Wiper failure, Accident involving aircraft SE-RDL at Londonderry/Eglinton Airport, U.K., on 18 July 2003

Micro-summary: **Wiper failure on this MD-83 on short final during foul weather.**

Event Date: **2003-07-18 at 2314 UTC**

Investigative Body: **Swedish Accident Investigation Board (AIB), Sweden**

Investigative Body's Web Site: **http://www.havkom.se/**

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Statens haverikommission
Swedish Accident Investigation Board

ISSN 1400-5719

Report RL 2004:30e

Accident involving aircraft SE-RDL at Londonderry/Eglinton Airport, U.K., on 18 July 2003

Case L-32/03

SHK investigates accidents and incidents with regard to safety. The sole objective of the investigations is the prevention of similar occurrences in the future. It is not the purpose of this activity to apportion blame or liability.

The report is also available on our web site: www.havkom.se

Translated by Tim Crosfield from the original Swedish at the request of the Swedish Accident Investigation Board.

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

Statens haverikommission (SHK) Swedish Accident Investigation Board

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2004-10-05 L-32/03

Swedish Civil Aviation Administration

SE-601 79 NORRKÖPING

Sweden

Report RL 2004:30e

The Swedish Accident Investigation Board (Statens haverikommission, SHK) has investigated an accident that occurred on 18 July 2003 at Londonderry Airport, U.K., involving an aircraft with registration SE-RDL.

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.

The Board would be grateful to be informed, by 5 April 2005 at the latest, as to how the recommendations included in the report are being followed up.

Göran Rosvall

Mats Öfverstedt Henrik Elinder

Contents

Report RL 2004:30e

L-32/03
Report finalised 2004-10-05

Aircraft; registration and type	SE-RDL, Douglas DC-9-83
Class/airworthiness	Normal, Valid Certificate of Airworthiness
Owner/operator	Debis Airfinance B.V., Avioport Building, Evert van de Beekstraat 312, Schipol Airport, NL-1118 CX Amsterdam, Holland / Nordic Air Link AB, Kungstensgatan 35, 113 57 Stockholm
Time of occurrence	18-07-2003, 01.14 hrs in darkness *Note: All times given in Swedish summer time* (UTC + 2 hours)
Place	Londonderry Airport, U.K.
Type of flight	Charter traffic
Weather	METAR issued by Met Office, London for Londonderry Airport on 18 July 2003, 01.20 hrs: wind variable 5 knots, visibility 8 km, thunder and rain, scattered cloud at 1500 feet, broken cloud at 3000 feet, temp/dew point +17/+15°C, QNH 1009.
Persons on board:	
crew members	Pilots 2, cabin crew members 4
passengers	143
Injuries to persons	None
Damage to aircraft	Considerable
Other damage	Damage to runway edge lighting
Pilot in Command:	
Sex, age, licence	Male, 61 years, ATPL (A) Norwegian
Total flying time	15 744 hrs of which 8 000 on type
Flying hours previous 90 days	257 hrs, all on type
Number of landings previous 90 days	97, all on type
Co-pilot	
Sex, age, licence	Male, 34 years, ATPL (A)
Total flying time	3 200 hrs, of which 1 600 on type
Flying hours previous 90 days	193 hrs, all on type
Number of landings previous 90 days	71, all on type

The Swedish Accident Investigation Board (SHK) was notified on 21 July 2003 that an aircraft with registration SE-RDL had been involved in an accident at 01.14 hrs on that day at Londonderry Airport, U.K.

At the request of the Air Accidents Investigation Branch in U.K. (AAIB) the accident was investigated by Lena Svenéus, Chair until 31 January 2004 and Göran Rosvall, Chair subsequently; Mats Öfverstedt, Chief Investigator, Flight Operations and Henrik Elinder, Chief Technical Investigator, Aviation.

The investigation was followed by Max Danielsson, Swedish Civil Aviation Administration.

Summary

The aircraft, a Douglas DC-9-83, line number LF 8144, was going to land at Londonderry/Eglinton Airport, UK, after a charter flight from Lisbon. When the pilots reported the aircraft established on ILS (Instrument Landing System) runway 26 they were informed by the air traffic controller at the airport that it was raining very heavily and there were thunderstorms in the area.

When the aircraft was approximately 50 feet over the actual decision height, which was set to 400 feet, the pilot in command got visual contact with the approach lights. It was raining heavily and he switched on the aircraft's windscreen wipers. However, after a few strokes the wiper blade on his side came loose, whereupon the wiper function was lost.

