Sikorsky S76A (Modified), G-BMAL

AAIB Bulletin No: 10/2001	**Ref: EW/G2001/07/14**	**Category: 2.2**
Aircraft Type and Registration:	Sikorsky S76A (Modified), G-BMAL	
No & Type of Engines:	2 Turbomeca Arriel engines	
Year of Manufacture:	1980	
Date & Time (UTC):	12 July 2001 at 0920 hrs	
Location:	North Denes Aerodrome, Norfolk	
Type of Flight:	Ground manoeuvring	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Buckled skin and stringers in lower portion of tail cone	
Commander's Licence:	Airline Transport Pilots Licence (Helicopters)	
Commander's Age:	50 years	
Commander's Flying Experience:	13,107 hours (of which 10,275 were on type) Last 90 days 140 hours Last 28 days - 51 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and report by the operating company	

History of the flight

The helicopter was parked into wind but with the tail pointing towards the area from which the passengers would come. The commander decided that the co-pilot, as handling pilot seated in the left seat, should turn the helicopter though 90° to the left to present the left door to the passengers

for boarding. After completion of this taxy manoeuvre, the handling pilot brought G-BMAL to a stop and reached over the centre console with his right hand to apply the 'T' shaped parking brake. However, he inadvertently pulled the commander's collective lever. The aircraft lifted rapidly and the co-pilot countered this movement by immediately lowering his collective lever; the helicopter landed heavily tail first.

Combined Voice and Flight Data Recorder (CVFDR)

The aircraft was fitted with a GEC-Plessey Avionics Combined Voice and Flight Data Recorder (CVFDR) type 900/D51506, serial number 1036/06/92. The voice recorder was capable of recording crew speech from the captain and first officer stations, and sound from the cockpit area microphone, on a continuous 1-hour loop when power was applied to the aircraft. The flight data recorder was capable of recording a wide range of flight, engine and navigation parameters, as well as Integrated Health Usage Monitoring Systems (I HUMS) data on a continuous 8 hour loop when power was applied to the aircraft. The CVFDR was fitted with an acceleration cut-off switch, which interrupts electrical power if a local acceleration above 4.5 g at 45 degrees to the longitudinal fuselage datum is exceeded (this is discussed later).

The crew speech and flight data were recovered successfully from the CVFDR. There was some "crackling" on the captain's and first officer's voice tracks, but the crew speech and radiotelephony was easily intelligible. Background cockpit noise from the area microphone was free from distortion.

Prior to the accident, crew transmissions were normal, with no indication of anomaly or malfunction. There were no unusual comments or exclamations by the aircrew prior to the time when power to the CVFDR was interrupted by the local acceleration cut-off switch.

The flight data was consistent with the aircraft taxiing up to about 3 seconds before the end of the recording. At that time, the collective pitch was increased, the normal acceleration increased to about 1.8 g, and the pitch attitude increased from about 0 degrees to about 6.5 degrees nose up. The main rotor speed decayed from about 108% to about 100%, probably in response to the application of collective pitch. The radar altitude trace indicated a maximum height of about 2.5 feet during the event. Within about 1.5 seconds, the collective pitch was restored to the original setting. The roll angle changed from about 2.5 degrees to the left (consistent with the aircraft turning to the right on the ground) to about 1.5 degrees to the right. The minimum normal acceleration recorded was about 0.3 g. The normal acceleration was increasing at about 1 g/sec before the cut-off switch was activated, the last recorded value being about 2 g. Therefore, the peak normal acceleration encountered during the accident was not necessarily recorded.

Company report

The operating company instigated a thorough investigation and produced a very comprehensive report. This confirmed the circumstances of the accident and highlighted the fact that it has been common practice for the left-hand seat pilot, when he is handling, to operate the parking handle. The parking handle is located on the right side of the centre console and adjacent to the right collective lever. It is not in view from the normal seating position of the occupant in the left seat; to see the handle, the left seat occupant would have to lean over to his right. The location of the 'T' handle is shown at Appendix 1.

The following aspects were raised in the report:

1. Local base procedures allowed single pilot ground manoeuvring of the helicopter from the left seat.

2. The aircraft checklist did not contain a procedure for ground repositioning the helicopter.

The company are incorporating changes to their operating procedures to ensure that only the occupant in the right seat operates the parking handle. Additionally, a formal procedure and checklist is being produced to cover ground repositioning.

Additional comment

As stated earlier, the g switch activated which then precluded the peak normal acceleration being recorded. While not necessary for investigation purposes during this accident, this g switch activation, in other accidents and serious incidents, has resulted in the loss of essential information. In the accident involving G-BMAL, the early activation of the g switch denied knowledge of the peak recorded normal acceleration to enable the operator to gauge and plan the extent of the inspections and repairs necessary.

Safety Recommendation number 97-32 (and subsequently recommendation 99-24) concerned the use of g switches to stop flight recorders during a crash impact. Identification of a more suitable means of stopping flight recorders was then studied by the EUROCAE Working Group 50 (WG50) as part of their task to update the technical specifications for new recording systems. The CAA expected the conclusions of WG50 to be published by 31 March 2000, following which they would decide what specific actions were needed. The WG50 conclusions have not yet been published.