

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
KANSAS CITY, MISSOURI 64106

*
In the matter of the petition of *
*
FAIRCHILD AIRCRAFT CORPORATION *
*
for an exemption from § 23.201(e), *
(f)(4), and (f)(5); § 23.203 *
(c)(4) and (c)(5); and § 23.1545 *
(b)(5) and (b)(6) of the Federal *
Aviation Regulations *

Regulatory Docket No. 109CE

GRANT OF EXEMPTION

By letter dated August 14, 1992, Mr. A. Pickens, Manager, Airworthiness, Fairchild Aircraft, P.O. Box 790490, San Antonio, Texas 78279-0490, petitioned for an exemption from § 23.201(e), (f)(4), and (f)(5); § 23.203(c)(4) and (c)(5); and § 23.1545 (b)(5) and (b)(6) of the Federal Aviation Regulations (FAR) to permit type certification of the SA227-CC, SA227-DC and all subsequent commuter category airplanes approved on type certificate A18SW, with certain stall characteristics and airspeed indicator markings that are appropriate to this category of aircraft.

The petitioner requires relief from the following regulation(s):

Section 23.201(e) requires that, during the recovery part of the stall maneuver, it must be possible to prevent more than 15 degrees of roll or yaw by the normal use of controls.

Section 23.201(f)(4) and (f)(5) requires that compliance with § 23.201 must be shown with:

1. Power or thrust off and at 75 percent maximum continuous power or thrust, and
2. The airplane trimmed at 1.5 V_{S1} or at the minimum trim speed, whichever is higher.

Section 23.203(c)(4) and (c)(5) requires that compliance with § 23.203 must be shown with 75 percent maximum continuous power and the airplane trimmed at $1.5 V_{S1}$ or at the minimum trim speed, whichever is higher.

Section 23.1545(b)(5) and (b)(6) requires the following markings on the airspeed indicator:

1. For the one-engine inoperative best rate of climb speed, V_y , a blue sector extending from the V_y speed at sea level to the V_y speed at--
 - (a) An altitude of 5,000 feet, if the one-engine inoperative best rate of climb at the altitude is less than 100 feet per minute, or
 - (b) The highest 1,000 foot altitude at or above 5,000 feet at which the one-engine inoperative best rate of climb is 100 feet per minute or more.

Each side of the sector must be labeled to show the altitude for the corresponding V_y .

2. For the minimum control speed (one-engine inoperative), V_{MC} , a red radial line.

The petitioner supports its request with the following information:

To date, Fairchild has succeeded in complying with all of the cited rules, but only by significantly increasing the complexity of the airplane, and at great cost. This was accomplished by installing a Stall Avoidance System (SAS), which provides stall warning, and an artificial stall (stick push). Originally, the system was a relatively simple, single-channel affair. However, when the SA227-AC was recertified to the commuter category rules (and became the SA227-CC and SA227-DC) it became necessary to comply with the accelerated stall requirements of § 23.203, which proved to require maneuvers not appropriate to this type of airplane. To limit the exposure of the airplane and crew to the very significant hazards attendant to showing compliance with the accelerated stall rules, it was necessary to dualize the SAS system so that the artificial stall could be substituted for the aerodynamic stall. Development and approval of the system required a long and costly flight test program. The end result was a complicated system that added stick shakers, lights, and aural devices, as well as the basic warning and stick push features.

