

Annual Report 2011

Summary

A MESSAGE FROM THE DIRECTOR	3
INSTITUTIONAL CONTEXT	4
ORGANISATION OF THE BEA	6
ACCIDENT STATISTICS IN 2011	7
BEA INVESTIGATIONS	8
A - BEA investigations closed in 2011	8
B - BEA investigations under way in 2011	10
C - BEA investigations initiated in 2011	11
FOREIGN INVESTIGATIONS WITH BEA PARTICIPATION	12
A - Foreign investigations closed in 2011	12
B - Foreign investigations under way in 2011	13
C - Foreign investigations initiated in 2011	14
SAFETY RECOMMENDATIONS	16
A - Recommendations issued in 2011	16
B - Follow-up on recommendations issued in 2010	19
C - Follow-up on recommendations issued in 2009	20
LABORATORY ACTIVITY	22
A - Engineering Department activity in 2011	22
B - Flight recorders and avionics systems	22
C - Structures, equipment and engines	23
INFORMATION AND INTERNATIONAL ACTIVITIES	24
A - Information to families of victims	24
B - Conferences and seminars	24
C - Cooperation Activities	25
EVOLUTION OF MEANS AND RESOURCES	26
A - Personnel	26
B - The budget	26

A Message from the Director



2011 can be described as an excellent year in terms of the safety of public transport in French aviation, since there were no fatalities during the year. It was also noteworthy for the lack of any accident fatalities on Airbus or ATR around the world.

This state of affairs is sadly not reflected in the activities involving helicopters and general aviation, which caused an increased number of fatalities and injuries in 2011 compared with 2010.

In 2011, the BEA's activity was maintained at a steady rate. It was marked by the discovery of the wreckage of the AF 447 Rio-Paris flight during the fourth phase of undersea searches. This was immediately followed by a campaign to recover the flight recorders and parts from the aeroplane. The complete recorder readout enabled the investigators to understand the circumstances of the accident, which were described in a further Interim Report published on 29 July.

In 2011, the BEA continued to assist other authorities in the context of safety investigations as representative of the State of Manufacture of Airbus, ATR and Eurocopter, as well as in the context of cooperation agreements or in response to requests for technical assistance, in particular for flight recorder readouts. This activity, though not widely publicised, contributes very strongly to the BEA's image in the eyes of the international aviation community.

In addition, at the end of 2011, the BEA launched the preparation of a strategic plan aimed at consolidating its position among the world's leaders in the domain of aviation safety investigations.

Le Directeur du BEA

A handwritten signature in blue ink, consisting of a stylized 'J' and 'P' followed by a horizontal line.

Jean-Paul Troadec

INSTITUTIONAL CONTEXT

The BEA (Bureau d'Enquêtes and d'Analyses pour la sécurité de l'aviation civile) is the French authority responsible for technical investigations into civil aviation accidents and incidents occurring on French territory.

International Civil Aviation Organisation (ICAO)

Over the years, a number of measures have been adopted under the auspices of ICAO to organise accident investigation and, since 1994, incident investigation. International cooperation is essential in order to ensure the safety of aviation operations, which are by their very nature transnational.

These measures are included in article 26 of the Convention on International Civil Aviation of 7 December 1944 (known as the Chicago Convention) and in Annex 13 to this Convention. The general organisation of investigations is codified, as are the notification rules for events, and the presentation and dissemination of results.

Specifically, States are obliged to institute an investigation in the event of an accident or serious incident on their territory. It is specified that "the sole aim of an investigation into an accident or an incident is to prevent future accidents or incidents" and that "this activity shall in no case be concerned with apportioning blame or liability". The close association of the representatives of the State of Registry, of Operation, of Design and Manufacture of the aircraft is defined: the investigating State benefits from their knowledge and skills, allowing for rapid and complete feedback regarding safety issues.

Annex 13 specifies that any personal information collected during the investigation (recordings of cockpit conversations or medical files, for example) must not be used for any other purpose than safety.

European regulations

European Union (EU) regulation 996/2010 of the European Parliament and Council of 20 October 2010 on investigations and the prevention of civil aviation accidents and incidents and repealing Directive 94/56/THIS, published in the Official Journal of the European Union on 12 November 2010, came into force on 2 December 2010.

This regulation follows on from the convention relating to international civil aviation and its aforementioned Annex 13, taking up their definitions of fundamental notions and their principal "recommended norms and practices". It sanctions the authority of safety investigation bodies and their national character, institutes a network grouping these bodies together, organises participation in investigations by the European Aviation Safety Agency (EASA) and Member State civil aviation national bodies, and sets out new procedures of information exchange between key players working together to ensure aviation safety, as well as between them and the public.

European Civil Aviation Conference (ECAC)

In addition, coordination between the different investigation bodies of the 44 member States is ensured by the European Civil Aviation Conference (ECAC).

French legislation

The transport code and civil aviation code respectively set out the legal and regulatory measures relating to investigation organisation, the status of the investigation authority and the prerogatives of the director and his or her investigators.

These measures are subject to the provisions of the aforementioned European regulation in those parts of the national territory where this regulation is applicable (metropolitan France and overseas departments, excluding Mayotte).

BEA missions

Every year, the BEA conducts about 250 new investigations following accidents or incidents in public transport and in general aviation occurring anywhere on French territory.

Each year the BEA represents France in 150 new investigations conducted by a foreign State. It participates actively in these investigations as State of Design, Manufacture, Registry, or Operation of the aircraft. It can also act as observer on behalf of France in these investigations when French nationals are among the victims.

In addition, the BEA offers technical assistance when a foreign organisation calls upon its skills, most frequently in relation to the readout of flight recorders.

Finally, the international and European texts authorise the BEA to call on any outside expertise it requires during an investigation.

ORGANISATION OF THE BEA

To accomplish its missions, on 31 December 2011 the BEA had 102 staff members, including 51 investigators.

Organisation Chart (as of 1st July 2012)



ACCIDENT STATISTICS IN 2011

Accidents to aircraft in France in 2011

This table presents all the accidents, notified or brought to the attention of the BEA, which occurred to registered or identified civil aircraft. 'Accidents with injuries' groups together fatal accidents with those that caused light or serious injuries.

