Serious Incident

Aircraft Type and Registration:	DG Flugzeugbau DG-1000T, G-CKLY
No & Type of Engines:	1 SOLO 2350 C piston engine
Year of Manufacture:	2005 (Serial no: 10-66T6)
Date & Time (UTC):	26 April 2025 at 1623 hrs
Location:	Court Place Farm Nature Park, Oxfordshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to propeller, fuselage and left wing. Propeller coupling separated
Commander's Licence:	Light Aircraft Pilot's Licence
Commander's Age:	57 years
Commander's Flying Experience:	1,500 hours (of which 52 were on type) Last 90 days - 9 hours Last 28 days - 4 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB

Synopsis

During a local flight, the pilot deployed the engine to gain height to return to the home airfield, when he heard a loud bang. He stowed the engine and after confirming he had control of the aircraft, made a successful landing at Weston-on-the-Green Airfield. An inspection of the aircraft revealed some minor damage to the airframe caused by the propeller when it detached from the engine. The propeller was subsequently recovered from the local area.

The coupling which attached the propeller to the output drive of the engine had separated through a rubber element with one half remaining attached to the engine and the other half attached to the propeller. The investigation determined that the desired surface roughness had not been achieved on the drive-side coupling and this had resulted in an adhesive bond failure between the rubber element of the coupling and the drive-side component. It was concluded that the design of the part and the manufacturing process, had made it challenging to achieve the required surface roughness to effectively bond the rubber to the aluminium. The surface roughness was not identified because of a lack of inspection and acceptance criteria for the surface finish after blasting. The manufacturer has made changes to the coupling to ensure the surface finish is achieved and therefore a more effective bond between the coupling components.

History of the flight

The pilot and passenger departed from Weston-on-the-Green Airfield at 1701 hrs for a local sightseeing flight of approximately 30 minutes. This was the second flight of the day and a duplicate of the previous flight which the pilot had completed with another passenger. Prior to the initial flight a compression check and ground run of the engine had been successfully performed. The intention was to use the engine if there was no thermal activity and this resulted in it being used three times on each flight.

The pilot started the engine for the third time when they were approximately 12 km to the south of the airfield, and he reported a loud bang followed by an engine overspeed warning. He realised they had lost the propeller and responded by closing the throttle and switching off the ignition. He retracted the engine after it had stopped and turned off the fuel cock.

After confirming that the control surfaces were functional, he radioed for a straight-in approach to Runway 01 at Weston-on-the-Green. The landing was uneventful and both occupants exited the aircraft without injury. The propeller was recovered and provided to the AAIB along with the coupling (Figure 1) for further investigation.

