Cancelled 00-2W

Federal Aviation Agency

ADVISORY CIRCULAR

AC NO:	AC 23-1
	AIRCRAFT
EFFECTIVE:	4/1/64

SUBJECT: TYPE CERTIFICATION SPIN TEST PROCEDURES

---

1. PURPOSE. This circular sets forth an acceptable means, not the sole means, by which compliance may be shown with the one-turn spinning requirements in Civil Air Regulations, Part 3.

2. REFERENCE.

   a. CAR 3.10, Eligibility for Type Certificate

   b. CAR 3.105, Requirements (Flight Characteristics)

   c. CAR 3.120(b), Stalling Demonstration

   d. CAR 3.122, Turning Flight Stalls

   e. CAR 3.124(a), Spinning

3. SCOPE. The scope of this circular is limited primarily to the entry and recovery test procedures related to the spinning requirements in CAR 3.124(a) Other portions of CAR 3.124(a) are believed to be self-explanatory.

4. DISCUSSION.

   a. A basic concept of type certification flight testing is to explore an envelope of the airplane's characteristics which is greater in all areas than the intended operational envelope. This is to assure that, during normal operations, the operational pilot will not encounter any airplane characteristic that has not been explored by an experienced test pilot. With regard to the spinning requirements in CAR 3, type certification testing requires recovery capability from a one-turn spin while operating limitations prohibit intentional spins. This one-turn "margin of safety" is designed to provide adequate controllability when recovery from a stall is delayed.

---

b. The spin requirements for normal category airplanes have changed over the years from six turns with a free control recovery to the present one-turn spin with a normal control movement recovery. Originally, and during the changes, there has never been any reference to the manner in which the spin entry should be conducted. The preamble of Amendment 3-7, dated May 3, 1962, states in part, "These /one-turn spin/ tests are considered to be an investigation of the airplane's characteristics in a delayed stall, rather than true spin tests." This statement is significant and recognizes that CAR 3.124(a) does not require investigation of the controllability in a true spinning condition for a normal category airplane. Essentially, the test is a check of the controllability in a delayed recovery from a stall. Intentional and inadvertent, normal and accelerated stalls should be considered.

c. Turning flight is a maneuver which is essential to the normal daily use of an airplane. This maneuver more closely approaches the hazardous conditions of an inadvertent stall than the wings level condition. Since spin entries are often the result of inadvertent stalls, the spin investigation should be made with entries from accelerated stalls as well as from level flight. The provisions of CAR 3.122, Turning Flight Stalls, provide a realistic standard for the angle of bank to be used for spin entry when determining compliance with CAR 3.124, Spinning.

d. There are two fundamental methods by which a spin entry is to be conducted. First, from a wings level 1G condition, and second, from a level turning flight condition. In the first method, slowly reduce the airspeed by pulling the nose up and apply pro-spin controls at the moment the airplane stalls. In the second method, start with a banked turn in level flight, increase the angle of attack with the longitudinal control while maintaining the bank angle, and apply pro-spin controls at the moment the airplane stalls.

e. The position of a retractable landing gear and flaps can have profound effects on the aerodynamic and inertia characteristics of an airplane. Because these effects can become critical, it is accepted practice to conduct spin tests with the landing gear and flaps in the critical configurations in both wings level and banked attitudes.

5. ACCEPTABLE MEANS OF COMPLIANCE. An acceptable means, not the sole means, of showing compliance with the one-turn spinning requirements of CAR 3.124(a), is as follows:

a. Normal Spins.

(1) Spins should be entered by reducing airspeed at approximately 1 m.p.h. per second from a wings level rectilinear flightpath and from a steady curvilinear, coordinated 30 degrees banked flight condition until the airplane stalls.

(2) Spins should be entered as the airplane stalls by applying full-up elevator and full rudder in the direction of spin desired. The ailerons should be kept approximately in neutral.

(3) The effect of power on the spin entry should be investigated.

(4) Spins should be conducted at critical combinations of CG, gross weight, and landing gear and flap positions. Trim should be appropriate to the landing gear and flap configuration, namely; .9 V_h for cruise and 1.5 V_{so} for the landing configuration.

(5) Spins should be performed to left and right, and should include at least the cruise and landing configurations.

(6) All spin recoveries should be made using the NASA spin recovery technique. In essence, the NASA recovery consists of ailerons in neutral position, full opposite rudder to stop the rotation, followed by forward elevator control as required to get the wing out of the stall and recover to level flight.

(7) The spin should be considered as starting on the airplane's heading at the time controls are applied to spin, and should be maintained for 360 degrees from the entry heading with controls in the same position before recovery is initiated.

b. Uncontrollable Spins. It should be demonstrated during the first turn of the spin, that it is possible to move aileron, elevator, and rudder controls, or any possible combination thereof, opposite to the above normal spinning positions without developing an uncontrollable spin. Evidence of an uncontrollable spin would be present if recovery cannot be effected within one additional turn by using normal NASA control recovery movement. The procedures in paragraph 5.a. are applicable to the investigation of uncontrollability except as indicated.

George S. Moore
Director
Flight Standards Service