

SERIOUS INCIDENT

Aircraft Type and Registration:	Agusta A109C, N109TK	
No & Type of Engines:	2 Allison 250-C20 turboshaft engines	
Year of Manufacture:	1991	
Date & Time (UTC):	5 July 2011 at 0845 hrs	
Location:	Near Kew Bridge, London	
Type of Flight:	Private	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - 1 (Minor)	Passengers - N/A
Nature of Damage:	Left windshield shattered	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	47 years	
Commander's Flying Experience:	1,980 hours (of which 1,400 were on type) Last 90 days - 60 hours Last 28 days - 20 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and further investigation by the AAIB	

Synopsis

While the helicopter was cruising at 150 kt at 750 ft agl a bird struck and shattered the left windshield. The commander, seated in the left seat, suffered minor injuries so the co-pilot took control and made a successful emergency landing. The Agusta A109C's windshield is not designed to withstand bird strikes and the regulations do not require it to do so. The US National Transportation Safety Board has recommended to the US Federal Aviation Administration that the regulations covering helicopters of the Agusta A109C's category should require a birdstrike-resistant windshield.

History of the flight

The helicopter had departed from London Battersea heliport and was transiting along helicopter route H10 at 750 ft agl and 150 kt when a bird struck and shattered the left windshield. The commander, who was flying the helicopter from the left seat, was struck by pieces of windshield and parts of the bird. The co-pilot, seated in the right seat, took control of the aircraft and after declaring a MAYDAY made an emergency landing in a field near Kew Bridge. The commander had sustained a few cuts and grazes but did not require medical attention.

Damage to the helicopter

The upper portion of the left windshield, which was made of acrylic, had shattered into multiple sections

(Figure 1). The maintenance organisation's engineer reported that the largest of these was about 30 cm by 45 cm, several pieces were about 15 cm by 15 cm, and many other pieces were much smaller. He reported that none of the pieces had broken into sharp fragments. The windshield was of a type that had a thickness of $3.81 \text{ mm} \pm 0.5 \text{ mm}$ (part number 109-0310-27-3).

The photographic evidence revealed substantial blood spatter on the left door post adjacent to the commander's seat indicating that the bird probably struck this post after shattering the windshield. The bird, which was mostly intact, was found inside the helicopter and was identified as a Herring Gull. The bird was not sent for analysis but the typical weight of a Herring Gull is 690 to 1,495 g and the species is classified as 'High' on the Hazard Probability list¹.

Previous incidents of A109 bird strikes

The aircraft manufacturer was aware of three previous birdstrike incidents involving the A109 type. One of these (A109E, registration N911UF) occurred on 3 May 2009 in Florida, USA and was investigated by the US National Transportation Safety Board (NTSB). The NTSB reported that while descending at 145 kt through 800 feet the windshield 'exploded' and the pilot was 'pelted' with pieces of windshield and other debris.

'The master caution warning light started flashing, but the pilot had difficulty reading the caution warning lights as the left lens to his eyeglasses was missing. The pilot was eventually able to determine that SAS² number 1 had been disengaged, and after resetting the switches, the master caution light extinguished.'

Footnote

¹ The bird classification on the 'Hazard Probability List' for aircraft is made by the Food and Environment Research Agency (FERA).

² SAS is the stability augmentation system.



Figure 1

Damage to the left windshield of N109TK

Several circuit breakers and switches were broken off and some switches had moved to the OFF position. The pilot landed the aircraft safely and post-flight examination revealed that a 1 to 1.5 kg duck had come to rest inside the cabin. The NTSB report also noted that:

'there was no forward shielding of the overhead panel switches and throttles.'

Another A109E suffered a bird strike in the USA in October 2006 but was not reported by the NTSB. The aircraft manufacturer stated that the bird strike created a 20 cm hole in the right windshield and the pilot sustained minor abrasions to his face but landed safely.

The third birdstrike incident occurred to an A109E in Mexico in November 2009 and resulted in most of the right windscreen being destroyed. The unidentified

bird came to rest to the right of the right rear passenger seat. The pilot suffered minor injuries but was able to land safely.

