LAA TYPE ACCEPTANCE DATA SHEET
TADS 202
AERO DESIGNS PULSAR & PULSAR XP

Issue 7	Addition of MOD/202/009. Addition of notes in section 3.4 and 3.5. Minor editorial changes.	21/01/21	JV

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

Alan Gill, Oakhayes, Monkokehampton, Winkleigh, Devon EX19 8AX

Tel: 01837 83326

1.2 Description

The Pulsar and Pulsar XP are two-seat aircraft of mixed wood and composite construction. The Pulsar is the original model, equipped with a Rotax 532 or 582 two stroke engine and fuselage mounted fuel tank. The Pulsar XP is fitted with a four stroke Rotax 912 engine and has wing tanks rather than a fuselage tank.

The Star-Lite and Pulsar are low-wing cantilever monoplanes of small size and very clean lines, featuring mainly composite construction. The Pulsar variants may be built in either nosewheel or tailwheel undercarriage form, the former being much more forgiving for low-time pilots. Despite their small size these aircraft are all 'group A' machines on account of their wing loading and stall speed. There are around 12 of these aircraft operating on LAA Permits to Fly.

The fuselage consists of two large epoxy/glass mouldings split on the vertical centre line (Airfix kit style) and epoxied together by the builder using a simple butt-joint between the generous flanges moulded into each half. Fin and tailplane are similarly constructed from mouldings. The wings of the early Pulsars are built around a spruce spar with foam ribs and plywood covering, but later moulded spars substituted for the wooden ones, and finally pre-moulded wing skins were also supplied to create an all-composite wing. Some models have integral wing fuel tanks.

Early Pulsars had a fixed length support strut and relied on bending of the noseleg for shock absorption. Later a spring strut unit was substituted for additional shock absorption.

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 – kit only accepted in slow-build form.

2.2 Build Manual

Supplied with kit.

2.3 Build Inspections

Build inspection schedule 36 (Pulsar).
Inspector approval codes A-A or AC-1 or K. Inspector signing off final inspection also requires 'first flight' endorsement.

2.4 Flight Manual

Simple Pilot's manual suppled with kit.

2.5 Mandatory Permit Directives

None applicable specifically to this aircraft type.

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)

MOD/202/001 Fuel system improvements
MOD/202/002 External canopy release
MOD/202/003 Flap mechanism changes
MOD/202/004 Enclosure of throttle cable
MOD/202/005 Addition of firewall
MOD/202/006 Flying control system improvements

The above mods are all applicable during the aircraft build stages. Builders should refer to the information sent directly to owner/builders, or otherwise contact LAA. All are LAA classification A - mandatory.

The following mandatory LAA mods/bulletins relate to later in-service issues.

MOD/202/007 Inspection for fuel damage to foam wing ribs
MOD/202/008 Pulsar cooling system
MOD/202/009 Nose undercarriage – drag brace attachment inspection

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 Rotax 582
Max CHT: 150°C (normal 110-130°C) max difference 10°C
Max EGT: 650°C (normal 500-620°C) max difference 25°C
Max Coolant temp: 80°C

With Rotax 912-UL
Maximum CHT: 150°C
Max Coolant Temp: 120°C (with 50/50 Glycol/water coolant)
Oil Temp Limits: 50°C to 140°C (Normal 90-110°C)
Oil Pressure 2-5 Bar
Minimum Fuel Pressure: 0.15 bar

2.8 Control surface deflections

Ailerons	Up: TBD° Down: TBD°
Elevators	Up: TBD° Down: TBD°
Elevator tab	Up: TBD° Down: TBD°
Rudder	Left: TBD° Right: TBD°
Flap	Down: TBD°

2.9 Operating Limitations and Placards

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

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.
Intentional spinning is prohibited.

2.2 Loading Limitations
Maximum Total Weight Authorised Pulsar: 900 lbs
Maximum Total Weight Authorised Pulsar XP: 960 lbs

CG Range: 31.25 inches to 39.10 inches aft of datum point
Datum Point is: The front face of the firewall.

2.3 Engine Limitations (Rotax 912)
Maximum engine RPM: 5800
Maximum continuous engine RPM: 5500

Engine Limitations (Rotax 582)
Maximum engine RPM: 6800
Maximum continuous engine RPM: 6500

2.4 Airspeed Limitations
Maximum Indicated Airspeed (V_{NE}): 160mph (previously 150mph)
Max Indicated Airspeed Flaps Extended: 80mph (previously 65mph)
Maximum Manoeuvring Speed (Va): 95mph

2.5 Other Limitations
The aircraft shall be flown by day and under Visual Flight Rules only.
Smoking in the aircraft is prohibited.
Reduce airspeed to 95 mph in turbulent air conditions.

Additional Placards:

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

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

2.10 Maximum permitted empty weight

Not applicable.

