



Designation: F3491 – 21

Standard Practice for Enhanced Indication Methods in Aircraft¹

This standard is issued under the fixed designation F3491; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice provides methods for how Enhanced Indications are provided to the responsible crewmember when an applicant uses these indications in support of compliance with the requirements for Stall Characteristics, Stall Warning, and Spins applicable to Normal Category Aeroplanes, using Specification **F3180/F3180M**.

1.2 The specific types of enhanced indications identified in Specification **F3180/F3180M** are as follows:

Type	Description
Angle of Attack	Angle of attack indication
Angle of Attack	Angle of attack indication with trend marker
Pitch Limit	Pitch limit indication displayed on attitude indication
Dynamic Low-Speed Markings	Indicated airspeed markings that change with flight condition
Airspeed Trend	Indicated airspeed trend marker displayed on airspeed indication
Flight Path Marker	Flight path marker displayed on attitude indication
LOC Alert	Alert issued when loss of control likely within trend window

1.3 An applicant intending to propose this information as Means of Compliance for a design approval must seek guidance from their respective oversight authority (for example, published guidance from applicable civil aviation authority (CAA) concerning the acceptable use and application thereof. For information on which oversight authorities have accepted this practice (in whole or in part) as an acceptable Means of Compliance to their regulatory requirements (hereinafter “the Rules”), refer to the ASTM Committee F44 web page (www.astm.org/COMMITTEE/F44.htm).

1.4 *Units*—This document may present information in SI units, English Engineering units, or both. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the*

responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

2.1.1 The following is a list of external standards referenced throughout this practice. In all cases, later document revisions are acceptable if shown to be equivalent to the listed revision, or if otherwise formally accepted by the governing CAA; earlier revisions are not acceptable.

F3060 Terminology for Aircraft

F3180/F3180M Specification for Low-Speed Flight Characteristics of Aircraft

F3117/F3117M Specification for Crew Interface in Aircraft

2.2 SAE Standard:³

ARP4102/7 Electronic Displays

3. Terminology

3.1 *Definitions*—Terminology specific to this practice is provided below. For general terminology, refer to Terminology **F3060**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *flight path marker, n*—flight path marker shows the aircraft’s predicted path based on horizontal and vertical speed, heading, wind, and possibly other contributing factors.

4. Significance and Use

4.1 The purpose of this practice is to discuss display or functional characteristics, or both, of enhanced indications for low-speed awareness.

¹ This practice is under the jurisdiction of ASTM Committee F44 on General Aviation Aircraft and is the direct responsibility of Subcommittee F44.10 on General.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

³ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, <http://www.sae.org>.

4.2 The information in this practice may be used in developing enhanced indications that are part of the compliance approach for Normal Category Aeroplanes using Specification **F3180/F3180M**, Stall Warning, and Specification **F3117/F3117M**.

5. Enhanced Indication Characteristics

5.1 The content within this section complements the Enhanced Indication requirements of Specification **F3180/F3180M**, Safety-Enhancing Features, but may not be limited to those indications.

NOTE 1—Symbology and symbology dynamic characteristics should be consistent within the cockpit.

5.2 Symbols other than those referenced in this practice may be used if determined to be acceptable to the CAA.

5.3 *Airspeed Trend Indications:*

5.3.1 Indications with trend markers shall display the future value of the specified indication based on the current aeroplane state.

5.3.2 An acceptable list of trend marker symbols and characteristics for airspeed can be found in SAE ARP4102/7.

5.4 *Angle of Attack Indication*—An acceptable list of indications for angle of attack can be found in SAE ARP4102/7.

5.5 *Angle of Attack with Trend Indication:*

5.5.1 An acceptable list of indications for angle of attack can be found in SAE ARP4102/7.

5.5.2 Addition of trend marker (symbology, characteristics) for angle of attack should be consistent with other trend markers presented to the flight crew.

5.6 *Pitch Limit Indication*—An acceptable list of indications for pitch limit indication can be found in SAE ARP4102/7.

5.7 *Dynamic Low-Speed Marking*—An acceptable approach for dynamic low-speed markings is described in Specification **F3117/F3117M**, Dynamic Low-Speed Markings.

5.8 *Flight Path Marker Indication*—An acceptable list of indications for flight path marker can be found in SAE ARP4102/7.

5.9 *Loss of Control Alert:*

5.9.1 Loss of Control Alert should be based on the estimated aeroplane state 6 to 10 s in the future.

5.9.2 Loss of Control Alert may complement other stall warning alerts or provide indication relative to potential for loss of control for states not addressed by other stall warning alerts, including conditions in other than the pitch axis.

5.9.3 Loss of Control Alert shall have defined flight crew procedures. (Reference **F3117/F3117M**.)

6. Keywords

6.1 alert; dynamic; enhanced indication; indication; symbology

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APPENDIX

(Nonmandatory Information)

X1. LIST OF CHANGES

X1.1 F3491-21

X1.1.1 Initial issue.

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