BEA

ACTIVITY REPORT 2021

ENCASIA

RÉPUBLIQUE FRANÇAISE
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Safety together

Cover photo: Accident to the Embraer EMB500 registered 9H-FAM operated by Luxwing on 08 February 2021 at Paris-Le-Bourget

Accident to the Robinson R22 registered F-GFHA on 17 August 2021 at Fleurey-sur-Ouche

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MESSAGE FROM THE **DIRECTOR**

Rémi Jouty

The hope at the start of 2021 that the COVID crisis would soon be over, once and for all, soon faded. Further periods of lockdown and enforced working from home were to come and social interaction continued to be restricted, in France and around the world.

Despite an upturn in international civil aviation traffic, the level remained far short of pre-Covid levels. The world commercial air transport safety figures were on a par with those of 2020 with seven fatal accidents resulting in 121 victims, including just one accident to a jet aeroplane (accident to a Boeing 737 that occurred off the coast of Java, resulting in 62 victims). The BEA's international activity, expressed in number of Accredited Representatives appointed to foreign investigations remained very low, and only one trip was made to an accident site abroad by a team of BEA investigators.

However, the general aviation activity seemed to remain stable in France, due undoubtedly to the fact that the periods of lockdown did not impact the periods of greatest activity, as well as to the fact that the health rules did not dampen the recreational pilots' desire to fly. The number of accidents and victims was therefore comparable with that of previous years.

Overall, the picture for the BEA was very similar to that of 2020, marked by the stable number of investigations opened and the participation in foreign investigations, although lower than in pre-Covid years, and a number of reports published exceeding the number of investigations opened. The mobilisation of agents was not impacted by the difficult context, and their resources freed up by the moderate number of investigations opened, and in particular due to low international activity, meant they were able to finalise older investigations.

As I write these words, the world has been shaken by a new major crisis that has created yet more uncertainty. The war opposes two countries that have recognised investigation organisations and with which the BEA maintains close and long-term relations, in particular because these two countries have a rich aeronautical history. BEA staff have a number of colleagues, sometimes friends, in the Ukrainian and Russian investigation organisations, with whom they used to meet regularly within the context of investigations, as well as at international meetings.

I hope that peace and serenity are restored quickly, that we can soon resume normal relations with our colleagues, and that our objective of improving safety, which may seem vain with so much destruction going on, will make sense once again.

RÉMI JOUTY

Director

1. OVERVIEW OF ACCIDENTS, INVESTIGATIONS INITIATED IN 2021 BY THE BEA

Accident to the Pipistrel Virus SW21 registered G-OVSI on 09 May 2021 at Albert Bray

1.1 GENERAL CONTEXT

The obligations of the Member States of the European Union in terms of Civil Aviation safety investigations are defined in European Regulation No 996/2010 of the European Parliament and of the Council on the investigations 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 2018/1139 (the aircraft listed in this Annex are mainly non-certificated aircraft: microlights, aeroplanes of historic interest, etc.).

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).

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. "

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, 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 2018/1139;
- 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 third parties on the ground.

1.2 ACCIDENT DATA AND INVESTIGATIONS OPENED

1.2.1 ACCIDENTS IN FRANCE IN 2021

The data in the table below 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.

Accidents in France in 2021				
	Number of accidents[1]		**Number of injured people**	
	Total	of which fatal	fatal	serious
COMMERCIAL AIR TRANSPORT				
Aeroplanes Helicopters Balloons	3 0 3	0 0 0	0 0 0	2 0 3
Commercial Air Transport TOTAL	**6**	**0**	**0**	**5**
AERIAL WORK / SPECIALISED ACTIVITY[2]				
Aeroplanes Helicopters Gliders Microlights	2 1 1 0	0 0 0 0	0 0 0 0	0 0 0 0
Aerial Work / Specialised Activity TOTAL	**4**	**0**	**0**	**0**
GENERAL AVIATION				
Aeroplanes Helicopters Gliders (including powered gliders) Balloons Microlights (including microlight helicopters)[3]	80 8 14 4 105	13 2 2 0 19	25 4 2 0 26	12 4 1 2 26
General Aviation TOTAL	**211**	**36**	**57**	**45**
TOTAL	**221**	**36**	**57**	**50**

(For information: no accident or serious incident involving a drone was reported to the BEA in 2021).

(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.

Comments about accidents in France in 2021

No fatal accident in commercial air transport was reported in France in 2021, but three non-fatal accidents to aeroplanes and three accidents to balloons operated within a context of commercial transport were recorded.

The three accidents to aeroplanes operated in commercial air transport concerned:

- a charter flight, during the landing phase: the accident did not result in any serious injury;
- a flight that crossed through an area of turbulence during descent: a member of the cabin crew was injured;
- the fall of a passenger on the stairs during disembarkation.

The total number of accidents that occurred in France in 2021 (all types of activity included), as well as the number of fatal accidents increased by 10% in relation to 2020. However, the number of victims was more or less the same.

A more detailed description of the types of accident in general aviation, which includes all victims in 2021, is included in chapter 3.

More information about the distribution of accidents per aircraft category and operation type

Three accidents, one of which was fatal, involved microlights operated within the framework of commercial sightseeing flights. These are included in the category of "microlights" operated in "general aviation" as this type of activity does not require the issuance of an Air Operator's Certificate (AOC).

One accident occurred while a microlight was towing a glider: the glider pilot was fatally injured during the collision with the ground whilst the pilot of the tug microlight managed to land without suffering damage. This accident was included in the category of "gliders" operated in "general aviation".

A mid-air collision between two gliders occurred during training flights at an international competition. This accident was included in the category of "gliders" operated in "Specialised activity".

Two fatal events were not included as they did not meet all of the criteria for defining an air accident:

- the assumed deliberate fall of a passenger during a flight;
- a fatal injury, on the ground, from a rotating propeller after a dry engine start-up, without intention to fly.

1.2.2 INVESTIGATIONS OPENED BY THE BEA IN 2021

Investigations opened by the BEA in 2021						
Type of event	**Commercial Air Transport**	**General Aviation**	**Aerial Work**	**Other or undetermined**	**TOTAL**	**(Reminder of total in 2020)**
Accidents	7	98	4	0	**109**	*(107)*
Serious incidents	3	5	2	0	**10**	*(8)*
Incidents	1	0	0	0	**1**	*(5)*
TOTAL	**11**	**103**	**6**	**0**	**120**	*(120)*
(Reminder of total in 2020)	*(7)*	*(102)*	*(9)*	*(2)*	*(120)*	

The number of investigations opened by the BEA indicated above 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.

More information about differences with the previous year

The number of investigations opened in 2021 and the categorisation per occurrence class and type of operation was around the same as in 2020. However, a reduction was observed in the number of investigations opened into incidents.

More information about delegated investigations

One investigation initially opened by the BEA was delegated to a foreign safety investigation authority:

- Investigation into an accident to a balloon operated and registered in Germany, during which a passenger was injured during a hard landing, delegated to the German investigation authority (BFU).

One investigation was delegated by a foreign investigation authority to the BEA:

- Investigation into an accident that occurred on approach to Nice airport (Alpes-Maritimes) over Italian territory, which resulted in injuries to a cabin crew member as the aircraft flew through an area of turbulence, delegated by the Italian investigation authority (ANSV).

In addition, two investigations were delegated by the BEA to the BEA-É (State Aviation Accident Investigation Bureau), within the framework of the protocol drawn up between the two authorities. Although the events concerned civil aircraft, the delegation of the investigations was deemed appropriate due to the nature of the mission of the flights considered:

- investigation into an accident involving an aeroplane operated by a private civil training organisation on behalf of a military training section, which resulted in material damage;
- investigation into an incident involving an aeroplane carrying out a surveillance mission for the Home Office (a representative of the BEA was appointed as part of this investigation).

More information about investigations into incidents and serious incidents:

Eleven investigations were opened by the BEA into incidents or serious incidents:

- Four of these investigations concerned commercial air transport: the corresponding incidents or serious incidents are described in para. 3.1.2.
- Seven concerned another type of operation:
    - o two near midair collisions between two aeroplanes, one involving two aeroplanes in initial climb, the other involving two aeroplanes on final;
    - o one near collision with the surface of the water, in night flight during a mission to set down marine pilots by helicopter;
    - o one loss of external visual references in the downwind leg, followed by a loss of control after being towed by a glider;
    - o one hard landing with bounce on a high performance aeroplane (HPA), during which the propeller was damaged, followed by a go-around;
    - o the loss of altitude and speed of a HPA while bypassing a cloud mass on approach;
    - o the shattering of a canopy during an aerobatic flight.

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 learned and the target public. On this basis, the BEA has established three categories for investigations and associated reports, based on the criteria detailed opposite.

The investigations opened by the BEA in 2021 were broken down as follows:

- category 1 (major investigation): no investigations;
- category 2 (adapted investigation, that can give rise to a simplified report): 85 investigations;
- category 3 ("desktop" investigation): 34 investigations.

However, this breakdown could change based on the information obtained during investigations, many of which are still in progress.

Classification criteria for investigations led by the BEA

Category 1 investigation: "**Major**" investigation into an accident to an aircraft operated under an air operator's certificate with a maximum certified take-off weight of more than:

- 5.7 t for an aeroplane, or
- 3.18 t for a helicopter,

during which:

- at least one person onboard is fatally injured, or
- an emergency evacuation is required and the aircraft is destroyed, or
- the aircraft is reported missing.

This category is for investigations requiring several areas of organisational and/or systemic analysis and which lead to the writing of a report, using the full structure proposed by ICAO Annex 13. These investigations generally give rise to safety recommendations.

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 issue 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 2021 about which the BEA has been officially notified							
Type of event	**Commercial Air Transport**	**General Aviation**	**Aerial Work**	**State aircraft**	**Other or undetermined**	**TOTAL**	***(Reminder of total in 2020)***
Accidents	25	40	12	4	17	**98**	*(101)*
Serious incidents	62	14	1	1	6	**84**	*(88)*
Incidents	16	0	2	0	3	**21**	*(15)*
TOTAL	**103**	**54**	**15**	**5**	**26**	**203**	*(204)*
(Reminder of total in 2020)	*(98)*	*(59)*	*(20)*	*(10)*	*(17)*	*(204)*	

The number of occurrences abroad notified to the BEA in 2021, and the categorisation per occurrence class and type of operation, was very similar to the number reported in 2020.

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.

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 occurrences with no safety issues identified for the French organisations involved.

Accident to the Cessna 172 - S registered F-HFBR on 17 March 2021 at Pessac

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 (except for deaths from natural causes);
  - 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 (except for deaths from natural causes);
  - 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 less than 2.25 t:**
  - where the BEA, in theory, does not provide any added value during the investigation;
  - without a clear link with the reason for accreditation;
  - where there is no specific request from the authority in charge;
  - which would be the subject of BEA Category 3 investigations.
- **Or accidents and incidents to aeroplanes of more than 2.25 t:**
  - where the BEA, in theory, does not provide any added value during the investigation;
  - without a clear link with the reason for accreditation;
  - where, in theory, there are no benefits or stakes for the advisor and/or the BEA;
  - which would not give rise to the opening of a BEA investigation in France;
  - where there is no specific request from the authority in charge;
  - where there is no justified request from the advisor.
- **Or helicopter accidents and incidents:**
  - without victim;
  - where there is no specific request from the authority in charge;
  - without a clear link with the reason for accreditation;
  - where there is no justified request from the advisor.
- **Or accidents or incidents involving aircraft equipped with engines of French design or manufacture:**
  - if no component manufactured by the French manufacturer contributed to the occurrence;
  - without a clear link with the reason for accreditation;
  - where there is no justified request from the advisor.

Category 2 accredited representations:

- concern aircraft accidents and incidents that do not meet the criteria of category 1 and 3 ACCREP.

No category 1 ACCREP was appointed by the BEA in 2021: indeed, no major accident concerning the BEA was observed for the first time since 2011!

Of the 203 occurrences notified to the BEA by foreign bodies:

- 126 were category 2 ACCREPs;
- 77 were category 3 ACCREPs.

The distribution between ACCREP categories can change depending on the requests of foreign safety investigation authorities.

1.2.4 GO-TEAMS

In the case of a particularly serious accident (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.

In 2021, 46 Go-teams were dispatched, including one abroad (as part of the investigation into the serious incident to a BK117 in Norway).

1.2.5 FIELD INVESTIGATORS

The BEA frequently 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.

Around 120 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.

Thirty-nine operations by Field Investigators were recorded by the BEA in 2021.

Accident to the Mudry Cap10 registered F-GGYC on 23 May 2021 at Peyrolles lake

2. INVESTIGATIONS CLOSED, REPORTS PUBLISHED IN 2021

Accident to the Robin DR400 registered F-GTPV on 10 September 2021 at Dijon

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. The BEA has defined three investigation categories (refer to paragraph 1.2.2).

