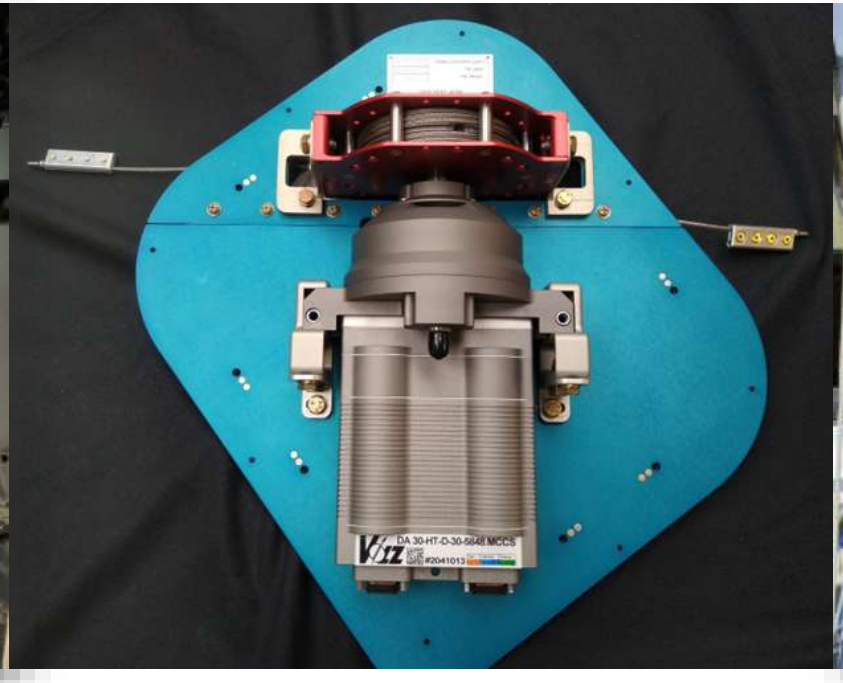
Practical application of a CFR Part 23 amendment 23-64 Certification Basis



Design Delegation Holders Seminar 6th November 2025

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Amendment 23-64 definitions

Term	Definition in this presentation
CFR 14 Part 23 amendment 23-64	Performance based regulations (The new way)
CFR 14 Part 23 amendment 23-63 (and prior)	Prescriptive regulations (The old way)
Performance Based Regulations (PBR)	14 CFR part 23 regulations rewritten at amendment 23-64 to state a safety objective, rather than a prescriptive requirement.
Prescriptive Regulations (PR)	Sufficiently detailed language to allow compliance directly with each section (regulation)
Means of Compliance (MOC)	Prescriptive requirements used as a means to demonstrate compliance to performance regulation (new definition)
Detailed Design Specification (DDS)	Prescriptive standards, appropriate for the specific aircraft design which contain the means of compliance used to comply with the safety objectives of the performance-based regulations of 14 CFR part 23,
Method of Compliance	Process to show compliance Eg Design review, Similarity, Analysis, Ground test, Flight test, Inspection (MOC in FAR 23 amdt 23-63 and FAR 25, 27, 29)

Performance Based Regulations - Goals

In 2017, the FAA implemented amendment 23-64 to part 23 airworthiness standards for normal category airplanes

- Improve Safety
  - Foster safety-enhancing innovation by offering applicants more flexibility in how to show compliance with part 23
  - Add new requirements to reduce loss of control and icing-related accidents
- Increase Regulatory Agility
  - Create a regulatory framework that allows the regulators to readily adapt to new technologies
- Reduce Costs for Regulators and Industry
  - Reduce the administrative burdens traditionally associated with certificating novel design features (e.g., Special Conditions/Issue Papers)
  - Tailor the level of rigor required for showing compliance based on risk (safety continuum)

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Performance Based vs Prescriptive Regulations

Prescriptive Regulations	Performance Based Regulations
14 CFR, Part 23 amdt. 23-63 and prior	14 CFR, Part 23 amdt 23-64 and subsequent
Detailed requirements	Objective-based requirements
“These exact technical requirements must be met”	"Meet this safety outcome"
Compliance is Objective	May require some subjective engineering judgement for compliance

