

AIRWORTHINESS ADVICE NOTICE

TYPE AFFECTED: Arcus M

SUBJECT: Miscellaneous airworthiness information.

BACKGROUND: Inflight propeller brake drum failure, engine in service defects / rectifications, undercarriage defects with maintenance recommendations.

DEFECTS:

1. An inflight failure of a propeller brake drum occurred on engine shut down. The propeller did not stop automatically in the vertical position, the manual brake additionally did not function. AWA 2015-4 was issued, now cancelled. The Arcus M was a 2013 model with 337 hours and 77 launches. On inspection after landing, the propeller drum brake remains were found at the bottom of the engine bay, the drum brake had catastrophically failed without causing any further damage.

An examination of the drum was carried out by a forensic engineering team at Defence Science and Technology Group, Aerospace Division. The report stated fatigue occurred near the hub and progressed outwards towards the rim, with final rupture starting close to the rim. Minor corrosion was found on the fatigue fracture surfaces indicating more than a short time from crack initiation to final failure.

No other failures of this kind have been reported as of date of this notice. It is however prudent that Arcus M operators are aware of the failure and take appropriate action when performing inspections.

2. Thermistor fault-engine fuel injection management. In self-launch mode the fuel injection system requires air temperature measurement to control fuel flow. Should this fail a redundancy operation is invoked with less power available. Could not achieve full power for a self-launch procedure when previous launch was normal.

SIGNED:



CHIEF TECHNICAL OFFICER

For and on behalf of:

**THE GLIDING FEDERATION
OF AUSTRALIA**

To locate the thermistor that is embedded in the wiring harness near mast and above throttle sensor. It is black, about the size of a match head (only this part exposed), it has two wires attached. Testing its operation using wiring diagram gave no results as no connection to this circuit. Dismantling the harness covering to expose the thermistor connection showed both ends not attached and unit free (poor soldering connection to both wires). Tested thermistor and found operational, soldered both wires into circuit and insulated and tested circuit, now shows it is connected. A software upgrade to fuel injection management system was also carried out before engine testing.



3. Throttle body aluminum rails fractured and replaced (reference Solo Service Bulletin Nr 4600-8). Vibration and mounting holes too close to edge of aluminum angle section caused the failure.



Rails replaced by composite material parts supplied by Schempp-Hirth from Solo. This required dismantling the unit in the engine bay and replacement / exchange with new parts. New engines do not require upgrade as have a modified throttle body unit.



4. Leaking head manifold water gasket on No.2 cylinder head. When removed it was found that one gasket had collapsed, unable to seal under pressure, the other was secure. Replaced both gaskets, supplied by SOLO, significant work to access these gaskets and refill and bleed water system. Manual supplied bolt torques as required.



5. Spiral wrap on cables LH side of mast to propeller auto retract sensors. This material with vibration has cut into the cables it protects. The cuts are in a spiral format, and one has cut wiring and disabled function.



Tested system by ignition on and both sensors should glow dull red, one had failed. When propeller rotated, the retract function was not performed. Traced cable for broken wire, cut and soldered connection and tested circuit operation. Replaced spiral wrap with round plastic sleeve wrap with a cut on one side supporting cables inside. Secured to mast frame and tested engine operation after maintenance completed. Engine now operational and returned to service.

6. UNDERCARRIAGE GAS STRUT FAILURE ON DUO

DISCUS (Same undercarriage mechanism as Arcus): The gas strut bottom end is suspected to have unwound at the bottom end fitting from the barrel of the gas strut. After detaching, the top attachment ball failed during operations and the gas strut penetrated the parcel shelf behind the rear cockpit.



Figure 1: View in the wheel wheel looking forward showing port undercarriage arm and disconnected gas strut connection



Figure 2: Gas strut end protruding through parcel shelf.

7. UNDERCARRIAGE GAS STRUT FAILURE ON DUO

DISCUS: While preparing to put the fuselage in the trailer, the undercarriage gas strut was found disconnected from the lower and upper attachment points. The ball ends had sheared and the end attached to the top of the gas strut rod was bent. Reference defect 6 above, this was the second gas strut failure experienced on the same aircraft.



Figure 3: Failed gas with bent strut.

The gas strut rating can vary depending on the mainwheel fitted (TOST or lighter Penta). It acts in tension to assist with retracting the undercarriage. It is attached at the lower end to the

GFA AN 187	ISSUE: 3	17Apr2023	Page 7 of 7
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undercarriage rocker arm which is part of the shock absorption system. The main wheel mounted to the rocker arm is subject to high oscillatory loads due to the rough nature of Australian grass runway strips for sailplane operations.

The balls which attach the strut are similar in design to L'Hotellier balls in control circuits, but smaller. Rather than being lubricated on a regular basis, they may or may not be lubricated subsequent to entering service and may not be lubricated at an annual inspection.

RECOMMENDATIONS: The Arcus and Duo Discus has the same gas strut arrangement except that the upper attachment on the Arcus is via a clevis pin supported in double shear through an end fitting screwed to the gas strut rod which provides a matching hole. The bottom is still attached to the undercarriage rocker via the ball.

1. **LUBRICATION:** The ball ends of the undercarriage gas strut should be lubricated every annual inspection.
2. **THREAD LOCKING:** The threaded junctions on the undercarriage gas strut should be secured against unwinding by use of a thread locking compound (recommend Loctite 243).
3. **BALL REPLACEMENT:** The ball ends are subject to significant fatigue loads due to the high oscillatory loads on the rocker arm mechanism on the ground roll during take off and landing, and during towing. It is recommended to replace the ball ends whenever the gas strut is replaced.
4. **GAS STRUT REPLACEMENT:** Replace the gas strut when it becomes noticeable that the retraction effort has increased significantly. Pay attention that the gas strut force rating matches the mainwheel type installed. Refer maintenance manual.