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Report RL 2000:07e

***Aircraft accident involving SE-AMH
at Eslöv airport, M county, Sweden
on the 4th of August, 1999
Case L-74/99***

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Translated by Dennis Lynn Anderson

From the original Swedish at the request of the Board of Accident Investigation.

In case of discrepancies between the English and the Swedish texts, the Swedish text is to be considered the authoritative version.

2000-02-25

L-74/99

Swedish Civil Aviation Administration

601 79 NORRKÖPING

Report RL 2000:07e

The Board of Accident Investigation (Statens haverikommission, SHK) has investigated an aircraft accident that occurred on August 4, 1999 at Eslöv airport, M county, Sweden, involving an aircraft with registration SE-AMH.

In accordance with section 14 of the Ordinance on the Investigation of Accidents (1990:717) the Board herewith submits a final report on the investigation.

S-E Sigfridsson

Monica J Wismar

Henrik Elinder

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L-74/99

Report finalised 2000-02-25

<i>Aircraft: registration, type</i>	SE-AMH, De Havilland DH-82A
<i>Class/airworthiness</i>	Experimental/airworthy
<i>Owner/Operator</i>	Private ownership
<i>Date and time</i>	1999-08-04, 12:37 hours in daylight <i>Note:</i> All times in the report in Swedish refer to Swedish summer time (SST) = UTC + 2 hours
<i>Place of occurrence</i>	Approximately 300 meters south-west of Eslöv airport, M county, (pos. 5550N 1319E, 90 m above sea level)
<i>Type of flight</i>	Private
<i>Weather</i>	According to the Swedish Meteorological Institution's analysis at 12:45 hours: wind south-easterly at approximately 5-10 knots, good visibility, no clouds below 5000 feet, temperature +25°C, dew-point +10°C, QNH 1017hPa.
<i>Persons on board:</i> crew	1
passengers	1
<i>Injuries to persons</i>	The pilot sustained minor injuries, the passenger's kneecap was crushed.
<i>Damage to aircraft</i>	Destroyed
<i>Other damage</i>	Flattened wheat field
<i>Pilot in command:</i>	
age, certificate	36 years old, private pilot's licence (Swedish)
total flying time	152 hours, of which 8 hours on the type
flying hours previous 90 days	4 hours, of which 3 hours on the type
number of landings previous 90 days	12, of which 9 on the type

The Board of Accident Investigation (SHK) was notified on 4 August 1999 that an aircraft with registration SE-AMH had an accident at 12:37 hrs on that day at Eslöv airport, M county, Sweden.

The accident has been investigated by SHK represented by Sven- Erik Sigfridsson, Chairman, Monica J Wismar, Chief investigator flight operations, and Henrik Elinder, Chief technical investigator aviation.

The Board was assisted by Dan Åkerman as technical expert.

The investigation was followed by Klas-Göran Bask, Swedish Civil Aviation Administration.

SUMMARY

The pilot planned to make a brief flight around the Eslöv area with a passenger. Prior to takeoff he noted that the takeoff would take place with the wind from the left, at approximately a 45 degree angle with respect to the direction of takeoff. During the application of power he applied left aileron, but does not recollect if he applied rudder, nor the amount if indeed such was the case. During acceleration, when the tail skid had lifted off the ground but the main wheels were still on the ground, the aircraft began to drift to the right. He attempted to realign the aircraft to the takeoff direction with the help of aileron and rudder inputs without success. In

order not to collide with a number of cones that defined the right edge of the runway he lifted the aircraft off the ground prior to the attainment of normal lift-off speed.

Subsequent to the lift-off the aircraft climbed at low speed while simultaneously yawing to the right. The pilot of the aircraft managed to clear a row of trees to the west of the airfield with a margin of 2-3 meters. After passing the trees the aircraft suddenly entered a stall over the right wing and impacted the ground. The pilot was injured upon impact but was able to exit the aircraft unassisted and remove his, at first, apparently lifeless and injured passenger.

During the technical investigation of the aircraft a defect was found in the right-hand ignition magneto which was assessed as having negligible or no significance in the course of events. The pilot had little flying experience on the aircraft type and had flown very little in the past few years.