Less "thou shalt", more "show us how that meets the objective"

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14 CFR, Part 23 Amdt 23-64

- Intended to maintain at least the legacy level of safety, at the aircraft level, established by amendment 23-63, except:
  - Introduces more rigorous requirements to reduce accidents caused by loss of control and icing
- Establishes four certification levels based on risk
- Establishes two performance levels
- Eliminates utility, acrobatic and commuter categories

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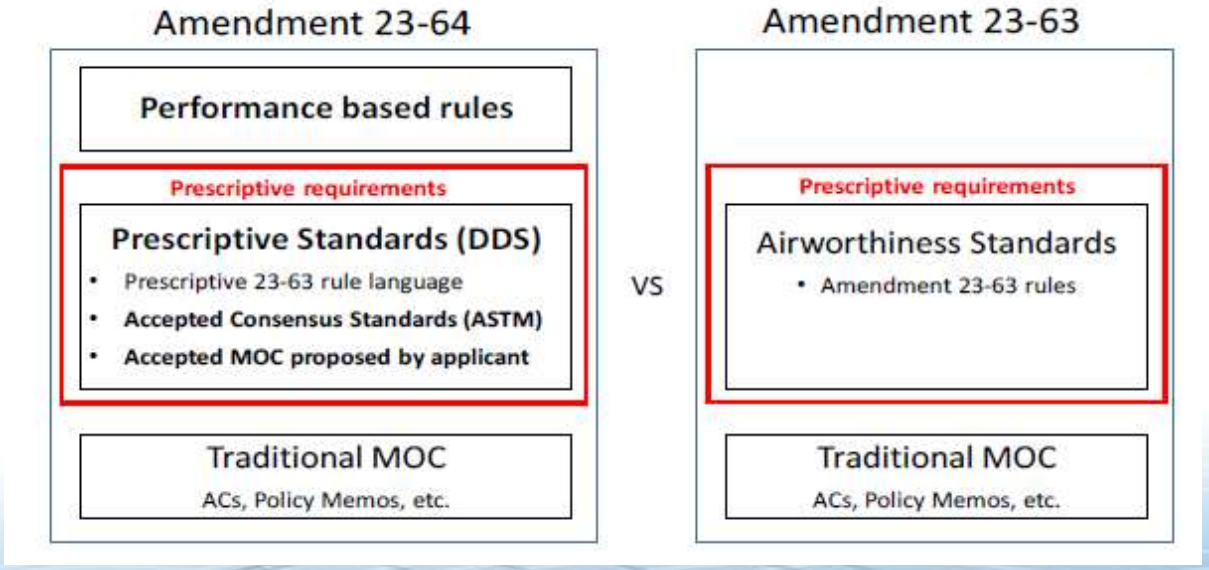
Means of Compliance

§ 23.2010 Accepted means of compliance.

(a) An applicant must comply with this part using a means of compliance, which may include consensus standards, accepted by the Administrator.

(b) An applicant requesting acceptance of a means of compliance must provide the means of compliance to the FAA in a form and manner acceptable to the Administrator.



