(Page 9/286) The investigation of the accident was based on the following four focal points, considering the Operational, Human and Material factors:
1) Functioning of the transponder and radio/navigation equipment of the N600XL airplane;
2) The degree of knowledge and preparedness of the N600XL pilots for the conduction of the flight in Brazil;
3) Aspects relative to the rules and procedures of the Air Traffic Control systems currently in operation, both in Brazil and around the world; and
4) The Communication and Surveillance Systems of the Brazilian Airspace Control System (SISCEAB).

The Report considers flights in Brazil different from other parts of the world. What is the reason, and aside from air traffic control failures and systemic deficiencies, is their contention that the reality of flying in Brazil differs from the applicable regulations?

(Page 10/286) Recommendations were made in relation to:
The preparation of the American pilots who travel abroad in sporadic missions, as the one of the accident in question; pilots who are used to another culture and other operating standards, following the rules of the Federal Aviation Administration (FAA) which present peculiarities and differences in relation to the rules of the International Civil Aviation Organization, the entity of which Brazil is a signatory State and whose rules are applied in the national airspace.
(In coordination with American aviation authorities) improving the alert systems of the airborne anti-collision equipment, with the purpose of making them more efficient through the use of sonorous alerts, capable of alerting and warning pilots who are with a poor situational awareness, as to the correct mode of operation of the equipment during the flight.
Operational and organizational aspects of the SISCEAB, aiming at perfecting the safety levels of the services provided to its users.
Enhancement of the process of involvement of the Brazilian aviation inspecting authorities in the field of delivery of new aircraft, as Brazil has an aircraft manufacturer of a considerable size, with the purpose of obtaining a higher level for the certification of the qualification, degree of proficiency and safety of the crews assigned to ferry flights and other types of flights over the national territory.

There is no recommendation for the pilots, merely a series of seemingly rhetorical questions.

(Page 13/286) **To EXCELAIRE SERVICES, Inc., it is recommended:**
[RSV (A) 69/A/07 – CENIPA, on 24/Sept/2007] - To reassess the criteria for the selection and assignment of the flight crews to conduct ferry flights, both in the USA and abroad, giving priority to the technical-operational knowledge of the crewmembers, their experience in the equipment, as well as their mastering of the flight rules in force.
[RSV (A) 70/A/07 – CENIPA, on 24/Sept/2007] - To reevaluate the CRM Training Program of the company, and insert a plan for systematic recurrent training.
[RSV (A) 71/A/07 – CENIPA, on 24/Sept/2007] - To set up protocols to be executed by the pilots, and supervised by the Operations Sector, aiming at the strict compliance with the prescriptions of the company's General Manual of Operations relative to flight planning.
RSV (A) 72/A/07 – CENIPA, on 24/Sept/2007 - To set up protocols to be executed by the pilots, and supervised by the Operations Sector, aiming at the strict compliance with the standards of cockpit doctrine prescribed for all the flights conducted by the company.
RSV (A) 73/A/07 – CENIPA, on 24/Sept/2007 - To reevaluate the organizational structure of the company, aiming at the optimization of the work done by the Flight–Safety Sector, while assuring that the sector has independence in the accomplishment of its tasks.
[RSV (A) 74/A/07 – CENIPA, on 24/Sept/2007] - To revise and update the General Operations Manual of the company, as well as the ExcelAire Operative Specifications, in view of the acquisition of EMB 135BJ aircraft.
[RSV (A) 75/A/07 – CENIPA, on 24/Sept/2007] - To reassess the criteria for the operational evaluation of the pilots, relative to the application of the principles of Crew Resource Management to the flight planning and all other phases of the flight.

[RSV (A) 76/A/07 – CENIPA, on 24/Sept/2007] - To reevaluate the criteria for the operational training of the pilots assigned to flights outside the USA, especially within airspace under the ICAO rules, concerning the preparation, planning and execution of the flight, aiming at keeping an adequate situational awareness through all the phases of the operation.

All these recommendations are for Part 135, not Part 91, under which the flight was conducted. They are also based on conclusions arising from unsubstantiated comments about the pilots' qualifications for this trip.

(Page 20/286)

a. Flight hours	PIC	SIC
Total	9,388:10	6,400:00
Total in the latest 30 days	Unknown	Unknown
Total in the latest 24 hours	03:20	03:20
Emb -135 BJ	05:35	03:30
This type in the latest 30 days	05:35	03:25
This type in the latest 24 hours	02:30	02:30

These numbers do not reflect flight hours in similar aircraft, which should be included, nor do they reflect recent simulator training in the aircraft.

(Page 20/286)
c. **Validity and category of licenses and certificates**
The four pilots held Technical Certification for the respective types of aircraft and valid "ATP" licenses. All of them had valid Medical and IFR Flight Certificates.
d. **Qualification and flight experience for flight type**
d1**. PR-GTD** – Both pilots were qualified and experienced for the flight type proposed.
d2**. N600XL** – Both pilots were qualified and certified for the flight type proposed; nevertheless, both of them had little experience in the Emb-135 BJ aircraft.
The N600XL co-pilot had about 300 flight hours in aircraft of the Emb-145/135 family, of regular air transport. As for the pilot, it was the third flight onboard an Emb-135 BJ, as a crewmember. Both pilots were making their first en route trip in the Brazilian airspace. It was also the first time they were flying together, as members of the same crew.

They consider the Legacy pilots qualified and certified for the flight. "Experienced" is not a quantifiable specification and depends on who is analyzing.

There is little or no substantiation about what leads to the statement about the Gol 737's crew. We would like to know more about their qualifications and whether there were any extenuating circumstances about the accident flight. There are reports that the crew of the Gol aircraft reportedly was distracted from their flying duties, yet none of that is explored in the Report. For instance, it appears the Captain of the Gol aircraft was giving OJT instruction to the co-pilot while on a commercial flight carrying passengers. The Gol recommendations include the restriction of electronic devices in the cockpit, but do not elaborate.

(Page 21/286) According to the technical maintenance logs examined, the maintenance was up-to date.

Maintenance performed at Embraer during the acceptance period is not considered, despite possible relationship between repaired items and possible equipment failures during the accident flight.

(Page 21/286) Less than 24 hours after the accident, a team made up of CENIPA and EMBRAER members performed checks ("self-tests") in the avionics of the Legacy airplane. The two pilots were present during the tests.

On the day after the accident, a team composed of members of the CIAA and Embraer moved to Cachimbo Air Force Base, State of Pará, Brazil (ICAO code SBCC), where the N600XL airplane had landed after the collision. This team, with the participation of the two N600XL pilots, conducted operational tests on the ground (self-tests) in some of the onboard systems of avionics. These tests involved the transponder and TCAS systems, according to the AMM 1770 Part II 34-43-00-5, TCAS – *Adjustment/Test* and the AMM 1770 Part II 34-52-00-5, *Transponder – Adjustment/Test.* None of the tests revealed any failure or abnormality.

The WOW switch was not checked during these or any subsequent tests, nor were the installation and wiring of the avionics and antennas.

(Page 26/286) 3.3.4 Tests conducted in Cachimbo on the 7 October 2006
Initially, at the *Campo de Provas Brigadeiro Veloso*, where the N600XL airplane had landed, tests were made with the intention of verifying the working condition of the Transponder system, (Mode A, Mode C and Mode S), the TCAS, and the VHF COM systems, in order to check, in particular, whether those systems were being operated according to the procedures prescribed in the production line of the Emb-135BJ design. The results of the tests showed that they were functioning properly and in accordance with what is prescribed in the aircraft design.

The WOW switch was not checked during these or any subsequent tests, nor were the installation and wiring of the avionics and antennas.

(Page 28/286) Basically, the investigators tried to rebuild all the operational environment of the accident flight. The focus was on the functioning of the avionics, and they tried to reproduce all the spurious messages that had been registered in the download process, so as to verify whether the binomial transponder/TCAS had not sustained momentary failures, as the collision involved two aircraft equipped with the most advanced airborne collision avoidance systems.

The tests were with the aircraft on ground. The WOW switch was not checked during these or any subsequent tests, nor were the installation and wiring of the avionics and antennas.

