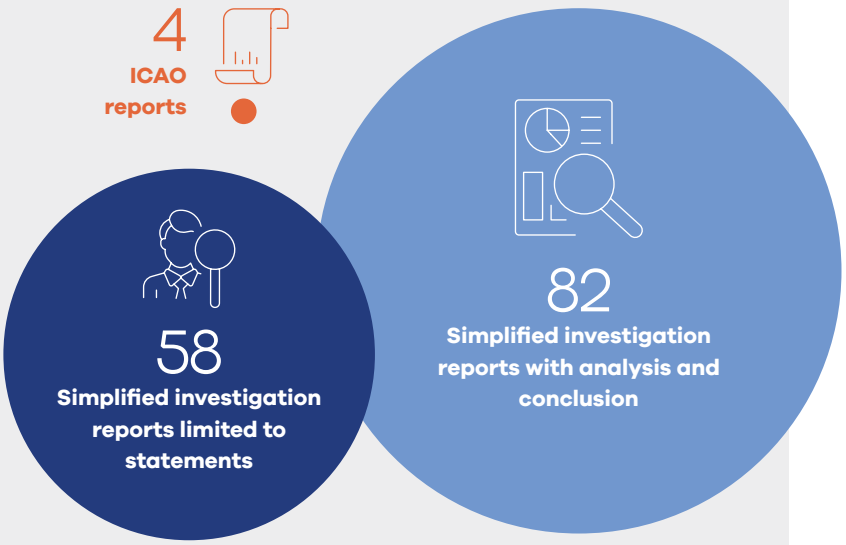
144
final reports
published

Number of reports published by the BEA in 2023

	Category 1	Category 2	Category 3	Total
Commercial Air Transport	0	17	2	**19**
including reports with safety recommendations	*0*	*5*	*0*	*5*
Aerial Work / Specialised Activity	0	3	3	**6**
including reports with safety recommendations	*0*	*0*	*0*	*0*
General Aviation	0	66	53	**119**
including reports with safety recommendations	*0*	*4*	*0*	*4*
Total	**0**	**86**	**58**	**144**
including reports with safety recommendations	*0*	*9*	*0*	*9*

Breakdown by report format

Category 1 investigations systematically give rise to ICAO format reports. Category 2 investigations are the subject of simplified investigation reports or ICAO format reports whilst category 3 investigations are systematically the subject of publications on the BEA website, generally limited to the elements gathered from statements.



2.2

More information about the BEA's production and performance

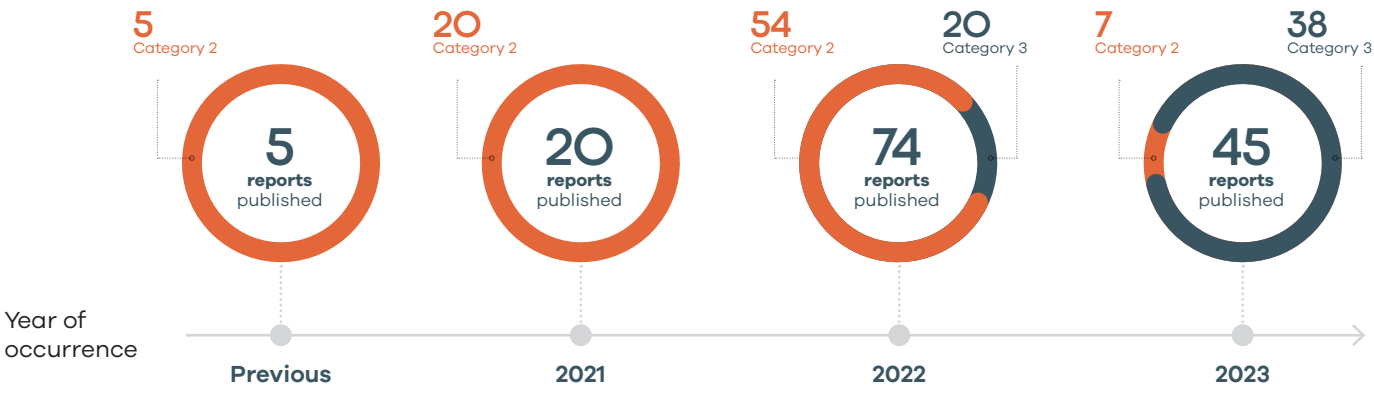
2.2.1 More information about the year of the investigations closed and the stock of investigations

The BEA published 144 final reports in 2023 (compared with 129 in 2022 and 140 in 2021).

The following image indicates, for each category, the year of the investigations closed in 2023.

A total of 116 investigations were open on 31 December 2023, down 14 % on the previous year. Of these investigations, 37 were more than one year old (compared with 34 in 2022 and 38 in 2021). The following table indicates, for each category, the age of these investigations.

Year investigations were opened for all reports published by the BEA in 2023



Number of years since the BEA investigations were opened, on 31 December 2023

	Category 1	Category 2	Category 3	Total
less than one year	0	64	15	79
one to two years	2	25	1	28
more than two years	0	9	0	9
Total	**2**	**98**	**16**	**116**

2.2.2 More information about the "investigations closed in less that one year" performance indicator

Regulation (EU) No. 996/2010 specifies that an investigation report should be published rapidly and, if possible, within 12 months of the date of the occurrence. For the BEA, this duration of 12 months for each investigation is thus a general objective and a monitoring indicator. This indicator is defined as the percentage of investigations closed within one year among the investigations opened the previous year.

In 2023, the global result of this indicator was 61 %, down slightly (by 4 points) from 2022 and 2021.

It can be seen that if a distinction is made between investigation categories (as defined in **paragraph 1.2.2**), the indicator varies substantially, as shown in the following table: the volume of factual items of information to be obtained, the time spent collecting and then analysing this information, the need to conduct complementary and potentially time-consuming work, and the duration of validation and consultation processes, may widely vary depending on these investigation categories. In addition, issuing recommendations (naturally more frequent for category 2 investigations, and especially for category 1) is - except in the case of urgent recommendations - a demanding process with various validation phases, which may significantly extend the duration of investigations.

The BEA has set itself the target of closing 80 % of its investigations in less than one year. More precisely, this target is broken down as follows:

- 100 % of category 3 investigation reports should be published in less than one year;
- 70 % of category 2 investigation reports should be published in less than one year. In addition, the BEA has set itself the target of closing all category 2 investigations within two years (on 31 December 2023, as in the previous year, the number of category 2 investigations open for longer than two years was seven).

Breakdown of the "investigations closed in less than one year" indicator for 2023

	Category 1	Category 2	Category 3	Total
Investigations opened in 2022	2	83	55	140
Closed in less than one year	-	30	55	85
2023 indicator	**-**	**36 %**	**100 %**	**61 %**

2.2.3 Analysis of the BEA's activity in 2023

Generally, the BEA's activity for a given year largely depends on the number of investigations concerning high-capacity aeroplanes operated within the context of commercial air transport, opened in previous years. Due to the often high number of areas of analysis, and the depth of these analyses, these investigations mobilise a lot of cross-functional resources for long periods of time.

Therefore, the BEA's activity in 2023 was particularly impacted not only by investigations opened into this type of event during this year (which are detailed above and/or in **paragraph 3.1** below), but also by the high number of those that were opened in 2022. The latter included the following:

- the failure of an air data system on board the Cessna 525 registered F-HGPH operated by Valljet and the proximity with an Embraer ERJ170 en route without activation of the anti-collision systems on board (TCAS) and on the ground (STCA) on 12 January 2022; **Read the report**;
- the management of the incapacity of the captain of the A330 941N registered F-HHUG operated by Corsair on 17 January 2022 in transoceanic cruise; **Read the report**;
- the loss of visual references of the crew of the Airbus A320 registered F-HEPB, operated by Air France on 10 February 2022 during a night visual approach to Pointe-à-Pitre; **Read the report**;
- the two pilots simultaneously making inputs and difficulties controlling the flight path during the go-around of the ATR 72 600 registered F-ORVS operated by Air Tahiti on 4 April 2022 at Atuona;
- the two pilots simultaneously making inputs and difficulties controlling the flight path during the go-around of the Boeing 777-300ER registered F-GSQJ operated by Air France on 5 April 2022 at Paris-Charles de Gaulle; **Read the report**;
- descent under the approach path and near-collision with the ground of the Airbus A320 registered 9H-EMU operated by Airhub on 23 May 2022 at Paris-Charles de Gaulle following an altimeter setting error;
- non-interception of the approach path to Paris-Le Bourget by the Beech 90 registered F-HHAM on 23 May 2022, followed by a loss of control and an occurrence of proximity with an Airbus A320 on approach to Paris-Charles de Gaulle;
- landing of the Boeing 737-800 registered 7T-VKR operated by Air Algérie on 5 September 2022 at Lyon-Saint-Exupéry on an occupied runway; **Read the report**;
- runway overrun of the Boeing 737 registered EC-NLS operated by Swiftair on 24 September 2022 at Montpellier-Méditerranée;
- hard landing of the Boeing 737 registered F-GZHA operated by Transavia on 1 October 2022 at Nantes-Atlantique;
- runway overrun of the Embraer 145 registered F-HYOG operated by Amélia International on 20 October 2022 at Paris-Orly; **Read the report**;
- uncontrolled movement during push-back of the Boeing 737-400 registered TF-BBM operated by Bluebird Cargo on 20 November 2022 at Paris-Charles de Gaulle, resulting in strike with infrastructures **Read the report**;
- loss of separation between the Airbus A320 registered OE-INE operated by easyJet, the crew of which had received clearance for landing, and a DR400 lined up on the runway on 31 December 2022 at Bordeaux-Mérignac **Read the report**.

In a context in which the total number of investigations opened by the BEA and the number of requests for accredited representations had, since 2022, returned to levels comparable with pre-COVID levels, this substantial mobilisation of resources proved detrimental to the overall production of investigations over the period 2022-2023, in particular category 2 investigations. The 2023 indicator dropped in relation to previous years as a result of this.

The decreasing stock of investigations in progress during 2023 did however enable the BEA to ensure good availability to absorb the fluctuating flow of new investigations in 2024 and to endeavour to improve the results of its performance indicator.

The recruitment of new investigators in 2023 to replace staff who had left the BEA in recent years, offered opportunities for a better distribution of future investigations, enhancing both efficiency and quality.

The BEA's overall production remains subject to the possibility of the occurrence of a major event in France, or to a cumulation of large-scale events abroad for which the BEA would act as accredited representative. Faced with this possibility, the BEA has prepared a continuity plan in order to anticipate the need for temporary changes to its activities and its operation.

2.3

Study of icing of piston engine induction systems

In December 2023, the BEA published a study of the icing of piston engine induction systems.

This study came about due to the observance by the BEA that the icing of piston engine induction systems, sometimes alluded to in the conclusion of investigations as the possible or known origin of a decrease in engine power, is by nature a phenomenon for which it is difficult to identify physical evidence. When the hypothesis of an icing of the induction system is alluded to, it is generally evidenced by looking at the meteorological conditions estimated at the time of the occurrence using a "Temperature/Dew point" diagram: the BEA led a discussion on the merits of this approach, and this discussion resulted in the launch of this study. This study naturally led to the questioning of manufacturers and authorities regarding their knowledge of this phenomenon and how to take it into account.

The study focused on three key areas of work:

- bibliographic research focusing on the information available from the various authorities, manufacturers and scientific sites;
- a test campaign on a powerplant equipped with a Lycoming engine;
- a series of measurements on aircraft equipped with Rotax engines, supplemented by measurements on an engine of the same type installed at a test stand.

The following main lessons were learnt from this study:

- carburettor icing is only observed in very rare cases, corresponding to extreme atmospheric conditions;
- the available diagrams are difficult to apply as they are to make an assumption about carburettor icing;
- in practice, for modern powerplants, the risk of icing is generally far below that shown on the diagrams commonly used by the aeronautical community;
- the way in which the engine is installed on the aeroplane substantially influences the possibility of the phenomenon occurring, as it concerns the temperature and humidity of the air flow inside the carburettor and the temperature of the carburettor body.

03

General considerations

on air safety
in France in 2023

3.1

Commercial Air Transport

3.1.1 Safety promotion

From the end of 2024, the BEA is planning to annually publish a summary of safety lessons from the most recent reports pertaining to commercial air transport events. Some of the first themes identified include:

- management of the aeroplane's energy;
- turbulence;
- losses of separation, in flight and on the runway;
- altimeter setting errors.

