FLTA - Class C

November 9, 2021

Abstract

The Forward Looking Terrain Avoidance (FLTA) function is one of the functionality of equipment performance standard conditions intended to alert the pilot to terrain/obstacle threats that exist ahead of the aircraft along the aircraft's projected flight path. The TAWS, as defined within this document, is an alerting system. It is intended to provide alerts to the pilot when a terrain threat is detected. The operational goal of TAWS is to reduce the occurrence of CFIT accidents. MOPS specify system characteristics. These MOPS defines three classes of TAWS, designated as "Class A", "Class B", and "Class C". FAA regulations specify which class of TAWS (if any) is required on a given aircraft. In this document, we discuss about the "Class C".

1 Introduction

Minimum Operational Performance Standards (MOPS) defines a Terrain Awareness and Warning System (TAWS).TAWS is an on-board system aimed at preventing unintentional impacts with the ground, termed "controlled flight into terrain" accidents, or CFIT.TAWS provide flight crews with earlier aural and visual warning of impending terrain, forward looking capability, and continued operation in the landing configuration. CFIT accidents are in which an airworthy aircraft, under pilot control, is unintentionally flown into the ground, a mountain, a body of water or an obstacle.

2 Equipment Performance Requirements

The Class C TAWS requirements are the least strict. Class C TAWS are intended for use in small general aviation aircraft which are not required by rule to have any TAWS installation, but whose operator desires to have TAWS functionality.

Below sections provide TAWS functionalities for class C. The description of each alerting functionality is broken down into common structure highlighting main characteristics such as arming conditions, alerting criteria and impacts on the cockpit in terms of aural alerting, visual alerting, and display representation. The performance of an alerting functionality is defined by the capacity to trigger a timely alert and its ability to limit the occurrence of nuisance alerts.

3 FLTA Function

The FLTA function looks ahead of the airplane, within the design search volume, and provides timely alerts in the event terrain (or optionally an obstacle) is predicted to conflict with the projected flight path.

The search volume consists of a computed look ahead distance, a lateral distance on both sides of the airplane's flight path, and a specified look down distance based upon the airplane's vertical flight path. See fig 1. how the FLTA function is intended to work.

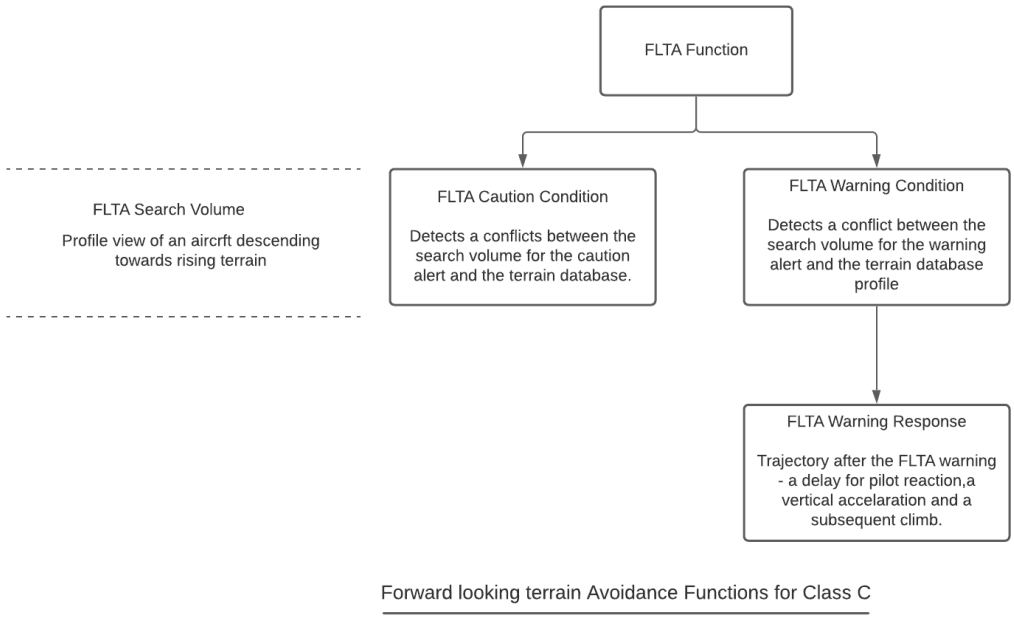

Figure 1:

