LEARN BEA’S PRELIMINARY REPORT ON LUFTHANSA CRASH

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ABSTRACT

The Writers (of this Report) predicted in their earlier report on 2014 AirAsia Airbus crash that a similar event will happen sooner or later. Really, the Lufthansa Germanwings Airbus crash has happened, much sooner than they assumed (several years), only 86 days after the former. For the latter, there have been a lot of causal speculations. Unlike the former, it was fine when the latter happened. Hence, the favorite **weather/pilot-error** hypothesis is not applicable. Given the criterion, a **copilot-suicide** hypothesis appears. The Black-box-data analysis is done by BEA, and its result, Preliminary Report on Germanwings Airbus Crash, is released. BEA says the report has no prejudice to any hypothesis. But its contents, in effect, support the copilot-suicide hypothesis. The Writers offered their **bulkhead-fatigue-rupture** Hypothesis in a previous report. Given the BEA report, they have learnt it and found several questionable premises in it. Summarizing the results of studies, the Writers shall forward this Report before the people concerned. The purpose of this Report is to confirm the authenticity of the Writers’ Hypothesis, in analogy with the BEA report.

Keywords: Lufthansa / AirAsia crashes, analogy between airbus crashes, bulkhead fatigue

INTRODUCTION

Definitions and abbreviations

As to basic technical terms (cause / fatigue) and logical terms (induction / deduction) that are needed as preliminary knowledge, cf. **[9]** and **[15]** respectively.

Abbreviations used in this Report are explained in **CORRASORY** at the end of this Report.

Purposes of this Report

The purposes of this Report are the same as the ones of the previous report **[16]**. That is;

The direct purpose is to present the bulkhead-fatigue-rupture Hypothesis for the L-event. The indirect purpose is to convince the societies concerned of how the methodology (methods, principles and rules) of a causation study should be. In this way, this report aims to salvage the causation study from being in current disarray.

Keynotes of this Report

This Report is of a rehearsal match with BPR as a sparing partner for a challenge match with BEA’s final report as a defending champion, for the title ‘A true cause of the L-event’. To pursue it, this Report underlines three keynotes as follows:

(1) BEA’s official stance is clearly declared in BPR’s *Foreword* as extracted below:

BEA is an independent authority. BPR aims at no more than aviation safety, has no data analysis, no prejudice to any hypothesis, no intention of blame or liability.

Hence, BPR shouldn't be interpreted as an indication of the conclusions of the investigation, **[5]**.

The matter is, 'if BPR really abides by the plausible statements. This Report verifies it.

(2) According to the statements, BPR's primary objective is to offer basic premises for due inductive / deductive investigations of the L-event with the data from flight recorders (popularly called black boxes), viz. CVR and FDR. Hence, the quality of the data in these devices plays a key role in BPR. Therefore, the quality of them has to be learnt.

(3) Notwithstanding ***(2)***, BPR seemingly relies on the readings of automatic transmission data from the second radar (flightradar24) rather than the data in FDR. Hence, to assess the quality of flightradar24 (Radar) data are also needed.

Note: In this report, quotations (except from BPR) aren't necessarily shown with origins. It is to avoid criticism by name. If readers are interested in them, they can be found in websites, e.g., mentioned in **[1] ~ [6]**. Quotations are all written in *Italic* letters.

BPR's official and actual stance

BPR declares BEA's official stance in *Foreword* as follows:

The BEA is the French Civil Aviation Safety Investigation Authority. Its investigations are conducted with the sole objective of improving aviation safety and are not intended to apportion blame or liability.

BEA investigations are independent, separate and conducted without prejudice to any judicial or administrative action that may be taken to determine blame or liability. This document is a Preliminary Report and has been prepared on the basis of the initial information gathered in the course of the investigation, without any analysis. ……. Nothing in the presentation of this document or in any of the points raised therein should be interpreted as an indication of the conclusions of the investigation.

Does BPR really abide by the above statements? Let's learn.

If BEA faithfully abides by the stated official stance, BPR is nothing more than presentation of Flight Recorders' data, just as they are, plainly, succinctly, without judgments and/or manipulations. If BPR is something more than that, it'd be inevitably affected by subjective judgments and convenient manipulations. It's more likely if an investigation team has the direct participation of stake holders of the study object. In L-event, Airbus and Germanwings are pertinent. cf. next quotations extracted from *Foreword* in BPR.

The BEA associated the following foreign counterparts with the Safety Investigation, which then appointed Accredited Representatives. ……… This made it possible to obtain the assistance of technical advisers from Germanwings; …….. The BEA also associated technical advisers from EASA, the DGAC, Snecma (on behalf of CFM) and Airbus.

The Safety Investigation is organized with three working groups in the following areas: aircraft, airplane systems and operations. The Accredited Representatives and the technical advisers were divided between the three groups.

BEA expresses its die-hard obsession about the copilot-suicide hypothesis (the hypothesis) as it speaks by proxy (ICAO) in BPR, *1.12.2 Previous Events*, as follows:

It is not possible to rule out the hypothesis of intentional maneuvers by one of the crew members that was intended to lead to the loss of the aircraft and its occupants.

In effect, BPR made judgments and manipulations that result in satisfying the hypothesis. It also tacitly discards the bulkhead-fatigue-rupture Hypothesis (the Hypothesis) in discussions. BEA may think it is the easiest way to establish the hypothesis and to negate the Hypothesis. That is, despite its official stance, BPR is not eligible for the label of **neutral**. Its contents are full support of the hypothesis with judgments and manipulations. Sure enough, a group of hypothesis mongers has immediately takes a preparatory legal action based on BPR. On the other hand, this Report learns BPR to point out its subjective judgments and convenient manipulations, by utilizing the factual data in BPR (though scanty). It is an uneasy way to establish the Hypothesis and to **neutralize** the hypothesis.

Comment: A preliminary report on AirAsia Airbus crash provided by the Indonesian black-box investigation team is really eligible for the label of neutral. It fully abided by the policy mentioned in *Foreword* of BPR. Its report is a plain and succinct presentation of the raw data in black boxes just as they are, without subjective judgments and/or convenient manipulations. BEA must learn from the Indonesian team.

Quality of data in FDR, CVR and QAR

General

Airbus A320 is equipped with two flight recorders, viz. FDR and CVR, and four QARs. Their functions, statuses after the crash and its effects on the quality of data are learnt as follows:

FDR

It is a digital Flight Data Recorder with a memory card of at least 25 hours recording capacity. It provides information on about 600 parameters. It comprises a front interface casing and a protection casing that accommodates a memory module in which a memory card is located.

As seen in **Photo 1 (a_1)** and **(a_2)**, its front interface and memory module protection casings had been deformed, tore, and exposed to heat. It implies that the memory module **Photo 1 (a_3)** had a direct thermal effect of conduction and radiation.

BPR says FDR was covered by *soot*. The soot comes from smoke. The smoke is from fire. But there was no fire in this crash. Hence, no soot could be. So-called soot is degenerated surface treatment materials of FDR. Then, where did the heat come from? Well, the heat didn't come from external conflagration out of the FDR casings. It was internally generated in the casing itself when it was subjected to an instantaneous cold-work (deformation to tearing) at the time of crash. If the heat would be from an external origin, e.g., a fire outside the casing, it should take time until heat reaches the memory module by conduction, and could be isolated by an insulation-layer placed in the space between the casing and the module. However, if the heat is from an internal origin, e.g., generated by the cold work in the casing itself, heat instantaneously reaches the module in which a memory card is located. Much more, the memory module was being stripped off with its protection casing and insulator. The effect of heat was severest at the front side in **Photo** 1 **(a_2)**, since generated heat was greatest (casing destruction was greatest) there, and heat protection was effectively 0 (the insulation layer was striped off from the position). In this context, the data recorded in this side were in the most vulnerable condition. Remember! The digital data in the memory card is susceptible to heat.

