



LAA TYPE ACCEPTANCE DATA SHEET
TADS G13
RAF 2000, RAF 2000 GTX-SE

Issue 7	Centrifugal rotor stop option added. Ronnie Legge tail mod included, Mod 12311.	Dated 07/07/11	FD
Revision A	TADS format update & Safety spot article addition.	Dated 22/02/21	MR

This TADS is intended as a summary of available information about the type and should be used during the build, operation and permit revalidation phases to help owners and inspectors. Although it is hoped that this document is as complete as possible, other sources may contain more up to date information, e.g. the manufacturer's website.

Section 1 contains general information about the type.

Section 2 contains information about the type that is **MANDATORY** and must be complied with.

Section 3 contains advisory information that owners and inspectors should review to help them maintain and operate the aircraft in an airworthy and safe condition. If due consideration and circumstances suggest that compliance with the requirements in this section can safely be deferred, is not required or not applicable, then this is a permitted judgement call. This section also provides a useful repository for advisory information gathered through defect reports and experience.

Section 1 - Introduction

1.1 UK contact

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1.2 Description

The RAF 2000 and its variants are two seat gyroplanes with an enclosed cockpit of Canadian origin. The aircraft is a kit-built gyroplane consisting of pre-fabricated components that are assembled with little fabrication needed. Powered by a converted Subaru EA22 or EJ22 'flat four' liquid cooled automotive engine. A three bladed Warp Drive propeller is fitted as standard. The RAF 2000 model was fitted with the EA22 engine. The later RAF2000 GTX-SE model has a revised cabin and the slightly more powerful EJ22 type engine. All RAF 2000 variants are equipped with a pre-rotator fitted to allow the rotors to be runup prior to take off.

Section 2 – Mandatory information for owners, operators and inspectors

At all times, responsibility for the maintenance and airworthiness of an aircraft rests with the owner. A Condition of a Permit to Fly requires that: *"the aircraft shall be maintained in an airworthy condition"*.

2.1 Fast Build Kit 51% Compliance

Not applicable – the aircraft is built from a slow-build kit.



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2.2 Build Manual

RAF 2000 Build manual

2.3 Build Inspections

Build inspection schedule 14 (RAF 2000).

Inspector approval code G. Inspector signing off final inspection also requires 'first flight' endorsement.

2.4 Flight Manual

RAF 2000 Operator's Manual.

Note supplemental operating procedures as follows:

- a. In "cabin check" add "Check joystick cross tube for fretting from gust lock".
- b. In section 2 under operations/limitations, amend as per MPD 2009-001 (see below).

2.5 Mandatory Permit Directives

2003-001 Replaced by MPD 2006-013.

[2003-007](#) Rotor blade inspection for cracks. This MPD required initial immediate inspection of the rotor blades for cracks and thereafter requires repeat inspections prior to the first flight of the day. The MPD permits the pilot to perform these 'daily' inspections.

[2004-011](#) Door placard. This MPD requires application of certain external placards adjacent to cabin door handles and latches. Compliance was required no later than 13th September 2004. Placards not required while cabin doors are not permitted to be fitted following MPD 2006-013.

[2006-003](#) Reinforcements of control system. This MPD mandates fitting RAF 2000 retro-fit kit to increase strength of control system where it has been shown not to meet Section T requirements.

2006-013 Replaced by MPD 2009-001.

[2009-001](#) This MPD prohibits flight with doors fitted, except when the LAA approved tailplane modification is fitted, and reduces Vne to 70 mph, and imposes other operating restrictions.

[2009-003](#) Inspection of rudder cables

Also check the LAA website for MPDs that are non-type specific ([TL2.22](#)).

2.6 LAA Required Modifications (including LAA issued AILs, SBs, etc)

The terms of the LAA's CAA approval do not extend to investigating the design of complete gyroplanes and the overall type design investigation and approval is carried out by the CAA. As a consequence of the CAA's investigation into the RAF 2000 the following list of modifications and placards is mandatory for all examples on the UK register. This list is supplied to all builders but for the purposes of ongoing inspections the list is provided here. Inspectors should check that any RAF 2000 they inspect



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either at first issue or Permit renewal inspection is compliant with the following list. Mods are obtainable from the UK agent, details above.