Further, we will discuss about the FLTA requirements in the following sections. See fig. 2 to better understand first about the requirements

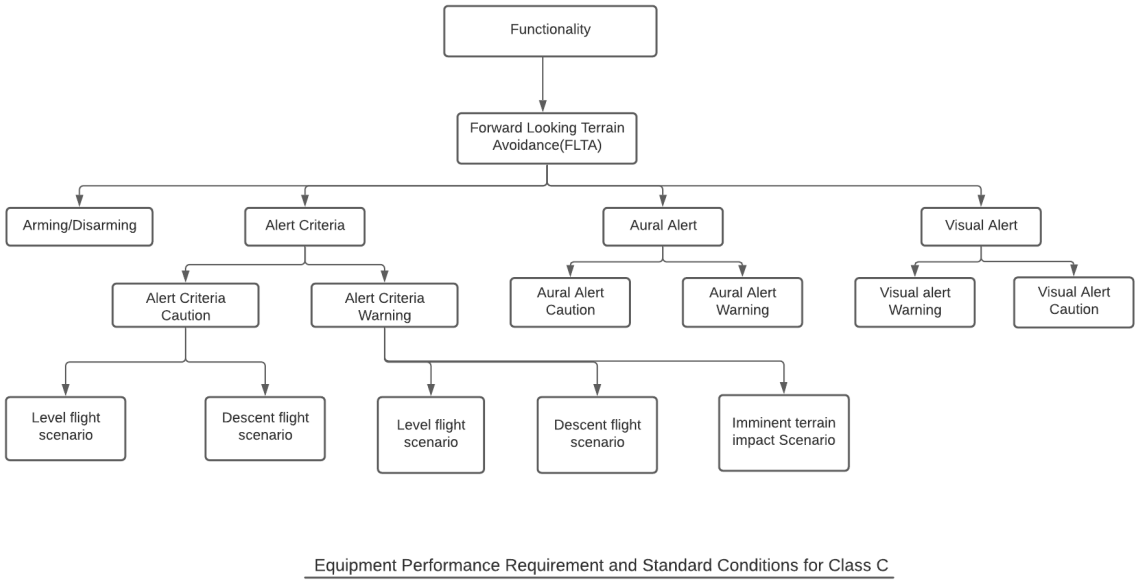

Figure 2:

3.1 Arming or Disarming

Class C Equipment (TAWS-MOPS-240) require arm FLTA during the entire flight, unless disarming is used to prevent nuisance alerts during normal departure/approach operations.

3.2 Alert Criteria

It describe a set of very exact conditions in which alerting levels are defined. Class C Equipment (TAWS-MOPS-241) provide FLTA alerts for both straight flight and turning flight. The FLTA alert criteria refer to the TAWS Required Terrain Clearance (TAWS RTC) and Small Aircraft Required Obstacle Clearance (Small Aircraft ROC). In the alert criteria requirements, the required minimum and maximum heights for caution and warning alerts are identical within each set of inputs. It is typically expected that a caution alert will occur before a warning alert.

The alerting criteria are defined for each flight environment (Cruise, Take-off/Landing), with a combination of three scenarios covering expected aircraft situations with respect to terrain. The level flight scenario and the descending scenario cover situations where the threatening terrain is below the aircraft. The imminent terrain impact scenario covers situations where threatening terrain is at or higher than the current aircraft altitude. The imminent terrain impact requirements apply specifically to the warning alert. Class C Equipment (TAWS-MOPS-242) provides FLTA protection during climbing flight.

