LAA TYPE ACCEPTANCE DATA SHEET TADS 048

DRUINE D.31 AND D.31A TURBULENT

Issue 1 Initial Issue dated 8.1.07

1. UK contact

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2. Description

The Druine D.31Turbulent is a small single seat low wing aircraft of traditional all-wood construction, fabric covered, the one-piece wing incorporating a wood / ply box spar and fixed wing tip slats. Engine types cleared by LAA for the Turbulent are Ardem or Peacock type VW conversions of up to 1700cc, also 60 BHP Jabiru 1600 engine cleared on a single example.

3. Fast Build Kit 51% Compliance

Not applicable – plans built aircraft.

4. Build Manual

Turbulent drawings formerly supplied by Rollasons now available from the LAA . Turbulent drawings are also available from Mme Druine in France but these do not incorporate UK required modifications. Turbi drawings also available from Mme Druine, 10, Avenue Aristide, Briand 94100, Saint-Maur, France.

5. Build Inspections

Build inspection schedule 1 (wooden aircraft).
Inspector approval codes A-A or A-W. Inspector signing off final inspection also requires 'first flight' endorsement

6. Maintenance Manual

The Rollasons Turbulent Operator's Manual includes a special maintenance schedule for the Turbulent. This is available from the LAA , (£25.00 inc p&p). LAMS should also be used as a guide to required inspections and this is reflected in the check list in Section 1 of the LAA 's Permit renewal application form. Maintenance is typical of wooden / fabric airframe including compliance with CAA Airworthiness Notice No 50. Engine maintenance is as appropriate to engine type.

Rigging figures and control range of movements can be found in the Operating Manual.

7. Flight Manual

The Rollasons Turbulent Operator's Manual includes pilot's notes for the type.

8. Mandatory Permit Directives

None applicable specifically to this aircraft type, but note

MPD: 1998-019-R1 Flexible Fuel Tubing Applies to all aircraft

9. LAAMandatory Modifications

The following are modifications introduced by Rollasons during the 1960s and 70s and incorporated into later issues of the drawings.and are considered mandatory by the LAA .

RAE/45 - Modified Aileron Hinges
RAE/51 - Windscreen Crash Arch
RAE/67 - Safety Straps on Tailplane Bolts
RAE/68 - Shoulder Harness Attachment Reinforcements
RAE/88- Attachment of Bulkhead – Engines over 1300cc
RAE/95 - Undercarriage Attachment Reinforcements
RAE/96 - Wing Inspection Panels

10. Service Bulletins

Nil known

11. Standard Options

- The D.31 drawings also show a reinforced wing mainspar intended for a proposed certified Turbulent designated D.31A. Use of the reinforced spar also involves relocation of matching fuselage frame and modification of wing ribs to fit. Use of the reinforced spar permits an increase in max gross weight from 620 lbs to 700 lbs, subject to satisfactory climb performance.
- The drawings also show optional sliding cockpit canopy and wheel spats which are acceptable provided weight allows.
- Most examples are fitted with a fixed tailskid but the castering tailwheel shown as an option on the drawings may also be fitted provided mainwheel brakes are installed.
- Uprated main undercarriage shock-absorber springs are a common modification, details from John Mansell (see section 1). These provide more protection of the wingspar from shockload damage in heavy landings.