(Page 32/286) By means of a consultation of the Logbooks Nº 001/PT-SFN/2006 and 002/PTSFN/2006, it was verified that, for the whole process of production and delivery of the N600XL, there are not any registers of abnormalities involving transponder failure, noncommanded change of the mode of operation, or any other failure that could be relevant in the context of the investigation.

Maintenance done at Embraer during the acceptance period is not considered nor was the troubled history of components on the aircraft.

(Page 33/286) The tests performed and presented in the Field Notes documents, of 1 December 2006 and 9 February 2007, confirmed the requirements of the descriptive documents of the Transponder, Communication and TCAS Systems, as well as their Certifications. Therefore, the N600XL equipment did not present design or integration error.

The tests were with the aircraft on ground. The WOW switch was not checked during these or any subsequent tests, now was the wiring and installation of the avionics and antennas.

*(*Page *34/286)* They were flying within type A controlled airspace, in which, in accordance with item 7.4.1 of ICA 100-12, only IFR flights are permitted, all flights are under air traffic control service, and are separated from each other.

RVSM rules are applicable but are not considered here. A key provision of flying legally in RVSM airspace is a properly functioning transponder, without which air traffic control is required to increase vertical separation.

(Page 35/286) N600XL received an initial clearance from the Ground Control at São José dos Campos, to fly at flight level FL370 (37,000 feet). No clearance limit was mentioned, up to which the clearance would be valid.

The definitive clearance limit given the pilots of N600XL by air traffic control was Eduardo Gomes Airport.

(Page 36/286) On account of the manner the clearance was transmitted, there could be some different interpretations of the FL 370 clearance limit.

There is no "different interpretation." The clearance limit was Eduardo Gomes. That limit was expressed unequivocally by the São José controller.

A possible understanding might be that the clearance was valid up to Eduardo Gomes International Airport.
Another interpretation would consider the limit as being the fix marked out by the city of Poços de Caldas.
However, according to the flight plan that had been filed, a flight level change was planned overhead Brasilia (BRS VOR), where the aircraft was to descend to FL 360 (36,000 feet).

There is no "different interpretation." The clearance limit was Eduardo Gomes. That limit was expressed unequivocally by the São José controller.

(Page 37/286) The control unit providing RADAR SURVEILLANCE took no action to interfere with the vertical navigation of N600XL when the aircraft passed the vertical of BRS VOR, at 18:55 UTC, and proceeded with a new heading, now at a wrong flight level, joining airway UZ6.

"Vertical navigation" should be changed or explained as altitude change.

The altitude was correct for the pilots as air traffic control has sole discretion over altitude assignments. It was only "wrong"' because air traffic control did not realize that they had directed two aircraft on a collision course.

(Page 37/286) On the screen of his console, the ATCO had every indication that the information of the transponder was not being received. The pilots, on the other hand, despite being within RVSM airspace, did not notice that the transponder was not transmitting altitude information anymore.

ATC is responsible for noticing the transponder not transmitting and taking corrective action.

(Page 37/286) The N600XL pilots, having not received any new instruction, maintained FL370, which was incorrect for airway UZ6.

There is no "incorrect" level for UZ6. Flight Level 370 was assigned by ATC, making it correct for the pilots. Again, air traffic control has the '"big picture" of the skies and the discretion to use airspace based on its own needs and knowledge.

(Page 37/286) According to data retrieved from the N600XL CVR, the flight crew, after the collision, perceived that the transponder was not transmitting.

This is a misinterpretation of the CVR. There is no factual data that the pilots perceived the transponder was not transmitting and the pilots have repeatedly explained their conversations to investigators.

(Page 37/286) At 20:02 UTC, the transponder equipment restarted transmitting signals to the ATC

radars, including the original code that had been assigned to the aircraft.

There is no mention of the GOL aircraft disappearing from the Manaus radar screen at the same point.

(Page 37/286) Since 19:26 UTC – about 30 minutes before the collision –, when the Air Traffic Controller responsible for sector 7 unsuccessfully tried to establish radio contact with N600XL, the Legacy airplane was no longer under effective Radar Surveillance, contrary to what had been informed to the pilots 35 minutes before.

The phrasing is not clear and could be interpreted as a pilot fault rather than equipment failure or human failure by controllers. Only the controllers could recognize that Radar Surveillance had ceased, which should have led the controllers to attempt contact with N600XL and divert any conflicting traffic.

(Page 43/286) From this transcript, it can be observed that both the N600XL crew and the ATC unit did not comply with the prescriptions of ICAO Doc. 4444, Chapter 4, items 4.5.4 “Contents of Clearance”, and 4.5.7.5 “Read-back of Clearances”. A main discordance was the IFR clearance, delivered in an incomplete manner, not mentioning a clearance limit.

The crew read the information back to ATC. Correction of the read back is the responsibility of ATC.

(Page 43/286) The following pieces of information were missing in the ATC instructions:
a) The clearance limit regarding FL 370 was not provided in a clear manner.
b) Information was not provided whether FL 370 was for the entire route or for part of the route. In the latter case, it was necessary to mention the other flight levels and their respective limits.
c) No mention was made whether the flight plan had been “cleared as filed”. This would certainly be fundamental to alert the pilots about where further level changes would occur.
On account of the manner the clearance was transmitted, there could be some different interpretations of the FL 370 clearance limit.
A possible understanding might be that the clearance was valid up to Eduardo Gomes International Airport.
Another interpretation would consider the limit as being the fix marked out by the city of Poços de Caldas.

The clearance was complete. The limit was Eduardo Gomes Airport. The fact that the controllers did not say ”cleared as filed”’ further reinforced the fact that N600XL should follow ATC verbal instructions and NOT the proposed flight plan.

(Page 43/286) It was observed that in his read-back, the pilot says “SBEG” when reading the fourletter ICAO location identifier of Manaus International Airport, as if it were a word, not complying with the standard phraseology.
This leads to a possible interpretation that the level referred might have been understood as the only one for the entire route.
This interpretation of the flight level 370 having been understood as the one prescribed for the entire route was confirmed by the N600XL crew in an interview to the CIAA.

ATC is responsible for correcting read backs, and in the absence of any corrections by air traffic control, the crew rightfully concluded that ATC was in agreement with the read back.

(Page 45/286) After this last two-way radio contact, both the N600Xl and the ACC BS did not make any calls during the next 35 minutes.

There is no mention of the radio calls heard in the cockpit, nor are such calls required by regulation. It was incumbent upon controllers to contact N600XL immediately upon the failure to receive a transponder return.

(Page 48/286) By means of a flight conducted by GEIV after the accident, it was verified for the FL 370 on airway UZ6 a loss of contact with ACC BS at the distance of 100 NM and beyond. This verification points toward an operational and organizational failure of the ACC BS in the frequency assignment to N600XL. It is important to point out that the frequency 135.900 MHz, prescribed for sector 7, is fully operational along UZ6.

This loss of contact in that portion of the airspace is not included in the Conclusions section.

(Page 49/286) The CVR of N600XL recorded the voices and sounds in the cockpit, and also the calls made to ACC BS and ACC AZ. However, there are not records of the frequencies on which the calls were made. The same is true for the transmissions received.

There seems to be some suggestion of fault, when this is merely a statement of fact. The equipment aboard N600XL functions this way. The frequencies are recorded in the ATC stations.

(Page 55/286) The airplanes collided without receiving the expected alerts from their airborne anticollision systems, due to the fact that one of the airplanes, N600XL, had interrupted the functioning of its own system, something that was not perceived by the crew.

This phrasing suggests that someone turned it off and that the crew should had perceived the OFF condition. It must be rephrased, as there is no evidence upon which this conclusion can be based. There is no conclusive evidence of why N600XL's equipment failed.

(Page 57/286) The investigation of the Operational Aspect was conducted under the aegis of the RBHA 91, also taking into account the prescriptions set in the *14 CFR Part 91,* as well as other documents published by the *Federal Aviation Administration (FAA).*

Throughout the Report, the investigators cite from Part 91 regulations and Part 135 regulations. This is a Part 91 requirement, while in other portions, they cite Part 135 requirements. This confuses many of the observations and conclusions in this Report.