Shortly before touchdown, at an altitude between 30 and 60 feet over the ground, the pilots were surprised by the aircraft suddenly "drifting to the right". The touchdown was to the right of the runway centreline and after a few seconds' rollout the aircraft's right main wheels and nose wheels came outside the runway edge. The right main wheels were off the runway for a large portion of the rollout before the pilot in command was able to steer the aircraft back onto the runway. There were no injuries to persons, but there was extensive damage to the aircraft.

Among other things the investigation has established that the weather information (METAR) available to the pilots was nearly four hours old and it was not until the aircraft was established on ILS that the pilots received the information that there were thunderstorms with heavy rain in the area. It has also been established that there is a difference between standard settings for high-intensity approach and runway lights in U.K. (ICAO) and Sweden.

The accident was caused by the difficulty in performing the landing increasing faster than the pilots fully realised in time.
Contributing factors were:

- The pilots were not prepared for the prevailing weather situation.
- The landing took place in darkness, with a low cloud base, in poor visibility, in heavy rain, with few extraneous visual references.
- The pilot in command's windscreen wiper did not function.
- The high-intensity approach and runway lights were set to the standard setting of low intensity.
- At approximately the time the autopilot was disconnected, the aircraft suffered a roll disturbance.
- There may have been local turbulence or wind shear.

Recommendations

The Swedish Civil Aviation Administration is recommended:

- to act internationally for the harmonisation of ICAO recommended standards with the Swedish standards for standard settings of high-intensity approach and runway lights and if not possible, to act for the harmonisation of the Swedish standards with ICAO recommended standards *(RL 2004:30e R1)*.

- to ensure that periodic functional checks of windscreen wipers on aircraft in commercial traffic are carried out under "load" *(RL 2004:30e R2)*.

1 FACTUAL INFORMATION

1.1 History of the flight

The aircraft, a Douglas DC-9-83, line number LF 8144, took off from Lisbon for a charter flight to Dublin, Ireland, via Londonderry in U.K. The flight was normal, with the Commander as PF (Pilot Flying). On board there were six crew members, i.e. two pilots and four cabin staff members.

When the aircraft was approaching Londonderry Airport the pilots confirmed with Londonderry tower (TWR) that they had information on the latest reported weather from Londonderry Airport: wind 360°/10 knots, visibility >10 km, few cloud at 1200 feet, scattered cloud at 2000 feet, broken cloud at 3500 feet, temperature/dew point +19/+16°C, atmospheric pressure 1009 hPa.

The approach was without radar vectoring for an ILS (Instrument Landing System) approach to runway 26. During the approach the crew requested clearance to avoid some rising cloud they could see on their weather radar.

When the pilots reported the aircraft established on ILS runway 26 they were informed by the air traffic controller at the airport that it was raining very heavily and there were thunderstorms in the area. The pilots also saw on their weather radar that there was thunder and rain over the airport. They then received clearance for approach to runway 26.

The approach was performed with both the autopilot and the autothrottle engaged. When the aircraft was approximately 50 feet over the actual decision height, which was set to 400 feet, the pilot in command got visual contact with the approach lights. It was raining heavily and he switched on the aircraft's windscreen wipers. However, after a few strokes the wiper blade on his side came loose and lay parallel with its direction of movement, whereupon the wiper function was lost. The pilot in command's extraneous visual references became worse, but he could still see the approach lights and runway lighting.

The pilot judged that he could complete the landing and disconnected the autopilot at about 150 feet above the ground. As he did so he felt that the aircraft underwent a roll disturbance. The autothrottle remained connected during the whole approach and landing.

Shortly before touchdown, at an altitude between 30 and 60 feet over the ground, the pilots were surprised by its suddenly "drifting to the right". The pilot in command judged that they were too low to correct the drift, given the roll restriction on this aircraft type (see 1.6). The touchdown was well to the right of the runway centreline and after a few seconds rollout the aircraft's right main wheels and nose wheels came outside the runway edge, which consisted of coarse gravel. The right main wheels were off the runway for a large portion of the rollout before the pilot in command was able to steer the aircraft back onto the runway. The aircraft was then taxied to the station area where the passengers disembarked in the normal manner.

There were no injuries to persons, but there were extensive damage to the aircraft in consequence of the gravel that was thrown up by the wheels.

The accident occurred on 18 July 2003 at Londonderry/Eglinton airport with reference position N550234 W0070940; 22 feet (6.7 m) above sea level, in darkness.