Section 3 – Advice to owners, operators and inspectors

3.1 Maintenance Manual

LAA is not aware of any airframe maintenance schedule published by the manufacturer and a customised version of the LAA Generic Maintenance Schedule may be used. Further information on maintenance schedules can be found in the Aircraft Maintenance section of the LAA website. There is an Operators manual available and important data such as control movements is shown in the construction manual. All owners should acquire this information and make it available to their inspector.

3.2 Manufacturer's/Standard Options

Tailwheel or nosewheel undercarriage.

Optional after-market aluminium alloy main undercarriage supplied by Grove Aircraft Company for Pulsar 3 and Pulsar XP has been accepted by LAA.

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

- A number of service bulletins and service letters have been issued by Aero Designs and Skystar relating to the Star-Lite and Pulsar variants. In the absence of any over-riding LAA classification, inspection requirements and modifications called for by the manufacturer should be satisfied according to the manufacturer's advice. Consult LAA Engineering in cases of doubt. It is the owner's responsibility to be aware of and supply such information to their inspectors.

- Pulsar Service Bulletin # 50 – Main Wing Spars. Skystar consider this SB mandatory. Applies to all Pulsar aircraft manufactured by Aero Designs, Inc. with composite (rather than wooden) wing spars. Some composite spars in Pulsars sold and manufactured by Aero Designs were incorrectly constructed at the factory and are not airworthy. Before continued operation, inspect your aircraft's spars as described in the service bulletin and do not operate the aircraft if it is found that the aircraft was built with defective spars. These defective spars could structurally fail in flight, resulting in injury and death.

- For Rotax 532, 582 and 912 series engines, there are many Rotax service bulletins dealing with a variety of important safety topics. Copies of the bulletins applicable to individual engines by engine serial can be downloaded directly from the Rotax website at http://www.rotax-aircraft-engines.com.

3.4 Special Inspection Points

- The aircraft are very lightly built and to this end one or two of the detail design features (for example, the flying control system) seem crude and 'go against the grain' with traditionalists. Nevertheless Pulsars are well proven designs with a good structural safety record to date. Particular care is however required in the implementation of apparently crude design features to achieve an acceptable, reliable result.
- The importance of proper working conditions and surface preparation prior to any bonding operations should be stressed, along with the need for neat workmanship and avoidance of unnecessary weight build-up.
- Check flying surfaces carefully for freedom from warps prior to skinning, as any warps once built in, are irretrievable.
- Ensure that all blind rivets are 'set' squarely and fully, and check that rivet heads are seated properly with a feeler gauge.
- The build manual is not detailed regarding engine installation and fuel system details etc. See Rotax installation manual and Rotax installation checklist for guidance.
- Note this is a very lightweight aircraft. Addition of extra 'options' will most likely result in the aircraft being overweight. Particular care is required to avoid an aft-cg problem with the Pulsar, as even the standard Pulsar usually has very limited baggage carrying capability when flown two-up due to rapidly reaching the aft cg limit.
- LAMS should be used as a guide to required inspections and this is reflected in the checklist in Section 1 of the LAA's permit renewal application form. Aero Designs and Skystar service information should also be reviewed. The owner

should obtain the engine maintenance manual and service bulletins etc and make this available to his inspector. The engine should be maintained to the Rotax maintenance schedule.

- Maintenance of the airframe is typical of a composite airframe. Watch out for signs of delamination cracking and separation of skins from underlying structure (coin tapping and observation of condensation patterns etc), movement of bushings, slack in undercarriage attachments etc. The aircraft should be de-rigged for inspection of wing attachments, root ribs etc. The control system should be inspected in particular for signs of cracking, loose rivets, wear and signs of fretting in joints (grey metal dust stains).
- As the design employs certain crude design features in common with most lightweight kit aircraft of this era particular care needs to be taken to monitor condition in service and replace components as they become worn or develop cracks.
- Mod 204/006 was issued following a Pulsar in the USA suffering asymmetric flap failure. Upon close internal examination of the wing, the cause of the failure became clear. By inserting a small lead light in the flap pushrod exit hole, the owner was shocked to find that the rib supporting the flap torque tube had disappeared. Further examination revealed that ribs 2 to 6 had been dissolved by petrol vapour and rib 7 was partially eaten away. The owner believes that the fuel migrated from a weeping fuel drain in the wing leading edge tank, up the wing to fuselage joint and into the wing through the aileron pushrod and flap torque tube bushes due to pressure differential. If fuel can enter the wing in this manner then clearly any fuel venting from either wing or fuselage tanks could cause similar damage.
- The latest kits have fuel resistant (Clegicell) foam ribs, but we believe the majority of UK Pulsars have blue foam ribs, or at best, Clegicell for the root rib (rib 1) only.
- Wings not yet built should use the later Clegicell wing ribs instead of the earlier blue foam type. Wings built but not yet skinned should be brushed with a thin coat of laminating epoxy on ribs 1-7 to seal them. Drill ¼" diameter vent holes through ribs after sealing to allow internal pressures to equalise and avoid possible damage to wing with changes in altitude/static pressure. Aircraft in service should be checked by using fingertips to press down firmly on upper and lower wing skins in the area of ribs 2-7. Increased flexibility may indicate damage to the underlying ribs. With palms resting on flap trailing edges, apply up/down loads to check for signs of undue free play or movement which may indicate failure of the ribs supporting the flap torque tube bearings. With wings de-rigged, check by appearance of root rib whether wing ribs are of blue foam (light blue colour) or Clegicell (brown). Examine internal structure through existing holes in root rib at flap torque tube and aileron pushrod exits. Sealing the joint between the wing and the fuselage root fillet with PVC tape may help avoid the problem occurring in the future. Ensure that fuel drains do not leak and fuel is not spilled in the vicinity of the wing root area.
- MOD/202/008 Pulsar Cooling System relates to an engine failure on a LAA Pulsar was caused by overheating after total loss of coolant from the radiator. This was found to have been due to side loads and vibration on the radiator from the filler cap hose, causing it to fail in the vicinity of the hose attachment. LAA therefore require that operators fit only hoses approved for use by the LAA or by the Pulsar kit manufacturer. Operators should carry out regular checks of the integrity of the cooling system, especially in the regions of the radiator hose couplings.
- Skystar service bulletin 50 applies to all Pulsar aircraft manufactured by Aero Designs, Inc. with composite (rather than wooden) wing spars. Some composite spars in Pulsars sold and manufactured by Aero Designs were

