

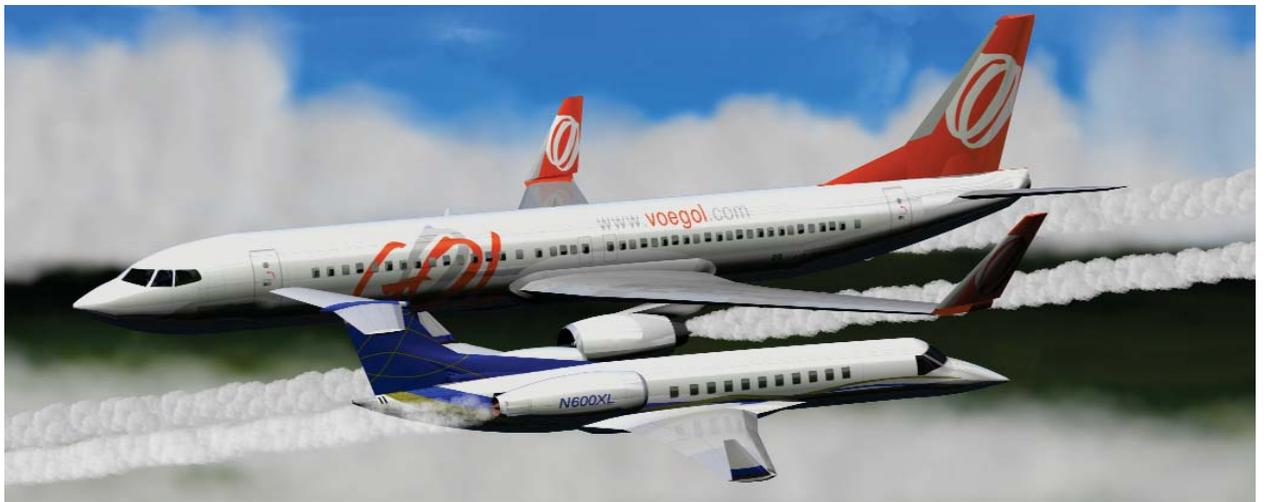
# IS ANYBODY OUT THERE?

## When All is Perfect

The captain of the Embraer 135 BJ Legacy was at ease. The aircraft was cruising along at FL370 above the vast Amazonian jungle. The weather could not be better and flying conditions were smooth. The crew had taken off with the brand new aircraft from the Embraer factory in São José dos Campos and were en-route to Florida with a technical stop in Manaus. Everything was running as planned.



Nowhere else is the communication process more important than in the cockpit of an aircraft, Michael R. Grüniger and Capt. Carl C. Norgren advise through real-life experience



The departure from São José dos Campos had been performed under time pressure. After the aircraft delivery ceremony, the five passengers had wanted to depart quickly. The crew had little time to complete their flight preparation and the co-pilot was busy finalizing the set-up of the performance calculation software on his laptop. A joint review of the route and flight plan was neglected in favor of a rushed departure.

## ATC Clearance

Before departure from São José dos Campos, the crew received their airway clearance to climb to flight level 370. No clearance limit was assigned. No mention was made of any flight level changes required along the route.

## Silence

The flight climbed to its assigned flight level. Traffic was light and the radio frequencies remained very

quiet. After changing frequencies to Brasilia Area Control Centre (ACC BS) at 18:51 there were no more radio communications for the next 35 minutes. Unfortunately for the crew, the radio frequency used to establish contact was incorrect. As the aircraft proceeded along the airway, radio contact was lost.

## When Silence is Heard

At 19:26, ACC BS tried calling the aircraft for seven times, but without any success. It was another 22 minutes until the co-pilot of the EMB-135 started feeling uneasy about the silence on the radio and attempted to contact ACC BS. Apart from the last assigned frequency he used his en-route communication chart and tried several frequencies published for the specific area. He made a total of 12 attempts – no success. The crew was now aware that they were flying without radio contact.

