

The scandal of the Airbus A320 crash at Habsheim, France.

Christian Roger is a professional pilot. He was leader of the French air force's aerobatics team and, later, a Boeing 747 Flight Captain with Air France.

He was President of the leading French pilots' union, the SNPL, at the time an Airbus A320 crashed into trees at Habsheim in Eastern France in June 1988.

The pilot, Michel Asseline, stumbled out of the blazing wreck saying the engines failed to pick up. The SNPL supported the pilot then gradually stood back and let things happen, when expert examination of the black boxes produced overwhelming evidence showing the A320 to be perfect. The pilot was sentenced to prison on this evidence.

Christian Roger retired and watched from the side-lines. One day he realised that some of crash data just released was rubbish. He looked closer at other crash data and that did not stand up to scrutiny either. He undertook a mammoth scrutiny of all the crash data supplied by the witnesses and aeronautical experts in two commissions of enquiries, one judicial enquiry and three court cases.

He exposed multiple anomalies, not to say lies, in the experts' evidence and in the data of the crash all of which pointed to a very high level, state inspired plot to whitewash the aircraft in the crash and confirmed what the pilot had been saying all along. He joined the pilot's defence team

His report to the SNPL, presented here in English, is a summary of those anomalies, discrepancies, omissions and distortions in a civilised nation's official Enquiry and Judicial system. The whole story of this Airbus crash and the high level plot to forge the data is to be found in the forthcoming book by Michel Asseline and Terry Anson.

Terry Anson
October 1998

The Airbus A320 crash at Habsheim, France
26 June 1988

Why and how the flight recorder tapes were forged

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Overview

On 26 June 1988 an Air France Airbus A320 made a low level fly-past for an air show at the Habsheim aeroclub in eastern France. The aircraft hit 35 foot high trees at the end of the short grass runway and crashed. Of the 130 passengers, 3 died and over 50 were injured. The A320 was totally destroyed. **The Flight Captain, Michel Asseline, climbed out of the blazing wreck saying the engines had not accelerated as they should.**

The French Minister of Transport rapidly cleared the A320 the day after the crash. He based his statement on the flight data print out. This data contained significant anomalies and faults for the last seconds of the flight, precisely at the disputed point where the pilot pushed the throttles forward for acceleration.

These flight recorders had been removed from the wreck, transported and examined **in total violation of all legal and administrative rules . The integrity of the recorders and their contents was not protected by legal seals**, which should have been applied by an officer of the Judicial Police (an OPJ). This legal laxism caused the Investigating Magistrate, Judge Guichard, to comment "*it is also a legal crash*".

Suspicion persisted during the enquiry, and is now shown to have been justified because the fact that the flight recorders had indeed been exchanged for false ones was demonstrated scientifically on 18 May 1988 by the Scientific and Criminal Police Institute of Lausanne in Switzerland..

The case

The Flight Captain was accused of flying "*Too low, too slow, and throttling up too late*".

Flying too low:-

The Court cleared the flight crew of flying at 100 feet, instead of the regulatory minimum of 170 feet. Responsibility for this was attributed to the Director of Operations at Air France who had programmed this height. He was also found responsible for having authorised passengers to be carried on this flight.

Concerning the charge of flying below 100 feet, all appointed experts and the Disciplinary Committee found that the crew did not intentionally pass under this limit.

Flying too slow:

We have shown in a report to the Court of Appeal that, contrary to the claims of the first legal experts, Venet & Belotti who assisted Judge Guichard, the intention to fly the A320 at its minimum speed did not constitute a breach of the law.

The minimum flying speed of the A320 is fixed by the builders at "*Alpha Max*". Higher useable speeds may be mentioned, **but they can only be recommendations**. There can not be two minimum speeds for any given configuration of the aircraft (landing gear and flaps). If there were, the range between these two speeds would also be forbidden!

Do the French jail pilots for an intention to fly at maximum incidence?

The question arises because the official enquiry showed that the A320 had reached stall speed, where its angle of incidence should have been 21°, but, in fact the angle of incidence never exceeded 14.5° according to the official data. The legal experts never gave any explanation of this total impossibility that all pilots will immediately understand.

The Flight Captain was also accused of having the intention of disconnecting the "*Alpha Floor*" low speed protection. In our counter experts' report we have clearly shown that Alpha Floor was never disconnected, contrary to a widely spread rumour.

Throttling up too late

Suspicion that the recorders had been tampered with clouded this A320 crash enquiry, and it has subsequently been proved that the aircraft's flight recorder were switched for false ones on the afternoon of the crash. Our counter experts' report has shown numerous facts that can only be explained by the real flight data having subsequently been replaced by forged data.

It follows that one can evidently not credit conclusions based on data on tapes of illegally diverted flight recorders, data which is so incompatible that the only explanation is forgery.

Switching the flight recorders enabled the flight data to be forged and the traces of this forgery are there to prove it.

So, the pilots carry no responsibility?

That is not what we are saying. It is up to the Judiciary to decide on the basis of the facts. It is not up to the technical experts.

Captain Asseline has always said he will take full responsibility within the limits of the means available to him in the aircraft. As to the means he had available (did the aircraft react correctly?), what confidence can one have in hi-jacked flight recorders?

In order that justice be dispensed in this case with all knowledge of the facts, and that is the least a citizen may expect, the judges must have answers to these two fundamental questions:-

- "Are the Flight Recorders used in Court the ones from the A320?"
- "Was the flight data tampered with?"

The investigation undertaken by the Defence has produced conclusions diametrically opposed to those of the official legal experts, Messrs Venet & Belotti.

Here follows a synthesis of the facts as of June 1998, it contains the following sections:-

- 1) Why were the flight recorders switched?
- 2) The expertise in Lausanne of wreck photos demonstrating the recorder switch.
- 3) How the recorders were switched.
- 4) The omissions of certain legal experts.
- 5) The way the flight data tapes were forged; method, timing, opportunity.
- 6) Glossary

part 1

Why arrange to switch the flight recorders?

On the day of the crash, the Airbus A320 had been in service for three weeks with Air France, which was naturally the launch airline for this aircraft which revolutionised flying techniques.

On previous airliners, the pilots' control column was connected by wire cables to the hydraulic rams which actuated the flight controls (ailerons, rudder, elevators). Cables also connected the engines to the throttles. The A320 replaced these cables with data which was transmitted electronically to the hydraulic jacks, or the engines, from computers that calculated the pilots' flight instructions. The expression "*Fly by wire*" was coined to describe this type of aircraft.

The Americans were several years behind Airbus because the first electronically controlled aircraft to come from Boeing was the B777 in 1996., Airbus had over 500 orders in hand when the A320 crashed at Habsheim and type certification was underway in the USA. In this context, any faults in the new system of flight controls, or in the automatic engine-thrust controls would cause an international industrial catastrophe.

But Captain Asseline had said "*The engines did not pick up correctly*" as he left the burning aircraft, so the decision was taken to hide any faults in the A320.

The flight recorders had to be got hold of to do this, and this meant they had to be replaced with other recorders so as to have the time to read the flight data and change it if needed.

There is no doubt that those who organised the switch were convinced they were acting in the national interest. The economic stakes were considered so high that placing total responsibility for the crash on the aircrew so as to clear the A320 was judged to be indispensable.

**That is called Raison d'Etat in France.
In other countries it is called a crime.**

part 2

The photos demonstrating the substitution of the flight recorders

After the lower Court verdict on 14 March 1997 the Defence understood that the Court was impressed by the expert witnesses for the Prosecution and was reticent, to say the least, to accept that the Flight Recorders could have been tampered with. Michel Asseline undertook the mammoth task of seeking out all the press photos connected with the crash. At the same time Captain Christian Roger started a detailed examination of the crash investigation and the findings of the two legal experts, Venet & Belotti.

Michel Asseline's quest lead him to the Sipapress photo agency. Two of their photographers had been in a helicopter that flew extensively over the wreck just after the crash. Sipapress co-operated and lent Captain Asseline the several dozen photos in their files. Detailed examination of these photos identified one showing a man carrying two Flight Recorders next to the wreck.

Airline aircraft have two Flight Recorders:-

The **CVR** Cockpit Voice Recorder, which records cockpit sounds and radio traffic.

The **DFDR** Digital Data Flight Recorder, which records 209 aircraft flight parameters.

These Recorders are coloured orange with white stripes for better identification under water.

Michel Asseline and his counsellors immediately noted a significant difference between the photo of the recorders taken in the lower Court at Colmar in 1996 and the Sipapress photos showing the Recorders being carried close to the wreck by Mr. Gérard, area manager for the DGAC (the French Direction Générale de l'Aviation Civile).

The white stripes on the DFDR are at right angles to the edge of the Recorder in the photo taken from the helicopter over the wreck. The stripes on the Court's "official" DFDR are diagonal! (See photos 2 & 3).

The Recorders used as evidence in Court could not therefore be those taken from the wreck. That is why the Defence, most logically, opened proceedings by requesting the Appeal Court to have these photos authenticated .

When proceedings opened in the Appeal Court in January 1998, the Defence logically requested the Court to adjourn for further information in the light of these photos and of Captain Roger's counter report on the legal experts' findings. His was a damning report for the legal experts Venet & Belotti.

The Court ruled that this request would be examined during the proceedings so Michel Asseline, his lawyer, Counsellor Agron and Christian Roger quit the Court. There was no certainty that the photos would be authentified by an independent body and it was useless to argue points for days in a case based on flight data they were sure was false.

Christian Roger explained, in a letter to the Court, why he refused to bear witness under such conditions. He underlined that the judges had no technical competence to decide between opposing experts without recourse to outside and independent expertise.

It should be noted that in the case of the later A320 crash at Mount St Odile, just 50 kilometres from Habsheim, the Court there has ruled that a new expert should arbitrate because the same Venet & Belotti cannot agree between themselves. This clarification judged indispensable for Mount St. Odile was not found necessary for Habsheim!

This Court rejected a demand for acquittal in the case by Mr. Gourgeon, currently Director General of Air France, who was Director of Civil Aviation at the time of the Mount St. Odile crash.

The Prosecutor in the Appeal Court had immediately claimed that the photos taken at the wreck could be fakes and because it was uncertain that the Court would ever accept to have them authentified to clear any doubt, Michel Asseline requested the **Institut de Police Scientifique et de Criminologie (IPSC) in Lausanne, Switzerland** to examine the photos. The IPSC is a recognised authority in these matters. It trains police forces all over the world in scientific detection, including certain experts in the Criminal Research Institute of the French Gendarmerie..

The Defence had previously submitted conclusions identical to those which the Lausanne experts would also make, the Appeal Court had ignored them

On 23 January, the Defence's demand for authentication was backed up by a letter from the French airline pilots' union, the SNPL to the Appeal Court.

Michel Asseline informed the President of the Appeal Court of the IPSC's examination

The Venet & Belotti report on the photos

On January 29 1998, during the Appeal hearing, the legal experts Venet & Belotti submitted their report on the analysis they had made of the photos and which concluded that:-

For the CVR (Cockpit Voice Recorder): "*The side visible on the left is the left side of the box and has reflective stripes. Despite the extensive "grain" in this picture, examination with a magnifying glass reveals that this side has two parallel reflective stripes about 10 centimetres apart and at an angle of about 20° to the rear side of the box (the side closest to the ground).*

For the DFDR and its side that is visible on the photo: "*This surface has two, parallel reflective stripes at an angle of about 20° to the rear side of the box (the side closest to the ground). The distance is much greater than on the CVR, as on the DFDR number 3237 already examined.*"

These experts conclude that the photos "*were not of a nature to modify their opinion that the flight recorders which they had been given for examination are authentic and are those of the crashed aircraft*"

The rejection of this Venet & Belotti report by Christian Roger

Before the Appeal Court reached its verdict, Christian Roger submitted a report rejecting the Venet & Belotti findings. **It should be noted that for photographic analysis "with a magnifying glass", these aeronautical experts are absolutely no more qualified than any other observer with good eyesight acting in good faith."**

some extracts from the dissenting Roger report:-

On the CVR (Photo #4): Christian Roger underlines that where other observers, working with either magnifying glasses or computer scanned blow ups, could not determine the exact form of the white spot on the CVR, it is remarkable that the Court's experts identified "*two parallel, white, reflecting stripes, some ten centimetres apart, at an angle of about 20°*"

The IPSC laboratory in Lausanne however, was observant of scientific procedure and refused to pronounce on the white spot on the CVR. The IPSC would only commit its reputation on totally irrefutable facts. Examination of the enlargement the IPSC made of the CVR shows only a vague spot from which it would be useless to try to identify any type of straight line.(See photo #4)

In testifying to the Court that they had identified precisely dimensioned and angled stripes, Venet & Belotti came to a conclusion that had all impartial observers wondering what they had based it on.

On the DFDR (Photo #2). Christian Roger pointed out that relating anything to the bottom of the box, which is closest to the ground, is nonsense. Anyone can see that the lower edge of the box disappears in shadow on photo #2 and cannot be distinguished. This can be proved by checking the vertical edges of the box which are perfectly identifiable. It is evident that the DFDR stripes are at right angles to these edges and not at 20° to them.

One wonders why Venet & Belotti chose an unusable reference point when the vertical edges are perfectly visible on the photo.

Venet & Belotti made a lot of fuss about a 1997 photo in the Roger report showing an Air France A320 DFDR with white stripes at right angles to the edge of the box. The Roger report clearly said that the A320 was taken into service in 1990 and the photo taken in 1997, but Venet & Belotti tried to argue that there was intention to mislead the Court. A sterile quarrel because, after the Swiss experts' examination, it is now accepted that DFDRs with white stripes at right angles to the edge of the box were in use at the time of the crash.

The Appeal Court only retained the Venet & Belotti evidence on these photos in reaching its verdict. **The Court took no notice of the dissenting report by Christian Roger, which report has since been confirmed by scientific examination at the IPSC Lausanne.**

The Court rejected the demand by the SNPL for authentication of the photos. The Court also rejected the demand for authentication by JC Boetsch, VP of the crash victims association. This association has since filed a charge against persons unknown of forging public documents.

The Court refused to take into consideration notification by the Defence that the IPSC Lausanne report would be available one month after the date fixed by the Court for pronouncing its verdict. **The Habsheim Airbus case has been going on for ten years.**

Nothing justified such haste, nothing justified a refusal to wait a month to see if crucial new evidence that could possibly invalidate the whole case was authentic or not.

This haste was prejudicial to establishing the truth, because the expert examination of Institute at Lausanne discredited the Venet & Belotti report which the had permitted the Court to justify its refusal of further authentication and enabled it to reach a verdict condemning Michel Asseline to prison.

The IPSC of Lausanne produced it's official report on 18 May 1988. The report is devastating for the official version of the crash. It confirms that the recorders used in evidence can not be the recorders being carried a few yards away from the wreck by the person responsible for removing the recorders from the wreck, Mr. Gerard, area manager for the DGAC.