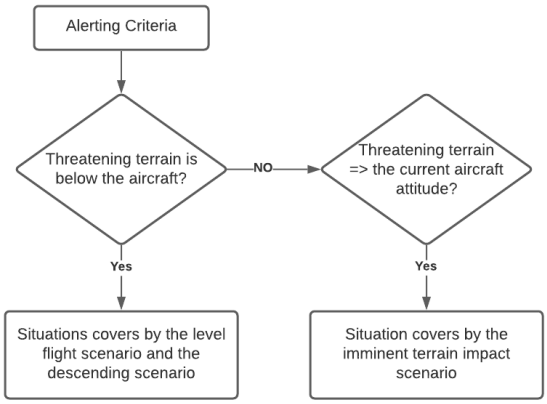

Figure 3: Alerting criteria - For each flight environment

3.2.1 Caution

Requirements on when Class C Equipment should not generate FLTA caution alerts described here. FLTA caution alerts are not required but are recommended.

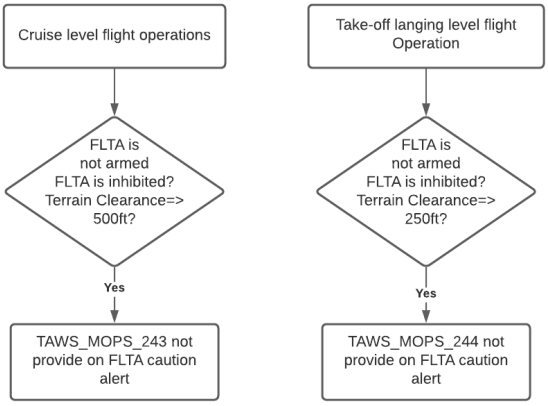

Figure 4: Level flight scenario

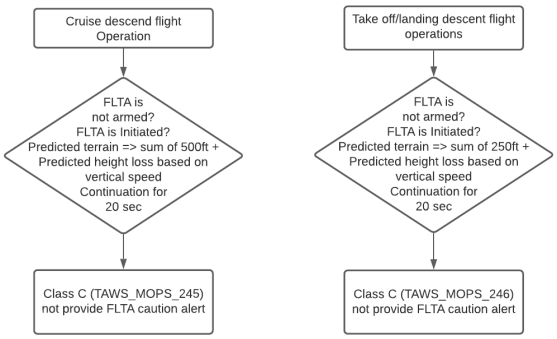

Figure 5: Descent flight scenario

3.2.2 Warning

Requirements on when Class C Equipment must generate FLTA warning alerts and when it must not generate FLTA warning alerts are defined here.

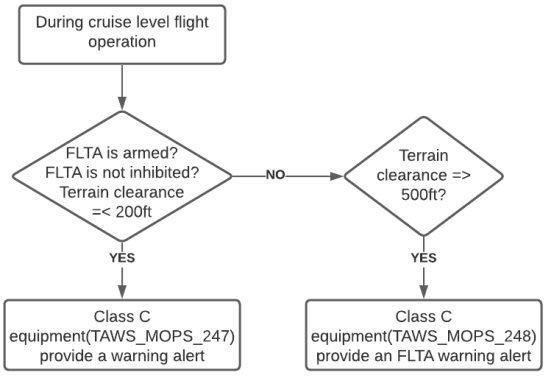

Figure 6: Level flight in Cruise environment (correction: 248 not provide an FLTA warning alert)