	Aircraft involved in accidents	Number of aircraft involved		Injuries on board	
		Accidents with injuries	Fatal	Fatal	Serious
PUBLIC TRANSPORT					
Aeroplanes	9	1	0	0	0
Helicopters	0	0	0	0	0
Balloons	0	0	0	0	0
Total public transport	9	1	0	0	0
AERIAL WORK					
Aeroplanes	6	2	1	1	1
Helicopters	3	1	1	4	0
Microlights	1	0	0	0	0
Total Aerial work	10	3	2	5	1
GENERAL AVIATION					
Aeroplanes	121	29	18	34	14
Helicopters	12	5	2	4	6
Gliders (incl. motorised)	23	6	5	7	2
Balloons	4	2	0	0	2
Microlights	124	52	27	32	38
Total general aviation	284	94	52	77	62
Overall total	303	98	54	82	63

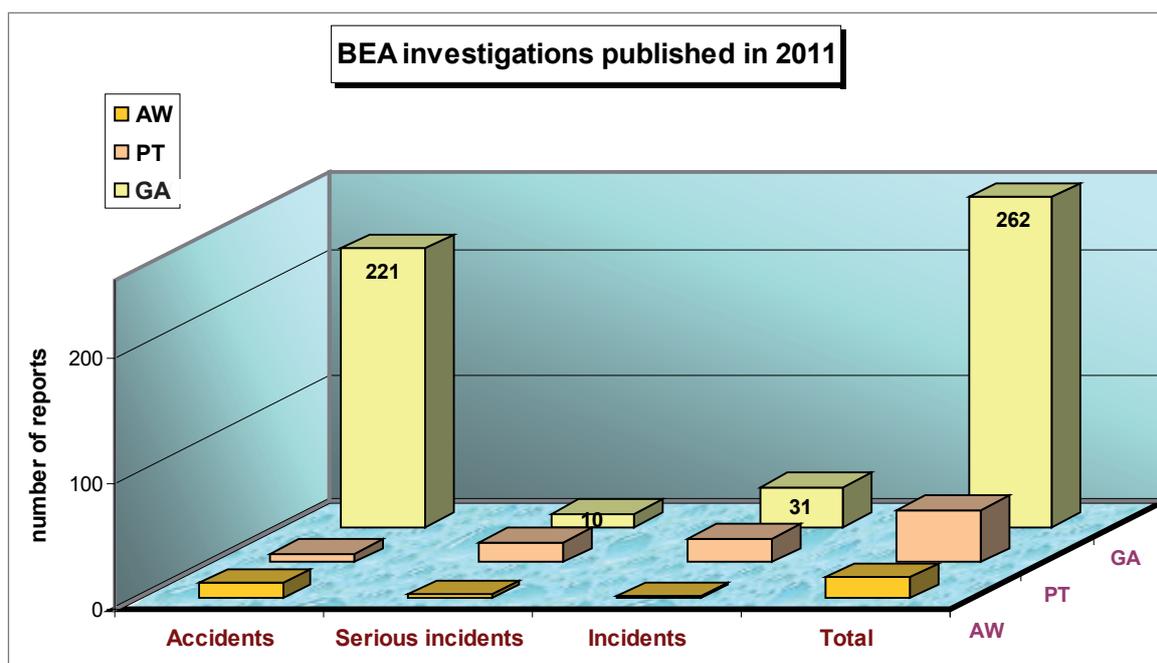
BEA INVESTIGATIONS

A - BEA investigations closed in 2011

The BEA closed 467 dossiers linked to events that occurred mainly before 2011. One hundred and forty-six of them, previous to June 2007, were not the subject of a publication.

The following table lists, for information, the distribution of the 321 investigations closed and published in 2011 by type of operation (public transport, general aviation (GA), aerial work (AW), and by type of event (accident, serious incident or incident).

BEA Investigations published in 2011	Public Transport	GA	AW	Total
	42	262	17	321
Accidents	7	221	12	240
<i>including, fatal</i>	0	62	4	66
Serious incidents	16	10	3	29
Incidents	19	31	2	52



The BEA published 205 final investigation reports in 2011, of which 21 in public transport, 170 in GA and 14 in AW.

The data and results from 116 other closed investigations were published in the occurrence database, accessible via the BEA website.

In 2011, the BEA issued 50 recommendations addressed to the French, European or international authorities.

Among the 321 investigations published by the BEA in 2011, it is of note that:

One hundred and forty-seven aeroplanes (including 3 Airbus), 20 helicopters (including 4 Eurocopter), 40 gliders, 3 balloons and 30 microlights were involved in accidents. Five of the 7 accidents that occurred in public transport involved 4 French operators.

Thirty aeroplanes, 4 helicopters (including 2 Eurocopter), 18 gliders and 14 microlights were involved in the 66 fatal accidents.

Twenty-seven aeroplanes (including 6 Airbus), 1 helicopter and one microlight were involved in the serious incidents. Eleven of the 16 serious incidents that occurred in public transport involved 4 French operators.

Fifty aeroplanes (including 8 Airbus and 8 ATR), 1 glider and 1 microlight were involved in the incidents. Fifteen of the 19 incidents that occurred in public transport involved seven French operators.

Among the 21 public transport investigation reports published, the following were of note:

Three reports concerning accidents:

- ▶ Accident on 19 June 1999 at Paris Orly (94) airport to the Boeing 737-200 registered F-GMJD operated by Aigle Azur with 127 passengers and 5 crew members. During takeoff, the nose gear struck a concrete block. The aeroplane was diverted to Paris Charles de Gaulle airport.
- ▶ Accident on 8 June 2004 off the coast of Cap Ferrat (06) to the Eurocopter AS 350 BA registered 3A-MIK operated by Hélicoptère Air Monaco with 5 persons on board. In cruise, the helicopter descended suddenly and struck the surface of the sea. This investigation led the BEA to issue reminders on safety recommendations concerning the carrying of flight recorders in public transport.
- ▶ Accident on 8 February 2009 at Paris Charles de Gaulle (95) airport to the Airbus A321 registered F-GYAJ operated by Air Méditerranée with 221 passengers and 8 crew members. On landing, during a snowstorm, the aeroplane ran into the buried concrete base of a flashing light located at the runway end. This investigation led the BEA to issue, to the Direction Générale de l'Aviation Civile (DGAC), 10 safety recommendations concerning updated information on the state of runways, stripping work, the nature and thickness of contaminant, operational measures on longitudinal grip coefficients, normal landing procedures, automatic terminal information service (ATIS) and on managing the state of the surface of runways in the winter period.

Three reports concerning serious incidents:

- ▶ Serious incident on 16 August 2008 on takeoff from Paris Charles de Gaulle (95) airport to the Boeing 737-800 registered SU-BPZ operated by AMC Airlines with 185 passengers and 7 crew members. At night, on a runway reduced for works, the aeroplane struck some temporary runway end lights and then, during the rotation, destroyed some beacons in the safety equipment positioned in front of the work area. It took off before one temporary blast barrier and continued its flight to destination. This investigation led the BEA to issue, to the DGAC and EASA, 2 safety recommendations concerning the certification and use of onboard performance calculation systems.
- ▶ Serious incident on 29 March 2010 at Nice (06) airport to the Raytheon 390 Premier 1A registered M-FROG and the Bombardier CRJ 200 registered EC-HHV. At night, one of the aeroplanes was obliged to abort its takeoff after the other entered the runway, which ATC did not notice. This investigation led to issuing, to the DGAC, 2 safety recommendations concerning the prevention of runway incursions and on the process for updating aeronautical charts.
- ▶ Serious incident on 2 June 2010 in the Bordeaux FIR near OLRAK point between the Airbus A318 registered F-GUGJ operated by Air France and the Pilatus PC 12 registered EC-ISH. Erroneous altitude and speed information led the latter to fly at a level in conflict with the Airbus without the risk of collision between the two aeroplanes being possible to detect by the ATC or by the anti-collision systems. This investigation led the BEA to issue, to EASA, 2 safety recommendations concerning crew procedures and to issue a reminder of a previous safety recommendation addressed to the Direction des Services de la Navigation Aérienne (DSNA) concerning the specific management of a flight in case of a distress or emergency being declared.