There is no doubt in view of the Swiss findings that such a wait would have led to a different verdict, or to an evident miscarriage of Justice.

The results of the examination of the photos by the Scientific Police Institute of Lausanne

The IPSC examination of the photos was in two stages:-

1) Verifying that the photos were genuine

The layers of emulsion composing the original negative were examined by macroscope, enlarged to the maximum limits of this system, to check for any tampering with the picture dots (coloured spots in the emulsion) which would have exposed any digital modification of the negative or even tampering with the emulsion layers. The ISPC also checked for continuity of subject matter between the different negatives, which had all been shot on the same film, and "*no trace of manual intervention was found*".

"The Kodak company confirmed that the film had been placed on the market at the beginning of 1988", a few months before the crash.

"Any intervention intended to modify an image on an original colour negative necessitates in-depth work and on specific layers of the emulsion. Such intervention would be evident either on the surface or inside the emulsion."

"All these elements combine to argue for the photo in question being genuine" (That is the photo of Mr. Gérard carrying the two recorders, disputed by the Public Prosecutor and Venet & Belotti. Ed.)

2) Study of the details shown on the DFDR

It had to be decided if the white strips seen on the DFDR in the photo in question were diagonal to or at right angles to the edges of the box. The slide was projected on a large screen at distances varying from 15 to 25 metres before two different groups of observers:

- The 17 observers of the first group each had to show with a ruler on the screen the orientation of the white spots they could see and the vertical edges of the DFDR box.
- The second group of 21 observers had to move a line of light points so as to line it up with the straight lines they could see on the screen.

These observers were either instructors or students of the Institute. **None of them knew the reason for their observations. The results of the test were calculated by trigonometry and statistically. They showed that the observers clearly saw a white area on the back of the DFDR (at the bottom on the photo) at right angles to the edges of the box.**

"These measurements agree perfectly with a logical construction where the ends of the white area are perpendicular to the edges. The error rate and the confidence factor show less than 1.5° variation (cf. the statistical results above) and any observation of an angle different from these results is inexplicable in the light of the geometry described."

"The testimony of the experts Venet & Belotti citing an angle of 20° is not comprehensible.

"If, as has been affirmed, the sealed DFDR at the disposition of the Court does not have white stripes at right angles to its long narrow sides, there are two possibilities:-

Mister Gérard is not carrying the DFDR of the crashed Airbus A320

or

The DFDR at the Court is not that from the crashed Airbus A320"

Conclusions

- a) We conclude the **authenticity and the genuineness** of the photo submitted. (Slide #12, seal # 1, sealed by us)".
- No manual intervention was detected in the emulsion or the base in the areas of the DFDR, the CVR nor Mr. Gérard (who is carrying the flight recorders). **The procedure followed to verify any contradiction with existing evidence shows one side of the DFDR with a white area at right angles to the long edges at the lower end. The recorder in this picture cannot be a recorder which does not have white stripes at right angles to the edges."**
- "The definition could have been exploited further Enlargement up to the limits of the image dots permits a better perception and definition of the disputed elements".

Lausanne, 18 May 1998 in collaboration with Professor Christophe Champod (Statistics) and Messrs. Egon Barosso, chartered assistant, Eric Sapin, instructor-photographer and Eric Durst, assistant preparer-photographer

signed: Professor Pierre Margot

Professor at the Faculty of Law

University of Lausanne,

Director of the Institut de Police Scientifique et de Criminologie.

NB. The IPSC has kept the original copy of its report under Swiss legal seals and holds it at the disposition of the French Judiciary, if necessary.

By writing evidently incorrect statements in their report of 29 January 1998 to the Court of Appeal, Venet and Belotti influenced the Court in a manner that caused it to condemn Michel Asseline.

Had they declared that they detected white stripes at right angles to the edge of the box they would have put in doubt their years of investigation and the Court's verdict would not have been possible.

Editors' note. The translation of extracts from the IPSC report is made with best efforts and all due diligence. It is sincerely believed to be accurate. All bold type, underlining or framing is solely the work of the editors

Part 3

How the flight recorders were switched

The switch was made easier by the laxism of certain key operators in the judicial system who did not discharge the duties allotted them by the regulations and by international convention.

Only one operator in the whole system recorded the serial numbers of the flight recorders!

In a libel action against Michel Asseline in Paris in October 1990, Mr Gérard, DGAC area manager testified that he had noted down the serial numbers of the flight recorders in pencil on a scrap of paper (#3237 for the DFDR and #52971 for the CVR). Funnily enough, it was only in November 1996 that he actually produced this scrap of paper to the lower Court in Colmar. The Court immediately seized it and it was then seen that the writing in pencil had changed into writing in ball-point, and on very new paper too!

It is surprising that the Public Prosecutor, Mr Wolf, who was at the crash site very early, did not order the serial numbers to be recorded. But it was his legal duty so to do, just as it was his duty to seal the flight recorders and to appoint a Judicial Police officer (OPJ) to accompany them and to escort them to the Investigating Magistrate after they had been duplicated by the BEA Accident Enquiry Bureau. Duplicated that is in the presence of the same OPJ.

It is surprising that the Aviation Transport gendarmes did not record the serial numbers, pilots known them to be meticulous, usually.

Surprising again that the CEV Flight Test Centre did not record the serial number of the CVR when it received it from Habsheim. (CEV report of 18 August 1988). The duty officer, Mr. Lejeune said it was an oversight!

Still surprising that the CEV failed to record the serial number of the CVR in any other report. Another oversight, no doubt!

And it is also surprising that Venet & Belotti asked no questions of the fire-fighters who took the flight recorders from the wreckage, visible on the Sipapress photo, even though suspicion and uncertainty surrounded the way the recorders were removed and later transported

The Defence request that Mr. Gérard be confronted by the fire-fighters was refused by the Investigating Magistrate.

Such conduct by professionals is amazing, and one would agree that such a series of omissions is suspect in itself.

Such widespread laxism was in accordance with neither accident enquiry regulations nor the law

It was providential, however. Switching the flight recorders necessitated that the serial numbers of the false recorders should not be recorded, because they were not the serial numbers shown in the aircraft's delivery documents.

An amazingly lack of urgency transferring the flight recorders

The crash happened at 2.45 PM and the "official" recorders were only sent on their way to Paris at 10.30 PM in the aircraft taking the DGAC Director Mr. Tenenbaum back. And yet the future of the A320 is at stake, both France and Great Britain had grounded their A320 fleets by the following day.

The situation is all the more urgent because the Flight Captain had *said "the engines did not pick up correctly."* In this context, the delay in getting the recorders away is surprising, particularly when one knows that the Director of the DGAC has full authority to order their immediate transfer to Paris to decode the flight data in the shortest possible time. Eight hours could have been gained to give an official answer to the question "*was it the engines?*".

Indeed, it takes less than two hours to decode the flight data on the RESEDA system at the CEV Flight Test Centre in Brétigny near Paris.

It is an understatement to say such nonchalance by the relevant authorities is incomprehensible

Something else unbelievable. When he arrived in Paris, the Director of French Civil Aviation went off to bed and ordered three conscripts from Villacoublay airbase to take the DFDR to the CEV at Brétigny. The regulations say it has to be an OPJ. Mr Tenenbaum had an equation: 3 rookies =1OPJ.

Such casual treatment of vital equipment with such importance for the future of French aviation is indeed curious.

Venet and Belotti are very forthright about this method of transfer and the applicable regulations and law, **in the first days of their mandate:** "*Being very important evidence, transported without legal seals being first affixed, the procedure followed for the transport and official reception in Villacoublay was not conducted with the following precautions:- recording of serial numbers.*

signatures on documents certifying the transport and the actual receiving of material with name and rank of operators and time and date of operations.

The flight recorders were in the hands of the law for only 6 days in the year following the crash, thus allowing time for forgery of the data.

A Ministry instruction of 3 January 1953 covers how flight recorders should be treated: "...*the Black Boxes should, with the approval of the magistrate in charge, be delivered to them* in the shortest possible time and against a receipt. The IGAC will urgently duplicate the information contained in the Black Boxes in order to obviate all subsequent risk of controversy in the judicial hearing. After this operation the original items will be given back*

to the OPJ who delivered them. They may then, if a judicial examination is ordered, be left with the judicial experts." (the IGAC, Inspection Générale de l'Aviation Civile. Ed)*

This regulation is unambiguous. It is the opposite of the way the recorders were actually treated, which lead Judge Guichard rightly to speak of "*the judicial crash at Habsheim*" (Judges speak, page 186). We quote the experts Venet & Belotti who wrote on 17 May 1990 in their "*A summary of what exists*", "*None of the authorities or organisations which in turn were responsible for keeping the recorders and/or having used them kept an accurate record of the copies made from the tapes and the use made of them.*

Despite rapid reaction by the judiciary to leaks in the press the day after the crash, (citing all or part of conversation in the cockpit of the A320 that crashed), it was only on 6 July that the various authorities responsible for the recorders and their precious contents obeyed the injunction of 29 June 1988 to return the recorders to the judiciary.

These magnetic tape recorders stayed with the judiciary only 6 days, that is up to 13 July 1988 when the Aviation Transports Gendarmerie gave them to the expert Auffray at his request. Neither in his report, nor in any of his intermediate reports, nor in any reports of the Gendarmerie is it shown that this hand-over was made with due recording of the serial numbers and that the judicial seals were inviolate.

When the recorders were returned to the judiciary, it does not seem that:

new seals were fixed on the recorders.

that a report on the state of the original seals was made.

that the serial numbers on the recorder boxes were noted.

For our part, we will not tamely follow Venet & Belotti who, after having shown all the contradictions and anomalies in the treatment of the flight recorders, concluded nevertheless that they are genuine. Genuine not by demonstration, but as an act of faith.

Legal examination is based on established facts, it is not an act of faith

How did the judiciary end up with false boxes instead of genuine flight recorders?

As the decision to switch the recorders was taken immediately after the crash, false recorders had to replace the real ones. There were several possible sources of supply; Airbus Industrie, the CEV, the BEA, a service point, or from a flight recorder supplier. It is not our job to find out where the false boxes came from, it is up to the judiciary.

Should one wish to be discreet, there is a fighter airbase quite close at Colmar, for example. A liaison aircraft with the precious false boxes could land there and fly back with the real ones once the switch was made. It was surprising to see an Air Force helicopter a few dozen yards away from the car in which Mr Gérard testified having put the recorders after he had taken them from the A320. What was that helicopter doing there?

Why did the legal experts not question the motorcycle policeman who accompanied Mr.Gérard when he was carrying the recorders?

The recorders were kept carefully out of sight of the press all afternoon following the crash. But the **false recorders** in the trunk of the Prefect's Renault 25 car were obligingly shown to photographers and reporters at about 8.30 PM, so that everybody could see "the recorders".

The press was shown false recorders, the DFDR stripes were diagonal

The real recorders were taken from the wreck at about 4.30 PM, the false ones were shown to the press at 8.30. PM. The switch was made between these two times.

And then, on 29 June, three days after the crash, Investigating Magistrate Judge Sengelin was surprised to find that the judiciary still did not have the recorders, despite the regulations which the DGAC itself must obey. He ordered that the recorders be returned to the judiciary, and he had to be obeyed.

But this order from the Judge was quite unusual because, up to this crash, flight recorders had been kept by the BEA Accident Enquiry Bureau. So nothing happened and on 5 July Judge Sengelin gave a no-nonsense injunction to the Aviation Transport Gendarmerie to seize the recorders; This was finally done on 6 July because the gendarme got turned away the night before on a pretext by both the BEA and the CEV when he went there for the recorders.

The DFDR switch

Giving the DFDR back to the magistrates posed a problem: The real DFDR has white reflecting stripes at right angles to the box edge, radically different from the diagonal ones that the press saw on the evening of the crash. The difference is too flagrant and so the real DFDR cannot be handed over to the judiciary without creating a scandal, because Michel Asseline and the SNPL feel something is up and are looking for clues.

And yet, on 6 July a DFDR with reflecting tapes like those seen in the Prefect's car and with serial number 3237 corresponding to the number delivered by Airbus to Air France is delivered to the judiciary. How was that done?

Facts on the switch

It is now accepted that:

- the boxes of the A320's flight recorder are not those in the hands of the judiciary, the ones we call "the Court recorders". This is certain since the examination by the IPSC in Lausanne.
- The serial numbers on the Court recorders correspond to the serial numbers delivered by Airbus to Air France. This was established during the hearing.
- The recorders seen in the Prefect's car on the evening of the crash and photographed by the press look almost new, which is confirmed by a reporter giving evidence at the hearing.
- The Court recorders look used and worn, the paint is old, they are dirty and scratched at the edges, as can be seen on photo #3.
- This state of wear does not correspond with the description given by the colonel commanding the fire brigade at the crash. He testified the recorders were "*brand new, reddish orange in colour and one had slight traces of soot in one corner*".

How the recorders were changed.

The real flight recorders are rapidly sent off for decoding. The false ones are shown to the press when they are put in the Prefect's car. The enquiry has shown that, providentially, seals were not applied to the recorders, which avoids having to record their serial numbers.

The false recorders are taken that night by the Director of the DGAC to Villacoublay, then the DFDR is taken by three conscripts to the CEV at Brétigny. They get there at 2 AM (*states the enquiry report*). The CVR was taken to the BEA.

When Judge Sengelin orders that the recorders and their tapes be immediately seized on 5 July he catches the forgers by surprise, and the gendarme supposed to seize the recorders is turned away. He returns the following day and is given a CVR box by the BEA and a DFDR box by the CEV. (*states the enquiry report*).

Two things have to be matched when handing over the DFDR;:

- give the judiciary recorders which have a diagonal reflecting stripes, like those seen in the trunk of the Prefect's car on the evening of the accident.
- Fix the identification plate with the serial number 3237 on the DFDR. This is simple, just unscrew the original number plate, and we shall never know what number this was, and screw the 3237 plat in its place. It takes two minutes.

The box does not look very new, it is worn, blackened and the paint is scratched, but there is nothing else available. The immediate action injunction of Judge Sengelin left no time to find another solution.

- There again, who would see any difference between the real box, that nobody knew about, and its stand-in?

The need to put the real DFDR and CVR electronics in the false boxes.

Why? Because there are enough problems as it is without stupidly creating others! Airbus and Air France documentation shows that this A320 had DFDR number 3237 **and when you put number 3237 on a box you have to put in the box the electronics that go with it because the electronics have two other serial numbers on the base plate which are tied in with the serial number on the box by the flight recorder manufacturer.**

These serial numbers also have to agree in the CVR too.