In 2021, the BEA published 140 investigation reports broken down as follows:

Number of investigations closed / reports published by the BEA in 2021				
	Category 1	Category 2	Category 3	Total
	(figures in brackets: with reports including safety recommendations)			
Commercial air transport	**0**	**14**	**0**	**14**
	(0)	*(7)*	*(0)*	***(7)***
Aerial work/ Specialised activity	**0**	**10**	**0**	**10**
	(0)	*(2)*	*(0)*	***(2)***
General aviation	**0**	**66**	**49**	**115**
	(0)	*(1)*	*(0)*	***(1)***
Other	**0**	**1**	**0**	**1**
	(0)	*(0)*	*(0)*	***(0)***
Total	**0**	**91**	**49**	**140**
	(0)	*(10)*	*(0)*	***(10)***

Category 1 investigations systematically give rise to ICAO format reports. Category 2 investigations are the subject of simplified reports or ICAO format reports whilst category 3 investigations are systematically the subject of simplified reports.

The details of the reports including safety recommendations are given in chapter 4.

2.2 COMMENTS ON BEA ACTIVITIES AND PERFORMANCE IN 2021

The BEA published 140 reports in 2021 (compared with 189 in 2020 and 164 in 2019).

For the third consecutive year, the number of reports published is greater than the number of new investigations opened. This result crowns the effort made by the BEA to reduce the stock of investigations in progress, whilst endeavouring to maintain a high level of quality.

Regulation (EU) No. 996/2010 specifies that an investigation report should be published rapidly and, if possible, within twelve months of the date of the occurrence. For the BEA, this duration of twelve 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 out of the investigations opened the previous year.

In 2021, the global result of this indicator was 65% (compared with 67% in 2020 and 56% in 2019).

It can be seen that if a distinction is made between investigation categories (as defined in paragraph 1.2.2 above), the indicator varies substantially, as shown in the following table: indeed, 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.

Breakdown of indicator for 2021				
Investigation categories	**Category 1**	**Category 2**	**Category 3**	**Total**
Investigations opened in 2020	0	76	44	**120**
Closed in less than one year	-	36	42	**78**
Indicator 2021	**-**	**47%**	**95%**	**65%**

The figures published in the 2020 activity report showed a slight decline in the total number of investigations opened (-12% on the previous year), but a relatively stable number of fatal accidents, and in particular a much higher number of victims due to the high number of occupants involved in several accidents. The specific operating contexts of these accidents led to the examination of some systemic components within the context of more complex, and therefore sometimes longer, investigations leading to a slight decline in the indicator in 2021.

The following table indicates, for each category, the year of the investigations closed in 2021.

Year in which the investigations were opened for all reports published by the BEA in 2021					
Investigation categories		**Category 1**	**Category 2**	**Category 3**	**Total**
Year of occurrence	2021	0	5	27	**32**
	2020	0	45	16	**61**
	2019	0	20	1	**21**
	Previous	0	21	5	**26**
Total		**0**	**91**	**49**	**140**

In total, 38 investigations were opened more than one year ago on 31 December 2021 (compared with 59 in 2020 and 125 in 2019). The following table gives details for each investigation category.

Number of BEA investigations opened more than one year ago on 31 December 2021				
Investigation categories	**Category 1**	**Category 2**	**Category 3**	**Total**
Commercial air transport	0	6	0	**6**
Aerial Work / Specialised Activity	0	0	0	**0**
General aviation	0	32	0	**32**
Total	**0**	**38**	**0**	**38**

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, most of these reports must be published in less than four months.
- 70% of category 2 investigation reports should be published in less than one year. No category 2 investigation should take longer than two years (for information, the number of category 2 investigations lasting longer than two years was 10 as of 01 January 2022).

The decreasing stock of investigations in progress should gradually enable these targets to be reached in the years to come, provided that no major accident in France or exceptional requests for major investigations abroad disrupt the BEA's organisation.

Indeed, the relative decrease in the number of reports published in 2021 (140 compared with 189 in 2020), combined with a stock of investigations in progress for longer than one year, which now seems close to the minimum that can reasonably be achieved (38), suggests that it would be difficult to further improve productivity with current staffing shortages, and in the absence of a revision of the current investigation policy. There is therefore no wiggle room to absorb major investigation activities without impacting the current investigation production process.

3. GENERAL CONSIDERATIONS ON AIR SAFETY IN FRANCE IN 2021

Accident to the Cessna F172 registered F-GCNK on 23 May 2021 at Abzac

3.1 COMMERCIAL AIR TRANSPORT

3.1.1 COMMERCIAL AIR TRANSPORT ACCIDENTS

In 2021, two accidents involved French operators holding an AOC. As indicated in paragraph 1.2.1, these accidents were:

- one event during which a member of the cabin crew was severely injured as the aeroplane flew through an area of turbulence on approach to Cayenne airport (French Guiana), whilst avoiding convective zones;
- one event during which a passenger was severely injured when he fell on the stairs whilst disembarking at Paris-Charles de Gaulle airport (Val-d'Oise).

Both of these events come under the "accident" category in accordance with the definition of serious injury, in compliance with ICAO Annex 13 and Regulation (EU) No 996/2010. As control of the flight path was maintained in the turbulence event, these events, considered individually, concern relatively uncritical risks for air safety.

However, a recurrence of injuries associated with turbulence was observed, both in clear air and in convective zones. This safety topic is monitored by the authorities. As indicated in paragraph 1.2.2, the BEA opened an investigation into a second accident of this nature in 2021, which involved a foreign operator on approach to Nice airport (Alpes-Maritimes).

We can also mention the accident to an Embraer 500, operated by a foreign operator, which occurred during a landing at Paris-Le Bourget airport (Seine-Saint-Denis). The aeroplane that had been undertaking a charter commercial air transport flight for a foreign operator, was confronted with icing conditions on approach. The crew lost control of the aeroplane on short final. A fire broke out but this was put out by the Aircraft Rescue and Fire Fighting Service (ARFFS) at the airport and the three occupants only suffered minor injuries.

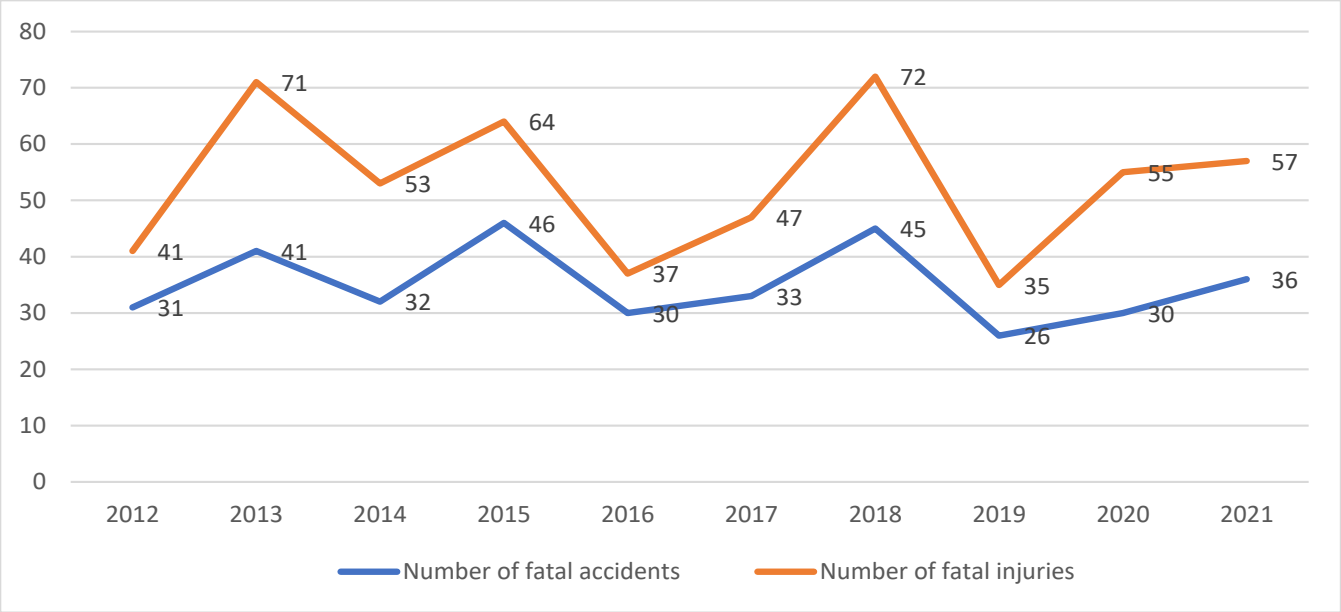
3.1.2 COMMERCIAL AIR TRANSPORT INCIDENTS AND SERIOUS INCIDENTS

Four investigations were opened into commercial air transport incidents and serious incidents in France in 2021:

- Serious incident associated with the reduction in power of the two engines, noticed by the crew of a De Havilland DHC6, on final approach to Futuna (Wallis and Futuna).
- Serious incident associated with a Bombardier CRJ1000 in descent below the slope during a RNP approach to runway 21 of Nantes airport (Loire-Atlantique). The deviation from the path seemed to be attributable to the display of an erroneous QNH value by the crew, which triggered a MSAW warning.
- Serious incident associated with the partial blocking of the elevator trim of a Beechcraft B1900, in cruise at FL180, during a flight between Toulouse-Blagnac and Metz-Nancy-Lorraine.
- Incident associated with the blocking of the elevator trim of a Cessna 404 after take-off from Fort-de-France airport (Martinique) following a maintenance procedure.

3.2 GENERAL AVIATION

3.2.1 OVERVIEW FOR ALL TYPES OF GENERAL AVIATION ACTIVITIES



Variation in fatal general aviation accidents (all aircraft categories) over the 2012-2021 period

The figures for types of general aviation accidents tend to vary significantly year-on-year. However, the figures for 2021 seem to be very similar to those for 2020.

Nevertheless, we note a 20% increase in the number of fatal accidents. In comparison, the number of victims remained relatively unchanged, which could be explained by:

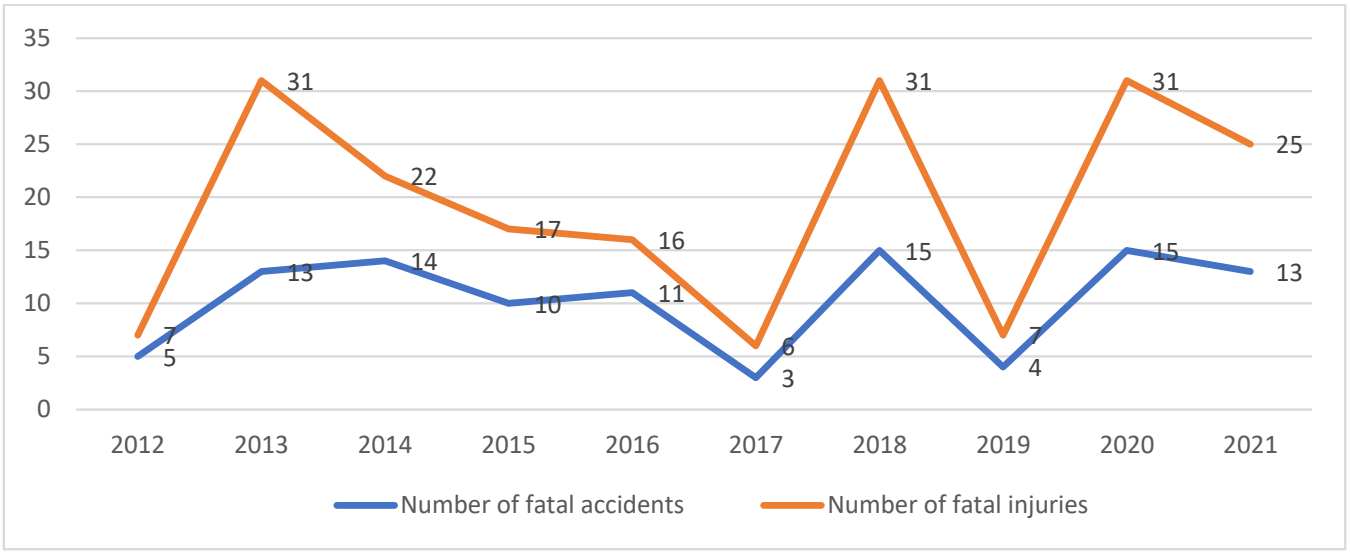
- the fact that the increase in the number of fatal accidents in 2021 was largely driven by microlight activity (see paragraph 3.2.3), for which the number of occupants - and consequently the number of victims - is generally lower;
- the fact that 2020 was marked by an exceptionally high number of general aviation accidents, in particular aeroplanes, resulting in three, four and even five victims.

Furthermore, two fatal helicopter accidents and two fatal glider accidents were reported in 2021. However, there were no fatal balloon accidents. In total, the figures for these three activities were identical to the 2020 figures.