(Page 57/286) Before conducting the Ferry Flight on the 29 September 2006, the N600XL crew participated in the receipt flights in Brazil and officially accepted the aircraft, after some necessary repairs and adjustments of non-conformities in the phase of finalization of the aircraft delivery, in accordance to what was prescribed in the purchase contract between the parties.

The purpose of the acceptance flights is to ensure the aircraft performs as it is supposed to, not based on some unusual contractual provisions. The repairs included some failures that could lead to a failure on the electrical essential bus. This fact was not considered in the analysis of any potential equipment failures, though it should have been.

(Page 57/286) In summary, the ferry flight between São José dos Campos and Fort Lauderdale was proceeding in accordance with the rules set in the RBHA 91, and it was also applicable to the *14 CFR Part 91*, by a crew that was certified and qualified to comply with the protocols established in the *14 CFR Part 135.*

These are Part 135 requirements. To be clear, the pilots were qualified to fly both Part 91 and Part 135 flights, although this flight was operated under Part 91.

(Page 69/286) The PIC assigned to the Mission by the Excelaire Directorship was considered an experienced, conscious, conservative, well standardized, punctual, dependable, highly qualified captain, according to the Company Chief-Pilot (CCP) and the Chief Operations Officer (COO). However, he was not experienced in the embarked avionics of the Emb-135BJ LEGACY airplane.

The PIC was trained in the equipment and had flown another EMB-135BJ Legacy in the United States, as well as the acceptance flights in Brazil. He also had experience with identical avionics in a different aircraft type.

(Page 69/286) The PIC believed that the adaptation to the positioning of the buttons of another aircraft was a challenge to be overcome with study. Thus, he would place a photo of the aircraft panel in the cockpit so that he could study the lay-out of the differences.
The PIC had been requested by a LEGACY client to be the Captain and, then, as a result of this request, the PIC was sent to be trained in the LEGACY.
Such a subjective criterion was accepted by the EXCELAIRE Directorship. There are no reports of a deliberation by an Operational Council conducted by the Excelaire Operations Directorship, a procedure that would be the normal rule in Brazil, with decisions validated in the meeting minutes and signed by all participants of the Operational Council.

Long before beginning formal training on the Legacy, the PIC demonstrated an interest in the aircraft, a thirst for knowledge and a desire to learn. These are all positive qualities. There is no basis for these comments about the pilots or the operator.

CINEPA investigators did not even question ExcelAire management and has little basis for such statements. Further, the "normal rule" in Brazil is irrelevant here.

(Page 70/286) He had 24 (twenty four) hours to assist in the planning of the ferry flight between São José dos Campos – SP (SBSJ) and Fort Lauderdale – FL (KFLL) while getting updated with the International Operation, ICAO rules, differences between the ICAO and FAA rules, Operation of the aircraft systems, Flight in South America, simulated LFT flight in the rooms of Excelaire, etc.

This has no connection to the accident. These statements are patently untrue. The planning for this trip began months before the pilots arrived in Brazil. New aircraft deliveries are not suddenly scheduled, they are anticipated and planned for over the course of several months.

(Page 74/286) The Excelaire Directorship was aware of the little experience of the N600XL crew relative to the new airplane, as well as of the fact that they had never flown together as part of the same crew.
Therefore, when working as a crew, they would need an efficient oversight, something that did not occur.
So, we detected the occurrence of internal administration failures in the company relative to the training provided to the pilots.

It is not a requirement for crews to first fly together, nor is it the norm in most sectors of commercial aviation. ExcelAire went above and beyond normal practice, sending the two pilots to training together, and arranging for additional flight time on the Embraer aircraft with Embraer pilots.

(Page 74/286) The Excelaire Directorship of Operations underestimated the degree of difficulty concerning the flight to be conducted by its pilots, and should have treated the mission as a non-routine operation, since it was a sequence of acceptance flights, followed by the ferry flight of a newly purchased complex airplane, after the first delivery by the manufacturer.
In this respect, we need to refer to the legislation to justify the statement that it was not a routine-flight, as Section 91.711 of the RBHA 91 considers the ferry flights to a new country of registration as being an activity under the "SPECIAL RULES FOR FOREIGN CIVIL AIRCRAFT". Therefore, if they are special, they can never be routine7.

"Special" does not mean routine or non-routine. What ExcelAire underestimated was the complete breakdown of air traffic control in Brazil, which no amount of training or foresight on the part of ExcelAire or its pilots could have foreseen or prevented.

Further, CINEPA investigators did not interview ExcelAire executives and had no factual basis for these conclusions.

(Page 74/286) On the flight of 29 September 2006, errors occurred in the operation of the aircraft systems, in the application of the Crew Resource Management (CRM) concepts, and in the International Operation, whose training had been done at the very Excelaire, and reinforced at the FSI-Houston-Texas.

What "errors occurred in the operation" of the aircraft systems and in CRM?

(Page 74/286) In Brazil, the PIC and the SIC participated in 3 (three) acceptance flights, in the same way they did the afore mentioned demonstration flight: the PIC and the SIC never shared the same cockpit of an aircraft as PF and PNF/PM, that is, as members of the same crew, in the literal meaning of the expression.

There is no requirement for crews to first fly together, nor is it the norm in commercial aviation. Airline crews, for example, rarely, if ever, fly with the same crewmembers.

However, the crew did train together and had considerable time in both the simulator and classroom.

(Page 74/286) Now, let us analyze the preparation of the PIC, who was inexperienced in the new aircraft and, even so, would assume the command the Mission.
The level of proficiency of the PIC in the new aircraft model proved inadequate for an International Operation.

The Report doesn't mention what requirements were used as reference for concluding the PIC was inexperienced in the new aircraft and his level of proficiency in the new aircraft model "proved inadequate for an International Operation."

The PIC was certified by the FAA, the authority responsible for establishing the requirements applied to all US pilots to fly American aircraft. The requirements are similar to Brazilian requirements. Both sets of aviation regulations are based on the ICAO (International Civil Aviation Organization) documents.

The Report doesn't mention what logic model was used to measure experience and doesn´t develop any study to prove the requirements set by the FAA (US Aviation Authority), ANAC (Brazilian Aviation Authority) and ICAO (International Civil Aviation Authority) are inadequate to evaluate pilots.

The PIC was extremely experienced in international operations and the airplane was precisely where it was directed to be. The failure was not in the pilots' selection or experience, but in the air traffic control services provided by the Brazilian defense ministry.

(Page 75/286) It was observed that the PIC had elementary doubts in relation to the operation of the aircraft systems, the application of the CRM concepts, from the planning up to the collision with the PR-GTD, passing through the flight preparation and pre-flight of the aircraft, before departure; and non-compliance with the prescriptions of the RBHA/14 CFR Part 91 and RBHA/14 CFR Part 135.

There is no factual basis to support any accusation that the PIC "had elementary doubts in relation to the operation of the aircraft systems." The investigators never tested the pilots for their level of familiarity with the aircraft systems.

CRM concepts are applied to operations under Parts 135 and 121, not to operations under Part 91. There is no factual to support the suggestion that the PIC "had elementary doubts in relation to application of the CRM concepts."

This operation was conducted under the requirements of RBHA/14 CFR Part 91, not under RBHA/14 CFR Part 135. As the Report says on page 9, "The N600XL was doing a ferry flight, from São José dos Campos (São Paulo State) to Fort Lauderdale, Florida, USA, with a technical stop programmed for Manaus International Airport/Eduardo Gomes, under the rules of RBHA 91." There is no factual support the for the statements about PIC non-compliance with the prescriptions of the RBHA/14 CFR Part 91 and RBHA/14 CFR Part 135.

(Page 76/286) The same can be said of the proficiency level in relation to the LOFT training, because elementary doubts, such as the fuel system performance, were still being tackled during the flight of 29 September 2006, at the cruising phase, as well as the planning for the next leg, all in detriment of the flight management by the PIC and the SIC.
All of these aspects point toward insufficient pilot training for the accomplishment of the mission with adequate safety levels.

There is no basis for the statement that the PIC had low proficiency level in relation to the LOFT training, including the suggestion he had elementary doubts about the fuel system performance. Besides, the investigators do not list the Part 91 requirement for LOFT training.

