

Terrain Awareness and Warning System (TAWS)

EQUIPMENT SPECIFICATIONS

TSO-C151a - prescribes the minimum operational performance standards that a Terrain Awareness and Warning System (TAWS) equipment must meet to be identified with the TSO-C151a Class A or B marking.

DISCUSSION

Beginning in the early 1970's, a number of studies looked at the occurrence of "controlled flight into terrain" (CFIT) accidents, where a properly functioning airplane under the control of a fully qualified and certificated crew is flown into terrain (or water or obstacles) with no apparent awareness on the part of the crew.

Findings from these studies indicated that many such accidents could have been avoided if a ground proximity warning system (GPWS) had been used.

In 1974 the FAA required all part 121 certificate holders and some part 135 certificate holders to install Technical Standard Order (TSO) approved GPWS equipment. In 1978 the FAA extended the GPWS requirement to part 135 certificate holders operating smaller airplanes: turbojet-powered airplanes with 10 or more passenger seats. In 1992 the FAA amended § 135.153 to require GPWS equipment on all turbine-powered airplanes with 10 or more passenger seats.

After the current rules were issued, advances in terrain mapping technology permitted the development of a new type of ground proximity warning system that provides greater situational awareness for flight crews. This new system is called Terrain Awareness and Warning System or TAWS.

TAWS improves on existing GPWS systems by providing the flight crew much earlier aural and visual warning of impending terrain, forward looking capability, and continued operation in the landing configuration. These improvements provide more time for the flight crew to make smoother and gradual corrective action.

In March, 2000, the FAA issued 2 rules, one for part 91 operations and one for part 135 operations that requires all turbine-powered U.S.-registered airplanes type certificated to have six or more passenger seats (exclusive of pilot and copilot seating), be equipped with an FAA-approved terrain awareness and warning system.

TAWS is designed to provide the flight crew with sufficient information and alerting to detect a potentially hazardous terrain situation that would permit the flight crew to take effective action to prevent a controlled flight into terrain (CFIT) event. The basic TAWS functions for all TSO approved systems includes a Forward Looking Terrain Avoidance (FLTA) function which looks ahead of the airplane along and below the airplane's lateral and vertical flight path and provides suitable alerts if a potential CFIT threat exists; a Premature Descent Alert (PDA) function which uses the airplane's current position and flight path information as determined from a suitable navigation source and airport database to determine if the airplane is hazardously below the normal (typically 3 degree) approach path for the nearest runway as defined by the alerting algorithm; and an appropriate visual and aural discrete signal for both caution and warning alerts.

Class A TAWS equipment must present terrain information on a display system and must provide indications of imminent contact with the ground for excessive rates of descent; excessive closure rate to terrain; negative climb rate or altitude loss after take-off; flight into terrain when not in a landing configuration; excessive downward deviation from an ILS glideslope; and a voice callout "Five Hundred" when the airplane descends to 500 feet above the terrain or nearest runway elevation.

Class B TAWS equipment does not require a display system and must provide indications of imminent contact with the ground only for excessive rates of descent and negative climb rates or altitude loss after takeoff. Class B equipment must also include a voice callout "Five Hundred" when the airplane descends to 500 feet above the nearest runway elevation.

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REGULATIONS

Section 91.223 states that for airplanes manufactured after March 29, 2002. No person may operate a turbine-powered U.S.-registered airplane configured with six or more passenger seats, excluding any pilot seat, unless that airplane is equipped with an approved terrain awareness and warning system that as a minimum meets the requirements for Class B equipment in Technical Standard Order (TSO)-C151. And, for airplanes manufactured on or before March 29, 2002 no person may operate a turbine-powered U.S.-registered airplane configured with six or more passenger seats, excluding any pilot seat, after March 29, 2005, unless that airplane is equipped with an approved terrain awareness and warning system that as a minimum meets the requirements for Class B equipment in Technical Standard Order (TSO)-C151.

Section 91.233 exceptions parachute operations when conducted entirely within a 50 nautical mile radius of the airport from which such local flight operations began, firefighting operations, and flight operations for the purpose of aerial application of chemicals and other substances

Section 135.154 states that for airplanes manufactured after March 29, 2002 no person may operate a turbine-powered airplane configured with 10 or more passenger seats, excluding any pilot seat, unless that airplane is equipped with an approved terrain awareness and warning system that meets the requirements for Class A equipment in Technical Standard Order (TSO)-C151. The airplane must also include an approved terrain situational awareness display. And, that no person may operate a turbine-powered airplane configured with 6 to 9 passenger seats, excluding any pilot seat, unless that airplane is equipped with an approved terrain awareness and warning system that meets as a minimum the requirements for Class B equipment in Technical Standard Order (TSO)-C151.

For airplanes manufactured on or before March 29, 2002, section 135.154 states that no person may operate a turbine-powered airplane configured with 10 or more passenger seats, excluding any pilot seat, after March 29, 2005, unless that airplane is equipped with an approved terrain awareness and warning system that meets the requirements for Class A equipment in Technical Standard Order (TSO)-C151. The airplane must also include an approved terrain situational awareness display. And that no person may operate a turbine-powered airplane configured with 6 to 9 passenger seats, excluding any pilot seat, after March 29, 2005, unless that airplane is equipped with an approved terrain awareness and warning system that meets as a minimum the requirements for Class B equipment in Technical Standard Order (TSO)-C151.

REFERENCES:

Federal Aviation Regulations Section 91-223
Federal Aviation Regulations Section 135.154
FAA Technical Standard Order TSO-C151a
Amendment 91-263 and Amendment 135-75
published in the Federal Register 65 FR 16736, dated March 29, 2000.

This information sheet is provided to the aviation industry as a public service of the Aircraft Electronics Association and your local AEA member repair station.