The following paragraphs provide a more detailed analysis of aeroplane and microlight activities.

3.2.2 OVERVIEW FOR GENERAL AVIATION - AEROPLANES

The number of fatal accidents involving aeroplanes operated in general aviation in 2021 was slightly down on 2020. However, the numbers for 2021 still remain some of the worst for the last 10 years.



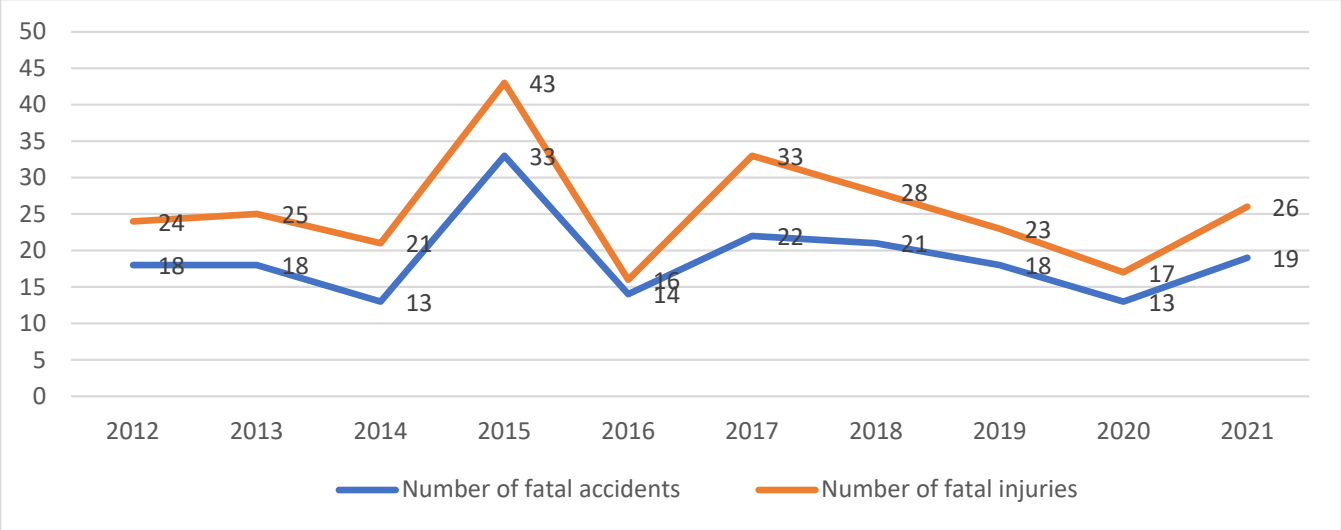
Variation in fatal general aviation accidents (aeroplanes only) over the 2012-2021 period

In 2021, two specific categories of aeroplane accidents were of note:

- Accidents that occurred when flying in a mountainous region: several accidents of this type were reported, two of which were fatal and three of which caused serious injuries. These accidents generally occurred during attempts to clear passes or during turn-arounds undertaken in valleys not conducive to turn-arounds. In previous years, the BEA had already recorded several fatal accidents in comparable circumstances. These accidents bear witness to the specificities of mountain flying. The risks arise principally from the modification of visual references, diminished performance and specific aerological conditions.
- Accidents associated with "get home-itis" factor: at least two fatal accidents can be associated with this factor, which the BEA has often had to explore further. The associated threats are adverse weather conditions, in particular visibility, or even darkness during a night arrival without recent night VFR experience.

3.2.3 OVERVIEW FOR GENERAL AVIATION - MICROLIGHTS[0]

After decreasing for three years, the number of fatal accidents and the number of victims involving microlights increased respectively by 46% and 53% in 2021 in relation to 2020 (which was one of the top three years in the decade for microlight activity). The 2021 figures therefore correspond to the average established over the last 10 years.



Variation in fatal general aviation accidents (microlights only) over the 2012-2021 period

Of the 19 fatal accidents in 2021, we note:

- Eleven accidents which already seem to be able to be attributable to losses of control in flight. Four of these losses of control seemed to occur when the pilots were faced with a technical anomaly in climb. This observation refers to a study published by the BEA in 2021 pertaining to the reduction in engine power at take-off[(4)]. This study mentions the fact that all fatal accidents in the sample were the result of a loss of control in flight. Most of these occurred during a significant heading change or even during an attempted turn-around.
- At least four accidents (three fixed-wing microlights and one gyroplane) appeared to be associated with the pilot taking risks, notably in the form of low-height manoeuvres. Over the last few years, the BEA has already published information on the execution of dangerous manoeuvres not necessary for normal flight. This type of accident, as with the previous type, although particularly marked in microlight activity in 2021, is however not exclusive to this activity. For information purposes, at least one fatal aeroplane accident and one fatal helicopter accident in 2021 may be associated with dangerous manoeuvres.

(4) *The English version of this report will be available in the second half of 2022.*

4. SAFETY RECOMMENDATIONS

Accident to the Reims Cessna F 150 M registered F-BXNO on 20 June 2020 at Montbéliard Courcelles

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.

2021, year of transition and new central repository ECCAIRS-SRIS 2.0

2021 was a year of transition in terms of the processing of safety recommendations. The European Commission overhauled the ECCAIRS "E1" system in order to implement a new system based on modern IT technologies, and if possible to provide better performance and functionalities.

The new support software for the European civil aviation safety occurrence central repository (ECR) pertaining to occurrence data, known as ECCAIRS 2.0 or "E2", must allow EU Member States to gather and manage data pertaining to events that must be reported and to meet the requirements of Regulation (EU) No 376/2014. This new software also concerns the SRIS[(5)], in compliance with the obligations of Regulation (EU) No 996/2010.

The European Commission's initial objective was to achieve a "Minimum Viable Product" (MVP) offering all the standard functionalities ensuring that ECCAIRS 2.0 worked in a similar way to the previous ECCAIRS system:

- in June 2020, in terms of the occurrence reporting system "E2";
- in September 2020, in terms of the safety recommendations (SRIS 2.0).

However, the "E2" project which started in October 2017, suffered major delays up to Q3 2019, after which the ECCAIRS 2 development phase and that of its SRIS platform could be initiated. The health situation associated with COVID-19 then had a major impact on the previously fixed schedule.

(5) Safety Recommendations Information System.

November 2020 saw the launch of a first evaluation phase of the new SRIS 2.0 system by the working group dedicated to safety recommendations (WG6) of the European Network of Civil Aviation Safety Investigation Authorities (ENCASIA), in which the BEA actively participates. This work enabled the detection and identification of a number of malfunctions resulting in questions about the reality of the effective implementation objective set by the European Commission.

Despite this observation, the European Commission wanted to keep the lead time fixed at December 2020 for the migration of all data to the ECCAIRS 2.0 system and obsolescence of the ECCAIRS "E1" system.

This was a cause of major concern within WG6: given the technical problems encountered during the evaluation, there was a risk of disrupting the continuity of management and monitoring of safety recommendations by European Union Member States.

To attenuate this risk and to move toward acceptable functioning of the system, close coordination between the WG6 and the EASA team tasked with implementing this new central repository was therefore established in January 2021.

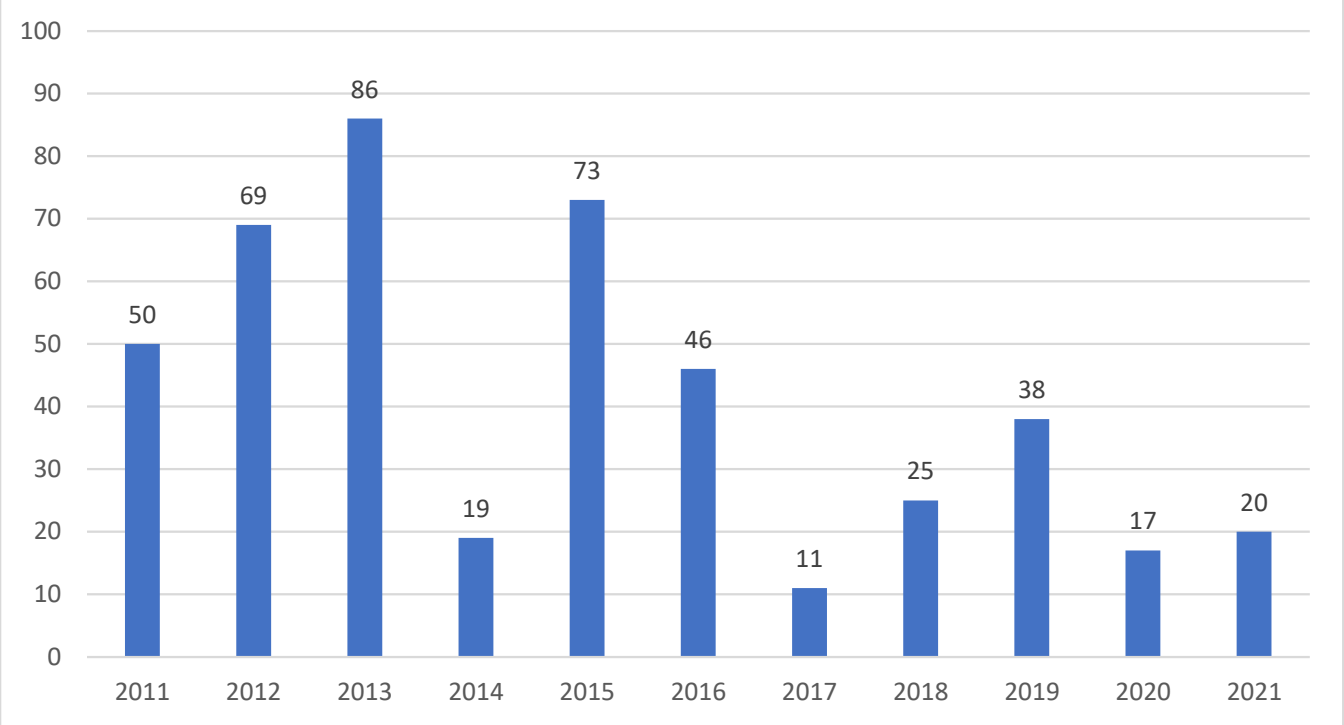
This work led to the provision in September 2021, of a shared safety recommendation collection and monitoring tool considered by users to be satisfactory.

ECCAIRS-SRIS 2.0 also enables the publication on line, of information pertaining to safety recommendations on the European Commission's "Public SRIS" portal.

The address for this website is: **https://sris.aviationreporting.eu/safety-recommendations**

4.2 SAFETY RECOMMENDATIONS ISSUED

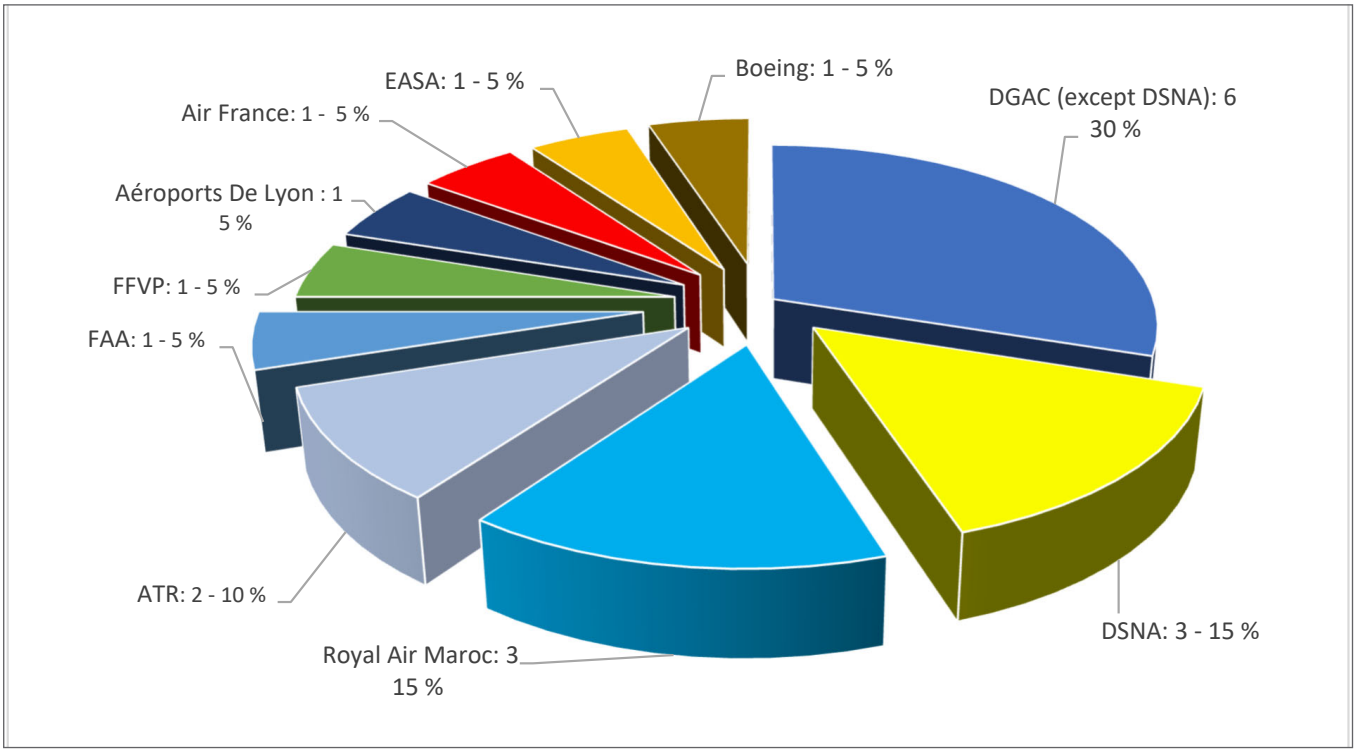
The BEA issued 20 recommendations in 2021.



