ACCIDENT

Aircraft Type and Registration:	MD Helicopters MD 900, G-EHMS
No & Type of Engines:	2 Pratt & Whitney Canada PW206E turboshaft engines
Year of Manufacture:	2000
Date & Time (UTC):	4 June 2006 at 1548 hrs
Location:	Walworth Road, London Borough of Southwark
Type of Flight:	Commercial Air Transport
Persons on Board:	Crew - 2 Passengers - 2
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to main rotor blades, main rotor head, main rotor gearbox and left vertical stabiliser
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	50 years
Commander's Flying Experience:	4,000 hours (of which 300 were on type) Last 90 days - 60 hours Last 28 days - 20 hours
Information Source:	AAIB Field Investigation

Synopsis

The helicopter was attending a road traffic accident (RTA) in which a pedestrian had suffered potentially life-threatening injuries. While landing on a garage forecourt, close to the RTA, a metal sign became detached from the wall of the garage and was blown into the main rotor disc. The commander was able to make a controlled landing on the forecourt and no-one within or outside the helicopter was injured by the flying metal debris from the sign.

History of the flight

G-EHMS had been tasked by the London Ambulance Service to attend a road traffic accident (RTA) on Walworth Road in the London Borough of Southwark, in which a pedestrian had received potentially life-threatening injuries. The crew received the call at their offices, adjacent to the helicopter landing platform on the roof of the Royal London Hospital, Whitechapel, at 1541 hrs and G-EHMS took off from there at 1543 hrs. The weather conditions were good, partly sunny, with visibility in excess of 10 km and a light wind from the north-west. On board the helicopter were a crew of two pilots, a doctor and a paramedic.

The straight line distance to the site of the RTA was 2.15 nm, in a south-westerly direction, and G-EHMS arrived overhead its location at 1546 hrs. The commander, who was the pilot flying (PF) in the right seat, commenced

an orbit at a height of between 500 ft and 1,000 ft agl while he and the co-pilot identified potential landing sites. The commander recalled seeing three possible sites and the co-pilot identified four. Between them they concluded that a nearby garage forecourt on the west side of the Walworth Road was the most suitable because of its size, proximity to the RTA (125 metres away) and freedom from obstacles. They also assessed that it was over and above the minimum dimensions required for a landing site when the helicopter is operating in its primary life-saving role. This demands a space whose dimensions in any direction are at least twice the length of the helicopter from the front of the main rotor disc, when rotating, to the end of the tail ('2D'). The co-pilot later stated that he had landed at this site some five or six years before.

The commander flew two or three orbits before making an approach to the forecourt, into wind. Before and during the approach the crew checked the forecourt for overhead wires, pedestrians, vehicles, loose articles and its slope, size, shape, surrounds and surface conditions. They also checked for the presence of high walls (which might affect the helicopter's handling if they encountered recirculated air from the helicopter's downdraft), fixed obstacles and vegetation, and a potential go-around flight path in case of an engine failure.

The garage forecourt, which was rectangular in shape, with its longest dimension orientated north-south, was adjacent to a petrol station but the commander observed, that there were no vehicles at the petrol pumps before committing himself to landing. However, one car was seen on the access driveway from the main road, which led to both the forecourt and petrol station. G-EHMS descended through the committal height of 100 ft agl and was established in a hover about four feet above the middle of the forecourt. During the final stages of the approach the co-pilot opened his door and looked out for any obstacles on the left of the helicopter, closing it again before they had reached the hover. In the hover, the commander manoeuvred the helicopter slightly to the left and rearwards, with lookout assistance from the co-pilot, to leave the access road clear once they had landed. Also, the co-pilot recalled advising the commander to manoeuvre the tail of G-EHMS to the left, and its nose to the right, in order to give adequate clearance from the vehicle which he had seen on the access driveway, to the right of the helicopter.

G-EHMS had been in the hover for 5-10 seconds when all the occupants of the helicopter heard a loud bang. The helicopter remained in a stable hover but the commander felt substantial vibration through the flying controls and immediately manoeuvred the helicopter forward 5-10 feet and down for a zero speed landing, facing north. He suspected that something had entered the main rotor disc and, without delay, shut the engines down and stopped the rotors. No-one was injured and the doctor and paramedic departed to attend the casualty at the RTA.

