Safety Regulation Group
Safety Investigation and Data Department

Follow-up Action on Occurrence Report

ACCIDENT TO HUGHES 269C, G-ZAPS, AT HARE HATCH, BERKSHIRE ON 8 MARCH 2000

(HELICOPTER BROKE UP IN FLIGHT AND CRASHED)

CAA FACTOR NUMBER	:	F3/2003
FACTOR PUBLICATION DATE	:	21 February 2003
OPERATOR	:	Private
CAA OCCURRENCE NUMBER	:	2000/01413
AAIB REPORT	:	AAR 1/2003

SYNOPSIS

(From AAIB Report)

On the day of the accident the owner, who was an instructor and type-rating examiner, had intended to use the helicopter for recurrent training and testing of a private pilot, but the wind conditions were unsuitable. The helicopter was therefore released to the owner's son and his friend for their use.

During the morning the helicopter had been refuelled at Shoreham Airport and had then flown to a private landing site nearby. At around 1500 hrs, the two pilots and a mutual female friend had boarded the helicopter to fly to Wycombe Air Park. The mutual friend occupied the centre seat position. Before the centre seat can be occupied, the right seat occupant's collective lever must be removed and the gap between the seats bridged with a purpose-designed cushion. The helicopter manufacturer provided a lap belt for the centre seat occupant, whereas the other two 'permanent' seats were equipped with lap and shoulder straps. The flight to Wycombe Air Park was apparently uneventful.

During the time that the helicopter was shut down at Wycombe Air Park, the female passenger had remained onboard while one pilot had collected some ground handling wheels and the other had paid the landing fee, 'booked in and out', and attended to some private business. Before the helicopter took off, a member of staff at a training centre had taken a digital photograph of the friend who had just completed his helicopter instructor's course. The picture showed the friend standing at the left side of the helicopter, with his back to the tailboom attachment area. After the photograph was taken, the friend had ducked under the tailboom and had gone to the right hand door, which led to the seat without a collective lever.

Nobody recalled seeing the two pilots boarding the helicopter and only two people saw it take off; they reported nothing abnormal. At 1631:40 hrs, one of the pilots transmitted that he was changing to an en-route frequency; this was the last RT message recorded from the helicopter on any of the likely frequencies. However, a minute later the helicopter's transponder was interrogated by radar at Heathrow and the data was recorded. The data did not include height encoding, but after making due allowance for the likely wind it enabled an accurate reconstruction of the helicopter's track which ceased some two minutes later, a few metres from the crash site.

The helicopter was tracking over the town of Wargrave on a southerly heading at about 65kt indicated airspeed (IAS) when witnesses on the south side of the town first noticed it. Their attention was drawn to the helicopter

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because it was quite low and the sound of its engine changed as it progressed towards the village of Hare Hatch. They reported that the engine note changed from a steady noise to a 'spluttering sound'. Other witnesses in the vicinity of Hare Hatch also heard an unusual engine note, but most saw the helicopter either coming towards them or going away from them.

Only two witnesses had an appreciable side view of the helicopter. They were standing in a garden and saw it flying at a steady height and speed, but the engine note sounded 'coarse'. Suddenly the helicopter broke into two sections with an audible 'pop' sound. They thought the cockpit section broke away from the combined engine and tailboom assembly, amidst a short-lived but large ball of dark coloured smoke; the main rotor blades then folded downwards and stopped. The witnesses saw smaller parts detach from the two main sections as they fell, in a manner similar to a ballistic trajectory. One witness reported seeing one of the occupants 'jump out' of the helicopter.

This person's body, that of the female passenger, was found some 50 metres from the main wreckage and to the north of the cockpit section's trajectory.

CAA EXECUTIVE SUMMARY

Aviation safety regulations and requirements, in conjunction with manufacturer's published recommendations, establish the sound basis that contributes to the continued safe operation of aircraft. This includes the requirements and standards for maintenance, including repair and inspection, so that aircraft remain in an airworthy condition. It is therefore essential that those who have legal obligations and authority to certify that an aircraft is fit to fly ensure that manufacturer's and regulatory continued airworthiness requirements are fully complied with.

