SA365C1 Dauphin, G-PLMI

AAIB Bulletin No: 1/98 Ref: EW/C97/7/6Category: 2.2

Aircraft Type and Registration:	SA365C1 Dauphin, G-PLMI
No & Type of Engines:	2 Turbomeca Arriel 1A-1 turboshaft engines
Year of Manufacture:	1977
Date & Time (UTC):	20 July 1997 at 1900 hours
Location:	En-route between Troon and Turnberry
Type of Flight:	Public Transport
Persons on Board:	Crew - 1 - Passengers - 1
Injuries:	Crew - None - Passengers - None
Nature of Damage:	Detached horizontal stabiliser
Commander's Licence:	Airline Transport Pilot's Licence (H)
Commander's Age:	N/K
Commander's Flying Experience:	6,920 hours (of which 16 hours were on type)
	Last 90 days - N/K
	Last 28 days - N/K (but 20 hours flown in last 7 days)
Information Source:	AAIB Field Investigation

Whilst in the cruise at 110 kt the helicopter suddenly pitchednose-down to approximately 30°. The commander immediatelyapplied aft cyclic and lowered the collective lever; this re-establishedlevel flight at 80 kt. A gentle handling check confirmed thatthe cyclic and yaw controls were functioning normally. As theaircraft was only 3 minutes from its intended destination - (Turnberry),the commander elected to continue at 80 kt. During a wide, curvedapproach to land unusual vibrations were felt through the airframeand as the helicopter approached the hover, a member of the groundcrew indicated to the commander, by means of hand signals, thatthe helicopter should not land since they had observed somethingunusual about its appearance. The commander then establishedthe aircraft in a high hover to the left of the landing site,whereupon the ground crewmember then indicated that an immediatelanding should be made. At this stage, eyewitness reports confirmedthat the left side horizontal stabiliser detached from the helicopterand fell to the ground. The helicopter was landed immediatelyand shutdown, with no injuries.

The horizontal stabiliser on this helicopter type consists ofleft and right aerofoil sections which are attached to a tubularsteel spar passing through the tail boom. The spar is attachedto the tail boom by means of bolts which pass through forks mountedon either side of the boom, and through horizontally orientatedspacer tubes welded across the diameter of the spar. The failurehad occurred in the spar at the inboard end of the left stabiliser,and was in the plane of the spacer tube. The diagram at Figure1 shows the attachment details, and a photograph of the failureis included at Figure 2.

The spar was later subjected to a metallurgical examination whichconfirmed that the failure was due to high cycle fatigue. Therewere multiple origins in the heel of the weld around the outboardpart of the circumference of the aft end of the spacer tube. The fracture had then progressed forward around the spar's uppercircumference and then more rapidly across the forward end ofthe spacer tube. A region of ductile overload failure was evidentaround the lower circumference. It was concluded that the failurehad probably resulted from in-service vibration causing fatiguein the weld.

The spars, which are not serialised and are not subject to a finitelife, had been the subject of a Service Bulletin (No 05-06) issuedby Aerospatiale (now Eurocopter) in the form of a Telex on 8 October1981. This stated that there had been three cases of fatiguefailure in the component, Part No 360A13-0012-01, caused by crackinitiation at the bead weld of the spacers/spar tube junction,and that dye penetrant inspection was required within the next10 flying hours and at 50 hour intervals thereafter. In June1982, the French Airworthiness Authority (DGAC) mandated the TelexedBulletin by issuing Airworthiness Directive (AD) 82-80-12(B). The Master Servicing Recommendations (MSR) were amended by themanufacturer to reflect the 50 hour inspection requirement. Note: The MSR contains the manufacturer's minimum servicing requirementsfor the aircraft, and forms the basis from which an operator preparesa Maintenance Schedule.

Eventually, the aircraft manufacturer introduced an improved spar,Part No 360A13-0012-03,with improved weld penetration, and whichwas not subject to the 50 hour inspections. However, followingthe accident to G-PLMI, it became apparent that the relevant pageof the Illustrated Parts Catalogue (IPC) had never been updated. Despite successive revisions to the IPC, the quoted part numberfor the spar retained the-01 suffix, with no alternatives listed.

The operator had purchased the helicopter from the manufacturerin July 1995, when it had accumulated 1,213 operating hours. Prior to the sale, the manufacturer had completely refurbishedthe aircraft and supplied documentation indicating that all ServiceBulletins, both Imperative and Recommended, together with allAirworthiness Directives, had been complied with.

In April 1997 some wear was observed in the horizontal stabiliserspar/tail boom fitting attachment and it was decided to replacethe spar. A new item was ordered from the manufacturer's UK agent;however the lengthy delivery time quoted forced the operator tosearch elsewhere for this component. One was subsequently obtainedlocally from a subsidiary company of a former operator of thistype of aircraft. In fact this operator had earlier passed theirMaintenance Manual to G-PLMI's new owners, who had copied it touse as their own. This made no mention of 50 hour inspectionson the horizontal stabiliser spar tubes as ADs are controlledon "out of phase" inspections. In any event, the aircraftto which the document had originally applied were equipped withthe latest -03 spars, with the associated MSR noting that theAD 82-80-12(B) was not applicable by part number.

When G-PLMI's current operator had removed the spar tube, whichwould have been to the latest -03 standard, the part number wasreportedly not visible. Reference to the latest revision of theIPC indicated only one possible part, ie the -01 spar tube, andaccordingly this part number was ordered both from the manufacturer'sagents and the former SA365C1 operator's subsidiary. The latterorganisation, in their capacity as parts distributor, releasedthe component (described as 'serviceable') to their customer ona Certificate of Conformity. However, they had to obtain thepart from their parent organisation, which had passed it on togetherwith a JAA (Joint Airworthiness Authority) Form 1. The 'remarks'box on this form referred to an Inspection Report which, subsequentto the accident, could not be found by the releasing organisation. It was thus not established whether any associated referencehad been made to the AD. There was no history card with the component.

The manufacturer's UK agent similarly had no information in theirsystem indicating an alternative to the -01 spar (although the-03 component was listed, if this was the number specified inan enquiry), when G-PLMI's operator attempted to order a replacementspar. In fact the order was left with the agent who, as a resultof having no spars in stock, ordered one direct from the aircraftmanufacturer. When it eventually arrived it was of course a -03component. This was subsequently fitted to G-PLMI following thisaccident.

It is probable that the former SA365C1 operator had removed thesubject spar tube from an aircraft when the improved componentsbecame available from the manufacturer, and which did not havethe imposition of the 50 hour inspection. It is thus possiblethat it had been in storage for up to 1415 years.

The aircraft manufacturer has been informed of the anomalous situationwith regard to the IPC.