- a) If the original type of driveshaft pre-rotator is fitted, the rotor spin up drive shaft roll pin connections must be wire locked. Applicants mod. No. RAF/UK/1.
- b) The engine cam belt drive cover attachment bolts must be wire locked. Applicants mod No. RAF/UK/2.
- c) The threaded rudder hinge pin must be replaced by a plain stainless-steel rod threaded at either end and fitted with castle nuts and split pins for retention. Applicants mod No. RAF/UK/3.
- d) Lower mast cheek plate spacer block assembly rivets must be removed and replaced with through-bolts with spacers. Applicants mod No. RAF/UK/4.
- e) Bungee elastic or locking wire must be fitted through the trim springs to ensure that a failed spring is retained. Applicants mod. No. RAF/UK/S3.
- f) The bolts through the mast at the hinge point must be fitted with castle nuts and split pins, as they may be removed routinely for transport or storage of the gyroplane. The rotor brake pivot bolt must also be fitted with a castle nut and split pin. Applicants mod. no. RAF/UK/5.
- g) Witness holes must be checked in the control rods to ensure that there is adequate length of thread on the rod ends engaged. Applicants mod No. RAF/UK/12.
- h) Stops must be fitted to the rudder control system at the rudder pedals. Applicant's mod. No. RAF/UK/S1 shows the details.
- i) The trim wheels must be marked to indicate the direction of rotation for the trim function. A device must be fitted to indicate the fore and aft trim position. Applicant's mod. No. RAF/UK/6 & RAF/UK/7.
- j) The gust lock must be modified to prevent fretting on the control cross rod, Applicant's mod No. RAF/UK/8. Additional plastic sleeves fitted over the control cross rod. Mod No. RAF/UK/S4.
- k) The fuel filler pipe to the seat tank must be padded and the head set bracket removed to prevent a head strike hazard. Applicant's mod. No. RAF/UK/9.
- l) The side ventilators supplied as optional equipment by RAF must be fitted.
- m) Additional venting must be provided in the fuel filler cap. Applicants mod. No. RAF/UK/10.
- n) A fuel level gauge must be fitted, visible to the pilot when strapped in the left seat, either a sight. tube per applicant's mod. No. RAF/UK/S5 or the optional electric fuel sender with gauge on the panel.

2.7 Additional engine operating limitations to be placarded or shown by instrument markings

Notes:

- Refer to the engine manufacturer's latest documentation for the definitive parameter values and recommended instruments.
- Where an instrument is not fitted, the limit need not be displayed.

With Subaru EA22 & EJ22 engine:

Engine water, oil, and fuel temperatures and pressures to be within the limits specified in the Flight Manual



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2.8 Control surface deflections

Cyclic (Pitch)	As specified in RAF 2000 flight manual
Cyclic (Roll)	
Rudder	

2.9 Operating Limitations and Placards

(Note that the wording on an individual aircraft's Operating Limitations document takes precedence, if different.)

For aircraft without the horizontal stabiliser mod 12311 fitted:

1. Maximum number of occupants authorised to be carried: Two.
2. The aircraft must be operated in compliance with the following operating limitations, which shall be displayed in the cockpit by means of placards or instrument markings:
 - 2.1 Aerobatic Limitations
Aerobatic manoeuvres are prohibited.
Manoeuvres involving a deliberate reduction in normal 'g' shall be avoided.
Minimum sustained load factor: 1g
 - 2.2 Loading Limitations
Maximum Total Weight Authorised: RAF 2000: 1125 lbs
GTX- SE: 1225 lbs

CG Range: Refer to hang check limits.
Solo flight from left seat only.
Minimum solo pilot weight 100 lbs
 - 2.3 Engine Limitations
Maximum Engine RPM:
RAF 2000: 6000
RAF 2000 GTX-SE: 5500
 - 2.4 Airspeed Limitations
Maximum Indicated Airspeed (V_{NE}): 70mph
 - 2.5 Other Limitations
Aircraft to be operated in accordance with the RAF 2000 Flight Manual including UK Supplement.
Minimum rotor RPM before start of take-off: 150 RPM
The aircraft shall be flown by day and under Visual Flight Rules only.
Smoking in the aircraft is prohibited.
The aircraft shall not fly closer than 110 metres to any assembly of persons.
Flight with doors fitted is prohibited.

