



Federal Aviation Administration

Memorandum

Date: August 14, 2014

To: Manager, Aircraft Certification Office, ASW-150

From: Manager, Small Airplane Directorate, ACE-100

Prepared by: Mike Heusser, Aircraft Certification Office, ASW-150

Subject: Equivalent Level of Safety (ELOS) Finding for SyberJet Aircraft Avionics System Upgrade on Model SJ30-2ASV, FAA Project # AT2244AC-A

ELOS Memo#: ACE-05-16A

Regulatory Ref: 14 CFR 23.1545(b)(4), Amendment 23-50

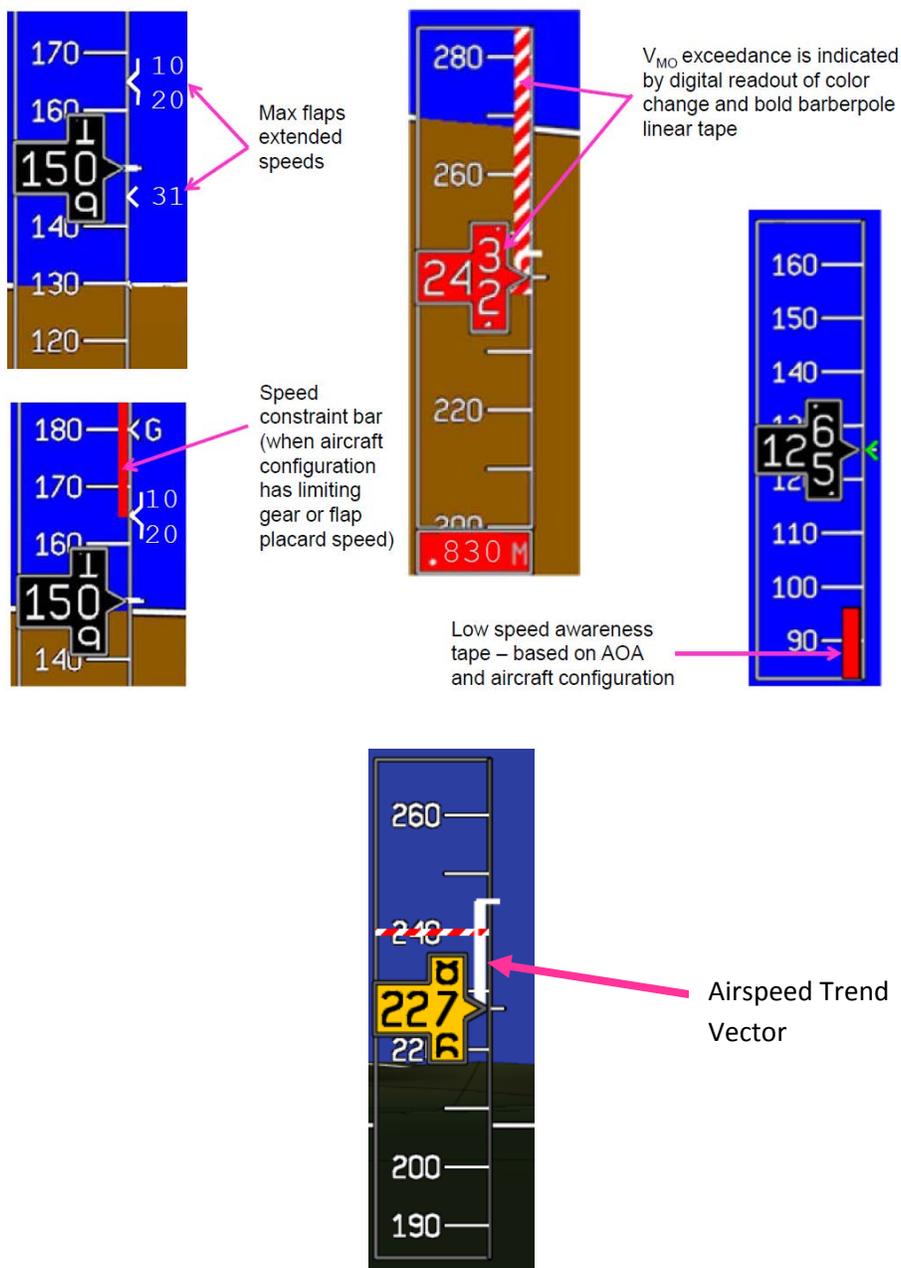
This memorandum informs ASW-150 of an evaluation made by the Small Airplane Directorate on the establishment of an equivalent level of safety (ELOS) finding for the SyberJet Aircraft Model SJ30-2ASV airplane. This ELOS finding pertains to the marking of flap operating speeds on the airspeed indicator required by § 23.1545(b)(4).