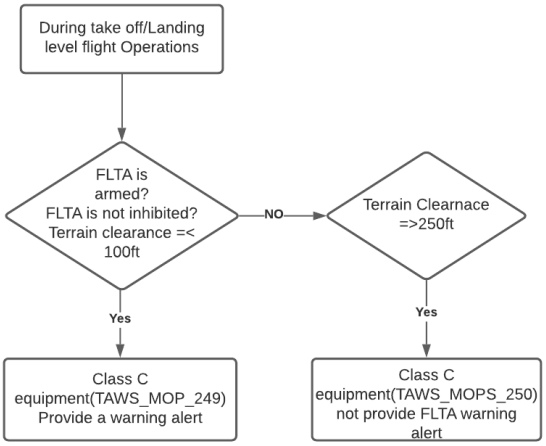

Figure 7: Level flight in Take-off/Landing environment

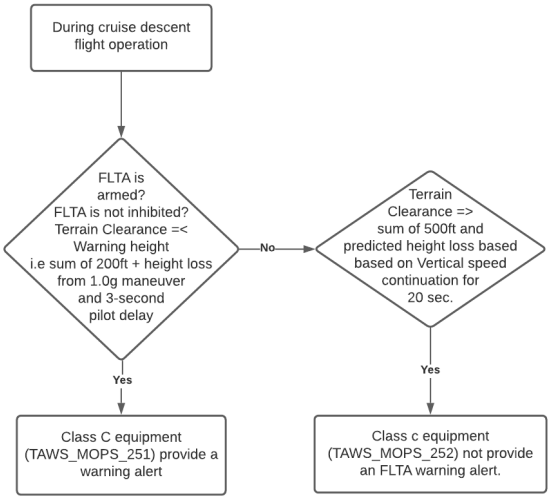

Figure 8: Descent flight in Cruise environment

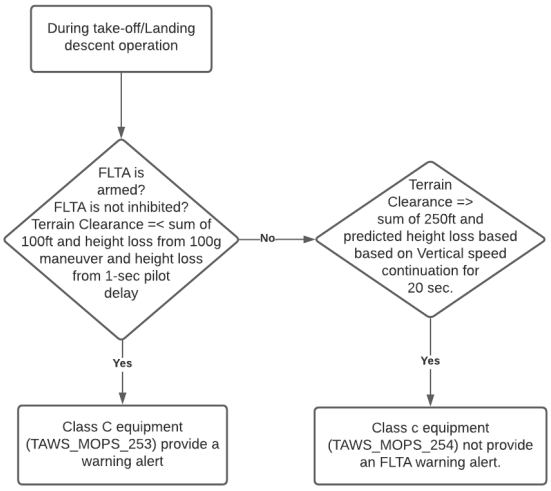

Figure 9: Descent flight in Take-off/Landing environment

Class C Equipment (TAWS-MOPS-255) provides a warning alert to the flight crew such that positive terrain clearance is ensured in the imminent terrain impact scenarios, when FLTA is armed and FLTA is not inhibited, assuming the specified altitude error and a 1.0-second pilot delay after the onset of the warning alert followed by a 1.0 g maneuver to a predicted climb angle of either 6.0 degrees or a higher predicted climb angle based on aircraft performance.

3.3 Aural Alert

For a caution level FLTA alert due to a predicted terrain conflict, Class C Equipment shall (TAWS-MOPS-256) be capable of generating or triggering an aural message of at least one of “Terrain Ahead” and “Caution Terrain”. For a caution level FLTA alert, Class C Equipment shall (TAWS-MOPS-257) repeat the aural message periodically for the duration of the FLTA caution alert condition, or until silenced by the pilot or a higher priority alert.

For a warning level FLTA alert due to a predicted terrain conflict, Class C Equipment shall (TAWS-MOPS-258) be capable of generating or triggering an aural message of at least one of “Terrain Ahead, Pull up”, “Terrain, Terrain, Pull up”, and “Terrain, Terrain”. (TAWS-MOPS-259) repeat the aural

message periodically for the duration of the FLTA warning alert condition, or until silenced by the pilot or a higher priority alert.

3.4 Visual Alert

For the duration of a **caution level FLTA alert**, Class C Equipment (TAWS-MOPS-261) is required for the TAWS to be capable of providing an output to trigger a yellow or amber indication. While, for the duration of a **warning level FLTA alert**, Class C Equipment (TAWS-MOPS-262) is required for the TAWS to be capable of providing an output to trigger a red indication.

4 Reference

2017. RTCA DO-367. German Aerospace Center.(2021).