The CAA, consistent with its ongoing safety improvement process and, recognising the events that may have contributed to the accident involving G-ZAPS, carried out a detailed review of its procedures, working practices, the training of technical staff and the Technical Procedures they are required to follow. The review concluded that CAA's continued airworthiness requirements and standards continue to be relevant and valid. Additionally, the Safety Regulation Group in its 2002 / 2003 Business Plan included a review designed to provide greater focus on industry's management of airworthiness directives and other mandatory requirements. This review culminated with the CAA publishing additional best practice advice to industry, the briefing of its Surveyors, further enhancements to its aircraft survey programme and, in 2003, the delivery of Continued Airworthiness industry seminars to promote applicable requirements and standards.

The CAA, having carried out a comprehensive review of this report into the accident involving Hughes 269C G-ZAPS, has concluded that it fails to acknowledge the significance of the different roles, interfaces and responsibilities of those involved. These include the Licensed Aircraft Engineer, the CAA approved welder, the aircraft commander on the day of the accident and the CAA. Failure to acknowledge the long accepted responsibilities, competencies and accountabilities of these roles distorts the analysis of the contributory factors to this accident. The report challenges the long established continued airworthiness assurance process prevailing in the UK that fully conforms to international standards and which has positively contributed to the UK aviation safety record that is amongst the best in the world. Deviation from these standards will directly affect the safe operation of the aircraft.

The CAA therefore responds to the report's safety recommendations as follows.

FOLLOW UP ACTION

The 14 Safety Recommendations made by the AAIB following their investigations are reproduced below, together with the CAA's responses.

Recommendation 2001-41

In view of the finding of non-approved welding repairs to the clevis lugs of the Centre Frame Rear Cluster Fittings on two Hughes 269 helicopters, failure of one of which caused a catastrophic in-flight separation of the tailboom assembly, it is recommended that the Civil Aviation Authority and the Federal Aviation Administration take early action to issue Airworthiness Directives to require immediate visual inspection of these fittings on all Hughes Schweizer 269 and 300 helicopters in order to check for any non-approved welded repairs to the clevis lugs, and to ground any affected helicopters until such repaired Centre Frame Rear Cluster Fittings have been replaced with new fittings. (Safety Recommendation No 2001-41, made 11 April 2001)

CAA Response

The CAA does not accept this Recommendation.

Following the accident to G-ZAPS and the advice received from the AAIB concerning a non-approved weld repair which may have contributed to the accident, the CAA issued a Letter to Operators (LTO) No 2018 in March 2000. This LTO raised the awareness of the failure due to the non-approved repair and recommended a 'one time' inspection of the affected structure on Hughes 269 series helicopters for evidence of in service non-approved repairs. At that time, subsequent to the issue of LTO 2018, no reports of in service non-approved repairs on operating aircraft were submitted to the CAA. During April 2001 the CAA received a report of non-approved repair to the clevis lugs concerning a helicopter which had been out of service and did not hold a current C of A. This aircraft had been out of service since 1997 and the non-approved repair was identified during an inspection carried out on behalf of a prospective purchaser. The CAA considers that the issuance of the LTO has alerted operators and maintenance organisations of the need to inspect affected aircraft for non-approved repairs and the need to follow the service information published by the manufacturer of Hughes 269 series helicopters.

CAA Status - Closed

Recommendation 2001-45

In view of the potential for catastrophic in flight tailboom detachment on Hughes Schweizer 269 and 300 helicopters due to fatigue fracture of the clevis lug attachments on the Centre Frame Rear Cluster Fittings, and the difficulty in reliably detecting by dye-penetrant testing all such fatigue cracking in service before related lug fracture occurs, it is recommended that the Civil Aviation Authority issues an Airworthiness Directive requiring the mandatory replacement, on all affected helicopters of these types on the UK Register, of all pre-modified Centre Frame Rear Cluster Fittings, part numbers 269A2234 and 269A2235, with the manufacturer's modified Cluster Fittings, part numbers 269A2234-3 and 269A2235-3; it is further recommended that the Federal Aviation Administration should implement similar mandatory modification action for all affected helicopters of these types abroad. (Safety Recommendation No 2001-45, made 11 April 2001).