The pilots were not planning for the next leg during the flight. The flight planning was already done, including the Flight Plan to be filed at Manaus. They were just verifying the amount of fuel for the next leg, which is a very normal procedure.

The investigators are blaming the FAA for the established requirements for US pilot certification when they state, "All of these aspects point toward insufficient pilot training for the accomplishment of the mission with adequate safety levels."

The mid-air collision resulted from ATC inattention, equipment failures, and repeated violations, not because the pilots were inattentive.

(Page 77/286) This is being reported, because the FAA POI, designated to audit Excelaire, should have acted in a more incisive manner, when the Director of Operations and the general Directorship of the company communicated that a new type of a high performance aircraft would be incorporated to the fleet.

The investigators are blaming the FAA Principal Operations Inspector for providing unspecified failures of oversight.

(Page 78/286) It is worth pointing out that the application of the Advanced Qualification Program (AQP) Page is on a volunteer basis, and the FAA-Flight Standards Service has encouraged the airline companies to participate in the Program.
There were not any records of the participation of Excelaire in the AQP Program established in the AC 120-54A – Advanced Qualification Program – AQP.

Since the AQP it is not a requirement, it should not be considered as company fault. If the investigators consider it as very important to the occurrence of the accident, they should recommend the FAA make it mandatory.

(Page 78/286) Finally, it is extremely important to have in mind that the training offered by the FSIHouston-TX focused the Emb-145 airplane, with application of the differences for the Emb-135BJ Legacy 600.
The CIAA considered the training of the N600XL pilots at the FSI inadequate, as the analysis of the CVR demonstrated an insufficient level of technical and operational knowledge, judging from the analysis of some dialogs extracted from the N600XL CVR.

These pilots were not the first pilots to have been trained at the FSI facilities for the Legacy. The FSI facility is certified by the FAA and several other civil aviation authorities, including ANAC. The CVR dialogues, taken out of context, do not support the accusation of an insufficient level of technical and operational knowledge.

Additionally, this training is provided contractually through FlightSafety by Embraer, who evaluated the facility and determined that they would provide training to the crews of all newly-purchased Legacies.

Since FlightSafety training is offered by the manufacturer, what is CINEPA's conclusion about Embraer's judgment and oversight?

We understand that CINEPA was denied access to FlightSafety and its personnel. If this is true, then there is little factual basis for their observations and conclusions.

(Page 80/286) The CIAA considered that there was a lack of systematized and standardized procedures (SOP) that might have helped the pilots to comply with the numerous tasks of the mission, since the pilots remained a very short time in Brazil. The did not have a knowledge of the airplane at a proficient level, did not master the operational environment relatively to the correct utilization of the facilities available, had never flown together before, resulting that all of this contributed to their inadequate performance relative to the management of the situations that were presented to them, such as: incorrect clearance, operation of the transponder and anti-collision system, communication difficulties and inadequate situational awareness.

There is no a clear link between SOPs and the very short time the pilots spent in Brazil.

The Report repeats the mantra, contradicted elsewhere in the Report, that the pilots did not have a level of knowledge of the airplane at a proficient level but are not providing any information about the process used to evaluate the crew technical knowledge of the aircraft.

The Report does not mention what "facilities available" were not correctly used and what "operational environment" the pilots did not master.

Neither the Company nor the pilots violated any regulations. There is no connection between any of the "events" listed and the happening of the accident. The failures leading to the accident were of air traffic control. The investigators are attempting to blame the pilots and ExcelAire for not catching and correcting each of air traffic control's many system failures.

(Page 80/286) The various SOP's pertaining to Excelaire have been analyzed by the CIAA and have complemented this analysis.
Their contents meet the requirements set up by the Operations Directorship of the company which, before being audited by the FAA, were also audited by three private companies specialized in aeronautical audits.

Although the flight was conducted under the Part 91, the investigators analyzed ExcelAire´s SOPs, a Part 135 requirement. They confirm the SOPs were audited by the FAA and three aviation auditing companies, but don't note that the FAA and three aviation auditing companies approved ExcelAire´s SOPs.

(Page 81/286) In the understanding of the CIAA, the Line of Irreversibility of the Accident presented two distinct moments:
1) The moment at which the ACC BS controller handed off the N600XL traffic to the ACC AZ, and informed that the aircraft was maintaining flight level FL360, without any technical evidence to consubstantiate his information; and,
2) The moment at which the N600XL crew did not understand the last call in the blind made by the ACC BS, on the only frequency they could use to communicate at that position, after more than 52 (fifty-two) minutes without perceiving that the transponder had stopped transmitting.
From that moment on, there was not time for any possible defense to actuate.

Comment No. 1 is correct.

As for Comment No. 2, it is correct on the first part but the second part – "after more than 52 (fifty-two) minutes without perceiving that the transponder had stopped transmitting – ignores ATC's responsibility to perceive that the transponder had stopped transmitting.

ATC continued to communicate incorrect information internally about N600XL's position and still had time to prevent this accident.

(Page 81/286) First, we have to consider that the pilot scheduled by Excelaire as Pilot-in-Command (PIC) was performing the tasks of Pilot-Flying (PF), although he did not possess enough experience, as he had never flown Embraer airplanes before.

The PIC was certified by the FAA and his credentials were current. There is no factual support for the assertion that he did not possess enough "experience."

(Page 82/286) These 3 (three) citations refer to moments at which the levels of attention should have been fully focused on the situations, on account of their importance. He could have had the initiative of questioning the flight level, in order to get assured of the clearance. That could have avoided the continuation of the flight at the flight level FL370. It is obvious that such an action was the responsibility of the controller, but, it does not exempt the SIC from doing a periodical check of the flight conditions. That would serve as an extra defense against the failure of the controller.

The crew received a clearance to maintain 370 so there was no reason to question ATC. What would have avoided the continuation of the flight at FL370 were ATC doing its job.

It is an entirely unreasonable expectation of flight crews that they should second guess each and every instruction of an air traffic controller.

(Page 82/286) That could have been done by the SIC, while acting as the PNF, that is, to perform a "crew monitoring and cross-check" prescribed in the "AC 120-51E – Crew Resource Management (CRM) Training.

The investigators acknowledge the controller responsibility but try to include it as a crew responsibility. The crew received a clearance to maintain 370 so there was no reason to question ATC. What would have avoided the continuation of the flight at FL370 were ATC doing its job.

(Page 82/286) The crew explained to the Commission that when they passed over the BRS VOR they noticed the heading change, however neither pilot expressed verbally the perception, a fact that obviously opposes good management of the flight, as they also confirmed that they were not aware of any company SOP's regarding the expected behavior of the crew for this type of situation.

There is no requirement for verbally expressing heading change. The crew trusted ATC because they just talked to them. At Teres, they were checking their position, as stated at CVR 19:30:05, against the charts.

The pilots continued to navigate the airplane in accordance with ATC instructions and were precisely where they were directed to be.

(Page 82/286) They explained that although the flight level was not compatible with the new heading to be flown, it was not considered by them a situation that had to be verified, since they were complying with the last clearance and, as nothing had been changed by the controller. For the N600XL crew, everything was right.

The flight was under the last clearance, as established by ICAO, American, and Brazilian regulations.

(Page 82/286) From the perspective of the air traffic rules, such a line of reasoning, that since there was not any instruction from the ATCO, everything should be maintained as it was, goes against the prescriptions established in the ICAO Annex 2 and in the FAA Order 7110.65R –Air traffic Control, stating that the responsibility for the conduction of navigation belongs to the pilot.

The regulations cited are general rules. The Report does not consider the specific rules of flights under radar control and RVSM special procedures. There are flight situations, such as radar control and RVSM, where the controller is responsible for conducting the aircraft. In this case, ATC failed to adhere to the applicable regulations.

(Page 84/286) It is important to point out that the CIAA has selected but a few of the items available in Appendix #1, which, if complied with by the N600XL crew, would have been enough to prevent the aircraft from flying at a flight level that was wrong and not-available, as well as the wrong operation of the aircraft (as a whole) and its various systems, especially the NAV/COMM/TCAS/XTDR systems.

The flight level was established by ATC, which it was authorized to do, and was made available to the flight by ATC.