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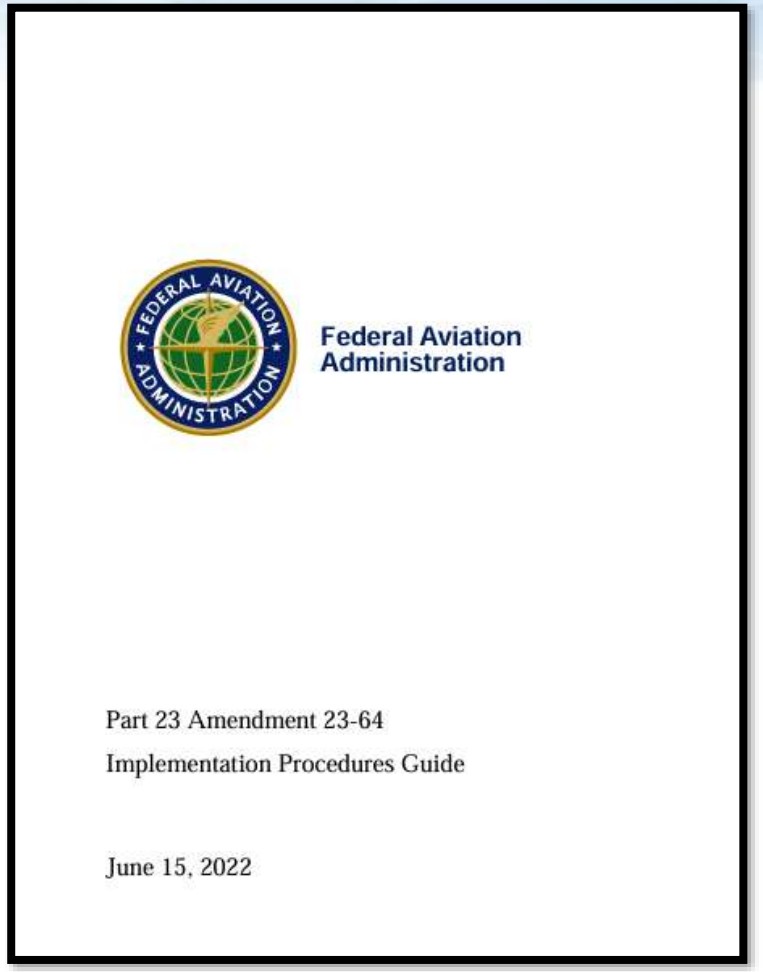
Implementation

- **FAA Implementation Procedures Guide (IPG), Initial Issue**
  - Current best source of guidance FAA Implementation Procedures Guide
  - Describes process for establishing a 23-64 certification basis and Detailed Design Standards (DDS)
  - Maps prescriptive regulations to performance based regulations



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Detailed Design Standards (DDS)

- FAA accepted DDS are identified by the Notice of Availability (NOA) published in the Federal Register:

  https ://www.faa.gov/aircraft/air_cert/design_approvals/small_airplanes/small_airplanes_regs/

- The accepted FAA DDS are based on ASTM F44 Committee consensus standards, but may include required changes by FAA for use as DDS for part 23.
- CAANZ adopts the FAA accepted DDS for STC projects (refer CAANZ AC 21-8)
- ASTM revises and adds standards content
- FAA reviews and accepts any revised/new content by publishing new Notice of Availability (NOA) published in the Federal Register.

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Common Misconceptions

- Industry groups, not FAA, chose ASTM to develop consensus standards for general aviation
- ASTM does not have personnel on staff writing standards for part 23 use
- Knowledgeable and experienced volunteers from industry, government, etc. develop technical content
- ASTM does not establish part 23 certification requirements
- ASTM publishing a standard does not mean that standard is accepted for showing compliance to part 23

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Practical application example 1 –Automatic Pilot System Requirement

The Old Way	The New Way
Under FAR 23 amendment 23-63	Under FAR 23 amendment 23-64
23.1329 Automatic pilot system (prescriptive requirement)	Determine applicable FAR 23 amendment 23-64 performance based regulation May use FAA accepted consensus standards as per FAA 23-20-01-NOA to select prescriptive requirement

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Automatic Pilot System Requirement – the old way (1)

- **SECTION:** Sec. 23.1329
  Amendment Number: 23-49, Effective Date: 03/11/1996

  TITLE: Automatic pilot system.