CAA Response

The CAA does not accept this Recommendation.

There is no evidence from the UK fleet that the pre-modification centre frame aft cluster fittings are unsafe when maintained in accordance with the appropriate approved service information. The aviation industry is well aware of the limitations of dye penetrant inspection and it is used in a manner to mitigate these limitations. This is clearly illustrated in the maintenance of the cluster fitting where a dye penetrant inspection is used repeatedly every 200 hours in combination with other inspections. The criticism of dye-penetrant inspection techniques, if accepted, would have wide ranging implications for a well tested standard practice in widespread use today. The maintenance specified by the manufacturer provides multiple opportunities for detection of cracks in the clusters before growth to a critical length and has shown to be affective in detection of cracked clusters on G-ZAPS and G-BMWA.

The recommendation is not justified by an objective analysis of the evidence presented in the report. The cause of the structural failure was that a prohibited and unrecorded repair was carried out after a crack in a cluster fitting was discovered. Post mod cluster fittings have also developed cracks; indeed, the previous fatal accident (1995) to a Hughes 269A helicopter was caused by a failure of a clevis lug on a modified cluster fitting.

CAA Status - Closed

Recommendation 2001-80

The CAA should forward an information notice to all Licensed Aircraft Engineers, and all approved aircraft and component maintenance organisations, reminding them of the requirement that all repairs, including weld repairs, can only be carried out to an approved repair scheme, and of their responsibilities to ensure that there is an

appropriate repair scheme in the manufacturer's maintenance or repair manual, or related approval is granted by the manufacturer, before any repair is authorised.

CAA Response

The CAA does not accept this Recommendation.

The CAA considers the current information published and readily available to LAEs meets the intent of this safety recommendation.

The requirements for the certification of maintenance are contained in British Civil Airworthiness Requirements Chapter A6-2. Additional requirements for the certification of inspections, overhauls, modifications, repairs and replacements are contained in British Civil Airworthiness Requirements Chapter A6-7. The certification responsibilities of Licensed Aircraft Engineers (LAE) are described in full in CAA Airworthiness Notice (AWN) No 3. In addition to AWN No. 3, the CAA has published Appendix 52 to Airworthiness Notice No 12, dated 19th July 1996, in order to remind engineers who carry out and certify maintenance on aircraft of their legal obligations and responsibilities. The CAA issues Airworthiness Notices to all LAEs and all approved maintenance organisations. Specific guidance on maintenance practices and procedures are published in Civil Aircraft Airworthiness Information and Procedures (CAAIP) including Leaflet 6-4 titled “Repair of Metal Airframes”.

Furthermore, as part of the process for the issue of an Aircraft Maintenance Engineer’s Licence, candidates must study the subjects outlined in the appropriate syllabus as described in BCAR Section L and/or JAA JAR-66. The documents mentioned above, CAAIP, AWN and BCAR Section A, form part of the material to be studied. Individuals issued with a licence will have been examined on the technical and regulatory aspects of their responsibilities prior to licence issue. The whole framework of the maintenance aspects of the continued airworthiness system relies upon the LAE exercising the privileges of his licence with integrity and professionalism.

In the case of G-ZAPS, a weld repair was not an option available to the LAE: the Hughes 269 Handbook of Maintenance Instructions (HMI) specifically prohibited clevis lug repairs.

CAA Status - Closed

Recommendation 2001-81

The CAA should tighten the approval process for persons granted CAA Welders Approval Certificates to ensure that before they carry out any welding repairs to aircraft or aircraft components, written assurance is obtained from the authorising Licensed Aircraft Engineer that such repairs are in accordance with an approved repair scheme.

CAA Response

The CAA does not accept this Recommendation.