Given the situation as the above, it is hardly possible to imagine that the memory card in the module is intact. BPR says in its Article: *1.8.3 Synchronization of recordings*, '*The FDR recordings then were synchronized with those of the CVR using the radio communications with the control centre, the triggering of the GPWS alarms and the Master Warning parameter.*'

Why FDR recordings must have been synchronized with radio-communications of ATC? Passengers from Jakarta to Tokyo must synchronize their watches with the Tokyo Local Standard Time. Since, there's a 2-hr. time difference between Jakarta and Tokyo Local Standard Times. However, the Standard Time of FDR and ATC is equal. The flight data were sent real-time from the plane to a Second Radar (in this case, flightradar24) by a transponder. The Second Rader sent the data to the ATC Center. That is, they all hold a common Standard Time. FDR has a time recorder. If not, it offends against the rule. cf. the following quotation.

The FDR onboard the aircraft records many different operating conditions of the flight. By regulation, newly manufactured aircraft must monitor at least eighty-eight important parameters such as ***time****, altitude, airspeed, heading, and aircraft attitude.*

In this context, there's no reason for BPR to synchronize FDR's own recorded grandfather time with flightradar24 Radar's child time and ATC Rader's grandchild time. It's equivalent to the confession of BPR that FDR's time recording is too spoiled to readout; hence, BPR must borrow the time data from Radar recordings. The time is recorded as digital status. The data in FDR are all digital status. Shock and heat works indiscriminately. Hence, it is quite reasonable to suppose that the data in FDR were all damaged as badly as the time data.

(a$_1$) Front interface casing **(a$_2$)** Module in protection casing **(a$_3$)** Module

Photo 1 Damaged FDR of crashed A320 (Origin: www.pilotman.net, www.bea.aero)

Comment: As FDR data usually play an important role in causation investigations, undamaged FDR data is an indispensable necessity for BPR to hold out its 'dignity'.

CVR

This recorder is equipped with a memory card and has a recording capacity of at least 2 hours in standard quality and 30 minutes in high quality. The data in CVR are analog except the time.

Photo 2 shows the mechanically damaged CVR of the crashed Airbus.

As seen in the photo, CVR's memory module protection casing (left part in **Photo 2**) doesn't show significant mechanical damage. Further, analog data are less susceptible to shock and heat than digital ones are. Hence, voice / sound data recorded in it may be able to be readout. However, its recorded time data disappeared as they were digitally recorded. It needed the synchronizations. More crucially, its analog data (sounds) were weakened by decompression, as the medium of sounds (air) was rarefied by the decompression.

Photo 2 Damaged CVR of crashed A320 (Origin: ditto)

Comment: Opaque analog sounds in CVR may be heard as human breaths. It’s an act of imagination. But an unclear digital number, e.g., ’09 41 ??’ shall not be read as ’09 41 06’. If dare do it, it’s an act of creation.

<u>QAR</u>

QAR records the same data as the FDR. The data are used exclusively for the flight analysis. Memory cards containing the flight data were extracted from the computer. But memory components from the two cards were so damaged that made it impossible to retrieve recorded data.

Quality of Radar data

The Radar data are products of objective-automatic processes without subjective judgments and/or manipulations, then, hardly possible being involved in human acts. Hence, if there’re any digital discrepancies between damaged / processed (synchronized) FDR/CVR data and Radar data, the latter is more trustworthy.

Summery

From the above analyses, it is reasonably realized that BPR has been forced to rely on CVR and Radar data. BPR scarcely used FDR data. Used digital data are Radar data only.

Comment: An exception is the data at the time of the collision. BPR doesn’t synchronize the time and data with Radar’s ones. DPR even rejected the Rader’s time and data. It says, ‘the data from FDR are used.’ This forced maneuver to help the hypothesis has ironically killed it with kindness. Readers will see it later in this Report.

LEARNING BPR

General

BPR *notes* in *1.1 History of Flight*, ‘*the following elements are based on the <u>flight recorders</u>* (it includes FDR), *as well as on <u>recordings of radio communications</u>.’*

In BPR, FDR data seem to play insignificant role in respective issues, even in crucial ones. For instance, to deny the decompression in the cockpit, it is enough for BPR to exhibit the air-pressure data measured by a sensor in the cockpit and recorded in FDR, and to announce that there can be found no air-pressure change throughout the flight. But BPR doesn't do so. Instead, it implies the normality in the cockpit by CVR's analog audio data of copilot's breaths. Likewise, many essential events mainly depend on the analog data in CVR and digital data of Rader. It implicitly proves the Writers' assertion that FDR data were damaged too fatally by shock and heat at the time of crash to readout them properly.

As discussed in the previous **Sect.**, the audio data in CVR are synchronized (relocated) on a time axis borrowing the time data from the Radar. In this regard, readers realize that the audio data in CVR that could be correctly relocated are the ones that were sent to and recorded in the Radar recorder only. The sounds and voices of intra-plane audio data such as so-interpreted noises of seat sliding, sounds from cockpit door, someone's call for the copilot etc were not sent to the Radar recorder. Hence, they were relocated on the time axis not by synchronization with the Radar data but by investigators' subjective judgments and manipulations. Likewise, the identifications of audio data, e.g., of what, from where, whose etc, are also by their subjective judgments. These judgments are the prerogative of the investigators. The matter is if they have an aptitude for the judgments. It is to be discussed later in other **Sect.** of this Report.

Given the situation as these, the following discussions are to be CVR and Rader data centered.

Previous flight

The crash happened on the return flight from Barcelona to Dusseldorf. But an evil sign had already appeared in the previous (out-bound) flight from Dusseldorf to Barcelona. BPR describes it in *1.8.4 Previous Flight* as follows:

All of the data from the previous flight, from Düsseldorf to Barcelona, was recorded on the FDR. The recordings from the CVR included the last 50 minutes of this flight. Synchronization of these recordings and the radio communications with the Bordeaux en-route control centre, with which the crew was in contact, was performed based on the same principle as for the accident flight.
On the previous flight, the following facts can be noted:
ˆat 7 h 19 min 59, noises like those of the cockpit door opening then closing were recorded and corresponded to when the Captain left the cockpit; the airplane was then at cruise speed at <u>flight level FL370 (37,000 ft)</u>;
ˆat 7 h 20 min 29, the flight was transferred to the Bordeaux en-route control centre and the crew was instructed to <u>descend to flight level FL350</u> (35,000 ft), an instruction read back by the copilot;
ˆat 7 h 20 min 32, the aircraft was put into a descent to flight level <u>FL350</u>, selected a few seconds earlier;
ˆat 7 h 20 min 50, the selected altitude decreased to <u>100 ft</u> for three seconds and then increased to the maximum value of <u>49,000 ft</u> and stabilized again at 35,000 ft;
ˆat 7 h 21 min 10, the Bordeaux control centre gave the crew the instruction to continue the <u>descent to flight level FL210</u>;
ˆat 7 h 21 min 16, the selected altitude was <u>21,000 ft</u>; ˆ from 7 h 22 min 27, the selected altitude was <u>100 feet</u> most of the time and changed several times until it <u>stabilized at 25,000 ft</u> at 7 h 24 min 13;
ˆat 7 h 24 min 15, the buzzer to request access to the cockpit was recorded;

ˆat 7 h 24 min 29 noises like those of the unlocking of the cockpit door then its opening was recorded and corresponded to the Captain's return to the cockpit.

Comment: The variations in selected altitude (allegedly extracted from the FDR) are illustrated in BPR, but omitted in this Report.

The above statements effectively gave people negative impressions to copilot's acts as represented by the following statements:

(1) *Cox said. "I've never seen it done, and it is the same methodology he used to fly the airplane into the ground. Was he practicing? I think that certainly is a possibility."*
(2) *"He was practicing to see how the airplane behaved," said John Goglia, an aviation safety expert and former member of the U.S. National Transportation Safety Board.*

Sorry to say, 'They are wrong.' For the copilot of above standard, such a descent as the one in the return flight had been routine practices for which he needed no rehearsal.

If BPR's statements on copilot's maneuvers in out-bound flight are carefully read without taking his acts in ill part, it can be reasonably realized that copilot's maneuvers were efforts to accelerate the sluggish descent in order to reach the low altitude instructed by ATC promptly. Despite his 100~49000-*ft* shake-off operation, the altitude instructed by ATC could not be achieved. The method to accelerate descent, i.e., the insertion of a short duration descent down to 100 *ft*, was his private accomplishment that's yet to be authorized. This creative copilot may have used the method in his past flights successfully. It might have been used by other young creative pilots as well (though it's never used after the L-event). Even ATC may possibly have tacitly permitted the practices of this kind, though, of course, it never happens again since the L-event.

