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Brazil Air Force Cites Faults and Confusion in Fatal Crash

By PAULO PRADA and MATTHEW L. WALD

RIO DE JANEIRO, Oct. 5 — Brazilian Air Force officials on Thursday identified what they said were equipment breakdowns and confusion that probably contributed to the apparent collision of two jets over the Amazon a week ago. Investigators still have not determined how three systems failed: a nearly new, top-notch air traffic control network and an anticollision system on each of the planes.

The crash killed everyone on the larger of the two planes, a Boeing 737. Its operator, Gol Linhas Aéreas Inteligentes, said Thursday that it had found an error in its passenger count, and lowered the toll to 154 from 155. The smaller plane, though damaged, was able to land.

For some period before the accident, Brazilian air traffic controllers were unable to speak to the smaller plane, a new Embraer Legacy being flown to the United States, and were unable to gauge its altitude by radar, according to Brazilian officials.

Technical experts said that a single electronic failure on the Legacy might have rendered the jet invisible on radar to the other plane, a new Boeing 737, as well as interfered with the Legacy's ability to pick up the Boeing on its own radar.

The director general of the Brazilian Airspace Control Center, Lt. Gen. Paulo Roberto Cardoso Vilarinho, said in a briefing for reporters in Rio that the controllers were not in voice communication with the Legacy's pilots at the time of the incident.

A police official who has interviewed the American crew said that, in the last known voice communication with the Legacy, the pilots had been told to switch radio frequencies as they entered the jurisdiction of a different air traffic control center.

But the official said they had misheard the frequency and failed to tune their radio correctly.

Álvaro L. Pinheiro da Costa, a Brazilian Air Force brigadier general who was in charge of building the Amazon's new air traffic control system, said in an e-mail message that the Legacy's altitude and identity, which should have been broadcast by its transponder, "was not being received by our system by the time of the collision."

The police official who interviewed the crew said that the pilots had reported that the transponder was working. Brazilian officials have said the transponder resumed broadcasting after the incident.

Brazilian prosecutors have said that they are pursuing the theory that the pilots turned off the transponder so

they could climb to a more favorable altitude without permission.

Asked if a pilot would turn off a transponder, General Vilarinho said, “Only a narco trafficker might.”

General Pinheiro’s e-mail message said the Legacy had been tracked by a primary radar. That system, in which radio-frequency energy is sent out and bounces back from passing planes, gives a two-dimensional location, but no altitude information.

He said the absence of the Legacy’s altitude information “precluded our software to warn the controller about the possible collision.” And, he said, if the air traffic system could not “hear” the Legacy’s transponder, that probably meant it was not broadcasting to the Boeing either, and so would not have been picked up by its anticollision system.

Other experts said that depending on exactly how the transponder failed, it might have prevented the Legacy from picking up signals from the Boeing. That would mean the anticollision system on both planes would not have been clued to go off.

The system, the Traffic Advisory and Collision Avoidance System, known as Tcas, works by “listening” for other planes’ transponder signals and sounding alarms if they are converging courses.

Still, an American safety expert said other normal procedures should have prevented any such mechanical failures from allowing a collision.

“If they were cleared both to 37,000 feet, there’s a glitch in the air traffic system, Tcas notwithstanding,” said the expert, John Cox, a former chairman of the safety committee of the Air Line Pilots Association, the major union. “If you can’t talk to the other airplane and you know he’s cleared to 37,000, you have to move the Boeing laterally,” he said.

The crash involved some of the most modern equipment available. The Boeing had about 200 hours in service. The air traffic system, finished earlier this year, had just gone through a four-year, $121.5 million modernization and now includes scores of radars. Radar and radio coverage over the vast jungle is complete, General Vilarinha said. “There are no black holes,” he said.

The system separates high-altitude traffic in 1,000-foot increments, a modern development that was achieved across the continental United States only last year.

The Legacy would ordinarily have been assigned to an altitude in which the number of thousands of feet was even, like 36,000 or 34,000, because it was flying northwest. (Eastbound flights are given odd-numbered altitudes.) But the Legacy was reported to be flying at 37,000 feet.

Paulo Prada reported from Rio de Janeiro, and Matthew L. Wald from Washington.