The BEA has also initiated and is looking to prolong the publication of summary documents (sheets and/or slides) at the end of its investigations pertaining to commercial air transport events involving high-capacity aeroplanes. The aim is to provide off-the-shelf safety promotion documentation, in particular for aircraft operators.

3.1.2 Commercial air transport accidents

In 2023, the BEA opened two investigations into two accidents involving aeroplanes operated within the context of commercial air transport that occurred on French territory. These accidents, which only resulted in material damage, were cited in paragraph 1.2.2. :

- runway veer-off of the De Havilland DHC6 registered F-OMYS operated by Caire during its landing at Saint-Barthélemy and collision with a helicopter parked in the apron on 24 August;
- collision of the Airbus A330-900 registered N411DX operated by Delta Air Lines while running on a taxiway at Paris-Charles de Gaulle with the stationary Boeing 777-300 registered F-GSQT operated by Air France on 30 August. **Read the report**.

For information, the BEA opened four investigations into accidents in the same category the previous year.

In addition, we recorded a single accident involving a French operator abroad: the collision of the Airbus A330-200 registered F-GZCB operated by Air France with a jetway, on 20 July, upon arrival at the parking area at Lomé (Togo).

3.1.3 Commercial air transport incidents and serious incidents

Last year, the BEA also opened three investigations into one commercial air transport serious incident and two commercial air transport incidents:

- loss of radar contact of the Boeing 737-800 registered EC-NGC operated by Albastar on 21 July en route between London-Stansted and Tarbes-Lourdes-Pyrénées;
- radome failure resulting in multiple flight system failures on the Airbus A350-900 registered F-HTYO operated by Air France en route on 28 May;
- damage to a right wing slat on the Airbus A380-800 registered A6-EOM operated by Emirates during the approach to Nice on 18 August.

3.2. General Aviation

Caution: from this issue, statistical graphs concerning general aviation will be established in such a way that fatal general aviation accidents occurring during non-commercial operation - in all aircraft categories, including microlights - and those occurring during commercial flights made with microlights are aggregated: the figures for previous years have been recalculated taking this aggregation into consideration.
Moreover, the figures for previous years may have been updated to take into consideration information obtained during the investigation, after the year of occurrence.
For these different reasons, the figures given for the years prior to 2023 may differ slightly from the figures published in the previous publications.

3.2.1 Overview of fatal general aviation accidents, in all aircraft categories

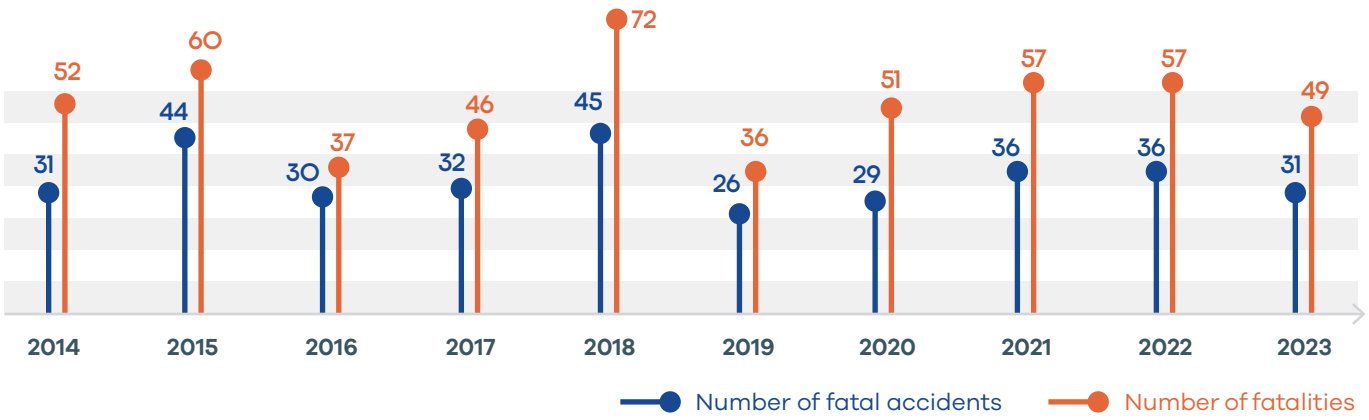
The number of fatal accidents and victims in 2023 was down slightly on 2022, at 31 and 49 respectively. The 2023 figures were slightly below the average for the last 10 years, at 34 fatal accidents and 52 victims.
These accident indicators, which are usually subject to substantial annual variations, have therefore stabilised since 2019, with no spikes. Behind these overall figures for general aviation, we can see:

- **for aeroplanes,** results similar to those in 2022 (see **paragraph 3.2.2**: 22 victims in 10 accidents in 2023 compared with 20 victims in 9 accidents in 2022);
- **for microlights** (see **paragraph 3.2.3**), a drop in the number of fatal accidents (18 compared with 24) and victims (21 compared with 32) compared with 2022;
- relative stability with a small number of fatal accidents **for glider** activities (2 fatal accidents in 2023 as in the three previous years) **and helicopter** (1 fatal accident in 2023 as in 2022).
- **for balloons,** no fatal accidents since 2016 (accidents during commercial flights are not included in this section specific to general aviation).

On the date this report was drafted, investigations are still ongoing for the majority of the fatal accidents that occurred in 2023. In addition, the facts have not yet been fully established for all ongoing investigations.

For the last four years, at the start of each year, the BEA has published a summary of the safety lessons arising from the reports published the previous year, by aircraft category, for general aviation. These summaries provide qualitative information that is advantageous in supplementing the preliminary information that may be provided within the context of this activity report.

Variation in fatal general aviation accidents (all aircraft categories) over the 2014 -2023 period



Accident to the Robin DR400 registered F-BUSU on 27 May 2023 at Laloubère

Accident to the Piper PA30 registered F-BPIR on 4 December 2023 at Villejuif

Accident to the Socata TB20 registered F-GDNU on 22 May 2023 at Lespéron

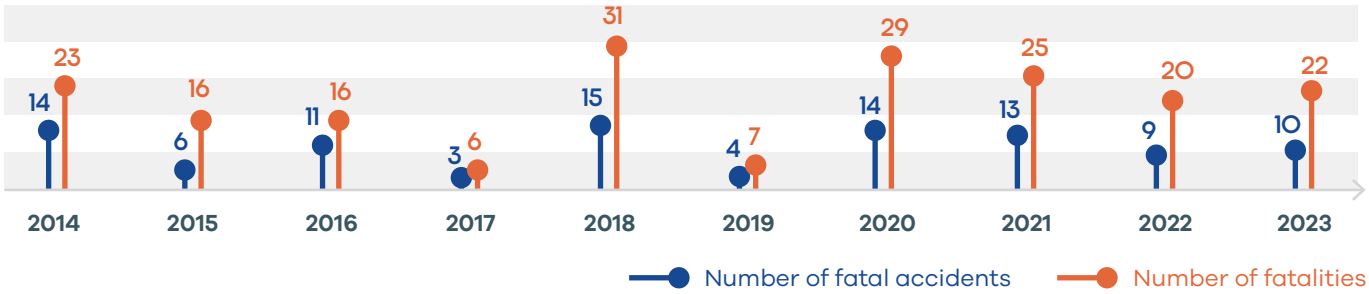
3.2.2 Overview of fatal general aviation accidents - Aeroplanes

In 2023, the number of fatal accidents involving aeroplanes operated in general aviation was in line with the average for the period 2014-2023.

The preliminary information did not reveal any key topics based on this low number of accidents. The following characteristics can be highlighted:

- six of the 10 fatal accidents involved aeroplanes operated by owner pilots;
- five accidents involved amateur-built aeroplanes or historic aeroplanes;
- four accidents occurred during the take-off or go-around phases;
- two accidents occurred en route in meteorological conditions conducive to loss of external visual references.

Variation in fatal general aviation accidents (aeroplanes only) over the 2014-2023 period



3.2.3 Overview of fatal general aviation accidents - Microlights

The results for 2022 were considerably higher than the average for the previous 10 years. In 2023, the number of fatal accidents (18) was close to the average over the 2014-2023 period (19) while the number of victims (21) fell below the average (26) for the same period.

Based on initial information collected and analysed for the 18 fatal accidents involving microlights for which the BEA opened an investigation, we noted:

- at least eight losses of control in flight;
- at least six accidents that occurred on approach or landing;
- three collisions with power lines.

These 18 fatal accidents can be broken down by class of microlight as follows:

- eight class 3 microlight accidents (fixed-wing);
- three class 1 microlight accidents (paramotor);
- three class 2 microlight accidents (flex-wing);
- two class 4 microlight accidents (gyroplane);
- two class 6 microlight accidents (microlight helicopter).

Accident and fatal accident rates per type of microlight based on the fleet size

Every six months, the DSAC sends the BEA an extract from the French microlight identification database. For each microlight class, with the exception of class 1 for which a data export problem has been identified, the BEA has recorded for the last three years (2021, 2022 and 2023):

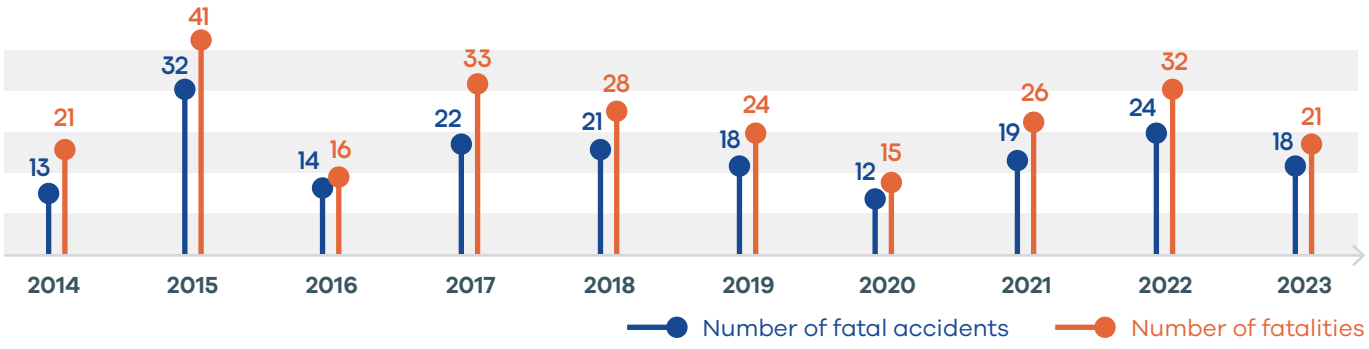
- the number of accidents;
- the number of fatal accidents;
- the number of microlights with a valid identification card on 15 December of the year in question (date of automatic export from the database each year).

The annual average over this period is as follows:

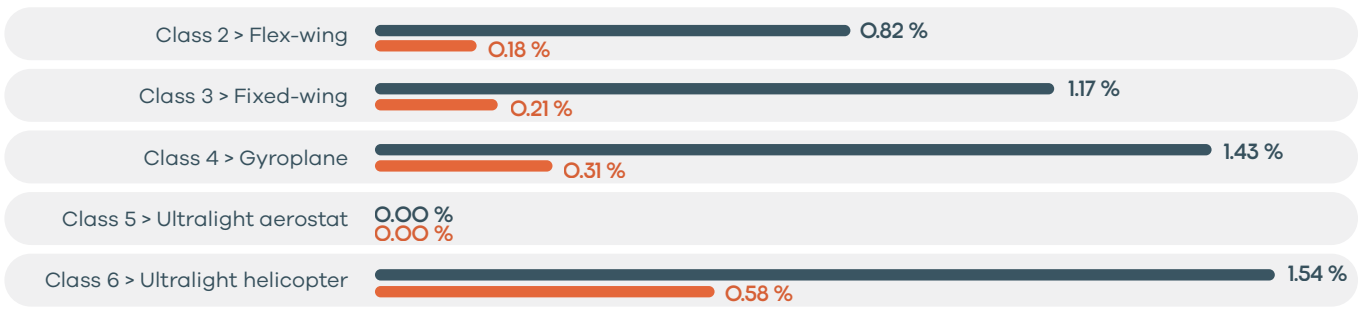
- class 2 microlights - flex-wings: 12 accidents (3 of which were fatal) for 1,506 microlights identified;
- class 3 microlights - fixed-wing: 64 accidents (11 of which were fatal) for 5,464 microlights identified;
- class 4 microlights - gyroplanes: 12 accidents (3 of which were fatal) for 862 microlights identified;
- class 5 microlights - ultralight aerostats: no accidents for 17 microlights identified;
- class 6 microlights - ultralight helicopters: 3 accidents (1 of which was fatal) for 173 microlights identified.