The false Court DFDR was thus fitted with the electronics from the crashed A320's CVR

The CVR switch

There was a problem of two almost contradictory requirements with the CVR;

- Make sure that the CVR box looks similar, as old and used, as the false DFDR just assembled. This prevents returning the real CVR even though it has reflecting tapes almost like those of the false CVR in the Prefect's car. **It would look much too new compared to the worn box of the false DFDR.**
- the reflecting stripes must look like those in the Prefects car.

So another CVR box which fits both criteria had to be found. The serial number plate was changed for #52971 from the crashed A320 and the electronics were changed for the same reasons as on the DFDR. It was duly handed over to the judiciary.

Further proof that the Court CVR is different from that seen on the evening of the crash

The forgers missed one important point: **the Court CVR has a ticket that did not exist on the CVR in the Prefect's car.**

There is a white label with a reference number on the Court CVR. There was no such label on the CVR in the trunk on the evening of the crash. Haste is always a source of error. It is also possible that this error was seen, but ignored, thinking nobody would notice it. The reporters' photos and videos were for press publication, so close scrutiny was improbable and difficult.

It was Judge Sengelin's determination to have the law respected that caused the forgers many problems by depriving them of what they most needed: time!

French TV channel Antenne 2 had broadcast a video showing the flight recorders in the Prefect's car. Michel Asseline tried to get a copy. He was told it had disappeared. Disappeared or been disappeared? Luckily British TV Channel Four had also broadcast a video and they obligingly had a copy for Michel Asseline. **It was by printing a series of stills from this video that showed the ticket on the Court CVR was not on the CVR in the Prefect's car.**

Venet & Belotti testified that the angle of the shot prevented the ticket being seen in the trunk. Just looking at the photos shows that this was just as accurate of them as their view of the right angled stripes on the DFDR. Nonetheless, the Court preferred to believe them again.

Professor Margot refused to examine the Channel 4 video at the IPSC, it being impossible to distinguish a copy video from an original video.

This ticket is there to be seen on the Court CVR, but is just as visibly absent from the CVR in the trunk.

One may certainly accuse the Defence of having forged these photos, but one also has to prove it. Just like the Defence has proven that the official video tape used in evidence had been forged.

part 4

Some experts' errors

During the eight years of the judicial enquiry, the experts played a key role in the way the judges understood this case. How could it have been otherwise in a case so technical that even professional airline pilots had sometimes to struggle to understand? It is only natural that, because of this crucial role, the experts' work be subject to the closest scrutiny. On their work depends the freedom and the honour of the accused, and particularly of Captain Asseline.

Describing the first team of legal experts, Auffray and Bourgeois, Judge Guichard underlined their "*procedural laxism*" and we have nothing to add to that. The enquiry was then handed over to Messrs Venet and Belotti for them to redo it completely.

These new experts played an essential role in guiding the decisions and the verdicts of the Investigating Magistrate, the judges of the Lower Court and of the Appeal Court. In the beginning they were considered to be objective when they presented their report "*A summary of what exists*", in which they cited the many and justified criticisms, both procedural and in aviation technology, that could be made of the enquiry before they were called upon to take over. All hope of seeing an impartial and determined enquiry were permitted, particularly an enquiry which would objectively examine the possibility of conspiracy.

As their enquiry progressed, it became obvious that they were drifting closer to the official version of the crash which was that the aircraft was totally perfect and the pilot, alone, responsible.

Before undertaking a highly detailed counter-enquiry, we had thought that the difference between their initial approach and their final report was due to a deep conviction, acquired during their investigations, that there had been no forgery of the flight data tapes.

They had every right to this conviction, but we have to point out that Judge Guichard declared in January 1997 "*the law does not demand of experts to have a deep conviction. That is reserved for Judges who alone make judgements, evaluating the data that experts supply in the majority of cases.*" The last part seems a little peculiar, it implies that judges can ignore truth established by expert examination!

Quality checks made by those who could be responsible for the fault

At the time Venet & Belotti took over the experts' role, there was very strong suspicion of fraud, fuelled by the legal laxism cited above and the technical contradictions which had been uncovered. Only strictly objective expert examination could establish for sure that there had been no falsification of evidence.

Was it therefore surprising to have the impartiality of certain experts questioned when it was seen to whom the most important examinations had been given by the Investigating Magistrate and his experts:

- although there was much suspicion of certain staff of the CEV, the BEA and Airbus participating in forgery of the flight data, the mandate of checking the authenticity of the data tapes was given to two members of this same CEV.
- Schlumberger distributes Fairchild flight recorders in France, Airbus is a big Schlumberger customer, but it was three engineers from Schlumberger who were named to verify that there had been no data forgery.
- the same CEV is named to verify the analysis of the A320's acceleration data.
- although there was much suspicion of engine malfunction on the crashed A320, it was CFM International who was called upon to check the engines, even though this company is the engine manufacturer, along with General Electric.
- although there are long established and very close ties between the Direction Générale de l'Armement and the State, the DGA's Propulsion Test Centre is named to identify various deposits on the flight recorders. This centre and the CEV both report to the DGA.
- whilst a trace of a wish for independence would have prompted such analysis to be entrusted to a foreign laboratory truly independent of the French state, analysis of the CVR data is given to the Acoustics department of the Gendarmerie.

In suggesting to Judge Guichard that the most crucial examinations be entrusted to experts employed by the State, Venet & Belotti deliberately guided him to a path where it was highly improbable that anything abnormal would be found. One can thus perfectly understand it when this same judge told the press "*it is impossible to establish the truth if government officials are accused*". But one would not have left it at that.

We do not, of course, contest the need for supplementary expertise in such complex examinations. Although they were experienced Captains, the legal experts Venet & Belotti could not have the knowledge required for varied and in-depth action in computer technology, jet engines, chemistry, acoustics and electronics.

All the same, it is evident that care in obtaining incontrovertible results requires that only supplementary experts who are totally independent in their careers or their companies be retained to obtain such results. This is evidently not the case with those cited above.

There are enough competent laboratories in the world to guarantee this independence; the legal experts approached only the Canadian Accident Enquiry Bureau, which refused. They stopped there. But this country is not the only country on the other side of the Atlantic capable of work totally independent of the French state and all the nebulous organisations and companies attached to it. It is equally beyond doubt that that very competent analysts exist in Europe in computer technology, chemistry, CVR and DFDR analysis, or jet engines. Analysts who would not be influenced by the French state being, or not being, involved in a crash.

We have demonstrated this independence by entrusting the analysis of the photos to the laboratory of the Scientific and Criminal Police Institute of Lausanne. It was a model of scientific precision and discipline.

Had there existed any wish to find such experts, they would evidently have been found. It is odd to see Airbus protest so much against analysis being carried out abroad on the grounds that such analysts could be biased and in the service of competitors. Is it so evident that the truth will out when the work is entrusted to state organisations when it is these very organisations that are suspect?

If independent and impartial experts had been chosen, they would naturally have had contacts with Airbus, the CEV and the motor manufacturer CFM because these evidently have specialised knowledge of their own products.

It is one thing for an organisation that is totally independent of the parties involved to question them to clarify technical points. Capable of evaluating the value of the explanations given, such experts could, in the end, reach conclusions different from those wished for by organisations or manufacturers involved.

It is another thing for the expert examination to be handed to organisations and manufacturers whose involvement is controversial and whose guilt would have very serious consequences for them.

As they were not technically competent enough to evaluate alone the pertinence of certain reports from supplementary experts with interests to protect, the legal experts Venet & Belotti could only pass on any possible false reports without being able to control them.

Would the police have a gunsmith do the ballistic report if they thought he was the killer?

Frankly, in the Habsheim case, suppose the supplementary experts checking to see if their organisation had been involved in data fraud had found that some of their colleagues were not so innocent and had said so in their report. What would have happened to their career? Has anybody ever seen a legal expert incriminate his own organisation? It is unseemly that the Investigating Magistrate put the supplementary experts in this dilemma.

At the beginning of the crash enquiry, and because of the growing misgivings among airline pilots, the President of the SNPL, and author of this present report, wrote to the President of the Administrative Enquiry on 19 September 1988 summarising these misgivings and ending his letter *"all these comments raise doubts that must absolutely be cleared by the Enquiry . . . We demand a completely new analysis of the DFDR tape in conditions that will ensure the veracity of the results, that is to say in an organisation completely independent from the manufacturer and the State".*

We will now review the criticisms that we may make about the Venet & Belotti report and some of the supplementary experts.

**Analysis of deposits on the recorders.
Traces of the fire being put out, but no traces of fire!
And on recorders that were not in the aircraft!**

The analysis was rigged to cover up fraud.

There cannot be traces of fire extinguishing products on the recorders boxes without traces of the fire itself.

The Investigating Magistrate instructed the Propulsion Test Centre, a state organisation if ever there was one, to analyse the oily "brown-black" deposits on the recorder boxes. Venet & Belotti supplied samples of Skydrol, the hydraulic fluid used by Airbus, and a chemical emulsion used by the fire fighters on the fire.

The analysts' report shows that the traces on the boxes:-

- are very similar to the infra-red spectrum of fluoroprolydol (an emulsion of liquids used to fight hydrocarbon fires).
- contain esters of the sort used in Skydrol LD4 (This is quite normal, there are hydraulic circuits in the recorder compartment and they could have been damaged in the crash - Ed.)
- had traces of different types of dust (which surprised nobody - Ed)

Neither the experts from the DGA nor the legal experts were surprised not to find traces of smoke from the aircraft fire on the recorders

And yet Colonel Schnebelen of the fire fighters testified that one of the recorders had traces of soot (at the lower court hearing),- **traces of fire extinguisher products could only get on the recorder boxes if a the recorder compartment had been breached in the crash. In that case, heat and smoke would also get to the recorders.**

According to Mr Lejeune, head of the decoding service of the CEV, "*the recorder paint starts to blister at about 100°C*" and one would accept that this temperature could have been reached by the recorders in an aircraft crash!

Apart from the very possible signs of heat on the paint, the smoke would also have left trace deposits of soot containing residues of burning paint, plastic, Teflon, aviation fuel, etc. No such residues were found by the experts.

Smoke which stops, conveniently, at the hole in the aircraft through which the fire fighters foam got in. Just like the radio-active cloud from Chernobyl that officially and miraculously stopped at the French frontier, even if it did leave traces in our countryside still detectable ten years later!

It is incomprehensible that the experts Venet & Belotti were not astonished by this absence of combustion residues.

The impossibility of having traces of fire extinguishers and hydraulic fluid on recorders that were not in the A320 that crashed at Habsheim.

We have proved conclusively that the Court recorders are not those taken from the wreck.
How then could they have traces of fire extinguishers and hydraulic fluid?

Somebody must have been dishonest enough to rub the boxes with the products they wanted the analysis to find. This person could not rub on combustion residues because they were no longer available. Who did it?

It is to be noted that the products found by analysis **are identical** to those supplied by Venet & Belotti.

Just how could such results be obtained by the experts from boxes that were not from the A320 that crashed at Habsheim?

It is perplexing that Venet & Belotti did not notice this enormous contradiction. This is yet another item in the case for data forgery.

How a DFDR works

Before we go any further, we have to know how a DFDR works. It records 209 different parameters on an A320. These are recorded as digital data on $\frac{1}{4}$ inch wide magnetic tape moving nominally at $\frac{1}{3}$ " per second past a recording head..

The DFDR tape is about 136 meters long. It is supplied as a continuous band by the recorder manufacturer, Fairchild, that is to say the two ends are joined by a manufacturer's proprietary process called a "*Splice*". The tape is installed in the recording deck of the DFDR, but it has to be cut to remove it. Standard practice is to cut the tape about 4 inches after the recording head in order to save the last few seconds of recorded data.

The tape has 6 parallel tracks, each with a capacity of 4 hours 10 minutes of data, 25 hours in all. Recording erases any preceding data, so the last 25 flight hours are continuously kept in memory on the tape. Flight parameters are recorded every second, or longer depending on their importance.

The tape has 4 particular sections:-

- **The cut**, necessary for removing the tape. This cut was made by the CEV about 3 inches from the recording head to save the last seconds of flight data.
- **The "stripper"** which is a head cleaner, like on a VCR, to stop tape particles building up on the recording heads. The stripper is a slightly rough section about $\frac{1}{2}$ " long which rubs across the recording head every 4 hours 10 minutes, this being the time it takes for the tape to make one complete cycle.
- **The "sticker"** is the signal to change tracks. It is a window just under $\frac{1}{4}$ " long of clear tape with no magnetic oxide coating. Data recording moves to the next track, sequentially, after the tape has completed one 4 hour 10 minute cycle of a track, track 1 for example.

The sticker passes in front of an optical detector which transmits an electronic instruction to go to the next track, number 2 in this example.

- the "splice", which is where the manufacturer glued the two ends together, before the tape was mounted in the recording deck of the DFDR.

Another 1 inch wide tape is copied from this 1/4" tape to enable the data to be read into the decoding systems, and the CEV at Brétigny does this on their RESEDA system.

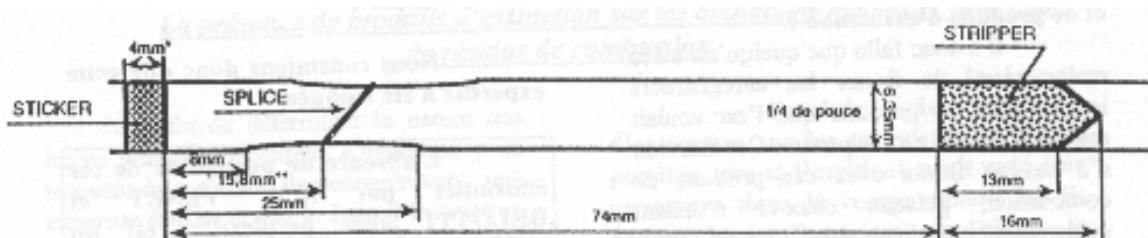


Diagram of the tape and its different sections

Unexplained DFDR tape leader changes is further proof of fraud

Tape leaders are blank pieces, the same width as the tape, which are fixed on it at both ends to enable it to be threaded in a tape unit. They are fixed either side of the cut in the tape. There was plenty of time to change the tape leaders, the enquiry has shown that the tapes were in the hands of legal expert Auffray from 17 August 1988 to 6 June 1989.

The experts Venet & Belotti noted that new tape leaders had been put on the tape, either when the tape was with Auffray or when the tape was with the Investigating Magistrate. According to the CEV engineers, these leaders were different from those the CEV put on the tape the evening of the crash.,

The new-look tape leaders on the tape held by Mr. Auffray are 24 inches long instead of the 40 inch long leaders put on by the CEV. They are opaque and not white, and stuck on the data side of the tape with permanent glue whereas the CEV sticks them on the plastic base side of the tape with detachable glue.

That these leaders were changed is the sign of the tape being used outside of official channels.