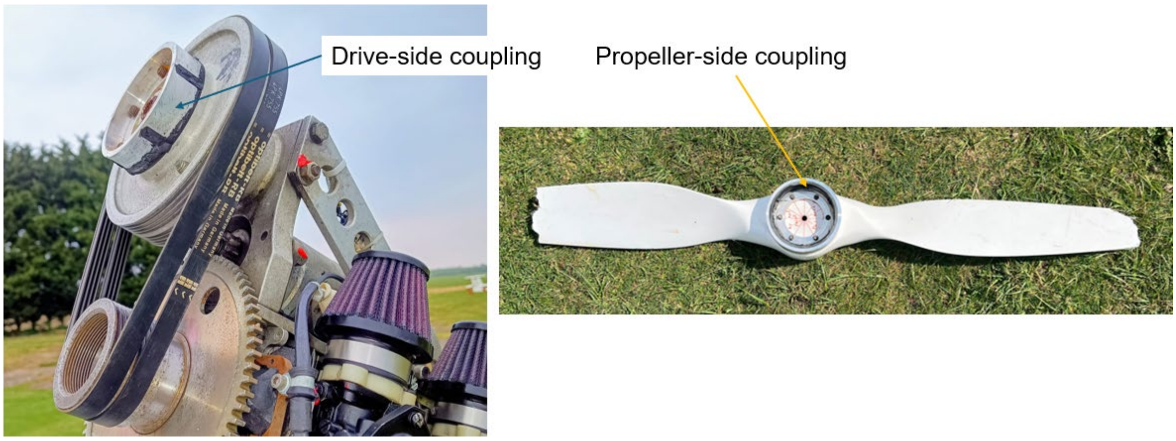

Figure 1
Engine and propeller after the flight

Aircraft information

The DG-1000T is a tandem two-seat, self-sustaining, powered sailplane constructed predominantly from carbon-fibre and was certified by the EASA in 2006. The SOLO 2350 C two-stroke auxiliary engine is mounted on a retractable pylon housed behind the cockpit. It drives a 1.48 m two-bladed propeller via a 2.3:1 reduction belt drive (Figure 2). The twin belts are tensioned by an eccentric steel shaft which adjusts the relative position of the final drive pulley. By 2013 there had been approximately 10 reported failures of the eccentric shaft with associated loss of propeller, so an EASA Airworthiness Directive (AD 2013-0217[1] September 2013) was issued prohibiting the use of the engine in-flight. The manufacturer

Footnote

1 EASA Safety Publications Tool Airworthiness Directive 2013-0217 [accessed January 2026].

released a modification (SB 4603-14) in April 2014 to the eccentric shaft which allowed the engine to be used again. However, in March 2015 a further AD 2015-0052[2] was issued after there were failures of the modified eccentric shaft. This prompted an inspection and prohibition of the engine use until another modification (SB 4603-17), which introduced a two-part rubber coupling, was installed.

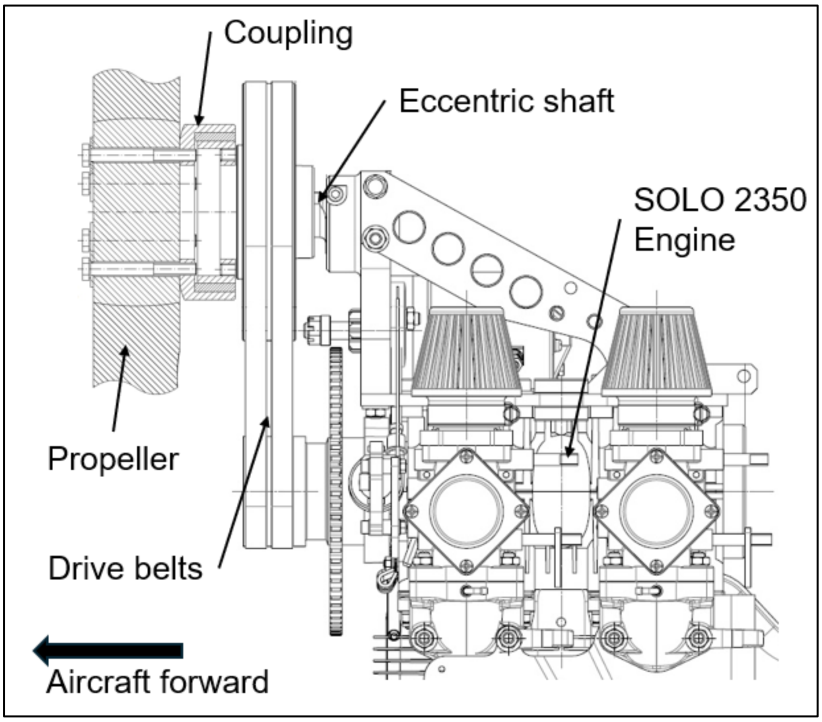

Figure 2

Engine / Coupling / Propeller system

Coupling

The two-part rubber coupling attaches the propeller to the final drive of the engine. The coupling consists of two machined aluminium components joined together with vulcanised rubber (Figure 3). The coupling was designed to reduce the loads on the eccentric shaft from the gyroscopic effects of the propeller.

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2 EASA Safety Publications Tool Airworthiness Directive 2015-0052 [accessed January 2026].