As his usually-effective method to accelerate descent didn't work when he applied it to the out-bound flight in spite of multiple trials, he might have felt something wrong in the elevator control system. In fact, this phenomenon was the evil omen of the coming fatal event. This phenomenon, a disorder of the elevator control system, was likely produced by the repairs at a hatch under the cockpit that had been done 10-hours ahead of the out-bound flight. The two affairs are so much synchronized that the causality of the two is hardly denied. The copilot didn't come to a think about it. He didn't tell the story, since it needed tell his out-of-program practices. The Writers' above insertions must be taken into account in due studies. Remember! The irregularity in an elevator control system is a common sign of F-, A-, and L-event. It implies that the causes of these three events are common.

Comment: In this episode, the Writers see an example how difficult for any out-of-program problem to be detected in a strictly program-controlled system.

Last 13-minute flight

BPR explains the last problematic 13-minute flight in *1.1 History of Flight* as follows:

'Note: the following elements are based on the flight recorders, as well as on recordings of radio-communications. The main points in the history of the flight below are referenced by the numbers on figure 1, page 10 (**Fig. 1, *(b)*** in this Report)*.'*

- *At 9 h 30 min 00 (point 2□), the Captain read back the controller's clearance allowing him to fly direct to the IRMAR point: (This was the last communication between the flight crew and ATC.)*

- ***At 9 h 30 min 08, the Captain told the copilot that he was leaving the cockpit and asked him to take over radio communications, which the copilot read back.***
- *At 9 h 30 min 11, the heading started to decrease and stabilized about a minute later around 23°, which is consistent with a route towards the IRMAR point.*
- ***At 9 h 30 min 13, noises of a pilot's seat movements were recorded.***
- ***At 9 h 30 min 24 (point 3□), noises of the opening then, three seconds later, the closing of the cockpit door were recorded. The Captain was then out of the cockpit.***
- *At 9 h 30 min 53 (point 4□), the selected altitude on the FCU changed in one second from 38,000 ft to 100 ft. One second later, the autopilot changed to ''OPEN DES'' (3) mode and autothrust changed to ''THR IDLE'' mode. The airplane started to descend and both engines' rpm decreased.*
- ***At 9 h 31 min 37, noises of a pilot's seat movements were recorded.***
- *At 9 h 33 min 12 (point 5□), the speed management changed from ''managed'' mode to ''selected'' (4) mode. A second later, the selected target speed became 308 kt while the airplane's speed was 273 kt.*
- *At 9 h 33 min 35, the selected speed decreased to 288 kt. Then, over the following 13 seconds, the value of this target speed changed six times until it reached 302 kt.*
- *At 9 h 33 min 47 (point 6□), the controller asked the flight crew what cruise level they were cleared for. The airplane was then at an altitude of 30,000 ft in descent. There was no answer from the copilot. Over the following 30 seconds, the controller tried to contact the flight crew again on two occasions, without any answer.*
- *At 9 h 34 min 23, the selected speed increased up to 323 kt. The airplane's speed was then 301 kt and started to increase towards the new target.*
- ***At 9 h 34 min 31 (point 7□), the buzzer to request access to the cockpit was recorded for one second.***
- *At 9 h 34 min 38, the controller again tried to contact the flight crew, without any answer.*

* *At 9 h 34 min 47 then at 9 h 35 min 01, the Marseille control centre tried to contact the flight crew on 133.330 MHz, without any answer.*

* *At 9 h 35 min 03 (point 8□), the selected speed increased again to 350 kt.*

Subsequently, and until the end of the recording:

* *the selected speed remained at 350 kt and the airplane's speed stabilized around 345 kt;*

* *the autopilot and autothrust remained engaged;*

* ***the cockpit call signal from the cabin, known as the cabin call, from the cabin interphone, was recorded on four occasions between 9 h 35 min 04 and 9 h 39 min 27 for about three seconds;***

* ***noises similar to a person knocking on the cockpit door were recorded on six occasions between 9 h 35 min 32 (point 9□) and 9 h 39 min 02;***

* ***muffled voices were heard several times between 9 h 37 min 11 and 9 h 40 min 48, and at 9 h 37 min 13 a muffled voice asks for the door to be opened;***

* *between 9 h 35 min 07 and 9 h 37 min 54, the Marseille control centre tried to contact the flight crew on three occasions on 121.5 MHz, and on two occasions on 127.180 MHz, without any answer;*

* *between 9 h 38 min 38 (point 10□) and 9 h 39 min 23, the French Air Defense system tried to contact the flight crew on three occasions on 121.5 MHz, without any answer;*

* ***noises similar to violent blows on the cockpit door were recorded on five occasions between 9 h 39 min 30 (point 11□) and 9 h 40 min 28;***

* ***low amplitude <u>inputs on the copilot's sidestick were recorded</u> between <u>9 h 39 min 33</u> and <u>9 h 40 min 07</u>***
* *the flight crew of GWI18G tried to contact at 9 h 39 min 54, without any answer.*
* *At 9 h 40 min 41 (point 12□), the ''Terrain, Terrain, Pull Up, Pull Up'' aural warning from the GPWS triggered and remained active until the end of the flight.*
* *At <u>9 h 40 min 56,</u> the Master Caution warning was recorded, then at <u>9 h 41 min 00</u> the Master Warning triggered and remained active until the end of the flight.*

<u>*At 9 h 41 min 06</u>, the CVR recording stopped at the moment of the collision with the terrain.

Comment 1: The statements written in **bold letters** have no independently confirmed time.
Comment 2: <u>Underlined phrases</u> are controversial statements that are to be checked.

Analog expression of last 13-minute flight

An illustration of BPR's data-time lineup above is shown in **Fig. 1** ***(b)*** with flightradar24's one in **Fig. 1** ***(a)*** as a reference.

When the two altitude charts are compared, they're visibly similar. It's no wonder as BPR's altitude chart is drawn mostly based on Radar data. But if scrutinized, there are essential differences particularly at the beginning and the end sections. Let's see them for each section.

(1) Pre-descent level section

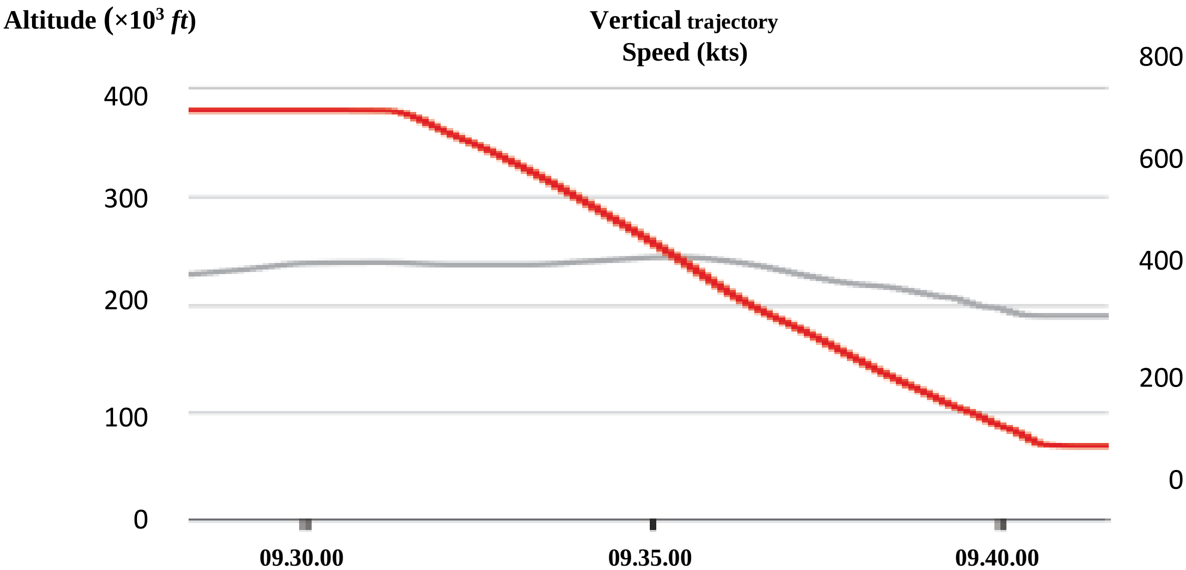
The descent began at the end of the pre-descent level flight. The beginning point of descent is clearly seen in the Radar altitude chart. But it's not in the BPR's one. It's because BPR inserted transition curves between the level and descent flight lines. Transition curves (usually Clothoid) are inserted also in the horizontal and vertical alignment of highways and railways to mitigate passengers' feeling of uncomfortable due to a discontinuous direction change. But in the L-event, the purpose of the descent was either suicide (hypothesis) or an emergency-measure (Hypothesis). In either case, to comfort passengers is at odd with the situation. The insertion of transition curve is worse than nonsense for a normal analysis of this event.