  SECTION RULE: If an automatic pilot system is installed, it must meet the following:
  (a) Each system must be designed so that the automatic pilot can--(1) Be quickly and positively disengaged by the pilots to prevent it from interfering with their control of the airplane; or
  (2) Be sufficiently overpowered by one pilot to let him control the airplane.
  (b) If the provisions of paragraph (a)(1) of this section are applied, the quick release (emergency) control must be located on the control wheel **[**(both control wheels if the airplane can be operated from either pilot seat)**]** on the side opposite the throttles, or on the stick control, (both stick controls, if the airplane can be operated from either pilot seat) such that it can be operated without moving the hand from its normal position on the control.
  (c) Unless there is automatic synchronization, each system must have a means to readily indicate to the pilot the alignment of the actuating device in relation to the control system it operates.
  (d) Each manually operated control for the system operation must be readily accessible to the pilot. Each control must operate in the same plane and sense of motion as specified in Sec. 23.779 for cockpit controls. The direction of motion must be plainly indicated on or near each control.
  (e) Each system must be designed and adjusted so that, within the range of adjustment available to the pilot, it cannot produce hazardous loads on the airplane or create hazardous deviations in the flight path, under any flight condition appropriate to its use, either during normal operation or in the event of a malfunction, assuming that corrective action begins within a reasonable period of time.
  (f) Each system must be designed so that a single malfunction will not produce a hardover signal in more than one control axis. If the automatic pilot integrates signals from auxiliary controls or furnishes signals for operation of other equipment, positive interlocks and sequencing of engagement to prevent improper operation are required.
  (g) There must be protection against adverse interaction of integrated components, resulting from a malfunction.
  (h) If the automatic pilot system can be coupled to airborne navigation equipment, means must be provided to indicate to the flight crew the current mode of operation. Selector switch position is not acceptable as a means of indication

Automatic Pilot System Requirement - the new way (1)

- Most applicable FAR 23 amendment 23-64 performance regulation:
- **§ 23.2300 Flight control systems.**
- (a) The applicant must design airplane flight control systems to:
  - (1) Operate easily, smoothly, and positively enough to allow proper performance of their functions.
  - (2) Protect against likely hazards.
- (b) The applicant must design trim systems, if installed, to:
  - (1) Protect against inadvertent, incorrect, or abrupt trim operation.
  - (2) Provide a means to indicate -
    - (i) The direction of trim control movement relative to airplane motion;
    - (ii) The trim position with respect to the trim range;
    - (iii) The neutral position for lateral and directional trim; and
    - (iv) The range for takeoff for all applicant requested center of gravity ranges and configurations.
- Special mention to 23.2505 Function and installation and 23.2605 Installation and operation.

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Automatic Pilot System Requirement - the new way (2)

Part 23 Accepted Means of Compliance Based on ASTM Consensus Standards
Updated September 22, 2020

Part 23 Rule		Accepted MOC[1,2]		Potential Supplemental MOC[3]
Section	Title	ASTM Standard	FAA Changes	and additional notes
Subpart D – Design and Construction				
23.2300	Flight control systems	F3264-19, Section 7.1		ASTM F3264-19 does not include means for showing that the airplane is safely controllable following a powered trim system runaway. If applying for certification of an airplane with a powered trim system, applicants may use the provisions of §23.677(d) at amendment 23-63 as a means of complying with this aspect of §23.2300, or may obtain FAA acceptance of a different means of compliance in accordance with §23.2010.

[1]Reference Notice No. 23-20-01-NOA, published in the *Federal Register* on September 22, 2020 [85 FR 59400]
[2]Aircraft Type Code compliance matrix tables found in F3061/F3061M-19a, F3227/F3227M-17, F3228-17, F3229/F3229M-17, F3230-17, F3231/F3231M-19, F3232/F3232M-19a, F3233/F3233M-17, F3234/F3234M-17, F3235-17a, F3236-17 and F3316/F3316M-19 are not accepted. Applicability will be determined by the Small Airplane Standards Branch.
[3]See also FAA Small Airplane Issues List (SAIL) at https://www.faa.gov/aircraft/air_cert/design_approvals/small_airplanes/small_airplanes_regs/

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Automatic Pilot System Requirement - the new way (3)

F3264 – 19

6.5 *Ground and Water Load Conditions:*
6.5.1 F3116/F3116M – 18 Standard Specification for Design Loads and Conditions
6.5.1.1 F3331 – 18 Standard Practice for Aircraft Water Loads

6.6 *Component Loading Conditions:*
6.6.1 F3061/F3061M – 19a Standard Specification for Systems and Equipment in Small Aircraft
6.6.1.1 F3232/F3232M – 19a Standard Specification for Flight Controls in Small Aircraft
6.6.2 F3116/F3116M – 18 Standard Specification for Design Loads and Conditions