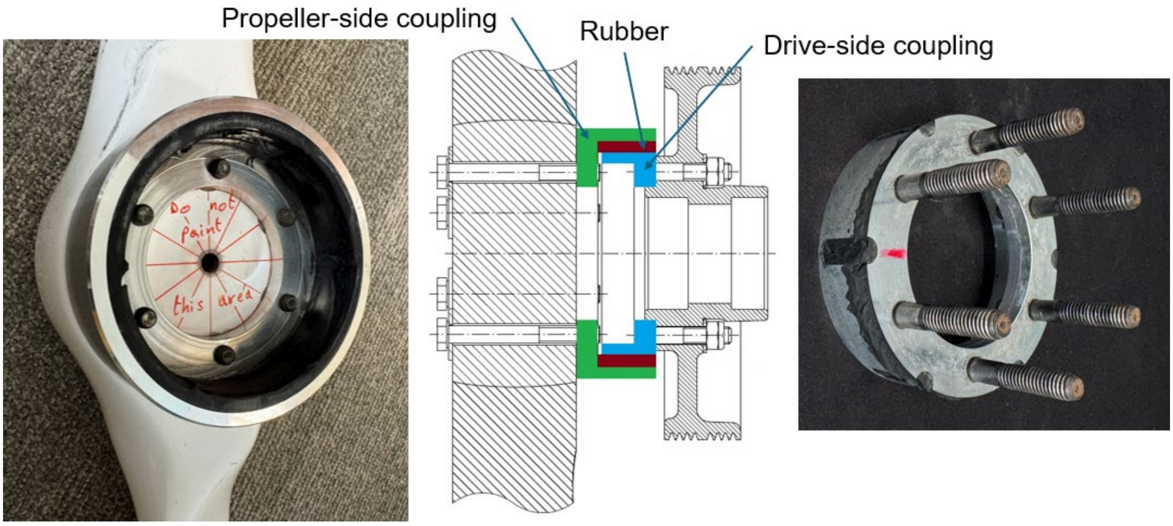

Figure 3
Two-part rubber coupling

The coupling starts as one piece of 7022-T6 aluminium alloy bar stock and it is partially machined (Figure 4) to include a 28 mm deep by 5.5 mm wide circular groove to accept the rubber. The groove is then media blasted with 850 – 1180 µm corundum particles and then cleaned with an alcohol-based primer. The surface finish is not specified on the drawing except for a generic Ra 3.2 µm which is typical for CNC machining. There are no production acceptance criteria for the surface blasted areas. A surface primer, followed by adhesive is then applied to the surfaces to be bonded to the rubber. The Nitrile Butadiene Rubber (NBR) is pressed into the groove and the coupling is heated to vulcanise the rubber, resulting in a rubber Shore A hardness of 70. After the vulcanisation process is complete the remaining features are machined into the coupling, which includes separating the coupling into two metallic components joined together by the NBR. This manufacturing process ensures good concentricity of the two metallic halves of the coupling. No protective treatments are applied as 7022 aluminium was determined to have sufficient corrosion resistance for the component's five-year life in service.

