

Safety Recommendation Number:	IRLD2016007
AAIU Event Reference:	IRL00913099
AAIU Report Number:	2016-007
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Safety Recommendation Status:	Not Accepted – Closed

Safety Recommendation:

The Boeing Aircraft Company should review the effectiveness of the current IAS DISAGREE warning as a means of alerting Flight Crews to an unreliable airspeed condition.

Response:

31 August 2016:

Boeing Aircraft Company responded to the AAIU by letter advising as follows;

"IAS DISAGREE is a caution level message on Boeing 747-400/-8, 757, and 767 EICAS airplanes and complies with Boeing flight deck philosophy. When the message is displayed, it is accompanied by an aural beeper, and Master CAUTION lights on the left and right glare shield panel. FCOM guidance also indicates immediate awareness is required for Caution messages, and corrective action may be required. (FCOM Chapter 15, Section 20, Chapter 15, Section 20). The IAS DISAGREE caution level crew alert is appropriate and effective for the condition it is indicating, which is simply a 5 kt difference between the captain's and first officer's airspeed displays. The flight crew checklist associated with the alert is simply a condition statement with no specific steps. Included in the checklist is guidance to go to the Airspeed Unreliable checklist elsewhere in the same Quick Reference Handbook (QRH) chapter"

AAIU Comment:

04 October 2016:

The AAIU has reverted to the Boeing Aircraft Company in respect of this response, and in the interim regards the status of this Safety Recommendation as 'Open'.

Response:

08 March 2017:

Boeing Aircraft Company responded to the AAIU by letter advising as follows;

The discussion section of AD 2016-07-10 references the "voted air data" function present in the 777/787 airplanes: "In normal operations, the air data reference system supplies the same airspeed to both the captain and first officer primary flight displays." This does not apply to the incident aircraft. As discussed in section 1.6.3 of the draft report, the design of the 757 incorporates three separate and independent systems to indicate airspeed to the

flight crew: The captain's airspeed indicator via the left ADC, the First Officer's airspeed indicator via the right ADC, and the standby airspeed indicator.

The IAS DISAGREE Caution level crew alert has a 5 second delay in annunciation which is necessary to avoid nuisance alerts caused by system latency, short term airflow differences, or intermittent system tolerance stack-ups. Upon receiving an IAS DISAGREE message or observing an unusual airspeed indication, the crew is trained to execute the Airspeed Unreliable unannounced checklist. After performing the memory items and stabilizing the airplane, the crew is directed to cross-reference the other independent airspeed indications to determine a reliable source. The check list instructions state, "When a non-normal situation occurs, at the direction of the pilot flying, both crewmembers do all memory items in their areas of responsibility without delay." In the course of normal CRM, it is expected that the crew member observing the anomaly, in this case the PF, would announce his observation. This would alert the PM to check his respective airspeed indication and serve as an immediate cross-reference and confirmation of the anomaly. At that point the IAS DISAGREE would be indicated, even with the 5 second delay. Also related, the 757 Flight Crew Training Manual currently includes information concerning 'Flight Control Sensitivity at High Speed and High Altitude'.

For these reasons, the current IAS DISAGREE alert provides flight crews with an appropriate level of alert.

AAIU Comment:

On 7 July 2017 the AAIU replied to Boeing as follows:

The AAIU has reviewed the Boeing response to the SR, and would like to make the following observations:

- The AAIU does not dispute the need for the 5 second delay to avoid nuisance alerts. However, during that 5 second period crews may have begun reacting to, and are now focused exclusively upon, the sight of an erroneous airspeed display on their flight instruments.
- Whilst the mode of detection and transmission of EICAS messages relating to IAS DISAGREE may differ between the 777/787 and the 757, the AD 2016-07-10 states '*This AD was prompted by reports indicating that in certain weather conditions with high moisture content or possible icing, erroneous low airspeed may be displayed to the flightcrew before detection and annunciation via engine-indicating and crew-alerting system (EICAS) messages*'.
- Therefore the FAA issued this AD based on evidence (from reports) that crews may see and react to erroneous airspeed displays on their Flight Instruments, before the EICAS message is displayed.
- This is essentially what occurred on the subject flight.
- The SR asks Boeing to '*... review the Effectiveness of the current IAS DISAGREE warning as a means of alerting crews...*'.
- Once a crew is alerted to an EICAS IAS DISAGREE warning, then they can be expected to react according to procedures and training. The issue is that crews **may not always perceive the alert**, having commenced reaction to a displayed low airspeed indication.

