

# **ISASI 2012**

## **History of the flight AF447 accident investigation,**

### **Keynote Speech by Jean-Paul Troadec** **Director BEA France**

Good afternoon,

Allow me, first of all, to thank the organizers of this conference for having given the BEA a complete half-day to speak about the history of the flight AF447 accident investigation, whose Final Report was published on July 5th, which you have doubtless been able to access via our website.

We have chosen to present you three main components of the investigation: readout of the flight recorders, analysis of human factors and relations with the families and the media.

Presentations will be made by two BEA investigators, Leopold Sartorius, head of the Systems working group, then Sebastien David, head of the human factors working group. You will then hear Martine Del Bono, responsible for communication, media and families relations at the BEA. The investigator in charge, Alain Bouillard, regrets that he has been unable to attend.

We have now finally reached the end of 3 years of an exceptional investigation.

- 1 It was exceptional firstly because of the international dimension: the 228 victims came from 32 nationalities, which led to numerous issues in communication such as language barriers and cultural differences without speaking of time differences
- 2 Exceptional too due to the almost simultaneous accident that occurred to a Yemenia aircraft off the coast of Moroni, which also heavily involved the BEA. This meant that in July 2009, the BEA was leading two undersea search campaigns, one in the Indian Ocean and the other in the middle of the South Atlantic! At this time, BEA was also investigating a 3<sup>rd</sup> major accident occurred six months before to an A320 in the Mediterranean sea
- 3 An exceptional mystery also surrounded the exact circumstances of the accident as the aircraft had disappeared without any message from the crew and beyond radar coverage. These circumstances were only clarified thanks to the readout of the flight recorders in May 2011,
- 4 Exceptional media attention accompanied the various stages of this investigation, marked by several phases of undersea searches and the publication of 3 Interim Reports. It was the first major aircraft accident of a new era in accelerated media coverage
- 5 Sadly, it was also exceptional in the number of violations by 3<sup>rd</sup> parties of the ethics of safety investigation, which require respect for the confidentiality of working documents

that are not published by the authority in charge of the investigation. Two police investigations have been requested by myself, unfortunately without conclusions;

- 6 Finally, there was an exceptional level of controversy and unjust accusations against the BEA investigators, whose professional integrity and impartiality was called into question.

At this juncture I would like to remind you that we are talking about the safety investigation conducted by the BEA. This investigation does not seek to determine responsibilities that being the role of the judicial investigation that takes place in parallel and independently of ours, as laid down under French law. Unfortunately, in the mind of the public, it is not always easy to understand the difference. Many people expected from the BEA investigation that it points out responsibilities and even culpabilities;

The BEA investigation started on the day of the accident, June 1<sup>st</sup> 2009, under the authority of Paul Louis Arslanian, then head of the BEA.

Right from the start, priority was given to recovering the flight recorders: without their readout, the investigation could not be conclusive, even if the examination of parts recovered at the surface of the sea and the data collected from the ACARS messages gave some indications on the accident.

It was only on 2 April 2011, during the 4th phase of undersea searches, that the wreckage was localised. The recorders, quickly recovered, could be read out in their entirety, after spending 2 years at a depth of 3,900 metres underwater. This Franco-American adventure was the subject of a presentation during the ISASI conference last year.

The exact circumstances of the accident were then related in a further Interim Report, which was published on 29 July 2011.

The circumstances of the accident as described in that report generated some strong reactions, in an emotive context that unfortunately demonstrated the commentators' lack of perspective.

We then needed to understand the reasons for the pilots' actions and how the loss of airspeed indications alone could have led to such a disaster.

Further progress in the investigation allowed us to understand the causes of the accident and to publish the final report on 5 July of this year. In contrast to the previous report, this publication did not generate negative reactions, even on the part of those who had previously been so critical of the BEA one year before. In fact, this report illustrates the complexity of the event.

Of course, this accident had its origins in the obstruction of the Pitot probes by ice crystals and, as a consequence, the temporary loss of airspeed indications. Above all, however, it resulted from the airplane exiting its flight envelope through the crew losing situational awareness.

This category of accident classified as loss of control has emerged over the last decade or so as the most deadly in public transport. It involves airplanes of both classic design as well as recent

planes with a high level of automation.

The BEA, which is associated with a large number of investigations worldwide, has investigated several accidents in this category.

We have also investigated a similar category of accidents classified as CFIT where, while still within the airplane's flight envelope, the loss of flight path control resulting from a loss of situational awareness by the crew has led to disaster.

We are currently carrying out a study of this category of accident.

A lot of work and research is being undertaken within the international aviation community on subjects related to loss of situational awareness by flight crew. The BEA's conclusions and recommendations on pilot training are consistent with these themes.

Automated systems are used on modern airliners during most of the flight and they have considerably improved safety.

The problem is that the automated systems are not always used, either involuntarily when they disconnect or, in some situations, deliberately.

Then, whether it's a classic or a modern airplane type, flight path control requires that pilots have perfect situational awareness.

This comes from the quality of the information provided to pilots, the way in which it is presented, the consistency of the signals that they perceive via the various sensory channels and their ability to make sense of these signals from their training and experience.

Clearly, we can still increase the level of automated systems, improve their reliability and strengthen protections.

But in the end, safety will still depend above all on getting the right adequacy between the cognitive capacities of pilots and the signals that are provided to them to understand and act on.

This accident has also taught us that hypotheses used for safety analyses are not always relevant, that procedures are not always applied and that warnings are not always perceived. Only an improvement in the quality of feedback will make it possible to detect any weaknesses in the safety model.

All these conclusions are the subject of BEA recommendations in particular the 19 dedicated to training and ergonomics.

These recommendations have been sent to their recipients who will answer by October if they accept them or not. We are confident that most of them will be accepted as we had already preliminary discussions with those recipients.

In accordance with Annex 13, our role as safety investigators could be limited to take note of these answers and, according to the European regulation to react to these answers.

But the acceptance of a recommendation is often just the beginning of a long process that could take years. To assess the real impact on safety of our investigations, we should check the effective implementation of our investigations.

This task, I will propose to our European counterparts to share with us, taking advantage of the newly created European safety recommendations data base.