The descent occurred 9 sec. after the descent setting. BPR measured 9 seconds <u>not</u> from 'the beginning point of the <u>descent</u>,' <u>but</u> 'the beginning point of the <u>transition curves</u>. It in effect advances the descent-setting time by 67 sec. before the beginning point of the descent (the end point of the transition curves), cf. **Fig. 1** ***(b)***, or 30 sec. before the genuine beginning point of the descent. cf. **Fig. 1** ***(a)***.

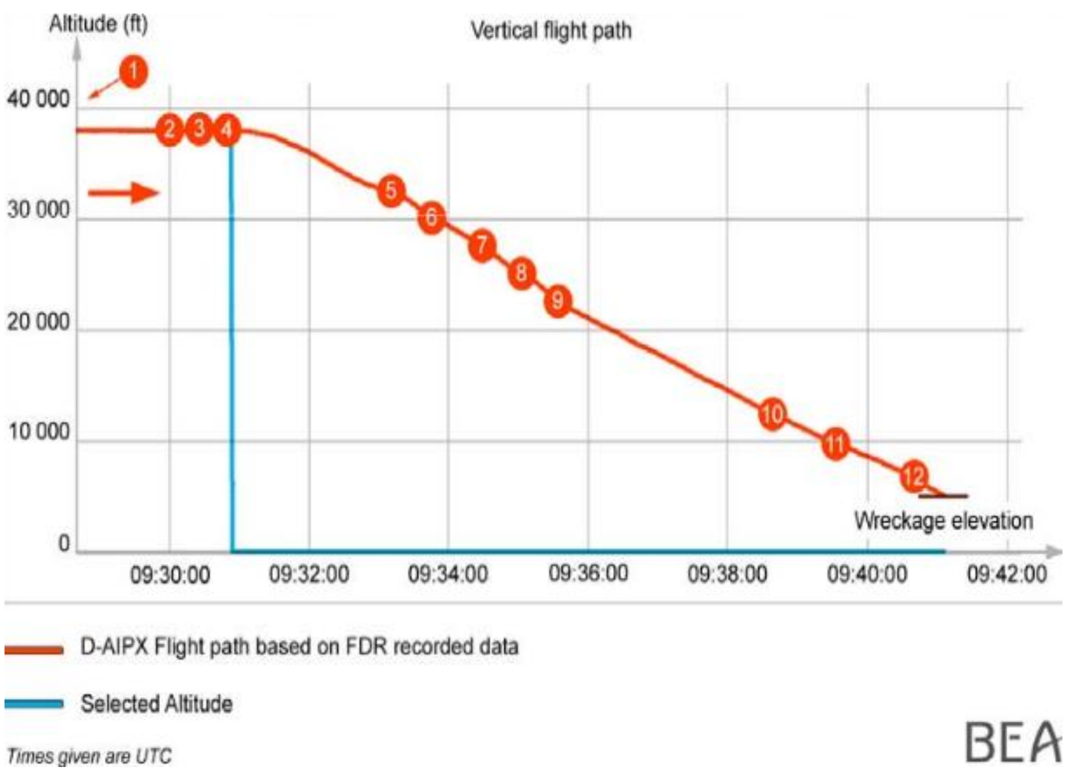
Advancing the descent-setting time together with putting off captain's cockpit exit time, a scenario has been so produced as if the copilot had been waiting captain's exit, and no sooner had the captain exited the cockpit than he set the descent. In this way, copilot-suicide hypothesis' view point has strengthened. If the respective events are reasonably located on the time line, the time lag between captain's cockpit exit and copilot's descent setting is at shortest 1 minute.

Comment 1: Captain's exit itself is skeptical, since a series of sounds such as so-interpreted seat sliding, cockpit door open/close doesn't necessarily mean his exit. Is it fantastic to assume that the captain stopped exiting cockpit as he also recognized irregularities in the cockpit, and closed the door again once he opened, and remained in the cockpit?

Comment 2: In the first place, are the sounds of seat moving, door open/close, captains call from the cabin-side, his axing the cockpit door etc, are really so as BPR implies? It's dubious.



(a) flightradar24



(b) BPR

Fig. 1 Altitude Chart of last problematic minutes (differences between FDR and Radar Data)

(2) Descent section

This Report reveals that the descent was copilot's emergency measure to manage the decompression, having abided by the Flight Manuals and regular trainings. To let the plane descend down to the programmed altitude as quick as possible, the copilot set the selected altitude at the possible lowest, 100 *ft*. But the plane's response to the setting was sluggish.

As the copilot had already learnt his original method to accelerate descent couldn't work, he had no way other than increasing plane's speed to realize the plane's quick descent. Copilot's efforts are explained in BPR as follows.

At 9 h 33 min 12 (point 5□), A second later, the selected target speed became 308 kt while the airplane's speed was 273 kt
At 9 h 33 min 35, the selected speed decreased to 288kt. Then, over the following 13 seconds, the value of this target speed changed six times until it reached 302kt.
At 9 h 34 min 23, the selected speed increased up to 323kt. The airplane's speed was then 301kt and started to increase towards the new target.
At 9 h 35 min 03 (point 8□), the selected speed increased again to 350kt.
Subsequently, and until the end of the recording: the selected speed remained at 350 kt and the airplane's speed stabilized around 345kt;

However, the effect of his efforts was insignificant. cf. the quotations below.

A BEA chart showed the plane didn't actually descend sharply while Lubitz was repeatedly adjusting the settings, so the passengers and crew might not have noticed any change.

Lubitz changed the setting in the "altitude select" window, although the airplane didn't move in response to the inputs, said aviation safety expert John Cox, president of Safety Operating Systems.

BPR's evaluation of copilot's effort between 09 hr. 33 min. 12 sec. and 09 hr. 35 min. 03 sec. is as follows:

The airplane's speed started to increase along with the airplane's descent rate, which subsequently varied between 1,700 ft/min and 5,000 ft/min, then was on average about 3,500 ft/min.

This evaluation seems not to reflect the reality. As seen in **Fig. 1**, ***(a)***, the speed decreased after 09 hr. 35 min. 03 sec. This obvious infidelity of plane's elevator control system is much more serious than copilot's breaths from an aviation safety point of view. But it was discarded in BPR.

Comment: Unlike A-event's explosive decompression, L-event's one was slow to rapid. It may have allowed the copilot barely to maneuver as the above. During the descent, the copilot was exposed to a double punch of the 8000→3000 (kg/m^2) decompression in a first-half round, and 3000→8000 (kg/m^2) compression in a second half round. This Report assumes that after the second punch, he was knocked out. This assumption is reviewed later in this Report.

(3) End of descent section

As seen in **Fig 1** ***(a)***, the trajectory as per Rader data after 09 hr. 40 min. 36 sec. entered its last stretch, the programmed post-descent level flight, **[16]**, until it collided against the terrain at 09 hr. 41 min. 33 sec. However, BPR denies the existence of this level flight. It assumes that the plane kept its descent motion unchanged until the plane hit the terrain 30 seconds later at 09 hr. 41 min. 06 sec. BPR's setting has effectively eliminated the post-descent level flight that's at odd with the copilot-suicide hypothesis. However, this forced manipulation cannot make the wishful scenario be wholly consistent. It exposes its defects somewhere. Readers see it later in this Report.

Last 60-second trajectory

<u>Basic data used in analyses</u>

There's no dispute about the time when the plane reached the 2000s-*m* altitude ($T_{(R)}$). It was 09 hr. 40 min. 36 sec. The altitude, plane's speed and the descent ratio ($Alt_{(R)}$, $V_{(R)}$ and $V_{v(R)}$) shows differences between BPR's and Radar's. However, they are within the tolerance of survey errors. Hence, the averages are used as the most probable values. cf. **bold letters** in **Table 1**.