Background

SyberJet Aircraft (SJA) has requested an ELOS to § 23.1545(b)(4), as required by 14 CFR 21.21(b), on the SJA Model SJ30-2ASV, which is the Model SJ30-2 with Avionics System Upgrades. This ELOS is an extension of ELOS ACE-05-16, dated October 24, 2005, for the Model SJ30-2 with the original Honeywell Primus EPIC CDS electronic display instrument system. ELOS ACE-05-16 was requested for the use of electronic display instrument systems that did not incorporate a white arc for marking the flap operating speed range. SJA has installed in the Model SJ30-2ASV a Honeywell Apex™ electronic display instrument system that also does not display a flap operating range, but has differing compensating features, and therefore, have requested an ELOS for the new airplane model.

The Model SJ30-2ASV incorporates electronic flight displays and utilizes a linear tape airspeed indication on the left side of the Primary Flight Display, as shown in Figure 1. Advisory Circular (AC) 23.1311-1C, Installation of Electronic Display in part 23 Airplanes, paragraph

17.7.2, indicates that the applicant should show compliance with §§ 23.1311(a)(6) and 23.1545, paragraphs (a) through (d), and incorporate speed awareness cues for Maximum Operating Speed (V_{MO}) airplanes, including a white band representing the flap operating range.



¹ All airspeed values are generic and may not represent the airspeed limitations of the SJ30-2ASV

Figure 1 – Examples of airspeed awareness cues on the SJ30-2ASV Primus Apex™ system¹

The applicant requests the Federal Aviation Administration grant an ELOS finding from § 23.1545(b)(4) based on an alternative arrangement for presenting maximum flap extended speeds.

The below recently certificated part 23 airplanes have been granted an ELOS for the omission of the flap operating range-marking requirement:

- Model SJ30-2 (TCDS #A00001AC).
- Pilatus PC-12/47E (ELOS ACE-07-15).

The PC-12E ELOS was granted for an airplane that also utilized the Honeywell Apex™ avionics system with very similar airspeed indication displays.

In considering the current design, the applicant has requested an ELOS to § 23.1545 for one specific condition of the Airspeed Indicator marking.

Applicable Regulations:

The airspeed indicator marking requirements are specified in § 23.1545(b)(4), Amendment 23-50 and states:

“§ 23.1545 Airspeed Indicator.

(b) The following markings must be made:

(4) For the flap operating range, a white arc with the lower limit at V_{so} at the maximum weight, and the upper limit at the flaps-extended speed V_{FE} established under Sec. 23.1511.”

Regulations Requiring an ELOS Finding:

Section 23.1545(b)(4), Amendment 23-50.

Description of Compensating Design Features or Alternative Standards, which allow the granting of the ELOS (including design changes, limitations or equipment needed for equivalency):

The SyberJet Model SJ30-2ASV aircraft incorporates the Honeywell Primus Apex™ integrated avionics suite and an “all-glass” cockpit. Primary flight information is indicated to the flightcrew on the pilot’s Primary Flight Display (PFD) and the copilot’s PFD. Airspeed is indicated to the flightcrew by means of a moving vertical tape in combination with a rolling digit indicator on the left hand side of the Airspeed Display Indicator (ADI) section of each pilot’s PFD.

In accordance with guidance provided in AC 23.1311-1C, the linear airspeed tape indicator includes airspeed awareness cues equivalent or superior to cues provided by traditional round dial type indicators. Figure 1 above provides examples of the airspeed awareness cues provided by the SJ30-2ASV Primus Apex™ system.

These awareness cues include:

- Altitude dependent V_{MO}/M_{MO} airspeed limitation indication (barber pole bar).
- Aircraft configuration related airspeed constraints (red bar and speed bugs).
- Airspeed trend vector indicating predicted airspeed with 6 seconds look ahead (white bar).
- Aircraft configuration dependent low-speed awareness indication (red bar).

In addition to these awareness cues, the system also includes the following “attention getters” to alert the flightcrew of imminent or actual alert conditions:

- “STALL” and “OVERSPEED” annunciations displayed on the ADI section of the PFD to alert the pilot of an imminent stall or speed exceedance condition.
- When a stall is imminent, two annunciators within the ADI will flash red reverse video on the ADI for 5 seconds, and then remain steady as show in Figure 2. Additionally a ‘Stall’ aural warning will be active for the duration of the stall condition.
- Color changes or emphasis of display elements (e.g. color change of digital airspeed readout)