In the absence of activity data (flight hours or number of movements), comparing this information gives an idea of the accident and fatal accident rates based on the assumed operational fleet, for each type of microlight and for the 2021-2023 period.

Variation in fatal general aviation accidents (microlights only) over the 2014-2023 period



Accident / fatal accident rates (2021-2023) for each microlight class based on the French fleet size



04

Safety recommendations

4.1. General context

According to the ICAO, a safety recommendation is a proposal made by an investigation authority on the basis of information gathered from an investigation or a study, in order to prevent accidents or incidents.

The BEA sends most of its recommendations either to the civil aviation authority of a State or to the European Aviation Safety Agency (EASA). Some recommendations may also be sent to operators or manufacturers. They must relate to the measures to be taken to prevent occurrences which would arise in similar circumstances.

Follow-up of safety recommendations

The provisions of Regulation (EU) No. 996/2010 require, for Member States, that recipients of safety recommendations acknowledge receipt and inform the issuing authority, responsible for investigations, of the measures taken or under consideration.

This response must be addressed to the issuing authority within 90 days of receipt of the Safety Recommendation letter.

The investigation authority then has 60 days to inform the recipient of the Safety Recommendation if it considers its response as adequate or, if it disagrees with the response, to give reasons.

2023, year of update of the BEA procedures adapted to the SRIS2 system

In 2023, the rapid adoption of the SRIS2 tool, of which the installation was referenced in the 2022 activity report, and the use of its new functionalities enabled the BEA to better follow up all of its recommendations and to modernise its internal procedures.

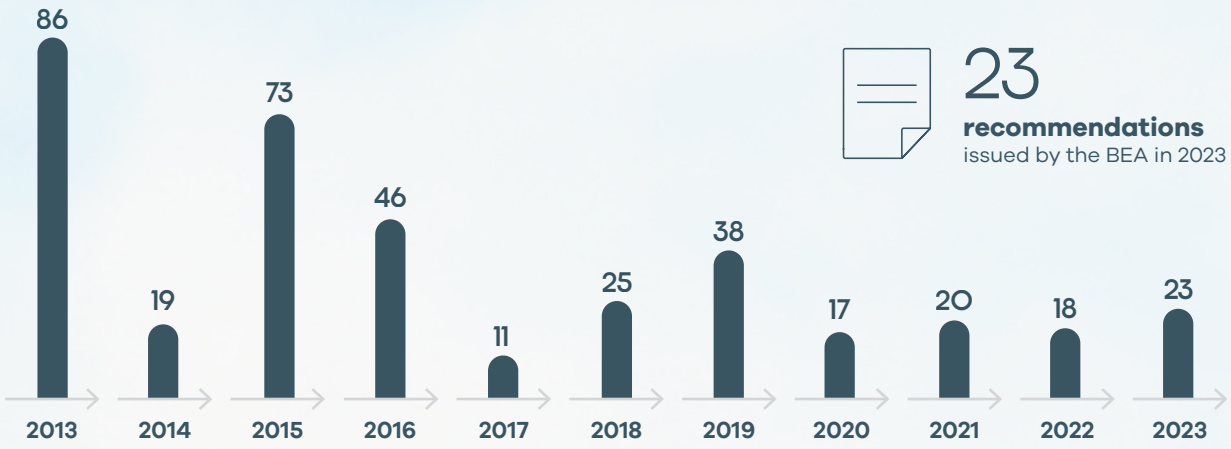
The European working group WG6 of the ENCASIA[5], dedicated to the management of safety recommendations, greatly contributed to improving the procedures of European investigation authorities by training their staff to use the SRIS2 tool.

As part of this training, a seminar was held in Cologne from 23 to 25 January 2024, bringing together all European investigation authorities to train them in the investigation data management and safety recommendations software.

The BEA is a key contributor to the work of WG6.

[5] European Network of Civil Aviation Safety Investigation Authorities. See **paragraph 6.3.2**

4.2. Safety recommendations issued

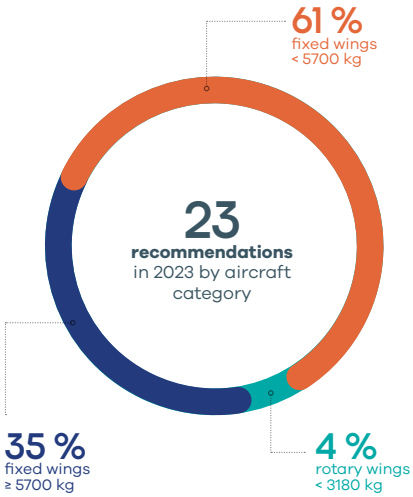


23 recommendations issued by the BEA in 2023

Breakdown by aircraft category

All recommendations issued in 2023 were made within the context of accident or incident investigations. The breakdown by category of aircraft involved in investigations that gave rise to recommendations is as follows:

Aircraft category	Safety recommendations issued
Fixed-wing < 5,700 kg	14
Fixed-wing ≥ 5,700 kg	8
Rotary wing < 3,180 kg	1
Rotary wing ≥ 3,180 kg	0
UAS (drones)	0
Other	0

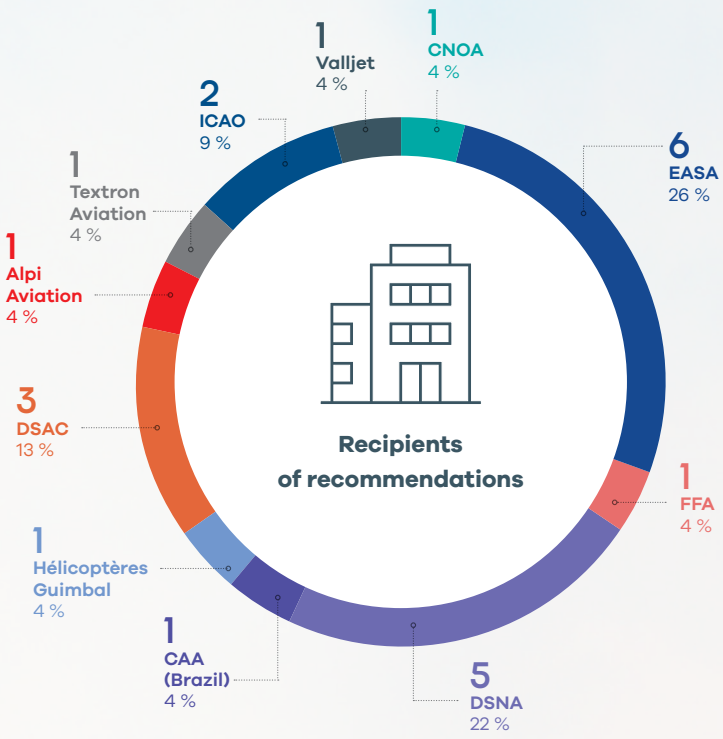


Breakdown by recipient

In 2023, 11 entities received safety recommendations.

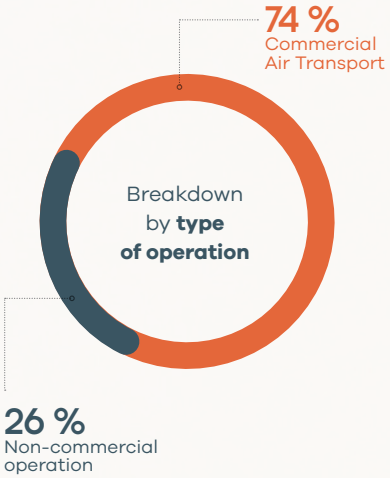
The EASA and the French Air Navigation Services Provider (DSNA) were the main recipients of recommendations, representing 48 % of the total issued.

Note: *For each recipient, the pie chart gives the total number of recommendations issued and the percentage of the total number of recommendations issued by the BEA. Due to the rounding up of the figures, the total of the percentages does not add up to 100.*



Breakdown by type of operation

In 2023, the recommendations issued by the BEA were mostly in connection with commercial air transport and not non-commercial aviation. No recommendations were issued in connection with investigations involving aircraft operated for aerial work.



Breakdown of recommendations by theme

The breakdown of recommendations issued in 2023 by theme includes 12 areas in which safety actions were recommended. The breakdown is as follows:

Note: *Several safety themes can be associated with a single recommendation*

Review of BEA investigation reports published in 2023 including safety recommendations

Nine reports published in 2023 contained safety recommendations.
All these reports followed category 2 investigations.
They concerned the following occurrences:

Accident to the Embraer EMB500 registered 9H-FAM operated by Luxwing on 8 February 2021 at Paris-Le Bourget: stall on short final in icing conditions, hard landing, rupture of main landing gear and nose gear, fire, runway veer-off.
The BEA issued three recommendations, respectively to:

- the Brazilian Civil Aviation Authority (CAA) for which it assessed (in coordination with Embraer) the improvement with regard to safety of the installation of an icing sensor on all EMB-500 Phenom 100 and the need to impose this modification on all Phenom 100 cleared for flight in icing conditions;
- the EASA to raise awareness (in a safety promotion policy) among operators to better take into consideration, from flight preparation, the landing performance of aircraft of which the performance in icing conditions differs markedly from that in non-icing conditions;
- the EASA to plan the review of certification criteria when an aircraft presents discrepancies between its performance in icing conditions and non-icing conditions such that this leads to operational constraints that crews find difficult to manage.

Read the report.

Accident to the Guimbal Cabri G2 registered F-HGRE on 18 February 2022 at Grenoble-Isère: loss of yaw control in hover taxi, collision with a pylon, in solo instruction.
The BEA issued one safety recommendation to:

- Hélicoptères Guimbal, regarding its provision to all training organisations of further information or recommendations on how to teach yaw control on the Cabri G2 as part of theoretical and practical training. **Read the report**.

Accident to the Robin DR400 registered F-BXEU and to the Alpi Aviation Pioneer 300 identified 37AHH on 10 October 2020 at Loches: mid-air collision, losses of control, activation of microlight airframe parachute, collisions with ground, microlight fire, during revenue passenger transport flights.
The BEA issued two recommendations, respectively to:

- the company Alpi Aviation, to review the assembly of the cables connecting the airframe parachute to the structure of the Pioneer 300s already delivered and in production to ensure that this system correctly complies with the given specifications;
- the EASA, to promote "out signal" interoperability of electronic conspicuity systems, for example through the development of technical solutions in order to promote safety. **Read the report**.

Serious incident to the Bombardier CRJ 1000 registered F-HMLD operated by Hop! on 20 October 2021 on approach to Nantes-Atlantique: altimeter setting (QNH) read-back error, triggering of a MSAW on final approach.
The BEA issued four safety recommendations, respectively to:

- the DSNA, to ensure that all documents relating to phraseology and MSAW procedures systematically indicate the urgency of the situation and the QNH in the event of a MSAW;
- the EASA, to develop guides in order to clarify in the SERA regulation, the procedures and the phraseology to be used by controllers to inform crews of a MSAW;
- the EASA, to initiate international actions in conjunction with ICAO to also resolve inconsistencies and ambiguities in Doc 4444 and Doc 9432 so that they systematically specify the urgency of the situation and the QNH information;
- the ICAO, to ensure that the inconsistencies between MSAW procedures and phraseology contained in Doc 4444 and Doc 9432 are removed.

Read the report.

Accident to the MUDRY - CAP10BK registered F-GGYC on 23 May 2021 at Peyrolles-en-Provence: collision with surface of a lake during an aerobatic flight. The BEA issued two safety recommendations, respectively to:

- the DSAC, to raise the awareness of the approved aviation medical examiners so that they can give suitable advice corresponding to the state of health of the pilots performing aerobatics, and prescribe, if necessary, a medical examination to assess as fully as possible their ability to withstand the physiological stresses associated with this activity;
- the French Aeronautical Federation (FFA), to make aerobatic pilots aware of the danger of certain manoeuvres which can lead to the physiological limits of the human body being reached. **Read the report**.