Three reports concerning incidents:

- ▶ Incident on 17 May 2008 at Carcassonne (11) aerodrome to the Boeing 737-800W registered EI-CSY operated by Ryanair with 142 passengers and 6 crew members. The winglet on the end of the left wing of the aeroplane struck a gutter on the terminal.
- ▶ Incident on 2 May 2009 on approach to Antalya (Turkey) to the Boeing 737-300 registered F-GFUF operated by Europe Airpost with 110 passengers and 5 crew members. The aeroplane stalled briefly while the autopilot and auto-throttle were connected.
- ▶ Incident on 20 December 2009 in cruise in Reims FIR (Flight information region) to the McDonnell Douglas MD-83 registered F-GMLU operated by Blue Line with 6 crew members. During a positioning flight, the aeroplane approached a stall situation at high altitude.

B - BEA investigations under way in 2011

Apart from the investigations initiated in 2011 that were not closed during the year, 44 investigations concerning events that occurred in previous years (1 in 2006, 2 in 2008, 5 in 2009 and 36 in 2010) remained under way at the end of the year. Among these, note should be made of the accident on 1st June 2009 over the Atlantic to the Airbus A330-200 registered F-GZCP operated by Air France, flight AF 447 Rio-Paris. In 2011, the BEA published the third Interim report on this event.

AF 447 Rio-Paris flight

At the end of 3 phases of unsuccessful searches in 2009 and 2010, the launch of a fourth phase of searches was decided on in 2011.

The new search strategy was based on a systematic exploration of an area of about 10,000 km² that had not previously been covered by sonar. The American Woods Hole Oceanographic Institution (WHOI) took operational responsibility for the searches with the aid of underwater equipment that had already been used in the previous campaign, two Remus 6000 belonging to the Ted Waitt foundation and to the German oceanographic institute GEOMAR, on board the Alucia.

On 2 April 2011, parts from the accident aeroplane were localised.

On 4 April, the BEA held a press conference during which photos taken at a depth of 3,900 metres were presented.

On 7 April, a fifth phase of sea searches was started in order to observe in the detail the accident site and search for the light recorders, as well as the parts of the aeroplane useful to the investigation. The cable ship Ile de Sein from Alcatel-Lucent and Louis Dreyfus Armateurs, equipped with a remotely operated vehicle (ROV) from Phoenix International Inc., was chartered to undertake this new mission, directed by the BEA and by the French State.

The director of the investigation, 3 other investigators from the BEA, one investigator from the AAIB (BEA's British equivalent), one investigator from CENIPA (BEA's Brazilian equivalent), 3 experts from Airbus, one expert from Air France, one American specialist in sonar imagery one psychologist and 4 officers from the Police Judiciaire assisted by 3 specialists from the Gendarmerie national criminal research institute (IRCGN) were on board the ship.

On 1st May 2011, the flight data recorder (FDR) was localised and lifted on board the ship. The cockpit voice recorder (CVR) was recovered 2 days later.

On 7 May, the French Navy ship La Capricieuse came to recover the flight recorders that were placed under judicial seal by the representatives of the French judicial authorities, to transport them as quickly as possible to Cayenne, from where they were taken Paris by plane and read out completely at the BEA on 12 and 13 May.

In the meantime, the recovery of parts from the aeroplane useful to the investigation continued until 3 June, then the ship returned to the port of Bayonne from where the parts were transferred to Toulouse, to a hangar belonging to the aeronautical techniques section of the Direction Générale de l'Armement (DGA).

Published on 29 July 2011, the third BEA Interim Report presented the circumstances of the accident, based on analysis of the data from the flight recorders. A human factors working group responsible for analysing all aspects linked to the conduct of the flight was set up and worked in close collaboration with the operations and aeroplane systems groups.

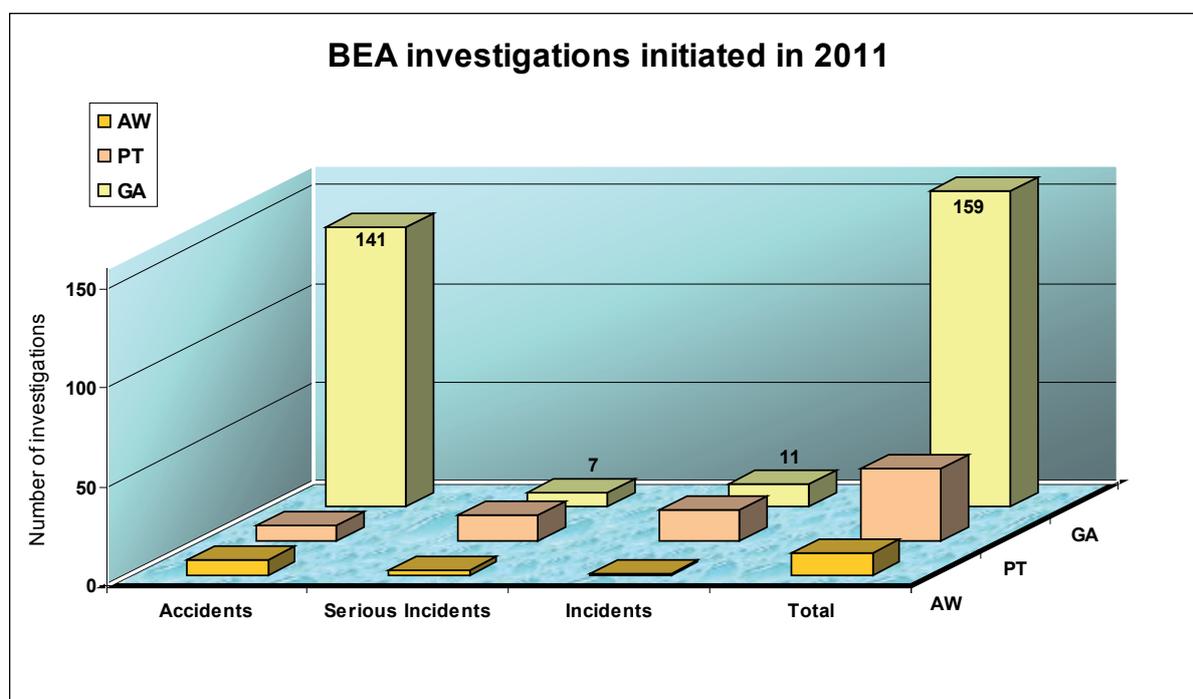
At the end of 2011, the BEA continued work on preparing the final report and planned its finalisation before the end of the first half of 2012.

Note: The BEA published the final report on the safety investigation into the accident to AF 447 on 5 July 2012.

C - BEA investigations initiated in 2011

In 2011, the BEA initiated 208 new investigations, closing over half of them in the course of the year.

