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Sultanate of Oman

MINISTRY OF TRANSPORT AND COMMUNICATION

DIRECTORATE GENERAL OF CIVIL AVIATION AND METEOROLOGY

INVESTIGATION REPORT ON THE ABU DHABI AVIATION BELL 212 HELICOPTER (A6-BAB) LANDING ACCIDENT ON 7 MAY 2005

REPORT 1/05

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Investigation report on the Abu Dhabi Aviation Bell 212 Helicopter (A6-BAB) landing accident on 7th May 2005

Operator: Abu Dhabi Aviation

Aircraft:	Type:	Bell 212
	Manufacturer:	Bell Helicopters
	State of registration:	United Arab Emirates
	Registration:	A6-BAB
	Serial Number:	31227

Place of Incident: Jabal Akhdar mountains, Rostak region, Oman (23.16.933 N / 57.29.248 E)

Date and Time: 7th May 2005 at 14.30 local time (10.30 UTC)

SYNOPSIS

On 7th May 2005, at approximately 14.30 local time (10.30 UTC), an Abu Dhabi Aviation Bell 212 helicopter landed at a site in the Jabal Akhdar mountains (Rostak region, Oman); during the landing process the main rotor of the helicopter contacted an antenna mast standing in the vicinity of the landing area.

On board the flight were the pilot in command (PIC), one maintenance engineer from Abu Dhabi Aviation (not part of the flight crew) and 4 passengers (telephone company technicians). The flight originated from Al Sawadi on 7th May 2005 at 09.25 local time (05.25 UTC) to transport the technicians to four sites in the Jabal Akhdar mountain area in order to carry out maintenance on antenna installations. During landing at the last (fourth) site, the helicopter main rotor blades struck an antenna tower resulting in major structural damage to the helicopter as well as damage to antenna tower and one of the antenna's installed on the tower.
There were no injuries amongst crew and passengers.

The accident was notified to the Director Flight Safety Department by the commercial manager of MAS (Mashareea Al Sultanate) at approximately 14.45 local time (10.45 UTC) on 7th May, 2005. An investigation team from Flight Safety Department comprised of inspectors from the Operations and Airworthiness Sections was dispatched to the scene of the accident on 8th May 2005 at 09.00 local time (04.00 UTC) to determine the circumstances that lead to its occurrence. Due to the inaccessibility of the terrain the team was transported by helicopter.

The team was accompanied by the pilot and maintenance engineer involved, the company chief pilot and the flight safety officer. Two engineers of the telephone company had also joined the team to evaluate damage to the antenna mast.

1. FACTUAL INFORMATION

1.1 History of Flight

The investigation revealed that the helicopter was operating under a contract between MAS, Oman and Abu Dhabi Aviation, for the purpose of transporting maintenance technicians to various antenna mast sites in Oman.

The helicopter was owned by, and operated by Abu Dhabi Aviation and registered in the United Arab Emirates.

The operation as such is considered as "Aerial Work" and had been approved by the Director General Civil Aviation and Meteorology of Oman (DGCAM). The approval was issued under CAN 3-26 Appendix A and was based on the information provided in the Operations Manual of Abu Dhabi Aviation and endorsed by the issuance of Air Operators Permit nr 409, issued on 27th March 2005 by the DGCAM.

The helicopter was operated by one pilot. (single pilot operation)

The accident took place at 10.30 UTC (14.30 local time) on 7th May 2005 at a landing site located in the Jabal Akhdar mountains, Rostak region, Oman (23.16.933 N / 57.29.248 E). –see App.1

There were no fatalities or injuries. Neither was there any known hazardous material cargo on board.

1.1.2 Aircraft Inspection

Inspectors of Flight Safety Department performed a cursory aircraft inspection. Records, documentation and maintenance were found to be satisfactory. According to the on-board aircraft documents, the aircraft was free of defects.

1.2 Injuries to Persons

None

1.3 Damage to aircraft

The tip of the main rotor blades struck the telephone tower mast structure and the antenna tube mountings attached to it. Both blade tips were sheared off with one loosing 21 inches from the tip and a large portion of the composite trailing edge ripped off. The other blade lost 9 inches of tip section. Several secondary damages were noticed which were a direct result of the sudden stoppage power on situation together with the rotating out of balance blades. The pylon fifth mount broken, both right hand side transmission mounts separated from the airframe, both support casings of the left hand side transmission mounts broken, main driveshaft disconnected at the forward and aft coupling areas, tail rotor driveshaft disconnected at the output flex coupling, cyclic control tubes bent, elevator control and engine throttle control tubes severed.