Serious incident to the Embraer ERJ170 registered F-HBXK operated by Hop! and to the Airbus A320 registered OO-SNE operated by Brussels Airlines on 21 October 2020 at Paris-Charles de Gaulle: Windshear warning on final approach, flight path deviation during the missed approach, abnormal proximity with an aeroplane taking off from a parallel runway, TCAS resolution advisory.
The BEA issued three safety recommendations, respectively to:

- the DSNA, to revise the demonstration of compliance with regulatory requirement ATS.TR.255 of Regulation (EU) No 2017/373, in particular the point relating to the minimum distance between runway centrelines and the divergence between departure and go-around paths for specialised simultaneous operations;
- the DSAC, to reassess its decision to approve the AltMOC submitted by the DSNA on the specific issue of the alternative means of compliance to AMC4 ATS.TR.255;
- the ICAO, to assess the appropriateness of recommending the adaptation of specialised simultaneous operations when certain meteorological conditions prescribed by the appropriate ATS authorities might cause an increase in deviations from the published flight paths to the extent that safety may be impaired. **Read the report**.

Serious incident to the Cessna 525 registered F-HGPG operated by Valljet and to the Embraer ERJ170 registered F-HBXG operated by HOP! on 12 January 2022: fault on an air data system en route, proximity with an aeroplane without activation of anti-collision systems.
The BEA issued six safety recommendations, respectively to:

- Textron Aviation, to supplement the maintenance documentation to specify the actions to be taken in the event of an air data system anomaly for all versions of the Cessna 525;
- the operator Valljet, to review its organisation, procedures and practices so that captains are encouraged to immediately record themselves in the TLB, at the end of each flight, the faults observed, without having to obtain prior validation by an operations manager or by an expert pilot, and without being concerned that restrictive measures will be taken against them;
- the DSAC, to ensure that the Valljet operator remains in full compliance with consolidated European Regulation (EU) No 965/2012 known as "Air Ops", by actively seeking all useful information in connection with maintenance operations or reports supplied by the French civil aviation safety organization (OSAC);
- the DSNA, to ensure that the emergency procedure relating to a pilot's doubt about the altitude of their flight is the subject of a quick reference card and is accompanied by recurrent training on a simulator;
- the National Air Operations Centre (CNOA), to determine the limitations of its systems and the data at its disposal in order to provide relevant information to air navigation partners;
- the EASA, to continue and complete the analysis of the risk posed by a fault on the air data system, taking into account the system as a whole. **Read the report**.

Accident to the JMB VL-3 identified 59DUJ on 19 June 2020 at Mortemer: loss of control en route, collision with ground.
The BEA issued one safety recommendation to:

- the DSNA, to review the organisation of the flight information service, the positioning of this service in relation to all air services provided by the DSNA and the training of staff providing this service in French airspace. **Read the report**.

Serious incident to the Airbus A320 OE-INE operated by easyJet and to the Robin DR400 registered F-GTZY on 31 December 2022 at Bordeaux: clearance to land on a runway occupied by another aeroplane at runway threshold.
The BEA issued one safety recommendation to:

- the DSNA, to equip the control centres with an automatic and nominative system to record the presence of controllers in position and at the workplace, and ensure that this information can be used by the DSNA services, in particular to ensure the appropriateness of staffing levels and to enable the analysis of safety events. **Read the report**.

4.3
Responses to safety recommendations

As regards the follow-up to the 23 recommendations issued by the BEA in 2023:

7
recommendations received a favourable response and were closed by the recipient

8
recommendations received a response from the recipient indicating that action was under way

7
recommendations are still awaiting a response from the recipient

1
recommendation was not followed up due to a disagreement between the BEA and the recipient of the recommendation

4.4
Performance indicator for safety recommendations

The BEA has established a recommendation performance indicator based on a qualitative evaluation of the appropriateness of the action envisaged or actually taken by the recipient in comparison with the action expected by the BEA.

For each recommendation issued, the BEA recommendations board (COREC) will assign a performance indicator (between 0 and 1):

- either when it decides to close the follow-up;
- or when receiving the final response from the recipient.

The recommendation general performance indicator is then determined by calculating the mean value of the indicators of each recommendation evaluated.

In 2023, the BEA closed the follow-up to 15 recommendations, 8 of which were issued that year.

The value of the indicator for 2023 was 0.80 compared with 0.98 the previous year.

The following table shows the breakdown of the appropriateness of the responses to these recommendations for each of the main recipients: As shown in this table, the value of the indicator and its drop compared with the previous year are due to disagreements (response deemed inappropriate/disagreement) between the BEA and the EASA on two recommendations.

Appropriateness of responses to the BEA's recommendations in 2023, by main recipients

Recipients	Number of recommendations	Appropriate responses	Inappropriate responses	Level
DSNA	4	4	0	1
EASA	5	3	2	0.6
DGAC	2	2	0	1

05

Activity of the laboratory
(Engineering department)

5.1

Overview of Engineering Department activity in 2023

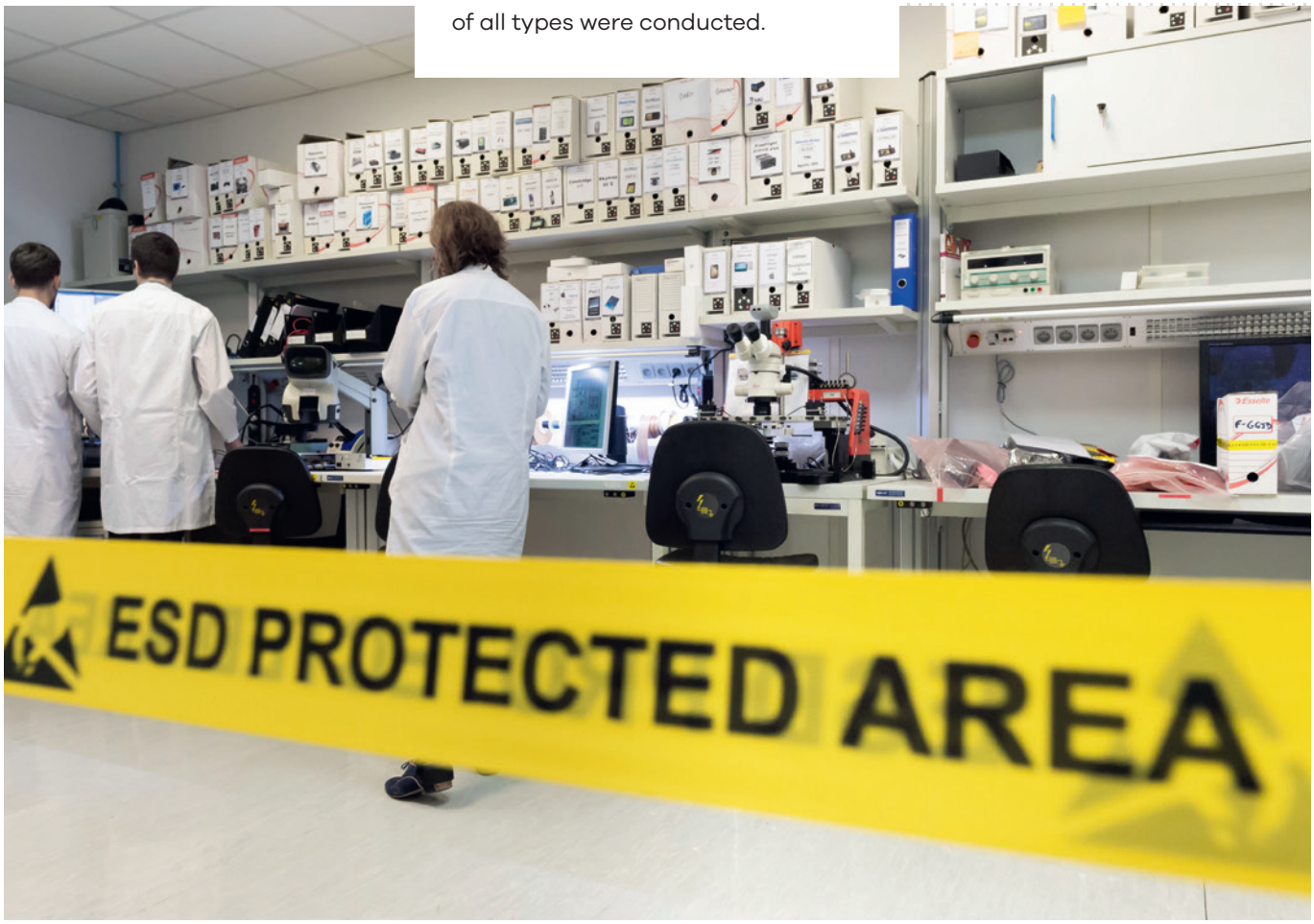
The Engineering Department is responsible for conducting and supervising examinations performed as part of investigations and studies on specific topics. Within this context, it develops, within its laboratories, the necessary tools and skills to maintain a high level of expertise in the fields most called upon by the investigations, and it develops its network of external partners who may conduct examinations under its supervision.

These examinations may be conducted:

- as part of investigations conducted by the BEA;
- as part of investigations conducted by foreign organisations for which BEA was designated an ACCREP (**see paragraph 1.1**);
- or as part of investigations conducted by foreign organisations for which the BEA was not designated an ACCREP: the BEA therefore provides technical assistance to the third-party country.

In 2023, a total of 440 examinations of all types were conducted.

440
examinations conducted
in 2023



5.2

Work by PESA (flight recorders and avionic systems section)

5.2.1 Flight recorders

In 2023, 26 voice recordings (CVR) and 48 flight data recordings (FDR or maintenance recorders) were read out at the BEA, representing a total of 74 recordings. This level is lower than that of the previous year (100 recordings in 2022). Most of these recordings concerned investigations in which the BEA participated as an accredited representative, or work carried out as part of the provision of technical assistance to third-party countries.

	BEA investigation	BEA ACCREP	Technical assistance	Total
CVR recordings read out at the BEA	6	16	4	26
FDR recordings read out at the BEA	11	33	4	48

5.2.2 Avionics systems

In 2023, the Avionics lab read out 104 computers*, and carried out work on photo and video recordings as well as on laptops and smartphones, totalling 165 examinations (compared with 186 in 2022, 173 in 2021 and 161 in 2020).

	BEA investigation	BEA ACCREP	Technical assistance	Total
Computers*	70	32	2	104
Laptops/Smartphones	25	4	0	29
Photo/video recordings	24	8	0	32

*The term "computer" groups various types of avionics and Global Navigation Satellite System (GNSS) equipment.

5.2.3 ATM recordings

In 2023, 63 occurrences led to work on ATM[5] data, based on radar data or ATC[6] exchanges, including seven examinations of data from Flight Radar 24 Live Tracking systems. This type of work related essentially to investigations led by the BEA. ATM work by type of investigation was split as follows:

	BEA investigation	BEA ACCREP	Technical assistance	Total
Number of events	60	3	0	63

[5] Air Traffic Management.
[6] Air Traffic Control.

5.2.4 PESA development work

For many years now, PESA has been involved in development work aimed at adapting to the new technologies of aircraft in service and their equipment, as well as improving the quality and speed of its examinations and analyses.

Developments in flight recorder reading capabilities

The BEA intends to maintain its reading capabilities for all flight recorders equipping the French fleet and aeroplanes manufactured in France. In this context, in 2023, the laboratory extended its capabilities to the Honeywell LightWeight Recorder equipping Dassault Aviation's Falcon range (acquisition of a Golden Chassis unit designed to be used for investigations, and development of associated procedures).

Developments in image and video processing

For two years, the laboratory has been working on implementing 360° cameras (increasingly used) in its technology tools, including in the recreational aviation field.

In 2023, a major development consisted in developing techniques enabling a return to the raw data saved by these cameras - i.e. "unproject" - images: the images captured by these cameras are digitally transformed to create a fluid 360° image without masking or discontinuity effects.

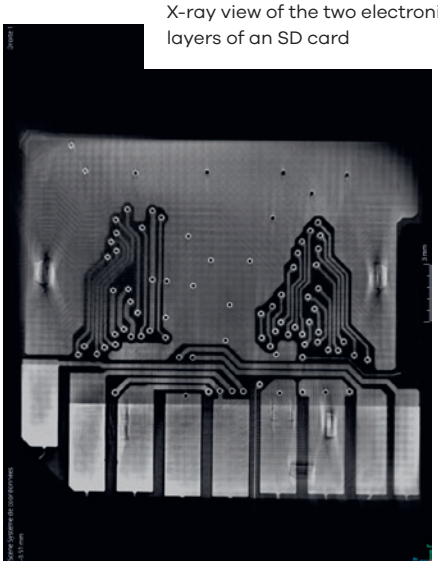
Work is currently focused on how to implement the modelling functions of this type of camera in photogrammetric tools (IGN's MicMac tool to which the BEA also contributed).

