

## Piston Engine TBO Mixed Agricultural and Other Operations

### General

Civil Aviation Authority (CAA) Advisory Circulars (ACs) contain information about standards, practices, and procedures that the Director has found to be an **acceptable means of compliance** with the associated rule.

Consideration will be given to other methods of compliance that are presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate AC.

### Purpose

This AC describes an acceptable means of compliance with standards for operators when calculating the piston engine time between overhaul (TBO) for aircraft on mixed agricultural and non-agricultural operations and changing to, or from, agricultural and non-agricultural operations.

### Related Rules

This AC relates specifically to Civil Aviation Rule Parts 91 and 43.

### Change Notice

Revision 1 makes minor stylistic and format changes in line with other ACs and adds a version history.

### Version History

History Log

| Revision No.   | Effective Date    | Summary of Changes  |
|----------------|-------------------|---|
| AC91-19, Rev 0 | 24 February 2011  | Initial issue   |
| AC91-19, Rev 1 | 29 September 2023 | Makes minor stylistic and format changes in line with other ACs.<br><br>Adds a version history. |

## Table of Contents

|   |          |
|---|----------|
| <b>General</b> .....                          | <b>3</b> |
| Abbreviations.....                            | 3        |
| <b>Agricultural Factor calculation:</b> ..... | <b>3</b> |
| <b>Various Scenarios</b> .....                | <b>4</b> |
| Scenario One .....                            | 4        |
| Scenario Two .....                            | 4        |
| Scenario Three.....                           | 5        |
| Scenario Four.....                            | 5        |

## General

This AC provides guidance material on acceptable methods for calculating the TBO for piston engines installed in aircraft on mixed agricultural and non-agricultural operations. It also provides guidance in calculating engine TBO when an aircraft is commencing agricultural or mixed operations, from non-agricultural operations or from agricultural or mixed operations to non-agricultural operations.

As referred to in rule 91.603(c), operators are required to comply with the engine manufacturer's recommended TBO periods. Some engine manufacturer recommended TBO periods differ for agricultural and non-agricultural operations.

An accurate record shall be kept in the applicable engine logbook of agricultural and non-agricultural time in service. Where there is a change of role of the engine, for example from non-agricultural to agricultural operations, or an engine change between aircraft in different operations, the change of roles and time remaining to overhaul, will need to be clearly documented. This is referred to in rule 91.617.

Compliance time for Airworthiness Directives and other time in service required inspections shall be performed at the normal total time since new or overhaul hours not the agricultural corrected times.

The examples given in this AC do not allow for any approved engine escalation programmes or manufacturer's calendar TBO periods. The requirements of any approved engine escalation programme and manufacturer's calendar TBO periods must be accounted for when using this AC to calculate the engine TBO period.

### Abbreviations

|     |                       |
|-----|-----------------------|
| TBO | time between overhaul |
| TSN | time since new        |
| TSO | time since overhaul   |

### Agricultural Factor calculation:

Where a manufacturer specifies different recommended TBO periods for agricultural operations and non-agricultural operations, an *Agricultural Factor* has to be established.

Given an **example** of a manufacturer recommended agricultural TBO of 1500 hours and a non-agricultural TBO of 2000 hours, an *Agricultural Factor* to be applied for mixed operations can be calculated as follows:

$$\begin{array}{lcl}
 \text{Non-agricultural TBO} & & 2000 \text{ hours} \\
 \text{Agricultural TBO} & & 1500 \text{ hours} \\
 \text{Agricultural factor} & = & \frac{2000}{1500} = 1.33
 \end{array}$$

That is, every hour of agricultural operations equals 1.33 hours non-agricultural operations.

## Various Scenarios

Continuing with the **example** of a manufacturer's recommended agricultural TBO of 1500 hours and a non-agricultural TBO of 2000 hours, the following four scenarios are given as examples of the required calculations:

### Scenario One

For engines operated on 100% agricultural operations, the manufacturer's TBO of 1500 hours applies. Unless otherwise approved by the Director, the engine must be overhauled at the manufacturer's recommended TBO before it is used on any type of operation.

