



FLIGHT TEST CHECKS

ENGINE CHANGED, MODIFIED, OVERHAULED OR RE-BUILT

LAA/FT- ENG
Issue 4

A/C
Type:

Reg:

Engine:

Gearbox ratio: :1

Description of engine modifications (state Mod No.) or extent of re-build:

Propeller Type/
Designation:

Dia: Inch/mm*

Fixed pitch propellers. Pitch: _____ inches/mm,
or _____ degrees measured at _____ % radius/tip*

In-flight adjustable propellers.
Controller Type/Make:

Loaded Weight: _____ lb*
(min 90% MTOW) _____ kg*

CG: _____ in/mm*
Aft/Fwd* of datum

OAT: °C QNH mb

* Delete as appropriate

WARNING

Check flights entail greater risk than normal flight, and although it may be legal to carry passengers on a test flight with a Permit to Fly in force, it is strongly recommended that the pilot in command should, before accepting any other persons on a test flight, inform them that the risk is greater than on an ordinary flight. A full seat harness or a diagonal shoulder strap must be fitted for spinning. A parachute should be worn.

Special Note

1. The first flight should be approximately 10-20 minutes duration, after which the engine installation should be inspected. Repeat the flight until satisfied that the engine is performing satisfactorily enough to undertake the test programme without other than strictly necessary maintenance.
2. If not otherwise specified, before commencing the Flight Test Schedule, one flight of at least two hour's duration, or maximum safe endurance, whichever is the shorter must be made.
3. Ensure that the engine manufacturer's instructions for running-in an overhauled engine are adhered to except when it is detrimental to flight safety.

1. GROUND TESTS

1.1 Engine Controls *(including friction/locking mechanisms)*

Throttle	SAT - UNSAT	Carburettor heat	SAT - UNSAT - N/A
Propeller pitch	SAT - UNSAT - N/A	Cooling flap	SAT - UNSAT - N/A
Mixture	SAT - UNSAT - N/A	Fuel booster pump	SAT - UNSAT - N/A
Fuel selector/off valve	SAT - UNSAT	Choke	SAT - UNSAT - N/A

1.2 Engine Start

Check oil pressure rises to within normal limits within the time specified for the engine.

MAX PERMITTED TIME DELAY FOR OIL PRESSURE RISE (FROM AFM, POH) _____ Sec	TIME TAKEN _____ Sec	SAT	UNSAT
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1.3 Engine Run

The aeroplane should face cross-wind.
If wind strength makes parking cross-wind hazardous, face into wind.

Outside air temperature	°C
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1.3.1 Magneto check

Run engine to normal operating temperature – check RPM, pressures, temps, mag drops, carb heat drop. Check operation of engine and fuel controls.
State if single ignition is fitted

FROM AFM, POH		MEASURED	
Magneto test RPM or RPM at which tested	<input type="text"/>	No.1 magneto off RPM drop Electronic ignition? Y / N	<input type="text"/>
Max Drop Permitted	<input type="text"/>	No.2 magneto off RPM drop Electronic ignition? Y / N	<input type="text"/>
Max Split Permitted	<input type="text"/>	Hot air or Alternate air RPM drop FITTED / NOT FITTED	<input type="text"/>
Carburettor Hot air or Alternate air test RPM	<input type="text"/>	Minimum RPM (Ground idle)	<input type="text"/>
		Ignition cut RPM (Self-powering electronic ignitions)	<input type="text" value="L"/> <input type="text" value="R"/>

1.3.2 Throttle response

From idle, open throttle briskly and check for hesitation before RPM increases or engine cut-out. Investigate abnormal behaviour before flight.

SAT	UNSAT	COMMENTS:
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1.3.3 Oil pressure

Check oil pressure remains with limits throughout the achievable RPM range and for abnormal pressure behaviour with RPM changes.

SAT	UNSAT	COMMENTS:
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1.3.4 Fuel pressure

Check fuel pressure remains within limits with and without back-up pump running throughout the achievable RPM range.

SAT	UNSAT	COMMENTS:
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1.3.5 Maximum power check

With Wide Open Throttle (WOT), the engine must not over-speed when 'static' on the ground.

| Chock main wheels and/or tie aircraft to and from secure anchorage.

RPM data entered that exceeds the maximum permitted on the Operating Limitations sheet or flight test authorisation will fail the application. It should not be possible to exceed maximum permitted RPM. If it is, then something is wrong – check tachometer. Otherwise an inappropriate or incorrectly adjusted propeller may be fitted.