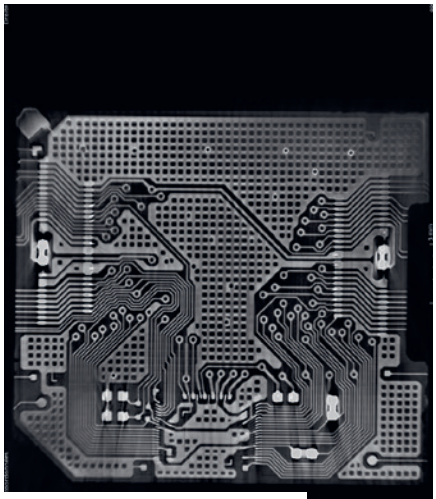
In addition, within the context of the continuous improvement of these path data tools in QCIS (geographical information system) enabling all types of geographical data to be displayed, the BEA began to use a database based on AIS (Aeronautical Information Service) publications: this involves retrieving raw data from the AIS to feed a geographical and time-based database in order to obtain valid data on a given date). This work subsequently allows this data to be used in QCIS and other software, comparing it with data associated with an event being investigated.

Developments in the Avionics Lab

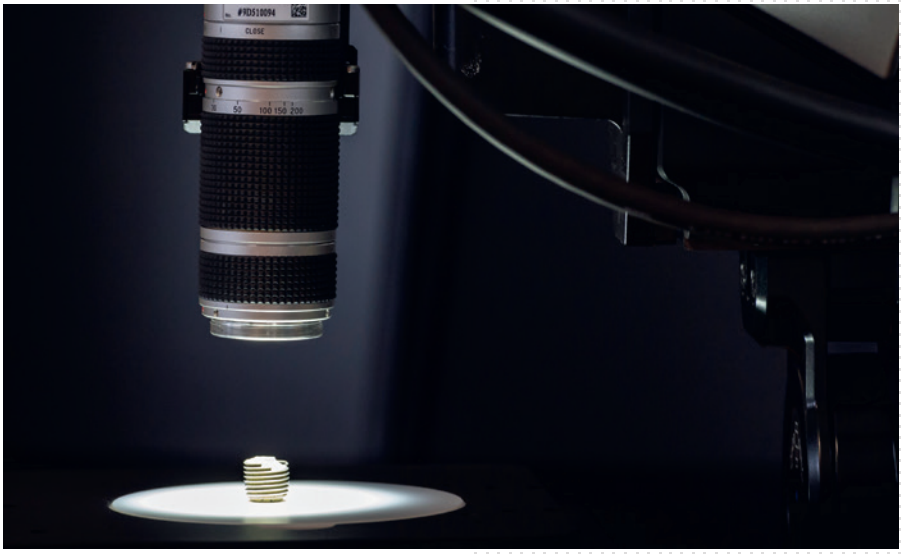
In 2022, the BEA started developing a new software for decoding binary data extracted from avionics systems examined in the laboratory: unlike flight recorders that use a relatively standardised data format, the systems examined in the avionics laboratory were very varied, requiring a capacity to process a large number of file formats and engineering data conversion software. The software is scheduled to be operational in September 2024.

X-ray view of the two electronic layers of an SD card





X-ray view of the two electronic layers of an SD card



In 2023, the laboratory also made substantial progress in the examination of damaged SD cards by notably developing tools designed to check the integrity of the cards, as well as NAND component reading means in the event of damage.
It also acquired a thermal camera to analyse electronic component or card failures.

Developments in aeroplane performance

At an AIP (Air Investigation Performances) meeting organised by its Canadian counterpart, the BST, in Ottawa in 2023, the BEA presented developments in methods used to estimate the aerodynamic coefficients of an aeroplane based on its geometry.
AIP meetings provide an opportunity for safety investigation authorities the world over to compare their know-how in the field of performance calculation, and to develop their tools. The previous AIP meeting was held at the BEA in 2019.
The method of estimating aerodynamic coefficients, for which validation is ongoing, uses the data digitised by the BEA from a Partenavia P68 as well as data digitised by its American counterpart, the NTSB, from a Cessna 208.

Developments concerning sea search capabilities

In 2023, a team of three people from the BEA attended the aeronautical part of the TIS (Technicien en Identification Subaquatique - *Underwater Identification Technician*) training course organised by the Gendarmerie's national nautical training centre. Attending the course enabled the BEA to maintain contact with police (gendarmerie) divers likely to be called upon following an air accident in water (sea, lake, river), to share with them its methods of gathering factual information, and to assess the options for photographing or removing items during a dive to a submerged aircraft.

This meeting also provided the opportunity for divers to get to grips with the BEA's transmitter detector: transmitters attached to flight recorders activate when they are submerged in water to enable their location.
A team from the BEA also took part in tests in Geneva lake within the context of a collaboration with its Swiss counterpart, the SESE, to develop methods for detecting 8.8 kHz signals from underwater transmitters now fitted on commercial air transport that must facilitate the search for an aircraft in the event of an accident in the sea or in a lake.

EGPWS bench[7]

The EGPWS is an onboard computer that triggers alarms in the cockpit when it detects the abnormal proximity of an aircraft to an obstacle or to the ground. To improve the system, the computer saves flight and diagnostic parameters in its internal memories. As this information is of interest to safety investigations, the BEA's avionics lab developed a bench for downloading EGPWS data.
This bench is configured for EGPWS manufactured by Honeywell that equip a high number of commercial transport aircraft. The download procedure proposed by Honeywell was validated by the BEA on test units and was successfully used within the context of a safety investigation.

[7] Enhanced Ground Proximity Warning System.

5.3

Work by PSEM (Structure, equipment and engines section)

5.3.1 Examinations carried out

In 2023, the PSEM carried out 138 examinations (compared with 166 in 2022).
The examinations carried out can be broken down as follows:

	BEA investigation	BEA ACCREP	Technical assistance	Total
Wreckage examinations	40	4	0	**44**
Engine and propeller examinations	6	3	0	**9**
Fluid examinations	4	0	0	**4**
Equipment examinations	58	23	0	**81**

5.3.2 Development of the PSEM

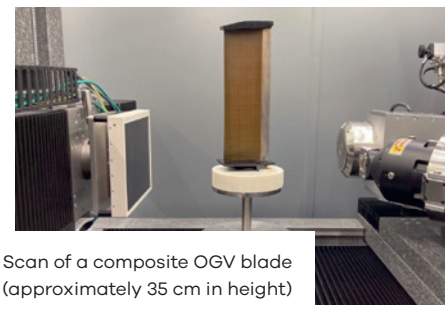
Inauguration of a new laboratory

Feedback concerning its investigation process confirmed the interest for the BEA to have a laboratory better equipped to analyse the materials and items retrieved from wreckages, enabling in particular the examination of larger parts and the hosting of foreign delegations playing a key role in major international investigations. The decision to create the new laboratory was therefore made in 2022. Part of the BEA's building needed to be rebuilt to house the lab and planning permission was granted in June 2022 by the Prefect of Seine-Saint-Denis, following a favourable opinion from the Bâtiments de France architect. Work began at the end of November 2022 and was completed in autumn 2023.

Covering a surface area of nearly 350 m², the new laboratory is equipped with the latest generation of analysis equipment, including a tomograph for the three-dimensional examination of large mechanical parts. The laboratory is scheduled to receive a field emission electron microscope (FEG) in 2025.

Delivery of a new tomograph

At the beginning of 2021, the BEA launched a tender to replace its radioscope with a tomograph to be able to scan larger samples while maintaining a capacity for ultra-high resolution examination.
Tomography is an imaging technique that can be used to create virtual cross-sections of an object using X-rays. It therefore gives access to information contained inside an object, without the need to alter the object, i.e. by cutting or disassembling it. It can be especially useful in determining the internal state of an item of equipment such as a computer, a smartphone, an engine part, or a composite structure part.
It works in the same way as a medical scanner: several hundreds of radio waves are picked up by the system when the object being studied is rotated. The difference in the density of the component materials of the object is shown in different shades of grey, as on a medical x-ray. When the image has been captured, software is used to reconstruct the volume of the object in three dimensions using all of the views. This digital volume can then be used to visualise the object in 3D, and also to visualise internal cross-sections in any required direction.
The solution chosen at the end of the tender was an EasyTOM XL Ultra 160-230 manufactured by RX Solutions, a French company located near Annecy. Equipped with two X-ray generators, this new tomograph enables the scanning of small objects with a very sharp resolution of up to µm - for example electronic board memory components - as well as the scanning of large samples measuring up to 32 cm in diameter and 60 cm in height. The 8 t unit was installed in autumn 2023 in the heart of the new PSEM laboratory.



Scan of a composite OGV blade (approximately 35 cm in height)

The BEA's tomograph in its new space

06

International activities

training actions and institutional relationships

The BEA undertakes many activities on the European and international scenes: communication activities through its participation in international conferences, the setting up of cooperation agreements with foreign investigation authorities, organising training seminars in France and abroad and participating in working groups in European and international organisations (in particular the European Union, ECAC and ICAO).

6.1
Communication activities in professional field

The BEA regularly participates in conferences and expert meetings. This allows the BEA not only to spread safety messages from investigations that it has led or participated in, but also to make its investigation expertise more widely known internationally. This sharing of lessons drawn from investigations and the keeping of close contact with its counterparts are essential for the success of its work during investigations abroad.

The most noteworthy international conferences and meetings attended by the BEA in 2023 were:

- **The GA-ASI General Aviation Air Safety Investigator:** at this seminar for international general aviation investigators, held in Dallas (USA), one BEA investigator presented an investigation topic on the subject of the failure of an air data system en route, proximity with an aeroplane without activation of anti-collision systems.
- **The ISASI (International Society of Air Safety Investigators):** this year's annual ISASI seminar was held in Nashville (United States). The two BEA officials who attended the seminar presented a paper on the topic of the simultaneous inputs of pilots on the controls during an approach to Paris-Charles de Gaulle.
- **The ESASI (European Society of Air Safety Investigators):** the ESASI is chaired by a BEA official. The annual seminar was held in April 2023 in Bratislava (Slovakia). A BEA investigator gave two presentations at this event:
  - the first, in conjunction with an Airbus investigator, focused on the actions at the site of an Airbus A330 accident at Cebu, in the Philippines in October 2022;
  - the second focused on a serious incident during an approach to Paris-Charles de Gaulle and the topic of erroneous QNH information, near-CFIT, a low-level go-around before the runway without visual references.
- **The Eurocontrol Workshop** *"Safety of Vertical Navigation on Final Approach":* the BEA was asked to present its investigation into the serious incident during an approach to Paris-Charles de Gaulle on the topic of erroneous QNH information, near-CFIT, a low-level go-around before the runway without visual references, which it also presented at the ESASI seminar. This double presentation of the same event at two international conferences demonstrated the interest of the different aeronautical community sectors (ATC sector, aerial operations sector, etc.) in some investigations conducted by the BEA.

6.2
Collaboration with foreign investigation organisations

Through its experience and know-how, the BEA is recognised as one of the most important safety investigation authorities. As such, it is regularly consulted by many States for assistance relating to the correct implementation of the standards and practices recommended by the ICAO. It is in this context that the BEA regularly signs Declarations of Intent for Cooperation in investigations into civil aviation accidents, with foreign investigation authorities: in total, 61 Declarations of Intent for Cooperation are currently in force.

In particular, these cooperation agreements propose assistance, within the bounds of reasonable limits, in case of a major investigation. One of the main outcomes of this co-operation is the provision of technical assistance by the PSEM and PESA sections of the Engineering Department (this technical assistance activity is described in **chapter 5**).

Three Declarations of Intent for Cooperation were signed in 2023:

- the Declaration concerning Argentina superseded a previous agreement, which became obsolete when the Argentinian investigation authority became multimodal;
- two Declarations with the investigation authorities in Libya and Uganda.

6.3
Participation in the work of international organisations

6.3.1 ICAO

The BEA plays an active role in several of the ICAO's groups of experts:

Accident Investigation Group Panel (AIGP): the BEA chairs this group of experts, which is mandated to study amendments to Annex 13 and to investigation manuals. The plenary session of the AIGP was held face-to-face in 2023 at the ICAO in Montreal. The activity of the AIGP Working Groups (WG) was conducted as usual in 2023, largely by video conference, the working method adopted for this activity some time back.

