Aviation Safety Investigation Report 199701170

Aerospatiale Super Puma

11 April 1997

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Aviation Safety Investigation Report

199701170

Occurrence Number: 199701170 **Occurrence Type:** Incident
Location: Karratha, Aerodrome
State: WA **Inv Category:** 4
Date: Friday 11 April 1997
Time: 1600 hours **Time Zone** WST
Highest Injury Level: None

Aircraft Manufacturer: Aerospatiale
Aircraft Model: AS.332L
Aircraft Registration: VH-BHT **Serial Number:** 2042
Type of Operation: Charter Passenger
Damage to Aircraft: Minor
Departure Point: Griffen Venture WA
Departure Time: 1500 WST
Destination: Karratha WA

Crew Details:

Role	Class of Licence	Hours on Type	Hours Total
Pilot-In-Command	ATPL	2500.0	7800
Co-Pilot/1st Officer	ATPL	872.0	14000

Approved for Release: Monday, July 21, 1997

FACTUAL INFORMATION

History of the flight

The helicopter was ferrying oil company personnel from the Griffen Venture oil rig to Karratha aerodrome. The weather was clear and the wind light. The co-pilot, occupying the left-pilot seat, was undergoing a line check by the pilot in command who was a company managing-captain and a qualified line-check captain. Although both pilots were experienced captains on the helicopter type, the co-pilot had the greater overall helicopter time, and the pilot in command the greater time on the helicopter type. Cockpit voice recorder (CVR) evidence indicated that there was some discussion between the pilots about a particular company matter during the flight and ground-taxi.

During the arrival at Karratha the co-pilot flew the approach, landing at a point known as "Heli 26" which is on taxiway F, parallel to runway 26. The pilot in command assumed control of the helicopter for the ground-taxi as control of the wheel brakes was possible only from the right-pilot seat. The co-pilot retracted the nosewheel-lock pin to allow the nosewheel to castor during taxi. CVR evidence indicated that the pilot in command did not invoke sterile-cockpit procedures and that the checklist challenge-and-response procedures were not conducted after the helicopter had landed. Both pilots reported however, that the pilot in command had completed the after-landing checks.

The pilot in command taxied the helicopter along taxiway F, completing a 90-degree right turn into taxiway A and a left turn onto the terminal tarmac area. A company-LAME eyewitness reported that the nosewheel appeared to be castoring normally. The pilot in command reported that he applied the park brake before disembarking the passengers and that he released the park brake before taxiing the helicopter to the company lines. The challenge-and-response procedure required for the pre-taxi checklist was not conducted before taxiing from the disembarkation point.

The helicopter had to be taxied slightly left around a parked BAe146 aircraft before executing a left 90-degree turn. This turn was succeeded by a right 90-degree turn to follow the marked taxiway, past a helicopter parking area. Having turned approximately 10 degrees left then 10 degrees right to go around the BAe146, the pilot in command attempted to turn the helicopter left to follow the marked taxiway. The helicopter's nosewheel steering did not fully respond. Although the pilot in command quickly realised that the nosewheel lock-pin had re-engaged and that he was unable to follow the marked taxiway, he decided to continue taxiing his helicopter through the occupied helicopter parking area. An eyewitness reported that the nosewheel was not castoring and that it was being dragged sideways on the tarmac as the helicopter turned slightly. Tyre-scuff marks on the tarmac surface confirmed that the nosewheel was not castoring.

The co-pilot reported that when the helicopter would not turn, he checked the handle, finding it slightly proud of the full-down position. He attempted to withdraw the lock-pin by pushing down on the nosewheel castor-lock control handle, first with one hand, then with both hands. He also reported that as his attention was diverted to disengaging the nosewheel lock-pin, he did not initially realise that the helicopter was entering the helicopter parking area. The pilot in command stated that he did not attempt to bring the helicopter to a light-on-wheels condition or low-hover to unload the nosewheel to release the lock-pin, due to the proximity of parked helicopters. He also reported that he did not stop as he thought that the Super Puma would clear a nearby parked S76. The CVR recorded a comment by the co-pilot, 13 seconds after it was noticed that the pin was still engaged, which appeared to indicate that he also thought the Super Puma would clear the parked S76. A further four seconds later, the CVR recorded clipping sounds made by the main rotor contacting the S76 tail rotor blade.

Both pilots heard the clipping sound which the pilot in command thought was a blade strike, although the co-pilot was unsure. The helicopter had travelled approximately 35 metres from where the lack of nosewheel castor was first noticed, to the impact point. Tips of two blades of the main rotor clipped a tail rotor blade of the nearby S76 helicopter. The tail rotor blade sheared at the contact point. The pilot in command then continued to taxi the helicopter across the parking area to the taxiway. Once clear of the parking area, he brought the helicopter to a light-on-wheels condition to unload the nosewheel. The co-pilot was then able to retract the nosewheel lock-pin which then allowed the helicopter to ground taxi normally.

Cockpit control configuration

The parking brake and nosewheel castor-control handles are located on the right side of the centre console, just to the left of the cockpit's right seat. The park brake-control handle is forward of, and in line with, the nosewheel castor-control handle. Both handles are similar in appearance and feel. The park brake is applied by pulling up the park brake-control handle and turning it 90 degrees. The brakes are released by turning the handle 90 degrees and pushing down.

The nosewheel is locked fore/aft by a lock-pin. The lock-pin is retracted by turning the castor control-handle 90 degrees then pushing down. The pin is re-engaged by pulling up on the castor-control handle then turning the handle 90 degrees to lock it in position. The locking of the nosewheel and application of the park brake are similar actions. The unlocking of the nosewheel and release of the park brake are similar actions. Other than the position of the handles, there are no cockpit indications to indicate the status of the park brake or nosewheel castor. Other company pilots reported they have, on occasions, unintentionally applied the park brake instead of engaging the nosewheel lock-pin during ground taxi.