But, it was at Auffray's own request that he was handed the original tape on 13 July 1988. Quite illegally, he then lent it for 23 days to Air France, who could not use it as their computer system could not read the DFDR 1/4" tape format. The experts Auffray and Bourgeois noted no difference in the tape leaders when Air France gave the tape back on 17 August 1988.

The tape leaders were therefore changed during the ten months that Mr. Auffray had the recorders and the tapes. That implies that things were done with this tape that were fraudulent, because they were hidden from the judiciary. The changing of the tapes during this long lapse of time shows that Mr. Auffray entrusted the original tape to an unidentified third party, who had adequate time to forge the flight data.

- The CEV fixes easily identifiable leaders on the evening of the crash.
- The leaders are different when legal expert Auffray hands back the tapes and the recorders 10 months later, showing that the original DFDR tape had been used when it was in his custody.
- It would not have been necessary to change the tape leaders just to read the tape.
- It can therefore be affirmed that the original DFDR tape was changed for another tape on which it was necessary to glue new leaders. This other tape could only be new, failing which it would be impossible for the forgers to proceed, as we shall show later. The forgers did not think that the different tape leaders would be noticed.
- The only possible reason for using another tape is forgery of the data from the original tape.

The only possible reason for changing the data is a problem with the A320. Venet & Belotti drew no conclusions from the DFDR tape leaders being changed, they just reported that it was unexplainable!

The CEV analysis of the aircraft acceleration - impossible changes of sign in formulas. The experts lied and mislead the judges

At the request of Venet & Belotti, the CEV studied the acceleration data of the crashed A320 both in absolute terms and in mathematical signs. The CEV report states that their analysis includes systematically "*a global integrity check (absolute terms, signs, development) intended to identify any faults in the recorder. Checking convinced us that this parameter showed globally coherent physical values and development*"(Jx is the aircraft's longitudinal acceleration -Ed.)

Let's see!

The CEV analysts did not spot an incoherent change of sign. That is impossible!

The DFDR records the aircraft's acceleration in the longitudinal, vertical and lateral axes. The experts' printout from the "official" tape is surprising, on take-off from Habsheim the recorded longitudinal acceleration values are written with a minus sign. It would be logical to find this same sign attribution throughout the tape data, from engine start to crash. But no.

In agreement with the minus sign attribution when the aircraft takes off, the aircraft decelerating is signalled with a plus sign. **But in less than one second of use, this plus sign attribute is reversed and it becomes a minus sign for the last 35 seconds of flight, showing the aircraft to accelerate, whereas speed is constantly falling and will do so for the rest of the flight. This reversed sign will be used until impact with the trees.**

It will be evident to all observers that an agreed sign attribute cannot reverse itself during a flight and furthermore, by the greatest coincidence, exactly during the last 35 seconds of a flight that is suspected for many reasons of having been reworked in a flight simulator or by computers.

It is just as if the forgers who reworked the end of the flight, most likely by computer, mistook the sign for acceleration. They showed deceleration by a minus sign, without realising that the beginning of the tape used a reverse logic used deliberately by the DFDR manufacturer.

The "analysts" from the CEV only studied the single parameter of longitudinal acceleration during a 292 second flight (from start up to the trees), which is not complicated. They could not fail to see that after 85 seconds of normal flights the sign for deceleration changed 35 seconds before impact with the trees.

That is as plain as the nose on his face for a specialist. It is therefore impossible that this anomaly was not noticed, even more so as these specialists specifically studied deceleration at the very second where the sign inappropriately changed (TGEN 640, or 1348 on their printout)!

Furthermore, they could not fail to notice that the sign signifies acceleration during the last few seconds of the flight, whereas aircraft speed is continually decreasing; And especially since this anomaly was reported by the SNPL as early as 1988!

The CEV wrote that they" are convinced Jx acceleration parameters showed globally coherent physical values and development"

That is untrue and the CEV knowingly concealed this anomaly.

The acceleration sign used by a computer for flight data can not change without human intervention.

As to the experts Venet & Belotti, one cannot believe that they did not spot this deliberate concealment of an abnormal sign change.

Analysis of the magnetic tapes by Microsurface The experts Venet & Belotti influenced the judges

This company was asked to determine if the DFDR and CVR tapes had been used in the Court "official" recorders and to check that there was no trace of fraudulent intervention on the tapes. **Their mission concerned the outward appearance of the tapes and excluded analysis of the data.**

The investigation by Professor Roques-Carme and Mme Wehbi was interesting. It demonstrated notably that the repeated passage of magnetic tape over a recording head creates a build-up of abrasive tape debris. This creates parallel scratches along the tape and these scratches are identical on all tapes used on that same recorder.

The most noteworthy conclusions of these experts are:-

- *"an indeterminate remains, and outside our control, on the all the data supplied, because of the poor quality of the items to be analysed. It was noted in particular that the tapes called "original" had folds and were crumpled where they needed to be analysed. No relevant information could be obtained from the crumpled sections of the tapes."*
- *"There is a strong probability that the CVR tape called "original" and the test CVR tape were used in the same box."*

- *There is a strong probability that the DFDR tape called "original" and the test DFDR tape were used in the same box.*
- *The probability that the CVR tape called "original" was "modified" is almost zero.*
- *The probability that the DFDR tape called "original" was "modified" is almost zero.*
- *The tapes called "original" and the recorder heads have been damaged which, on one hand, made analysis difficult and, on the other hand, prevented obtaining certain structural measurement information.*
- *the most relevant part of the tapes, i.e. those for a few seconds before the crash, are damaged.*
- *Our conclusions do not exclude the possibility that the tapes called "original" could have been used in a read or write station for a relatively short period. If so;*
if these tapes were only read, our conclusions are valid.
if these tapes were recorded upon, only measuring the time desynchronisation of the written data would prove it."

Of the very circumspect conclusions from these experts, Venet & Belotti only retained in their final report the phrases "- *The probability that the CVR and DFDR tapes called "original" were "modified" is almost zero*". and - "*There is a strong probability that the DFDR tape called "original" and the test DFDR tape were used in the same box*".

These phrases do appear in the Microsurface report, but **taken out of context they give the impression that these conclusions are valid not just for the surface analysis of the tapes, which was the mission, but also for the data on the tape, which Microsurface did not study.**

When one compares these two carefully selected excerpts with all of Microsurface's comments, it is patently obvious that there are holes in Venet & Belotti's conclusions, deliberately oriented to the official state version. In actual fact, their duty as experts was to report on the observed facts.

The mission of Prof. Carme and Mme Wehbi was limited to the external aspect of the tapes not their contents. Their expertise gave no certainty concerning a possible forgery of the contents of the tapes. They were careful to advise another expertise for the "*time desynchronisation of the written data*" to determine if there had been any forgery of data.

This information should have reached the judges, who thought that the conclusions by the Microsurface experts were limited to the excerpts presented by Venet & Belotti, and that Microsurface was referring to both the tape and the data.

In distorting the facts presented by Microsurface, the experts Venet & Belotti contributed to the judges developing the conviction that no data falsification had taken place, whereas the Microsurface experts had in fact drawn their attention, discreetly, to the fact that it was possible and should be further examined.

And furthermore, they are either mistaken or lying!

Not satisfied with a summary that had deliberate shortcomings by quoting only two phrases from a 100 page report, Venet & Belotti did not hesitate to say in their report "*Microsurface never wrote that the most relevant parts are damaged*" although this is exactly what the Microsurface report says on page 14. This was their reply to Counsellor Agron, Michel

Asseline's lawyer, who had drawn their attention to this comment in the Microsurface report. That made the counsellor out to be a liar and strengthened the no-forgery theory.

Tests in the USA show the DFDR works perfectly, but the "original" tape shows three different recorder faults.

VENET & BELOTTI draw no lesson from this proof of data forgery

Messrs Venet & Belotti visited the recorder manufacturer, Fairchild, in Florida in January 1991. They met with Mr. Harmas, an expert from Fairchild. He noted anomalies on the "original" DFDR tape;

- recording jumps abruptly back to track #1 several times from the track being used for recording. Data should have been recorded continuously on the same track, with the track only being changed at the sticker.
- abnormally, other tracks are partially or totally empty of data, indicating a fault in the data input. **This showed up a third fault**, timing marks spaced every 100 milliseconds should have replaced the absent data.

Mr. Harmas' tests of this recorder show that it works perfectly! "*The DFDR tested was up to the standard of new DFDRs shipped to our American customers*". and also "*After a lack of data, or erroneous data, for 64 seconds, the system transmits an alarm signal to the cockpit which lights an ALARM or a FAULT light for 4 seconds. This is repeated as long as the DFDR receives no data or bad data*"

If the DFDR had really recorded these faults, the Airbus and Air France pilots who flew the A320 from before delivery would have known about it. But no such fault was reported.

Mr. Harms' report continues "*My only interest is flight security. The DFDR is designed to keep data for the last 25 hours of flight on tape. The sequence of this data had not been recorded correctly. I drew Messrs. Venet & Belotti's attention to this. I hope this will not cause any problems, but I believe it was my duty to make this report.*"

Mr. Harmas discreetly, and with much consideration for Venet & Belotti who have brought him a recorder in perfect working order and a tape which shows up three different recorder faults passes the message that there is something wrong somewhere.

According to the experts' reports, this DFDR worked perfectly up to 23 June 1988, **and the very convenient track jumps only appear 3 days before the crash**. That is tough for equipment declared in perfect working order by the manufacturer after the crash.

But there is always a silver lining, the shock of the crash cured the DFDR and it worked perfectly again. It got better all by itself and returned to brand new condition after all its problems. Terrific. That might work on a flight to Lourdes, but not in Alsace!

If one does not believe in miracles, the only explanation of this cure is forgery of the DFDR tape.

These faults were deliberate, they enabled the data to be altered on a computer in a way that was not too complicated for reinsertion on a tape. (See how it was done further on, Ed.)

As to the experts Venet & Belotti, they noted these facts, but drew no conclusions as to what they could mean.

Undeniable proof the official video is a fraud.

The proof is in the absence of public address commentaries **which have simply been suppressed on the official video tape filmed by the Karsenty company and preferred by the Investigating Magistrate.**

The airshow presenter's commentaries were broadcast by loud speakers all over the field at Habsheim. They could be heard perfectly in the control tower where cameraman Karsenty had set up his equipment, **because they can be heard on this video tape** which was retained as evidence by the judiciary.

The commentaries were also recorded on an amateur video tape which was sold to French TV channel FR3. This film was intercepted by a rival French channel, M6, when FR3 transmitted it to Paris by relay link and M6 broadcast the film immediately. It is therefore possible to check that these two broadcasts of the same video of the same event show the same thing.

The M6 tape

The commentaries can be divided into 3 sections: A, B and C.

- Section A, starts with the last turn of the A320 to line up with the strip. It is "*Oh, look at that, a few metres from the ground, super!*"
- Section B between the end of the turn and hitting the trees: "*150 passengers on board too, for information, the passengers must be delighted, above all listen to the silence . . .(a dull thud) . . I think I hear applause, look at the trees . . SUPER! (very loud)*"
- Section C starts when the column of smoke billows up "*Anybody who has a film is requested . . .*"

The official "Karsenty" video

This video has section A and C, **but section B has purely and simply disappeared!**

- There is absolutely no trace of the commentary in section B. The word SUPER, said so loudly, has gone. What explanation is there for this commentary to disappear when it was spoken so loudly?
- The commentary has been replaced by the sound of slow speed jet engines which accelerate just before the trees. This could have been recorded anywhere.

This absence of the commentator's voice proves that the video used by the Commission of Enquiry had been forged, in all probability to confirm the official version of the engines accelerating before the trees.

Even though the Defence notified the Investigating Magistrate of the fraud, it was still this forged tape that was used for a spectral analysis to prove that the A320 engines accelerated correctly!

The Defence demanded other comparative spectral analyses, which were refused by the Investigating Magistrate.

It was Venet & Belotti's duty, as legal experts, to report the evident fraud with this tape, to exclude it from their enquiry and to insist that those responsible be identified.

The fact that the Air France tape had data different from the official tape data was hidden by Venet & Belotti.

The original DFDR tape was illegally lent to Air France by the expert Auffray from 26 July to 17 August 1988. As the Air France system was not equipped to read this tape format, the CEV gave them a copy of this original 1/4" tape on 1" tape, which they could read.

Reading the data on the copy tape revealed that the tape had been tampered with. Air France wrote to Venet & Belotti that there was no trace of the time nor of the aircraft identity number on the CEV tape, and this tape was supposed to be a strict copy of the original DFDR tape!

In the world of computers, three readings of the same tape can only give identical information. The CEV printouts of this tape, published just days after the crash, do not show the aircraft identity number, but they do show the time. Furthermore both the time and the aircraft identity are on the "official" tape which appeared in the hands of the judiciary a year after the crash.

One can only conclude that the identity and the time, which should have been on the CEV tape given to Air France, had been deliberately erased. No doubt this was because this information was contradictory at that stage of the forging process. They were - recorded on the "original" tape some time after the loan to Air France. Venet & Belotti did not bother to mention this anomaly reported by Air France, so the Investigating Magistrate and the judges could not be aware of it, unless they read all 17,000 pages in the files!

The experts failed to follow up printout anomalies

Venet & Belotti made no investigation of the anomalies and lack of concordance between parameters in the first printouts of the crash data. When the Defence protested this failure, the CEV and Schlumberger supplementary experts replied "It is not our mission to examine the reasons for desynchronisation on these provisional printouts"

The experts' mission was to make up for any omissions in the judicial procedure that was seeking traces of tampering with the tapes! Deliberately to ignore what happened at the very beginning of the crash enquiry, the moment when any fraud would have been done, was surely not the best way to detect the fraud. But such indifference was a sure way of not detecting it!

Venet & Belotti considered it was legal to take passengers on this airshow flight - False!

Concerning passengers on an airshow flight, Venet & Belotti's comments and those of the Investigating Magistrate were no more relevant than those of Air France. All said that

because the law of 5. Nov 1987 on the utilisation of passenger aircraft did not forbid passengers on airshow flights, these flights could not be prohibited. It was Captain Asseline's Defence that had to point out to them that a law of 19 June 1984 prohibited airshow flights with passengers. Had this law been obeyed, only the two pilots would have been on board. There would have been no passengers, no cabin crew and there would not have been 3 dead and 50 injured.

Even the Public Prosecutor was mislead by Venet & Belotti. If the legal experts had read the introduction to this law of 1987 which they included in their report, they would have seen that the list of laws it replaced did not include the law of 1984 prohibiting airshow flights with passengers. This law was still valid at the time of the crash, because as long as a law is not abrogated it remains valid. It was only in April 1996 that it was replaced by new airshow regulations.

The lower Court accepted the Defence's argument and found the Operations Director of Air France to be responsible for the presence of passengers on this flight. This was confirmed on appeal.

The experts gave no explanation of an aerodynamic impossibility.