(FROM AFM, POH)		(MEASURED)	
MAX ALLOWABLE ENGINE RPM		MAX ACHIEVED STATIC RPM	
MAX ALLOWABLE OIL TEMPERATURE	_____ °C _____ °F	ACTUAL OIL TEMPERATURE	_____ °C _____ °F
ALLOWABLE OIL PRESSURES IDLE / MIN / MAX	/ / / bar/psi*	ACTUAL OIL PRESSURES MIN / MAX	/ / bar/psi*
MAX ALLOWED TEMP (CHT OR COOLANT)*	_____ °C _____ °F	ACTUAL MAX TEMP CHT/COOLANT*	_____ °C _____ °F
MAX ALLOWABLE EGT	_____ °C _____ °F	ACTUAL MAX HOTTEST EGT	_____ °C _____ °F
		MANIFOLD PRESSURE	In/Hg
		FUEL PRESSURE	bar/psi*

* Delete as appropriate

2. TAKE-OFF

(Valid flight test authorisation issued by LAA Engineering required)

The take-off is to be made with full power and flaps (if fitted) in the take-off position. As soon as possible after unstick, record:-

Wing flap setting	degrees	
Unstick speed	kts	mph
Engine RPM		
Oil Pressure	bar	psi
Oil Temperature	°C	°F
CHT/Coolant Temp	°C	°F

3. CLIMB

Flight conditions: Clear of cloud and turbulence and well clear of any hills which could produce wave conditions.

Configuration: Normal for best rate of climb (see Manual).

Power: Maximum Continuous with air intake in 'Cold' or 'Ram' air position.

Altimeter: 1013 mb (29.92 in Hg).

Speed:
(knots/mph IAS)*

Enter scheduled best rate of climb speed (V_Y); Before starting to record data, establish the aircraft in the climb at best rate of climb speed V_Y and maintain heading and speed ± 2 knots/mph throughout. (From AFM, POH)

To aid look-out it is permissible to turn during the climb. Carry out gentle turns (max 10° bank angle).

Important notes:

1. Sustained 5 minute climb is normally required to be carried out to establish adequacy of cooling, proper functioning at altitude and to provide sufficient data points to calculate a reliable rate of climb figure. However, where the rate of climb exceeds 1500 ft/min, or an aircraft with a Cirrus Minor or Gipsy Major engine is fitted, then a 3 minute climb will be accepted.
2. Incomplete climbs due to airspace, cloud or other similar reasons will not be accepted.
3. Do not allow engine to exceed limits.
4. Plot and attach a copy of the climb performance results, preferably using the spreadsheet that is available from the flight testing section of the LAA website, or use the grid on the last page.

TIME (min)	ALTITUDE (ft) 1013 mb	IAS	RPM	OIL TEMP	OIL PRESS	*CHT/COOLANT	EGT
0							
1							
2							
3							
4							
5							

* Delete as appropriate

Towards the end of the climb, record:

MANIFOLD PRESSURE	in Hg	FUEL PRESSURE	bar/psi*
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If there is any difficulty in recording these figures during the timed climb, maintain the climb speed and power, and record them at the end of the climb.

RPM data entered that exceeds the maximum permitted in the flight test authorisation will fail the application. See 5.3.2 above.

4. VIBRATION

Check for signs of vibrations or buffeting throughout the rpm range and in all phases of ground running as well as in flight. This may result if the natural frequency of vibration of the engine on its mount rubbers, or the tail surfaces or fuselage, or of the engine/reduction drive should happen to couple in an unfortunate way with the resonant frequency of the propeller blades in bending, or the aerodynamic buffet coming from the slipstream. It may also indicate that the propeller is out of track or out of balance.

SAT	UNSAT	COMMENTS:
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5. LEVEL FLIGHT

At a constant altitude in stable conditions not above 2000 feet, after at least 2 minutes at each of the throttle settings required (provided that this has no detrimental effect on the engine), record:-

POWER SETTING	RPM	MAN PRESS	IAS	OIL T °C /°F*	OIL P bar/psi*	*CHT/ COOLNT	EGT	FUEL FLOW Lit/Gal*/ hr
ECONOMY CRUISE								
NORMAL CRUISE								
MAX CONT. ENG RPM								
MAX RPM*								
WOT REACHED?	YES / NO							

* DO NOT EXCEED ENGINE LIMITS

MAXIMUM RATED ENGINE RPM = _____

Fly with maximum rated RPM. If max rated RPM cannot be achieved in level flight, dive sufficiently while maintaining WOT to achieve max rated RPM (not exceeding VNE) then smoothly and continuously throttle back to idle. Report any undesirable vibration or behaviour.