The accident was caused by the pilot's failure to abort the takeoff when he became aware that the aircraft was about to swerve off the runway. A contributory cause was his limited experience with the aircraft type.

RECOMMENDATIONS

None.

1 FACTUAL INFORMATION

1.1 History of the flight

The pilot, together with a passenger, was going to perform a brief flight around the Eslöv area where the aircraft was stationed. Upon arrival at the airport he noticed by observing the airport windsock that the wind was easterly and stronger than he had expected. The windsock oscillated between a little more than half to the entire sock standing straight out. He decided to prepare the aircraft for flight and to decide during taxi to the fuel depot whether he should carry out the flight considering the prevailing winds.

The pilot removed the aircraft from the hangar. During motor start, which is accomplished by manually rotating the propeller, the pilot was of the opinion that it was more difficult to start than normal. It first started after ten attempts opposed to the normal two to three. He taxied to the fuel depot, shut down the motor and fully fuelled the aircraft. Taxiing in direct crosswind presented no problem and he decided to carry out the flight. After fuelling the motor started upon the first attempt. The pilot performed the usual pre-flight checks prior to takeoff, released the leading edge slots¹ and lined the aircraft up for takeoff on runway 15.

According to the pilot's assessment the wind direction was from the left at approximately 45° in relation to the takeoff heading. During the application of power he applied left aileron, but does not recollect if he applied rudder, nor the amount if indeed such was the case. During acceleration, when the tail skid had lifted off the ground but the main wheels were still on the ground, the aircraft began to drift to the right. He attempted to realign the aircraft to the takeoff direction with the help of rudder and aileron inputs without success. In order not to collide with a number of cones that defined the right edge of the runway he lifted the aircraft off the ground prior to the attainment of normal lift-off speed. Subsequent to the lift-off the aircraft climbed at low speed while simultaneously yawing to the right. The pilot of the aircraft managed to clear a row of trees to the west of the airfield with a margin of 2-3 meters. After passing the trees the aircraft suddenly entered a stall over the right wing and lost altitude. Everything happened very quickly and the pilot did not have time to regain control of the aircraft before it impacted the ground.

The pilot was injured upon impact but was able to exit the aircraft unassisted and remove his, at first, apparently lifeless and injured passenger. During this time, a person who had seen the occurrence arrived at the scene and alerted the rescue service. He assisted the pilot in moving the passenger farther away from the aircraft, which had begun to leak fuel. After a few minutes the rescue personnel arrived on the scene.

Location: 5550N 1319E; 90 m above sea level.

1.2 Injuries to persons

	<i>Crew</i>	<i>Passengers</i>	<i>Others</i>	<i>Total</i>
Fatal	–	–	–	–
Serious	–	1	–	1
Minor	1	–	–	1
None	–	–	–	–
Total	1	1	–	2

¹ Slots = A wing leading-edge device that increases wing lift at low airspeed and improves the stall characteristics of the aircraft.

1.3 Damage to aircraft

Destroyed.

1.4 Other damage

Flattened wheat field.

1.5 Personnel information

The pilot was 36 years old at the time and had a valid Private Pilot's licence.

Flying hours

<i>previous</i>	<i>24 hours</i>	<i>90 days</i>	<i>Total</i>
All types	0	4	152
This type	0	3	8

Number of landings this type previous 90 days: 9.

Flight training on DH-82A concluded in the summer of 1997.

Latest periodic flight training (PFT) carried out 1999-06-16 on Cessna 172.

The pilot got his licence 1987 and flew the DH-82A five hours in connection with the flight training 1997. During 1998 he did not practise any flying at all. In June 1999 he performed a flight test for an inspector from the Swedish Civil Aviation Administration in order to get his licence back. After that he had flown the DH-82A for three hours.