### Scenario Two

For engines operated on mixed agricultural/non-agricultural operations, an accurate record is to be kept of times flown on agricultural and non-agricultural operations. Every hour flown on agricultural operations is to be multiplied by the calculated *agricultural factor* and this time added to the running total time since new/overhaul. Hours flown on non-agricultural operations are added to the total time since new/overhaul in the normal manner.

CAA 2158 Engine Logbook (Revised 01/09) *Section 1 Service Record* is used to record the time in service of the engine. When operating on mixed operations, the column headed *Cycle/Other Record* is to be used to record the time since new/overhaul to include agricultural hours calculated to non-agricultural hours ( $\times$  *agricultural factor*) and non-agricultural hours. When the total in this column reaches the manufacturer's recommended non-agricultural TBO, the engine is time-expired. The totals in columns *Total Time Since New* and *Total Time Since O/H* are to be recorded in the normal manner.

Example of Engine Logbook:

Page 6

**SECTION 1  
SERVICE RECORD**

| Date                   | Hours Flown | Total Time Since New |    | Total Time Since O/H |    | Cycle/Other Record |        | Maintenance Required                    |
|------------------------|-------------|----------------------|----|----------------------|----|--------------------|--------|---|
|                        |             | Hours                |    | Hours                |    | Hours              | Number |   |
| Totals Brought Forward |             | 3773                 | 05 | 1773                 | 05 | 1976               | 35     |   |
|                        | 1.30        | 3774                 | 35 | 1774                 | 35 | 1978               | 10     | Ag (1.30 x 1.33 = 1.75)                 |
|                        | .90         | 3775                 | 25 | 1775                 | 25 | 1979               | 00     |   |
|                        | .45         | 3775                 | 70 | 1775                 | 70 | 1979               | 45     |   |
|                        | .45         | 3776                 | 15 | 1776                 | 15 | 1979               | 90     |   |
|                        | 1.10        | 3777                 | 25 | 1777                 | 25 | 1981               | 35     | Ag (1.10 x 1.33 = 1.45)                 |
|                        | .35         | 3777                 | 60 | 1779                 | 70 | 1983               | 80     |   |
|                        | 1.75        | 3781                 | 45 | 1781                 | 45 | 1986               | 15     | Ag (1.75 x 1.33 = 2.35)                 |
|                        | .95         | 3782                 | 40 | 1782                 | 40 | 1987               | 10     |   |
|                        | 1.25        | 3783                 | 65 | 1783                 | 65 | 1988               | 75     |   |
|                        | .20         | 3783                 | 85 | 1783                 | 85 | 1988               | 95     |   |
|                        | 4.00        | 3787                 | 85 | 1787                 | 85 | 1992               | 95     |   |
|                        | 3.20        | 3791                 | 05 | 1791                 | 05 | 1997               | 20     | Ag (3.20 x 1.33 = 4.25)                 |
|                        | .40         | 3791                 | 45 | 1791                 | 45 | 1997               | 60     |   |
|                        | 1.50        | 3792                 | 95 | 1792                 | 95 | 1999               | 60     | Ag (1.50 x 1.33 = 2.00)                 |
|                        | .40         | 3793                 | 35 | 1793                 | 35 | 2000               | 00     | Engine time expired. Overhaul required. |
| Totals Carried Forward |             | 3793                 | 35 |                      |    |                    |        |   |

**Scenario Three**

For engines coming off 100% agricultural or mixed agricultural/non-agricultural operations to 100% non-agricultural operations, the time in service is recorded in all three columns in the normal way. The engine becomes time-expired when the total in the *Cycle/Other Record* column reaches the engine manufacturer’s non-agricultural TBO; (in this case 2000 hours.)

**Scenario Four**

For engines coming on to mixed agricultural/non-agricultural operations from 100% non-agricultural operations, the time in service on agricultural operations is to be calculated (time in service x agricultural factor) and recorded in the *Cycle/Other Record* column as shown above.