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Flight when surface winds exceeds 15 kt is prohibited.
Flight when surface wind gust spread exceed 10 kts is prohibited.
Continued Flight in moderate, severe or extreme turbulence is prohibited.
Maximum airspeed, should such turbulence conditions be encountered, is 60 mph.
Additional Placard (located adjacent to ASI): "Maximum permitted airspeed 70 mph, ref MPD 2009-001"

For aircraft with the horizontal stabiliser mod 12311 fitted:

1. Maximum number of occupants authorised to be carried: Two.
2. The aircraft must be operated in compliance with the following operating limitations, which shall be displayed in the cockpit by means of placards or instrument markings:
 - 2.1 Aerobatic Limitations
Aerobatic manoeuvres are prohibited.
Manoeuvres involving a deliberate reduction in normal 'g' shall be avoided.
Minimum sustained load factor: 1g
 - 2.2 Loading Limitations
Maximum Total Weight Authorised: 1275 lbs

CG Range: Refer to hang check limits.
Solo flight from left seat only.
Minimum solo pilot weight 140 lbs
 - 2.4 Engine Limitations
Maximum Engine RPM: 5500
 - 2.4 Airspeed Limitations
Maximum Indicated Airspeed (V_{NE}): 70mph
 - 2.5 Other Limitations
Gyroplane to be operated in accordance with RAF Flight Manual including UK supplement and Pilot's Notes for RAF 2000 with Horizontal Tail' dated 10.6.08.
Minimum rotor RPM before start of take-off: 150 RPM
The aircraft shall be flown by day and under Visual Flight Rules only.
Smoking in the aircraft is prohibited.
The aircraft shall not fly closer than 110 metres to any assembly of persons.
Max crosswind component for take off or landing 15 mph.
Flight with doors fitted or removed is permitted.
Continued Flight in moderate, severe or extreme turbulence is prohibited.
Maximum airspeed, should such conditions be encountered, is 60 mph.
LAA modification 12311 (horizontal tailplane, tip fins, rudder centring springs and pip pin door hinges) must be fitted.



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Tailplane, tailplane attachments and keel tube to be inspected in vicinity of base of mast and rear engine mount attachments for signs of cracking or distortion at each pre-flight inspection.

Additional Placards for all examples:

A fireproof identification plate must be fitted to fuselage, engraved or stamped with aircraft's registration letters.

The following placards must be fitted in addition to all placards recommended by RAF:

1. The inside of the door must be placarded to indicate the procedure to be used to enable the doors to be forced open from the inside in an emergency. *"In emergency - release"*. Mod No. RAF/UK/S6.
2. A placard, indicating that switching the ignition switch off ensures that the fuel is cut off, must be located adjacent to the ignition switch *"Ignition/fuel on/off"*. Mod No. RAF/UK/S6.
3. A placard adjacent to the fuel filler indicating the fuel grade must be installed as standard. A placard indicating the oil grade and whether the oil is detergent or non-detergent is installed adjacent to the oil filler. Mod No. RAF/UK/11.
4. A placard must be displayed in the cabin *"check c of g position before take off"* and on the mast to warn that the mast adjustment must be set correctly prior to flight to ensure that the gyroplane is in trim for the cabin loading being flown. Mod No. RAF/UK/S6.
5. The outside of the cabin must be placarded to indicate where to pull on the doors in an emergency to gain access to the cabin. *"In emergency, lift here"*.
6. In full view of the pilot and crew. *"Occupant Warning - This aircraft has not been certificated to an international requirement"*.

For RAF 2000 mandatory placards see also MPD 2004-011 above, also the aircraft's Operating Limitations document.

2.10 Maximum permitted empty weight

Not applicable.