The dip angle is computed Sin^{-1}(1055(*m*/min.)/(665000(*m*/hr.)/60(min./hr.)))=**5.462** → **5.5** (°).

Table 1 Input data used in analyses

(1) at $T_{(R)}$

	$T_{(R)}$	$Alt_{(R)}$	$V_{(R)}$	$V_{v(R)}$
Unit	*hr. min. sec.*	*m*	*km/hr.*	*m/min.*
BPR	09: 40: 36	2030	640	1070
Radar	do.	2070	690	1040
Used	**09: 40: 36**	**2050**	**665**	**1055**

(2) at $T_{(M)}$

$T_{(M)}$	$Alt_{(M)}$	$V_{v(M)}$
hr. min. sec.	*M*	*m/min.*
09: 41: 06	1550	1055
09: 41: 33	2050	0
-	-	-

Note: BPR's **Fig. 1 *(b)*** is an analog expression of the digital data shown in **Table 1**.

<u>Analysis</u>

As seen in **Fig. 1 *(a)*** and ***(b)*,** a qualitative difference of the last trajectory between of BPR and of Radar is: if a post-descent level flight existed after $T_{(R)}$. For the sake of easy recognition, the two trajectories of last 60 seconds are illustrated in **Fig. 2** in which the controversial digital values are shown as well.

After $T_{(R)}$, BPR's trajectory kept the constant motion as it was before $T_{(R)}$, till the time ($T_{(M)}$) when the plane collided against the sloped terrain of 1550-*m* altitude at 09 hr. 41 min. 06 sec.

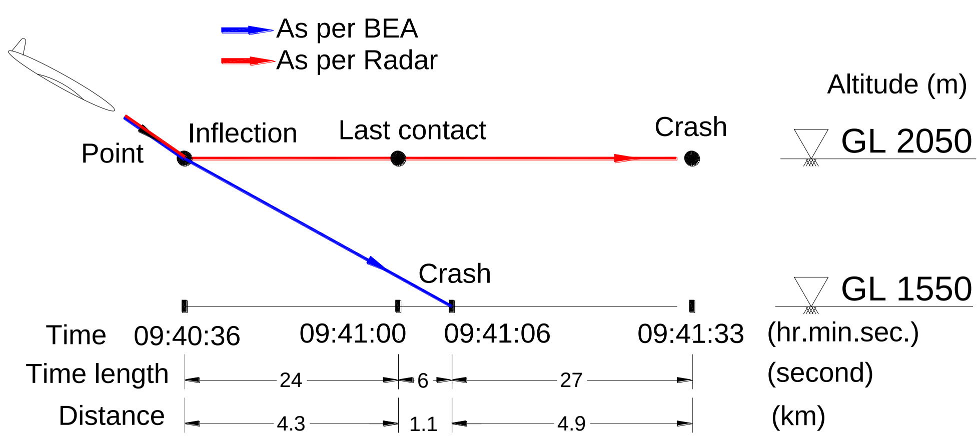


Fig. 2 last 60-second trajectories of BPR and. Radar assumes

Radar's trajectory changes its descent to the level flight at $T_{(R)}$, and it didn't change the altitude after $T_{(R)}$, via the last Radar contact time, 09 hr. 41 min. 00 sec. to the time $T_{(M)}$ when the plane collided with the mountainous terrain of 2050-*m* altitude at 09 hr. 41 min. 33 sec.

A key question is: if the altitude at the last Radar-contact time is just. There might be an irregular solution to this controversy. That is, the flightradar24 might voluntarily withdraw the last Radar-contact data. If it would be the case, it'd be a sad story per se, on any plausible pretext whatever. Hopefully, it won't happen.

As seen in **Fig. 2**, there're three 3-dimensional discrepancies in BPR's and Radar's plane-crash point, i.e., in time: 27 sec., in height: 500 *m* and in distance: 4.9 km. These are not survey errors. Either (or both) of them is (are) wrong.

There's one fact to give emphasis on the above subject. It's the plane's ill functioning control system. It'd followed about the plane throughout the flights (out-bound and return flight) until the last moment. It was practically testified to the fact by BPR itself in four occasions (three were explained). The last testimony is the statement in BPR, *2-INITIAL FINDINGS*. It says:

An input on the right sidestick was recorded for about 30 seconds on the FDR 1 min 33 s before the impact, <u>not enough to disengage the autopilot. The autopilot and autothrust remained engaged</u> until the end of the CVR and the FDR recordings.

It's not clear in the above sentence if copilot's input was of descent or of ascent. According to the earlier information, it was of ascent. The Writers have assumed that the copilot had been unconscious when the plane descended down to 2000-*m* altitude due to rapid compression in the 2nd half after decompression he suffered in the 1st half of the descent. If he'd have been still functional and really so functioned at the time of 1.5 minutes before the crash, it indicates two things, i.e., not only ill-function of plane's control system but copilot's ultra physical strength and professionalism. It also implies his consistent will to salvage the plane until the last moment. If it is the case, Hypothesis suffers a partial setback, but it'd be a fatal blow for the hypothesis. Anyway, there must be satisfactory explanations on this matter in due studies.

Analogy between BPR's and Radar's collision vs. debris-distribution patterns

In this **Sub-sect.**, patterns of the carriage of the plane when it collided against the terrain and the debris distribution are analyzed for DPR and Radar trajectories respectively.

<u>Check and assess BPR pattern</u>

The slope of the ground of the plane-crash site is estimated by photographs at 35 (º).
Then, the angle of incidence of the inrushing plane vs. the ground is: 90 – 35 – 5.5 = 49.5 (º).
If the plane's fuselage and its debris rebound, the angle of reflection is 49.5 (º). It yields:
The direction of reflection (rebound) leans from the vertical axis to upper side at 14.5 (º).
The angle between the initial velocity vs. the horizontal axis is 75.5 (º). cf. **Fig. 3 (a).**
To blowup debris of total mass 70 (ton) to, on average, 250-*m* high and 250-*m* distant area, an initial velocity **(V_r)** of debris in **Fig. 3 (a)** must be 300 (km/hr.). This velocity can't be generated theoretically. Let's learn it.

If mountain's massiveness / rigidity and plane's colliding speed are taken into consideration, plain's elasticity is nearly 0. In other words, the plane's structural property is almost plastic. As primary physics tell, a non-elastic body can't rebound. It can be confirmed by comparing the plane's kinetic energy before the crash with the total W.D. after the crash. The kinetic energy of the plane before the collision = $½*m*v^2$, where m is the mass of the plane and v is $V_{(R)}$. Total W.D. = W.D. to cause plastic deformation of fuselage to flat + W.D. to cause fuselage tearing to 1 × 1 (*m*) square pieces on average + margin (heat, sound etc). The greatest W.D. is the 2nd item. The smaller the debris size is, the greater the W.D. is. When an average size of 1-*m* square debris is assumed, the 2nd item W.D. only is as great as plane's kinetic energy. That is, after the collision, there's no more kinetic energy to transport the smashed plane debris to higher and more distant locations than the plane-crash point. In other words, the real debris scattering at the site contradicts the collision pattern set by BPR. cf. **Fig. 3 (a)**.

Comment: All the necessary data needed in the calculations, e.g., fuselage specifications and YP, BP, PP of fuselage material can be found in internet and textbooks.

<u>Check and assess Radar pattern</u>

Radar defines the plane-crash time, 09 hr. 41 min. 33 sec. It is the time when the contact signal died out. This device can give only a time datum but can't send flight data. The altitude and the speed at the time of impact are defined by assuming a constant altitude and speed after the last Radar contact. The Writers agree to these assumptions as reasonable.