Michel Asseline opted for a low speed fly-past at what is called a high angle of incidence of the wings. The incidence of an aircraft wing is the angle between the centre line of the wing thickness and the air stream over the wing. This angle increases as the aircraft speed decreases, and the carrying capacity of the wing decreases as well.

But, as there is an end to everything, the carrying capacity collapses once a maximum point is passed. There is a quasi total loss of lift below this speed. The aircraft stalls and falls. Recovery demands speed, engine thrust and entails loss of height. On an A320 configured as for the fly-past, the angle of incidence at stall speed is 21°.

Electronic controls on the A320 can detect when stall speed is approached and will, in certain conditions, automatically increase engine thrust and may point the nose down if that is not enough. Airbus installs this flight protection at 5% above stall speed. This speed is called "Alpha Max" and corresponds to the maximum angle of incidence at which the aircraft can be flown, either manually or by automatic pilot.

The "official" DFDR data says that the A320 flew at stall speed of 113 knots at Habsheim, but it also shows that the angle of incidence never exceeded 14.5°, and never reached the 21° angle of stall speed.

There is therefore something very disturbing in this data, because only one single speed can correspond to a particular angle of incidence in aviation

This 14.5° angle of incidence corresponds to only one aircraft speed and that is speed is 128 knots, not 113 knots!

It is odd that the experts Venet & Belotti never once spotted this discrepancy. They asked Airbus 141 questions, but not "*How can an A320 be simultaneously at stall speed of 113 knots and at an angle of incidence of 14.5° instead of 21°??*"

Contrary to what Venet & Belotti say, flight at Alpha Max is not a state of emergency

Relying on their so-called experts, the judges blamed Michel Asseline for flying in a state of emergency by intending to fly at Alpha Max. But this accusation did not agree with the Airbus A320 flight manual.

In civil aviation, a "state of emergency" is defined as a critical situation calling for specific action which is always covered in an emergency check list. There are check lists for normal procedure, and check lists for emergency procedure.

It is evident that manoeuvres in the standard flight domain have no emergency check list, neither at the time of the crash nor today furthermore.

Venet & Belotti's expert argument is therefore wrong.

Other proof of data fraud on the DFDR tape

DFDR flight path differs radically from radar records

The record of the flight path shown on radar is an essential part of all official international crash enquiries, when it is available. This radar record is also used when aircraft stray from the official take-off and landing pattern, leading sometimes to penalties for Flight Captains and airlines. This shows that radar records are taken seriously everywhere. Regulatory minimum accuracy of airfield radar is 1/10 sea mile, or 185 metres and no information was given to flight crews using Basel-Mulhouse airport, from which the A320 took off, that the airport radar was out of specification.

The radar record of the flight path is considered an important factor in any crash enquiry in modern countries, except by Venet & Belotti in France who wrote in their report that they had discarded the radar flight path because "*they could not get a sufficiently accurate radar flight path*". **They never said why the radar record was not accurate enough.**

But this evidence exists. It was published in the government *Journal Officiel* with the official report of the Administration's crash enquiry and Venet & Belotti have given no reason to take their claims seriously.

It is interesting to compare the flight path tracked by radar and that recorded by the DFDR:

- They diverge from take-off.
- The DFDR path moves away from the radar path, staying inside the radar path by more than 1 kilometre at the first turn.
- The DFDR flight path is about 3 kilometres shorter than the radar flight path, this corresponds to over 30 seconds in a 5 minute flight. Or 10% difference!

According to the manufacturer of the gyro-laser platforms which supply positioning data to the flight recorder, the position error in a 5 minute flight would not normally be more than 150 meters in the worst case and this tolerance would certainly not explain errors of several kilometres.

That the legal experts discarded the radar record as evidence is not justified by normal procedures applicable in international civil aviation.

Unexplained and abnormal absence of GPWS alarm in flight data

All airlines concerned with security equip their aircraft with GPWS Ground Proximity Warning Systems which warn pilots when they approach too close to the ground. GPWS became obligatory in France after it was found that the A320 that crashed into the Mount St. Odile did not have one.

This alarm sounded 44 seconds before the trees on the short Habsheim flight. **It is clearly audible on the CVR, but it was not recorded by the DFDR as it would normally have been.** This supports the theory that the data tapes were tampered with after the crash. This data would have assisted identifying fraud by enabling better synchronisation of the CVR and DFDR tapes.

No investigator, no expert, has explained the abnormal absence of this data. But that absence is real.

Flaps extend before the pilot orders it.

Flaps are sections which are lowered down on the trailing edges of the wings. They increase wing curvature and enable aircraft to fly slowly in security. There are four flap positions on the A320, number 4 being for landing. The Flight Captain logically chose Flaps 3 for the fly-past at Habsheim, he would evidently not be landing on a grass strip.

The DFDR data published in the *Journal Officiel* showed that:

- the flaps start to move normally from position 1 to position 2 about 3 seconds after the Captain's order. These 3 seconds are due to reaction time by the first officer and system inertia.
- However, the flaps start to move from position 2 to position 3 one second before the order is given! If we add a reaction time of 3 seconds as before, we get a total time **of 4 seconds before the Captain gave the order to the First Officer!**

It is unthinkable that the First Officer took it upon himself to lower the flaps 4 seconds before the Captain's order. There was no emergency and no airline pilot would do such a thing, especially if he were as experienced as Captain Mazières. But even if he had, he would not have done it secretly, he would have announced it and that would have been picked up by the CVR. This is yet another anomaly ignored by the experts of the official Commission of Enquiry, which goes to show just how seriously one should treat something in the very official *Journal Officiel* of the French Republic.

It is quite comical to compare this to the comments of Captain Bechet, the President of that official Commission of Enquiry, who testified that "*the correlation between the CVR and the DFDR was as close as 1/10 of a second*".

Mr Bechet said that after he retired from Air France he was going to a job specially made for him as Flight Safety Officer for the ATR aircraft company in Toulouse, which is related to Airbus.

How the flight data tapes were forged Why was it necessary? To hide faults in the A320?

If the A320 had been so perfect, there would be no reason to find so many traces of data forgery on the CVR and DFDR tapes. If forgery there is, then there was something to hide and that something could be a fault in the aircraft. We can only guess what these faults could have been, unless we find the original tapes one day.

The main fault leading to this forgery was most probably abnormal acceleration times of the engines caused by the computerised engine controls, or problems inside one or both engines. We shall objectively study the data we have and which could indicate certain faults, bearing in mind that:

- The recorders would not have been switched if the possibility of a major fault had not been accepted from the beginning by the instigators of this fraud.
- The data would not have been forged if the fault found on the tapes had not had an effect on the flight.

A fault in the A320 was not the only cause of the accident, but nothing permits brushing aside the idea that such a fault was the final straw that made a catastrophe out of what would only have been a frightening brush with the trees.

Engine thrust was not symmetrical prior to hitting the trees; this proves a fault in the engines or their computerised controls.

Aerial photos show that the aircraft surfed over the tree-tops before sinking into the forest. The tree-tops broke off under the blast of the engines and **the marks left on the trees are not symmetrical, which implies that thrust was not symmetrical either.**

Oddly, the BEA ordered the trees to be cut down three days after the crash and before any official study had been made of the way the trees had been broken. Such study would certainly have been instructive concerning engine thrust.

The BEA pretends it was the ONF Forestry Commission that decided to cut the trees down, and that is false.

- The local ONF ranger testified that there were no "forestry" reasons for this hasty destruction and that it been done at the demand of the BEA.
- Luckily for posterity, this man recorded the marks in the trees and these show that **the tracks of the left engine are 11 metres high, the tracks of the right engine are 8.5 metres high.** The crash enquiry established that the A320 was listing by 1° , which could not explain this difference of 2.5 metres.

It is the proof that engine thrust was not symmetrical, the left engine was idling and the right engine pushing hard.

This could be due to the following possibilities:

First possibility: VSV vane faults

Aerodynamic law governs airflow around the compressor blades in a jet engine, just like over an aircraft wing. When the angle between the compressor blades and the surrounding airflow

becomes too great (angle of incidence), the airflow breaks down and stalls. This is called compressor stall. The engine loses all power and is most often damaged. Compressor stall is accompanied by a sound like a dull thud.

The A320's CFM56 engines, made jointly by SNECMA and General Electric, are designed to avoid compressor stall, the air intakes have special equipment to regulate air flow through the compressor. This equipment comprises moveable radial slats - Variable Stator Vanes, actioned by fuel pressure operation of a hydraulic jack. The pressure varies with engine speed and extends or closes the jack.

If pressure is too low for these vanes to leave the idle position, for example, the engine cannot accelerate and engine speed stagnates. If the vanes, still for the same reason of lack of pressure in the hydraulic jack, do not correctly follow as the engine accelerates, there is compressor stall.

Airbus issued technical bulletin OEB 19/1 one month before the crash. This reported an engine acceleration deficiency at low altitude. The cause was a problem with the VSV variable Stator Vanes. According to Airbus, hydraulic pressure was too low and it was increased from 284 pounds to 380 pounds less than one month after the crash.

Aerodynamic loads were very high at the compressor air intake at Habsheim, because of the high angle of incidence at which the A320 was flying. All the conditions for compressor stall existed.

The Airbus technical bulletin added "*It is improbable such a problem will occur at low speed*". **Improbable does not mean impossible, it does not mean zero risk that it could happen at slow speed.**

Airbus issued another technical bulletin **two months after the crash**, OEB 19/2. It dealt with a lack of engine acceleration at low altitude. This could affect all aircraft and **did not exclude that both engines could be effected simultaneously.**

The "*Compressor vane default*" alarm is inhibited below 800 feet on the A320 and the crew could not have been aware of such a fault if it had occurred at Habsheim.

Engine acceleration failure due to inadequate operating pressure of the VSV hydraulics is therefore a major possibility as the ultimate cause of the Habsheim crash.

There must have been a problem of potential failure if the engine manufacturer increased vane operating pressure from 284 to 380 pounds,

Inspection a month after the crash of the other two A320 flying with Air France showed that:-

- one engine had been changed because of bearing problems.
- **two engines were still flying because the engine manufacturer had dispensed them from the modification required by OEB 19/2 to bring VSV operating pressure up to 380 pounds and which was effective the month this surprising decision was made.**
- the report does not say what happened to the fourth engine.

This surprising, and imprudent, decision had the significant advantage of **not** seeming to confirm the possibility of a problem with the A320 at Habsheim.

Examination of the engines was entrusted to the engine manufacturer, without any other engine expert being permitted to comment to the conclusions reached in this "judge and accused" situation.

For our part, we just note that, according to this expert examination, the only A320 with perfect engines was the one that crashed at Habsheim!

Second possibility: fault in the computerised engine controls

In this quest for the truth we cannot exclude the possibility that the anomaly was caused by a computer error.

There is no mechanical connection between the engines of the A320 and the throttles that the pilot moves. Engine reaction to throttle movement is controlled by Auto-thrust computers, depending on which engine command mode is selected. Selection is made manually with the throttles or automatically by either the automatic pilot or the flight protection systems.

Delay in the acceleration instruction from the computers to the engines could have caused delay in an engine, or both engines, accelerating as required.

-a) Possibility of a fault in N1 instruction

On the A320 electronic control panel, pilots may check the "*N1 command*", this indicates compressor revolutions expressed as a percentage of maximum revolutions. In normal flight, throttle movement causes instantaneous display of the corresponding N1 command. The pilot is thus reassured that his throttle movement is being actioned by the computer.

The printout of the "official" Habsheim DFDR tape shows several anomalies in this Auto-thrust operation;

- the Auto-thrust computer tells the pilots to select the CLIMB position for the throttles when the A320 was still on the runway. There was no reason for this.
- later Auto-thrust selected Constant Speed mode, all by itself, without any pilot instruction.
- there are multiple abnormal reactions of N1 Command compared to throttle movement.
- At 12.42.08 PM, TGEN 466, there is a 2 second delay between throttle movement and N1 Command. It should have been instantaneous.

And in perfect bad faith, the official Commission of Enquiry reported "*there is never, at any time on the DFDR, throttle movement that is not immediately followed by the corresponding N1 Command*" That is false because such a case was specifically recorded at TGEN 466.

These anomalies show clearly that Auto-thrust was acting unpredictably on the crashed aircraft. It is clear to all that a passenger aircraft needs better than an unpredictable system, especially for computer control of engine thrust.

Some years after the crash at Habsheim, the Flight Analysis service of Air France studied a case of engine acceleration problems when an A320 aborted a landing in high and turbulent winds. (Case 20-14-A320).

In this near miss, engine thrust only started to accelerate 6 to 8 seconds after throttle movement, causing the co-pilot to declare he thought the Captain was going to land after all.

And yet, in this case acceleration had not been ordered from Flight Idle, which is 29% of engine maximum, but from Approach Thrust, which is 65% of engine maximum. The engines should have responded in ONE second in this selection.

It is astonishing that there was no in-depth analysis by Air France of such a serious delay in engine acceleration, especially as the Habsheim crash enquiry was still going on.

-b) The possibility that the engine thrust control went from Flight Idle to Ground Idle during the flight.

Engine revolutions are reduced during flight to improve fuel consumption. But it must be kept at a sufficiently high enough level to ensure the engines pick-up in a reasonable time when needed. On the A320 this Flight Idle is 29% of maximum power.

This idling speed is still too fast for taxiing and would cause excess braking, so it is to be reduced to 22% on the ground. If, during a flight, the pilot accelerated from this Ground Idle, it would evidently take longer.

The DFDR tape recorded an abnormal selection of the N1 Command to Ground Idle only 85 seconds before impact with the trees. At 12.44.14 PM the N1 Command went to Ground Idle for at least two seconds instead of the Flight Idle ordered by the pilot (22% instead of 29%).

What excluded this anomaly that happened 85 seconds before the crash from happening again when Captain Asseline moved the throttles to accelerate?

The ultimate reason for the crash could have been that acceleration had been retarded because the engines were in Ground Idle instead of Flight Idle. The aircraft only needed another four meters height to clear the trees, that is to say another 1 or 2 seconds of established thrust.

Furthermore, an Air France Captain wrote describing a delay in engine acceleration during a "Touch and Go" landing and immediate take-off. An instructor seconded to Airbus, he ascribed the error to the engine control system slipping into Ground Idle.

We are looking at possible causes of this crash and it is astonishing that at no time did the numerous persons seeking the cause of the crash, either in the official Commission of Enquiry or in the judicial enquiry, ever report these anomalies.

In concluding this description of the engine problems on the Airbus A320 when it went into service, we cannot ignore the possibility that there was a fault in one, or both, of the engines at Habsheim.

Forging the data printout

The printout published on the evening of the crash is a collection of errors!

Analysis of flight recorder information is made from a printout which lists the data as it is on the tape, second by second for important data, every 2 to 4 seconds for less vital data. Each line therefore contains some of the 209 parameters that are recorded.