6.7 *Limit and Ultimate Loads:*
6.7.1 F3114 – 19 Standard Specification for Structures

6.8 *Structural Strength:*
6.8.1 F3114 – 19 Standard Specification for Structures

6.9 *Structural Durability:*
6.9.1 F3061/F3061M – 19a Standard Specification for Systems and Equipment in Small Aircraft

7. Design and Construction

7.1 *Flight Control Systems:*
7.1.1 F3061/F3061M – 19a Standard Specification for Systems and Equipment in Small Aircraft
7.1.1.1 F3232/F3232M – 19a Standard Specification for Flight Controls in Small Aircraft
7.1.2 F3066/F3066M – 18 Standard Specification for Aircraft Powerplant Installation Hazard Mitigation

7.2 *Landing Gear Systems:*
7.2.1 F3061/F3061M – 19a Standard Specification for Systems and Equipment in Small Aircraft

7.3 *Buoyancy for Seaplanes and Amphibians:*
7.3.1 F3061/F3061M – 19a Standard Specification for Systems and Equipment in Small Aircraft

7.4 *Means of Egress and Emergency Exits:*
7.4.1 F3061/F3061M – 19a Standard Specification for Systems and Equipment in Small Aircraft
7.4.2 F3083/F3083M – 19 Standard Specification for Emergency Conditions, Occupant Safety and Accommodations

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Automatic Pilot System Requirement - the new way (4)

4.13.4 For single-engine aircraft and multiengine aircraft with no slipstream effects on the flaps, if compliance with 4.13.1 or 4.13.2 is met through the use of an interconnection it must be designed to account for unsymmetrical loads assuming 100 % of the critical air load acts on one side and 70 % on the other.

5. Automatic Flight Controls

Note 2—Table 2 provides correlation between various Aircraft Type Codes and the individual requirements contained within this section; refer to 3.2.1. For each subsection, an indicator can be found under each ATC character field; three indicators are used:

An empty cell ( ) in all applicable ATC character field columns indicates that an aircraft must meet the requirements of that subsection.

A white circle (○) in multiple columns indicates that the requirements of that subsection are not applicable to an aircraft *only* if all such ATC character fields are applicable.

A mark-out (×) in any of the applicable ATC character field columns indicates that the requirements of that subsection are not applicable to an aircraft if that ATC character field is applicable.

Example—An aircraft with an ATC of ISRLLDLN is being considered. Since all applicable columns are empty for 5.1.1, that subsection is applicable to the aircraft.

5.1 *Automatic Pilot Systems:*

5.1.1 If an automatic pilot system is installed, it must be designed so that: the automatic pilot can be quickly and positively disengaged by the pilots to prevent it from interfering with their control of the aircraft; or, be sufficiently overpowered by one pilot to let him control the aircraft.

5.1.2 If an automatic pilot system is installed and is designed so that it can be quickly and positively disengaged by the pilots as described in 5.1.1, the quick release (emergency) control must be located on the control wheel (both control wheels if the aircraft can be operated from either pilot seat) on the side opposite the throttles, or on the stick control (both stick controls if the aircraft can be operated from either pilot seat), such that it can be operated without moving the hand from its normal position on the control.

5.1.3 If an automatic pilot system is installed, unless there is automatic synchronization, each such system must have a means to readily indicate to the pilot the alignment of the actuating device in relation to the control system it operates; refer to Specification F3117/F3117M.

5.1.4 If an automatic pilot system is installed, each manually operated control for the automatic pilot system operation must be readily accessible to the pilot. Each control must operate in the same plane and sense of motion as specified in Specification F3117/F3117M for cockpit controls. The direction of motion must be plainly indicated on or near each control.