CAUTION: With 2-stroke engines, a mid-throttle setting at high RPM may result in a rapid increase in EGT leading to piston seizure. Do not allow engine to exceed maximum EGT.

COMMENTS:

6. DIVE TO V_{NE} - THIS TEST MUST ONLY BE FLOWN IN SMOOTH AIR CONDITIONS

The purpose of this test is to check that flight at V_{NE} can be achieved without exceeding max permitted RPM. The V_{NE} speed is stated in the PFRC or Operating Limitations sheet. Never exceed the V_{NE}. Beware of false reading ASI. Airspeed or RPM data entered that exceeds the maximum permitted will fail the application.

Increase speed up to V_{NE} at shallowest dive angle possible by maintaining sufficient power but keeping RPM within maximum permissible. If any unusual vibration is felt, immediately reduce speed by closing the throttle and gradually pulling the control column back. Record:-

Scheduled V _{NE} (from flight test authorisation/Operating Limitations)	knots	mph
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Any unusual behaviour.	
Whether the control forces and responses over small angles are normal.	
Steadiness of propeller governing (if applicable).	
Maximum IAS	
Record maximum engine RPM =	Was throttle fully closed? Y / N

Regain cruising flight by closing throttle and gradually pulling the control column back.

Engine behaviour on closing throttle:	SAT - UNSAT
Propeller governing:	SAT - UNSAT - N/A

7. Simulated Baulked Landing.

At altitude, set the aircraft in the approach configuration, at approach speed, throttle fully closed and record behaviour in simulated overshoot using full power.

Flight idle eng. RPM		Throttle response		Engine RPM		Oil Pres	
Tendency to pitch and yaw on application of throttle and (if applicable) flaps retraction.		Throttle: Flaps retraction:					

8. FUNCTIONING CHECKS

When appropriate during the flight, check the following:-

8.1 Engine Instruments

Check for satisfactory functioning. Record unsatisfactory items:-

8.2 Gyro Instruments

Check behaviour of gyro instruments. Record unsatisfactory items:-

If air-pump driven, record:- Press gauge during cruise at RPM

8.3 Electrical/Avionics Systems

Check all electrical and avionics equipment for satisfactory operation and that no equipment, instrumentation or indications are adversely affected due to electromagnetic interference:-

Record generator charging rate under maximum electrical load. Amps

9. Fuel System

During flight, feed from each fuel tank or source in turn for not less than 3 minutes.

Record:-

System functioning on each tank.
(identify which)

Fuel selector

Fuel gauges

SAT-UNSAT	SAT-UNSAT	SAT-UNSAT	SAT-UNSAT
SAT-UNSAT	SAT-UNSAT	SAT-UNSAT	SAT-UNSAT

10. SPINS (Applicable only to aeroplanes cleared for deliberate spinning).

Note that it may not be possible to conduct this item on the same flight as the other items due to loading / CG restrictions. If flown separately:

Date	A/C weight	CG
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A minimum of one spin is to be made in each direction. Recovery should be initiated after two turns.

Direction of rotation	Left	Right
Whether spin or spiral dive		
Any engine abnormality from spin entry to recovery?	SAT - UNSAT	SAT - UNSAT

11. COMPARISON WITH ENGINE BEFORE MODIFICATION / RE-BUILD

If possible, comment on relative performance, vibration, etc.:

Total test flying time flown:	
Two hour / max endurance flight time: (see Special Note 2)	

12. CERTIFICATION

I certify that I have flown the above aircraft and that the above checks have been carried out to my satisfaction.

Name:	Signed:	Date:	Licence No.:
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Once completed, send this form to LAA Engineering.

Send in also the aircraft's Operating Limitations document if the engine designation differs from the previously fitted engine.

Important note: Following conclusion of satisfactory flight test, the modified aircraft must not be flown until issue of modification final approval.

Enter appropriate scales and plot climb results on grid below and draw on best fit slope then calculate the average rate of climb.

Ave ROC = _____ fpm

Climb Performance