By a very opportune accident and an unknown source, Michel Asseline one day found in his letter-box a copy of the printout for the last part of the flight as it had been printed on the evening of the crash.

If this printout is real, it must be noted that the DFDR was afraid of the trees! For 275 seconds after take-off, the DFDR records a few anomalies. That leaves 14 seconds before hitting the trees and **our DFDR becomes very anxious during these 14 seconds.**

- Nothing is recorded for 4 seconds. When recording starts again, speed has fallen abruptly from 140 to 123 knots in 4 seconds. This is impossible the way the A320 was configured.
- **3 seconds of data are desynchronised, none of the flight parameters are readable.**
- and by real bad luck and terrible coincidence, using normal radio altimeter operation as a timing reference, these 7 seconds are at exactly the point on the DFDR tape when the pilot moved the throttles for acceleration.
- there are hand-written notes on the printout, for example "*4 secs to add*", **and in English, if you please.** Why would French civil servants at the CEV write in English? They use French, of course, there are only French people there. Let us just mention that English is the standard working language at Airbus.
- There are no seconds recorded for the times. Seconds are normally recorded by the DFDR. This implies intervention to remove the seconds. Why?
- **The geographic co-ordinates show the crash is in Zambia!** (Again with a hand-written note in English "*Geographical position in Zambia*").

Incredible as it seems, this was the brilliant record presented to the DGAC the morning after the crash. The CEV tried to explain away all these comical errors by saying the faults were due to reading the tape back at 8 times the recording speed, as specified by the DFDR manufacturer Fairchild. The errors were corrected the following day by reading the tape back at twice recording speed. This is ridiculous!

Suppose the CEV noticed during the night that reading back at 8X speed really did cause desynchronisation and the loss of 4 seconds of data, on this particular tape:

According to this same CEV, it takes 20 minutes to read 5 minutes of flight data on the screen and 30 minutes to edit the six volumes of the flight.

It is inconceivable that the CEV did not take the time to re-do the readout at 2X speed, or even just re-do the last minute of the flight, and deliver it to the authorities that morning. They had the time, they had done the first one by 6 AM. Had they so done, we might have had a less whimsy printout. But then, if these anomalies were due to the data being altered deliberately, then changing the read speed would not have changed what was read!

Finally, Mr. Lejeune, head of the decoding service at the CEV testified in 1991; "*We knew neither which type of aircraft it was nor who it concerned*". If the sincerity of the head of the decoding service of the CEV can be judged by that claim

What had to be hidden in the printout to clear the A320?

The forgers who switched the flight recorders had a tough problem. If the switch was to be worthwhile; that is, if there was something on the tapes that had to be hidden to clear the A320, then a new set of data had to be delivered the morning after the accident. That meant working all evening and all night.

The data had to be forged in three operations to meet the deadline:

- a computer printout of the data was produced on the night of the accident. Contrary to what the enquiry members testified, there was nothing to prevent altering the printout on the evening of the crash to clear the A320.
- A transcript of the CVR tape was made on the evening of the crash, but included no precise timing of the end of the flight. The different timings of the events on the DFDR tape were added to this transcript a few days after the crash. Those first transcripts from the BEA are in the official file.
- there was ample time to alter the DFDR tape, it was out of the judicial circuit for ten months **and there is proof of it being used during this period when officially it was not used.**

Up to 6 June 1989, almost a year after the crash, there was no reading of the DFDR tape in the presence of an Officer of the Judicial Police (OPJ). There was adequate time for fraud.

The printouts were the only available evidence for the flight during this first year, Venet & Belotti catalogued five different versions of the printout.

The complete "official" printout of the DFDR tape would only be published by the crash investigators in 1992, 4 years after the crash.

Leaving false recorders at the crash site and rapid transport of the real recorders permitted gaining precious time. Decoding the flight recorders could have taken place about 8 hours earlier than the official version which places it "*during the night after the crash*".

We may imagine that the DFDR and the CVR were decoded in total co-operation with Airbus, because an Airbus Senior Vice President Engineer said that he was informed on the evening of the crash. How could he have been told what happened that evening if we believe the official version which had the first printout coming out of the CEV at 6 AM the following morning?

The tape loop has to be cut to get it out of the recorder, then it is put in the reader. After about half an hour to identify which track concerns the flight in question, the data can be read second by second on the control monitor, stopping on any parameter if necessary. It is very easy rapidly to identify the end of the flight and to print the data that would show normal, or abnormal, acceleration of the engines.

If a major anomaly were detected, the DGAC would have been the first to know, at about 8.30 PM that evening. The information would then, of course, be given to Airbus because very close co-operation is customary between this government department and this manufacturer.

In fact, this closeness went as far as the DGAC supplying blank, pre-signed approval documents for aircraft parts made by Airbus. The DGAC handed over its role of legal watchdog and safety controller to a constructor it was supposed to check on! This caused a scandal in the States when an American senator got hold of the affair and accused France of "*criminal behaviour*" to discredit both France and Airbus.

If it were a fault in the A320 that caused the crash, time was needed to hide it and so the cause of the crash had to be camouflaged in the computer printout which was to be presented to the press and aviation circles the following day.

The anomalies in the first printout could very well be the result of this forgery, **the printout is dated 31 May 1988, a month prior to the accident!**

The real original tape probably showed an interval of 9 seconds between throttle movement and engine thrust instead of the usual 4 to 5 seconds. **The aircraft was out of specification, because certification regulations require that thrust be established and the flight path be positive (i.e. upwards) in less than 7.5 seconds.**

Those extra 5 seconds needed to reach the required engine thrust were hidden by repositioning the pilot's throttle movement to 5 seconds later than reality on the flight record. This enabled showing a version of the crash with the usual interval of 4 seconds between throttle movement and engine pick up.

Naturally this was not done on the DFDR tape that night, there was no time. All that was needed that night was a computer printout that showed data confirming the required version of how the crash happened.

Forging the printout

This is not intended to be an exact description of how the printout was forged in the night following the crash, we do not know exactly how it was done. It is intended to show how wrong are those who say it cannot be done in a few hours, even those who said this in good faith.

The CEV readout of the DFDR tape was not an ordinary computer process. The equipment available for reading DFDR data seems, today at least, unsophisticated , but it was not impossible to gather together the technical means that night to produce a duly modified printout showing an acceptable time for engine acceleration.

The DFDR records data on an a 1/4" tape loop. In the CEV system, this 1/4" tape had to be converted to 1 inch wide, 9 track tape on an RDU, a Read Data Unit. This is the work of one team, in one room.

The 1 inch tape is then taken by hand to another room and given to another team of computer technicians who load it onto an off-line print station for printout of the flight data. The off-

line print station just reads and prints the data, nothing else. This explains why the off-line print station operators were adamant that it was impossible to falsify their printout from the 1 inch tape in the time available. This is what they said and they were, quite rightly, believed..

But what can be done upstream of the print station is another matter.

The data is recorded at very slow speed on the tape, at one second intervals for vital data, at longer intervals for less important data. It is read back in the Read Data Unit to create that 1 inch tape, The data is fed into memory and displayed on a monitor. 64 data words are recorded every second. The data for each parameter is preceded by an identification code, the vital data is easy spot. The operator can freeze the readout on the monitor for closer examination of any particular data. That is, the data is in memory and memory to monitor display is held. The data is malleable. There are sufficient proprietary tools available for data manipulation, down to bit level, that modifying and moving data around in memory and then feeding the doctored result to 1 inch tape is perfectly plausible.

If, for example, one wanted to modify the N1 Command data at a particular time during the flight, one would call up the particular second required and then the N1 Command identification, #51, for example. The data for this parameter would then be moved to another point in the data stream, or altered to a more convenient value, from the keyboard. It takes about 15 seconds to modify a second of data for a given parameter this way.

Throttle movement is recorded on the DFDR. The data for the last few seconds of the flight could be altered by moving the throttle movement data, recorded when the pilot slammed the throttles forward, to a point 5 seconds later on the tape.

The new version would then be written to 1 inch tape and subsequently printed out. It would give a totally different version of the crash from what really happened.

Data on a 1 inch tape can also, and more easily, be doctored in a computer,

The computer equipment needed for any of these possibilities is not very different from that usually available to a government department or a manufacturer in the aviation industry.

It was also possible to use a simulator.

The exceptional capabilities of Airbus' simulator "*Iron Bird*" help appreciate the possibilities of this method. Iron Bird was used in the development of the A320 and particularly in the simulation of different faults and problems. Airbus documentation of December 1997 said that 6 million different faults had been explored, (so obviously that of engine failure to pick up at low altitude was included!)

Internal Airbus documentation is even more specific; "*These simulators permitted systematic checking of each new computer software or hardware version before it was installed in an aircraft . . . conditions in which certain faults had occurred in flight were also replicated in the simulator*

with modification of the suspect parameters" (our italics, Ed.), *by associated increase in the degree or the response of the instruments we acquired a collection of observed data which enables us to rapidly isolate the cause of an anomaly, and at less cost."*

Iron Bird has its own DFDR, using identical 1/4" tape.

It is evident this simulator can do many things. Notably it is possible to have tailor-made flights, and therefore recordings and therefore printouts of them, i.e. "*We can replicate certain faults that occurred in flight*".

It would have been technically possible to replicate the Habsheim flight on Iron Bird.

The experts Auffray and Bourgeois demonstrated that the crash flight could be faithfully replicated on Airbus' simulator. These experts give very interesting information in their final report. They are pilots, but had no experience of flying an A320. Nevertheless they succeeded in flying Iron Bird on flights that simulated the Habsheim crash conditions and "*our difference from (crash flight) speed at any given time is generally less than 1 knot. Differences in height are small, +10 feet at the most and -5 feet on average during the last seconds.*"

They specify that "*all these approaches were recorded as they would have been recorded by the DFDR of a real aircraft*" Iron Bird has evidently all the necessary equipment to produce whatever flight data is required; data, tapes and printout. And to make it absolutely clear, Auffray & Bourgeois go on; "*The fact that the speed and altitude graphs are practically in conformity with the timing data from the recorder shows that the real aircraft behaved in this sense just like the simulator*".

We would have said that it was therefore easy to replicate the crash flight on the simulator!

It was possible to fake the printouts in a few hours

It would be wrong therefore, in the light of all this, to claim that it was impossible to fake the printout in a few hours.

In such a situation of urgency and working under pressure, getting something wrong when inserting the modified data was a major worry. Deliberately desynchronising the data at the crucial point when the throttles were slammed forward was one possible method. of distracting attention. Any eventual errors would be covered.

The Read Data Unit for the DFDR tape permits second by second presentation of the tape data on the display monitor, the second by second timing of the data which has to be desynchronised is easy to identify. Desynchronisation of the data blocks and timing marks can be done by the same computer methods as used for changing the flight parameters.

Forging the CVR tape

The CVR records the last 30 minutes of cockpit conversation and ambient sound. After 30 minutes, new recording overwrites the previous. The tape is analog, like a music cassette, and not digital like the DFDR.

The CVR tape was first played back by the BEA in Paris. In the information heard on a CVR is the voices of the pilots, radio traffic with the ground and also the call-outs of the radio-altimeter, which indicates height above ground by digital display on the pilots' flight screens

and by voice call-out. Voice call-out avoids the pilots having to read their screens when they need to be looking elsewhere.

The Airbus flight manual that pilots are given states, among other things, that at a constant height (plus or minus a few feet) radio-altimeter call-outs are repeated every 4 seconds below 50 feet, and this has always been the way it operated.

On the CVR recording of the Habsheim crash, the sound of the throttles being pushed forward by the pilot a few seconds before impact is clear, "*"Clack-clack"*". It is followed 0.8 seconds later by "*Thirty*" from the radio-altimeter, reporting that the aircraft is at thirty feet, and then two more "*Thirty*" call-outs, which should normally be 4 seconds apart according to the computer program and the flight manual.

The sound of impact with the trees is heard 0.7 seconds after the third and last "*Thirty*", and that is also the point at which the engines are heard to pick up.

In normal operation of the radio-altimeter that would show 9.5 seconds between throttle movement and engine acceleration ($0.8 + 4 + 4 + 0.7 = 9.5$).

However, on the "official" CVR it only takes 4 seconds from throttle to acceleration. 5.5 seconds are missing from normal radio-altimeter operation. Where did they go?

A transcript of the CVR was leaked to the press the day after the crash, apparently by an employee of the DGAC. Because of this unwanted publicity, the sound of the throttle movement was definitely fixed before the first "*Thirty*" and that was a catastrophe for the forgers.

To move the sound of the throttle movement to 5 seconds later, thus whitewashing the A320, and having the CVR agree with the DFDR, meant putting the sound of the throttles between the second and the third "*Thirty*". But that was no longer possible! Airline pilots and others had seen the original version. They would have been up in arms, there would have been a scandal, so the actual chronology of events could not be touched.

The only way left to get an interval of 4 or 5 seconds between the throttles and acceleration was to shorten the interval between the three "*Thirty*" call-outs. The intervals were changed to 0.9 and 2.1 seconds, that is a total of 3 seconds instead of 8 seconds between the last two "*Thirties*".

The examining experts had no explanation for this bizarre change from standard on the CVR record.

Airbus "*studied the problem*" and "*proposed*" a "*hypothesis*" for an explanation. Not very professional, that. One expects a manufacturer to provide an explanation based on documentation and fact. Venet & Belotti, again, did not question this "*proposed hypothesis*". We shall see that this is an important contribution to the forgery of the flight data.

The normal interval between the first and the third "*Thirty*" is 8 seconds, not 3 seconds.

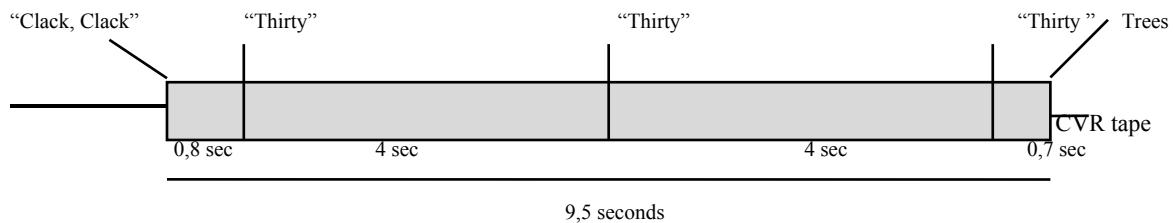
This difference of 5 seconds between normal operation of the radio-altimeter and the official version is providential because it shows there was no problem with engine acceleration.

The Airbus explanation must be considered as opportune and suspect. No manufacturer can simply propose a hypothesis for something that is highly suspect in a case of alleged forgery.