Compare Requirements

23.1329 amendment 23-63	ASTM F3232/3232M-19 Section 5.1
Automatic Pilot Systems **SECTION RULE:** If an automatic pilot system is installed, it must meet the following: (a) Each system must be designed so that the automatic pilot can-- (1) Be quickly and positively disengaged by the pilots to prevent it from interfering with their control of the airplane; or (2) Be sufficiently overpowered by one pilot to let him control the airplane. (b) If the provisions of paragraph (a)(1) of this section are applied, the quick release (emergency) control must be located on the control wheel **[**(both control wheels if the airplane can be operated from either pilot seat)**]** on the side opposite the throttles, or on the stick control, (both stick controls, if the airplane can be operated from either pilot seat) such that it can be operated without moving the hand from its normal position on the control.	5.1 *Automatic Pilot Systems:* 5.1.1 If an automatic pilot system is installed, it must be designed so that: the automatic pilot can be quickly and positively disengaged by the pilots to prevent it from interfering with their control of the aircraft; or, be sufficiently overpowered by one pilot to let him control the aircraft. 5.1.2 If an automatic pilot system is installed and is designed so that it can be quickly and positively disengaged by the pilots as described in 5.1.1, the quick release (emergency) control must be located on the control wheel (both control wheels if the aircraft can be operated from either pilot seat) on the side opposite the throttles, or on the stick control (both stick controls if the aircraft can be operated from either pilot seat), such that it can be operated without moving the hand from its normal position on the control.

Compare Requirements

23.1329 amendment 23-63	ASTM F3232/3232M-19 Section 5.1
(c) Unless there is automatic synchronization, each system must have a means to readily ….	5.1.3 ……, unless there is automatic synchronization, each such system must have a means to readily …...
(d) Each manually operated control for the system operation must be readily accessible to the pilot…..	5.1.4 …… operated control for the automatic pilot system operation must be readily accessible to the pilot…..
(e) ….must be designed and adjusted so that, within the range of adjustment available to the pilot, it cannot ….	5.1.5 ….must be designed and adjusted so that, within the range of adjustment available to the pilot, it …….
(f) …must be designed so that a single malfunction will not produce a hardover signal in more than one control axis. ……integrates signals from auxiliary controls or furnishes signals for operation of other equipment, positive interlocks …….	5.1.6 ……must be designed so that a single malfunction will not produce a hardover signal …...
(g) There must be protection against adverse interaction of integrated components, resulting from a malfunction.	5.1.7 ……..integrates signals from auxiliary controls or furnishes signals for operation of other equipment, positive interlocks……..
(h) ……..can be coupled to airborne navigation equipment, means must be provided to indicate …….	5.1.8 ….must be protection against adverse interaction of integrated components, resulting from a malfunction.
	5.1.9 ……..can be coupled to airborne navigation equipment, means must be provided to indicate …….

Practical application - Example 2 Aircraft Stall Characteristics

CFR 14 § 23.2150 Stall characteristics, stall warning, and spins.

(a) The airplane must have controllable stall characteristics in straight flight, turning flight, and accelerated turning flight with a clear and distinctive stall warning that provides sufficient margin to prevent inadvertent stalling.

New

(b) Single-engine airplanes, not certified for aerobatics, must not have a tendency to inadvertently depart controlled flight.