BEA investigations Initiated in 2011	Public transport	GA	AW	TOTAL
	37	159	12	208
Accidents	8	141	8	157
<i>including fatal</i>	0	20	2	22
Serious incidents	13	7	3	23
Incidents	16	11	1	28
Closed in 2011	3	95	8	106



General aviation alone represented three quarters of the investigations and almost 90% of the accidents.

Thirty-five fatal accidents that occurred in 2011 among those that involved non-registered aircraft, did not lead to a safety investigation. In fact, the BEA initiates an investigation into accidents or serious incidents involving old aircraft (registered in FA) or of amateur construction (FP)

or of microlight type when the flight is undertaken in the context of instruction, aerial work, is remunerated or part of an air show.

However, for each accident involving such an aircraft, the facts are collected and analysed and result in a BEA investigation if it appears that information from the event may lead to an improvement in aviation safety.

Among the events investigated, 22 accidents caused fatalities, including 2 in AW:

- ▶ The MS 8808 Rallye-club towing aeroplane, registered F-GBCZ, which stalled on 4 July after releasing a glider on takeoff from Dijon-Darois (21) aerodrome, causing the death of the pilot, the only person on board. This investigation was closed.
- ▶ The Eurocopter AS 350 registered F-HFBI, which struck a ski-lift cable during a reconnaissance flight in a mountainous area, leading to the deaths of 4 persons.

The 20 other fatal accidents that occurred in GA involved 10 aeroplanes, 5 gliders, 3 microlights and 2 helicopters (including one Eurocopter).

Five of the 8 accidents that occurred in public transport involved 2 French operators.

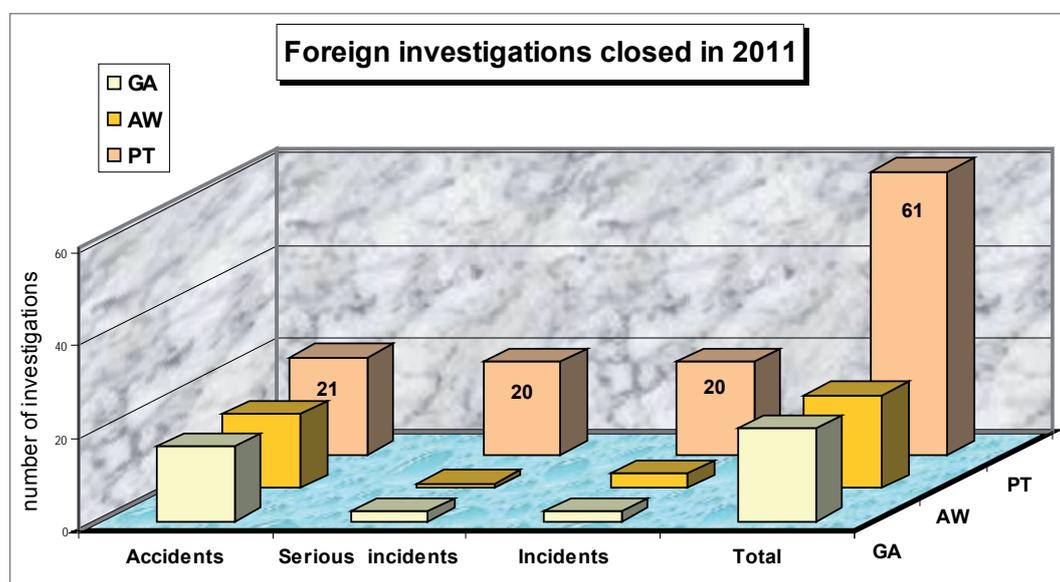
Three Airbus and 2 ATR were involved in the 23 investigations initiated into serious incidents. Nearly a half occurred at an aerodrome. Nine of the 13 serious incidents that occurred in public transport involved 3 French operators.

Four Airbus and 6 ATR were involved in the 28 investigations initiated on incidents. Fourteen of the 16 incidents that occurred in public transport involved 8 French operators.

FOREIGN INVESTIGATIONS WITH BEA PARTICIPATION

A - Foreign investigations closed in 2011

Foreign investigations closed in 2011	Public Transport	GA	AW	TOTAL
	61	20	20	101
Accidents	21	16	16	53
<i>including fatal</i>	5	8	4	17
Serious incidents	20	2	1	23
Incidents	20	2	3	25



Twenty-three aeroplanes (including 8 Airbus, 3 ATR and 1 Dassault-Breguet), 27 helicopters (including 26 Eurocopter) and 3 microlights were involved in accidents. 2 accidents out of 21 that occurred in public transport involved 2 French operators.

Seven aeroplanes (including 2 Airbus), 7 helicopters (Eurocopter) and 3 microlights were involved in the 17 fatal accidents.

Twenty-one aeroplanes (including 17 Airbus and 2 ATR), and 2 helicopters (Eurocopter) were involved in the serious incidents. One serious incident out of 20 that occurred in public transport involved one French operator.

Twenty-two aeroplanes (including 14 Airbus, 1 ATR and 1 Dassault-Breguet) and 3 helicopters (Eurocopter) were involved in the incidents. 2 incidents out of 20 that occurred in public transport involved 2 French operators.

Among the investigations closed in 2011 into accidents and serious incidents in public transport, the BEA was involved in a significant manner in the following events:

- ▶ Accident on 16 August 2005 near Machiques (Venezuela), to the McDonnell Douglas MD-80 registered HK-4374X and operated by West Caribbean Airways. While it was flying at flight level 330 in unfavourable meteorological conditions, the aeroplane stalled and crashed. The 152 passengers and 8 crew members were killed. Ten safety recommendations were issued by the Venezuelan commission of investigation and addressed to aviation authorities, to manufacturers of flight data recorders, and to the aeroplane manufacturer.
- ▶ Serious incident on 19 June 2008 in cruise to the Airbus A319 registered B-6167 and operated by China Eastern Airlines. The aeroplane diverted after a fire broke out in the compartment where the passenger oxygen reserve is stored. None of the 117 persons on board was injured. The investigation report was not made public.
- ▶ Accident on 7 October 2008 near Learmonth aerodrome (Australia) to the Airbus A330-300 registered VH-QPA and operated by Qantas Airways Limited. During flight in cruise, the aeroplane dived suddenly several times. It diverted to Learmonth aerodrome. There were 14 serious injuries among the 315 persons on board. The final report was published by the ATSB.
- ▶ Accident on 27 January 2009 at Lubbock airport (United States) to the ATR 42-300 registered N902FX and operated by Empire Airlines. The aeroplane struck the beginning of the runway after the crew continued an unstabilised approach in icing conditions. The Captain was seriously injured.
- ▶ Accident on 28 July 2010 near Islamabad (Pakistan) to the Airbus A321 registered AP-BJB and operated by Airblue. In degraded meteorological conditions, while it was on approach to the airport, the aeroplane struck a hill. The 146 passengers and 6 crew members were killed.
- ▶ Serious incident on 14 September 2010, to the Airbus A319 registered B-6054 and operated by Sichuan Airlines. On approach to Wuxi aerodrome in degraded meteorological conditions, the aeroplane was subject to windshear and vertical gusts. The crew decided to divert to Ningbo airport.