Among the working groups in which the BEA is particularly engaged, we note:

- The WG24, which was formed following the accident of flight PS752 in Tehran on 8 January 2020, to examine the provisions of Annex 13 in the event of an accident linked to an act of unlawful interference and/or in the event of a conflict of interest in the investigation process, when such investigation is conducted by a State responsible, for example, for a missile launch.
- The WG20, which is responsible for analysing the reasons why some investigation authorities do not make all final investigation reports public after accidents involving commercial air transport aeroplanes.
- The WG14, which is responsible for proposing standards for Annex 13 and for drafting SRGC[8] for the ICAO investigator's manual.
- The WG25, which deals with providing information to air accident victims and their families.
- The WG23, which helps the ICAO to revise Document 9946 on regional authority investigation organisations (RAIOs) to include other investigation cooperation mechanisms (ICM). From this point of view, the group distributed a survey to all ICAO States in order to:
  - examine the involvement of States in all types of cooperative investigations into aircraft accidents,
  - identify the types of existing investigation cooperation mechanisms, their strengths and their challenges, and to assess the level of implementation,
  - gather the opinions of States on the way in which Document 9946 can be improved to incorporate the different types of ICM.

The BEA chairs WG14, WG20 and WG25.

[8] Safety Recommendation of Global Concern

***Flight Recorder Specific Working Group* (FLIREC-SWG):** this group of experts is responsible for proposing amendments to ICAO Annex 6, particularly with respect to the carrying of flight recorders, the location of aeroplanes in distress and the retrieval of flight data. It held its plenary session by video conference in 2023.

***Occurrence Validation Study Group* (OVSG):** this group reviews accidents and incidents which occurred the previous year to establish statistics per occurrence category and develops the database of accidents and incidents used by the ICAO to establish general statistics regarding global aviation safety.

ICAO's RASG[9]-EUR: under the umbrella of this group, the BEA is involved in the EASPG[10], which brings together 52 European States and whose work particularly focuses on developing methods and implementing shared tools for occurrence reporting and data analysis. One meeting of the group was held "face-to-face" at the ICAO regional office in Paris in 2023, and another "remotely". It should be noted that the EASPG usually also offers an opportunity to strengthen relations with authorities in Eastern European countries (Russia, Georgia, Ukraine, etc.), but the conflict situation in Ukraine affected some of these relations in 2023.

In addition, the ICAO's regional offices organise meetings or workshops for regional investigators in some regions of the world. France is involved in facilitating cooperation between investigators in the South Pacific and Asia (APAC-AIG) and North, Central America and Caribbean (NACC-AIG) regions, which include overseas departments and territories. One BEA staff member actively participated in "remote" meetings held in 2023.

6.3.2 European Union

European Regulation (EU) No. 996/2010 created the ENCASIA[11] network, which incorporates all European investigation authorities (as well as members of the European Economic Area (EEA)). This network aims to coordinate their work and to promote the sharing of experiences. The BEA's Director relinquished his chairmanship of ENCASIA in 2023, after serving for two terms and a total of six years.

In the context of ENCASIA's work, the BEA remains a key player in the various permanent working groups. The BEA is very involved in the following working groups:

- WG3 (promotion of mutual support between all European investigation authorities), the main aim of which is to guarantee that all air transport accidents, wherever they occur throughout Europe, are the subject of a suitable investigation and that lessons are learnt and shared to avoid any repeat occurrences. The ENCASIA Mutual Support System (EMSS) provides one example of the BEA's extensive involvement in a medium to long-term project.
- WG4 (logistical aspects and training), which in particular organised an ENCASIA workshop on relations between safety investigation authorities and judicial authorities on 16 and 17 November 2023. This initiative brought together around 60 people from investigation and judicial authorities in various European countries to discuss a number of topics, such as access to data, the proportionality test, protection of sensitive data, etc.
- WG5 (Peer Reviews): European Regulation 996/2010 stipulates that the ENCASIA implements a Peer Review programme for all European Union Member State safety investigation authorities. Within this context, WG5 was established in 2014 to define an initial framework and launch a review programme. This programme was carried out over six years, after which time a decision was made to implement a second review phase, aimed more particularly at assessing the capacity of different States to conduct investigations into major commercial air transport accidents. A new framework was therefore defined by WG5, and a phase-two review programme was developed: two initial States were the subject of a phase-two review in 2023. In addition, the ENCASIA's internal regulations specified that non-member States of the Union could be admitted to the ENCASIA as observers. One of the prior conditions to this membership was that the applicant State had to submit to a Peer review. Following Ukraine's application, a review was conducted in 2023 by a panel of three European investigators, chaired by a BEA investigator. The review report was sent by the panel to the chairman of the ENCASIA. The ruling on Ukraine's membership as an observer of the ENCASIA is currently under discussion.
- WG6 (Safety Recommendations): this group is heavily involved in developing the new version of the ECCAIRS European repository, which notably comprises a safety recommendations module. The monitoring of these developments is deemed particularly important by the ENCASIA to ensure the sustained availability of safety lessons (details concerning the work of this group are given in **chapter 4**).

[9] Regional Aviation Safety Group – Europe
[10] European Aviation System Planning Group
[11] The ENCASIA's annual activity report is available at https://transport.ec.europa.eu/transport-modes/air/about-encasia-network/encasia-activities_en

6.3.3 European Civil Aviation Conference (ECAC)

The Group of Investigation Authorities (ACC), bringing together the 44 Member States of the ECAC, is a forum for sharing feedback. It enables the BEA to give an update on its investigations in progress to its European counterparts. Two meetings were held in 2023, the first in Bratislava (Slovakia) in April and the second in Paris in October. These meetings were an opportunity for the BEA to present various aspects of its investigations, ranging from the methods used to process serious incidents at the BEA, to case studies such as the stalling of an aeroplane on short final in icing conditions at Le Bourget. In addition, the BEA also presented the activities of the AIGP and the progress of ENCASIA's work (see **paragraphs 6.3.1 and 6.3.2** above).

6.3.4 European Aviation Safety Agency (EASA)

EASA's role is to ensure safety and environmental protection in civil aviation in Europe. Every year, it organises many events (seminars, meetings, etc.) in which the BEA regularly participates. For 2023, these included:

- **The annual EASA-CASIA meeting** between the European SIAs and EASA, aiming to improve the coordination of safety investigations, discuss the events of the past year, review the follow-up of safety recommendations issued by the investigation authorities, and circulate information from EASA to the European SIAs.
- **The ECCAIRS Steering committee,** whose role is to validate developments to the ECCAIRS 2.0 repository, used by Member State investigation authorities and civil aviation authorities (this event is organised each year by the European Commission).

EUROCAE is an organisation that publishes reference documents on specifications for onboard systems.

- **The annual meeting between EASA and the FAA,** the US civil aviation authority.
- **The EU-China partnership project:** With the European Commission initiating a partnership in the field of civil aviation between the European Union and China (APP), EASA is monitoring and coordinating this project. The project encompasses a number of subjects, including that associated with investigations into accidents and incidents, and focuses on further discussions involving the Chinese investigation authority (CAAC), European investigation authorities (EASA), and European and Chinese manufacturers and operators in the field of investigations into aircraft accidents and incidents. Some challenges were identified, especially cultural differences that can hamper the smooth running of safety investigations.

In 2023, this project included the visit of a Chinese delegation to France from 19 to 27 September. On the first day of the visit, the delegation stopped at the BEA to give a presentation to the BEA's managers and investigators on the conducting of investigations in China. The BEA's Director also shared how investigations are conducted in France. These presentations gave rise to open and fruitful discussions aimed at further involving accredited representatives in safety investigations conducted in France or in China. Following this, a BEA investigator accompanied the Chinese delegation to a meeting with French manufacturers, namely Airbus Helicopters in Marseille, then Airbus and ATR in Toulouse. In week two, the delegation visited the premises of EASA in Cologne before meeting with ENCASIA investigators at a plenary session in Brussels.

6.3.5 EUROCAE[13]

EUROCAE is a European organisation that publishes reference documents on specifications for onboard systems. EUROCAE works in close coordination with the RTCA[14], its American counterpart, in many fields. EUROCAE and RTCA documents are written by representatives of the aeronautical community. The BEA actively took part in a number of Working Groups, which met via video conference in 2023: we note in particular WG118, created in 2020, which reviews specifications concerning flight recorders (ED-112A) and light flight recorders (ED-155) and is planning to develop new specifications for the recordings of UAS[15] and RPAS[16].

[13] EURopean Organisation for Civil Aviation Equipment.
[14] Radio Technical Committee for Aeronautics.
[15] Unmanned Aircraft System.
[16] Remotely Piloted Aircraft System.

6.4

Investigator training organised by the BEA and BEA participation in ENAC training

The investigator training organised by the BEA generally comprises each year:

- **Two identical two-week training sessions covering "Basic Investigation Techniques".** These courses are mainly intended for investigators recently recruited by the BEA and for Field Investigators (FI). Two places are systematically reserved in each session for the air transport gendarmes (GTA) and, subject to availability, places are offered to French-speaking foreign investigators. An Andorran investigator attended the October training course. We note that agreements signed between France and Andorra specify that the BEA will be responsible for conducting a safety investigation following the occurrence of an event in Andorra.
- **One advanced training course for commercial air transport investigators:** this two-week phase 3A course is intended for experienced investigators. Sixteen participants took part in this training in November 2023:
  - two BEA investigators;
  - ten investigators from foreign countries (Italy, Romania, Germany, Lithuania, Finland, Austria, Poland, Dominica, Sweden);
  - one investigator from the Bureau Enquêtes Accidents pour la sécurité de l'aéronautique d'État (BEA-E) (French Civil Aviation Safety Investigation Authority);
  - three industry (Daher) and airlines (HOP! and Air France) investigators.

In common with the previous sessions, the marked variety of participants gave rise to some particularly fruitful discussions, enhancing the training experience for all of the investigators.

The Phase 3A training course is co-organised with the École Nationale de l'Aviation Civile (ENAC), with which the BEA signed a framework agreement, stipulating that specific agreements can be signed to define joint actions. This Phase 3A training is the subject of specific agreement No. 1 regarding the collaboration to be set up for commercial air transport training. Under the framework agreement, participants other than BEA investigators now pay for this training.

Furthermore, each year, the BEA participates in different training courses provided at the ENAC in the form of safety investigation information modules:

- **ENAC Engineers' Course** (IENAC-major OPS-2nd year): two half-days per year;
- **ENAC Engineers' Apprenticeship Course** (IENAC-APPR-2nd year) two half-days per year;
- **Control Engineers' Course** (MCTA - Air Traffic Control and Management): two half-days per year;
- **Higher Technicians' Course** (GSEA): two half-days per year;
- **MS-MSA Master** (Safety Management in Aviation): one day per year;
- **MS-AM Master** (Airport Management): one half-day per year;
- **MS-ASAA Master** (Aviation Safety / Aircraft Airworthiness): one half-day per year;
- **NAVIG training course** (Aircraft Airworthiness): one half-day per year.

All of these courses were delivered face-to-face in 2023.

Institutional relationships

Work to ensure coordination between the BEA and the Civil Defence Services in the scope of aviation accidents

The context

In March 2016, feedback following an exercise performed at an airport highlighted the need to update the specific ORSEC airport plan provisions (DSOA) and the specific SATER provisions (DSO-SATER) pertaining to aviation accidents. Indeed, during this exercise, it was noted that an emergency organisation plan had failed to take into account the mission and actions of the BEA in the system diagram.

A systemic way of updating and amending plans taking into account the prefectorial authority's steering action and local variabilities was the subject of Interdepartmental Letter INTK1701919J, issued on 30 January 2017 and co-signed by the office of the Secretary of State for Transport, the Sea and Fisheries, and the Home Office, asking prefects to amend their ORSEC and SATER systems pertaining to aviation accidents by incorporating the mission and actions of the BEA.
This letter initiated a cooperation between the BEA, the DSNA-SAR department and the ARCC Lyon and the French General Directorate for Civil Defence and Crisis Management (DGSCGC, BPERE) based on feedback from safety investigations concerning the implementation of search and rescue operations and the organisation of the emergency services.