1.6 Aircraft information

1.6.1 General

AIRCRAFT:

<i>Manufacturer:</i>	Morris Motor Ltd.
<i>Type:</i>	De Havilland DH-82A
<i>Serial number:</i>	84959
<i>Year of manufacture:</i>	1942
<i>Gross weight:</i>	Max authorised 830 kg, actual 800 kg
<i>Centre of gravity:</i>	Within allowable limits
<i>Total flying time:</i>	6017 hrs
<i>Flying time since latest inspection:</i>	7 hrs
<i>Fuel loaded before event:</i>	100 LL

ENGINE:

<i>Manufacture:</i>	De Havilland
<i>Model:</i>	Gipsy Major IC
<i>Number of engines:</i>	1

Operating time since overhaul 459 hrs

PROPELLER

<i>Manufacture:</i>	Hoffman
<i>Operating time since latest overhaul:</i>	80 hrs

The aircraft had a valid Certificate of Airworthiness.

1.6.2 Aircraft type

The De Havilland DH-82A (also known as the Tiger Moth) was fabricated and manufactured in England in the 1930s, primarily as a basic trainer. It is of the bi-plane type and equipped with a tail skid, or through subsequent modification a tail wheel. The fuselage consists of a steel construction that is covered with wooden veneer and taut cloth. The wing spars are made of wood. The aircraft type is a two-seater and those aboard sit in an open cockpit with the pilot placed behind the passenger. The fuel tank is an integral part of the upper wing and is placed above the forward cockpit seat. This type is normally equipped with tandem controls and is normally flown from the backseat during solo flight. The aircraft in question was equipped with lockable automatic slots.

1.7 Meteorological information

The area was covered by a minor high pressure ridge with clear weather and light winds. According to The Swedish Meteorological Institute's weather analysis the prevailing weather at Eslöv airport at time 12:45 hours was: wind south easterly at approximately 5-10 knots, good visibility, no clouds below 5000 feet, temperature/dewpoint +25/+10°C, QNH 1017 hPa.

1.8 Aids to navigation

Not applicable.

1.9 Communications

Not applicable.

1.10 Aerodrome information

Eslöv airport has two grass runways with the following directions: 040/200 degrees and 150/330 degrees. Runway 15 which was used for take off is 650 meters long and 50 meters wide. At the time the grass was dry and short-cropped.

1.11 Flight recorders

There was no requirement to carry a Flight Data Recorder (FDR) or a Cockpit Voice Recorder (CVR) on board the aircraft and neither was fitted.

1.12 Site of accident and aircraft wreckage

1.12.1 Site of accident

The aircraft impacted in an upright position in a field about 40 meters west of the row of aspen trees that it had just passed over. Upon impact the magnetic heading was about 290 degrees. Thereafter it slid on the ground ten meters on the same heading while simultaneously turning 180 degrees on its axis before it came to a stop. At the time the field was covered with 50 centimeter high mature wheat.

1.12.2 *Aircraft wreckage*

The forward portion of the aircraft fuselage was severely demolished. The motor had separated from the fuselage. Both wings and several wing struts were shattered. The tail was battered out of shape. The left landing gear was folded in under the belly and the right landing gear was folded out to the right. The wing tank had burst and fuel leaked down into the cockpit. The wreckage was confined to an area 20 x 20 meters.

1.13 **Medical information**

Nothing indicates that the mental and physical condition of the crew had been impaired before the flight.

1.14 **Fire**

There was no fire.

1.15 **Survival aspects**

The pilot only sustained a few abrasions on his arms while the passenger that sat in the front seat sustained a crushed right kneecap and facial abrasions. Both used four-point safety belts and leather caps. The pilot had his seat belts cinched tightly while the passenger had them more loosely drawn because she felt discomfort with them tightly cinched.

Fuel leaked out over the forward cockpit seat. It can be attributed to fortunate circumstances that a fire did not break out.

The emergency transmitter of type EBC G7 was found in the "OFF" position during the investigation. No signal has been registered from it. It has not been possible to determine if it was armed at the time of the accident.

1.16 **Tests and research**

1.16.1 *The aircraft*

The aircraft was inspected at the scene of the accident prior to being removed to a hangar. The inspection however, has not revealed anything that indicates that a technical failure occurred on the aircraft or its flight control system. The slots on the aircraft were extended however the pilot has no recollection that they extended during the flight. There is no indication that functional failure took place with these.