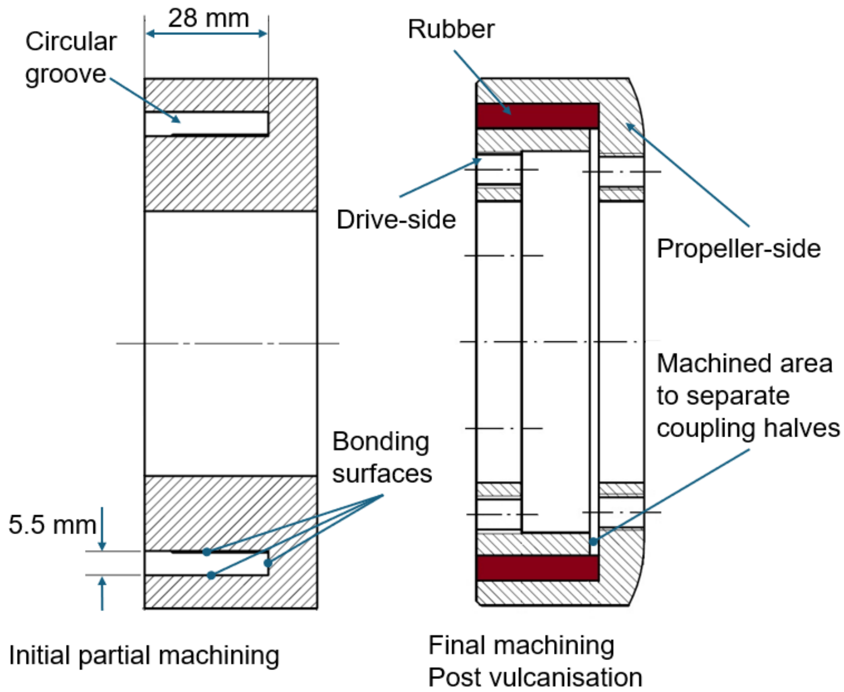

Figure 4
Coupling manufacturing steps

During the qualification process of the coupling, it was subjected to a total of 50 hours of ground and in-flight testing. Sequences were conducted similar to those in CS 22.1849[3] but modified to consider that the maximum endurance was limited to 1.5 hours on a single tank of fuel. There were no repetitive acceptance tests specified or conducted on the production couplings.

The failure of the coupling fitted to G-CKLY, and other reported failures, has led to the EASA issuing AD 2025-0112[4] to prohibit the use of the engine in flight which has been fitted with modification SB 4603-17 coupling. AD 2025-0112 was subsequently superseded by AD 2025-0220[5] in October 2025 which introduces a further design evolution of the coupling (DG TN1000-52) to allow use of the engine in flight to recommence.

Aircraft examination

After the landing the aircraft was inspected by the pilot and damage was found on the top of the fuselage, solar panel and the top surface of the left wing (Figure 5).

Footnote

[3] Easy Access Rules for Sailplanes and Powered Sailplanes (CS 22) Subpart H – Engines. CS 22.1849 – Endurance Test: Duration for engine endurance runs are 120 minutes. Easy Access Rules for Sailplanes and Powered Sailplanes (CS-22) (Amendment 1) [accessed December 2025].

[4] EASA Safety Publications Tool Airworthiness Directive 2025-0112 [accessed January 2026].

[5] EASA Safety Publications Tool Airworthiness Directive 2025-0220 [accessed January 2026].

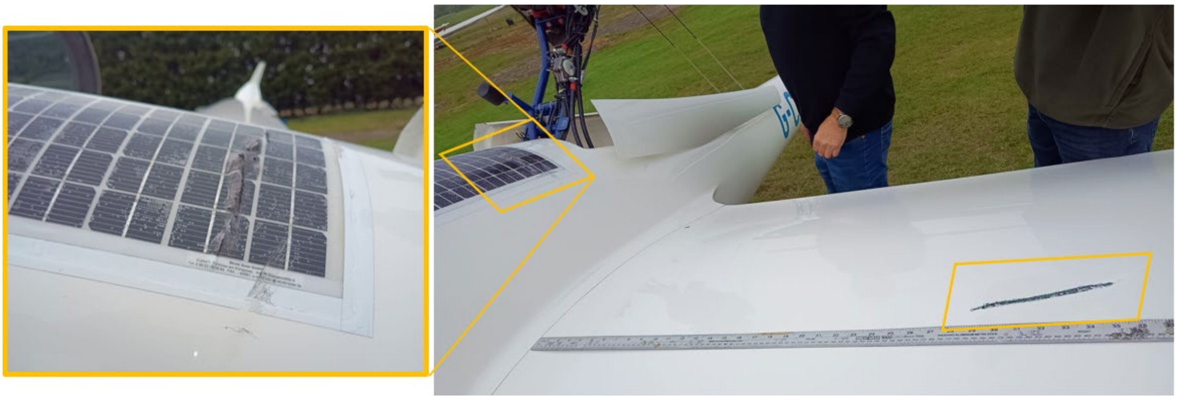

Figure 5
Damage found to G-CKLY after landing

The pilot described the propeller having green scratches indicating it had fallen through trees and was recovered from woodland to the north of the A40. The propeller with half of the coupling still attached, was sent to the AAIB along with the drive-side half of the coupling.

The two halves of the coupling were examined and it was found that the rubber element was predominantly retained within the propeller-side coupling. Both halves showed two distinct regions of the failure, the first; a cohesive failure of the rubber element; and the second, an adhesive failure between the rubber element and the drive-side coupling (Figure 6).