The last flight trajectory as per Radar data also qualitatively agrees to the reality. That is, after the crash, **t**he debris of the plane ran down the steep slope due to the gravity force, having scattered about the debris on the ridge surfaces and along the ravines. cf. **Fig. 3 (b).**

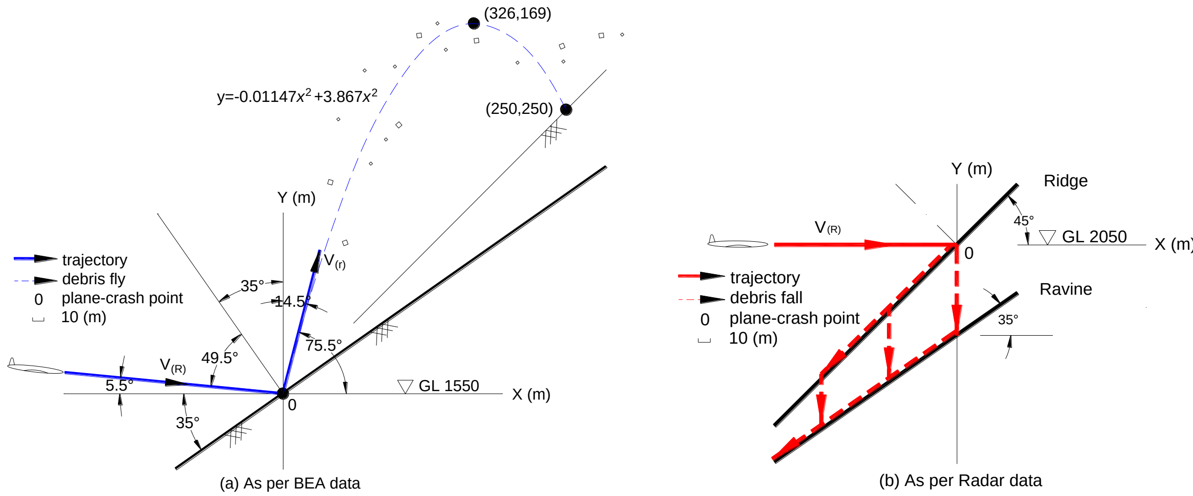


Fig. 3 Geometrical feature of plane collision

The copilot-suicide hypothesis has been checked inductively in this **Sect**. In the next **Sect**., it'll be analyzed deductively by investigating the alleged plane-crash site with photos.

DETERMINANTS IN L-EVENT

General

There're two questions whose answers are the determinants that directly relate to the cause of L-event. They're: ***(i)*** where is the plane-crash site? ***(ii)*** Did the cockpit decompression really happen? If these two determinants would have been given, the study on the L-event could reach the causation easily. The matters such as copilot's breaths, his study on and rehearsal of suicide performance, captain's heroic axe wielding etc could find their proper positions naturally.

Plane-crash site (identified by BPR)

<u>Learning the alleged site</u>

BPR pinpoints the plane-crash site (BPR calls it the '*accident site'*) by latitude / longitude: as *44°16'47.2''N / 006°26'19.1*''E. There's no explanation, 'if it is by astronomic surveys or by a pocket GPS device.' If by the latter, there'd be considerable errors in latitude and longitude, depending on geo-circumstantial conditions. The plane-crash site is shown by **Photo 3**.

BPR identifies the plane-crash site as follows:

On the lower part of the site, about 20 m above the ravine, is an area where the vegetation had been torn up, tree trunks were uprooted, tree branches were broken and the ground churned up. Parts from the airplane's wings and fuselage were found in this area. Apart from this area and the final debris field, no other contact with the environment was observed around the accident site.

The alleged site is seemingly a decomposed granite deposit area. Such a land is generally characterized by slow landslides. **Photo 3** evidences it by a few cliff lines (top of sliding surface) of about 0.5 ~ 1-*m* high. The mode of the landslide is slow and small. It may occur as frequent as once a year in the end of each snow season. A landslide is caused by water from melting snow. A landslide maybe used to cause a snow-slide of small scale.

Photo 3 Plane-crash site area (identified by BPR)

The landslide in **Photo 3** is new, happened in this spring. The site may have had occasional, powerful, big scale avalanches in mid snow seasons.

<u>Deductive denial of the plane-crash site alleged by BPR</u>

In **Photo 3**, there're trees broken at about 2-*m* high from GL. BPR judges they're the result of a plane collision. If it is so, the trees must have been broken at GL where the maximum bending moment occurs. The force that cut the trees at their intermediate height was the avalanches in mid-snow seasons. That is, snow accumulated during the early days of a snow season is apt to be subjected to temperature changes of above and below the freezing point. Correspondingly, snow melts and refreezes, resulting in formation of a consistent frozen snow layer. It fixes tree trunks at their lower parts. In a mid-snow season, new snow accumulates on the old snow layer. Any time when it's warm, snow melts, but water can't reach GL. The frozen layer interrupts it. Water flows down on its surface. An avalanche takes place at this surface. The sliding snow pushes trees downward. A tree trunk shears off at a point where the maximum shear happens. It is the boarder between the frozen old snow layer and the sliding new snow layer. En passant, no rooted-out tree is seen in the photo, despite BPR says it is.

Readers also can see fallen upper parts of trees lying on the ground. BPR explains them as the cut branches by the plane collision. In fact, they're the upper parts of trees cut and transported by past avalanches from upper sides. If they're the branches cut by plane collision, they must still bear leaves. The photo was taken within a couple of days after the crash. The lying tree trunks are long-ago-dead tree trunks. Remind that Christmas trees (without roots) keep their status during the Christmas season (more than a few weeks).

There's no vegetation on the site ground. BPR imagines the plane cut it down, having kept the covering snow intact! En passant, no vegetation is a common landscape of any landslide site.

There're disturbed ground surfaces in the photo. BPR says it was churned by the plane crash. It is a trace of ground erosion by the melt-and-flow water at the end of this snow season.

Photo 4 is the satellite image of the same site as **Photo 3**.

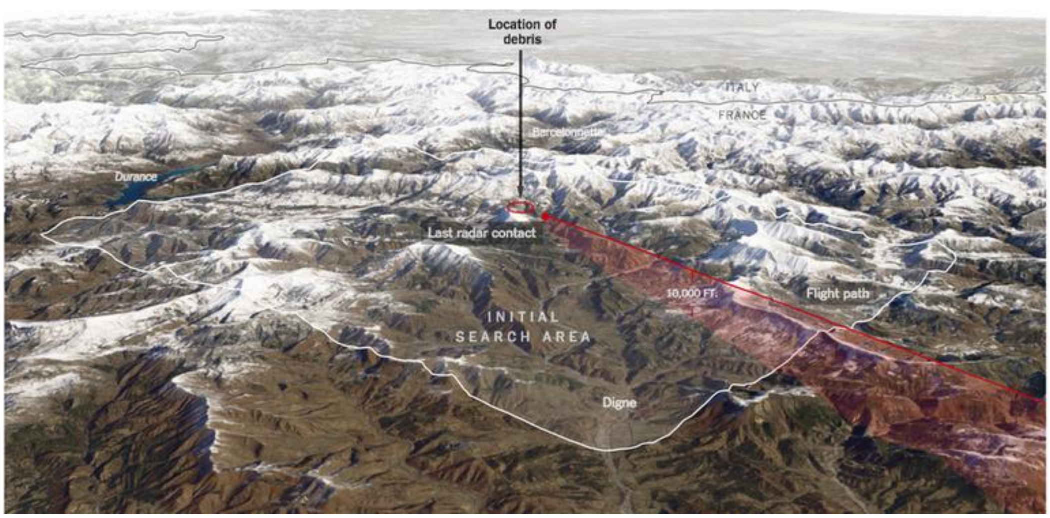


Photo 4 Plane-crash site assumed by BEA (satellite image)
Origin: The New York Times | Flight path data from [Flightradar24](); satellite image by NASA/U.S.G.S. Landsat; debris location from French national police

It shows that the so-called accident site area had been covered by lingering snow in the morning of L-event. As a piece of plane's part is seen on the snow in the photo, it reveals that the landslide took place in the daytime within a couple of days after the L-event since the photo was taken within 2 days after the L-event. Several light-broad pieces of fuselage may slid down the snow-covering slopes of ridge side surfaces and ravines like snowboards, and could have reached the 'accident site' of 20-m higher than the ravine elevation there.

Photo 4 also shows: ***(i)*** two faults where pre-weathered bedrock crops (the bedrock was the sliding surface), and ***(ii)*** landslide marks nearby the 'accident area'.