1.2 Injuries to persons

	Crew	*Passengers*	*Others*	*Total*
Fatal	–	–	–	–
Serious	–	–	–	–
Minor	–	–	–	–
None	6	143	–	149
Total	6	143	–	149

1.3 Damage to aircraft

Damage occurred to all the main wheels, the right and left wing flaps, the underside of the fuselage and the fan stages of both engines.

1.4 Other damage

Many of the runway edge lights were damaged.

1.5 The crew

1.5.1 Pilot in command

The pilot in command was 61 years old and had a valid Norwegian ATPL (A).

Flying hours			
latest	*24 hours*	*90 days*	*Total*
All types	5.2	257	15 744
This type	5.2	257	8 000

Number of landings on this type in the previous 90 days: 97.
Latest OPC (Operator Proficiency Check) carried out on 28 March 2003.

1.5.2 Co-pilot

The co-pilot was 34 years old and had a valid ATPL(A).

Flying hours			
Previous	*24 hours*	*90 days*	*Total*
All types	5.2	193	3 200
This type	5.2	193	1 600

Number of landings on this type in the previous 90 days: 71.
Latest OPC (Operator Proficiency Check) carried out on 7 April 2003.

1.5.3 Cabin crew

Four cabin crew members were on duty in the cabin.

1.5.4 Crew members' hours on duty

According to BCL[1], maximum duty time per week/24-hour period is 270 and 90 points[2], respectively.

[1] BCL – Swedish Aviation Regulations
[2] Points – Parameter in calculation of on duty time

The pilot in command's duty points were 222 for the week and 73 for the 24-hour period in question.

The co-pilot had 259 points for the week and 73 points for the 24-hour period in question.

1.6 Aircraft information

AIRCRAFT	
Manufacturer	McDonnell Douglas Corporation
Type	Douglas DC-9-83
Serial number	53014
Year of manufacture	1990
Gross of mass	Max authorised landing weight 68 039 kg, actual weight 58 154 kg
Centre of mass	LITOM 33
Total flying time	35 792 hrs
Number of cycles	14 959
Flying time since latest inspection	386. hrs
Fuel loaded before event	Jet A1, 13 413 litres

ENGINES		
Manufacture	Pratt and Whitney	
Model	JT8D-219	
Number of engines	2	
Engine	*No 1*	*No 2*
Serial number	725 647	71 6771
Total operating time, hrs	32 981	36 089
Total number of cycles	13 654	15 267

According to the Aircraft Flight Manual (AFM) the A/C type has a roll restriction during starts and landings of maximum 9 degrees in order to prevent the wingtips hitting the runway.

The aircraft had a valid Certificate of Airworthiness.

1.7 Meteorological information

In an extensive area of low pressure north and west of the British Isles with an epicentre over the Irish Sea was moving north-west and was near Londonderry at approximately 24.00. There were thunderstorms in the area.

No forecast for Londonderry Airport (TAF) had been issued.

During the approach, Londonderry TWR asked whether the crew had received the latest weather for Londonderry Airport from Scottish Control. The crew read back the latest received METAR dated 17 July 2003 21.20 hrs: wind was from 360° at 10 knots, visibility over 10 km, few clouds at 1200 feet, scattered cloud at 2000 feet, broken cloud coverage at 3500 feet, temp/dew point +19/+16°C, QNH 1009. Londonderry TWR confirmed that this was the actual METAR.

The METAR issued by the Met Office in London for Londonderry Airport 18 July 2003, 01.20: was wind variable 5 knots, visibility 8 km, thunderstorms and rain, scattered cloud at 1500 feet, broken cloud coverage at 3000 feet, temp/dew point +17/+15°C, QNH 1009.

Nine minutes prior to landing Londonderry TWR reported that a thunderstorm was passing over the airport with very heavy rain. The crew saw the storm on the aircraft's radar screen. During the whole approach and

landing the pilots felt that the wind was light without turbulence or wind-shear. They estimated visibility on landing to be about 1.5 km.

Whilst giving clearance to land, Londonderry TWR reported that ground wind speed was 5 knots, varying between 090° and 300°.

1.8 Aids to navigation

Runway 26 at Londonderry Airport is equipped with ILS (Instrument Landing System), NDB (Non Directional Beacon) and DME (Distance Measuring Equipment).

1.9 Radio communications

Radio communication between Londonderry TWR and the crew of LF 8144 was normal.