Again, the investigators are insisting on the "wrong" operation of the aircraft and its systems without any factual information to support the accusation. N600XL was exactly where air traffic control directed it to be.

(Page 85/286) Any confusion in the flight deck is immediately cleared up by requesting ATC Confirmation. If any crewmember is off the flight deck, all ATC instructions are briefed upon his/her return. Or if any crewmember is off the flight deck all ATC instructions are written down until his/her return and then passed to that crewmember upon return. Similarly, if a crewmember is off ATC frequency (e.g., when making a PA announcement or when talking on company frequency), all ATC instructions are briefed upon his/her return.

The investigators may have been confused when analyzing this regulation, because there was no confusion in the flight deck. Further, when the PIC returned to the flight deck, he was informed about the communication difficulties.

(Page 85/286) Monitoring during high workload periods is important since these periods present situations in rapid flux and because high workload increases vulnerability to error. However, studies show that poor monitoring performance can be present during low workload periods, as well. Lapses in monitoring performance during lower workload periods is often associated with boredom and/or complacency.
Poor Monitoring occurred with the two parties directly involved in the collision: the N600XL crew and *the* work team on duty at Brasília ACC, especially the controller responsible for sector 7, as well as the sector supervisors. This will be analyzed later on.

The Report accuses the pilots of poor monitoring but does not state what they should have been monitoring that led to the collision. The Report also does not back up this statement with any facts.

(Page 85/286) *Crew monitoring performance can be significantly improved by developing and implementing effective SOPs to support monitoring and cross-checking functions, by training crews on monitoring strategies, and by pilots following those SOPs and strategies.*
Considering the evidence that there was a deficiency in the training received by the N600XL crew, as they did not understand what had really happened with the transponder equipment, a fact that was confirmed after landing by the CVR data.
And, also, considering that, according to declarations, they did not perceive that the equipment was not functioning correctly, we may say that the monitoring strategies adopted by the Excelaire pilots in the flight of 29 September 2006 were inadequate.

** SOPs are not required for RBHA/FAR Part 91.*

The Report accuses the pilots of not understanding what really happened with the transponder equipment. The CVR data refers shows instead that they did not understand the collision because the TCAS and transponder were working properly. It appears the investigators did not understand the conversation recorded by the CVR.

The Report also completely ignores the possibility of equipment failure. There is insufficient evidence to support any conclusion about the failure of the transponder and TCAS. Nobody understands the true nature of the failure because it has never been thoroughly investigated.

(Page 86/286) *A fundamental concept of improving monitoring is realizing that many crew errors occur when one or more pilots are off-frequency or doing heads-down work, such as programming a Flight Management System (FMS). The example SOPs below are designed to optimize monitoring by ensuring that both pilots are "in the loop" and attentive during those flight phases where weaknesses in monitoring can have significant safety implications.*
Coincidentally, the content of the text above is a complete definition of what occurred: the N600XL pilots allowed themselves to remain out of the correct frequency and to work while keeping their heads low for a long time. The difference was that, instead of programming the Flight Management System, they were programming a laptop, that is, in the end the effect was exactly the same.

Again, the investigators are accusing the pilots of poor monitoring without mentioning what they should have been monitoring or other factual support.

(Page 87/286) *A. Before flight, the routing listed on the flight release must be cross-checked against the ATC clearance and the FMS routing.*
This task had to be executed with both pilots seated on their seats in the cockpit of the N600XL airplane, but it did not occur. The PF commanded a division of the crew, by sending the PM to the installations of Embraer to expedite the protocols relative to the FPL. The initial treatment of the FMS was conducted by the PF, inexperienced as he was in Embraer aircraft, in the absence of the PM, this latter experienced in the aircraft made by Embraer.

The investigators apparently did not understand the text in the environment, which considers the pilots seated in the cockpit and not going to installations or working on Flight Plans. The Flight Plan Approved was inserted in the FMS with both pilots seated in the cockpit, as recorded in the CVR. The FMS is not unique to Embraer aircraft.

(Page 88/286) Below, some acronyms are listed, which are of interest to this investigation, because they could have been applied by the N600XL crew:
1) ***"AVIATE, NAVIGATE, THEN COMMUNICATE"***
If we apply these three tasks to the flight conducted by the N600XL crew, we will observe that: that the N600Xl crewmembers just kept the airplane flying: AVIATE: The pilots maintained the N600XL airplane flying;
NAVIGATE: They did not navigate adequately;

COMMUNICATE: They did not perceive, at a crucial moment, that they were under a communication failure. They did not coordinate adequately, within the international rules, to find a solution for the communication failure.

The pilots' navigation was, in fact, perfect. They navigated the airplane to the exact position directed by air traffic control. They were not under any communication failure.

The failures were in ATC directing two aircraft on a collision course and in failing to follow proper procedures in separating aircraft.

The Report does not consider the radio calls received in the cockpit between the last two-way communication and the accident. Those radio calls show that the radios were working properly in he cockpit.

The use of Portuguese on all other communications does not support situational awareness among non-Portuguese speaking crews. It is a requirement that controllers speak English, not that flight crews speak the local language.

(Page 88/286) ***"I'M SAFE"***
I ILLNESS;
M MEDICAL;
S STRESS;
A ALCOHOL;
F FATIGUE;
E EMOTION.
The N600XL crew should have made a self-evaluation of their level of STRESS, as they were receiving a new aircraft, which they had never flown before as one crew. In addition, the PIC had never commanded an Embraer aircraft before, and was doing an international Ferry Flight, departing from a country which followed the ICAO flight rules.
Concomitantly to the STRESS, there was the emotional component (EMOTION) of receiving a new aircraft, removing it to the USA with members of the Directorship onboard, a fact that was confirmed in the Notes of NTSB, and that will be better explained by the Human Factor in the Psychological Aspect.
If this had been considered by the Pilots, they certainly would have changed the way they viewed the flight to which they had been assigned, and would possibly have performed this checklist as an acronym, for strengthening flight safety.

The pilots were experienced professionals and not stressed. There is no substantiation for this statement. The term "ferry flight" is used incorrectly here and throughout the Report, suggesting a special flight for an aircraft that does not meet airworthiness requirements, and not simply a Part 91 flight.

(Page 89/286) ***"ARROW" (AIRCRAFT DOCUMENTS)***
This acronym refers to the documentation to be embarked on the aircraft, therefore, to be taken to the airplane before the flight.
A AIRWORTHINESS CERTIFICATE;
R REGISTRATION CERTIFICATE;
R RADIO STATION LICENSE;
O OPERATING LIMITATIONS;
W WEIGHT AND BALANCE DATA.
The two items underlined were neglected by means of a crew distraction, as the pilots were making use of a laptop in the cockpit of N600XL, in detriment of the management of the flight they were conducting.
This acronym should have been applied by the pilots before they asked the Embraer Delivery Manager to give them support regarding the FPL. Thus, there would not have been the need for the SIC to be downloading a weight and balance program in to his laptop up to the last moment before

flight, in detriment of a preparation that should have occurred in a planned, detailed, natural and completely attentive manner, covering the vertical navigation of the route with more detail and attention.

The pilots were not "playing" with a laptop; they were working on the aircraft laptop and were not distracted. The laptop used was not the SIC´s laptop, as stated in the Report.

(Page 89/286) ***"CRAFT" (IFR CLEARANCE LIST)***
This acronym should have been used by the N600XL pilots, just after they read back the clearance transmitted by the DTCEA-SJ controller. If it had been applied in the form of questions to the controller, he would possibly have corrected the clearance limit.
C CLEARANCE LIMIT;
R ROUTE;
A ALTITUDE;
F FREQUENCY;
T TRANSPONDER CODE.

The clearance provided to N600XL had Eduardo Gomes as Clearance Limit, Direct to Poços de Caldas and Oren Departures as Route, Flight Level 370 as altitude, Frequency 126.15 or 133.50 and 4574 as transponder code. The clearance limit was clearly articulated as Eduardo Gomes in Manaus.