Breakdown by recipient

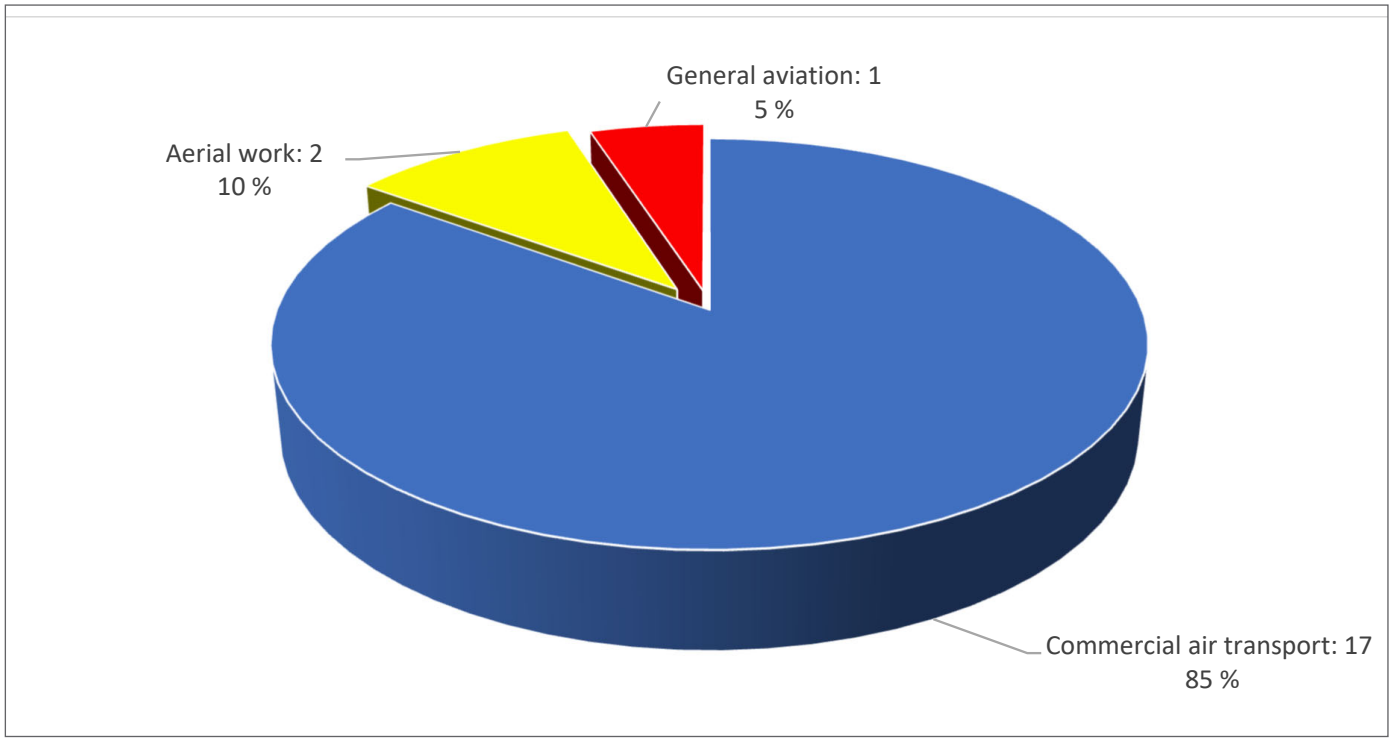
In 2021, 10 entities received safety recommendations, which represented a considerable diversity. By way of comparison, only four entities received safety recommendations in 2020, for an equivalent number of recommendations issued.

The French civil aviation authority (DGAC), excluding the French Air Navigation Services provider (DSNA), the French Air Navigation Services provider (DSNA), the airline Royal Air Maroc and the ATR were the four top recipients of recommendations, representing 70% of the total.

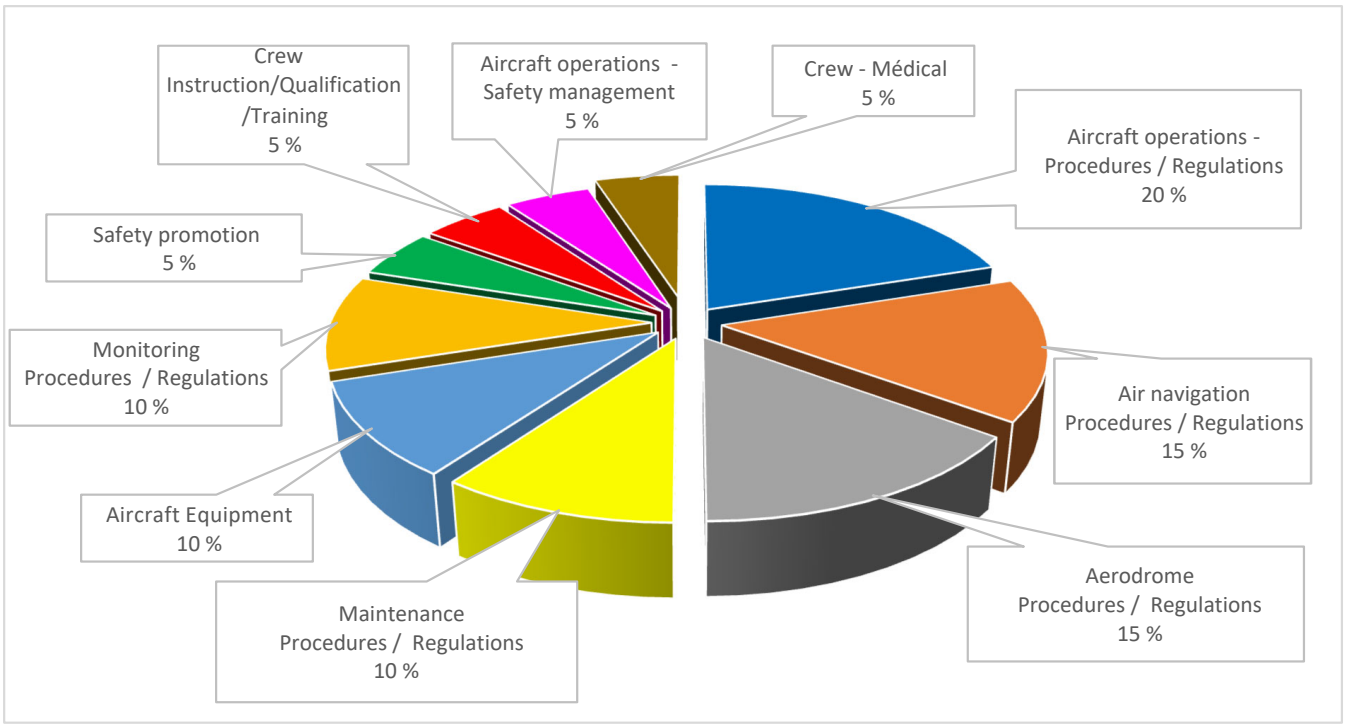


Recipients of recommendations
For each recipient, the graph gives the total number of recommendations issued and the percentage of the total number of recommendations issued by the BEA.

Breakdown by type of operation



Themes of recommendations



Breakdown of recommendations by theme

Review of BEA investigation reports published in 2021 including safety recommendations

Ten of the reports published in 2021 contained safety recommendations. These ensued from category 2 investigations of the following occurrences:

- **Serious incident to the ATR 42-500 registered F-GPYF operated by HOP! on 25 March 2018 at beginning of descent to Aurillac airport (Cantal)**: in-flight loss of the left main landing gear door, which knocked against the fuselage. The BEA issued two recommendations to the manufacturer concerning documentation pertaining to the use of standard parts in fasteners and the policy of reusing self-locking nuts.

- **Serious incident to the Boeing B737-800 registered 7T-VKR operated by Air Algérie, on 14 November 2019 at Lyon-Saint Exupéry airport (Rhône)**: incursion of snow-clearance vehicles cleared to enter the runway, rejection of take-off run. The BEA issued four safety recommendations to the DGAC, the Lyon Air Navigation Services (SNA-CE) and to Aéroports de Lyon, concerning decisions to regulate and suspend operations in degraded meteorological conditions, as well as the Snow Plan.

- **Serious incident to the Boeing B737-800 registered CN-ROJ operated by Royal Air Maroc on 30 December 2016 at Lyon-Saint-Exupéry**: diversion, ADIRU IRS malfunction, non-stabilized approach in manual control and IMC conditions, descent below the nominal slope, off-centre exit from cloud layer, MSAW, EGPWS warnings. The BEA issued five safety recommendations to:
  - the manufacturer and to its oversight authority concerning operation of the ADIRU;
  - the operator concerning the flight crew fault reporting procedures, the processing of intermittent faults and ILS interception practices.

- **Accident to the Agusta Bell AB206 registered F-HGJL on 02 May 2018 at around 35 NM south-west of Cayenne (French Guiana)**: loss of control in flight in adverse meteorological conditions for a VFR flight, collision with ground. The BEA issued a safety recommendation to the DGAC in order that potential instructing parties are informed of their responsibilities in the scope of an own-account flight, and of the differences with a commercial flight.

- **Accident to the Piper PA-46 - 350P registered F-GUYZ on 08 February 2019 at Courchevel (Savoie)**: runway excursion during landing, collision with a mound of snow. The BEA issued two recommendations to the DGAC regarding training to obtain the access authorization to a mountain airfield and oversight of the transport activity that may in fact be commercial air transport.

- **Incident to the Airbus A350-900 registered F-HREV operated by French Bee on 04 February 2020 at Paris-Orly (Val-de-Marne)**: *predictive windshear* warning on final, cognitive incapacitation of co-pilot during go-around, lateral and vertical flight path deviations, *low energy* alert, conflict with a departing aeroplane. The BEA issued a recommendation to the DSNA for them to study the feasibility of increasing the published missed approach altitude at Orly airport.

- **Incident to the Airbus A318-100 registered F-GUGM operated by Air France on 12 September 2020 at Paris-Orly**: non-stabilized approach, activation of MSAW and *Glideslope* warnings. The BEA issued two recommendations addressed to the operator and to the DSAC concerning automatic detection criteria of non-stabilized approaches during the systematic analysis of flight parameters.

- **Accident to a paraglider involving the Airbus EC135-T2+ registered F-HTIN on 11 May 2019 at Le Conquet (Finistère)**: fall of a paraglider pilot during slope soaring flight on crossing a helicopter on final, collision with ground. The BEA issued a recommendation to the EASA concerning the sharing of information with pilots on the dangers associated with wake vortex generated by the movement of helicopters.
- **Accident to the Comco Ikarus C42 identified 03AEN and the Schleicher ASK21 registered F-CITS on 11 September 2019 at Itxassou (Pyrénées-Atlantiques)**: loss of control of tug microlight at take-off and collision with the ground; collision of towed glider with a tree, in instruction. The BEA issued a recommendation to the French Gliding Federation (FFVP) concerning medical requirements for towing a glider with a microlight.
- **Serious incident between two BEECH 200s registered F-HNAV and F-HCEV on 17 April 2019 near Le Bourget (Seine-Saint-Denis)**: two consecutive losses of separation between two planes, during flights to calibrate radio-navigation means. The BEA issued a recommendation addressed to the DSNA concerning control clearance for calibration flights.

4.3 RESPONSES TO SAFETY RECOMMENDATIONS

As regards the follow-up to the 20 recommendations issued by the BEA in 2021:

- seven recommendations received a favourable response and were closed by the recipient;
- eight recommendations received a response from the recipient indicating that action was under way;
- five recommendations are still awaiting a response from the recipient authorities and manufacturers, including one issued in December 2021.

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 investigation;
- or when receiving the final response from the recipient.

