

US Patent 11,840,354 enhances airliner flight-deck safety by using machine learning to detect and alert flight crews to anomalous automation behavior. It significantly improves situational awareness during critical phases of flight where automation disengagements may lead to loss-of-control incidents.

Modern airliners rely on layered automation systems for controlling flight trajectory, propulsion, and navigation. These systems have evolved into a complex “stack” of functions, each with its own modes, engagement logic, and annunciations scattered across the cockpit. This distributed design obscures unexpected changes in automation—particularly disengagements of the Autopilot or Auto-throttle that have contributed to Controlled-Flight-Into-Stall (CFIS) accidents.

This technology introduces a new approach: *machine-learning-generated probabilistic alert rules that help the aircraft recognize when an automation configuration change is inconsistent with safe patterns.*

### Methodology:

- Historical flight records are analyzed to identify key flight attributes (e.g., airspeed, pitch, etc.)
- A trained model produces real-time probabilities of an erroneous configuration
- Device presents unified summary display in ways existing flight-deck interfaces do not

### Advantages:

- Significantly improves flight crews’ ability to identify, understand, and respond to automation issues in real-time
- Reduces reliance on scattered annunciations and resolves longstanding human-factors problems inherent to legacy flight-deck design
- Reduces pilot cognitive load during automation transitions with a consolidated display
- Uses flight-data-driven machine learning instead of static rule-based systems
- Seamlessly integrates with existing avionics while enhancing situational awareness



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