12. Special Inspection Points

- Drawings have not been updated for many years and may contain dimensional errors. Check dimensions / fit of parts carefully prior to cutting or drilling.
- The Turbulent drawings do not include engine conversion details, see Peacock VW conversion drawings for details.
- Note the Turbulent was designed as a very simple lightweight aircraft. Due to the fitting of additional 'options', e.g. bigger capacity VW engines, wheel spats, canopy, radio etc over the years, the type has a reputation for turning out overweight. This means that many Turbulents cannot be flown within permitted max gross weight except by very light pilots with minimal fuel. Owners MUST avoid the temptation to add extra weight to the Turbulent if they want a satisfactory payload
- Take care to minimise operating friction in flying controls by careful attention to hinges, cable tensions, lubrication etc. The Turbulent has very light controls and undue friction in the control system will spoil control feel.
- A well-known serious defect with Turbulent aircraft is cracking / compression shake in wing mainspars at undercarriage attachment points or fuselage sides, caused by heavy landing. Any damage in this area is likely to seriously reduce the strength of the wing and the aircraft must be grounded pending major repair.
- Cases have also been reported of the engine mounting studs cracking in the threaded portion which screws in the crankcase.
- 'Wheelbarrow wheels' if fitted to be checked carefully for signs of overstress / failure of hub.
- With VW engine, design of conversion to be agreed with LAA Engineering as there is no standard design of VW conversion. 'Peacock' VW conversion drawings are available from LAA Engineering, but these drawings are now many years old and not all parts called up are still available. Dual ignition system (of an accepted type) required. LAAVW Engine Build checklist to be completed during build up of engine to record critical measurements. Refer to SPARS section on VW engines. Oil cooler may be required, and careful ducting to achieve adequate cylinder cooling. Compression ratio must be set up (usually no more than 8.0:1) using choice of cylinder base shims if required. With 1834cc conversions, failing to use base shims usually results in excessively high compression ratio and consequent excessively short engine life.
- With VW conversion, if gravity feed is used, check gravity flow from downstream side of carburettor float valve (by removing float chamber bowl or float chamber drain plug) rather than at carburettor fuel inlet. If an automotive carburettor (e.g. Stromberg CD150) is used with gravity feed, the carburettor float valve is often found to provide inadequate or very marginal flow. This is because automotive carburettors are set up for use with a pump-fed installation not gravity feed. The fuel pressure from a pump allows a carb float jet of only about 1.5 mm diameter to be used, this restricts the flow too much with the much lesser fuel pressure in a typical gravity fed system. This is a common cause of lean running and engine failure. This is cured by fitting a larger diameter jet to the float valve, (typically 2.5 to 3mm diameter) or carefully opening up the existing jet and lapping it in with a household brass polish
- With VW engine, quality of fit of propeller hub on crankshaft nose is critical to security of propeller mounting in flight.
- Builder interpretation of areas which are sparcely detailed on the drawings, such as canopy hinges, canopy latches, fuel tank, engine controls, exhaust

system, cowlings, wheel brakes, cockpit harness, flap system etc. Due to the lack of details on the drawings, inspectors must ensure that these areas are dealt with in accordance with normal light aircraft design practises. Refer to Bingelis's books 'Firewall Forward', 'The Sportplane Builder' and 'Sportplane Construction Techniques' for examples of standard aviation practises. If in doubt, consult LAA Engineering for advice.

13. Operating Limitations and Placards

Maximum number of occupants authorised to be carried: One
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:
Aerobatic Limitations
Intentional spinning is prohibited
Aerobatic manoeuvres are prohibited
Loading Limitations
Maximum Total weight Authorised: 620 Lbs (700 lbs with D.31A type spar subject to satisfactory climb performance)
CG Range: D.31: 12.2 inches to 16.0 inches aft of datum. D.31A: 9.0 inches to 16.4 inches AOD
Datum Point is: Leading Edge of Wing
Engine Limitations
Maximum Engine RPM: 3300
Airspeed Limitations
Maximum Indicated Airspeed: D.31: 109 Kts D.31A: 115 kts.
Other Limitations
The aircraft shall be flown by day and under Visual Flight Rules only.
Smoking in the aircraft is prohibited.

Additional Placard
"Occupant Warning - This Aircraft has not been Certificated to an International Requirement"

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

14. Additional Engine Limitations/Placards

With VW: Max CHT: 225C Max
EGT: 800C Max
Oil temp: 90C Max
Oil pressure Min 2.5 Kg/sq cm @3000 RPM

15. Maximum Permitted Empty Weight

Fuel tank contents may vary slightly between examples so it is not possible to define a universal maximum empty weight. With full fuel tank, normally the aircraft should be able to carry a pilot weighing 170 Lbs without exceeding max permitted gross weight. However many of the older examples cannot meet this requirement, and historically it has been accepted provided a 170 Lbs pilot can carry enough fuel for one hour of flight at cruise power setting without exceeding max gross weight.

16. Special Test Flying Issues

- Turbulents are renowned for their delightful handling characteristics but several have been involved in fatal accidents through over-exuberant flying. Due to their low aspect-ratio wing they lose airspeed very rapidly in a steep turn and there have been a number of stall-spin accidents. Due to their lightweight structure they are definitely not aerobatic.
- The mainwheels are well aft consequently the weight on the tailskid is minimal, care required to avoid tipping it onto its nose whilst running up the engine.

17. Control surface deflections

Ailerons	Up:	TBD degrees
	Down:	TBD degrees
Elevators	Up:	TBD degrees
	Down:	TBD degrees
Rudder	Left	TBD degrees
	Right	TBD degrees

18. Additional Weighing information

Longitudinal levelling datum: Upper fuselage longerons at cockpit.

Approved:

F.R.Donaldson
Chief Engineer

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