1.16.2 *Aircraft engine*

The aircraft engine was in good condition and no mechanical failure was ascertained. Maintenance was carried out according to applicable directives. The engine's two magnetos were dismantled from the aircraft and were inspected at an aircraft engine workshop. At the time of the functional test of the magnetos, both supplied strong sparking at all engine rotation speeds except that the spark from the right-hand magneto was absent at full advanced ignition, corresponding to full-throttle. According to the pilot the magnetos were checked prior to takeoff at 1600 rpm. At that time the rpm was normal for both magnetos. It has not been possible to establish when the fault in the magneto occurred.

With the exception of the fault in the right-hand magneto, no defects were found on the engine.

1.16.3 Test flight

In order to establish the possibility of performance deterioration during takeoff and climb if only one ignition magneto is operative, a test flight has been performed with an aircraft of the same type as the actual aircraft. The test was carried out at Västerås/Hässlö airport during the following meteorological conditions: wind 340°/3 knots, temperature/dewpoint +5/+1°C, QNH 1036 hPa. The takeoff test was done from an 800 meter long grass strip to the side of runway 01. The grass was damp but not soft. When both magnetos were connected the time from a standstill to passage over the runway end was clocked at 40 seconds. The aircraft's height over the runway was then 80 meters and the speed 100 km/hr. During takeoff with only the right-hand magneto connected the same height was attained with the same climb rate in 37 seconds.

Any deterioration in climb performance at a height of 500 meters with one magneto connected could not be noted either.

The difference in the outside air temperature at the time of the accident in relation to standard temperature (+15° C) corresponds to 7% longer takeoff distance.

1.17 Organisational and management information

Not applicable.

2 ANALYSIS

With the exception that the right-hand magneto did not supply a spark at maximum takeoff power, no technical fault was found with the aircraft or its engine. Whether the aforementioned fault occurred during the course of the takeoff is uncertain. If that was the case, the execution of test flights has shown that this probably did not have any effect, or if so only negligible effect on the takeoff performance of the aircraft. Nor did the pilot experience any engine problems during the takeoff.

The pilot had flown little the last few years and his flying experience with this aircraft type was limited. He was also somewhat unsure if he should perform the flight considering the prevailing wind. The actual force of the wind and the crosswind component from the left during the takeoff is uncertain, but according to the pilot's account the wind was probably stronger and more abeam the runway than according to the Meteorological Institute's (SMHI) report. Some gusting may even have occurred.

The aircraft type, which has a tail skid and large fuselage and wing surfaces, is significantly more susceptible to crosswind during takeoff and landing than modern nose-gear equipped light aircraft are. In connection with crosswind, significantly larger deflection of both rudder and aileron is required, and this in an earlier stage of the takeoff, than is the case with a Cessna; the aircraft type that the pilot had most flying experience with. The pilot is uncertain of how he applied aileron and rudder during the takeoff. The drift to the right, subsequent to the tail skid lifting from the ground, indicates that the flight control surface inputs were not sufficient.

Instead of aborting the takeoff when the aircraft approached the cones on the runway edge the pilot pulled the control stick back and became air-

born before the aircraft had obtained normal takeoff speed. The flight after lift-off therefore took place with a nose-high attitude, close to the stall limit and without the required speed increase to be able to climb and correct for the drift to the right. During the drifting to the right the aircraft was exposed to a tailwind condition that aggravated the situation.

To clear the row of trees west of the field the pilot probably attempted to climb by further raising of the aircraft nose. In connection with this the airspeed decreased and the aircraft entered a stall immediately after passing the trees. At this low altitude the pilot had no possibility to regain control of the aircraft and prevent it from hitting the ground. A contributing factor to the stall may have been the existence of a wind vortex on the leeward side of the tree row, something that further impaired the aircraft's lift.

3 CONCLUSIONS

3.1 Findings

- a) The pilot was qualified to perform the flight.
- b) The aircraft had a valid Certificate of Airworthiness.
- c) The pilot had limited flight experience on the aircraft type and had flown little the last few years.
- d) With the exception of a fault on the right-hand ignition magneto, no technical faults were found on the aircraft.
- e) The fault on the right magneto had no or negligible consequence on the takeoff and climb performance of the aircraft.

3.2 Causes

The accident was caused by the pilot's failure to abort the takeoff when he became aware that the aircraft was about to drift off the runway. Contributory was his limited experience on the aircraft type.

4 RECOMMENDATIONS

None.