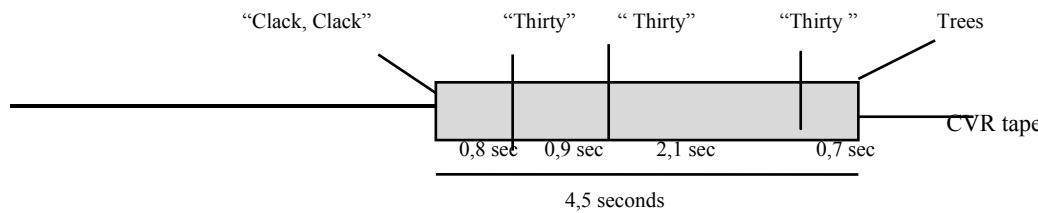
Oh yes, that wonderful "Hypothesis". This was that bumps 1 inch high or more on the runway reset the radio-altimeter. And the bumps were there at exactly the point required to clear the A320. And it happened not just once, but twice. No pilot had ever reported it happening before in level flight on an A320. None has ever reported it since. It has not been included in the A320 flight manual. Not very professional at all, all that.

A good diagram being better than a long explanation, here is normal CVR data for the flight compared to the "official" version:

1) Normal "Thirty" spacing



2) Forged CVR data



Forging a CVR tape is not complicated.

The CVR is an analog recorder and it is quite possible to modify analog data without leaving any trace detectable by spectral analysis, contrary to what some experts think. Also, coherence must be maintained between the DFDR and the CVR tapes to forge the CVR correctly.

The process is first to copy the analog CVR tape onto a Digital Audio Tape, a DAT tape. This digital version of the data is then read into a computer and one is in the same situation as for the forging of the DFDR tape. All the data doctoring needed to clear the aircraft is possible, notably shortening the interval between the radio-altimeter "Thirty" call-outs to reduce the interval between the first and the third call-out from 8 to 3 seconds. We have just seen that this timing is essential to substantiate the forged 4 second reaction time between the throttle movement heard on the CVR and engine acceleration.

Also, when suppressing seconds of recording between the call-outs, the periods before and after the suppressed seconds have to be in an area of the tape when only background noise is heard, because this is stable noise with unvarying and identifiable spectral characteristics. If the spot is chosen correctly, the join will be undetectable.

The modified version is then recorded back to Digital Audio Tape and from there to the analog audio tape as used in the CVR. And recorded on the same CVR tape deck of course, to maintain identical traces of head wear on the tape.

This is the system used to enhance old music recordings to be compiled on Compact Disk. Detection of the enhancement, or the fraud, is impossible.

More on the DFDR forgery

Let's go back to the expert examination in 1992, made by supplementary experts appointed by the Investigating Magistrate.. The mission was "*to use all the most advanced scientific methods for establishing the authenticity and the integrity of the data from the DFDR recorder*" **This was important, because this examination had to fill the legal gaps which prevented any certainty in the authenticity of the recorders.** Five supplementary experts were named:

- three engineers from Schlumberger, experts in magnetic recording heads and telemetry.
Schlumberger is a supplier of Airbus, notably for flight data recorders!
- two engineers from the CEV, **who had to determine if their colleagues had not participated in a plot to forge the data.**

These experts had an interest in the thing they were judging.

Both the CEV and Schlumberger have interests in, and are now judges of, this affair. Both would benefit from the official version of the crash prevailing. Analysis of this examination will enable us to develop the scenario for forging the DFDR tape

Analysis of the tape.

The tape was analysed opto-magnetically to examine the data areas without damaging the base tape. Under optical observation, the digital data on the tape appears as lines, similar to bar codes.

It was thus confirmed that no alteration had been made to the tape at the splice (joining the two ends of the tape loop), at the stripper (head cleaning zone) or the sticker (track change window). It has to be said, however, that because of the multiple, erroneous track jumps and the other recording problems reported by the American Schlumberger expert, Mr. Harmas, there were scarcely any coherent parameters in these zones anyway and the experts' conclusions are not very significant.

This examination also verified coherence of the tape "*offsets*", which are;

- the horizontal traces left on the tape by the small, but highly possible, variations in the position of the tape as it goes over the recording head on each pass.
- displacement of a recorded track compared to the position in which the track was recorded on the previous pass over the recording head.

- finally, an offset could possibly be produced by fresh recording on a track at points other than the sticker or the splice. If this were to occur, it is perhaps possible to see where the new recording begins and ends compared to the data previously recorded on that track.

Existence of offsets is only a possibility, not a certainty.

Sophisticated means were necessary for the fraud - and they were available.

The supplementary experts thought that any attempt to insert false data on the tape to save the reputation of the aircraft would require sophisticated equipment to reconstitute the flight history recorded on the tape and to identify the exact location of the data to be modified. That is obvious enough, but rather restricted in its thinking. **Why would getting sophisticate equipment be an obstacle to anyone who had already had the means to switch the recorders in the context of this major economic problem?**

According to these experts, the flight parameters on the recorder tapes could have been modified with a flight simulator, another tape recording, or a whole series of weird solutions which are not worth bothering with because simpler and more efficient methods were at hand. The supplementary experts said "*We consider it impossible to make any forgery in such a short time*" They suppose that everything was done in the night after the crash and we agree with them, that would have been impossible. But that is naive and lacking in analytical spirit.

If we suspect forgery we have to look at all the facts:-

For one year, the only crash data available was supplied exclusively from several differing versions of the printout and by three differing versions of the DFDR tape, which indicates that at least two, or perhaps all three, were forgeries!

The new tape leaders, of unknown origin, stuck on the "official" DFDR tape during this period are proof that the tape had indeed been used out of legal control.

Simple logic concludes that action by government employees or agents indirectly in government service may be envisaged. No doubt experts not so closely involved, impartial experts, would have had no qualms at following this up. We might then have had a real "expert" examination.

We spoke earlier of the problems that made this a suicide mission for the experts that the Investigating Magistrate selected.

Forging the DFDR tape

The experts from Schlumberger and the CEV envisaged the following scenarios:-

- cutting the tape and physically sticking in a new section. This is totally inept.
- altering the data directly on the tape. But the data bits would be seen to have been modified when the tape was examined. Impractical, we feel.
- read the tape into a computer, modify the data and re-record the results on tape.

It is this last solution that we shall examine, because we believe it left traces that confirm that this was the system actually used. We believe it entailed the following operations;

- read the data tape into a computer. This was either the original 1/4" DFDR tape read via a standard QIC40 tape reader, or the 1" copy of this tape read in by the more common MTU tape unit.
- modify the data for the parameters to be doctored, being careful to maintain aerodynamic and technical continuity.
- place a new tape in the "official" DFDR, which was supposed to be in the hands of the law, and record data on this new tape to get the identifying horizontal scratches from the recording head onto the tape and thus prove it had been recorded in this DFDR. Any old data would do for this "running in" recording because it would be overwritten by the last recording, just like recording one film over another in a VCR.
- record the modified flight data destined to clear the aircraft on the new tape in the DFDR

The Swiss examination has proven that the "official" DFDR is not the one from the wreck. The original electronics read/write deck had to be installed in this official DFDR so that the box and the electronics' serial numbers would agree with Airbus and Air France records.

Nobody in the judiciary knew what was in the 25 hours of flight data on the original tape, apart from 5 minutes of crash data, until the expert examination by Schlumberger and the CEV in 1992. That was four years after the crash. The forgers were completely free to doctor the entire tape.

And it became clear in 1992 that the 6 tracks of the tape have been recorded in a most disorderly manner, attributed to two different faults, uncontrolled changes of the recording track and a breakdown in data input from the FDIU, Flight Data Input Unit which provides digital data from the various analog/digital sensors throughout the aircraft. However, it is impossible that the DFDR actually had these faults, because Venet & Belotti had this DFDR checked by the makers, Fairchild, in the USA. It was declared up to USA delivery standard.

This is further proof of fraud.

Why use a new DFDR tape?

The tape is already in a loop when received from the manufacturer with the ends joined together by a proprietary process (please see the section "splice"). It thus just needs to be installed in the DFDR, to remove it however, it has to be cut.

The flight data recorded in the last few seconds of flight was still on the recording head when the DFDR was opened on the night of the crash to extract the tape. The tape was cut about 4 inches after the recording head in order to preserve that data. There was data on the tape before it was cut and the scissors cut across this recorded data, cutting some data words in two.

Re-recording doctored data on the original tape would necessitate replicating these split words exactly. That would require precision in the order of 1 micron, and that is impossible. Here we totally agree with the supplementary experts who emphasised this impossibility, but they also rejected the use of a new tape for reasons we shall show were not fully thought through.

The cut is the reason for using a new tape. The data words cut on the original tape are reconstituted on the computer and recorded on the new tape in the DFDR with the other, original and doctored, data. The new tape is then cut to extract it from the DFDR and data

words are again cut in two. But it does not matter exactly where the tape is cut this time, or what data is cut in two. Nobody knows where the cut was on the original tape, nor which data was cut.

Positioning forged flight history data on the tape with the computer

The reference point for recording the modified data onto the new DFDR tape is the data for the Paris - Basel/Mulhouse - Habsheim flights, Basel/Mulhouse - Habsheim being the one with the forged data. The data for these flights will be recorded on track 1, which was probably its original position.

The rest of the 25 hours of data on the original tape must then be copied on to the new tape in a logical manner in relation to this reference point. But there is a problem. It will be a long and complex operation to ensure overall coherence of all flight information if the original data for the preceding flights is used. In particular, as the new tape will not be cut in the same place as the old tape, it will be necessary to reconstitute the flight data destroyed on all the tracks when the original tape was cut, as was done for the crash flight data on track 1.

It would take a long time and would mean rebuilding 25 hours of continuously logical data.

What faults could a DFDR have, which would avoid this obligation of logical continuity? Why erroneous track jumps and data input problems, of course! So, these two faults of uncontrolled track jumps and a fault in the FDIU data input are also faked on the tape.

The recorders had been kept well away from the judiciary in previous crash enquiries, so it was probably thought that this easy way out of the problem would not attract any attention. Nobody would look closely at tape data that had nothing to do with the crash.

These fake DFDR faults enabled compiling different parts of the flight history of the aircraft without having to assemble them in a logical sequence. It is particularly useful as there is no need to ensure data continuity either side of the place tracks 2, 3, 4, 5 and 6 will be cut when the newly recorded new tape is extracted from the DFDR. This camouflages the data at the end of each track at the cut.

The experts' track by track analysis of the official tape showed that tracks 3, 4 and 5 had no continuity of data either side of the cut. Only tracks 2 and 6 had continuity, and here the aircraft was luckily on the ground. Very luckily, it saved having to ensure continuity of the data of an aircraft in flight, which is much more complicated.

The aircraft is on the ground in Berlin on track 2 and on the ground in Toulouse on track 6. There is no problem in data continuity, apart from time and geographic position, which is conveniently fixed.

These track jumps and data input problems were red herrings designed to put seekers of the truth off track, literally! But what was not planned in this orchestrated confusion **was that an expert from the American maker of the DFDR would declare it to be in perfect condition, which left no room for it to have three different faults; track jump, lack of data input and no DFDR error signal to the flight instrument panel!**

This is a puzzle with only two possible solutions;

- **The DFDR and the FDIU repaired themselves in the crash, or**
- **These faults were deliberately faked on the official flight data tape.**

Positioning the computer forged flight data on the new DFDR tape

Once the data had been modified and positioned for the selected track, it could be recorded on a new DFDR tape.

A new tape had already been installed in DFDR serial # 3237. This was a genuine manufacturer supplied DFDR tape loop. It had been running for about 50 hours recording unimportant data to get the identifying scratches of the authentic recording head on it.

The 6 tracks of false crash data and previous flight history compiled on the computer are recorded one after the other on this tape in DFDR #3237. **Exactly as if the DFDR were in an aircraft.**

Recording of track 1, which contains the crash data, starts logically immediately after the sticker, the optical signal to change tracks. Starting recording at this precise point means that there will be no data offset with the next data recorded at this point in 25 hours time.

To make things even easier, the computer created a wide 25 minute zone (23 meters long!) after the sticker filled with unimportant data which avoided having to worry about data continuity at this point where the Paris - Basel/Mulhouse - Habsheim flight would be recorded.

Recording on tracks 2 to 6 also starts at the sticker for the same reasons of avoiding offset. The legal experts confirmed that "*recording may be started at very precise positions on the tape, to within one second*". Starting recording just after the sticker was no problem.

Keep in mind that the tape was not read in the presence of a Judicial Police Officer until one year after the crash. That is enough time to go calmly about perfecting a forgery.

All that was known about the data on the tape until then was what had already been shown on the official printout:- 5 minutes of the Basel/Mulhouse - Habsheim flight and a few seconds of a Venice - Paris flight. It was easy to insert these five and a bit minutes of known information in the doctored data because nobody knew, officially or legally, what was on the original tape.

The only way to find the reality of these flights would be to find the genuine original tape.

The tape was then extracted from the DFDR. For this, the tape was first cut and then removed from the DFDR. The famous tape leaders were then fixed to it, so that it could be subsequently fed into a tape reader. But, the leaders were fixed on by an operator who was not conversant with the CEV standard operating procedure for DFDR tape leaders. This operator fixed on leaders that were too short and of the wrong colour. They were glued on the wrong side of the tape and glued permanently, not with an easily undone joint that permitted reading the data underneath the leader.

The name and address of this operator, an eminent French scientist, were given to the Investigating Magistrate by the Defence. Nothing happened.

Authenticating the forged tape

So it was that on 6 June 1989, a year after the crash, the forged DFDR tape could be read under the control of legal expert Bourgeois, who was not necessarily aware of the forgery and apt to protest his honesty later. Adjutant Wiatt of the Aviation Transport Gendarmerie, who had seized the tapes and the recorders for the law, was the Judicial Police Officer present, as required by law. He failed however to fix seals to the tape to be read, nor had he noted the condition of the tapes returned by the expert Auffray. He was soon promoted to be head of the B.G.T.A. (Air Gendarmerie brigade) at Toulouse airport, the headquarters of Airbus.

With all these errors and contradictions; with all the opportunities available, the time to accomplish the task and the multiple technical possibilities for achieving it, how can anybody still swear that the tape examined by Schlumberger and the CEV was the authentic DFDR tape?

The Schlumberger/CEV experts said that the scenario of tape forgery was impossible: they were wrong.

As to these experts' "proof" that forgery was impossible . . . a little bit of common sense is needed; They rejected the Defence's scenario for forging the tape on the following grounds:-

- **first objection:** "As the tape used for the copy could not be new (because of the presence of offset on tracks 2 to 6), it would of course have been recorded upon by another recorder with a different recording head from that of DFDR #3237. But our magneto-optical analysis revealed no signature of a different head from that of #3237".
- 1. **We reply; the electronics deck from DFDR #3237, the crash recorder, was perfectly available to the forger. So it is far from surprising that the #3237 head signature was found on the tape that they analysed.**

The experts' objection, which appeared to be valid at the time, was accepted by the judges, but an examination that did not up-front reject the possibility of forgery would also checked another possibility that invalidated the experts' objection;

the Schlumberger/CEV experts refused to envisage the possibility of a government department being implicated in the forgery. They thus rejected out of hand the idea that it was really the DFDR #3237 recording head that had been used.