After exiting the helicopter, the crew found metal debris scattered on the forecourt and damage to the helicopter's main rotor blades. One of the helicopter's VHF aerials had detached and they found a puncture hole in the left vertical stabiliser. The metal debris was identified as being from one of the signs located above the garage doors.

A number of police officers had attended the scene of the RTA before the arrival of the helicopter. On seeing the helicopter making an approach to the garage forecourt, two of them ran towards the forecourt to prevent members of the public approaching too close to the helicopter and its landing site. While doing this, one of these police officers saw a metal sign above one of the garage doors

being "pulled off" the wall into the path of G-EHMS's main rotor blades as it was landing. There was a loud "crashing" sound and some pieces of the metal sign were thrown towards the people being held back by the other police officer on the pavement, three to four yards from the access driveway to the forecourt. One piece of metal, which measured about one foot by 10 inches, landed within a few feet of them. However, no-one was struck by any of the debris.

Aircraft description

The MD 900 helicopter is fitted with a five-bladed, fully articulated, hingeless flexbeam main rotor driven by a PW206E turboshaft engine. Anti-torque, directional control and yaw stability are provided respectively by the NOTAR fan driven directly from the main transmission, the circulation control tailboom, the thruster and the horizontal and vertical stabilizers. The rotor diameter is 10.83 metres and at its nominal 100% rotor speed, the rotor runs at 392 rpm, which equates to a tip speed of 695 ft/s. The distance 'D' from the front of the main rotor disc to the rear of the tail boom is 11.83 metres. G-EHMS was used being as the London Air Ambulance and was fitted with special cabin equipment for the role.

Accident site and wreckage examination

Figure 1 shows a plan of the garage and the petrol station forecourt on the Walworth Road. The garage has a clear area in front for vehicle manoeuvring and over which cars access the petrol station. There are kerbs and bollards within this area to direct entry and create parking areas. The total extent of the clear area is approximately 42 metres (from boundary wall to the petrol station canopy) by 25 metres (from the front of the garage to the pavement kerb). However, a car was parked within this clear area at the time of the accident (see Figure 1), approximately 13 metres from the front of the building.

The garage is constructed with brick side walls and brick pillars linked across the front of the building by a corrugated metal fascia board. The latter is attached via metal brackets cemented into the brick wall. Metal advertising signs are attached to the fascia board. One of these had detached in the helicopter downwash and been drawn into the rotor disc.

The helicopter had come to rest on a northerly heading with the rotor disc approximately 5m from the front of the garage building. Numerous impacts with the rotor blades had shredded the metal sign, pieces from which had been flung to the edge of the garage forecourt. The remains of fixings on the fascia board indicated that the sign had been attached prior to the helicopter landing. The metal bracket connecting the fascia to the end brick wall had been dislodged so that the fascia was no longer attached to the wall. There was also damage to the brickwork at the base of the side wall. The garage manager stated that the base of the wall had been hit by a Heavy Goods Vehicle (HGV) at some time prior to the accident. It was not possible to determine whether the detachment of the fascia board had occurred in the HGV impact, or was part of the damage caused by the helicopter downwash.

All the main rotor blades, which were of fibreglass/epoxy construction, had suffered damage to their outer sections. The leading edge abrasion strips were smeared with blue paint from the sign and the blades had suffered multiple impacts. An aerial from the top left side of the helicopter had detached and the left vertical stabiliser had suffered impact damage from the sign fragments.

Further examination of the helicopter revealed no pre-impact faults with could have contributed to the accident. A download of the non-volatile memory (NVM) from the Integrated Instrumentation Display System (IIDS) showed no faults or exceedances had been recorded.