Meaning of abbreviations and acronyms:

ORSEC:	Civil Defence emergency management
DSOA:	Specific ORSEC airport provisions
DSO-SATER:	Specific ORSEC provisions devoted to air-land rescue
SAMAR:	Air-sea rescue
DSNA-SAR:	Search and Rescue department of the French air navigation services provider
RIM-SAR:	Interdepartmental Search And Rescue meeting
ARCC:	Aeronautical Rescue Coordination Centre

Actions carried out since 2021

The preliminary BEA-DGSCGC agreement, reviewed on 18 May 2021, updates the cooperation between the authorities involved in the specific aeronautical ORSEC provisions (DSOA and DSO SATER):

> BEA-DGSCGC coordination:
The annual meetings postponed during the lockdown periods in 2020 and 2021, went ahead, continuing discussions motivated by feedback from investigations.

> Update of the ORSEC airport and SATER measures:
The DSOAs and DSO-SATERs must be updated by the prefectures every five years. Since 2017, the BEA has helped to update and amend some plans twice, in coordination with the ARCC Lyon and the DSNA/SAR department on the one hand, and the services concerned on the other hand.

> Participation in DSOA and DSO-SATER exercises:
The BEA was invited to take part in different types of exercises organised by the prefects in the departments concerned ("management" and "field" exercises). Firstly, these exercises enabled the BEA to test the prefecture's notification system, to establish the right communication channel, in particular with the operations control division and, when necessary, to take part locally in some phases of the exercise. The scale of the measures put to the test during these exercises is large enough to deal with major accidents. Therefore, while Field Investigators were intended to intervene for light aviation, the BEA offered to develop their skills by engaging them in these ORSEC exercises. Assuming a role that differs radically from their role in light aviation, the Field Investigators may be required to work alongside the Director of Operations (DO) in the system's departmental operational centre (COD). Their role consists in ensuring continuous dialogue between the authority that controls the State services and the duty investigators at the BEA as far as possible, in particular when establishing the go-team.

> Participation in interdepartmental SAR meetings (RIM-SAR):
Since 2018 and in pursuance of the 2017 interdepartmental letter, the BEA has been fully associated with the annual RIM-SAR meeting organised by the DSNA-SAR department. The meeting brings together the different stakeholders involved in the SATER, SAMAR and ORSEC measures (authorities, civil and military organisations, etc.). This meeting takes stock of activities carried out the previous year, and of the problems encountered by the SAR service stakeholders, with the aim of strengthening and, if necessary, developing cooperation between authorities. In 2023, the ARCC Lyon acknowledged the support provided by some BEA investigations in promoting the SAR culture and directives, in particular the dominant role of the ARCC Lyon in metropolitan France.

> Interface in the context of assistance with safety investigations and participation in working groups:
In some safety investigations, the investigator in charge was confronted with issues regarding the location of aircraft involved in accidents, equipped or not with an ELT, as well as specificities regarding the deployment of air assets. Insight gained into SAR feedback by these safety investigations contributed to a reflection and action process at both local and national level. Thus, the BEA systematically receives reports on search and rescue operations issued by the ARCC-Lyon, and received invitations to join working groups coordinated by the DSNA-SAR department. The SAR FEEDBACK WG is a consultation and working group that increases the synergy between stakeholders based on the reality in the field, especially through safety investigations.

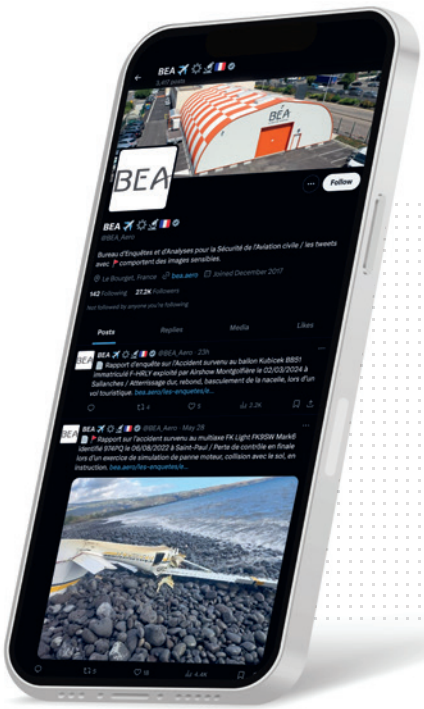
07

Information and communication actions

7.1

Relations with the families of victims

In compliance with European Regulation No. 996/2010, before publishing its findings, the BEA informs the families of victims and sends the investigation report to those who have requested to receive a copy. In the case of a particularly complex report, or when required by the circumstances, the BEA can also offer to hold a meeting with the family to present the investigation and its findings before they are published.
In 2023, two meetings were therefore organised with the families of victims of microlight accidents that occurred respectively in 2020 (this meeting took place in Belgium) and in 2022.



7.2

Translation policy

Since 2020, all of the BEA's publications have been translated into English. This will optimise the visibility of publications (technical reports, final investigation reports, recommendations, etc.) and extend their international reach. Whilst most reports are translated in-house, some are outsourced depending on the workload of the in-house translators.
The English version is, on average, published one month after publication of the initial French report.
In 2023, 110 investigation reports of the 144 published were translated (27 translations of investigation reports that were published in French in previous years must be added to this number). Four reports, including safety recommendations issued by the BEA, were published simultaneously in French and in English.

Of the 110 investigation reports published in French and in English in 2020:
> two are ICAO reports;
> five are level two commercial air transport reports;
> fifty-three are level two general aviation reports;
> fifty are level three reports.

7.3

Social media

The BEA continues to create X (formerly Twitter) feeds, on the one hand to provide notification of investigations opened, Go-Team dispatches to sites and its publications year round and, on the other hand, to provide real-time information about major crises.
The BEA has also released two videos on its YouTube channel, a virtual tour of the BEA, in particular the new laboratories opened at the end of 2023, and a presentation of the work of its investigators at an accident site.

7.4

Document devoted to the history of the BEA

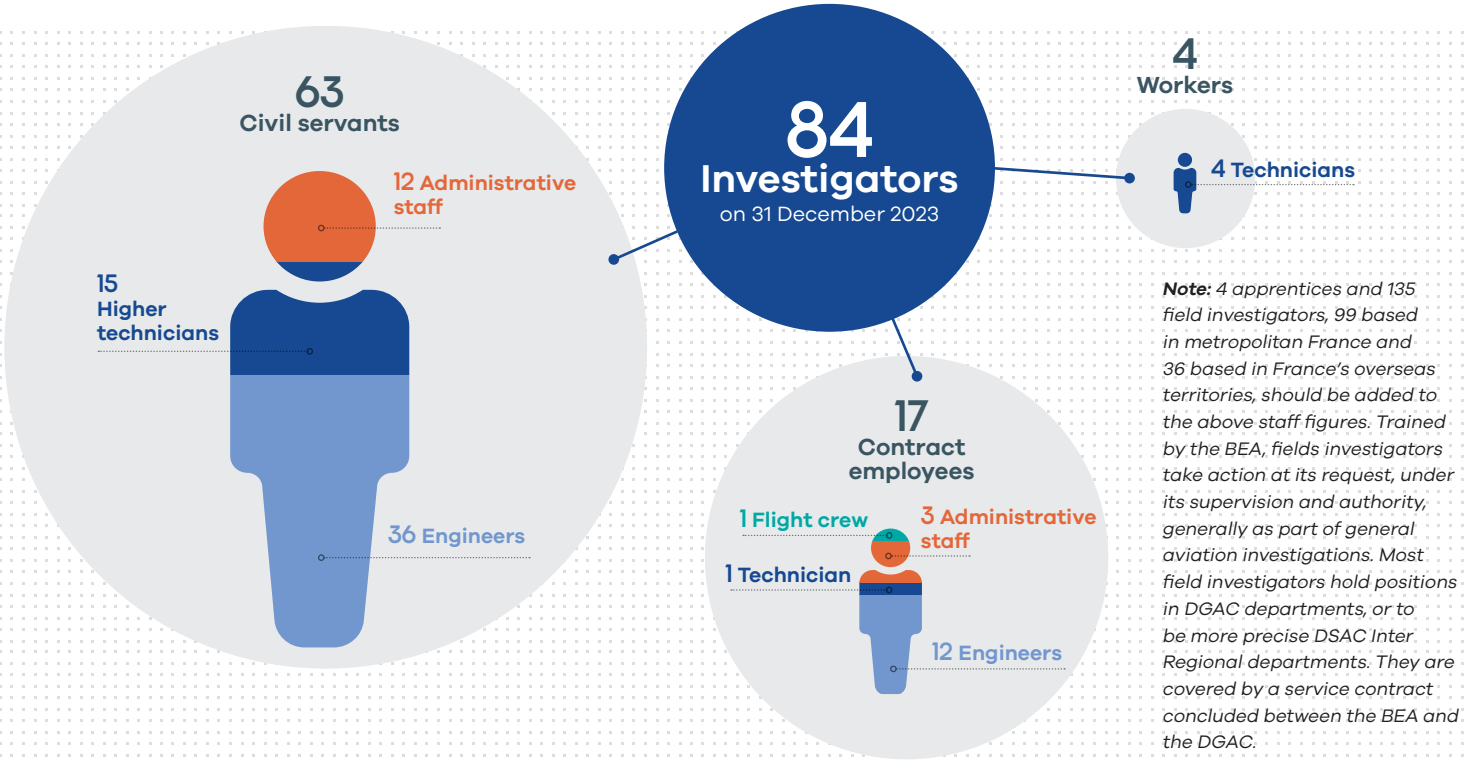
The BEA's Communication Department continued its work to write a document devoted to its 75 years of existence in collaboration with the DGAC's and GIACRE's (group of engineers and senior civil aviation executives) remembrance mission. It will be published in 2024.

Human resources & finances

8.1 Staff

8.1.1 Staff on 31 December 2023

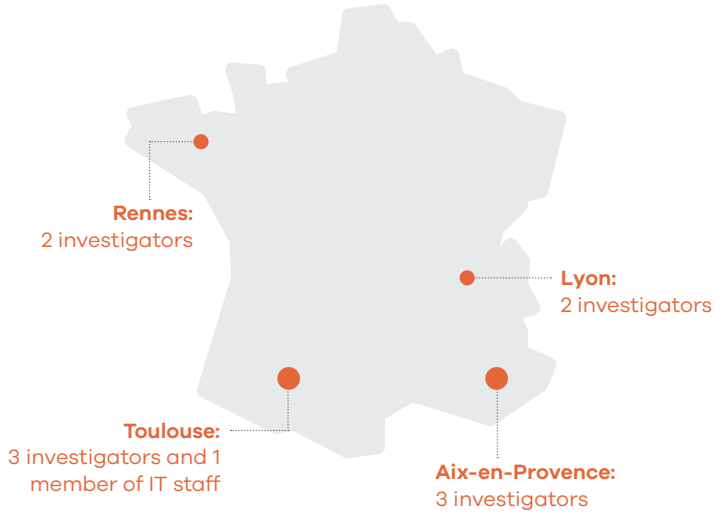
As of 31 December 2023, the BEA had 84 members of staff divided as follows:



Note: *4 apprentices and 135 field investigators, 99 based in metropolitan France and 36 based in France's overseas territories, should be added to the above staff figures. Trained by the BEA, fields investigators take action at its request, under its supervision and authority, generally as part of general aviation investigations. Most field investigators hold positions in DGAC departments, or to be more precise DSAC Inter Regional departments. They are covered by a service contract concluded between the BEA and the DGAC.*

8.1.2 Regional branches

The majority of the BEA's staff work at Le Bourget site but 11 are based at the different regional branches (staffing on 31 December):



Regional branches enable the BEA to ensure a better-distributed presence in Metropolitan France and specifically:

- in regions where there is a high level of recreational general aviation activity;
- near the main aeronautical manufacturers.

They are housed in premises made available by the DSAC as part of the service contract between the BEA and the DGAC (already mentioned in **paragraph 8.1.1**).

8.1.3 Personnel training

The BEA spends on average 10 % of its annual operating budget on professional training in order to guarantee a high level of skills for its personnel in various areas, vital for its activity.
The 2023 training programme had therefore been defined based on an initial budget of €240,000 of commitment authorisations (CA) and payment appropriations (PA).

The total budget allocated to professional training was around €230 k in CA, and the PA used amounted to around €210 k. These figures are relatively stable compared with 2022.