B - Foreign investigations under way in 2011

Eighty-two safety investigations, for which the BEA had named an accredited representative, continued in 2011, including 52 in public transport, 14 in AW and 12 in GA. The 4 other investigations related to State flights.

Among these investigations, 2 public transport accidents involved the BEA in a significant manner:

- ▶ Accident on 30 June 2009 near Moroni aerodrome (Comoros) to the Airbus A310 registered 7O-ADJ and operated by Yemenia. In this accident, one young passenger was the only survivor among the 142 passengers and 11 crew members. After a period of inactivity the Comoros authorities restarted the investigation at the end of 2011, with the active participation of the BEA.
- ▶ Accident on 12 May 2010 at Tripoli aerodrome (Libya) to the Airbus A330-200 registered 5A-ONG and operated by Afriqiyah Airways. While on final to land, the crew made a go-around. The aeroplane adopted a pitch-up then a pitch-down attitude. It struck the ground about 800 metres from the threshold of the runway. One young passenger was the only survivor among the 93 passengers and 11 crew members. The events that occurred in Libya during 2011 delayed the investigation.

C - Foreign investigations initiated in 2011

In 2011, 167 safety investigations for which the BEA named an accredited representative, were initiated by the BEA's equivalents in foreign States.

Thirty-nine aeroplanes (including 11 Airbus, 3 ATR and 1 Dassault Aviation), 50 helicopters (including 48 Eurocopter) were involved in the accidents. One accident out of the 27 that occurred in public transport involved a operator French.

Thirteen aeroplanes, 22 helicopters (including 21 Eurocopters) were involved in the 35 fatal accidents.

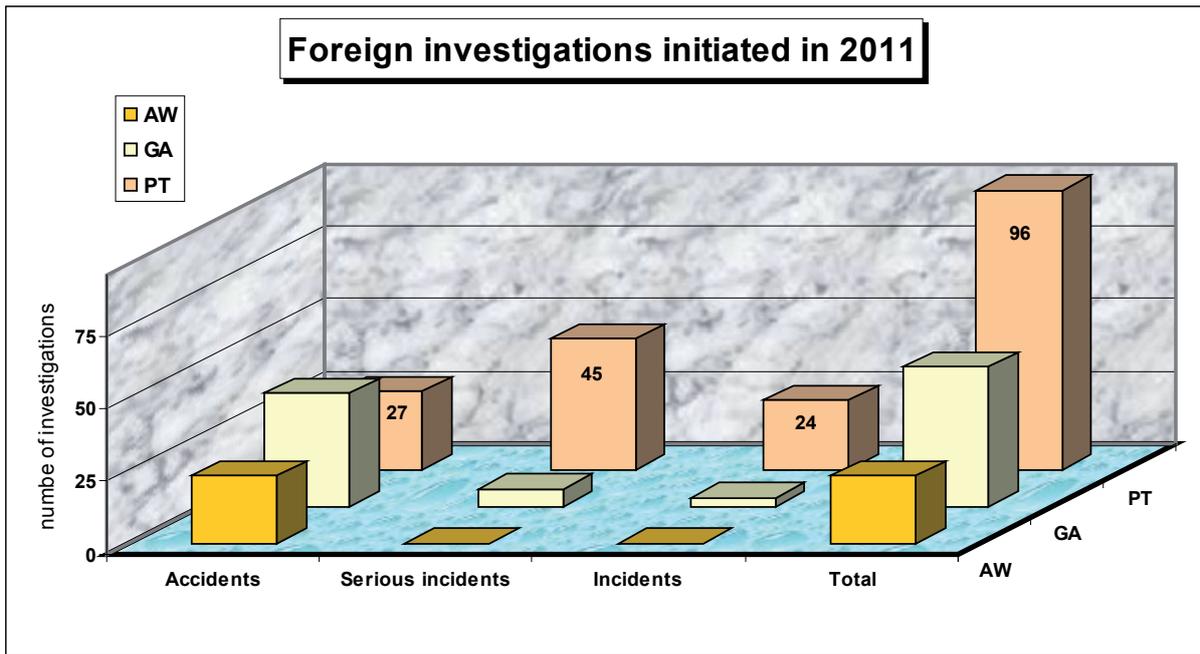
Forty-nine aeroplanes (including 35 Airbus and 6 ATR), and 3 helicopters (including 2 Eurocopter) were involved in serious incidents. Two serious incidents out of the 45 that occurred in public transport involved 2 French operators.

Twenty-six aeroplanes (including 16 Airbus and 5 ATR) and 1 helicopter (Eurocopter) were involved in incidents. No French operators were involved in the 24 incidents that occurred in public transport.

Seven investigations were closed during the year. The most serious accidents were the following events:

- ▶ Accident on 14 October to the Cessna 208 registered A2-AKD and operated by Moremi Air Services. The aeroplane stalled shortly after takeoff from Xakanaka (Botswana). There were 8 victims.
- ▶ Accident on 10 November to the Eurocopter EC 130 registered N11QV and operated by Blue Hawaiian Helicopters. The helicopter crashed in Hawaii (United States) during a flight at a low height in unfavourable meteorological conditions. There were 5 victims.
- ▶ Accident on 7 December to the Eurocopter AS 350 registered N37SH and operated by Sundance Helicopters. The helicopter crashed after a loss of control in cruise during a flight around Las Vegas (United States). There were 5 victims.

Foreign Investigations Initiated in 2011	Public Transport	GA	AW	TOTAL
	96	48	23	167
Accidents	27	39	23	89
<i>Including, fatal</i>	8	17	10	35
Serious incidents	45	6	0	51
Incidents	24	3	0	27



SAFETY RECOMMENDATIONS

A - Recommendations issued in 2011

Fifty safety recommendations were issued in 2011, of which 32 led to concrete action in 2011 or at the start of 2012.

For more details, consult:

- ▶ The expectation and the text of each recommendation in the corresponding investigation report on the BEA website;
- ▶ Details of the answers provided by the DGAC to the recommendations that were addressed to it on the website of the Ministry of Ecology, Durable Development and Energy. (<http://www.developpement-durable.gouv.fr/-Suites-donnees-aux-recommandations-.html>)
- ▶ The detailed answers provided by EASA to the recommendations that were addressed to it on its website: <http://easa.europa.eu/safety-and-research/safety-recommendations.php>

The 24 recommendations that resulted in concrete action were as follows.

▶ **Accident on 8 February 2009 at Paris Charles of Gaulle (95) airport to the Airbus A 321-111 registered F-GYAJ: five of the 10 recommendations were implemented**

- ▶ The BEA recommends that the DGAC ensure that, in case of operations in degraded meteorological conditions, the aerodrome operator implement a programme to trigger runway inspections on additional runways that is not only based on requests from the ATC services, in order to supply crews with updated information.

□ Answer: The civil aviation safety directorate (DSAC) and the civil aviation technical service (STAC) published a guide entitled "Caractérisation de l'état de surface des pistes en conditions météorologiques dégradées" to be used by aerodrome operators.

- ▶ The BEA recommends that the DGAC ensure that aerodrome operators define and implement upgrade procedures without delay when below-standard characteristics are observed, notably when a CFL is below the minimum threshold.