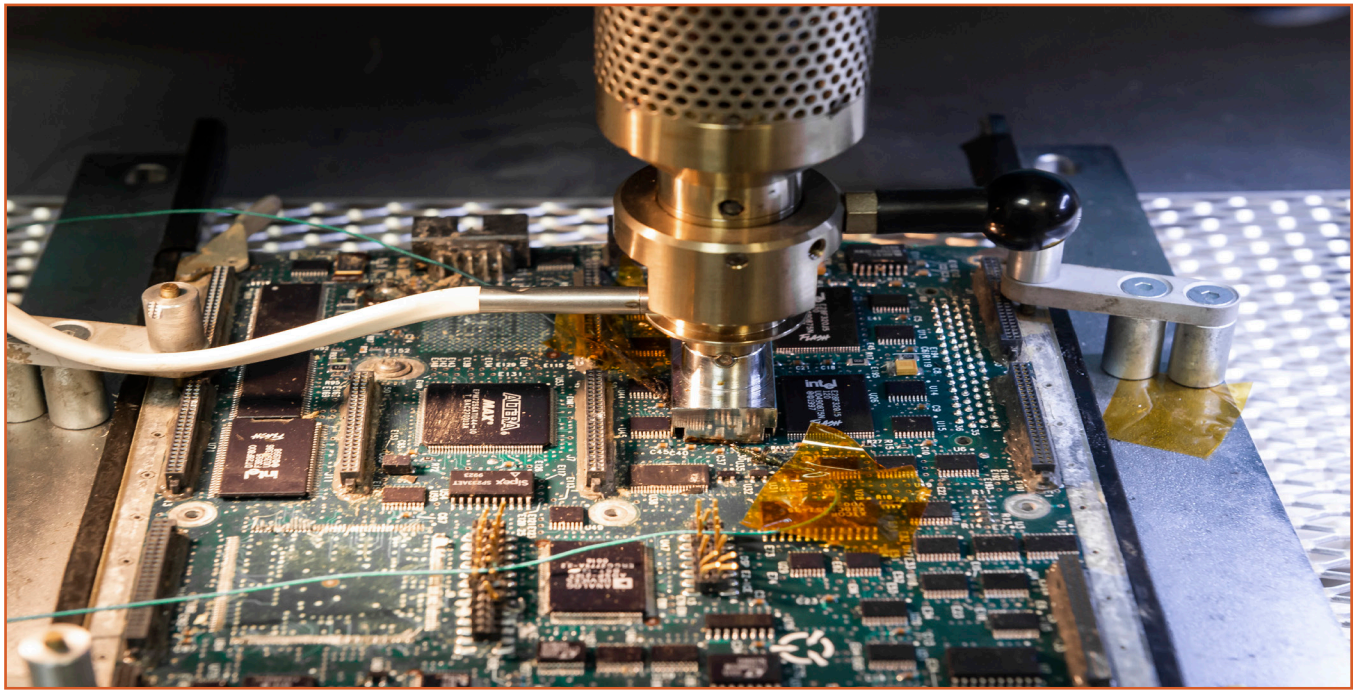
The recommendation general performance indicator is then determined by calculating the mean value of the indicators of each recommendation evaluated.

In 2021, the BEA closed 26 recommendations and the overall value of the indicator was 0.77, compared with 0.82 the previous year. **The following table shows the breakdown of the appropriateness of the responses to these recommendations for each of the main recipients:**

Appropriateness of responses to the BEA's recommendations in 2021 for the main recipients

Recipients	Level
EASA	0.50
DGAC	1
DSNA	1

5. ACTIVITY OF THE LABORATORY ENGINEERING DEPARTMENT



5.1 OVERVIEW OF ENGINEERING DEPARTMENT ACTIVITY IN 2021

The volume of activity of the Engineering Department in 2021 was higher than in 2020, with a total of 445 examinations (all types) versus 392 in 2020. This volume is similar to that observed before the health crisis, slightly below that of 2019.

Occurrences generating particularly high workloads or complex or highly technical work within the Engineering Department include:

- The continuation of research work into the cause of a fire that broke out during a flight of the Piper PA28 registered HB-PNP, on 23 July 2020 at Basle-Mulhouse.
- The continuation of temperature and relative humidity measurements in flight as part of the "carburettor icing" study. The writing of the summary report of this study will be completed in 2022.
- Research work into fires fed by an oxygen leak in the cockpit and the acoustic characterisations of these events in the cockpit voice recorder (CVR) recordings.
- Technical assistance to the manufacturer of the L3Harris recorder, to retrieve data from a flight recorder severely damaged by the heat.

5.2 WORK BY PESA (FLIGHT RECORDERS AND AVIONIC SYSTEMS SECTION)

5.2.1 FLIGHT RECORDERS

In 2021, 31 CVR recordings and 42 flight data recordings (FDR) were read out and used at the BEA, representing a total of 73 recordings. This level was comparable with that of the previous year (79 recordings in 2020).

Over half 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	9	16	6	**31**
FDR recordings read out at the BEA	13	26	3	**42**

5.2.2 AVIONIC SYSTEMS

In 2021, the BEA's avionics lab read out 101 computers*, along with work on photo and video recordings as well as on laptops and smartphones. With a total of 173 examinations (versus 161 in 2020, but 254 in 2019, 231 in 2018, 189 in 2017, 152 in 2016), the number of examinations carried out by the avionics lab stabilised after several years of very strong growth. This was in all likelihood the result of the health crisis.

	BEA investigation	BEA ACCREP	Technical assistance	Total
Computers*	70	26	5	**101**
Laptops/Smartphones	43	0	0	**43**
Photo/video recordings	25	3	1	**29**

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

5.2.3 ATM RECORDINGS

In 2021, 53 occurrences led to work on Air Traffic Management (ATM) data, based on radar data or Air Traffic Control (ATC) exchanges. This type of work related essentially to investigations led by the BEA and the level of this activity was stable with respect to previous years.

ATM work by type of investigation was split as follows:

	BEA investigation	BEA ACCREP	Technical assistance	Total
Number of events	50	2	1	**53**

5.2.4 PESA DEVELOPMENT WORK

Laboratory capacities

PESA built up its fleet of flight recorders and its downloading capacity, including the latest L3Harris recorders now installed on most new Airbus aeroplanes (type FA7100). Of note is also the acquisition of a new BeeProg 2 programmer, and the development of automated electrical test means, to sustain the reading capabilities of electronic memories, including memories which use the most recent technology.

The section of the laboratory dedicated to avionics and computers was expanded to facilitate work and accommodate new machines to increase electronic analysis and data retrieval capabilities.

Studies and developments

A study was completed on servo transparency; this phenomenon, which occurs on helicopters equipped with a flight control assistance system supplied by a single hydraulic system, is a complex phenomenon that is always difficult to characterise during investigations. The study will facilitate identification of the likelihood of a servo transparency situation having occurred during investigations.

Laboratory investigators are often required to perform X-ray examinations of the extent of damage to memory chips. Whilst these examinations did not raise any questions for old electronic memory technologies (NOR type), the harm which laboratory tool x-rays might cause to new generation memories (NAND type) was not controlled. A study was able to determine the thresholds from which exposures to X-rays could cause data modifications or losses. This study confirmed the option to use the laboratory's current radiographic means without risk of corrupting data by applying an adapted filter. A new campaign will be launched when the new tomograph is received, to confirm that the results are still valid with the new machine.

Also of note in the other studies and developments are sound recordings in a laboratory, cockpit or simulator, made to enrich the catalogue of acoustic signatures, a study of the performance of 8.8 kHz transmitters (attached to the aeroplane and used to locate the aircraft in the event of its immersion in water), improvement of the LEA study and analysis software (correction of automatic import of parameter grids for Airbus aeroplanes, integration of a GPWS module), developments intended to facilitate the management of CVR audio transcriptions and associated annotations, the development of plug-ins designed to facilitate the generation of flight paths published in BEA reports based on QGIS software, and the use of real-time GPS to record the precise position at accident sites.

5.3 WORK BY PSEM (STRUCTURE, EQUIPMENT AND ENGINES SECTION)

5.3.1 EXAMINATIONS CARRIED OUT

One-hundred-and-forty-six examinations were carried out in 2021, essentially for investigations conducted by the BEA, and to a lesser extent for accredited representations, for a volume of activity significantly up on 2020 (in which 104 examinations were carried out).

The examinations performed can be broken down as follows:

	BEA investigation	BEA ACCREP	Technical assistance	Total
Wreckage examinations	52	0	0	**52**
Engine and propeller examinations	14	3	0	**17**
Fluid examinations	12	0	0	**12**
Equipment examinations	58	7	0	**65**

5.3.2 PSEM DEVELOPMENT WORK

Acquisition of a tomograph

The BEA is renewing its X-ray analysis and tomograph (3D visualisation of parts) capabilities through the acquisition of a tomograph to replace a radioscope that was equipped, over time, with tomograph options. This acquisition, for an estimated cost of €900,000, will increase its capabilities in terms of the examination of larger and denser parts.

The operation was announced in the 2020 activity report, and should have been finalised at the end of 2021. However, delays were met: the call for tender was made, but measures relating to foreign travel restrictions meant that it could not be completed in 2021 due to the prolongation of the competitive dialogue phase caused by these restrictions.

The estimated schedule therefore now includes a notification of the contract in the spring of 2022 with a delivery in 2023.

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Construction of a new Materials and Failure Analysis laboratory

The tomograph will be large and heavy and cannot be installed in the BEA's laboratory with its current configuration. A project to develop a new laboratory was therefore initiated.

This new laboratory will be installed in new premises to be created at the BEA's headquarters in Le Bourget. These premises will not only have room to house the new equipment in optimum conditions but will also rethink the organisation of the laboratory's work spaces, closer to the BEA's hangar wreckage examination space.

The new laboratory should be completed by the end of 2022.

6. INTERNATIONAL ACTIVITIES, TRAINING ACTIONS AND INSTITUTIONAL RELATIONSHIPS

Signing of a new collaborative administrative protocol between the BEA and its Togolese counterpart, the BTEA

The BEA undertakes many activities on the European and international scene: 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 international organisations (in particular the European Union, the European Civil Aviation Conference (ECAC) and ICAO).

6.1 COMMUNICATION ACTIVITIES IN PROFESSIONAL FIELD

Every year, the BEA participates in many conferences and expert meetings. This allows the BEA not only to spread safety messages based on investigations that it has led or participated in, but also to make its investigation expertise more widely known abroad. This reputation and the keeping of close contacts with its counterparts are essential tools for the success of its work during investigations abroad.

A lot of international conferences scheduled to take place in 2021 were cancelled due to the pandemic but most were able to take place "virtually".

The most noteworthy international conferences and meetings attended by the BEA in 2021 were:

- The symposium on support to victims and their families: the director of the BEA was invited to attend this face-to-face symposium organised under the aegis of the ICAO, to give a presentation in his capacity as Chairman of the ENCASIA[(6)].
- Several events organised by the EASA and attended by the BEA:
    - SAFE 360° - Safety in Aviation Forum for Europe 2021.
    - EASA-CASIA meeting: this meeting between the European SIAs[(7)] and the EASA focused on the coordination of safety investigations, the presentation of events reported the previous year, the follow-up of recommendations and yearly information circulated to the European SIAs by the EASA. In particular, the BEA presented investigations on SMS[(8)].
    - EASA annual conference on air safety: Focus on safety in ATM.
- The ISASI[(9)]: During this "virtual" conference, the BEA presented the final report of an investigation into an uncontained engine failure on an Airbus A380 operated by Air France over Greenland.

(6) European Network of Civil Aviation Safety Investigation Authorities.
(7) Safety Investigation Authorities.
(8) Safety Management Systems.
(9) International Society of Air Safety Investigators.

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, Declarations of Intent for Cooperation are in force with 56 foreign investigation authorities. 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 cooperation 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 above).

However, we note that although several agreements are currently being drawn up, none were able to be signed in 2021 due to the pandemic, and these are expected to be signed in 2022.

6.3 PARTICIPATION IN THE WORK OF INTERNATIONAL ORGANISATIONS

6.3.1 INTERNATIONAL CIVIL AVIATION ORGANISATION (ICAO)

The BEA plays an active role in several of the ICAO's groups of experts. The operation of some of these groups was impacted by the health situation, although, generally, activity continued albeit to a lesser extent:

- **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 virtually in 2021. Moreover, the activity of the sub-groups – the majority having adopted video conferences as a working method some time back – was able to resume normal operation. The BEA chairs two of these sub-groups:
  - the first (WG20) 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 second (WG14) is responsible for proposing standards for Annex 13 and for the ICAO investigator's manual to draft SRGC[(10)].
- **Flight Recorder Specific Working Group (FLIREC-SWG)**: this group of experts is responsible for proposing amendments to ICAO Annex 6 and in particular, with respect to the carrying of flight recorders, the location of aeroplanes in distress and the retrieval of flight data. The plenary session was held virtually.