€230 K
of budget allocated
for professional training
in CA in 2023

€210 K
of PA used
for professional training
in 2023

Concerning flight training, the initiative launched in 2016 to enable staff who are type rated on passenger planes to periodically undertake commercial air transport flights as a co-pilot, which had been suspended in 2020 due to the COVID-19 health crisis, was resumed: a staff member has the possibility to fly one week per month as co-pilot on the A320 within the framework of an agreement signed with an airline. This initiative gives the staff members major experience in flying commercial air transport flights, which is necessary for carrying out some complex investigations in this specific area and for strengthening the credibility of the BEA in the eyes of air operators involved in an accident.

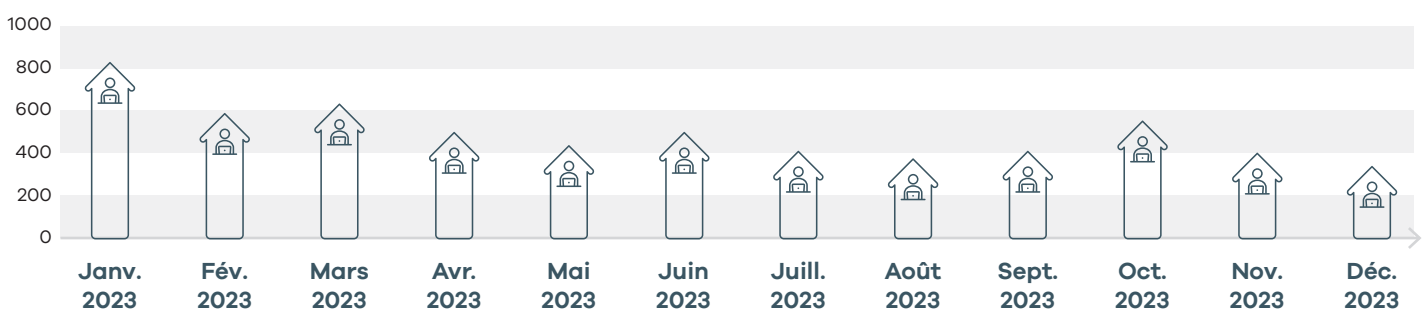
8.1.4 Working from home

The BEA introduced the concept of working from home a few years ago within the framework of agreements between certain staff and HR. The practice became a lot more common in 2020 and 2021 due to the health situation and the recurrence of lockdown and mandatory or recommended working-from-home periods. During these periods, the framework for working from home was generally no longer set by agreements, but by government directives.

In 2023, of the 84 members of staff on 31 December 2023, there were:
- three members of staff doing work that could not be done from home;
- eighty-one members of staff doing work that could partially be done from home.

The total number of working-from-home days in 2023 was nearly 5,850, which represented an average of 72 days per member of staff able to do some of their work from home.
The following graph shows the monthly trend in the total number of days worked from home for all staff concerned in 2023. The data of this graph must be interpreted with caution (for example, the fact that staff often take holidays through the summer or over the festive period, translates to a decrease in the number of days worked from home). As for the previous year, however, it shows a downward trend throughout the year. Compared to 2022, there was a 9 % drop in the number of days worked from home in 2023.

Number of work-from-home days in 2023



8.2 Budget

8.2.1 Allocations

The BEA budget was set in the initial finance law (2023) at €3.91 million in commitment authorisations (CA) and payment appropriations (PA). The budget was reduced by cancellations in the amending finance law (2023) and transfers between operational budgets for Programme 6141, in particular for support to Ukraine.

In addition, resources were supplemented by:

- carry over of CA (CA not appropriated): €0.014 million in CA;
- carry over from 2022 to 2023: €0.297 million in PA;
- carry over of product allocations from 2022 to 2023:
  - €0.022 million in CA;
  - €0.022 million in PA;
- the allocation of product allocations in 2023:
  - €0.035 million in CA;
  - €0.035 million in PA.

In the end, the budget available for the year was therefore:

- €3.94 million in CA;
- €4.12 million in PA.

8.2.2 Expenditure for the period

Expenditure for the period is broken down in the table below:

	CA (€)	PA (€)
Operation		
General support	€1,139,087	€1,037,289
Travel	€460,874	€459,168
Communication, documentation and hospitality	€58,885	€57,974
Training	€229,510	€211,317
Information Technology	€247,318	€223,218
Fuel, sundries and studies	€199,093	€189,780
Sundries (taxes, fees, extraordinary expenses, etc.)	€2,362	€2,286
TOTAL Operating costs	**€2,337,129**	**€2,181,032**
Investment		
Tangible assets	€200,302	€1,146,186
Intangible assets (e.g. software)	€0	€0
TOTAL Investment costs	**€200,302**	**€1,146,186**
TOTAL	**€2,537,431**	**€3,327,218**

Note: *General support items include fluids (excluding fuel), leasing, provision of services, cleaning of premises, equipment maintenance, building maintenance, telecoms and postage, as well as tangible assets that come under the "Investment" budget.*

The BEA's total consumption was therefore:

- €2.54 million in CA and €3.33 million in PA;

which represents a consumption ratio of:

- 64 % of available CA;
- 81 % of available PA;

representing an under-implementation of:

- €1.40 million in CA and €0.79 million in PA.

During the various management discussions, the BEA anticipated this under-implementation given the uncertainties linked to work contracts and the staffing situation.

The substantial under-implementation of CA (on the BEA's operating budget scale) is due in particular to the management of the laboratory creation project (described in **paragraph 5.3.2** above), which was complicated and which mobilised a high percentage of BEA General Secretariat staff, and had collateral effects on other projects. Also, a wiring, wifi and security camera tender was declared unsuccessful (only one bid was received and the costs proposed were deemed too high), and a number of investment activities, such as the replacement of the wreckage transport vehicle or the purchase of an electric vehicle, were not pursued due to the lack of a commercial offer and administrative deadlines. These activities were deferred to 2024.

Operating expenses:

The operating budget for 2023 was €2.34 million in CA and €2.18 million in PA. After the health crisis, 2022 saw a return to sustained activity at the BEA in terms of air safety investigations. The strong recovery in commercial air transport led to several accidents abroad, requiring a team of investigators to be sent to the accident sites and travel to locations where parts or equipment were being examined or investigated until the start of 2023. For the remainder of 2023, activity returned to a more normal level. Overall, business travel stabilised as the year went on. However, travel expenses showed a marked increase, rising to €460,874 in CA and €459,168 in PA (compared with €421,861 in CA and €420,537 in PA in 2022, i.e. an increase of around 9.2 % in CA and PA). The increase in expenses, despite stable travel, is largely due to a continuous rise in air fares. Constant efforts to implement the new travel policy helped to contain the costs, keeping them around €60,000 below the estimated CA.

In addition, the stabilisation of BEA activity levels also led to lower fuel expenses and fewer purchases than initially expected.

Professional training expenses for 2023 were:

- €229,510 million in CA;
- and €211,317 in PA;

compared with €242,385 in CA and €206,950 in PA in 2022. The annual training plan was deployed nominally (of note, however, was the cancellation of training for a group of investigators at an aeronautical manufacturer's site due to a quote that was considered to be too high).

Initial estimates for building maintenance were revised upwards in CA and PA due to renovation work undertaken in adjacent premises at the Materials laboratory site.

Lastly, there was an increase in IT expenses (both in CA and PA), associated with the implementation of the LISE (investigation data management software) project and migrations to ECCAIRS V2 (accident and incident repository software), which were carried out at the same time as a major overhaul of the BEA's website at the end of 2023. The BEA also modernised its data storage servers.

Investment expenses:

The major investment scheduled for 2023 concerned the completion of the building of the Materials lab, which had begun on 28 November 2023. The final general accounts for the corresponding 10 tender lots were financed at the end of the management period. Five lots were closed, but there were five lots for which a carrying over of accrued expenses for 2024 was generated, amounting to €0.17 million in PA.

The BEA had planned to launch a major renovation of the infrastructure of its wifi and wiring network in 2023: the preliminary study was conducted at a cost of €22,800 in CA and €16,200 in PA but the call for tenders for the work proved unsuccessful. Consequently, the BEA reviewed its priorities and assigned its resources to creating the new PESA (flight recorders and avionic systems section) laboratory.

8.3 ENCASIA contributions

The ENCASIA is the European Network of Civil Aviation Safety Investigation Authorities. It is tasked in particular with preparing suggestions and advising the Union institutions on all aspects of the drafting and implementation of Union policies and rules pertaining to safety investigations and the prevention of accidents and incidents. It therefore organises seminars and training for its members, which it finances by European subsidies.

On 8 March 2023, the ENCASIA signed a management delegation agreement with the BEA for the latter to manage the administrative and financial matters of the network. In April 2023, the BEA opened the ministerial contributions 93, No. 1-1-00911, "Participation of the European Union in the management of the European Network of Civil Aviation Safety Investigation Authorities (ENCASIA) by the Bureau d'Enquêtes et d'Analyses (BEA)". It received a subsidy of €0.16 million from the European Commission to be used over a business period of two years.

09

Logistics, staff safety and environment

9.1

Logistics, staff safety and environment

At the end of 2023, the BEA restructured its logistics, transport and professional risk prevention activities with the creation of a logistics, staff safety and environment section (PLSE) with the aim of optimising the performance of activities, promoting a more cross-disciplinary and effective way of working to support safety investigations.

As part of the energy transition and faced with the increasing scarcity of resources, the BEA is pressing forward with its work to sustainably modify its technical resources, its habits and behaviour while remaining in line with the specific context of its activity. The LSE section is therefore taking into account ministerial directives via the government's environmental transformation plan for ecoresponsible public services. Projects to thermally insulate buildings and maintenance operations on reverse air conditioning units were initiated at the end of 2023 as part of a multi-year cycle. In terms of the vehicle fleet, the purchase of an electric vehicle was scheduled and two vehicles were introduced in the field.

The logistics division was heavily involved in monitoring the major project to create the new materials laboratory, and also following its installation (relocations, reorganising premises, adapting equipment, etc.) It also contributed substantially to the Le Bourget platform projects, in liaison and coordination with staff at Aéroports de Paris (ADP), especially during the construction of a hydrogen service station on land adjacent to the BEA's premises and involving the construction of a dividing wall. Roadworks within the context of the linking of Paris-Le Bourget airport to the Dugny-Le Bourget geothermal heating network were therefore also managed in coordination with the logistics division, due to their impact on traffic and access to the BEA.

In terms of professional risk prevention matters, the section's staff safety entity identifies hazards and regularly assesses the associated risks. The unique professional risk assessment document was updated in 2023 to include psychosocial risks, associated with work carried out by the working group revived in early 2023. This risk prevention work is carried out across all sectors with all BEA departments, whether technical or administrative, to promote a mutual knowledge of the activity and support sections.

In terms of security, the GS and the LSE section undertook a number of actions in 2023 with Onet, which provides security services at the BEA's facilities, to improve site monitoring. Specific work is in progress to modernise the technical resources used and optimise the human resources employed.

Transport of wreckage:

The BEA ensures the independent transport, from the accident sites to the Le Bourget premises, of all general aviation wreckage or parts of wreckage requiring further examination, in particular to determine whether mechanical or structural failures may have caused the accident. This priority operational mission is carried out in coordination with the structure and materials section.

The transport logistics chain is therefore an integral part of the department's operational activity. Over 2023, this represented approximately 35 journeys for the transport unit and approximately 65,000 km travelled, 14,000 km of which with the trailer.

Grouping together these activities, as part of the BEA's strategic plan, therefore aims to facilitate vertical and horizontal communication to improve and consolidate mutual knowledge between the staff of the two activity and support sections.

Notable work by the IT section

The IT section started work on a number of structural projects aimed at improving efficiency, reducing operating costs, and enhancing system security.

These projects included the following:

The DELL storage array:
A new storage array was purchased to ensure the redundancy of the current array. Due to this configuration, we can now ensure active/passive back-ups.

Redevelopment of the Structures and Materials section (PSEM) and the IT section premises:
Construction of the new PSEM laboratory and the IT section was completed in September and network connections have been established between the new premises and the other areas of the BEA building.

Migration of the bea.aero website from Ecritel to Outscale:
The website hosting migration project required several months of work in collaboration between different internal & external parties and enabled a smooth transition to the new system . The market corresponding to the website involves the following organizations:

- UGAP (Contracted company);
- 3DS Outscale (server hosting);
- ATOS/AGARIK (responsible for infrastructure maintenance);
- EWILL (website developer).

BEA

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