Section 3 – Advice to owners, operators and inspectors

3.1 Maintenance Manual

The aircraft and engine should be maintained in accordance with the servicing schedule published by RAF. Owners should ensure they obtain this information, including RAF service bulletins, from the UK agent and make this information available to their inspector. Maintenance and inspection should also be in accordance with the checklist in the LAA's gyroplane Permit renewal form (LAA/GR-1) and in accordance with instructions and guidance contained in the LAA Owners Handbook for Ultralight Gyroplanes.

3.2 Manufacturer's/Standard Options

The listing below shows the factory options that have been accepted by the LAA.



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- RAF Alternative seat tank
- RAF Weighted rotor tips and stiffened rotor head
- RAF Centrifugal teeter stops
- RAF fuel injection system (note when the fuel injection system is used, problems have been experienced with engine failure with low fuel levels in the tank – refer to section 3.5 below).

'Ronnie Legge' Horizontal tail modification MOD 12311, which also involves addition of cabin doors retained by pip-pin hinge pins and additional rudder centring springs, and allows an increase in max gross weight to 1275 lbs.

Note the RAF optional 'stabiliser' tab is NOT accepted by LAA or CAA.

3.3 Manufacturer's Information (including Service Bulletins, Service Letters, etc)

In the absence of any over-riding LAA classification, inspections and modifications published by the manufacturer should be satisfied according to the recommendation of the manufacturer. It is the owner's responsibility to be aware of and supply such information to their Inspector.

Service bulletins are available from the UK agent.

3.4 Special Inspection Points

The following is a list of specific items to watch closely on the RAF 2000, provided by the UK agent:

- a) Check the two eyebolts acting as mounts for the alternator as these can fracture, particularly if the spacing between them has not been set correctly and they have been placed in lateral tension.
- b) The battery should have some form of secure connections to the terminals as the screw-on type supplied are not really sufficient for the job.
- c) Check for any run-off on the prerotator belt – black rubber marking on the crankcase is a give-away.
- d) Check for cracks where the prerotator mounting bracket is attached to the crankcase.
- e) Check security of the small eyebolts at each end of the lower main control rod.

Following any roll-over accident, contact LAA to discuss repair proposals and mandatory replacement of highly stressed components, pushrod rod-ends etc which may have been over-stressed in the accident. Refer to RAF service information.

Note that in addition to standard flight instrumentation, the ANO requires that a slip indicator is fitted to all gyroplanes. On pusher gyroplanes this is usually accomplished with a simple yaw string on the aircraft centreline in view of the pilot.

In some cases, there has been wear of the base of the lower cyclic control rods due to their rubbing on the trim springs. Inspectors should check that excessive wear has not occurred. To avoid wear occurring, a short length of protective tape can be fitted over the affected area at the bottom ends of the pushrods such as proprietary propeller leading edge anti-chafing tape.



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In one case it was found that at extreme nose-down trim setting, there was potential for the safety chain connected to the pitch trim springs to interfere with the control system and it is possible that this could slightly limit the extreme range of travel of the roll control. In order to prevent this possibility, any surplus links at the free end of the chain must be either cut off or restrained clear of the moving parts. A suitable restraint method is to insert the free end of the chain down the centre of the pitch trim spring.

3.5 Operational Issues

When the fuel injection system system is used, problems have been experienced with the engine stopping prematurely with low fuel level in the tank, due to the return feed from the injector to the tank causing swirling of the fuel in the tank and allowing air to be injected into the feed line from the bottom of the vortex which forms in the tank. This in effect results in a greatly increased 'unusable fuel' level. A LAA mod (mod 11836) re-routes the return fuel and avoids the problem.

Safety Spot references

The following *Safety Spot* articles are relevant to RAF 2000 aircraft:

Light Aviation [Jan 2009](#) RAF 2000 GTX-SE Rudder Cable Failure
Light Aviation [Aug 2013](#) RAF 2000 Autogyro Warp Drive Prop Hub

3.6 Standard Modifications

None.

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Please report any errors or omissions to LAA Engineering: engineering@laa.uk.com