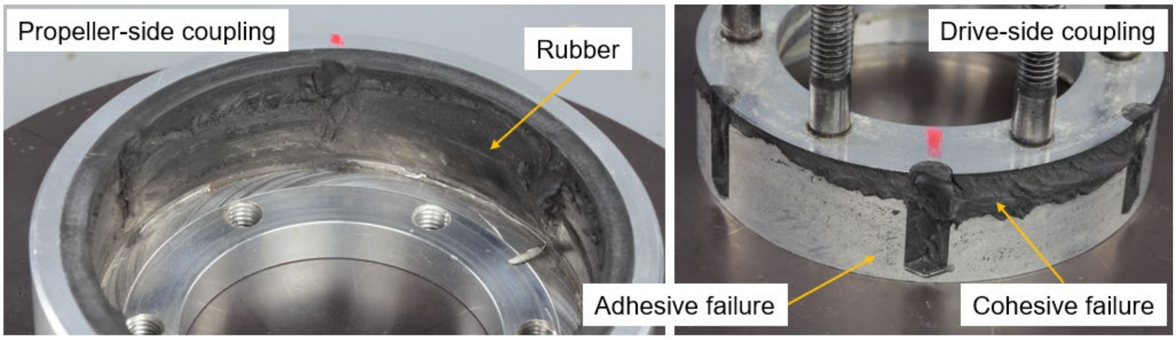

Figure 6
Observed adhesive and cohesive failures

Fourier Transform Infrared spectroscopy confirmed the rubber to be a vulcanised Nitrile Butadiene rubber by comparing it to a known material sample. The Shore A hardness was tested on a sample and an average result of 72.2 was obtained from five tests. Using a combination of UV light and energy dispersive X-ray methods it was possible to confirm the present of the primer and adhesive which had been applied prior to the vulcanisation process.

Figure 7 is a photo montage of the drive-side coupling showing the areas of coverage where the rubber had bonded to the aluminium. This area is approximately 1/3 of the total area.

Figure 7

Area of bonded rubber to the drive-side coupling

A random section was chosen from the drive-side coupling and by using acetone, as much rubber as possible was removed. It was not possible to completely remove all the rubber from the surface pitting and therefore an accurate surface roughness measurement could not be made. Instead, a qualitative assessment was made at three different locations on the section as shown in Figure 8.