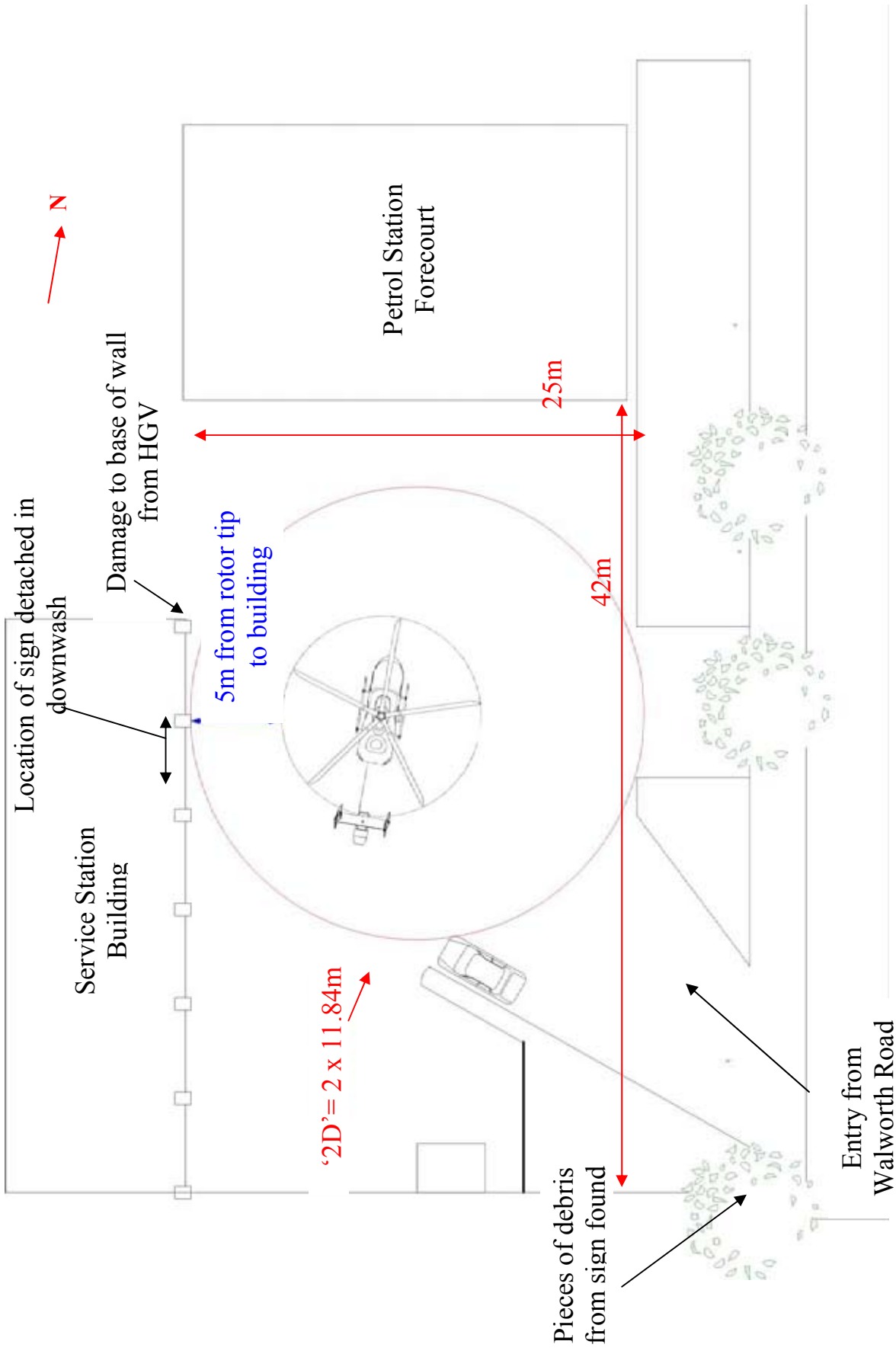

Figure 1

G-EHMS at Walworth Road, 4 June 2006

Procedures

Selection of Landing Sites

For operations in its Primary Helicopter Emergency Medical Services (HEMS) role, when tasked by the London Ambulance Service and where human life is in immediate danger, the operator's operations manual states that a landing site is to be at least 2D in size, where D is the overall length of the helicopter, with rotors running. The operations manual specifies that 2D for G-EHMS is 77.6 feet, which equates to 23.66 metres. This reflects the requirements in JAR-OPS 3 for HEMS daylight operations.

The operator's operations manual also states that:

> *'When landing and taking off from congested sites which exercise the Rule 5 (1) (b) dispensation it is essential that both pilots are checking their respective sides of the aircraft throughout the manoeuvre for adequate clearance from surrounding obstructions.'*

'Adequate clearance' was not defined but the inference was that the helicopter should land in the centre of a landing site of limited size to give maximum clearance in all directions. It is worth noting that G-EHMS is a type of helicopter which has no tail rotor and uses vectored air emitted from the tail boom for yaw control. This design removes the hazards associated with tail rotor blades and the potential danger from nearby obstacles.

