Unit 1

Initial post
Boeing developed the Manoeuvring Characteristics Augmentation System (MCAS) in the Boeing 737, Max, to prevent stalling of the aircraft. Two accidents with a fatality of 346 were reportedly linked to the software resulting in the grounding of the aircraft by several airlines. According to evidence collected from some pilots, the software continuously controlled the aircraft when it detected stalling. The initial design made it difficult for the pilots to override the software's decision where human intervention would have potentially resulted in a decision that is different from the machine recommended.

According to John McDermid (2020),

> *"The system was also hard to override. In both cases, the flight crews were unable to override the MCAS, although other crews had successfully managed to do so in similar situation, and this contributed to the two accidents."*

The software has since been updated to prevent similar accidents from occurring. The updates give more control to the pilots giving them the ease to disagree with the software's recommendations. Some additional training has also been introduced for pilots to be able to handle situations that may arise from the software's recommendations. While there are still some trust-related issues, some airlines have restarted flying the aircraft.

References

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Federation Aviation Administration (November 18, 2020) Summary of the FAA's Review of the Boeing 737
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My response
Hi Charles,

Thanks for this interesting discussion piece.

The MCAS system sensors did not cross-check the readings to confirm the reading. As Roberto mentioned, Boeing made the executive decision to not treat the 737 Max as a new aircraft to avoid money being spent on pilot training, the MCAS system was not known to pilots (Johnston and Harris, 2019). In the Lion Air crash, there was a 20-degree discrepancy between the sensors

Four main reasons have been found to be behind the failure of the MCAS that caused the two crashes. I) poor documentation, ii) rushed release, iii) delayed software updates, and iv) humans out of the loop.

The pilots reported non-existent training on the aircraft, and no instruction in the manuals about the MCAS system, which led to the pilots of the Lion Air crash did not know of its existents. The black box shows the pilots frantically searching the manual and trying to unsuccessfully override the system 21 times. The rushed release meant corners were cut, with engineers reporting double the normal workload in a shorter time span. Updates to the system were delayed, by as much as about 4 months. (Johnston and Harris, 2019).

It has been argued that the fault is not bad software per se, but quickly applied patch within a larger system context. The lesson to take from the MCAS failure is that a complex system may not be forced to perform tasks it does not have the capacity for. Boeing took an existing system and altered it for monetary and time-bound reasons, trying to optimise the system by optimising parts of it, not the system itself ensuring all parts function properly together. (Johnston and Harris, 2019).

It is particularly important to allow a user of a fully automated system to override its functions. A system designed to perform specific tasks on limited data cannot improvise or understand it is not performing as intended. As research analyst Colin Barnded concluded regarding the MCAS system, there was a “failure of intended function, a plane shouldn’t fight the pilot and try fly into the ground” (Yoshida 2019).

References

Yoshida, J. 2019. Boeing 737 Max: Is automation to blame? EET Asia (March 19). Available from https://www.eetasia.com/news/article/Automation-and-Boeings-B737-Max-Crash.

Johnston, P., Harris, R. (2019) The Boeing 737 MAX Saga: Lessons for Software Organizations *Safety and Automation* SQP VOL. 21, NO. 3/© 2019, ASQ