It is considered that the Recommendation would not enhance safety. The Approved Welder is a skilled practitioner who welds in accordance with instructions given to him/her by the person or organisation bearing the ultimate responsibility for the airworthiness of the weld, typically an LAE. An LAE should never authorise a repair that is not in accordance with an approved repair scheme.

CAA Status - Closed

Recommendation 2001-82

The CAA should take early action to introduce a requirement that Welding Certificates of Conformity must state details of the applicable aircraft registration, type, component/part number, serial number and approval for the related weld repair.

CAA Response

The CAA partially accepts this Recommendation.

The CAA approves welders who have demonstrated competence to carry out particular weld techniques. They are not required to have knowledge of an aircraft type or components on which they are carrying out a weld repair. Their involvement is restricted to the accomplishment of a weld or series of welds in accordance with approved technical data. The responsibility for ensuring a repair scheme conforms to approved technical data rests with the LAE who will certify the work done.

Both Airworthiness Notice No. 3 and BCAR Chapters A6-2 and A6-7 require a summary of the work carried out, including a reference to any associated repair schemes or approved drawings, to be recorded in the legally required aircraft records.

The Welding Certificate of Conformity is not a required document. Where the work is carried out on an aircraft, the details of a welding repair will be added to the maintenance work sheets already in use. Alternatively, a welder or an organisation, at a facility remote from the aircraft, may carry out work on a component or part. The responsible welder or organisation will then supply an appropriate record of the work carried out which includes the details of the component, part number and serial number. The aircraft registration may not be appropriate, since the component or part may be returned after repair and fitted to another aircraft.

The LAE accepting the repaired component or part, prior to fitting to an aircraft, is responsible for ensuring that the weld repair carried out has been done to approved technical data and that the details of the repair are sufficient to meet the requirement for appropriate records to be satisfied. Although this is considered to be implicit in paragraph 1.5 of Airworthiness Notice No. 3 this will be reviewed.

CAA Status - Open

Recommendation 2001-83

The CAA should remind all Licensed Aircraft Engineers and aircraft maintenance organisations that maintenance should not be undertaken on aircraft without access to the associated Log Books and Technical Log (if applicable) and that all work should be recorded as required.

CAA Response

The CAA partially accepts this Recommendation.

Light Aircraft Maintenance (CAP520) highlights the need for aircraft operators to supply the relevant logbooks to the maintenance organisation whenever planned maintenance is to be carried out. Airworthiness Notice No. 3 and BCAR Chapter A6-2 clearly state that a record of the work carried out must be made as the work progresses and to support the certificate of release to service. The issue of Appendix 53 to Airworthiness Notice No.12, titled 'Planning and Recording of non-scheduled Maintenance Tasks' reinforced this.

As part of the CAA's communication initiatives with industry, a number of seminars are planned for 2003 to promote awareness on operational continued airworthiness matters. The CAA will include in these seminars a session relating to work records, aircraft Log Books, Technical Logs and other associated documentation.

CAA Status - Open

Recommendation 2001-84

In order to better justify assumed airworthiness assurance arising from Survey Reports the CAA should require, before any aircraft or helicopter is surveyed by a CAA Surveyor for the purpose of issuing a Survey Report, that the service history of the type be carefully audited by the Surveyor to identify any critical structural areas which have

been the subject of special inspections/Airworthiness Directives to ensure that such areas are closely inspected, if reasonably accessible, during these surveys.

CAA Response

The CAA does not accept this Recommendation.

The International Civil Aviation Organisation (ICAO) publish guidance material in their Manual of Procedures for an Airworthiness Organisation Doc 9389-AN/919. Chapter 4 paragraph 4.3.1 clearly identifies that detailed inspection by airworthiness authorities can create potentially hazardous situations by owners / operators relying upon inspections by the regulator as a process to enable them to avoid their maintenance / inspection responsibilities. To adopt the intent of this recommendation would be contrary to ICAO guidance and would inappropriately divert responsibility for the inspection function towards the CAA.