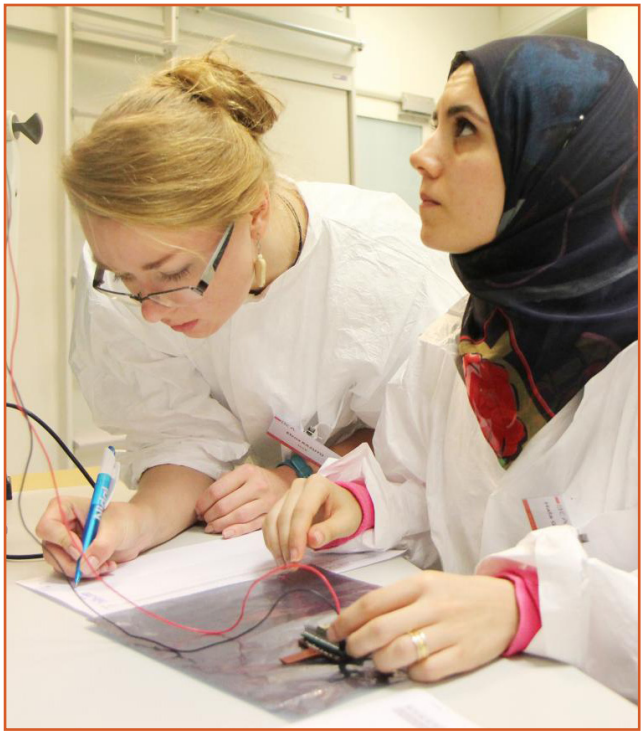
(10) Safety Recommendation of Global Concern.

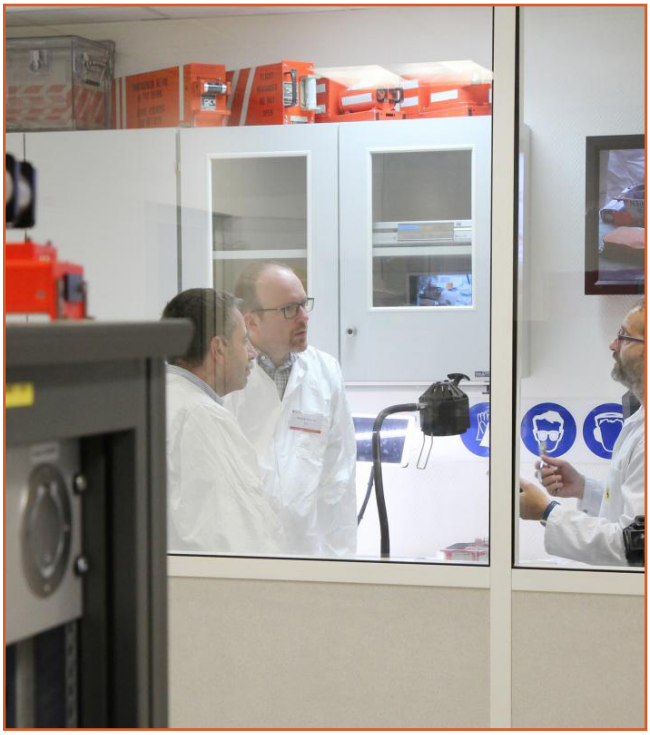
- **Occurrence Validation Study Group (OVSG)**: this group replaces the Safety Indicators Study Group (SISG) and reviews accidents and incidents which occurred the previous year to establish statistics per occurrence category. This group's operation was not impacted by the pandemic, and the BEA was able to continue to contribute remotely to the establishment of the central repository of accidents and incidents used by the ICAO to establish general statistics regarding global aviation safety.

- **ICAO's GADSS-AG Working Group**: the aim of this group is to update the actions to be taken as part of the GADSS[(11)] concept, particularly taking into account the lessons learned from the accident to the AF 447 (over the Atlantic in 2009) and the MH 370 disappearance (over the Indian Ocean in 2014). The BEA participated in video conferences that were able to be organised in 2021. This working group is drafting a new manual for all GADSS concept elements. A lot of meetings were held virtually regarding development of the manual, which incorporates guidelines for the implementation of the standards and recommended practices as regards the four core elements of the GADSS:
    - the tracking of aeroplanes;
    - the location of aeroplanes in distress;
    - the precise location of an accident site;
    - the rapid retrieval of data from flight recorders.

- **ICAO's RASG-EUR[(12)]**: under the umbrella of this group, the BEA is actively involved in the EASPG[(13)], which brings together 52 European States. The group primarily focuses on developing methods and implementing shared tools for occurrence reporting and data analysis. The group also offers an opportunity to strengthen ties, in particular with authorities in Eastern European countries (Russia, Georgia, Ukraine, etc.). A meeting of the group was able to be held via teleconference in 2021.

In addition, the ICAO's regional offices organise meetings or workshops for regional investigators in some regions of the world. With its overseas territories, France is involved in facilitating cooperation between investigators in the Asia-Pacific (APAC-AIG) and Central America ((NACC-AIG) regions. France actively participated in "virtual" meetings held in 2021.





(11) Global Aeronautical Distress Safety System.
(12) Regional Aviation Safety Group – Europe.
(13) European Aviation System Planning Group.

6.3.2 EUROPEAN UNION (ENCASIA)

> Regulation (EU) No 996/2010 created the ENCASIA to coordinate the work of and feedback from the EU's various investigation authorities. The BEA's Director has been the chairman of ENCASIA since 2017, for a term of six years [(14)].

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

- Peer reviews between European investigation authorities. Phase one of these reviews was completed in 2019. Based on the summary report of the first reviews, the foundations of phase two were developed.
- Promotion of mutual support between all European investigation authorities. The main aim is to guarantee that all air transport accidents, throughout Europe, are the subject of a suitable investigation and that lessons are learned and shared to avoid any repeat occurrences. This ENCASIA Mutual Support System (EMSS) provides one example of the BEA's extensive involvement in a medium to long-term project.
- Relations between the ENCASIA and EASA. In 2020, the group had reported its findings aimed at improving relations. In 2021, new operational procedures were developed by another group of the ENCASIA based on the findings of the first group.
- Development of the new version of the ECCAIRS. This new version notably comprises a module concerning safety recommendations: 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).

The meetings of these groups have been held via teleconference for the last two years. These meetings, shorter but generally held more frequently than those organised before the health crisis, enabled work to progress at a near-normal rate.

(14) 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 ECAC[15]

The BEA's Director is the vice-chair of the Group of Investigation Authorities (ACC) bringing together the 44 Member States of the ECAC, a forum for sharing feedback. The ACC holds meetings every six months and these were held via video conference in 2021. These provided an opportunity for the BEA to give an update on the investigations opened in 2020 to its European counterparts. A virtual workshop on the topic of drones took place in 2021. Two focal areas were studied: drone accidents and the use of drones at accident sites. The BEA made three presentations during the workshop.

6.3.4 EUROCAE[16]

EUROCAE is a European organisation that publishes reference documents on specifications for onboard systems. EUROCAE works in close coordination with the RTCA[17], its American counterpart, in many fields. EUROCAE and RTCA documents are written by representatives of the aeronautical community.

The work of the EUROCAE involving the BEA was not affected by the pandemic: meetings of the working groups it participates in were held by video conference in 2021.

The BEA has chaired various EUROCAE working groups over the last 20 years, and in particular WG-98, a joint EUROCAE-RTCA group. This group defined the specifications for new generation Emergency Locator Transmitters (ELT), and in particular those activated in flight when an emergency situation is automatically detected by the aircraft systems. These specifications are based on recommendations issued by the BEA as part of the investigation into the accident to flight AF 447 from Rio to Paris, which occurred in 2009. These documents are now referenced by ICAO standards and all international regulations (FAA, EASA, etc.). They are an essential component of effective regulatory changes to improve aviation safety.

A sub-group of the WG-98, which the BEA actively contributes to, is currently developing the specifications for the RLS[18] for ELTs. This functionality will, in particular, inform people in distress that the ELT signal has been picked up and that the emergency services are on their way. This sub-group published RLS specifications in 2021.

A new group, the WG-118, created in 2020, reviewed the specifications concerning flight recorders (ED-112A) and light flight recorders (ED-155) and is planning to develop new specifications for the recordings of UAS [19] and RPAS [20]. Several BEA investigators actively take part in the working groups and were able to attend all of the scheduled video conferences.

(15) European Civil Aviation Conference.
(16) EURopean Organisation for Civil Aviation Equipment.
(17) Radio Technical Committee for Aeronautics.
(18) Return Link Service.
(19) Unmanned Aircraft Systems.
(20) Remotely Piloted Aircraft Systems.

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. Two places are systematically reserved in each session for the air transport gendarmes (GTA) and, subject to availability, two places are offered to French-speaking foreign investigators. Both sessions went ahead in 2021: there was little change to the autumn session, but the spring session in March had to be organised in a more "hybrid" way, with:
  - remote presentations via teleconferencing;
  - practical exercises at the BEA.
- **One advanced training course for commercial air transport investigators**: this two-week, phase 3A course is intended for experienced investigators. It went ahead as normal in 2021.

The Phase 3A training course is now co-organised with the École Nationale de l'Aviation Civile (ENAC), which helped in particular to create an E-learning module. The agreement with the ENAC stipulates that the training must now be paid for, except for a number of free places reserved for the BEA.

The 2021 session was attended by:

- six BEA investigators;
- eight foreign investigators (Congo, India, Israel, Sweden, Turkey, Ukraine);
- four industry investigators (Airbus, ATR, Thalès).

Around 15 BEA investigators, some of the most experienced in their respective fields, gave presentations. The marked variety of participants on this year's course gave rise to some particularly fruitful discussions, enhancing the training experience for all of the investigators.

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.
- Senior 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 training courses went ahead in 2021, mostly by teleconference.

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 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.

The examination of around 50 plans sent to the BEA confirmed this finding at national level and showed their high degree of variability due to regional and local specificities.

This documentation work highlighted the need for a systemic way of updating and amending plans, while taking into account the prefectorial authority's steering action and local variabilities.

To guarantee the relevance of the amendment actions proposed and the update of the emergency plans and their consistency at national level, a process was carried out in coordination with the DSNA-SAR (tasked with keeping track of updates to DSOAs and DOS-SATERs), the French general directorate for civil defence and crisis management (DGSCGC) (which is responsible for coordinating the updating of emergency plans by the prefectorial authorities) and the ARCC Lyon located at Mont-Verdun.

As a result of these actions, 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, asks prefects to amend their ORSEC and SATER systems pertaining to aviation accidents by incorporating the mission and actions of the BEA.

Actions carried out in 2021

The preliminary BEA-DGSCGC agreement, updated on 18 May 2021, acknowledges the BEA's position within the SATER body directing search and rescue. It specifies the framework of the interactions between the authorities and organisations present or involved in this measure. These interactions are divided into four topics as follows:

- **Update of the ORSEC and SATER systems:**

The DSOAs and DSO-SATERs must be updated by the prefectures every five years.
Since 2017, the BEA has helped to update and amend, in coordination with the relevant services, 50 SATER plans out of the 101 national departments. It should also be noted that a (Mediterranean) SAMAR plan update, for which the BEA was consulted, was carried out in 2021. In the same way, the BEA has reviewed 27 DSOAs since 2018.

- **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.

- **Participation in interdepartmental SAR meetings (RIM-SAR):**

Since 2018, the BEA has been associated with an 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, as well as focusing on any problems encountered by the SAR department stakeholders, with the aim of identifying solutions through direct communication in order to optimise the current system.

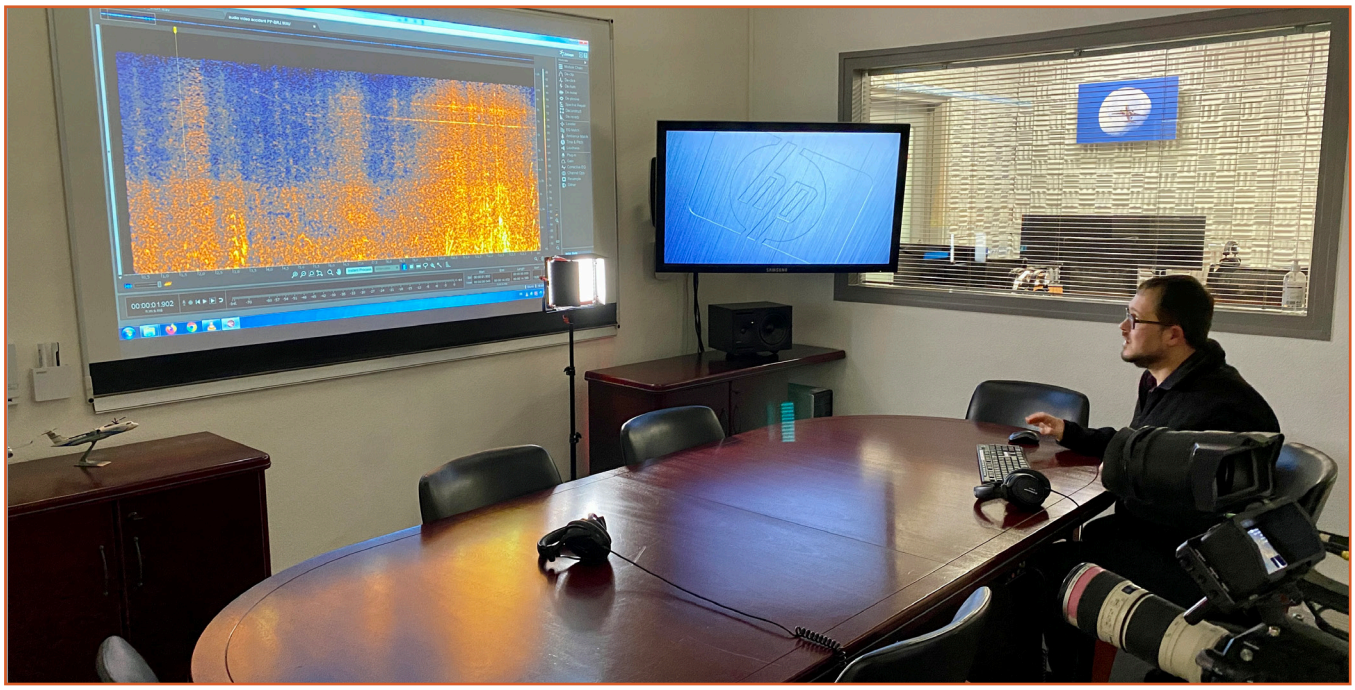
- **Interface in the context of assistance with safety investigations and participation in working groups:**

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 the safety investigation 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.