1.10 Airport information

The airport is directly adjacent to a bay of the sea, with rising ground to the north-west and south-east. Runway 08/26 is 1 852 m long and 45 m broad, orientated 080/260°. The surface is asphalt and the edge consists of an approximately half-metre-wide strip of coarse gravel. Then there is a level grass surface. The threshold heights above sea level for runways 08 and 26 are 17 feet and 10 feet, respectively.

Approach lighting to runway 26 extends into the sea. Runway 26 has high-intensity runway edge lights and centreline lighting. Runway 26 has Precision Approach Path Indicator (PAPI) lights.

At the time of the accident, the approach lights, runway edge lights, centreline lighting and PAPI were set to 3% intensity. The airport is situated in a geographical area with few fixed light points except its own.

The pilots have stated that during the landing they did not see that the runway centreline lighting was switched on.

1.11 Flight and sound recorders

1.11.1 Flight Data Recorder (FDR)

The aircraft was equipped with a Sundstrand Digital FDR (DFDR) which was sent to the AAIB in the U.K. for download after the accident. Appendix 1 gives a printout of the relevant parameters in diagrammatic form.

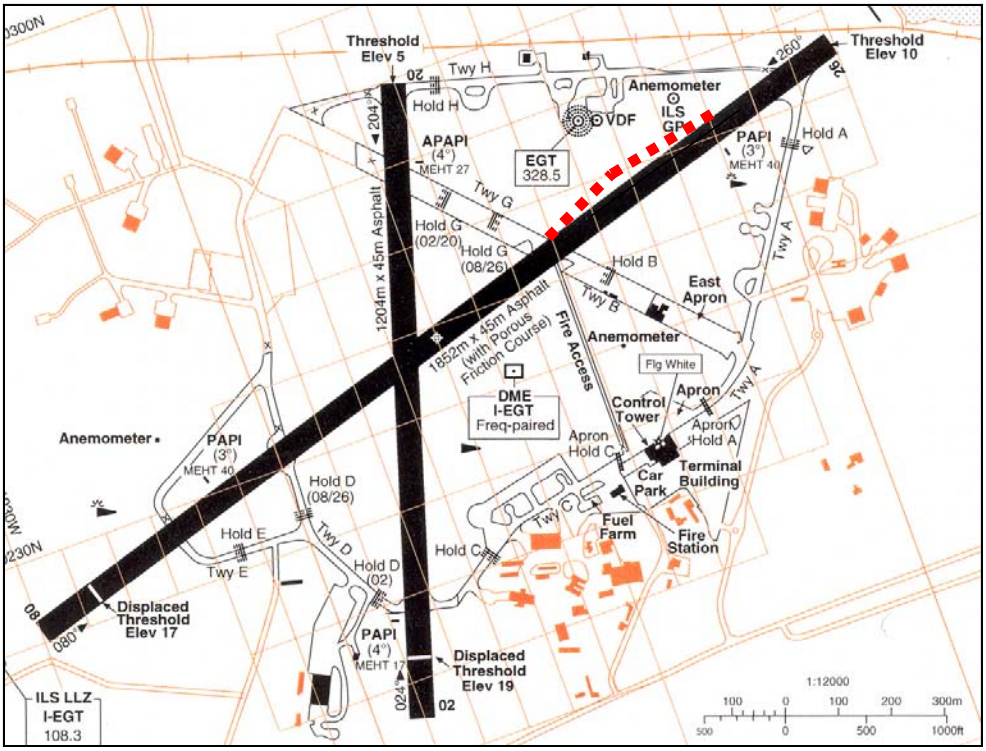
1.11.2 Cockpit Voice Recorder (CVR)

The aircraft was equipped with a CVR which was capable of recording 30 minutes of crew speech and area microphone inputs when power was applied to the aircraft. The 30-minutes duration was, however, insufficient to capture the approach and landing of the accident flight. It had been overwritten with more recent information after the landing, while the aircraft was stationary on the ground with the electrical power on.

1.12 Site of occurrence

The accident occurred during landing at Londonderry/Eglinton Airport, runway 26. Approximately 270 m from the runway threshold the aircraft's

right main wheels ran off the edge of the runway. The aircraft then rolled with the right undercarriage on the grass alongside the runway and the nose wheel on the gravel surface for approximately 370 m before all the main wheels had returned to the runway (see below).



Runway excursion

1.13 Medical information

Nothing has emerged to indicate that the crew's mental or physical condition was impaired before or during the flight. At the Board's request the crew's sight was specially tested at the FMC[3], and both pilots were found to have full visual function.

1.14 Fire

There was no fire.