(Page 89/286) It would also be possible to apply this acronym before the aircraft passed BRS VOR, as a crosscheck with the ACC BS controller, as the aircraft was about to join a two-way airway at a flight level which was incorrect and not-available.
It would be a conservative attitude on the part of the pilots to re-check the CLEARANCE, because after they passed overhead the BRS VOR, the new heading (336º) would not be compatible with FL370, but susceptible of being made available by the ATC units. That could occur, either through the request of the pilots or through the determination of the ATC unit itself.
Neither one thing nor the other occurred and, after the aircraft passed overhead BRS VOR, a wrong navigation was started, which persisted until the in-flight collision with the PRGTD airplane that was occupying the same airway, at the same flight level (correct and available), under the same RVSM conditions.
It would also be possible to apply this acronym before the aircraft passed BRS VOR, as a crosscheck with the ACC BS controller, as the aircraft was about to join a two-way airway at a flight level which was incorrect and not-available.
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Neither one thing nor the other occurred and, after the aircraft passed overhead BRS VOR, a wrong navigation was started, which persisted until the in-flight collision with the PRGTD airplane that was occupying the same airway, at the same flight level (correct and available), under the same RVSM conditions.

The flight level was established by ATC, pursuant to its authority to do so, and was made available to the flight by ATC, so the altitude was not "wrong," as repeatedly misstated through this Report.

The investigators are once again, and inaccurately, referring to the "wrong" operation of the aircraft.

What makes the PRGTD flight level correct and available is the last assigned clearance, which, coincidently, is the same received by N600XL. The altitude "became wrong," unbeknownst to the pilots, when ATC put two airplanes on a collision course and failed to correct their mistake.

(Page 90/286) The phrase "request full route clearance" is standardized in the Chapter "Pilot-Controller Glossary" of the "Aeronautical Information Manual-AIM", published by the FAA.

Considering that the AIM is one of the several FAA publications that must be known by the pilots who fly in the USA, the phrase "request full route clearance" is certainly known to the crew of the N600XL airplane.
In fact, the N600XL pilots had the obligation to apply the information contained in the AIM with proficiency, because it is the AIP, as is explained in the text of the FAA relative to the meaning of AIM (24).

The clearance provided to N600XL had Eduardo Gomes as Clearance Limit, Direct to Poços de Caldas and Oren Departures as Route, Flight Level 370 as altitude, Frequency 126.15 or 133.50 and 4574 as transponder code. The crew did not have any reason to request the full route clearance.

(Page 91/286) For the FAA, everything originates from the "SEE AND AVOID" concept.
Again, the SEE AND AVOID CONCEPT is emphasized and legally founded. The American legislator states that the 14 CFR Part 91 is based on this concept, which requires that vigilance has to be maintained during the whole flight time by each person operating an airplane, regardless of the fact that the operation is being conducted under IFR or VFR.
Such a statement deserves a detailed analysis, because it is directly related to the scenario of the accident.
The "*AC 90-48C Pilots' Role in Collision Avoidance*" is a document that warns the pilots that they have to bear in mind their responsibility in maintaining a continued vigilance of the airspace outside the aircraft, regardless of the type of aircraft being flown, that is, from a single reciprocating engine to a high performance jet airplane. If flying under the 14 CFR Part 91, VFR or IFR, he must pay attention to his obligations.
This gives us the foundation to affirm that various instructions published in the vast documentation published in the USA were left unobserved in all the phases of the flight conducted by the N600XL crew, before, during, and after the beginning of the flight of 29 September 2006.

When the flight is under radar control, ATC is responsible for the separation of aircraft. The "See and Avoid Concept" does not apply to flights in RVSM environments.

It should be incumbent on CINEPA to qualify such a broad statement and answer whether either aircraft could have "seen and avoided" the other has any relevance to two aircraft on a head-on collision course at a closure rate of 1,000 miles/hour.

There is no basis to support any suggestion that the crews of the Legacy and the GoI aircraft had time and conditions to see and avoid the collision.

(Page 91/286) Here, we have to remark that the N600XL pilots passed over 6 (six) important defense barriers: the Instructor of the Emb-145 Simulator at the FSI- Houston-TX, the Inspector designated to conduct the check-ride at the simulator of the FSI-Houston-TX, the EXCELAIRE Company Chief-Pilot (CCP), the FAA POI responsible for EXCELAIRE, and the FAA POI responsible for the FSI-Houston-TX, as a Training Center (14 CFR Part142).

The text is not clear if it means to suggest the pilots "passed over" the defense barriers intentionally or if the EMB-145 instructor at FSI, the FSI simulator check-rider, ExcelAire's Chief Pilot, FAA POI, and the FAA FSI POI were not doing their jobs. The investigators apparently are making accusations against various individuals at FSI, FAA and ExcelAire involved in the training process to support their unsubstantiated equipment monitoring fault theory.

(Page 91/286) Finally, we may say that appropriate conditions existed for the PIC and the SIC to receive adequate training regarding the accomplishment of the Mission, but such training was managed with various administrative, technical and operational failures, which ended up becoming contributing factors to the occurrence of the accident.
Those deficiencies began well before Excelaire had the intention to purchase an aircraft from Embraer.

The investigators seem to be faulting professionals at FSI, FAA and ExcelAire involved in the training process to get traction for their unsubstantiated equipment monitoring fault theory.

(Page 92/286) In fact, the Excelaire Operations Directorship, at first instance, contributed to the accident by choosing the SIC to compose the N600XL crew with the PIC, without a good knowledge of the new pilot, since he had just been hired by the company.
In this regard, the Operations Directorship considered that the newly-hired pilot was experienced enough to counterbalance the operational limitations of the Pilot designated to be the PIC, that is, the Captain of the flight of 29 Sept.2006.
Besides, the Excelaire Operations Directorship disregarded the fact that the SIC had flown 317 hours on an EMB – 145, a model that, although requiring the same Pilot certification, has some differences which could not (and should not) be studied onboard the Legacy, during the ferry flight of 29 September 2006. Those differences should have been studied and evaluated during the initial phase at Excelaire and, later on, during the trainings done with the simulators at the FSI- Houston-TX.

There is no evidence of aircraft differences being studied on board N600XL. Also, there is no evidence of crew composition contributing to the accident.

If the N600XL crew was composed by two senior pilots with years flying Legacies, and trusting the ATC services, the result would be the same. The result would be different only if the crew had suspected the ATC services were not doing their jobs and started questioning everything from the first radio call up to the conversation over the phone with the Manaus ATC Commander at Cachimbo.

(Page 92/286) Thus, what was really considered as a contributing factor was the management of the strategy defined by the company.

The Report is not consistent because, after criticizing several professionals, it identifies only the management strategy defined by the Company as a contributing factor to the accident.

Essentially, CINEPA is stating that the result was unavoidable as long as the crew placed its trust in the performance of air traffic control.

(Page 92/286) The Excelaire Directorship and, especially, the Operations Directorship, did not have for an adequate evaluation of whether the crew designated for the mission met the adequate technical/operational requirements for a safe conduction of the whole operation.
The management was no longer exercised by the Operations Directorship, from the moment the responsibility for the training was transferred to the FSI- Houston-TX, without a close monitoring, and the situation was aggravated by the unsatisfactory performance of the FAA POI designated to audit EXCELAIRE.
The errors committed by the Operations Directorship should have been identified by the FAA, through the POI assigned to audit and monitor the Excelaire company.
The analysis made by the Operational Aspect considered that the deficiencies presented by the PIC and SIC should have been identified by Excelaire at first instance, and, then, by the FAA POI responsible for auditing the company.

Again, the investigators are finding fault with some FAA, FSI and ExcelAire professionals but identify only the management strategy defined by the company as a contributing factor to the accident.

CINEPA already has identified the primary mistake on the part of ExcelAire and its pilots as placing faith in air traffic control's performance.