See App. 6 for photos of the damaged aircraft.

1.4 Other Damage

Several structural trusses of the tower mass were distorted. Mobile phone antenna was damaged and put out of commission.

See App. 7 for photos of the damaged antenna tower.

1.5 Personnel Information

Pilot: Male, Canadian
License: ATPL(H) # 11999 United Arab Emirates
Medical: Valid United Arab Emirates medical certificate

-see App. 4

1.6 Aircraft Information

1.6.1 General description

The Bell 212 is a twin-engine utility helicopter powered by Pratt and Whitney PT6T engines. This helicopter is certified for transport category passenger for land operation under day and night VMC, non-icing conditions. The minimum crew consists of one pilot who sits on the right hand side.

1.6.2 Leading particulars

Manufacturer:	Bell Helicopter Textron
Type:	Bell 212
Date of Manufacture:	January 1983
Certificate of Airworthiness:	UAE Public Transport Category valid until 05 February 2006
C of M R:	Issued 06 February 2005 and valid to 05 June 2005
Total Airframe Hours:	17,450 hours
Hours since last check:	1 hour and 45 minutes (Weekly Inspection)
Maximum gross weight authorized:	11200 lbs
Estimated CG on landing:	Within CG range limits

At the time of the accident, the helicopter had a gross weight of 9055 lbs.

DOW	: 6875 lbs
1 crew	: 180 lbs
5 pax	: 900 lbs
Fuel	:1000 lbs
Cargo	: 100 lbs

1.7 Meteorological Information

The weather condition at the accident location was good, with unlimited visibility and a 5 to 10 knots SE wind (as reported by the pilot involved)
Temperature 25 C (as reported by the pilot involved)

1.8 Aids to Navigation

Standard operating equipment including GPS on board the helicopter.

1.9 Communications

Standard operating equipment on board the helicopter.

1.10 Landing Site Information

The landing site is located on the top of a mountain with an elevation of 5700 ft.

The landing site is an improvised helipad with a horizontal surface area of approximately 5 sq. meter (2m x 2.5 m) consisting of gravel and rock.

Approximately 8 meters northeast of the center of the helipad is a steel construction antenna mast with an estimated height of approximately 25 meters and a base of 25 sq. meters.

The landing site has no ground markings for landing assistance and no wind direction indication.

1.11 Flight & Voice Recorders

Not installed and not required by regulations.

1.12 Wreckage and Impact Information

Due to the initial normal landing, there were no impact markings on the landing area, except that, as reaction on the rotor blade impact, the right hand skid partially dug into the gravel surface.
The fuselage did not rotate.

Missing peaces of the main rotor blades could not be located due to the inaccessibility of the terrain.

1.13 Medical and Pathological Information

No injuries occurred on persons aboard the flight; therefore, no medical or pathological matters were involved.

1.14 Fire

No fire was involved in the accident.
No fuel leak was observed either.

1.15 Survival Aspects

The pilot reported the accident by means of GSM telephone to the Commercial manager of the MAS company who subsequently informed the Royal Oman Police, Seeb Airport ATC and the DGCAM.

All persons on board were airlifted from the site by a helicopter of the Royal Oman Police upon notification of the accident.

1.16 Tests and Research

None

2. ANALYSIS

2.1 Conduct of Flight

2.1.1 Flight Crew

As well as being valid and current on the helicopter type the pilot had a total of approximately 5300 flight hours on single-engine and multi-engine helicopters with 3 years experience on the type (Bell 212), indicating considerable experience.

Prior to the flight the pilot had 2 days off which ample meets the required rest time. The duty period started at 03.00 UTC (07.00 local time) at Seeb Airport and total flight time till the moment of the accident was 01.45 hrs, all well within the duty and flight duty time restrictions as specified in the company Operations Manual part A.

The pilot was familiar with the type of operation and had landed 2 times before at the landing site.

2.1.2 Landing

As stated in the pilot's report and confirmed by interviews with the pilot, the pilot felt comfortable with the approach and the condition and obstacle clearance of the pad and decided to land.
After positioning over the pad at a height of 3 ft the pilot landed the helicopter.
Being not satisfied with the positioning (not flat on the ground) of the bear paws of the landing skids the pilot decided to re-position a little forward, but being now too close to the antenna mast, decided to move a little back again by adding a little power and moving the cyclic to the rear.
Although still on the ground, upwards tilting of the rotor blades as a result of this maneuver caused the blade tips to make contact with a vertical part of an antenna mounted on a corner of the antenna mast. This resulted in a severe in-balance of the helicopter causing further damage.