1.15 Survival aspects

The G forces were so low that the emergency transmitter (ELT) was not activated.

1.16 Tests and investigations

1.16.1 Analysis of DFDR data

All the channels of the aircraft's flight data recorder were recorded with good accuracy. Analysis of the data shows that the approach, until shortly

[3] FMC – Aviation Medical Centre

before touchdown, was normal, except that as the autopilot was disconnected the aircraft underwent a moderate roll disturbance.

The DFDR data shows that the calculated speed on touchdown was approximately 140 knots and that the course was 256°. The stretch along which the right main wheel was outside the runway was measured as 370 m. Using recorded G forces in the horizontal plane and assuming that the touchdown was with the right main wheel 18 m to the right of the centreline, it was calculated that, on touchdown, the aircraft had a lateral speed (at right angles to its length) of about 13 m/s.

1.16.2 Technical investigation of windscreen wiper

The windscreen wiper is fixed to the wiper arm with a bolt and locking nut. The contact surface is provided by two knurled washers, permitting adjustment of the blade at fixed angles in relation to the wiper arm (see photo).

In the technical examination carried out after the Accident, it was found that, with moderate force, the wiper blade could be turned in relation to its arm, and that the locking nut could be tightened a further two flats (120°) after the split pin was removed.

Apart from periodic checking of windscreen wiper function in connection with inspection on the ground, there is no prescribed check of the wiper blade lock onto its arm.

Mounting of the windscreen wiper

1.17 The company's organisation and management

At the time of the accident the company, Nordic Air Link AB, operated scheduled flights in Sweden and regular charters for various travel companies. The company was using four MD-81-83 aircraft, and had about 85 permanent employees. The company's head office was located in Umeå but operational management was conducted from Stockholm. Outside Sweden the company had operational bases in Dublin and Basel. On each base there were four crews including a base captain who reported directly to the flight operational manager in Stockholm.

The aircraft fleet was maintained by contracted suppliers. Inspections and maintenance were provided at the operational bases by contracted organisations. For landings at other than the fixed bases, pre-take-off inspection was carried out by the pilot in command.

1.18 High-intensity approach and runway lights

According to AIP[4] Sweden, AD 1-1-5, standard settings for high-intensity approach and runway lights should follow the table below.

	Cloud-cover-altitude	Visibility on ground, km	Approach and runway lights (percent)		EFAS TRID
			Daylight	Darkness	
CIV aircraft, and MIL aircraft on FPL/GAT	Irrespective of cloud-cover altitude	≥ 5,0	---	---	---
		3,0 – 4,9	30	30	On
		< 3,0	100	100	On
MIL aircraft on FPL/OAT	≥ 210 m (≥ 700 ft)	≥ 8	---	---	---
		5,0 – 7,9	30	---	---
		3,0 – 4,9	100	30	On
		< 3,0	100	100	On
	< 210 m (< 700 ft)	Irrespective of ground visibility	100	100	

According to U.K. regulations, (UK CAA Doc CAP 168) which are aligned with ICAO recommended standards, the standard settings for high-intensity approach and runway lights should follow the table below.

Table 6.4 Typical AGL Luminous Intensity Settings

	DAYLIGHT		TWILIGHT				DARKNESS				
Weather Conditions	*A*	*B*	*C*	*D*	*A*	*B*	*A*	*B*	*C (Note 1)*	*D (Note 1)*	*Weather Conditions*
High Intensity approach lighting	–	100%	100%	100%	10%	30%	1%	3%	10%	30%	A: Vis > 5000 m and cloud ceiling (cc) > 700 ft
Supplementary approach lighting	–	–	100%	100%	–	–	–	–	10%	30%	
Low intensity approach and runway lighting	–	–	–	–	–	–	100% (Note 2)	100%	–	–	
High intensity runway lighting:											
(a) edge, threshold and end	–	100%	100%	100%	10%	30%	1%	3%	10%	30%	B: Vis 1500 – 5000 m or cc 200 – 700 ft
(b) centreline	–	–	100%	100%	10%	30%	1%	3%	10%	30%	
(c) TDZ	–	–	100%	100%	10%	30%	1% (Note 6)	3% (Note 6)	10%	30%	
HI Taxiway centreline and stopbars	100% (Note 3)	100% (Note 3)	100%	100%	10%	30%	10%	10%	10%	30%	C: Vis 800 m – 1499 m or cc < 200 ft
LI Taxiway centreline and stopbars	100% (Note 3)	100% (Note 3)	100%	100%	10%	30%	30%	30%	100%	100%	
Taxiway edge (Note 4)	–	–	100%	100%	10%	30%	30%	30%	30%	30%	D: RVR < 800 m
PAPI or APAPI	100% (Note 5)	100%	100%	100%	10%	30%	1%	3%	10%	30%	

NOTES:

1 Change setting at 600 m RVR when visibility is deteriorating and at 800 m RVR when visibility is improving. When the runway edge luminous intensity is set to less than 10% the IRVR system is unable to provide a reading. When the observed visibility deteriorates to less than 1500 m the runway edge lights should be set to 10% or greater.