The CAA, when discharging its overall responsibilities, has to strike an appropriate balance between the regulatory role and the responsibilities and activities of persons and organisations that maintain and certify aircraft are fit to fly.

The responsibility for inspecting aircraft rests with the certifying person / organisation conducting that inspection. Therefore, and in keeping with ICAO guidance, the CAA, when carrying out a survey, does not seek to deliver airworthiness assurance of any specific part of an aircraft. The survey is a sampling process.

CAA Status - Closed

Recommendation 2001-85

The CAA should specify who is authorised to carry out and certify a Daily Inspection (A Check), in addition to describing the initial training and continuity training required for such authorised persons, how that training should be recorded and monitored, and where the authorised person should sign to certify that a Daily Inspection (A Check) has been carried out satisfactorily.

CAA Response

The CAA does not accept this Recommendation

At the time of the accident this aircraft was being privately operated. For non-commercial air transport a certificate of release to service is not required for a daily inspection (A Check). In accordance with normal practice, it is the pilot intending to fly an aircraft that is responsible for carrying out the required inspections. These determine the aircraft is fit to make the intended flight. An authorisation is not required, unless the aircraft is being operated for commercial air transport and subject to the requirements of JAR-145.

The Light Aircraft Maintenance Schedule (LAMS) reference CAA/LAMS/H/1999, to which this aircraft was maintained, required that a Check A be carried out to Section 7 of the schedule prior to the first flight of the day. Additionally LAMS required that the pilot carry out a pre-flight check in accordance with the Helicopter's Flight Manual. The Helicopter Flight Manual in turn required inspections to be made of specific items for the Hughes 269.

The pilot's competence to carry out such checks would form part of the training requirements for the issue of the Helicopter type rating on the Pilot Licence held by an individual.

CAA Status - Closed

Recommendation 2001-86

The CAA should require that all pilots use a Pre-Flight Check List from the CAA approved Pilot's Flight Manual whenever a flight is conducted for training, conversion or testing so that only approved and fully amended Check Lists are used.

CAA Response

The CAA accepts this Recommendation.

The use by pilots of the approved and fully amended Pre flight checklist is examined as part of the CPL(H) Skill Test and the CAA is not aware of situations where checklists are not used in the PPL(H) and CPL(H) training environment. CAA Standards Documents for all Single Pilot Aeroplane and Helicopter skill tests and proficiency checks require that the applicant shall use the approved checklist throughout and that, where checks are conducted in flight, these are to be spoken out loud and in conformance with the written checklist.

In Multi Pilot Aeroplanes strict adherence and challenge and response using approved checklists are standard practices. CAA Safety Sense Leaflet 1, paragraph 4, states that the checklist is to be used 'unless the pilot is very familiar with the aircraft'; the wording of that statement will be reviewed to qualify the use of 'very familiar' where the aircraft is not operated subject to a Training Operations Manual.

CAA Status - Open

Recommendation 2001-87

The Schweizer Aircraft Corporation should amend the Pre-Flight Check List contained within the Pilot's Flight Manual for the Hughes/Schweizer 269 and 300 helicopters to include in the Pre-Flight Inspection a visual check of the right centre frame rear cluster fitting for cracks and damage, and to include the warning that if cracking of cluster fittings is suspected then dye penetrant inspection is required before flight.

CAA Response

This Recommendation is not addressed to the CAA.

CAA Status - Closed

Recommendation 2001-88

The CAA should conduct a review of JAR 145.55 with the aim of proposing to the JAA the improved harmonisation of maintenance document retention time requirements with those specified in the ANO, so that maintenance Worksheets and component Certificates of Release that are referred to in Aircraft, Engine and Propeller Log Books are retained until the aircraft, engine or propeller has been destroyed or scrapped.