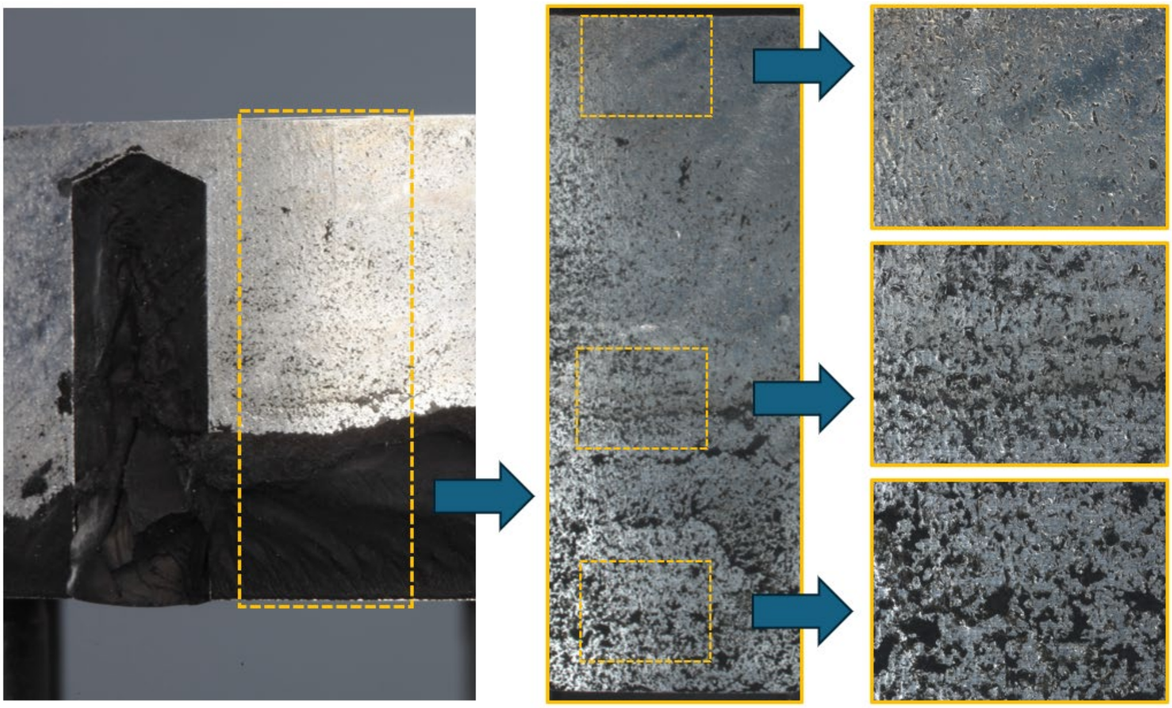

Figure 8

Examination of the drive-side coupling surface finish

The areas where bonding was more effective directly correlated to a rougher surface finish, such that would be expected from the media blasting process. The density of media blast impacts gradually decreased from the bonded to the de-bonded region.

A section of the propeller-side coupling was prepared in the same way by removing the rubber and the surface finish was compared between two area of similarly bonded rubber on each of the coupling halves (Figure 9). The drive-side coupling (left) had visible horizontal machining marks along with a non-uniform distribution and size of media impacts. The propeller-side coupling showed a uniformly distributed and even media blast finish with no visible machining marks.

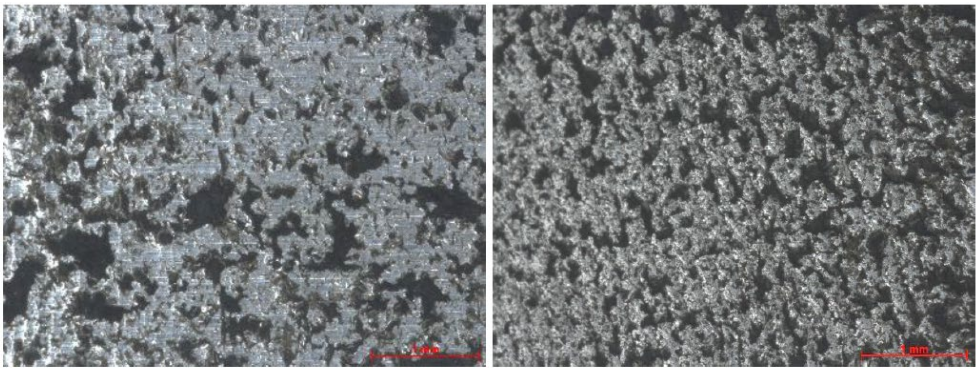

Figure 9

Comparison between drive-side (left) and propeller-side (right) surface finish

Analysis

The bonding failure of the NBR dampening component within the drive coupling was primarily a result of an adhesive bond failure between the rubber and the drive-side coupling. This led to a cohesive failure of the rubber that had successfully bonded to both halves of the coupling. The bonded area of the drive-side coupling was approximately 33% of the total area and was insufficient to transmit the engine torque load to the propeller. This resulted in the loss of the propeller when the coupling separated and the damage to the aircraft.

The investigation determined that the lack of adhesion between the rubber and the drive-side coupling was due to a lack of surface roughness on the drive-side coupling. During manufacturing, the narrow, machined annular groove (for the rubber) was media blasted to achieve a rougher than machined surface finish (> Ra 3.2 μm). But there was evidence showing that the finish was not consistent over the area to be bonded to the rubber, with it being rougher near the top of the groove and gradually decreasing further into groove. Machining marks were still visible in the areas of minimal media blasting.

It was concluded that the design of the component and the manufacturing process had made achieving a consistent media blasted finish challenging. The lack of surface roughness was not captured due to the absence of drawing control or production acceptance criteria being specified. The manufacturer has stated that in the latest standard of the coupling (DG TN1000-52) the two halves of the coupling are media blasted separately to ensure better access and a consistent finish.

Conclusion

A lack of surface roughness on the drive-side coupling resulted in an adhesive bond failure of the NBR to the aluminium. The remaining 33% of the bonded area was insufficient to transfer the loads and suffered a cohesive failure of the rubber. This resulted in the coupling separating and the loss of the propeller. The latest design of the coupling has made changes to ensure an effective bond is achieved over the total area of the coupling halves.