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*

7. COMMUNICATION ACTIONS



Filming of the documentary “Les détectives du Ciel” on 14 January 2021

7.1.4 RELATIONS WITH THE FAMILIES OF VICTIMS

> In compliance with European Regulation No 996/2010, before publishing its findings, the BEA sends the investigation report to families of victims who have requested to receive a copy, ensuring that it does not compromise the safety objectives of the safety investigation. 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.

However, the health situation made it very difficult, sometimes impossible, to host these meetings at the BEA's premises in 2021. As it had done for the two previous years, the BEA therefore continued to hold more frequent, but shorter meetings remotely by video conference or by telephone.

It should also be noted that one video conference meeting was unusual in its organisation as it was held after publication of the final report. This meeting was held to answer questions raised by the pilot's family subsequent to the reading of the circumstances of the accident and the BEA's findings. In this case, a postal response would not have been adequate due to the complexity and sensitivity of the information to be shared.

7.2 PROMOTION OF THE BEA'S WORK

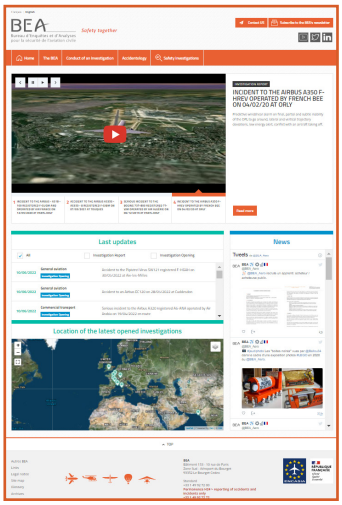
7.2.1 COMMUNICATION CHANNELS: THE BEA'S WEBSITE, TWITTER FEED AND YOUTUBE CHANNEL

The BEA's website (**www.bea.aero**) is an essential communication tool for the BEA. The website was visited 47,000 times in 2021, largely in France, the United States and the UK.

The number of users accessing the website from their smartphones and tablets has topped the number of users accessing the website from a computer for the first time:

- 68% of visitors use a smartphone or tablet;
- 32% of visitors use a computer.

These figures led the BEA to launch several initiatives to facilitate access to its investigation reports on these devices. The first development will be introduced in 2022.



In terms of the BEA's other communication channels, its Twitter feed has exceeded 15,000 followers and its YouTube channel has nearly 3,000 followers. Although the number of YouTube followers has not really grown since last year, the first two episodes of the "Lessons Learned" videos published on line on the channel in 2021 were viewed 50,000 times (see below). The BEA has therefore decided to continue developing communications through this media.

7.2.2 PUBLICATION OF INVESTIGATION REPORTS, "LESSONS LEARNED" VIDEOS AND "ACCIDENTOLOGY" SECTION

All of the BEA's investigation reports are published in French and in English on the BEA's website. Over 100 reports are published every year (140 in 2021, refer to paragraph 2.1), and their format and editorial style must adhere to a specific protocol. Until now, some safety lessons did not have the outreach required to reach the greatest number of people in the aeronautical industry.

Two actions were therefore implemented in 2021:

- The production of "Lessons learned" videos broadcast at: https://www.youtube.com/playlist?list=PLthlpMbEA4pwZttrvQFwKK4Se3_EYQZ1j
- The creation of an "Accidentology" section on its website: https://bea.aero/en/bilans-etudes/enseignements-2021/

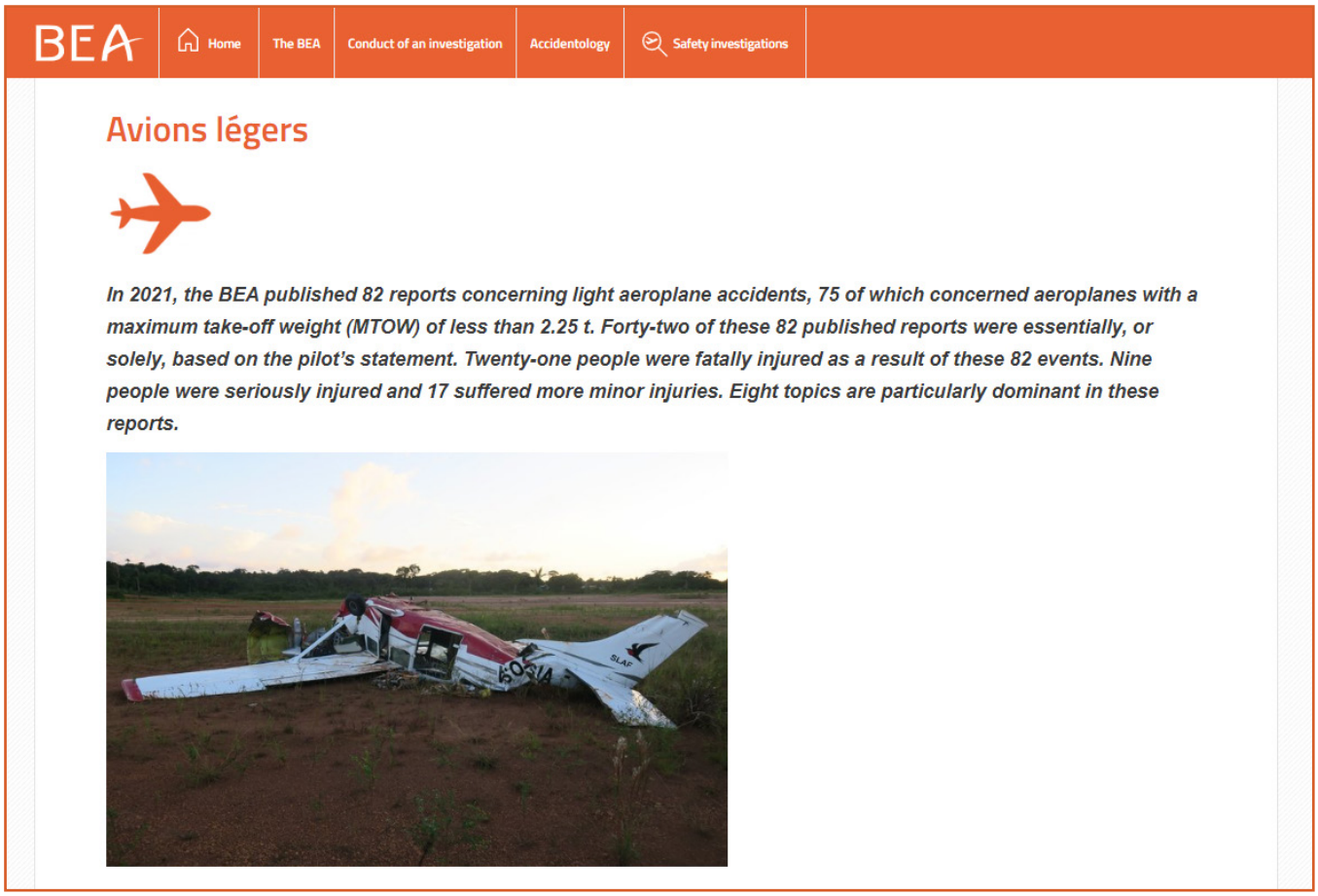
Filming at the Air and Space Museum of a video
regarding the accident to a paraglider involving the Airbus - EC135 registered F-HTIN on 11 May 2019 at Le Conquet

The "Lessons learned" videos explain and illustrate the findings of a BEA safety report and usually contain an animation of the event along with input from the investigators who worked on the report.

The first two videos published concerned:

- the incident to the Airbus A350 registered F-HREV operated by French Bee on 04 February 2020 at Paris-Orly: "Cognitive incapacitation & flight path deviations during go-around" video;
- the accident to a paraglider involving the Airbus - EC135 registered F-HTIN on 11 May 2019 at Le Conquet (Finistère): "helicopter wake turbulence / a dangerous phenomenon" video.

The "Accidentology" section of the website contains safety lessons by type of aircraft, focusing on certain investigation reports published by the BEA the previous year. This section allows the various stakeholders to access reports on common topics, not via one event in particular but via a "cause" such as "Incomplete flight preparation", or "Insufficient experience for mountain flying" and so gain awareness of the recurrence of some types of accidents, as well as the seriousness of their consequences.



Accident to the Cessna - 207 registered F-OSIA on 25 January 2019 at Cayenne

This section will be added to and developed in 2022 and in 2023 to offer new options to access content with the continued aim of promoting the BEA's publications and their safety lessons and of helping readers to understand the hierarchy of risks associated with the various aviation activities.

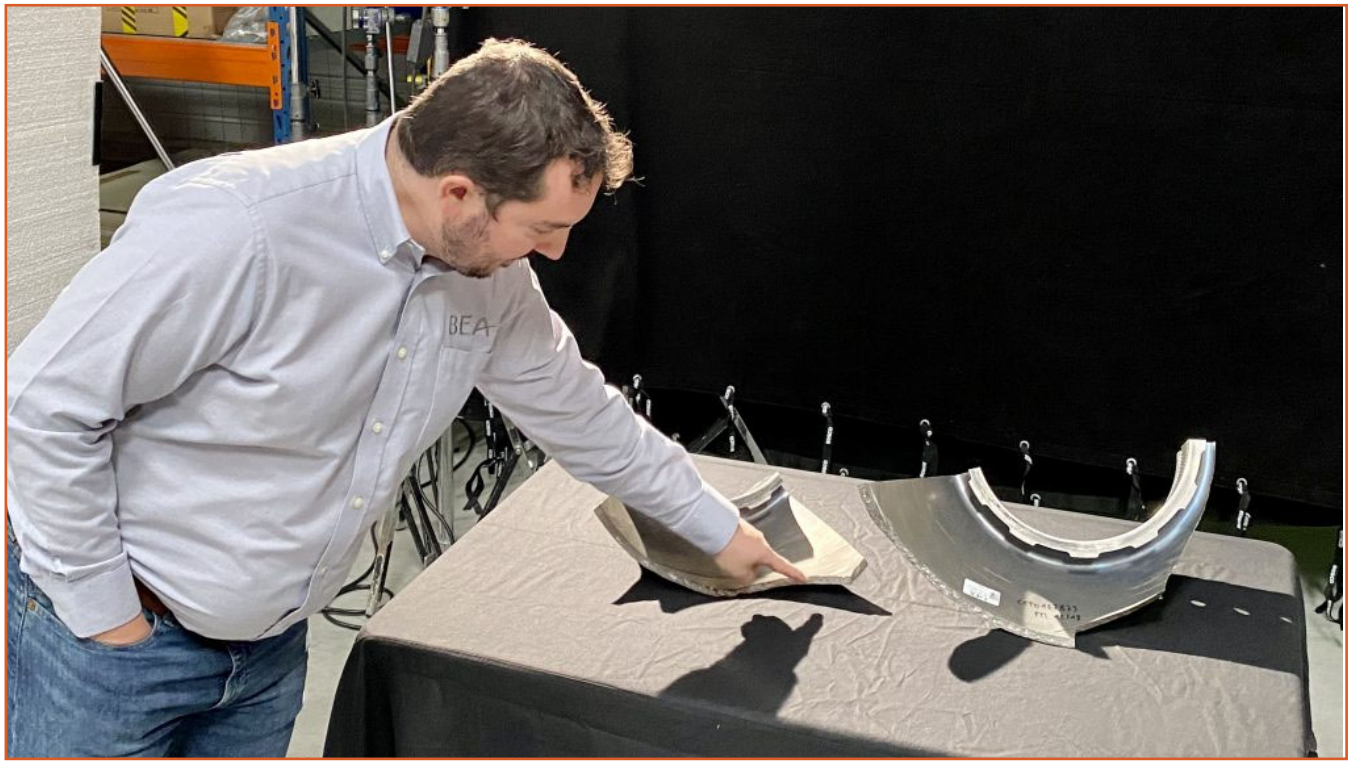
7.3 THE BEA FEATURED IN A TELEVISION DOCUMENTARY AND IN A FICTION FILM

7.3.1 TELEVISION DOCUMENTARY “LES DÉTECTIVES DU CIEL” (SKY DETECTIVES)

Produced by François Ducroux and directed by Louis-Pascal Couvelaire, production on this documentary began in 2019, but it was only completed in 2021 due to delays caused by the health crisis. It was broadcast on the French channel, France 5 at the start of 2022.