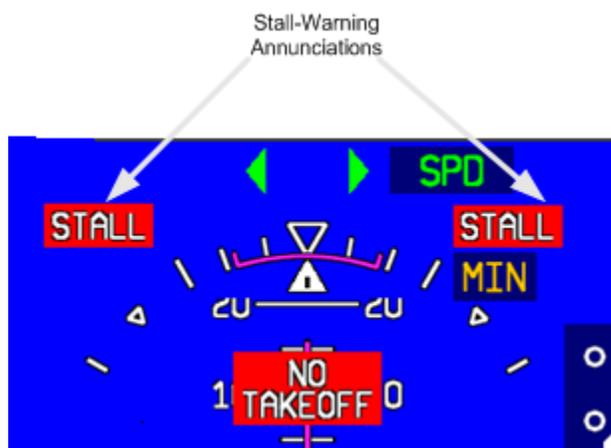


Figure 2. Stall Warning Annunciators

At any time, the Airspeed is greater than the V_{MO} or V constraint (gear or flaps), the Airspeed digits turn red, overspeed annunciation and aural warning are active. The annunciation is displayed in the ADI Flight Alert area as depicted in Figure 3. The CAB ALT, GEAR, OVERSPEED, and CAB PRESS alerts share the same display window on the PFD. The CAB ALT alert has the highest visual priority, followed by GEAR, OVERSPEED, and CAB PRESS.



Figure 3. Overspeed Warning Annunciator

Explanation of how design features or alternative standards provide an ELOS to that intended by the regulation:

SyberJet believes that the airspeed indication and airspeed awareness cues implemented in the SJ30-2ASV Primus Apex™ system provides an ELOS to what is required by § 23.1545(b)(4) for the following reasons:

1. The intent of § 23.1545(b)(4) is to provide awareness to the flightcrew of the airspeed range (relative to the present airspeed) within which the flaps can be safely fully extended.
2. The implementation of the SJ30-2ASV Primus Apex™ airspeed indicator follows the guidance provided in AC 23.1311-1B and provides airspeed awareness cues that are equivalent, or superior to the traditional round dial type indicator.
3. The airspeed indicator markings required by § 23.1545 are very much written with a round-dial type indicator in mind. Applying these markings to linear tape style airspeed indicators may, under some circumstances, lead to conflicts with other symbols. On the SJ30-2ASV Primus Apex™ system, such a conflict would exist between the flaps operating range marking required by § 23.1545 (b)(4) and the airspeed trend vector, both of which have the appearance of a white bar alongside the airspeed tape.
4. The SJ30-2ASV Primus Apex™ system will display speed constraints associated with flap and gear configuration as described below.

The safe flap extension and landing gear operating speed constraints, as published in the Limitations section of the Aircraft Flight Manual (AFM), are marked on the airspeed tape by

bugs as shown in Table 1 below (see Fig. 1 for an example of the actual appearance on the airspeed tape):

Table 1 – Speed Bug Fixed Conditions

Meaning	Symbol	Speed Bug Label	Speed Bug Fixed Condition
Landing gear operation speed constraint		G	225 KIAS
Flaps extended 10 and 20 speed		10 20	200 KIAS
Flaps extended 31 speed		31	170 KIAS

In addition, Table 2 depicts the aircraft configuration dependent speed constraint symbols that are displayed on the airspeed tape:

Table 2 – Speed Constraint Symbols

Condition	Speed constraint symbols
Landing Gear Down OR Landing gear in transit (extending or retracting)	Red speed constraint bar from V_{MO} down to the landing gear operation speed bug (225 KIAS)
Flaps extended 10 or 20	Red speed constraint bar from V_{MO} down to the flap extended 10 or 20 speed bug (200 KIAS)
Flaps extended 31	Red speed constraint bar from V_{MO} down to the flap extended 31 speed bug (170 KIAS)

If the current airspeed exceeds a speed limit, as marked by the red speed constraint bar or the V_{MO} barberpole, the Primus Apex™ system will alert the flightcrew by changing the color of the digital airspeed readout to red reverse video with white digits. In the event that the airspeed does not exceed any max speed (V_{MO} or V constraint), but the airspeed trend vector exceeds the V constraint red thermometer or the V_{MO} airspeed, then the Airspeed digits will turn Amber reverse video.

Federal Aviation Administration Approval:

The FAA has approved the aforementioned ELOS finding in FAA Project # AT2244AC-A. This memorandum provides standardized documentation of the ELOS finding that is non-proprietary and can be made available to the public. The Small Airplane Directorate has assigned a unique

ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum number should be listed in the Type Certificate Data Sheet (TCDS) under the Certification Basis section for this Amended Type Certificate (ATC). An example of an appropriate statement is provided below.

An ELOS Finding has been made for the following regulation of 14 CFR part 23.

§ 23.1545(b)(4), Amendment 23-50, Airspeed indicator.

(Documented in ELOS Memorandum ACE-05-16A)

Monica L. Nemecek

 for Small Airplane Directorate,
 Aircraft Certification Service

8-14-14

 Date

ELOS Originated by ACO: Military Certification Office	Military Certification Office Manager: Derek Morgan	Routing Symbol: ACE-100M
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