**Science Question**

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The Airbus A320 is among the highly versatile and successful jetliner family. It has a seating capacity ranging between a hundred to two hundred and forty passengers and flies across the universe. A320 has always set standards since its launch as the first civil aircraft pioneering fly-by-wire technology. Airbus A320 has the widest single-aisle cabin enabling it to land and take off every 1.6 seconds. It can take passengers anywhere they wish to go, whether from the desert heat to the Antarctic runways or from urban environments to remote airports (Petrescu et al., 2017). On the other hand, CRJ700 belongs to the Canadian-built Bombardier CRJ aircraft family. Its design is derived from smaller airliners like CRJ100 and 200. The CRJ700 first made its flight in 1999. It was later followed by the CRJ900, which was a stretched version with an added 20 seats. This paper seeks to compare and contrast between Airbus A320 and CRJ700 flight control systems.

The Airbus A320 uses a fly-by-wire flight control system (Ground School Articles, 2021). This differs from the flight control system installed on traditional aircraft. It means that for the Airbus A320, the mechanical linkage existing between the control surface and column has the electrical wires instead. A320 is split into two flight controls, that is, primary and secondary. Both flight controls have a total of seven computers controlling their functionality. In the aircraft, the installed primary flight controls are controlled by sidestick inputs. The control is done alongside digital processing by the Flight Augmentation Computer (FAC), the Elevator Aileron Computer (ELAC), and the Spoiler Elevator Computer (SEC). While the primary controls are being operated in the Airbus A320, electrical signals emerging from the sidestick are first taken to the computers used in flight control before passing to hydraulic actuator flight control.

On the Airbus A320, the roll control is performed by autopilot commands or using the sidestick movements. Electric signals are sent to the active ELAC computer when the ailerons are moved using the sidestick. In the Airbus A320, two ELAC computers are always operational. One of the computers does operate in damping mode serving as a failure backup, whereas the other operates in the active mode (Petrescu et al., 2017). The SEC and FAC computers receive signals from the ELAC computer. The SEC and FAC computers are then responsible for controlling the flight spoilers and sending turn coordination orders for the rudder consecutively. In case the aircraft is under control of the autopilot, electric signals generated by the FMGS are received by the FAC and ELAC (Ground School Articles, 2021). In addition, there are two ways in which pitch control is maintained on the Airbus A320. Elevators are primarily used in aircraft pitching. Apart from the elevator, the Trimmable Horizontal Stabilizer (THS) is utilized to help trim the aircraft.

On the other hand, the CRJ700 has its assembly and interior fitting done at the Bombardier Canadair manufacturing facility, located at Dorval, Quebec. The CRJ700 features a flight control system that is automatic. The automatic flight control system comprises three major parts; autopilot, flight director, and Yaw dampers (Yongjie et al., 2021). The flight director provides the pilot with visual guidance by indicating command bars on the primary flight display’s attitude indicator. With such a feature, the pilot can manually fly the aircraft while applying the instrument for guidance purposes. The pilot can as well see what the autopilot would do if it were to be engaged. The autopilot is responsible for controlling the aircraft’s pitch and roll. It uses the ailerons and the elevator trim to follow the flight director’s commands. The yaw dampers are not implemented in this though they are officially necessary for operating the autopilot.

On the CRJ700, the flight director has various modes which can be set up through the panel responsible for flight control. Whenever the flight director is engaged, the vertical and basic lateral modes automatically become active. When a button engaging another mode in a given category is pressed, the corresponding basic mode gets disable. If the same button is pressed again, the autopilot reverts to the basic mode. For the flight director to control the aircraft, the autopilot must first be activated, making the autopilot follow the flight director's commands and control the ailerons and the elevator trim. This means that when autopilot is engaged in the CRJ700, it will automatically engage the flight director in basic mode. When this is done, the references for pitch and roll get synced (Yongjie et al., 2021). Consequently, the CRJ700 cannot land on its own with autopilot. This is because it is not equipped with autoland. Therefore, to ensure a safe landing, the pilot switches off the autopilot at least 300 feet above the ground. While at around 50 feet above, the pilot set the throttle to idle while carefully pulling up the nose. This happens since the real CRJ700 does not have an autothrottle.

In conclusion, this research paper critically compared and contrasted the Airbus A320 and the CRJ700 by discussing their flight control systems. For the Airbus A320, it is distinct that it uses fly-by-wire flight control systems. This is unlike the flight control system installed on conventional aircraft. Furthermore, the Airbus A320 is mainly divided into primary and secondary flight control systems. Here, roll control is performed by the autopilot commands. On the other hand, the CRJ700 is a Bombardier Canadair jet that uses an automatic flight control system consisting of three parts. These parts include flight director, autopilot, and yaw dampers. However, On the CRJ700, the autopilot has to be activated to allow the flight director to control the aircraft. Also, the yaw dampers are not implemented.

**References**

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