The nosewheel lock-pin has a design weak point. This allows the lock-pin to shear if sufficient side-loads are applied to the nosewheel. The nosewheel lock-pin can be jammed in place if the nosewheel is not centred or undergoing even slight side-loads. Centring and off-loading the nosewheel is achieved by using tail rotor inputs and by bringing the helicopter to a light-on-wheels condition or hover. With the nosewheel lock-pin engaged, it is possible to achieve approximately 30 degrees of heading change whilst ground-taxiing. Flight Data Recorder (FDR) evidence indicates that the helicopter had turned approximately 10 degrees to avoid the BAe 146. The nosewheel lock-pin did not break during this incident despite the tyre-scrub marks on the tarmac surface. These marks indicated that the nosewheel underwent significant side-loading. A post-flight engineering inspection could not fault the nosewheel system.

Company procedures

The company operations manual prescribes which checklist actions are challenge-and-response items. These include the pre-taxi and after-landing checks. The pilots reported that they were aware of these requirements. The operations manual also directs the helicopter commander (pilot in command) to other publications including Base Instructions - Individual Unit Orders (IUOs) and Operations Information Circulars (OICs).

An OIC, detailing cockpit resource management procedures, introduced the use of a cockpit "sterile environment" within ten miles of a takeoff or landing point. This OIC had not been incorporated into the operations manual at the time of the incident, although both pilots later stated that they were aware of the requirement. Sterile-cockpit procedures require that only communications and actions essential to the safe conduct of a flight are conducted at certain periods in a flight. United States Federal Aviation Administration Regulation 135 requires the practice of such procedures during certain phases of flight, including ground taxi. The failure to practise this procedure has been implicated in several fatal accidents in the United States. Such a requirement does not exist under present Australian civil aviation regulations and orders.

IUOs are held at each company base. To reduce the amount of material being read by pilots, the company introduced a procedure whereby new orders were noted on the publication's cover sheet. If they were familiar with the prior orders, the pilots would then just read the new orders annotated on the cover sheet.

As company helicopters had been observed to diverge from the taxiway and cross the parking area, Karratha base introduced an order reminding pilots, "to stay on the taxi lines in the Woodside apron area and to be particularly vigilant". This order was dated 23/01/97, however the last entry on the cover sheet was 21/01/97 and referred to another order. There is no evidence to indicate that either pilot had read the order although the co-pilot did recall being advised by the company's chief pilot of a requirement to stay on the taxiway and the pilot in command stated that he was aware of the order. Some base pilots, however, stated that they were not aware of the order until it's existence had been noted during the investigation.

Both pilots had undergone company-provided cockpit resource management training (CRM).

ANALYSIS

Although company procedures required the use of sterile-cockpit procedures within ten miles of the landing point, the pilot in command did not invoke the requirement. Whilst the company procedures also required the conduct of challenge-and-response checklist items for after-landing and pre-taxi, no challenge-and-response items were conducted once the helicopter had landed or before taxiing from the disembarkation point. It was considered possible that the pilot-in-command may have inadvertently raised the nosewheel castor-control handle instead of applying the park brake before disembarking the passengers, although there is no evidence to confirm this and the pilot stated that he did not.

Having achieved two 90 degree turns after landing, physical and eyewitness evidence confirm that the nosewheel lock-pin had re-engaged some time after the helicopter had manoeuvred onto the main tarmac area. The lack of nosewheel lock-pin damage, despite the considerable side-loads generated, indicated that the pin had not fully engaged thereby not permitting the weak point to achieve is designed purpose. With no cockpit indication of the nosewheel pin position, the pilots were unaware of any potential problem with the steering until it was time to manoeuvre the helicopter within the constrained turning area.

Although he was aware of the IUO requiring company pilots to follow the taxi lines, the pilot in command decided to continue into the occupied helicopter parking area. The co-pilot did not raise an alert, possibly because his attention was focussed on attempts to release the nosewheel lock-pin, although he implied that he thought they were clear of the nearby, parked S76. It is unclear as to why, having thought that the Super Puma's main rotor blades had clipped the S76 helicopter, the pilot in command then decided to continue and bring the Super Puma to a light-on-the-wheels condition.

Despite the in-situ organisational defences and the pilot in command's considerable experience, he made a succession of decision-making errors. Both pilots were aware of the instructions, yet neither enforced the requirements. The co-pilot did not promote the sterile-cockpit requirement when the helicopter was within 10 NM of the landing point, he did not question the lack of challenge-and-response checks during the ground taxi, or challenge the crossing of the taxiway lines when the nosewheel refused to castor. The status of the pilot in command and the type of check being conducted may have encouraged the co-pilot, despite his CRM training, to assume a passive role in the crew's decision-making process.

The pilot in command's experience and his standing within the company indicated that the decision-making errors were uncharacteristic. The only contributing factor the investigation found was the CVR evidence that indicated that the pilots appeared to be preoccupied with other company matters. The preoccupation with issues outside the conduct of flight and the co-pilot's passive role within the cockpit probably contributed to the pilot in command's decision making errors. The design and location of the nosewheel castor-control and park brake handles associated with the lack of cockpit warnings may have also contributed to the incident.

SAFETY ACTIONS

As a result of this incident, the Bureau of Air Safety Investigation is evaluating safety issues concerning the regulation of cockpit procedures and design aspects of the Super Puma helicopter cockpit. Any forthcoming recommendations will be published in the Quarterly Safety Deficiency Report.