Comment: In **Photo 4**, a flight path is shown with a red line. Its notation 'Last radar contact' must be replaced by 'End point of the flight path'. The last radar contact point is about 6 km this side (can't be in the photo). The notation of '10000 FT' has to be replaced by '6800 FT', if it expresses the altitude of the flight path.

Photo 5 shows an '*area damaged by the aircraft*' with red hatches. It is a landslide area caused by melting snow and followed by snow-slides.

In the above context, the plane-crash site urged by BPR is not a plane-crash site but a landslide site. Then, where is the true plane-crash site? The answer is in the next **Sub-sect**.

True plane-crash site (identified by this Report)

This Report explains the plane-crash pattern as follows: cf. **Photo 5**.

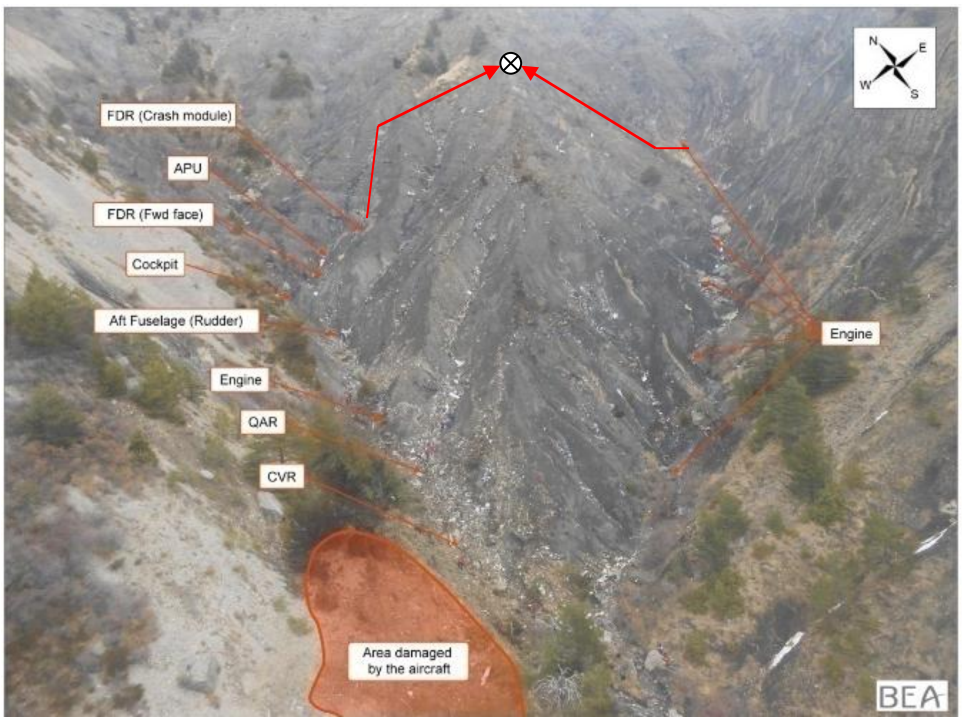


Photo 5 Plane-crash site of BEA (red hatched area) and this Report (× marked point)

(i) The plane flew horizontally and collided against the ridge summit of 45(º)-slope with the plane's joint of the right wing. ***(ii)*** The fuselage was deformed to flat and smashed to pieces. There was no rebound (cf. 13 lines in page 13~14). ***(iii)*** The slope of the surfaces of both side of the ridge is about 45(º). ***(iv)*** By gravitational force, the elements pertained to the right wing fell down along the east side ridge surface and other elements fell down the west side ridge surface, down to ravines at both sides of the ridge. ***(v)*** The debris further rolled/slid down the ravines of 35(º). ***(vi)*** While they were falling down, some elements came to halts along the ridge's side surfaces and most of debris at ravines. ***(vii)*** Many of them stopped at the lower ravines where their slope is relatively lenient, 25 (º).

If the plane-crash pattern is as explained above, the plane-crash point is identified by tracing back the fallen debris remaining at the highest elevations on both sides of the ridge reversely along the furrows of the ridge side surfaces up to the ridge summit. The ⊗ marked point where the trace back lines (red) meet the summit line is the plane-crash point. The color of the ridge summit nearby ⊗ marked point is a little different from the color of other ridge summit.

As granite weathering is quick, soon site investigations find traces of the plane-crash there.

Decompression in cockpit

How to confirm or deny decompression

This is another determinant of the L-event. The best way to confirm or deny it is to show the FDR data that records the air pressure in the cockpit. CVR data can also indirectly indicate the decompression by a fact that the recorded sounds become weaker at around the beginning time of descent when the decompression developed from slow to rapid, resulting in the medium of sounds (air) be rarefied. Both are easy. But BPR did neither.

If the above is impossible, there're three alternative solutions to this problem, i.e., ***(i)*** Check the remnant cockpit's cut sections if fatigue marks are. ***(ii)*** Check all the fuselage debris if fatigue marks are, and determine the locations of them in the fuselage. ***(iii)*** Check captain's and copilot's bodies if any symptoms of the exposition to decompression and compression are. Method ***(ii)*** takes time, needs resources. Method ***(iii)*** may not be applicable if the remains' damage is too big to pursue the purpose. The Writers recommend Method ***(i)***.

The Writers remind readers of the fact that the cockpit and the aft kept their shapes relatively better than the main body fuselage. In the A-event, the plane was found in the sea divided into three parts, cockpit, aft and main body with wings. Remember! When something that houses a structurally weak point is broken, the rupture always occurs first at the point where the weak point exists. L- and A-event reveals the weak points were the cockpit and the aft join the main body. Really the structure is discontinuous at these points, **[14]**. The cockpit is welded with the main fuselage. The aft joins the main fuselage where a pressure bulkhead joins them. After the separation, each part has each rupture pattern that independently develops. In the L-event, the cockpit was not involved in a smashed-into-pieces pattern of main fuselage. It is highly probable that fatigue marks are found in the cockpit cut section, unless otherwise disturbed by 'processing'.

BPR's engagement in decompression

For the time being, BPR's deduction on this matter heavily depends on opaque audio (analog) data from CVR. This **Sub-sect**. alludes to the audio data, 'sound'.

There're three principal factors of sound, viz. strength, pitch (tune) and tone. From an acoustic view point, they correspond respectively to amplitude, frequency and shape of sound waves. Among the three, the 'strength' of sound is the easiest subject to identify. Everybody can do it unless being deaf. To differentiate the 'pitch' needs talent. The person who cannot differentiate a 0.6 % frequency difference cannot be a sound professional. A person who cannot differentiate a 1.3 % frequency difference pertains to tune deafness. To evaluate the 'tone', it needs hard exercises. The aviation experts are not necessarily good enough for these standards; much less the well connected experts. For instance, the CVR data of L-event weakens the sound strength after the cockpit decompression took place. ----- In vacuum, sound waves have no medium; hence, no sound is recorded. ----- Even for this easiest subject, ‘strength’ of sound, there’s no statement in BPR. In this context, every judgment on sounds, ‘noise and voice,’ in BPR must be reviewed.

<u>Suggestions</u>

For the time being, this Report suggests in three points as follows:

(1) As to voices, the most controversial sound is copilot’s breaths. First of all, breath has no vibrating body with which sound waves is generated. A snoring is a kind of breath that generates harsh sounds as caused by the vibrating of the soft palate. Does BPR mean this kind of breath? If yes, it means the copilot was unconscious, since the snoring occurs only when a human is unconscious, e.g., sleeping. There’s one more possibility. It’s the air cylinder vibration in human nostrils as pipe organ’s pipe. But the human nostril has no mechanism of pipe organ’s pipe. That is, there’s no vibrating body, no sound waves, hence, no breath can be recorded in CVR. Then, is the breath sound illusory? Hum, it can be the sounds of wind breaths came from fatigue cracks in the cockpit bulkhead.

(2) As to noises, an expression, ‘*noises similar to violent blows on the cockpit door,’* must be deleted if the axe (shock-resistant by nature) is not found in the debris. The violent noises were the sounds of the cockpit bulkhead rupture.