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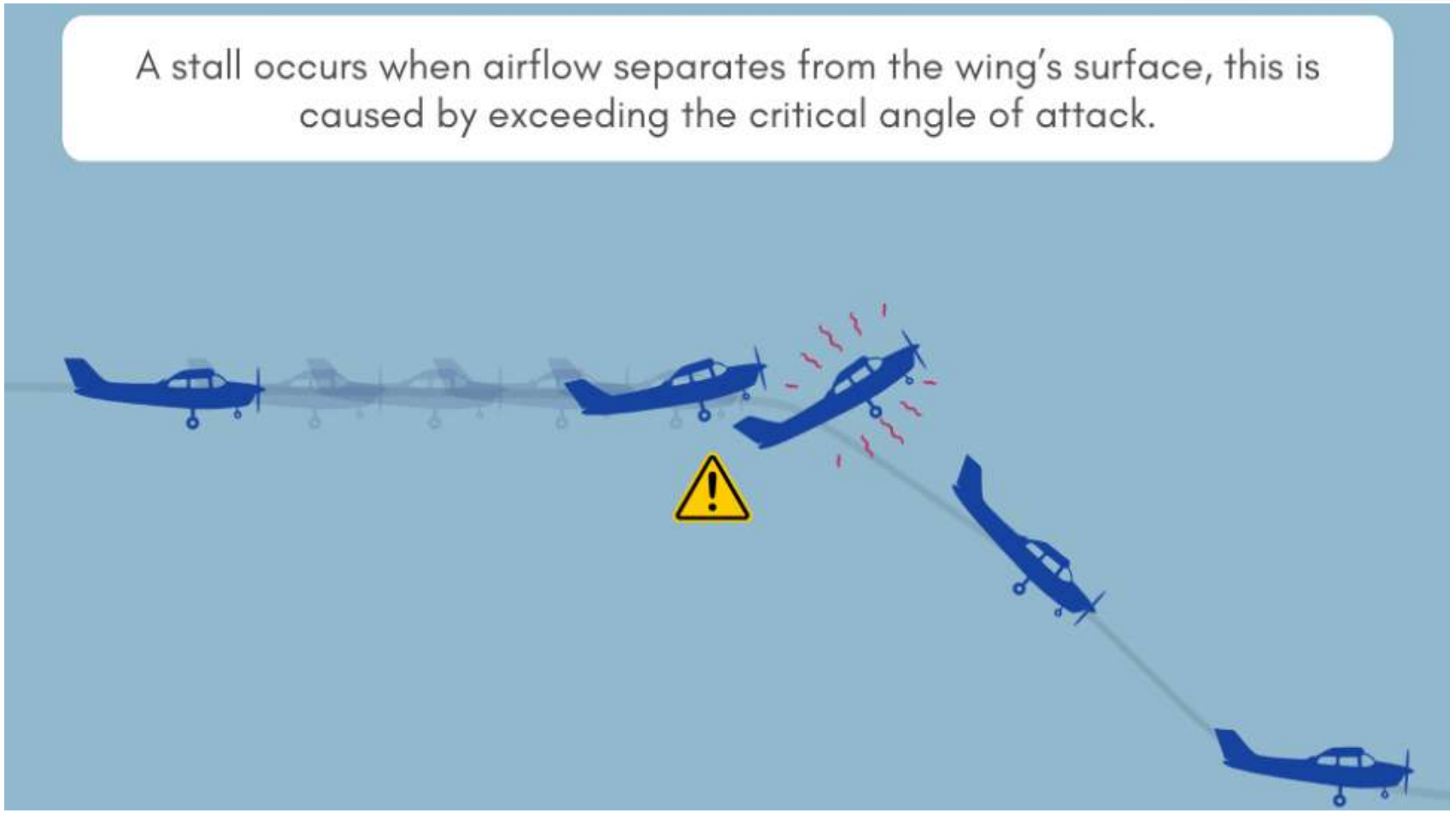
Aerodynamic Stall



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ASTM F3180/F3180M Standard Specification for Low-Speed Flight Characteristics of Aeroplanes

Section 4. Low Speed Characteristics

4.1 Stall

4.1.1 Wings level Stall

4.1.2 Turning flight and accelerated turning stalls

4.1.2.1Turning flight and accelerated turning stalls must be demonstrated by establishing and maintaining a coordinated turn…..

4.1.2.3 Compliance must be shown under the following conditions:

(1) Wings flaps: Retracted, fully extended, and each intermediate normal operating position as appropriate for the phase of flight.

(2) Power OFF and Power ON

New

4.2 Departure Characteristics All Level 1, all Level 2, and single engine Level 3 aeroplanes that are not approved for spinning shall meet one of the following…….

4.2.1.3 Compliance with 4.1.1 and 4.1.2 shall be demonstrated with the aeroplane in uncoordinated flight, corresponding to one ball-width displacement on a slip-skid indicator, unless one ball-width displacement cannot be obtained with full directional control, in which case the demonstration shall be with full directional control applied.