2 Low intensity may be used at 30% if conditions warrant; low intensity and high intensity may be used together or independently; high intensity should be at 3% except that where there is little or no extraneous lighting, it may be operated at 1% or 0.3% if available and conditions warrant.

3 When used for taxiway guidance/control (stopbars) system purposes, otherwise not required.

4 Settings other than 100% should be used as indicated when available.

5 80% may be used if available.

6 Where required.

7 Where Taxi Guidance Signs capable of being illuminated are installed, they should be lit at night and whenever the weather conditions are C or D during the day.

[4] AIP – Aeronautical Information Publication

For the actual landing the luminous intensity was set to 3%, which is standard in U.K. for visibility values between 1500 m and 5000 m in darkness.

As the above tables show there are differences in intensity settings for the high-intensity approach and runway lights in U.K. (ICAO) and Sweden for equivalent visibility conditions. For a visibility value of 1500 m in darkness the high-intensity lighting in U.K. must be 3% but according to Swedish norms, 100%.

During the landing, neither of the pilots has any memory of having seen the centreline lighting.

2 ANALYSIS

2.1 The accident

According to the information available to the pilots, the weather at the airport was favourable with moderate wind, cloudbase over 1200 feet and visibility over 10 km. However the pilots were not informed that their weather information (METAR) was almost four hours old, which was unfortunate as they were therefore unaware of the low-pressure area with rain and thunderstorms that had moved into the area. Not until about nine minutes before landing, when the aircraft was established on ILS, did they receive from Londonderry TWR the information that a thunderstorm was passing the airport and that it was raining heavily.

Had the pilots been informed of the current weather situation earlier during the flight, they would probably have been better prepared for a possibly difficult landing in darkness with heavy rain, thunder and poor extraneous visual references.

Only when the aircraft reduced altitude to about 450 feet did the pilots get visual contact with the ground. Visibility was then only about 1.5 km in heavy rain. Considering that the airport is in an area with few fixed light points and that the high-intensity approach and runway lights were set to only 3% of their intensity, it is reasonable to assume that the pilots' visual references for the landing were compromised.

When the windscreen wiper on the pilot in command's side stopped working, the situation became further aggravated. He was forced to decide quickly whether he should abort or complete the landing, or have the co-pilot take control and land the aircraft. In the situation then prevailing, however, it was probably too late to hand over control to the co-pilot for landing.

Since the pilot in command, despite the problem with the windscreen wiper, nevertheless judged that he had sufficient visual references to perform the landing in a safe manner, and since the aircraft was otherwise well established on its landing path, it is understandably that he, in this situation, elected to complete the landing. It is however probable that the rain and the movement of the water on the windscreen caused reflections, refractions and glare, that increased the pilot's difficulty in effecting a landing with full control.

As the course of events shows, the pilots were surprised that, just before touchdown, the aircraft "drifted" to the right and that touchdown was thus well to the right of the runway centreline. It is further shown at Section 1.16.1 above, that the aircraft's course on touchdown was four degrees to the left of the runway orientation, and that it had a lateral speed to the right of about 13 m/s. On touchdown the aircraft skidded to the right, a movement the pilot in command was unable to correct until the nose wheel and the right main wheel had run onto the runway edge. A contributory cause may

have been that friction on the runway was impaired as a result of the volume of water on it and/or aquaplaning.

Since there was active Cumulonimbus (Cb) cloud in the vicinity of the airfield, it cannot be excluded that, just before touchdown, the aircraft was subjected to a local windshear that caused a lateral movement which the pilot in command attempted to correct with left rudder. However, neither pilot remarked any turbulence or windshear during the landing.