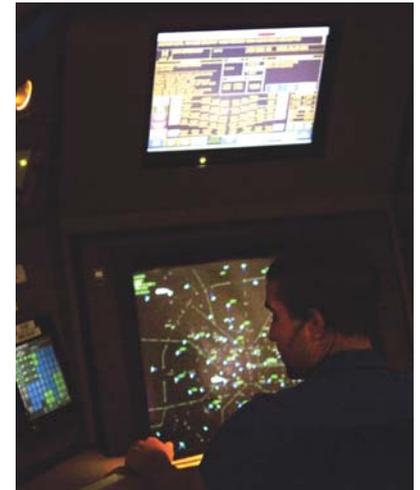
## Tragedy Strikes

At 19:56, a sudden violent jolt is felt and the aircraft veers sharply to the left. The autopilot remains engaged and returns the aircraft back on track. The crew is startled. In cruise with unlimited visibility something has impacted the aircraft without any warning.

The crew focuses on controlling the aircraft. Without knowledge of the extent of the damage they commence a descent towards the nearest aerodrome. The crew again attempts to contact ACC BS to declare an emergency and to inform ATC of their situation and intentions. They call on all published frequencies as well as on 121.5 MHz, but without success. Through the relay of another aircraft on 121.50 MHz, the crew receives the radio frequency of the tower of their diversion aerodrome and 5 minutes prior landing ATC contact is re-established.

## MISHAP

*A breakdown in the communication process often leads to less than desirable events.*



## Damage Inspection

After landing, the crew inspects the aircraft: Part of the left winglet is missing and the left stabilizer and left elevator are damaged. It was a very close call.

## Mid-air Collision

They were extremely lucky to have survived a mid-air collision with a Boeing 737 airliner. However the other aircraft was less fortunate. It lost the outboard half of the wing resulting in loss of control. 148 passengers and six crew members perished.

How could such a fatal mid-air collision occur between two modern aircraft under ATC control in class-A controlled airspace?

## Communication

The separation of aircraft in controlled airspace requires permanent and effective communication between aircraft and air traffic control (ATC). When communications are lost, so is the ability of ATC to provide separation between aircraft. Hence, radio contact is a basic requirement for IFR flight and redundant radio transmitters and receivers are installed.

## The Safety Net

TCAS provides an additional layer of safety. When ATC fails to separate air traffic TCAS is designed to provide for coordinated avoidance maneuvers between two aircraft on a collision course. TCAS relies on transponder signals. For unknown reasons, the transponder of the EMB-135 stopped transmitting a signal at 19:02 hrs. It had been inadvertently switched off.

No cautions were generated to alert the crew.

ATC did not notice the disappearance of the transponder signal. Without transponder, the TCAS was inoperative and the aircraft was invisible to other TCAS equipped aircraft. The EMB-135 was flying in RVSM airspace. An inoperative transponder would have rendered the aircraft non-RVSM and would have required an increased vertical separation of 2,000 ft.

## See and Avoid

Even with perfect flight visibility the chance of detecting traffic approaching head-on on the same airway centerline and the same altitude with a closing speed of 1.6 times the speed of sound is too small to constitute a feasible safety net. 'See and avoid' at high altitudes and at high speeds is not a viable survival strategy.

## Somebody is Always Out There

Radio silence is a loud warning to any pilot flying in IFR. There is always 'somebody out there' and avoiding them requires effective communications with ATC. A functioning TCAS is an additional safety layer.

## In a New Aircraft, in a Foreign Land

The crew had completed their type rating course in the US. At the time of the accident the PIC had 5:35 hours on type. It was his third flight in an EMB-135 BJ. The co-pilot had accumulated 3:30 on type. Previously, he had accumulated 300 hours on EMB-145 aircraft. Both of the crew mem-

bers were only getting to know their new 'office space'.

It was also their first flight in Brazilian airspace. They were not familiar with the details of the communication procedures and the navigation requirements. The airway they were using required even flight levels for their direction of travel. The flight level was correctly filed in their flight plan and contained on the navigation charts.

## Language

The ATC command of the English language was another barrier to effective communications. In Brazil, Portuguese is used in parallel with English to control air traffic on the same frequency and in the same airspace. Radio transmissions in Portuguese did not convey any information to the EMB-135 BJ crew.



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## HURDLE

*The language barrier and wide-ranging accents can also pose problems.*