CAA Response

The CAA does not accept this Recommendation

The CAA recently published Airworthiness Notice 12 Appendix 61 (Retention of records - Post Incident and Accident Investigations) in which maintenance organisations and aircraft operators were reminded of their responsibilities in relation to the content and retention of maintenance records. The Notice makes the clear distinction between those records to be kept by a JAR 145 approved organisation maintaining aircraft used for Commercial Air Transport (CAT), and the records that are required to be retained for non commercial air transport as described in the Air Navigation Order Article 17. A copy of the records raised by the maintenance organisation should be supplied to the aircraft operator / owner, for retention as part of the aircraft record.

In all cases, the operator / owner is required to retain the aircraft records. In the case of aircraft operated for CAT, records must be kept until one year after the aircraft is destroyed or permanently withdrawn. In the case of aircraft operated for non-CAT, records must be kept until two years after the aircraft is destroyed or permanently withdrawn.

CAA Status - Closed

Recommendation 2001-89

In order to avoid inadvertent omission of manufacturer's inspections during maintenance, it is recommended that the CAA withdraw the option to use the generalised CAA Light Aircraft Maintenance Schedule for Hughes

Schweizer 269 and 300 series helicopters so that they may only be maintained to the manufacturer's Handbook of Maintenance Instructions (HMI).

CAA Response

The CAA does not accept this Recommendation

The Light Aircraft Maintenance Schedule (LAMS), when properly applied, has been used successfully to maintain a wide range of light aircraft since 1978. In view of the fact that it appears that non compliance with the aircraft manufacturer's maintenance recommendations and an Airworthiness Directive led to the accident, the CAA does not accept that the use of LAMS by the owner or operators of similar aircraft should be withdrawn in order to address inadvertent omissions which could lead to an accident in the future.

It should be remembered that a fundamental principle and underpinning philosophy of LAMS, as described in CAA document CAP 520 and Appendix 13 of this report, is that when owner/operators elect to maintain their aircraft to LAMS, they must take full account of the aircraft manufacturer's recommendations appropriate to the aircraft's continued airworthiness and safe operation, from a maintenance standpoint.

LAMS also requires that owner / operators, or their contracted maintenance organisation, assess technical service information published by the type design organisation. Airworthiness Notice number 36 requires compliance with Airworthiness Directives issued by the regulatory authorities of the State of Design.

CAA Status - Closed

Recommendation 2001-90

The CAA should conduct a review of the manufacturer's maintenance manual requirements for all helicopter types on the UK register which are currently maintained to CAA/LAMS/H/1999 issue 1 and where there are significant additional 'specific-to-type' maintenance requirements in the applicable maintenance manuals, require such helicopters to be maintained only to the manufacturer's maintenance manual.

CAA Response

The CAA does not accept this Recommendation.

CAP 520 defines that the responsibility for the continued airworthiness of an aircraft clearly rests with the owner / operator. The CAA has advised owners / operators that should they consider LAMS to be unsuited to their particular aircraft, as the result of a review of 'specific to type' maintenance requirements or design features, an alternative schedule may be submitted to the CAA for approval.

To assist owner / operators to prepare an alternative schedule, based on the manufacturer's recommendations, CAA has published guidelines in CAP 562, Civil Aircraft Airworthiness Information & Procedures (Part 14 Leaflets 19 and 21).

CAA Status - Closed

Recommendation 2001-91

It is recommended to the CAA that where an aircraft seat requires an upper torso restraint in accordance with Schedule 4 of the Air Navigation Order but no upper torso restraint has been fitted and no exemption certificate issued, then the seat position should be required to be made unusable for the carriage of a passenger.

CAA Response

The CAA does not accept this Recommendation.

Where the Air Navigation Order requires an aircraft to have upper torso restraint and none is fitted, it is illegal to operate that aircraft unless a specific exemption has been issued. In the case in point, the Air Navigation Order, Schedule 4, provides a clear requirement that proscribes operation of the subject aircraft type without an upper torso restraint fitted. The CAA believes this primary requirement is clear and unambiguous and is entirely adequate for its intended purpose. To go further and introduce an additional requirement to render the seat physically unusable if the requirements for its use are not met is considered over-regulation.

CAA Status - Closed