Birdstrike requirements

The Agusta A109C was certified to US Federal Aviation Administration (FAA) Regulation Part 27 (FAR 27) in 1989. FAR 27 applies to rotorcraft with maximum weights of 7,000 lb (3,175 kg) or less and up to nine passenger seats. The only requirement in FAR 27 for windshields is as follows:

27.775 Windshields and windows

Windshields and windows must be made of material that will not break into dangerous fragments.'

There are no requirements in FAR 27 relating to birdstrike resistance. The European Aviation Safety Agency (EASA) Certification Specification 27 (CS-27) contains the same windshield requirement as in FAR 27 and no additional requirements for birdstrike resistance. The use of acrylic (also known as Plexiglas™ or Perspex™) for the windshield material is accepted by industry for applications where breakage into dangerous fragments is not permitted.

Rotorcraft with a maximum weight greater than 7,000 lb or with more than nine passenger seats are certified to FAR 29 which includes birdstrike resistance requirements. FAR 29.631 'Bird Strike' requires that the rotorcraft is designed to ensure the capability of safe landing³ after impact with a 1.0 kg bird when the

speed of the rotorcraft is equal to the lower of V_{NE} or V_H ⁴ at altitudes up to 8,000 feet.

In November 2010 the US NTSB wrote to the FAA with safety recommendations following an investigation of a Sikorsky S-76C birdstrike accident which resulted in eight fatalities (registration N748P). The S-76C is certified to Part 29, but the NTSB's letter included the following statement:

'...no bird-strike requirements exist for CFR Part 27 normal-category helicopters, even though they are frequently used for commercial operations such as emergency medical services and sightseeing flights. The NTSB concludes that Part 27 helicopters should be held to the same safety standards regarding bird-strike resistance as Part 29 helicopters, particularly given the data accumulated by the military and civilian bird-strike databases.'

This was accompanied by the following NTSB Safety Recommendation to the FAA:

'Revise 14 Code of Federal Regulations Part 27 to specify a bird weight and velocity of impact that the helicopter must withstand and still be able to land safely and that the windshield must withstand without penetration. Consider current military and civilian bird-strike database information and trends in bird populations in drafting this revision. (A-10-147)'

The FAA responded to this recommendation in January 2011 by stating that they are reviewing

Footnote

³ For Category A rotorcraft (greater than 20,000 lb and 10 or more passenger seats) there is an additional requirement of 'continued safe flight'.

Footnote

⁴ V_{NE} is the 'never exceed' speed and V_H is the maximum speed in level flight with maximum continuous power.

multiple bird-strike databases to determine whether Part 27 should be included in the rotorcraft regulatory and policy review, and that an updated response would be provided in December 2011.

In 2008/9, as part of its rulemaking activity, the EASA contracted a study, covering all aircraft categories, to investigate the adequacy of current aircraft certification requirements in relation to current and future risks on aircraft structures and windshields. The final report '*Bird Strike Damage & Windshield Bird Strike (EASA 5078609-rep-03)*' is available on the EASA website. The study included conclusions that airframe bird strikes are a relatively rare cause of accidents, that CS-27 category helicopters appear to have a higher accident rate due to bird strikes than the other aircraft categories and that a requirement that small helicopter windshields withstand collision with a 2lb/1kg bird would significantly reduce the birdstrike accident rate.

The study report recommended that CS-27 be enhanced, preferably to include a 2lb/1kg windshield birdstrike capability. EASA comments that this task has been added to the rulemaking programme, including evaluation of the cost and weight impact against the safety benefit of regulatory change.

Birdstrike-resistant windshields

The aircraft manufacturer offers a birdstrike-resistant windshield as an optional extra for newer versions of the A109 such as the E, K2 and Grand models. This windshield is made of a 5 mm thick polycarbonate material (Lexan Optigard VLG1000) which conforms to specification MIL-P-83310.

Analysis

This serious incident was caused by a Herring Gull striking the helicopter's left windshield at a relative speed of about 150 kt. The commander suffered cuts and grazes as a result of being struck by pieces of acrylic and bird remains, but the bulk of the bird appears to have hit the left door post to the left of the commander's head. The Agusta A109C's windshield is not designed to withstand bird strikes and the applicable Part 27 regulations only require that it does not break into dangerous fragments. Larger helicopters, certified to Part 29, are required to be fitted with a birdstrike-resistant windshield and the NTSB has recommended to the FAA that a similar requirement be developed for Part 27 helicopters. As of December 2011 the FAA had not published a decision on the recommendation.