

Revision 0

### **Piston Engine TBO Mixed Agricultural and Other Operations**

24 February 2011

#### **General**

Civil Aviation Authority Advisory Circulars contain information about standards, practices, and procedures that the Director has found to be an **Acceptable Means of Compliance (AMC)** with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate Advisory Circular.

An Advisory Circular may also include **Guidance Material (GM)** to facilitate compliance with the rule requirements. Guidance material must not be regarded as an acceptable means of compliance.

#### **Purpose**

This Advisory Circular provides guidance material (GM) to operators when calculating the piston engine TBO for aircraft on mixed agricultural and non agricultural operations and changing to, or from, agricultural and non agricultural operations.

#### **Related Rules**

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

#### **Change Notice**

This is the initial issue of this Advisory Circular.

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## General

This Advisory Circular 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.

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. *Refer to rule 91.603(c)*

An accurate record is to be kept in the applicable Engine Logbook of agricultural and non agricultural time in service. In the case of 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. *Refer to rule 91.617.*

Compliance time for Airworthiness Directives (ADs) and other time in service required inspections are to be performed at the normal Total Time Since New or Overhaul hours not the agricultural corrected times.

The examples given in this Advisory Circular 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 Advisory Circular to calculate the engine TBO period.

## Abbreviations:

In this Advisory Circular:

**TBO** means time between overhaul.

**TSN** means time since new.

**TSO** means 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:

Non agricultural TBO		2000 hours		
Agricultural TBO		1500 hours		
<i>Agricultural factor</i>	=	$\frac{2000}{1500}$	=	1.33

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 4 scenarios are given as examples of the required calculations:

### Scenario One

For engines operated on 100% agricultural operations, the manufacturers 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

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SECTION 1									
SERVICE RECORD									
Date	Hours Flown	Total Time Since New		Total Time Since O/H		Cycle/Other Record		Maintenance Required	
		Hours	Hours	Hours	Hours	Hours	Number		
Totals Brought Forward		3773	05	1773	05	1976	35		
	1.30	3774	35	1774	35	1978	10	Ag	$(1.30 \times 1.33 = 1.75)$
	.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	$(1.10 \times 1.33 = 1.45)$
	.35	3777	60	1779	70	1983	80		
	1.75	3781	45	1781	45	1986	15	Ag	$(1.75 \times 1.33 = 2.35)$
	.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	$(3.20 \times 1.33 = 4.25)$
	.40	3791	45	1791	45	1997	60		
	1.50	3792	95	1792	95	1999	60	Ag	$(1.50 \times 1.33 = 2.00)$
	.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.