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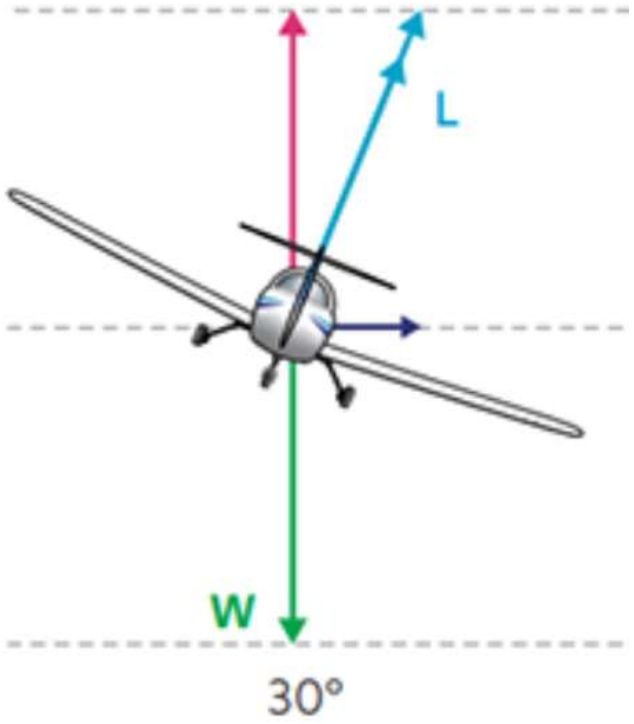
Turning Flight Stall - Uncoordinated



Stall speed increases with bank angle

Coordinated turn | Skid | Slip

Uncoordinated flight – one ball displacement

Relevant Accident

Aviation Investigation Final Report

Location:	Snohomish, Washington	**Accident Number:**	WPR23FA034
Date & Time:	November 18, 2022, 10:19 Local	**Registration:**	N2069B
Aircraft:	TEXTRON AVIATION INC 208B	**Aircraft Damage:**	Substantial
Defining Event:	Aircraft structural failure	**Injuries:**	4 Fatal
Flight Conducted Under:	Part 91: General aviation - Flight test		

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Accident during Accelerated Stall Tests

Analysis

The pilot and three other crew members were performing flight testing for a new Supplemental Type Certificate (STC) for the single-engine turboprop-powered airplane. After departure, the pilot performed several maneuvers from the test card, then configured the airplane with the flaps extended for an intentional accelerated stall in a 30° left bank with the engine torque set to 930 ft-lb.

Analysis of ADS-B data combined with a simulation matching the recorded trajectory of the accident maneuver revealed that, after the stall, the airplane rapidly rolled to the left, reaching a roll angle of 120° while the pitch angle decreased to 60° nose down. The airspeed rapidly increased, exceeding both the maximum flaps-extended speed (Vfe) and the airplane's maximum operating speed (Vmo). Recorded engine data indicated that, after the stall, the engine torque increased. ADS-B data was lost at an altitude about 7,000 ft above ground level; the final track data indicated an approximate 8,700 ft/min rate of descent. Witnesses observed the airplane break up in flight and subsequently spiral to the ground. The wreckage was found in a rural field distributed over a distance of about 1,800 ft.

Accident Finding

FAA guidance warns of the risks associated with upset events during stall maneuvers and advises against performing accelerated stalls with flaps deployed due to the increased risk of exceeding the airplane's limitations in this configuration. Following a nose-low departure from controlled flight, reducing the power to idle immediately is crucial to avoid exceeding airspeed limitations and overstressing the airplane.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's improper recovery following a departure from controlled flight after an intentional aerodynamic stall, which resulted in an exceedance of airspeed limitations, airframe overstress, and a subsequent inflight breakup.

Practical Application of FAR 23 amendment 23-64

- Improved Safety?
  - Fostered safety-enhancing innovation by offering applicants more flexibility in how to show compliance with part 23?
  - Added new requirements to reduce loss of control and icing-related accidents?

- Increased Regulatory Agility?
  - Created a regulatory framework that allows the regulators to readily adapt to new technologies?

- Reduced Costs for Regulators and Industry?
  - Reduced the administrative burdens traditionally associated with certificating novel design features (e.g., Special Conditions/Issue Papers)?
  - Tailored the level of rigor required for showing compliance based on risk (safety continuum)?

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Questions

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Bonus Content
B727 - Oil Spill Response

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Tanks and Pump Pallet

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