□ Answer: The DGAC will ensure specific oversight of the evolution of the measurement of friction coefficients by Aéroports de Paris (ADP) and of the regular performance of runway cleaning work.

- ▶ The BEA recommends that the DGAC study the evolution and the validity of the standards applicable to functional friction coefficient measurement equipment, to approval of this equipment and the way it is used.

□ Answer: The STAC set up a procedure for approval and use of the equipment. The approval procedures are published on the STAC website.

- ▶ The BEA recommends that the DGAC define the information relating to the condition of the runway so that it is useful and usable by the crews when making decisions on takeoff and landing, and that aerodrome operators must provide to ATC services.

□ Answer: The "Caractérisation de l'état de surface des pistes en conditions météorologiques dégradées" guide designed and published by the DSAC and the STAC deals with this subject.

- ▶ The BEA recommends that the DGAC ensure that the DSNA guarantees that the information transmitted by ATIS correctly reflects the true condition of runways.

□ Answer: From now on, friction coefficient measurements will be included in the ATIS transmission.

► **Serious incident on 2 June 2010 in the Bordeaux FIR near the OLRAK point between the Airbus A 318 registered F-GUGJ and the Pilatus PC 12 registered EC-ISH: the 2 recommendations were implemented.**

► The BEA recommends that EASA ensure that procedures in the flight manual relating to situations of doubtful or erroneous altitude be completed or developed by manufacturers.

► The BEA recommends that EASA ensure that these cases be considered as emergency situations that must be declared without delay by crews to the ATC services.

□ Answer to the 2 recommendations: The manufacturer Pilatus modified its flight manual as a result.

► **Accident on 4 June 2010 at Saint-Rambert-d'Albon (26) to the Cap 10 registered F-GRRR: one of the 4 recommendations was implemented.**

► The BEA recommends that the DGAC study the setting up of an additional recurrent training programme for aerobatics instructors to improve and reinforce the knowledge and teaching of all types of spin.

□ Answer: The DGAC has studied, in coordination with aerobatics training schools, integrating this additional element in the programme of recurrent training for aerobatics instructors.

► **Accident on 21 September 2005 at La Falaise (78) to the Robinson R22 Mariner registered F-GRIB: one of the 2 recommendations was implemented.**

► The BEA recommends that EASA make it mandatory for pilots to undertake training in the specific characteristics of the R22 Mariner when equipped with float-type landing gear.

□ Answer: The DSAC checked that safety for the Robinson R22 Mariner training courses in fact integrated a presentation of this accident and of the associated warnings.

► **Serious incident on 8 September 2008 at Roussillon (38) to the CTSW type microlight identified 26-ZT: the recommendation was implemented.**

► The BEA recommends that the DGAC amend the official documentation available to pilots to complete the description of the interception procedures, and makes it easily accessible.

□ Answer: In 2011 French aeronautical documentation integrated this recommendation.

► **Serious incident on 29 March 2010 at Nice (06) airport to the Raytheon 390 Premier 1A registered M-FROG and to the Bombardier CRJ 200 registered EC-HHV: the 2 recommendations were implemented.**

► The BEA recommends that the DGAC install, on aerodromes with heavy traffic, equipment enabling the air traffic control service to detect and be alerted of a risk of ground collision, in particular the risk of a runway incursion.

□ Answer: The DSNA established and implemented a plan to deploy such devices at the main French aerodromes.

► The BEA recommends that the DSNA ensure that, on all aerodromes, aerodrome charts reflect the reality of the infrastructure in a precise manner.

□ Answer: The DGAC continues with its oversight of aerodromes. In the case of this incident, the Nice aerodrome chart has been modified.

► **Accident to flight AF447 Rio-Paris: four of the 10 recommendations in Interim Report n°3 have been implemented.**

► The BEA recommends that EASA and the FAA evaluate the relevance of requiring the presence of an angle of attack indicator directly accessible to pilots on board airplanes.

□ Answer of the Federal aviation administration (FAA, USA): This recommendation has been taken into account in its programme to modify American regulations.

► The BEA recommends that EASA and the FAA evaluate the relevance of making mandatory the recording of the air data and inertial parameters of all of the sources used by the systems.

□ Answer from EASA: The conclusions of the working group on the standardisation of recorded parameters in flight will be taken into account.

► The BEA recommends that EASA and ICAO make mandatory as quickly as possible, for aeroplanes making public transport flights with passengers over maritime or remote areas, triggering of data transmission to facilitate localisation as soon as an emergency situation is detected on board;

► The BEA recommends that EASA and ICAO study the possibility of making mandatory, for aeroplanes making public transport flights with passengers over maritime or remote areas, the activation of the emergency locator transmitter (ELT), as soon as an emergency situation is detected on board

□ Answer from ICAO to the 2 recommendations: Amendment of Annex 6 relating to the localisation of accidents will be applicable in 2013.

□ Answer from EASA to the 2 recommendations: The various possibilities to facilitate the localisation of aircraft in an emergency situation are being studied.

► **Serious incident on 17 August 2008 on takeoff from Paris Charles of Gaulle (95) airport to the Boeing 737-800 registered SU-BPZ. One of the 2 recommendations has been implemented.**

► The BEA recommends that the DGAC, in the context of the State Safety Plan, take into account the risks associated with operators introducing new computer tools.

□ Answer: The DGAC implemented the procedures for approval of the use of software and electronic documents instead of paper documentation.

► **Accident on 25 September 2011 after takeoff from Mulhouse Habsheim airport (68) to the MCR -010 F-PSLA (and, with the same cause, the accident on 19 July 2010 after takeoff from Royan (17) to the MCR Sportster registered F-PFDE): the urgent recommendation of 7 October 2011 was implemented immediately.**

► The BEA recommends that the DGAC immediately ground aeroplanes of MCR-01 Sportster VLA type and define a safe procedure for inspection and checks of the flap actuating cylinder to be applied before any further flights may take place.

□ Answer: The DGAC issued urgent Airworthiness Directive UF-2011-003 on the same day.

► **Accident on 6 February 2010 at Grenoble Isère airport (38) to the McDonnell Douglas MD-81 registered OY-KHP: one of the 2 recommendations was implemented.**

► The BEA recommends that the Danish Civil Aviation Administration (SLV) check that the instructions for operators under its oversight make it possible to ensure the rapid preservation of CVR recordings, after an accident or serious incident, in accordance with the obligations in EU-OPS n°859/2008 and European regulation n°996/2010 (article 13.3).

□ Answer: At the beginning of January 2012 the SLV stated that they had performed the checks recommended by the BEA.

► **Serious incident on 14 July 2010 on approach to Paris Orly (94) airport to the Airbus A321-111 registered F-GMZB: the recommendation has been implemented.**

► The BEA recommends that the DGAC define a schedule with a high priority to implement the availability on ATC en-route and approach radar screens of a visualisation of stormy and turbulent zones, and that it define the conditions for the use of this information.

□ Answer: The DSNA plans that, from 2016, air traffic controllers will progressively have access to a display of the known meteorological phenomena on the radar image.