(Page 92/286) Here, it is worth highlighting that there were the following defenses for the prevention of aeronautical accidents, according to the investigation of the case in question:
The Pilots themselves. Because they, by means of a self-evaluation, could learn that they had not reached an adequate level of proficiency for the execution of the mission, mainly in relation to the management of the Legacy operational systems;
This situation was aggravated by the poor situational awareness of the N600XL crew, mainly because they flew 52 (fifty-two) minutes between BRS VOR and the point of collision, without, apparently, making periodic checks of the aircraft panels, especially the RMU, the Blink of the Transponder, or the PFD itself;
The Excelaire Directorship, in the process of Aeronautical Decision Making (ADM);
The Excelaire Directorship of Operations, in the process of ADM, in the judgment and evaluation of the entire operational protocol under its responsibility, mainly, because the Safety Manager and the Company Chief Pilot were directly linked to the Operations Directorship, acting as direct advisors.
The FSI-Houston-TX, which was the manager of all the training done by the PIC and the SIC on its premises;
The POI designated by the FAA to audit the Excelaire company; and
The POI designated by the FAA to audit the FSI-Houston-TX
For all the above mentioned, there were tools within their reach that could have been used as effective preventative barriers for Flight Safety.
In addition to these preventive barriers, there were the periodic private audits contracted by Excelaire from three companies: ARGUS, WYVERN and EXECUTIVE JET MANAGEMENT. These companies evaluated Excelaire on a yearly basis. By contract, Excelaire had to provide the audit companies with all the information they needed, during the period of one year, so that they could do their job.

The Report accuses the pilots of poor situational awareness based on the premise that APPARENTLY they did not make periodic checks of the aircraft panels and equipment. The accusation of causing an accident cannot be supported by something based on APPARENTLY.

Panel scans are not verbal, they are visual, so there is no supporting evidence from the CVR to make this conclusion.

(Page 95/286) In the Logbook number 001/PT-SFN/2006 (29) pertaining to the aircraft, there are not registers of any failure that might have been found during the delivery flights.
The only occurrence found in the Logbook refers to the weather radar of the aircraft, a simple problem that was soon corrected by Embraer during the phase of delivery.
On 25 September 2006, Embraer drew up the Opening Term of the second Logbook of the PT-SFN (N600XL), number 002/PT-SFN/2006 (30), and, according to the Brazilian legislation in force, still with the provisional Brazilian registration PT-SFN.
The second Logbook was closed on 27 September 2006 (Wednesday) and, in its records, nothing of relevance can be found relative to the delivery flights, suggestive of a malfunctioning of the aircraft and its systems, having as a last remark the acceptance of the aircraft: “ACFT ACCEPTED BY THE CLIENT.”

The investigators do not consider the electrical failures, equipment changing, and maintenance repairs done during the acceptance flights.

Some electrical failures could lead to a potential electrical essential bus failure that could induce a transponder temporary out of service.

There was also a history of problems in several components that were not disclosed to ExcelAire or its pilots. These components were installed in other aircraft, removed due to malfunctions, then reinstalled on later aircraft, including N600XL.

ExcelAire informed the investigators about these events, which were not considered during the investigation.

(Page 96/286) No records of malfunctioning relative to the airplane, including its avionics, navigation and communication equipment, were found in the Production Flights and, later, in the Delivery Flights.
There was no indication that any component of the aircraft systems had been delivered to the operator by the manufacturer, in discordance with the criteria of continued airworthiness.

The investigators do not consider the electrical failures, equipment changing, and maintenance repairs done during the acceptance flights.

Some electrical failures could lead to a potential electrical essential bus failure that could induce a transponder temporary out of service.

ExcelAire informed the investigators about these events, which were not considered during the investigation.

Nor did the investigators examine other potential problems on the aircraft itself, such as faulty wiring or other installation issues that may have led to intermittent problems in-flight.

(Page 104/286) There was not any error or operational misapplication in that, however, the pilots must always evaluate the convenience and the operational limitations, if any, for complying with the proposed navigation. It is not usual to climb and descend while en route, unless it is really necessary, and it will depend on the actuation of the crewmembers in their interaction with the control units.

The text is not clear and suggest that the pilots are responsible for asking ATC to change altitude. This was not true for N600XL because the flight level assigned was 370 up to Eduardo Gomes and no ATC controller changed the clearance.

(Page 104/286) These facts were aggravated, as it was the first trip of the N600XL (a type aircraft), operated within an airspace under ICAO regulations, which the two pilots appeared not to master at a proficient level, besides having little experience in the aircraft model to be removed.

Both pilots had extensive international experience in areas where ICAO regulations are applied, and they were certified by the governing aviation authority.

The accusation is too serious to be based just on the word "appeared." The investigators do not have factual data to support this spurious accusation.

(Page 105/286) As it was the first flight of both pilots in a mission of this type, the receipt of a new airplane in a country the pilots were not familiar with, the division of tasks was not adequate for the preparation of the aircraft. There were lingering doubts, as well as information still to be assimilated by the crew as, for example, the differences of the fuel system in relation to the simulator.

The investigators are suggesting a lack of familiarity with the aircraft systems without any factual data.

(Page 107/286) These data have been presented to ratify the understanding that everything, after the N600XL delivery ceremony, was done in a hurry and under self-imposed stress by the crew, in detriment of the rules prescribed by the Brazilian and American legislations, with deviations from the instructions listed in the SOP, and breach of the precepts established in the CRM, among others.

There was no hurry or self-imposed stress to the pilots. Investigators did not even interview others present at the delivery to establish either the timeline or conditions present.

The rules prescribed by Brazilian and American regulations and purportedly not observed by the pilots are not clear from the Report.

The Report is inconsistent because, elsewhere, it says there is no SOP established by ExcelAire for the operation and here it faults the pilots for not observing instructions listed in the SOPs.

"Precepts established for CRM" are not required for Part 91 operations, nor do the investigators list the "precepts" supposedly breached by the pilots.

(Page 108/286) They should have made the insertion of the navigation into the FMS of the new equipment together, as it was the airplane they would fly on a long distance flight, for the first time together, and without being helped by the manufacturer's pilot (Safety Pilot).

Again, the pilots inserted the clearance in the FMS when they were seated in the cockpit. Probably, the investigators did not understand the scenario when analyzing the CVR transcripts.

(Page 108/286) If Excelaire observed attentively its own SOP's and confronted them with the particularities of the mission, it would certainly have reevaluated the selection of the pilots for the flight, as well as the flight itself.

The Report is inconsistent because, elsewhere, it says there is no SOP established by ExcelAire for the operation and here it faults the pilots for not observing instructions listed in the SOPs.

(Page 110/206) On the day of the aircraft delivery, after the ceremony, when they were already doing the preparation for the flight, the crew still had doubts about the N600XL weight and balance. However, the clarifications were not obtained, as they were called on by the Excelaire officials, who were already going to the airplane. As a result, they did not solve their doubts about the Weight and Balance and went on board the aircraft still without the Flight Plan.

This is factually untrue. There is no factual basis for the assertions regarding supposed doubts about weight and balance or that the crew boarded the plane without the flight plan.

Further, the crew was not directed to return to the aircraft. They were encouraged to complete their duties and told there was no hurry to depart.

(Page 111/286) The Flight Plan was handed to the crew, when they were already on the plane, and the pilots did not examine the plan with the person that had elaborated the FPL.

The Flight Plan is not prepared by a person. The Flight Plan was prepared by a computer system and handed to the crew, as it is in the US, in Brazil, and several other countries.

(Page 113/286) From the transcript presented in item 3.6.2 Aeronautical Fixed Service of this report, it is observed that both the N600XL crew and the ATC unit did not comply with the prescriptions of ICAO Doc 4444, Chapter 4, items 4.5.4 "Contents of clearance" and 4.5.7.5 "Readback of Clearances", mainly in relation to the IFR Flight Plan Clearance, which, on account of not being complete, did not indicate its limit.
This went against the prescription of the item 8.4.9 of the ICA 100-12, in letters b) e d).
On account of the way the clearance was transmitted, different interpretations could exist in relation to the FL 370 clearance limit.
However, according to declarations of the pilots as to the influence of this first clearance, named "initial" clearance, it was understood as normal. With the clear message that the flight level authorized up to Eduardo Gomes Airport was FL 370, since no mention was made of a clearance limit, or whether the flight plan had been cleared as filed.
This fact had influence on the situational awareness of the pilots in relation to the maintenance of the flight level FL370.

The clearance provided to N600XL had Eduardo Gomes as Clearance Limit, Direct to Poços de Caldas and Oren Departures as Route, Flight Level 370 as altitude, Frequency 126.15 or 133.50 and 4574 as transponder code. So, there was no reason to complain about the clearance and the crew did not have any reason to request the full route clearance.