In summary the probable cause of the accident lies in a number of interacting negative factors that step by step increased the degree off difficulty to perform the landing without the pilots realising it. One of the more significant of these was probably that the pilot in command's ability, using the external visual references available under the prevailing conditions of darkness, limited visibility owing to heavy rain, limited number of "cultural" lights of villages and roads around the airport, low intensity of the runway lights and a broken windscreen wiper, to determine the aircraft's position, attitude and speed during the final phase of the landing, was more reduced than he realised. Another important contributory cause may have been that, just before touchdown, the aircraft suffered a roll disturbance, for which the pilot had to correct.

2.2 High-intensity approach and runway lights

As shown in Section 1.18 there is an appreciable difference regarding the prescribed standard intensity settings for high-intensity approach and runway lights between ICAO recommended standards and AIP Sweden. Since the intensity of the light is one factor of significance for when contact is established with the ground, and for assessing distances to visual references during landing, this difference may be confusing for pilots operating at airports with differing standard settings although the pilots always have the options to ask for the lights to be turned up or down if they have a problem. SHK considers this unfortunate and that it may negatively influence flight safety. There are therefore reasons for the Swedish Civil Aviation Administration to act internationally for the promulgation of ICAO recommended standards and the Swedish standards for standard settings of high-intensity approach and runway lights. The Swedish AIB consider high intensity of light is to be preferred for landing in bad weather.

2.3 The windscreen wiper failure

It emerged from the technical investigation that with moderate force the wiper blade could be turned in relation to the wiper arm. However, no impairment of windscreen wiper function had been reported, either during the flight or in connection with the ground inspection. There is therefore every reason to believe that the heavy water flow on the windscreen during landing was what placed an extra load on the blade, causing its attachment to give.

Since it is reasonable that loads on windscreen wipers are greater during flight in rain than when the aircraft is parked on the ground, there is reason to supplement the periodic functional check of the windscreen wipers so that this is also done under load. This is particularly important since any malfunction probably occurs in situations when pilots are in greatest need of the wiper function, as in the present accident.

3 CONCLUSIONS

3.1 Findings

a) The crew were qualified to perform the flight.
b) The aircraft had a valid Certificate of Airworthiness.
c) The weather information (METAR) available to the pilots was nearly four hours old.
d) Only when the aircraft was established on ILS did the pilots receive information that there were thunderstorms with heavy rain in the area.
e) There are limited number of "cultural" lights of villages and roads around the airport.
f) The airport's high-intensity approach and runway lights were set at the standard setting of 3% luminous intensity.
g) There is a difference between standard settings for high-intensity approach and runway lights in U.K. (ICAO) and Sweden.
h) At the time of disconnection of the autopilot, the aircraft suffered a roll disturbance.
i) Periodic functional checks of windscreen wipers are usually carried out without loading.

3.2 Cause of the accident

The accident was caused by the degree of difficulty to perform the landing increasing at a rate that the pilots did not fully realise in time.
Contributing factors were:

- The pilots were not prepared for the prevailing weather situation.
- The landing took place in darkness, with a low cloud base, in poor visibility, in heavy rain, with few extraneous visual references.
- The pilot in command's windscreen wiper did not function.
- The high-intensity approach and runway lights were set to the standard setting of low intensity.
- At approximately the time of disconnection of the autopilot, the aircraft suffered a roll disturbance.
- There may have been local turbulence or wind shear.