Training

The operator's training on the assessment of landing sites is included in the ground training syllabus for newly appointed pilots. This includes instruction on the exemptions granted to HEMS operations as well as the performance, operational and physical factors to consider when selecting a landing site. Initial Line Training is conducted on non passenger carrying flights. Following a satisfactory Line Check, the pilot is then '*cleared for line flying under the supervision of a Line Training Captain'* on all types of missions. Practical flying training in Confined Area Techniques is carried out during the latter period of Line Training, and this builds on the subjects covered during ground training.

Since the accident, the operator has introduced a new requirement for all their pilots:

> *'to undertake site selection refresher training by auditing one randomly chosen, previously used landing site per week.'*

The results of the audits are recorded and all comments arising are reviewed by the Chief Pilot and discussed on a monthly basis by all the operator's pilots.

Other accidents

The helicopter was involved in a similar event in October 2005. G-EHMS had been attending an RTA in London and was touching down in an area which had been secured and was of adequate size for a HEMS operation. Part of a metal shutter from a nearby shop window became dislodged, due to the downdraft from the main rotor blades, and passed through the rotor disc damaging one main rotor blade. No one was injured.

Discussion

Both pilots assessed the garage forecourt, in which one of them had landed before, as being in excess of the minimum size required for a landing site when operating in their primary HEMS role. Subsequent measurement of the landing site showed that its external dimensions were greater than 2D but that the presence of a vehicle reduced the clearance around the helicopter; although

it was still possible for G-EHMS to land in an area of the minimum required size. In the event, the helicopter landed with its main rotor disc less than 0.5D from the garage wall and it may have been closer than that during the hover manoeuvres. These manoeuvres were carried out to ensure that the access road to the petrol station remained clear. Had G-EHMS landed in the centre of the clear area and equidistant from all the obstacles, it would have been at least 0.5D from any obstruction. Also, landing without manoeuvring would have reduced the time in which the helicopter's downdraft had an effect on the surrounding structures. The inference in the operator's procedures is that, when landing in a site of limited size, the helicopter should maintain the maximum clearance from all the surrounding obstacles.

The evidence indicates that the sign which detached and struck the main rotors may have been loose before the arrival of G-EHMS, possibly loosened when the garage wall was struck by a lorry at an earlier date. It seems that the sign became detached from the garage wall as a result of the helicopter's downdraft, and then struck the main rotor blades.

The operator's pilots receive instruction on the assessment of landing sites during their initial training with the operator. By the very nature of the operation, the assessment of the dimensions of an unsurveyed landing site for a primary HEMS task is, of necessity, a visual exercise. Since the accident, the integrity of landing site assessments has been enhanced by the addition of weekly landing site audits in which the operator's pilots are required to select, at random, one previously used landing site and critically assess it.

The operator, like many others carrying out missions of a similar nature, successfully completes many landings and takeoffs during the course of a year. However, in these two cases, although the crew correctly assessed the size of the landing site as being greater than the minimum required dimensions, they could not assess the security of the surrounding structures and the effect the helicopter's downdraft would have on them. In this accident, members of the public who were observing the landing missed being struck by flying debris by a few metres.

The operator began operating in August 1990. Before being authorised to do so, the regulatory authority (the CAA) carried out a comprehensive risk assessment. In the light of these two events, it is recommended that new risk assessments are carried out to establish that the current policies and procedures address the potential risks of HEMS operations into improvised confined areas, while enabling the operators to achieve their tasks.

The following two Safety Recommendations are made:

Safety Recommendation 2007-057

It is recommended that the European Aviation Safety Agency perform a risk assessment of the policies and procedures in JAR-OPS 3 associated with Helicopter Emergency Medical Services (HEMS) operating into improvised confined areas.

Safety Recommendation 2007-058

It is recommended that the Civil Aviation Authority ensure that a risk assessment is performed of the current agreed operating standards associated with Helicopter Emergency Medical Services (HEMS) operating into improvised confined areas.