**Air France 447: Crash, Investigation, and Subsequent Precautions**

In 2009, an Airbus A330 referred to as Air France 447 departed from Rio de Janeiro with the intention of landing in Paris. However, due to circumstances stemming from the flight’s course through highly inclement weather conditions. Approximately two and a half hours after departure, the flight entered what is known as an intertropical convergence zone. Such conditions are not uncommon in the region for plane’s to encounter, but care must be taken in order to maintain a safe flight. At the time when the incident first began to occur, the plane was cruising at high altitude with the help of its autopilot system. This system is used to maintain the plane’s trajectory and flight conditions by automatically taking over certain controls such as control surfaces for stability and adjustment to the course, as well as throttle control in order to maintain a set speed. However, in order to ensure the proper functionality of this system, all relevant sensors must supply it with accurate readings. In the event that some instrumental inconsistencies are found, the system rejects the readings and deactivates itself as a failsafe. At this point, control of the plane is relinquished to the pilots manually. This is precisely what happened as the plane passed through heavy weather conditions. At least one of the sensor systems failed to give accurate readings, resulting in a return to manual control. Later investigation would determine that the specific error occurred likely due to false airspeed readings as a result of ice formation in the pitot tubes mounted on the plane. Such ice formation would obstruct flow through the tube and alter pressure readings. Although this is a major problem from which the crash ultimately stemmed, it is not considered to be the cause of the crash. The crash is thought to be a result of the pilots’ incorrect reaction to this situation. One autopilot disengaged, the plane began to roll and slightly deviate off course. The pilots correctly provided an opposing roll input to counteract this motion, but additionally increased the pitch at the same time, resulting in an increasingly high angle of attack. The latter of the two inputs was not considered appropriate for the situation, but rather very dangerous under those circumstances. As a result of this, the plane eventually exceeded its maximum rate of climb substantially, especially for high altitude flight. This led to a drastic reduction in airspeed, an angle of attack of 40 degrees, and a subsequent loss of lift due to stall. This stall led to a rapid reduction in altitude and before long, to a crash.

As with most plane crashes, investigation of the cause and circumstances was difficult because of the desolate nature of the flight’s location and the depth of the ocean into which it crashed. Initially, a surface search was performed. Although the search was unsuccessful in finding the major wreckage, several bodies and parts of the plane were recovered, confirming the notion that the plane had in fact crashed. Perhaps the most valuable part to recover was the black box, a data recorder that would contain valuable information about the nature of the plane’s crash. Some underwater searching was performed in this period as well, but with little success, as the crashes potential location spanned too great of an area. Investigation resumed in 2011, where analyses were performed in order to determine the most likely locations of the plane. These analyses eventually led to a successful search, finding the major wreckage on the ocean floor, including the black box. With the information contained here, various conclusions could be made about future flights.

Subsequently, various changes were implemented. Weather evaluation in flight planning became a large area of emphasis, with weather patterns being evaluated for their probabilities of disturbing instruments. Additionally, the issue of icing was addressed specifically through policy changes requiring the use of deicing procedures preventatively. A third change was the policy on command in the case of long flights requiring pilot changeovers. It is predicted that if the chain of command had been more strict in the case of Air France 447, the problem may have been addressed in a way consistent with safe procedures.

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