Fairchild cites Exemption No. 5216 as their technical basis for the petition. Exemption No. 5216 is for the Beech 1900D commuter category airplane and is identical to Fairchild's petition. A summary of the supportive information from that exemption is as follows:

1. If required to comply with these sections, significant design compromises must be made that will degrade the safety, performance, and utility of this airplane and increase the development and operating costs.
2. The request is based upon the requirement that the pilot must be type rated. It is also based on the fact that commuter airplanes must be operated in accordance with scheduled performance, similar to part 25 requirements, which prohibits the operation of the airplane near the stall. In addition, should the pilot inadvertently operate the airplane below the scheduled airspeeds, an impending stall would be obvious to the crew because the low speeds of operation at high power produce very high pitch attitudes and very high rates of climb. These characteristics are similar to those of other high performance airplanes that are certified under part 25.
3. Commuter category performance requirements are similar to those of transport category. High thrust-to-weight ratios are required to meet the increased payloads and the high/hot day field performance that will satisfy the operational requirements of the commuter airlines. These high thrust-to-weight ratios, in turn, do not allow power on stalls to occur until very high flight deck angles and very low airspeeds are reached. Operating speeds in the part 23 commuter category also have become similar in definition to part 25 (in particular, V_1 , V_2 , V_{LOF} , V_R). However, for the commuter category, power-on stall characteristics must be demonstrated with 75 percent maximum continuous power, which is much higher than that required for the similar power-on stall characteristics demonstration for the transport category. The latter prescribes power-on stall demonstrations with the power necessary to maintain level flight at $1.6 V_{S1}$ (where V_{S1} corresponds to the stalling speed with flaps in the approach position, the landing gear retracted, and maximum landing weight).
4. During the power-on stall testing with the high powers required by §§ 23.201(f)(4) and 23.203(c)(4), pitch attitudes in excess of 30 degrees and airspeeds well below V_{MC} are experienced. In some cases, the

indicated airspeed drops to zero. In consideration of the power induced rolling moments generated at low speed, the higher powers and higher roll inertias associated with larger airplanes and the fuel imbalances that are required to be demonstrated, an increase in the maximum permissible roll angle from 15 degrees to 20 degrees during recovery is reasonable for a commuter category airplane.

5. In order to comply with the requirements of §§ 23.201 and 23.203, a method to artificially control the angle of attack of the airplane would have to be developed. This would create a significant addition of complexity to the airplane. Because of the go/no go nature of such an addition, dispatch efficiency and operating costs would be adversely affected. Field performance would likely be increased by the requirements to artificially increase stall speeds. These factors all show up as increased costs to the operator and to passengers, which is not in the public interest.

Beech, therefore, proposed that their airplane be exempted from the requirements of § 23.201(e), (f)(4), and (f)(5); and § 23.203 (c)(4) and (c)(5). In the public interest and to maintain safety, the airplane shall comply with the following requirements, which are similar to those of part 25 for transport category airplanes:

Wings level stall.

1. During the recovery part of the maneuver, it must be possible to prevent more than approximately 20 degrees of roll by the normal use of controls.
2. Compliance with the requirements of this section must be shown under the following conditions:
 - (a) Power: Power or thrust off, and the power necessary to maintain level flight at $1.6 V_{S1}$ (where V_{S1} corresponds to the stalling speed with the flaps in the approach position, the landing gear retracted, and maximum landing weight).
 - (b) Trim: At a speed between $1.2 V_{S1}$ and $1.4 V_{S1}$.

Turning flight and accelerated stalls.

1. Compliance with the requirements of this section must be shown with:
 - (a) Power: The power necessary to maintain level flight at $1.6 V_{S1}$ (where V_{S1} corresponds to the

stalling speed with the flaps in the approach position, the landing gear retracted, and maximum landing weight), and

(b) Trim: At a speed between $1.2 V_{S1}$ and $1.4 V_{S1}$.

The petitioner states that the stall demonstrations, proposed instead of the current commuter category requirements, will provide a level of safety similar to that of transport category airplanes. The requirements, as proposed, will provide for lower flight attitudes at power-on stall conditions that are more appropriate for a commuter category airplane operating as a regional airliner.

Beech also requested an exemption from including the blue line and red line markings on the airspeed indicator as required by § 23.1545(b)(5) and (b)(6). For a commuter category airplane, the pilot is type rated and performance is scheduled using several defined and scheduled airspeeds (V_1 , V_2 , V_{LOF} , V_R). The scheduled performance and associated airspeeds are included in the AFM. The blue and red lines on the airspeed indicator required by the above regulations only serve to clutter the airspeed indicator and detract from the scheduled takeoff airspeeds. Removing these markings would allow proper crew focus on the appropriate takeoff airspeeds. This would promote safety and, therefore, be in the public interest.