Measurements at the landing site indicated that the estimated clearance at the first landing position could not have been more than 0.5 meter. Subsequent maneuvering reduced this clearance.

With such a close obstacle and without any form of landing assistance, this maneuver invites for misjudgment, as the pilot has to concentrate on skid position and obstacle clearance at the same time.

- see App. 2 & 3

2.1.3 Landing Site

The chosen landing site does not qualify as a suitable landing area due to the close vicinity of an obstacle (25 meter high antenna mast) approximately 8 meters from the center of the pad.

The Abu Dhabi Aviation Operations Manual section E2, (Away from Base Operations) prescribes:

"quote"
The Aircraft Captain has the final authority to approve or reject any landing area. Generally, the minimum standard or temporary landing areas is a 4-meter square touchdown area, free of rocks and stones that could damage the helicopter skids. A ground slope angle of greater than eight degrees is not acceptable.
In addition to the touchdown zone, the area that extends for a further 15 meters shall contain nothing taller than one-half meter. The extended area from 17 to 20 meters, known as the maneuvering area, shall contain nothing taller than 1.5 meters.
These minimum clearance areas are required to prevent damage to the helicopter landing gear, main and tail rotors.
"unquote"

It was observed that approximately 125 meters below, southeast of the mountaintop, 2 suitable landing areas are available.

-see App. 8

2.2 Operations and Maintenance

2.2.1 Operations

As usual for this type of operation, the pilot conducts the flights with "self dispatch". However, except for the previous mentioned general landing area restrictions, the operations manual does not provide any specific area and landing site information and guidance for this specific operation to assist the pilot in the flight planning. Information on landing sites is based upon observation and hand-over of information by the pilots to each other. This method is too subjective to ensure a safe operation.

At time of the accident, the aircraft gross weight was in limits of the ground effect hover ceiling limitations stated in the Bell 212 flight manual. (max. gross weight at 5700 ft above sea level at 25 C is 9200 lbs.)

2.2.2 Maintenance

The helicopter was maintained in accordance with United Arab Emirates General Civil Aviation Authorities approved Bell 212 Maintenance Schedule reference AMS/212 edition 4 dated April 2004. The aircraft records show that both the major inspections (150 & 300 hours) and line checks (pre-departure, daily and weekly) were performed as per the schedule. Engine # 1 and #2 have 4895 hours and 635 hours remaining before the next overhaul respectively, and were running properly prior to the accident. There was one deferred defect existing at the time of the accident (removal of bleed air heating system). The deferring of this defect was agreed by the United Arab Emirates GCAA since 2002 and was determined not to be a factor in the occurrence of this accident.

2.3 Meteorology

2.3.1 Weather

The weather on the day of the event was not restrictive and did not contribute to the occurrence.

2.4 Other

2.4.1 All psychological & physiological (human factors) conditions of the event are not addressed in detail as they are considered to be outside the realm of this report. However, due to the nature of the operation it is likely that pilots can be more driven by the challenge to operate under difficult circumstances than adhering to standards for a safe operation.
A Recommendation has been put forth accordingly.

2.4.2 As there are no specific ICAO recommendations for "Aerial Work operations it is left to the operators and Civil Aviation Authorities to establish policies and procedures.

3. CONCLUSION

A. Findings

1. The pilot was properly licensed and adequately experienced to conduct the flight.
2. The pilot landed at an unsuitable landing area.
3. The landing area did not comply with the company operations manual general criteria for "away from base operation".
4. The company operations manual does not provide adequate information and guidance for planning and dispatch specific to this operation.
5. The helicopter had valid Certificate of Airworthiness.
6. The helicopter had been maintained in accordance with an approved maintenance schedule.
7. The helicopter was below the maximum permissible weight and was within the center of gravity limits.

B. Probable Cause

- Misjudgment of obstacle clearance by the pilot.

- Contributing factors: -Landing on an unsuitable landing area.
  -Lack of adequate information on landing sites in the operations manual.

4. SAFETY RECOMMENDATIONS

It is **Recommended** that:

For Abu Dhabi Aviation

1. The operator instructs the flight crew to adhere to the requirements for temporary landing areas as set forth in the company operations manual Part E, par.2.11.
2. The operator evaluates the landing areas for suitability before commencing further operations to the applicable sites.
3. The operator includes adequate route- and landing area information in the operations manual in order to provide flight crew with essential data for flight planning purposes.
4. The operator initiates a flight safety awareness program for "Aerial Work" operations.

It is further **Recommended** that:

The International Civil Aviation Organization establishes recommendations for "Aerial Work" operations.