The airplane was flying precisely where air traffic control directed it to be.

(Page 114/286) From the recording of the N600XL CVR, the PIC and SIC were together using a computer (notebook), to calculate and obtain data of the landing and takeoff performance relative to Manaus. This computer was used until 19:13 UTC . With an adequate planning of the flight, this task should have been finished on the ground before departure, mainly because there was a NOTAM applicable to Manaus Airport, indicating that only part of the runway of that airport was available for operation of landing and takeoff.

There is no connection between using the aircraft notebook to verify landing and takeoff performance at Manaus and the accident. Flight planning is done by a service provider and there is no connection between flight planning and the accident.

(Page 115/286) BRASÍLIA Center informed: "N600XL - squawk ident, radar surveillance" 18:51:20 UTC
The SIC replied: "Roger". It was the last contact.
The SIC recognized the instruction of "squawk ident" and said, at 18:51:20.6 UTC: "Oh fucking ... I forgot how to do that ...". For that purpose, the PIC oriented him: "ID is there";
18:51:26 UTC
The SIC then declares: *"I think I did it. Yeah",* and the normal identification code 4574 was, then, received by BRASÍLIA. This segment of the flight indicates a certain difficulty or lack of familiarity of both pilots with the airplane.

The Report misquotes the CVR transcript. The SIC says at 18:51:20.6 UTC: "Oh fucking ... I forgot to do that ..." and not "how to do that," as stated in the Report.

In the same conversation, the PIC said to the SIC: "ID´d right there," which is completely different from "ID is there," as stated in the Report.

This misreading of the transcription misleadingly suggests that the pilots do not know how to operate the transponder, and compromises the integrity and transparency of the Report.

(Page 115/286) The N600XL intercepted the centerline of airway UZ6, course 336°M, and the crew did not discuss the progression of the flight in comparison with what was planned (heading change, next fix, fuel consumed, elapsed time, etc);
Leaving BRASÍLIA, no communication was made between the aircraft and ATC. The crew could have called Brasília Center to confirm the altitude of FL370 "in the opposite direction" (UZ6 heading 336°), since the understanding was to remain at that level;
The PIC and SIC changed to another airway, overflying Brasília, but continued with their attention fixed on the laptop;
The N600XL was out of the standard altitude at FL370, flying in a direction opposite to the normal flow of airway UZ6.

Immediately after the radio call with Brasilia Center, at 18:51:55, the crew started to check the alternate, to do fuel calculations for the destination and the alternate and to check the weather at destination.

Under radar control, the crew generally is not supposed to question ATC clearances.

And again, they were flying at the altitude directed by air traffic control.

(Page 116/286) The PIC asked the SIC (in part): “that tail work we did it at ...the ETO the Big One” (i.e. ET OFF);
The SIC agreed (in part): “... try it...”, for the departure from Manaus.
18:59:54 UTC

The PIC is not asking when he says “that tail work we did it at ...the ETO, the Big One.” Also, there is no explanation for “(i.e. ET OFF)” cited in the Report.

The SIC said something before saying “try it” and never said it was for the departure from Manaus.

(Page 116-117/286) What may have occurred:
The PIC and the SIC were still working together in the calculation for Manaus, not realizing that the status of the Transponder had changed;
When the Transponder changed to the “STANDBY” mode, the radar lost the SSR signal of the N600XL, and reverted to the “Primary Mode”;
The warning “TCAS OFF” was shown on the displays of the two PFD’s, and the “STANDBY” condition was shown on both RMU’s;
At that moment, neither crew member perceived the OFF-LINE warnings of the TCAS system.
With the N600XL at autopilot, and with the pilots focusing on the calculations on the computer, neither of them noticed the warnings on their RMU’s and PFD’s; since the only activity in the *cockpit*, minutes before and minutes after 19:02:08Z, is the PIC and the SIC working together at the *laptop,* calculating landing and takeoff parameters relative to Manaus.
The altitude being received was the one measured by the 3D radar available, and the transponder was not being received. Consequently, the altitude information was not as precise as the one provided by the transponder.
It was necessary to contact the aircraft to confirm its altitude, request the crew to verify transponder, and assess the capability of the aircraft to continue under RVSM.
N600XL left Sector 5 for Sector 7 of the BRASILIA UTA. The ATC did not contact N600XL to make him change from the frequency of Sector 9 (125.05) to Sector 7 (135.90), in order to guarantee that the N600XL did not get out of the VHF coverage, as it proceeded into Sector 7.
From 19:02:30 UTC on, BRASÍLIA Center , never contacted the N600XL to question about the loss of the SSR signal (the display showed “370Z360 ”) and/or alert the aircraft about the reactivation of the Transponder.

The Report does state that it was ATC’s responsible to contact the aircraft to confirm its altitude, to request the crew to verify transponder, and to assess the capability of the aircraft to continue under RVSM, when the transponder signal was affected.

(Page 119/286) The N600XL continued flying in the counter flow of the airway UZ6, at FL370, and its primary radar contact was maintained until 19:38:23 UTC.

N600XL was flying at the last assigned clearance from ATC.

(Page 121/286) However, according to the CVR, the SIC noticed the PIC’s incapacity to fly the aircraft, and asks:
“Do you wanna fly dude? Do you want me to fly it?

The SIC never said he noticed the PIC´s incapacity to fly the aircraft. He suggested the position changing because the Captain would be able to supervise the situation and command the emergency procedures if the SIC was at the controls.

(Page 122/286) The register of the CVR is very clear, the SIC released an exclamation of aw, when he noticed that the TCAS was OFF.
“ Ahh!...dude, is the TCAS is on?”
The PIC replied, at 19:59:15 UTC :
“...yes, the TCAS is off “

19:59:17 UTC
The DFDR registered that the page of the display of the TCAS was selected at the MFD2 of the SIC, right side, presumably to confirm that the TCAS system was OFF, precisely two seconds after the reply of the PIC, in a quick corrective action, typical of the profile the SIC showed all along the emergency.
19:59:25 UTC
There was silence during ten seconds, in which the pilots said nothing, and, then, the copilot, reestablishing control of the situation, said:
"All right, just keep an eye for traffic. I'll do that, I'll do that, I'll do that .I got that" in the CVR, this last phrase may be indicative that the co-pilot was about to reactivate the transponder, or had just reactivated it.

The conversation quoted in the Report differs from the CVR. The Report cites the SIC as saying "Ahh!...dude, is the TCAS is on?" but really what the SIC said was "dude, you have the TCAS on?" as it is recorded in the CVR. The two statements have completely opposite meanings.

The Report does not mention that the transponder was back on at the same location the Gol´s transponder lost its signal, meaning a black hole.

The Report misstates the content of the conversation about the TCAS being off. Also, the Report concluded that the pilots noticed the TCAS was off and turned it back on without factual data to support it.

(Page 132/286) The interruption of the transmission of the transponder equipment occurred on account of an **unintentional** action of the crew.
No evidence was found that any ergonomical aspect of the aircraft might have contributed to this action.

The Report says the pilots were working on the aircraft laptop when the transponder stopped transmitting the correct signal. If so, what is the action of the crew they are talking about?

(Page 198/286) The pilots clearly possessed the necessary qualifications and experience for the flight.
However, the simulator training, besides the five short flights made in this new version manufactured by Embraer, even though meeting the legislation prescriptions, were not sufficient for an adequate adaptation of the pilots to the requirements of the flight.

The Report says the pilots clearly possessed the necessary qualifications and experience for the flight. This is inconsistent with others parts of the Report, which say that the plots did not have enough experience for the flight.

(Page 198/286) There are not registers about the captain's degree of knowledge of the Honeywell FMSPRIMUS utilized in the Legacy.

ExcelAire sent this information to the investigators.

(Page 200/286) The Operational Factor regards the crew as being "operationally immature" in the equipment.
Such lack of maturity refers to the condition that they had not flown together before the trip to Brazil; that they had studied the new aircraft together, but not deeply enough (in detail); and that they were not convinced that the removal of the new aircraft, which the PIC had never flown before, would not be a routine flight.

The Report says the pilots clearly possessed the necessary qualifications and experience for the flight. This is inconsistent with other parts of the Report, which say that the pilots did not have enough experience for the flight.