► **Accident on 12 October 2009 in the Gulf of Girolata (2A) to the Cessna T 210N registered N442SF: the 3 recommendations have been implemented.**

► The BEA recommends that the DGAC study, in liaison with the federations involved, the means required to inform or update pilots' knowledge on the principles of survival, searches and rescue at sea when making maritime crossings.

□ Answer: The DSAC plans to distribute this information through a quarterly Safety Bulletin and through the federations.

► The BEA recommends that the DGAC study the possibility of carrying appropriate means of signalling for light aviation, in case of a maritime crossing less than 100 NM from a coast.

□ Answer: The DGAC has ensured, in the context of the consultation on the draft European regulation relating to non-revenue operations, that the recommendation was taken into account.

► The BEA recommends that the DGAC ask the organisations involved to ensure that the information transmitted between the various participants in the SAR chain be repeated and its precision, when known, be reminded.

□ Answer: The DGAC has applied the terms of the recommendation in order to improve the precision of localisation of accidents over the sea.

B - Follow-up on recommendations issued in 2010

In 2010 the BEA issued 28 safety recommendations; 24 received an answer other than that expected, 20 in 2010, and 4 in 2011.

Aside from evolutions in regulations at the European or ICAO level, 4 answers with an immediate effect were given to safety recommendations. These measures can be added to the 7 already taken in 2010.

► **Accident on 27 May 2009 at Montferrier (09) to the Eurocopter AS 350 B3 registered F-GVCE: the recommendation was implemented in 2011.**

► The BEA recommends that EASA make mandatory the wearing of a protective helmet by helicopter crews, at least for some activities.

□ Answer on 21 June 2011: EASA proposed an amendment NPA 2009/02 that details the mandatory equipment for the helicopters pilots.

► **Incident on 22 May 2006 at Metz Nancy Lorraine (57) to the Boeing 737-4B6 registered CN-RMX: two of the 4 recommendations were implemented in 2011 and at the start of 2012.**

► The BEA recommends that the DGAC systematically and explicitly add to NOTAM's (Notice to airmen) and to the ATIS the modifications that may have consequences on operational performance, in particular the available length of runways.

□ Answer on 4 January 2011: The DSAC has included the terms of the recommendation in the guide to undertaking work on aerodromes.

- ▶ The BEA recommends that ICAO, EASA and the DGAC establish a guide allowing airport operators to programme and coordinate all of the actions related to works so that the level of safety is not compromised on these occasions.

- Answer from the DGAC on 4 January 2011: A guide is available on its website.

- Answer from ICAO on 15 April: Doc 9137 responds to the recommendation.

- Answer from EASA on 30 January 2012: An NPA 2011-20 was published on 13 December 2011 to answer this question, and one modification of the system of airport management relating to works has been introduced.

▶ **Incident on 21 November 2007 in the southern sector of France, in cruise (FL) 410 to the Airbus 330-202 registered F-WWKK and operated by Airbus, on delivery to Air Mauritius: one of the 3 recommendations was implemented in 2011.**

- ▶ The BEA recommends that EASA evaluate with Airbus the relevance of adding an information note in the Flight Crew Training Manual on the functioning of the outflow valves and a modification of the CAB PR EXCESS CAB ALT Procedure.

- Answer on 27 September 2011: EASA stated that Airbus modified the Flight Crew Operating Manual in its revision of November 2011.

C - Follow-up on recommendations issued in 2009

In 2009, the BEA issued 25 safety recommendations; 5 received an additional answer in 2011 and 3 in January 2012. As a reminder, 22 were the subject of an answer at the end of 2010 of which 2 received concrete answers in the BEA 2010 report.

Among the 8 answers indicated, 3 corresponded to measures that closed these recommendations; the other corresponded to evolutions planned over a longer time period.

▶ **Accident on 27 November 2008 off the coast of Canet-Plage (66) to the Airbus A320-232, registered D-AXLA, operated by XL Airways Germany: the following 2 recommendations were implemented in 2011.**

- ▶ The BEA recommends that EASA require that non-revenue flights be described precisely in the approved parts of the operations manual, this description specifically determining their preparation, programme and operational framework as well as the qualifications and training of crews,

- Answer on 27 September 2011: EASA has proposed to the European Commission to include a new paragraph "ORO.AOC.125 Non-commercial operations of aircraft listed in the operations specifications by the holder of an Air Operator Certificate" that details the conditions for undertaking these specific operations.

- ▶ The BEA recommends that as a temporary measure, EASA require that such flights be subject to an authorisation, or a declaration by the operator, on a case-by-case basis.

- Answer on 21 June 2011: EASA issued on 5 May 2011 a safety information bulletin (SIB) n°2011-07 on "functional check flights" for all aeroplanes, certified in all categories, and operated under an AOC.

► **Accident on 1st June 2009 to flight AF447 Rio-Paris: the following recommendation was implemented at the start of 2012.**

► The BEA recommends that EASA undertake studies to determine with appropriate precision the composition of cloud masses at high altitude.

□ Answer on 30 January 2012: EASA is involved in a research programme that has been defined and launched so as to precisely determine the composition of cloud masses at high altitude, to characterise the atmosphere at high altitude, and to identify the technical problems linked to the characteristics of convective clouds. EASA launched the High Ice Water Content (HIWC) study, which will contribute to the international High Altitude Ice Crystals (HAIC) project.

LABORATORY ACTIVITY

A - Engineering Department activity in 2011

The volume of activity in the engineering department was similar to that of 2010 in all of its areas of competence.

2011 was notable for the work undertaken that was part of the investigation into the accident to the AF 447 Rio-Paris flight. The sea search operations undertaken in 2011 came to an end with the localisation of the wreckage site, the recovery of the flight recorders and lifting of numerous parts.

The recorders had remained underwater at a great depth for 2 years. It was essential to use special examination techniques for data preservation and readout. Over the years, the BEA has acquired a high degree of specialised skills in reading out data from electronic cards from onboard systems that have been damaged during an accident. These same techniques made it possible to ensure readout and analysis of all of the data from the AF 447 flight recorders under the best conditions.

In addition to the work on the flight AF 447 recorders, many examinations were also carried out on the pilot and copilot seats as well as on various onboard computers.

Finally, the BEA published the report of the working group on triggered data transmission.

B - Flight recorders and avionics systems

In 2011, CVR 42 recordings and 70 flight data recordings were analysed at the BEA. Nearly half of these recordings related to investigations led by the BEA, about one third to investigations in which the BEA participated via an accredited representative, and one fifth represented work in the area of technical assistance.

The number of recordings handled was practically identical to that of 2010.

	BEA investigations	BEA ACCREP	Technical assistance	Total
CVR recordings handled at BEA	19	11	12	42
Data recordings handled at BEA (FDR, DAR and QAR)	33	26	11	70
Total number of recordings handled at BEA	52	37	23	112

DAR: Direct access recorder; QAR: Quick access recorder

In 2011 the BEA avionics laboratory analysed 86 items of onboard equipment, broken down as follows:

	BEA Investigations	BEA ACCREP	Technical Assistance	Total
Avionics Systems	17	16	0	33
GNSS	36	2	9	47
Audio/video recordings	3	3	0	6

GNSS: Global navigation satellite system

In 2011, 37 events required work on air traffic management data that was drawn from radar or ATC communications. One event related to technical assistance, the rest corresponded to BEA investigations or to BEA participation through an accredited representative.

