



# Federal Aviation Administration

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## Memorandum

Date: September 14, 2015

To: Manager, Certificate Management and Safety Oversight Branch, ACE-120A

From: Manager, Small Airplane Directorate, ACE-100

Prepared by: Donald J Young, Certificate Management and Safety Oversight Branch, ACE-120A

Subject: INFORMATION: Equivalent Level of Safety (ELOS) Finding for Honda Aircraft Company, Model HA-420 (HondaJet), Airspeed Indicator (ASI) Flap Markings, Project TC9438AT-A

ELOS Memo#: ACE-15-11

Regulatory Ref: ELOS ACE-15-15 § 23.1545(b)(4)

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This memorandum informs the certificate management aircraft certification office of an evaluation made by the Accountable Directorate on the establishment of an equivalent level of safety finding for the Honda Aircraft Company Model HA-420 airplane. This ELOS finding is to ELOS memorandum number ACE-15-15 § 23.1545(b)(4).

### **Background:**

The Honda Aircraft Model HA-420 is powered by two General Electric Honda Aero Engines (GHAE) Model HF120 medium bypass turbofan engines mounted in a unique over-the-wing configuration. The HA-420 avionics suite incorporates a Garmin G3000 Integrated Flight Deck with three displays. Two of the displays are configured as pilot and copilot Primary Flight Displays (PFD) and the third is configured as a Multi-Function Display (MFD) and is located between the pilot and copilot PFDs. Primary flight information is indicated to the flightcrew on the PFDs during normal operation. Honda has requested an ELOS for marking of the Flap Operating Range Indication which is required per ELOS ACE-15-15 § 23.1545(b)(4).

The G3000 PFD displays the maximum flap-extension airspeed references as solid white triangles to the right of the airspeed tape when the altitude is below 18,000 feet. These references provide the maximum airspeed limit for the flightcrew to extend the flaps, dependent on the flap condition.

There is no low airspeed operational limit that corresponds with  $V_{SO}$  at maximum gross weight for the HA-420 flap settings as defined in ELOS ACE-15-15 § 23.1545(b)(4). However, the Low

Speed Awareness (LSA) indication provides the operational limits based on the aircraft configuration when approaching the stall speed.

**Applicable regulations:**

ELOS ACE-15-15 § 23.1545(b)(4)

**Regulations requiring an ELOS finding:**

ELOS ACE-15-15 § 23.1545(b)(4)

ELSO ACE-15-15 § 23.1545(b)(4) requires a “white arc with the lower limit at V<sub>SO</sub> at the maximum weight, and the upper limit at the flaps-extended speed V<sub>FE</sub> established under 14 CFR § 23.1511” be provided for the flap operating range.

**Description of compensating design features or alternative Methods of Compliance (MoC) which allow the granting of the ELOS (including changes, limitations, or equipment needed for equivalency):**

The Garmin G3000 displays the maximum flap-extension airspeed references (for both the Takeoff/Approach and Landing configurations) as solid white triangles (bugs) to the right of the airspeed tape when the altitude is below 18,000 feet. A “TA” bug denotes the maximum flap-extension airspeed for the Takeoff/Approach flap setting (TO/APPR) and a “LD” bug denotes the maximum flap-extension airspeed for the Landing flap setting (LDG). These references provide the maximum airspeed limit for the flightcrew to extend the flaps, dependent on the flap condition and cannot be turned off or modified by the pilot.

The airspeed indication is displayed in red text if the airspeed exceeds the active flap limit. A solid red bar is displayed at the upper airspeed limit for the currently selected flap setting.

When the flaps are set to UP, the “TA” bug indicates to the flightcrew the airspeed at which the use of flaps is possible. When the flaps are set to or are transitioning to TO/APPR, the “LD” bug indicates to the flightcrew the airspeed at which flap deflection greater than the TO/APPR setting is possible.

The logic for the flap airspeed bugs takes into account the present airspeed and flap setting to determine the proper flap airspeed bug to display. Only one flap airspeed bug is displayed at a time and the transition to the next flap airspeed bug occurs after the flaps have fully transitioned to the commanded flap setting.

There is no low airspeed operational limit that corresponds with V<sub>SO</sub> at maximum gross weight for the HA-420 flap settings as defined in ELOS ACE-15-15 § 23.1545(b)(4). However, the LSA indication provides the operational limits based on the aircraft configuration when approaching the stall speed.

A solid red and a striped red and white low speed awareness tape are presented when takeoff V-speeds are not displayed. The solid red tape extends from the stick-pusher-activation airspeed down to the bottom of the viewable airspeed tape. The red and white striped tape is distinct (i.e., barber pole) between the stick-pusher and stick-shaker airspeeds. The width of the red and white tape is constant, but the width of the solid red tape expands when the airspeed is at or below the stall-warning airspeed. The digital-numeric airspeed display also changes to white digits with a red background when the indicated airspeed is below the stall-warning airspeed.

The HA-420 is a turbojet airplane that requires type specific training, including operating limits for the flaps. In addition, the airspeed limits for the flaps are included on the operating limitations placard.

**Explanation of how design features or alternative Methods of Compliance (MoC) provide an equivalent level of safety intended by the regulation:**

The display of the flap-airspeed-limit bugs provides a clear indication to the flightcrew of the limiting airspeeds for the flap settings. The variation in the digital numeric display color for airspeed indication corresponding to flap speed limit exceedances provides enhanced awareness to the flightcrew. In addition, the changes in the solid red tape provide additional visual cues of the low-airspeed limitations.

The Garmin G3000 avionics system airspeed display installed on the HA-420 provides multiple cues to the pilot for the operating limits specific to the flap airspeed limits. The flap-extension-airspeed limit bugs along with the LSA display indications that are configuration dependent provide the flightcrew with a dynamic display of the operating limits of the aircraft that integrate the flap operating airspeed limits. The electronic airspeed tape display features for flap operating airspeed limits, identified above, provide an ELOS to a traditional radial-arc dial gauge with colored arcs that indicate configuration specific airspeed limits.

**FAA approval and documentation of the ELOS finding:**

The FAA has approved the aforementioned equivalent level of safety finding in project issue paper S-13. This memorandum provides standardized documentation of the ELOS finding that is non-proprietary and can be made available to the public. The Accountable Directorate has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum number must be listed in the Type Certificate Data Sheet under the Certification Basis section (TCs & ATCs) or in the Limitations and Conditions section of the STC.

Equivalent Level of Safety Findings has been made for the following regulation(s):

ELOS ACE-15-15 § 23.1545(b)(4), Airspeed indicator  
(Documented in ELOS Memo ACE-15-11)

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9/14/2015

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Earl Lawrence, Manager, Small Airplane Directorate,  
Aircraft Certification Service

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Date

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