Nobody denies the Court recorders have authentic read heads in them.

It has been shown that expert Auffray kept the recorder boxes and the tapes with him for over 10 months and nobody denies that the recorder box he kept is serial #3237. The presence of different tape leaders of unknown origin on the tape proves irrefutably that the tape had been used while in his guard.

The presence of offset on tracks 2 to 6 reported by the experts was easy to obtain by running the tape on DFDR #3237 for about 50 hours as we have explained and for precisely these reasons of offset.

**Why would another electronics deck have been needed when the original was available?
Furthermore, the legal seals on it were broken so it could be used with no problems.**

- **The experts' second objection**

"The tape used for the forgery should have been identical in length to the original, with no more than 1 micron difference".

Our reply:

- **First of all, length of the tape is unimportant.** The experts argument sounds highly scientific, but it was intended to deceive the judges. Venet & Belotti themselves wrote that "The American expert Mr. Harmas indicated that the length of a tape can vary by several feet, depending on the tape tension, the temperature and the number of hours of use it has".

This ridicules the experts' objection. Nobody can measure a tape 136 meters long to as accurately as 1 micron. A measurement which furthermore would have been useless, because tape length would have changed the following day.

- **Positioning the faked data on the new tape posed no problem "accurate to 1 micron".**

We have seen that the tape was full of erratic recording errors identified by the Mr. Harmas and by the Schlumberger/CEV experts three years after the forgery was perpetrated.

Recording could therefore easily be positioned at a position on the tape which was not the same as on the authentic original tape, because nobody knew officially what was on the tape until 1992, 4 years after the crash.

In developing this objection, these experts put themselves in the position of imagining that the forged data had been inserted on the original tape. We have already shown that there was an insurmountable problem with this way of doing things, placing the data words originally divided by the first cut at the exact position of the new cut.

We have also shown that this objection is groundless if a new tape is used.

- **The experts' 3rd objection: It is impossible to reproduce the slowing down of the DFDR.**

Magneto-optical analysis of the DFDR tape showed that that it had slowed down in its passage over the recording head during the last two seconds of recorded data when the A320 sank into the trees. **The supplementary experts objected that it was impossible to reproduce this in a forgery.**

Our reply: The engine alternators produce frequency stabilised current and the DFDR tape reel motors consequently work at a constant speed. These alternators disconnect at 50% of engine compressor speed and this will cause the DFDR to stop. This is what happened when the engine, or engines, of the A320 slowed considerably from ingested tree debris.

According to the CEV/Schlumberger experts, the reel motors of the DFDR slowed by about 3% over a 2 second period, while the data was still sent to the recording head at normal speed,

because the internal recording electronics are less sensitive to electrical frequency variations than the motors.

The tape goes more slowly over the recording head, so less tape passes over the head in any given period of time. But just as much data arrives, on less tape, so the data is recorded closer together. The data is compressed. This is what happened during these two seconds, that is over about 2 centimetres of tape.

After all, why not?

Could this be reproduced? We say "Yes!"

The tape converter that first read the DFDR tape and produced 1 inch tape did not reproduce this data compression, because it did not prevent reading the data.

All that is needed to reproduce the slowing down and the data compression when recording faked data on a DFDR tape is to reproduce the original cause and vary the frequency of the electrical supply by the same amount of 3% and for the same time.

The frequency of electric current is stabilised electronically, it is also varied electronically. A standard electronic frequency variator installed in the DFDR electronics power cable will vary the frequency of the DFDR reel motor supply by whatever is needed, in this case 3%. The frequency has to be varied at exactly the right moment, however, and this cannot be done by hand. But all the electronic equipment needed to do it automatically is available, principally the computer that is reading the fake data as it is transmitted to the tape for recording. One piece of data is identified as the point when the tape should start slowing down, when that data is read by the computer it sends a signal to the frequency converter to enter into action. The frequency converter reduces the DFDR supply current by 3% and the current is cut off 2 seconds later. The slowing down of the DFDR tape in the crash has been replicated. And remember the tape moves very slowly when recording, about 1 cm per second, so there is plenty of time for a computer to do this.

But, you will say, why replicate this data compression that nobody officially knew about if you are forging the tape? What is the need?

Good question. Quite simply because, during the year that the DFDR was out of legal control, it became obvious that Michel Asseline and other airline pilots were not going to swallow any old story. As of September 1988 the President of the SNPL pilots' union had demanded that the recorders be examined by an organisation totally independent from the French state. There was a considerable risk of close examination of the forged tape in another country, by other experts.

The evidence of the experts Venet & Belotti about "*scientific proof*" disproving the case for the tapes being forged was based on the expert analyses we have just examined and criticised, and particularly on the CEV/Schlumberger analysis. We have shown the errors in this analysis.

So what is left of the famous authentication of the DFDR tapes? An authentication clamoured to the rooftops as incontrovertible truth.

Nothing is left, except flight recorders that have been proven to be substitutes and flight data that multiple facts show to have been forged.

And yet it was on such evidence that Captain Asseline was sentenced to prison.

Sufficient proof of forgery

Substitution of the flight recorders now being an incontrovertible fact, we shall probably hear that "yes, it certainly happened, but that does not prove forgery of the data. Furthermore, they will say, the legal experts said the tapes were not forged". "They" are the same people who swore blindly in the first place that the recorders had not been switched.

All this closing of ranks to confirm each others' integrity is totally shameful in an affair where the decision to lie and fraud was taken at a very high level. They should stop treating the French, and the rest of us, like idiots.

To summarise, we have established the following **facts**;

- The recorders were intercepted and removed from the normal legal circuit. This shows that there was a desire to fraud immediately after the crash, otherwise there would have been no need to switch the recorders.
- As the Court recorders are not the recorders from the crash, it is impossible that traces of hydraulic fluid and fire extinguisher products from the crashed aircraft be found on them.
- If these products really reached the recorders in the crash, it is impossible that traces of the smoke from the fire did not also reach them. In which case, such traces would also be found in the expert examination.
- The tape leaders on the "official" Court DFDR tape are not those originally fixed to the DFDR tape. This confirms that a different tape has been used with different leaders.
- The CEV analysts testified that there was no anomaly in the recordings of the aircraft's accelerations. This is patently false and they could not be unaware of it.
- It is impossible for a DFDR to be declared as up to delivery quality by its manufacturer and to have three different operational malfunctions recorded on the "official" tape that was in use in this recorder when the A320 crashed.
- It has been proved that the official video of the crash was faked.
- It is not possible for an aircraft to fly at stall speed and at an angle of incidence equal to 15 knots more than stall speed at the same time.
- The probability that the CVR would record a malfunction in the radio-altimeter which was hitherto unknown to the manufacturer and which has not happened since and which, providentially, proved the aircraft innocent is astronomical. And this radio-altimeter quirk happened twice in less than 5 seconds, so the probability is . . . at least twice as astronomical, especially if both quirks happen precisely at the disputed point of a throttle-up in a famous crash..
- Engine thrust was dissymmetrical as recorded by the scars at different heights the trees. This dissymmetry should have been recorded in the flight parameters on the DFDR. It was not recorded.
- The GPWS alarm is clearly audible on the CVR, but it is not recorded on the "official" DFDR tape, although it is a parameter that is normally recorded. This is coherent with the tape having been forged. It was not due to a recorder fault, the recorder was checked and found in perfect working order.

These are facts recorded in the official enquiry and are therefore indisputable. We believe that they are the traces of a forgery which could not be totally hidden and taken

together, they form a sufficiently complete and coherent proof that forgery really did take place.

Naturally, absolute proof may only be supplied by comparison with the genuine original tape. But if substitution of the recorders was organised, it was precisely to prevent ever finding the original tape.

Comment

From the very beginning of this case, justice has been the victim of relentless determination to prove the A320 perfect, even if that meant blaming the pilots for total responsibility in this crash, whereas responsibility was shared amongst many.

It is understandable that an accumulation of witnesses impressed the judges and that they were tempted to follow the arcane declarations of so many experts. The technicality of the case was such that they had no way of knowing if they were being told the truth or lead up another path.

The experts Venet & Belotti told the court that they had produced 27 decisive witnesses. Truth does not depend on numbers. Such reasoning did not help Galileo when he maintained the earth was round, against the mob.

Such reasoning did not help Captain Dreyfus either, he was accused of treason and he was alone against 200 officers and other dignitaries until it was proved that the bordereau that had been used to condemn him was a forgery.

Indeed, it is difficult not to compare the Captain Dreyfus case at the beginning of the century with the case of Captain Asseline 100 years later. Both are victims of a plot to protect a *raison d'Etat*.

Except that the truth still has to be told for Michel Asseline in the light of this criminal substitution of the recorders and the flight data forgery.

Flight data recorders are there to help establish the causes of an aircraft accident, in order to prevent it happening again, as far as is possible.

Will airline pilots let their black boxes keep recording when they fly over France if the data from them can be forged in all liberty in our country to hide the real truth of a crash?

Photo captions:

Photo #1

Taken from a helicopter by Sipapress. Near the right edge a man is carrying two flight recorders (arrowed).

Photo #2

Enlargement of photo #1 by the IPSC of Lausanne. Mr Gérard is carrying the CVR (the shorter box) in his left hand and the DFDR in his right.

Photo #3

The flight recorders in the Tribunal Correctionnel (lower Court) at Colmar in December 1996. The DFDR is in front. The narrowest side visible is the one to compare with the side of the DFDR carried by Mr. Gérard, manager of the Alsace arm of the DGAC (photos 1 and 2). The DFDR removed from the wreck has two white reflecting stripes at right angles to the edge of the box, that in the Court has diagonal stripes!

Photo #4

Enlargement of photo #2 by the IPSC. A vague white spot can be seen on the side of the box Mr. Gérard is carrying. It is this spot that the experts Venet & Belotti testified was "*Two parallel white stripes at an angle of approximately 20° to the rear side of the box*"!

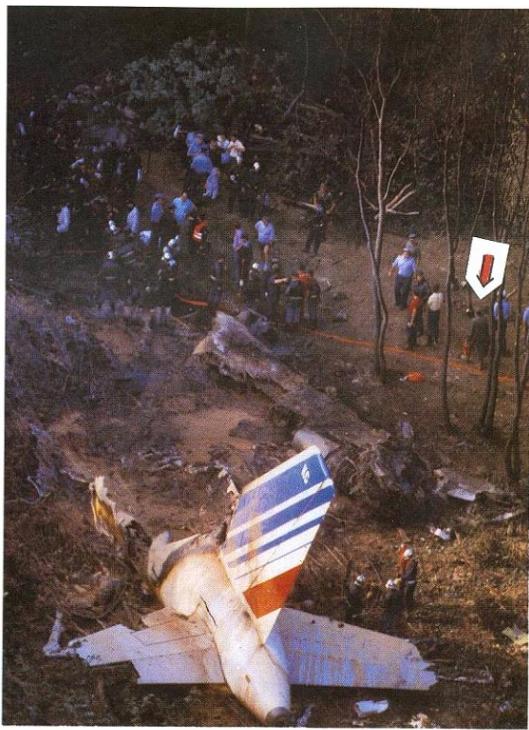


PHOTO N° 1 : prise d'hélicoptère par SIPAPRESS. Sur le bord droit, au milieu, on distingue un homme portant deux enregistreurs de vol (flèche rouge).



PHOTO N° 2 : agrandissement de la photo n° 1 par l'IPSC de LAUSANNE. M. GERARD porte le CVR de la main gauche (plus court) et le DFDR de la main droite.

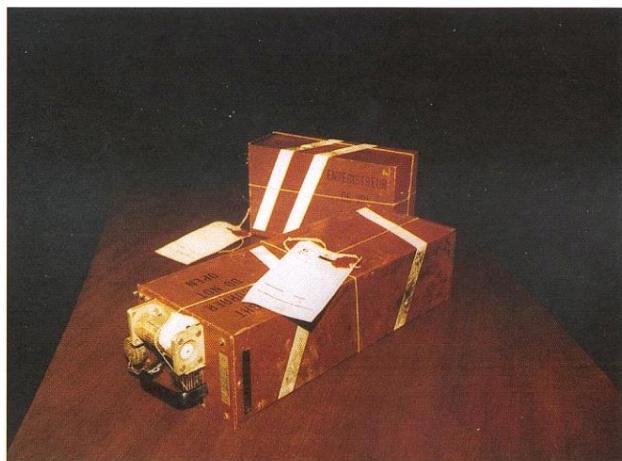


PHOTO N° 3 : Les enregistreurs au Tribunal Correctionnel de COLMAR en décembre 1996. Le DFDR est devant. La face visible la plus étroite est à comparer avec celle du DFDR porté à proximité de l'avion par M. GERARD, Chef de district ALSACE de la DGAC (photos 1 et 2). L'enregistreur DFDR extrait de l'avion comporte des bandes blanches perpendiculaires. Sur celui du Tribunal, elles sont en diagonales !



PHOTO N° 4 : agrandissement de la photo n° 2 par l'IPSC. Sur la face latérale du CVR porté par M. GERARD, on distingue une tache blanche informe. Les experts VENET et BELOTTI affirment voir sur cette tache : "deux bandes blanches parallèles entre elles et orientées selon un angle d'environ 20° par rapport à la face arrière du boîtier" !!

Glossary

BEA

Bureau d'Enquêtes Accident - Accident Enquiry Bureau. at Villacoublay airbase near Paris. Reports to the DGAC

CEV

Centre d'Essais en Vol - Flight Test Centre. Located at Brétigny airbase near Paris. Reports to the DGAC.

CVR

Cockpit Voice Recorder (a "Black Box")

DFDR

Digital Flight Data Recorder (a "Black Box")

DGAC

Direction Générale de l'Aviation Civile - French Civil Aviation Authority - equivalent of FAA.

IGAC

Inspection Générale de l'Aviation Civile - should be something like the NTSB, but is very low profile.

IPSC

Institut de Police Scientifique et Criminelle - Scientific and Criminal Police Institute. Lausanne, Switzerland.

ONF

Office National des Forêts - the Forestry Commission,

Prefect

(Préfet) French official, administratively responsible for a Département.

RESEDA

The CEV's DFDR decoding system

SNPL

Syndicat National des Pilots de Ligne- the main French pilots' union.

TGEN

Time Generated. An identification point on the DFDR tapes. Generated by timing bips from an arbitrary, pilot defined "Mark", usually leaving the gate.

TOGA

Take Off/GO Around. Throttle position for maximum engine thrust.