This film was the result of an unprecedented collaboration between the BEA and the production company Éléphant. For the first time, the BEA opened all its doors to demonstrate how the scientific knowledge and skills of its staff help with the progress of its investigations.

The documentary focused in particular on **the accident to the Airbus A380 registered F-HPJE and operated by Air France on 30 September 2017 en route over Greenland**, a case combining human and technical challenges, while referring to other investigations simultaneously conducted by the BEA, so as to highlight certain skills.



Filming of the documentary “Les détectives du Ciel” on 15 October 2020

During the making of this documentary, BEA investigators were interviewed at Le Bourget and in Toulouse and a lot of elements, photos, videos and evidence gathered during its investigations were shared with the film crew.

Filming of the documentary "Les détectives du Ciel" on 16 October 2020

7.3.2 THE FILM “BLACK BOX”

The film “Black Box”, directed by Yann Gozlan and released in cinemas in September 2021, is a fiction feature film in which the BEA plays a central role. It contributed to the production in a technical advisory capacity.

A number of other aeronautical stakeholders also contributed to the film, with many scenes being filmed in the autumn of 2019 inside several museums (Air & Space at Le Bourget, Delta at Orly and Safran at Réau), at several airports (Le Bourget, Orly and Roissy) and at several manufacturers such as Corsair and Dassault.

The BEA did not validate the film script (it was not asked to and validating a work of fiction does not fall in its remit), but it acted in an advisory capacity in terms of the dialogue, set, costumes and direction to ensure these were as close to reality as possible within a fictional universe. It also contributed to the film press launch helping the media to distinguish between fact and fiction.

The film's success attracted a lot of attention from the media, interested in discovering the "real" BEA: several reports were published in the written press or broadcast on radio stations after the film release to present the BEA's work and its staff. One such report was France Inter's podcast "Les oreilles d'or des cockpits" produced and broadcast in December 2021, which focused on the analysis of flight recorders.

8. HUMAN RESOURCES & FINANCES

8.1 PERSONNEL

8.1.1 STAFF ON 31 DECEMBER 2021

As of 31 December 2021, the BEA had 91 members of staff divided as follows:

BEA staff	Civil servants	Contractual employees	Workers	Total
Flight crew		2		**2**
Engineers	39	11	0	**50**
Senior technicians	17			**17**
Technicians		1	4	**5**
Administrative staff	14	2	1	**17**
Total staff	**70**	**16**	**5**	**91**

Note: 3 apprentices and 123 field investigators, 86 based in metropolitan France and 37 based in France's overseas territories, must 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, the DSAC and the DGAC Secretary General.

8.1.2 REGIONAL BRANCHES

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

- Rennes: 2 investigators.
- Toulouse: 3 investigators and 1 member of IT staff.
- Aix-en-Provence: 3 investigators.
- Lyon: 2 investigators.

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, the DSAC and the DGAC Secretary General (already mentioned in paragraph 8.1.1).

8.1.3 PERSONNEL TRAINING

The BEA spends a significant part of its budget on professional training in order to guarantee a high level of skills for its personnel in various areas, vital for its activity.

The 2021 training programme was defined based on an initial budget of €200,000 of commitment authorisations (CA) and payment appropriations (PA) (representing around 6% of the annual budget and 10% of the operating budget). This budget was cut at the start of the year due to the continuing health crisis, and finally increased again during the year up to €235,000, due to a carry over of the budget allocated to staff travel expenses, which were markedly lower than the amount allocated at the start of the year.

In this context, the BEA succeeded in maintaining its annual training programme.

The total budget allocated to professional training was €222,000, distributed as follows:

- €197,500 for BEA staff;
- €24,500 for apprentices;

and payment appropriations used amounted to €195,500, i.e.:

- €183,000 for BEA staff;
- €12,500 for apprentices.

Note: The amount spent on the training of BEA apprentices corresponded to the amount paid by the BEA to the Apprentice Training Centres. This amount is set at the start of the school year (September in the actual year) and effectively paid at the end of the school year (August of the following year). The BEA took on 5 apprentices in 2021:

- *two apprentices completing their sandwich courses;*
- *three apprentices starting their sandwich courses.*

Training credit commitment authorisations and payment appropriations corresponding to apprentices completing their sandwich courses in 2021, were included in the figures for 2021, but PA corresponding to apprentices who started their sandwich courses in 2021 will not be included in the figures until 2022.

Training expenses were up 6% on 2020.

A total of 77 BEA staff members participated in at least one training action. On a basis of 254 working days each year, all of the training actions represented 3.69 person-years, and were in the following areas:

- language training (mainly English);
- technical training courses with specialised organisations related to investigations;
- manufacturer's training;
- flight training.

Concerning flight training, we note that 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 health crisis, was partially resumed in 2021: one member of staff was able to start his line conversion training as a co-pilot in the A320 within the framework of an agreement signed with an airline. This initiative gives the agents 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 some 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.

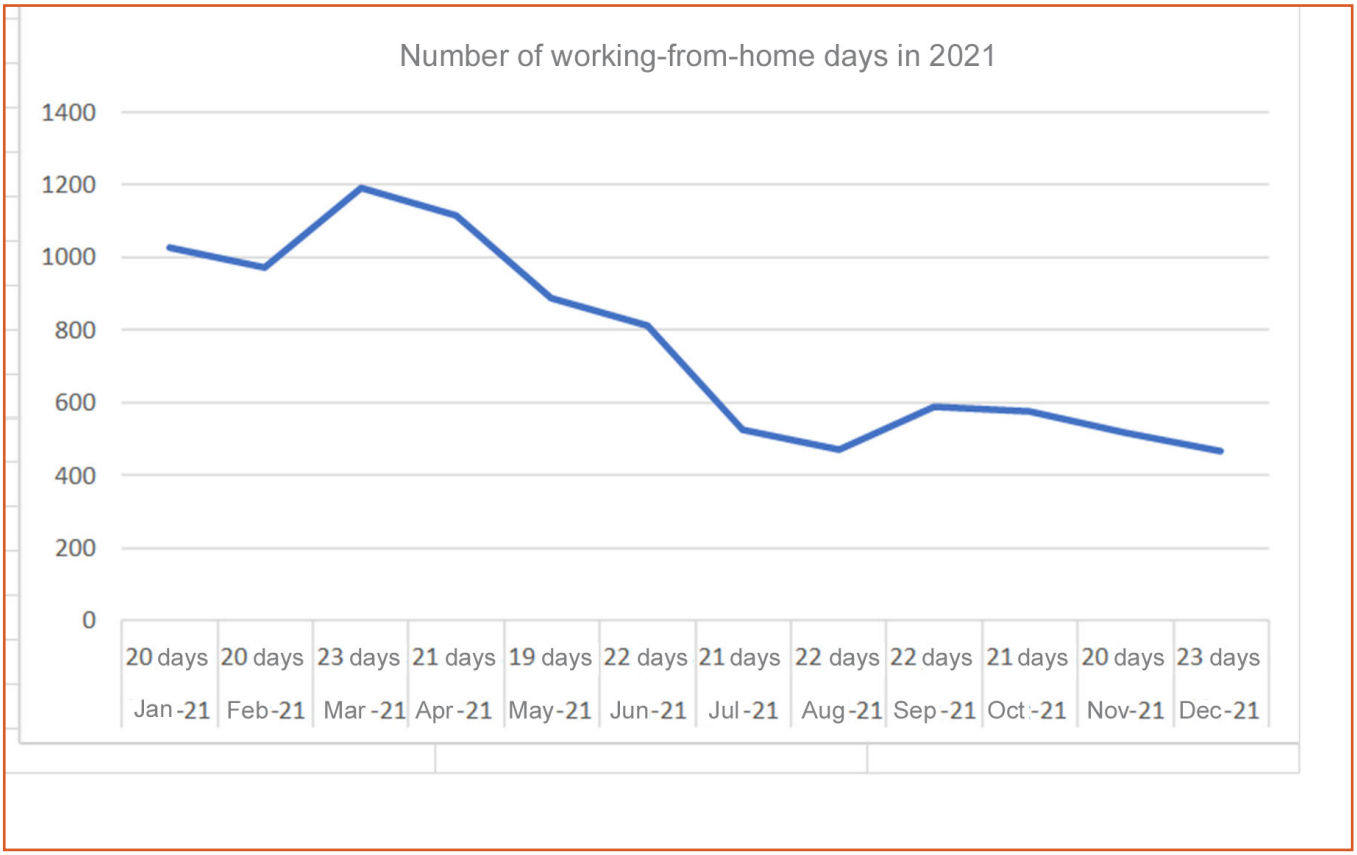
In 2021, of the 91 members of staff on 31 December 2021, there were:

- three members of staff doing work that could not be done from home;
- eighty-eight members of staff doing work that could partially be done from home.

The total number of working-from-home days was 9,144.5, which represented an average of 100.5 days per member of staff or 104 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 2021. The data for this graph must be interpreted cautiously (for example, the fact that staff often take holiday through the summer or over the festive period, translates to a decrease in the number of days worked from home). However, it shows a downward trend throughout the year, including over the festive period, during the (partial) mandatory working-from-home periods, which gave staff the option to work on site one or two days per week.

In all likelihood, working from home will be continued for years to come, within the framework of new agreements between staff and HR, and a balance between working on site and working from home will be found. More details will be given in future activity reports.



Number of working-from-home days in 2021

8.2 BUDGET

8.2.1 ALLOCATIONS

The BEA budget was set in the initial finance law at €3.13 million in commitment authorisations (CA) and €3.13 million in payment appropriations (PA).

Resources were supplemented by:

- carry over of CA appropriated in 2020: €0.70M in CA;
- carry over from 2020 to 2021: €0.07M in PA;
- carry over of product allocations from 2020 to 2021; €0.019M in CA and PA;
- derived product allocations in 2021; €0.015M in CA and in PA (these allocations were from the sale of vehicles and various moveable assets).

In addition, the amending finance law of 2021 cancelled out €0.25 million in CA and in PA.

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

- €3.61M in CA;
- €2.98M in PA.

8.2.2 EXPENDITURE FOR THE PERIOD

Expenditure for the period is broken down by service in the table below.

Services	Operation		Investment	
	CA (€)	PA (€)	CA (€)	PA (€)
Logistics	849,498	797,450	19,328	
Travel	279,758	284,348		
Communication	77,405	82,271		
Training of BEA staff	197,449	182,730		
Engineering	326,342	293,501	163,143	142,986
Information Technology	324,181	315,622		
Investigation support	9,140	8,988		
Total (€)	**2,063,773**	**1,964,910**	**182,471**	**142,986**

Note: the amount paid by the BEA to the Apprentice Training Centres to train their apprentices is included in the table above in the row corresponding to the department in which they are working, and not in the "training" row.

The BEA's total consumption was therefore:

- €2.25M in CA;
- €2.11M in PA;

which represents a consumption ratio of:

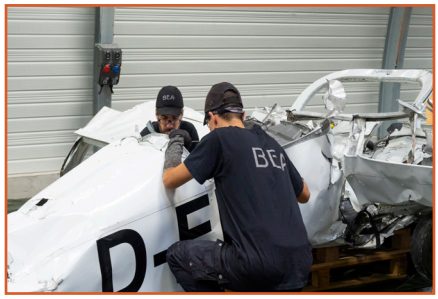
- 62% of available CA;
- 71% of available PA.

This low level of consumption was mainly due to the health crisis, which resulted in a significant drop in global aviation activity.

> During a "normal" year, the travel budget represents a significant share of the overall budget, in particular regarding the dispatch of investigation teams abroad. In fact, during 2021, the BEA only sent one investigation team to an accident site abroad and there was very little travel associated with foreign investigations. In addition, practically all of the international meetings were held via teleconference, or were simply cancelled.

In this context, the BEA was able to set aside €629,000 of CA for functional purposes, i.e.:

- €100,000 to fund the purchase of a tomograph, initially scheduled for 2022;
- €529,000 to fund the creation of a new laboratory, also scheduled for 2022.

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