The Investigation is therefore of the view that Boeing's response is a re-statement of the current position with an emphasis on the CRM aspects. The Final Report acknowledged the CRM aspects, and made safety recommendations to the operator in this respect. Notwithstanding, the Investigation is of the view that the circumstances of this event, combined with AD 2016-07-10, warrant a more detailed and considered review than Boeing's response suggests has occurred.

On 31 November 2019 the AAIU sent the following additional email to Boeing:

In relation to our Safety Recommendation, the point that is being made is that, in the midst of a perceived loss of airspeed, the immediate concentration by the Pilot Flying (PF) in reacting to the sight of low airspeed, and possible Startle Effect, may result in a caution alert being missed.

In the subject event, the PF genuinely was of the belief that the aircraft was about to stall. In other words, that the airspeed he was seeing was 'realistic'. Otherwise he would most likely not have reacted the way he did, which was to commence control inputs to recover the situation.

This is not an isolated case, and AD 2016-07-10 points to similar events on the B787:

Quote from the text of AD 2016-07-10: During one in-service event, with autopilot engaged, the pilot overrode the engaged autopilot in response to the displayed erroneous low airspeed and made significant nose-down manual control inputs. In this situation, there is the potential for large pilot control inputs at high actual airspeed, which could cause the airplane to exceed its structural capability.

During such instances the built-in delay of approx. 5 seconds before the master caution annunciates the Airspeed Disagree caution, gives enough time for the PF to narrow his/her focus on the 'loss of airspeed' they are perceiving to the exclusion of other possible information. In such circumstances, a low level caution may not be sufficient to draw the PF's attention to the actual cause of the problem. Hence the text of SR IRLD2016007.

There are other factors that would play a part in militating against such pilot reaction to seeing a sudden drop in airspeed, such as CRM, crew training; and these were addressed in SRs to the operator. But the Investigation feels that one of the core issues in this event is the fact that as the subject occurrence evolved, the Airspeed Disagree warning was not effective enough to draw either of the pilots' attention to the failure that had occurred.

Response:

24 July 2020:

Boeing Aircraft Company responded to the AAIU by letter and email (including reference material from the B757 FCTM and QRH) advising as follows;

[...]. Please note, the QRH procedure provides potential evidence presented to the flight crew of unreliable airspeed indications, other than an IAS DISAGREE alert. The evidence includes speed/altitude information not consistent with pitch attitude and thrust setting and

variations between captain and first officer airspeed displays. Also please note the FCTM advises There have been reports of passenger injuries due to over-controlling the airplane during high altitude, high airspeed flight when overriding the control column with the autopilot engaged or after disengaging the autopilot with the disconnect switch and informs flight crew members that to avoid over-controlling the flight controls during high altitude high airspeed flight, smooth and small control inputs should be made after disengaging the autopilot.

We have evaluated the AAIU's request that Boeing reconsider our response to IRLD2016007 and Boeing has found our response sufficiently addresses your concerns. Boeing's existing published 757 Flight Crew Training Manual (FCTM) and 757 Quick Reference Handbook (QRH) guidance, as detailed above, along with industry standard Crew Resource Management training and practices, provide flight crews the information necessary to recognize an incorrect airspeed display, take appropriate action to fly the airplane at a safe airspeed, and safely maneuver the airplane, if required.

AAIU Comment:

The AAIU considers this Safety Recommendation 'Not Accepted – Closed'