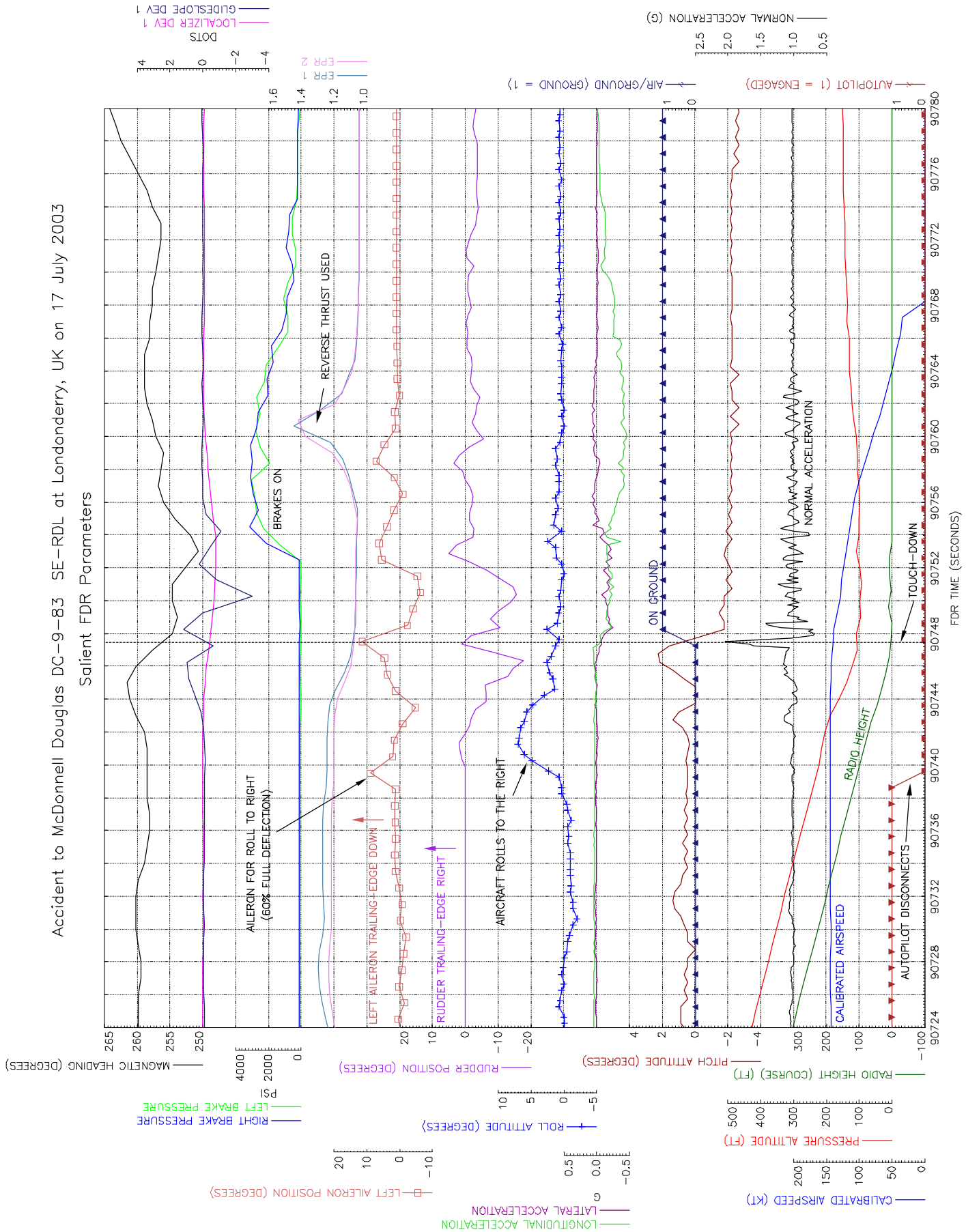
4 RECOMMENDATIONS

The Swedish Civil Aviation Administration is recommended:

- to act internationally for the harmonisation of ICAO recommended standards with the Swedish standards for standard settings of high-intensity approach and runway lights and if not possible, to act for the harmonisation of the Swedish standards with ICAO recommended standards *(RL 2004:30e R1)*.

- to ensure that periodic functional checks of windscreen wipers on aircraft in commercial traffic are carried out under "load" *(RL 2004:30e R2)*.

Appendix 1


Accident to McDonnell Douglas DC-9-83 SE-RDL at Londonderry, UK on 17 July 2003
Salient FDR Parameters
MAGNETIC HEADING (DEGREES)
RIGHT BRAKE PRESSURE
LEFT BRAKE PRESSURE
PSI
RUDDER POSITION (DEGREES)
LEFT AILERON POSITION (DEGREES)
ROLL ATTITUDE (DEGREES)
G
LONGITUDINAL ACCELERATION
LATERAL ACCELERATION
PITCH ATTITUDE (DEGREES)
RADIO HEIGHT (COURSE) (FT)
PRESSURE ALTITUDE (FT)
CALIBRATED AIRSPEED (KT)
DOTS
LOCALIZER DEV 1
GLIDESLOPE DEV 1
EPR 1
EPR 2
AIR/GROUND (GROUND = 1)
AUTOPILOT (1 = ENGAGED)
NORMAL ACCELERATION (G)
AILERON FOR ROLL TO RIGHT
(60% FULL DEFLECTION)
LEFT AILERON TRAILING-EDGE DOWN
RUDDER TRAILING-EDGE RIGHT
AIRCRAFT ROLLS TO THE RIGHT
REVERSE THRUST USED
BRAKES ON
ON GROUND
NORMAL ACCELERATION
RADIO HEIGHT
CALIBRATED AIRSPEED
AUTOPILOT DISCONNECTS
TOUCH-DOWN
FDR TIME (SECONDS)