incorrectly constructed at the factory and are not airworthy. Before continued operation, inspect your aircraft's spars as described in the service bulletin and do not operate the aircraft if it is found that the aircraft was built with defective spars. These defective spars could structurally fail in flight, resulting in injury and death. If the spars were manufactured properly, the cap on the top of the spar will be thicker than the cap on the bottom. On completed aircraft, the wings may need to be either partially or fully removed to permit adequate inspection. When the root end of the spar can be clearly seen, carefully measure the vertical thickness of the upper and lower spar caps. If the vertical thickness of the upper spar cap is less than that of the lower cap, the spar is defective and should not be considered airworthy. Under no circumstances should an aircraft be flown with a defective spar. The LAA does not require that this inspection necessarily be accomplished by a LAA inspector, and the aircraft owner may carry out the inspection, the result of which must nevertheless be recorded in the aircraft log book. At Permit renewal, inspectors should check and confirm that the required inspection has been satisfied. Please advise LAA Engineering if defective spars are found.

- Noseleg failures have occurred due to failure of early type 5/8" diameter noseleg castor pivot pins. As a result, improved pivot pins were introduced by Aerodesigns with diameter increased to 3/4". Aerodesigns manufactured ¾" diameter pivot pins were made removable from the leg, whereas the earlier 5/8" diameter pins by Aerodesigns, and the later Skystar produced ¾" diameter pins were welded integral with the noseleg. Check carefully for signs of bending/cracking of noseleg pivot pins particularly if they are of the earlier 5/8" diameter design and particularly following any heavy landing.
- Noseleg failures have occurred due to the square steel tube support stub for the front noseleg suspension strut failing through fatigue where it is welded to the forward engine mounting cross-beam. The tube concerned is the one which runs fore and aft on the aircraft centre line, linking the front and rear cross beams, and projects aft to provide a mounting for the front noseleg strut. Check carefully for signs of bending or cracking of this square tube where it passes underneath the forward cross beam, especially following any heavy landing and especially if the early type fixed-length support strut is used rather than the later suspension spring link. This does not apply to the Pulsar XP which has a different noseleg suspension strut mounting arrangement.

3.5 Operational Issues

- The light control forces and low stability plus relatively ineffective flaps are such that a proper 'checkout on type' should be undertaken, and short strips and gusty weather avoided until experience is gained.
- Limit airspeed to twice the stall speed in gusty conditions to avoid risk of over stress and structural failure.

The following *Safety Spot* articles are relevant to Pulsar aircraft:

Light Aviation Jun 2015 *Pulsar XP – In flight throttle failure.*
Throttle stuck open and pilot unable to get power to below 3500RPM elected to 'hang off the prop' to approach. Throttle subsequently sprung open and aircraft spun in. A simple securing nut on the back of the throttle bracket had come loose.

Light Aviation Jan 2012 *Wing rib deterioration due to fuel vapour.*
Wing ribs constructed of foam had severely deteriorated and the wing was found to be flexible between rib one and two. An AIL was released in 2001 to check for this

after the rib supporting the flap torque tube failed.

Light Aviation Oct 2010 *Pulsar XP – Fuel pump leak.*
Following a 'spot the problem' session at Sywell, one onlooker discovered a genuine issue with a fuel pump. The engine cowling has worn a small hole through the pressure side of the diaphragm pump.

3.6 Standard Modifications

None.

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