(3) The people who best suit the acoustic analysis are young chorus or orchestra members at music schools. The BEA is kindly advised to have their assistance. Or, at least, the works must be supported by forensic tools, e.g., Fourier analyses with a computer or sound spectrogram analyses by a sound spectrograph to make analogy with an original sound, e.g., a voice-print. Remember! These devices should be applied to original data that have yet to be subjected to any kind of processing. If the raw data are too damaged to undergo the talented/trained human assessment and/or appropriate forensic tools, it means that there’s no way to identify the nature of sounds, i.e., noises and voices, unless otherwise imagined. In this context, the aviation experts who are laymen in acoustics should refrain from commenting at random on the sounds.

COPILOT’S PERSONALITY

This **Sect.** learns copilot’s personality that induced people’s unilateral ill concept in the worst form with the L-event. This is an example of the same cases occurring often but, in most cases, invisibly in modern times. One prominent precedent is:

In the 1940s and 1950s, the United States was in the grips of a “red scare”. Under this trend, the FBI tried to link Charlie Chaplin, ‘a creative genius who predicted the problems of automation already in 1930s,’ to the Communist Party. FBI with Attorney General’s support successfully deported him from the US (but resolved in a little while). Chaplin explained the situation, ‘*Under these conditions I find it virtually impossible to continue my motion-picture work, and I have therefore given up my residence in the United States*.’

Comment: One of the Writers had the similar but much smaller experience in 1980, **[15], [16]**.

The relationship between a ‘beyond-program act’ and ‘politico-social responses to it’ for some representative examples are as follows:

* For law-order enforcers, an act of beyond a program (law) is criminal.
* In computer-governed organizations, an act beyond a program (rule) is dangerous.

* For below-standard researchers, an act beyond a program (standard) is murderous.

As it is so, this society is apt to be difficult for a creative human to live. Copilot's suffering is to be seen with the same politico-socio-cultural dimensions as the above. Copilot's creativeness (character being beyond program) induced a consequence with a particular event under certain conditions. It's no wonder the copilot was depressed. But his will was not to surrender but to overcome the depression. It's proven by his frequent consultations with mental counselors. Unfortunately, all his acts including the efforts to help the plane until the last moment were taken in ill part. Mass media sensationalism enlarged the tide. The tide must be stopped as it's an evil sign not only for an individual but for the society. To recover from this socio-corporate-corporal disease, it is indispensable to provide an insider arena where any original suggestion can be expressed, with an incentive, never with reactionary persecution.

The Writers have presented causation study reports of originality in many occasions, **[8]** ~ **[16]**. They've been promptly and widely exhibited. Having sent a ball to an opposite court, the Writers have felt refreshed. How to handle the ball is the matter of the players in the court where the ball is now. If the copilot would have a means as this, his depression should have instantly disappeared. In this way, the personal matter has a solution. But the matter in the program-governed society of lacking in dealing with the beyond-program problems has yet to be solved. The solution is to digest the suggestions by a volley of open discussions. Its result salvages the organization from its weak point in detecting or finding the cause of to-happen or have-happened accidents, **[16]**. It is a right way but not necessarily easy to realize.

The Writers have made suggestions in their past causation study reports, **[8]** ~ **[16]**. Generally, they were responded but in some cases weren't. E.g., *(1)* in **Table 2** gave the Writer a clear answer, and the society (the Writer as well) had useful inputs from it. The cases of *(2)* ~ *(5)* in **Table 2**, the Writers' suggestions fall off *one* like water off a duck's back.

Table 2 Responses from counterparts (how many yr passed since then)

	Counterpart	Object	Type of proposal	Status of response (time passed)
(1)	Happy Pontist	**[8]**	Cited in writer's report	Prompt-proper response, **[7]** (0 yr)
(2)	Scott-Ciwem	**[11]**	Contribution of a paper	Received, no reply despite demand (2 yr)
(3)	JCEA	**[11]**	Ditto	Received, under examination (1.5 yr)
(4)	JICA	**[12]**	Vis-à-vis proposal	One is fugitive, one is studying (1 yr)
(5)	BEA	**[16]**	Open question by name	No response (0.5 yr)

The attitudes of (2) ~ (5) do not meet a solution to the hanging problems. The reason why they do not respond is, "not to respond is less dangerous than to respond for their partners' interest." Their choice gives nobody any interest in a long run.

CONCLUSIONS

This Report summarizes its conclusions as follows:

(1) BEA declares in BPR that it's independent, has no prejudice for any hypothesis.
BEA's devout belief in the copilot-suicide hypothesis is obvious, as expressed in BPR when BEA urges by proxy, '*it is impossible to rule it out the hypothesis of intentional maneuvers by one of the crew members.'* It's the entity of BPR. The entity itself doesn't matter. Every study, investigation or research must be guided by a hypothesis. The matter is: if the hypothesis is just. The copilot-suicide hypothesis is unjustifiable.

(2) This Report judges digital data in FDR and CVR are damaged by the mechanical and thermal effects. Analog data in CVR survived the effects, but seemingly too opaque to readout data without wishful interpretations. In other words, opaque data allowed BPR to wishfully interpret the data. BPR's roundabout expressions in BPR's logic are likely due to poor flight records, particularly in digital ones.

(3) BPR relies on Radar data not only for the time records but for the flight data, except for an item, i.e., the plane-crash time and the altitude data at that time. The data are said to be defined by the FDR data. This forced identification doesn't help the hypothesis. Let's see.

(4) There're two determinants that lead the study directly to the cause. One of them is the location of the plane-crash site. BEA's site-investigation team found the site. It is pinpointed with latitude / longitude: *44°16'47.2''N / 006°26'19.1*''E and gave its altitude: 1550 *m*. BPR reinforced it with a site photo. These findings play a key role in the copilot-suicide hypothesis; hence form a crucial part of the BPR.

(5) BEA deskwork team defined the last 30-second trajectory based on the above findings. When BPR set up the plane-crash time, it wasn't synchronized with the Radar's time data. Rather, BPR negated the Radar data, despite the data were sent by transponder from the plane to the Radar. BPR's final time is said to be based on FDR data.

(6) This Report inductively / deductively denies the plane-crash site found by BEA's site investigation team, and gives a true site. Its altitude is 500 (*m*) higher than and 500 (*m*) more upper side from the BEA's site that doesn't theoretically agree to the debris distribution at the site, while the site identified by this Report agrees to it. The plane-crash-site conditions with which BPR justifies its authenticity are denied by this Report.

(7) There was an obvious disorder in plane's elevator control system throughout the flight (out-bound and return flight) as BPR itself recognizes in effect. If the elevator control system would have been in order, the copilot could manage the emergency. BPR regards copilot's struggle to manage the crisis as his effort to destroy the plane.

(8) This Report points out the inadequacies in BPR in another determinant, 'cockpit decompression'. BPR indirectly denies the decompression in the cockpit by copilot's breaths and other acoustic bases. It doesn't convince enough. If BPR wants to prove the authenticity of the acoustic judgment, it must be done by the acoustic talent, or at least supported by appropriate forensic tools. To have an ultimate answer to this question, this Report suggests checking if fatigue marks are on the cut sections of the cockpit bulkhead.

EPILOGUE

This Report's sparing partner, BPR, has suffered a technical knockout in a rehearsal match. Dear Messrs at BEA, please rehabilitate the wounded boxer for the performance in a final match so that Messrs needn't throw a towel into the ring. The Writers have felt refreshed by releasing this Report. Next is Messrs' turn to feel refreshed by responding to this Report. Won't you?

GLOSSARY

US: The United States of America,

FBI: Federal Bureau of Investigation, **BEA**: Bureau d'Enquêtes Accident (Accident Enquiry Bureau), Paris, **ATC Center**: Air Traffic Control Center, I**CAO**: International Civil Aviation Organization, **LPEM**: Research Institute of Social Affairs, **BAT:** Agency of Applied Technology, **JCEA**: Japan Civil Engineering Association, **JICA**: Japan International Cooperation Agency,
L-event: Lufthansa Germanwings Airbus crash event, **A-event**: AirAsia Airbus crash event,
F-event: Air France Flight 447 Airbus A330-220 crash event,
CVR: Cockpit Voice Recorder, **FDR**: Flight Data Recorder, **QAR**: Quick Access Recorder, **GL**: Ground Level, **GPS**: Global Positioning System, **YP**: Yield Point, **BP**: Breaking Point, **PP**: Plastic Portion

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