Comments on published petition summary:

A summary of this petition was published in the FEDERAL REGISTER for public comment on October 2, 1992 (57 FR 45650). The comment period closed October 22, 1992. No comments were received.

The Federal Aviation Administration's (FAA) analysis is as follows:

To obtain this exemption, the petitioner must show, as required by § 11.25(b)(5), that: (1) granting the request is in the public interest, and (2) the exemption would not adversely affect safety, or that a level of safety will be provided that is equal to that provided by the rules from which the exemption is sought.

The FAA has carefully reviewed the information contained in the petitioner's request for exemption.

The FAA agrees that the requirements proposed by Fairchild, which are similar to transport category requirements, will provide for lower flight attitudes at power-on stall conditions. These flight attitudes are more appropriate for commuter category airplanes operated by a type rated pilot and at scheduled airspeeds. The FAA also agrees that, in addition, should the pilot inadvertently operate the airplane below the scheduled airspeeds, an impending stall would be obvious to the crew because the low speeds of operation at high power produce very high pitch attitudes and very high rates of climb.

The FAA agrees that, since the scheduled performance and associated airspeeds are included in the AFM, the blue and red lines on the airspeed indicator only serve to clutter the airspeed indicator and detract from the scheduled takeoff airspeeds.

The FAA has evaluated each of the specific conditions proposed by the petitioner with respect to ensuring a level of safety equivalent to the requirement from which the exemption is sought. The FAA has concluded that, when compliance is shown with specific conditions set forth as limitations herein, the level of safety intended by § 23.201(e), (f)(4), and (f)(5); § 23.203(c)(4) and (c)(5); and § 23.1545(b)(5) and (b)(6), will be achieved.

In consideration to the foregoing, I find that a grant of exemption is in the public interest and that it will not adversely affect safety. Therefore, pursuant to the authority contained in Sections 313(a) and 601(c) of the Federal Aviation Act of 1958, as amended, delegated to me by the Administrator (14 CFR 11.53), Fairchild Aircraft is granted an exemption from § 23.201(e), (f)(4), and (f)(5); § 23.203(c)(4) and (c)(5); and § 23.1545(b)(5) and (b)(6) of the Federal Aviation Regulations to the extent necessary to allow type certification of the Fairchild Model SA227-CC, SA227-DC, and all subsequent commuter category airplanes approved on Type Certificate A18SW without an exact showing of compliance with the requirements of the previously cited sections. For the previously listed Fairchild Model SA227 airplanes, this exemption is subject to the following conditions and limitations:

1. For the wings level stall, during the recovery part of the maneuver, it must be possible to prevent more than approximately 20 degrees of roll by the normal use of controls.
2. Compliance with the requirements of § 23.201 must be shown under the following conditions:

- (a) Power: Power or thrust off, and power necessary to maintain level flight at $1.6 V_{S1}$ (where V_{S1} corresponds to the stalling speed with the flaps in the approach position, the landing gear retracted, and maximum landing weight).
- (b) Trim: At a speed between $1.2 V_{S1}$ and $1.4 V_{S1}$.
3. During turning flight and accelerated stalls, compliance with the requirements of § 23.203 must be shown with:
- (a) Power: The power necessary to maintain level flight at $1.6 V_{S1}$ (where V_{S1} corresponds to the stalling speed with the flaps in the approach position, the landing gear retracted, and maximum landing weight), and
- (b) Trim: At a speed between $1.2 V_{S1}$ and $1.4 V_{S1}$.

Issued in Kansas City, Missouri on December 2, 1992.


Barry D. Clements
Manager, Small Airplane Directorate
Aircraft Certification Service