Half of the ATM work performed in 2011 concerned GA events, the other half events in public transport. The distribution of ATM work by type of investigation was as follows:

	BEA Investigations	BEA ACCREP	Technical assistance	Total
Number of events	33	3	1	37

The development of technical equipment and software specific to the lab has continued with some notable successes:

- ▶ The validation of the ODILE prototype, a new reader/tester of memory components.
- ▶ Launch of the development of the new LEA recorder data analysis software.
- ▶ The development of BALISA, software designed to assist in the localisation of recorders under water.
- ▶ The development of some software designed to assist in analysis of video recordings.

Improvements in this equipment and software will continue to be made in 2012.

C - Structures, equipment and engines

One hundred and seventeen examinations were carried out in 2011. This level of activity is similar to that of 2010 (130 examinations) and of 2009 (116 examinations).

It is notable that:

- ▶ Two examinations of wreckage were undertaken in the context of accredited representation.
- ▶ Three examinations were performed at the BEA in the context of accredited representation.
- ▶ Public transport represented more than a third of the examinations undertaken.

Type of operation (Eccairs)	Number of occurrences	Number of examinations
Public Transport	26	44
GA	39	54
AW	14	19
Total	79	117

Examinations of wreckage on-site, that performed at the BEA or in external labs, is divided as follows:

	BEA Investigations	BEA ACCREP
Examinations of wreckage on site	23	2
Examinations performed at BEA	23	3
Examinations in external centres	33	33
Total	79	38

INFORMATION AND INTERNATIONAL ACTIVITIES

A - Information to families of victims

► In the context of the safety investigation into the accident to the AF 447 Rio-Paris flight on 1st June 2009 in the Atlantic Ocean, the BEA continued to inform the families of the victims and their associations on the progress of the safety investigation. In particular, the BEA met the associations in May, after the recovery of the flight recorders, and in July to present them the contents of the third Interim Report. In addition, this presentation was webcast so as to be able to be followed by all of the families.

► Despite the repeated demands of the French authorities to the Comorian authorities, the safety investigation into the accident on 29 June 2009 on approach to Moroni airport (Comoros) has not progressed, and no report has been made public.

B - Conferences and seminars

To develop partnerships with its colleagues abroad and to promote exchanges of experience in relation to safety, the BEA participates in or organises conferences, seminars and workshops on a regular basis.

► In France

BEA agents gave a variety of conferences at the French Ecole nationale de l'aviation civile (ENAC) and worked with various training organisations.

In addition, the ongoing training programme at the Ecole Nationale de la Magistrature (ENM) includes a course led by the BEA.

► Abroad

In February, the BEA participated in the "Aircraft Accident Investigation and Management" training organised by the Singapore Aviation Academy (SAA).

In March, at the request of Hong Kong, China, the BEA organised a seminar on accident investigations in the context of the Asian World Expo in Hong Kong.

In March the NTSB (BEA's American equivalent) organised a conference on the theme of assistance to families, during which the BEA shared its experience in the area of providing information to the families of victims.

In May, the BEA participated in the ITSA Conference (International Transportation Safety Association) in Oslo, where it was officially accepted as a member state. This conference groups together the main multimodal investigation authorities: Australia, Canada, Russia, Finland, India, Japan, South Korea, the Netherlands, New Zealand, Norway, Sweden, Taiwan, United Kingdom and the United States. At this conference, the BEA presented its experience of the investigation into the accident to the AF 447 Rio – Paris flight to its foreign colleagues.

At the beginning of September, the BEA attended the 42nd annual seminar of ISASI (International Society of Air Safety Investigators) that took place in September at Salt Lake City (USA) on the theme "Investigation - a Shared Process". The BEA presented its paper on its work on the accident off the coast of Perpignan in 2008 "Hands across the sea: teamwork in the cause of aviation safety", as well as a joint presentation with Phoenix International, Inc. and WHOI entitled: "AF 447 Underwater Search and Recovery Operations - A Shared Government-Industry Process", which received the Award of Excellence for Best Seminar Paper.

In October, the BEA was represented at the APAC (conference of Asia-Pacific region General Directors), that was held in New Caledonia, presided over by the French Director General of civil aviation. In conjunction with the NTSB, the BEA presented a document on the theme "Update to ICAO Circular 285-NA/166: Guidance on Assistance to Aircraft Accident Victims and their Families" as well as a text on "New Safety Data Handling Technologies".

In November in Abu Dhabi (United Arab Emirates), the BEA was awarded the Prize for Innovation, voted for by online vote via the "Flight Global" website for its success with the AF 447 sea searches.

C - Cooperation Activities

Exchange of information and experience is essential to the good conduct of safety investigations. The most experienced States share their know-how. Apart from the seminars and conferences previously mentioned, bilateral exchanges are often desirable to establish a climate of confidence that facilitates the work of investigation.

Thus, in 2011, the BEA signed cooperation agreements for investigations into civil aviation accidents with the United Arab Emirates and with Mauritania.

In the context of the administrative arrangements previously signed with other States, in order to get an overview and to envisage new cooperation axes, the BEA made visits to China and India. It also organised an accident investigation seminar in Rabat at the request of the Moroccan authorities.

During the year, the BEA received in particular delegations from Australia, China, the USA, Indonesia, Kosovo, Singapore, South Africa, India, Croatia, Madagascar as well as representatives from the FAA, ICAO and TRACECA (Transport Corridor Europe-Caucasus-Asia).

In parallel, the BEA provided technical assistance to various countries, in particular for flight recorder readouts in its lab.

EVOLUTION OF MEANS AND RESOURCES

A - Personnel

BEA staff	Public servants	Contractual employees	Workers	Total
Flight Crew	-	2	-	2
Engineers	34	14	-	48
Senior technicians	14	1	-	15
Workers	-	-	15	15
Administrative staff	16	6	-	22
Total staff	64	23	15	102

B - The budget

The BEA budget for 2011 was in the Initial Finance Law (LFI) set at 2.879 M€ for commitment authorisations (CA) and 3.569 M€ for payment appropriations (PA).

However the call for a contribution from the BEA for the organisation and the financing of the operation of phase 5 (lifting, recovery) of the wreckage of the aeroplane from the Rio-Paris flight that had been at a great depth under the South Atlantic since 1st June 2009 led, for this operation costing 6.250 M€, to an exceptional expenditure in the BEA budget of 5.8 M€ in CA and 5.6 M€ in PA.

Services	Operations (in €)		Investment (in €)	
	AE	CP	AE	CP
Communication	193 095	216 302	0	0
Logistics	1 119 381	938 080	65 341	3 220
Engineering	6 408 938	6 336 272	146 458	135 658
Total	7 721 414	7 490 654	211 799	138 878

Note: The importance of items of expenditure inherent to the BEA's activity: training at 194 k€, and travel at 905 k€.

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