



Statens haverikommission
Swedish Accident Investigation Board

ISSN 1400-5719

Report RL 2007:11e

**Aircraft incident to SE-LNX
at Luleå/Kallax airport, BD county, Sweden,
on 13 October 2006**

Case L-29/06

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.

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Translated by Interpreter Centre, City of Göteborg, from the original Swedish at the request of the Swedish Accident Investigation Board.

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Swedish Civil Aviation Authority

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Report RL 2007:11e

The Swedish Accident Investigation Board has investigated an incident that occurred on 13 October 2006 at Luleå/Kallax airport, BD county, to an aircraft registered SE-LNX.

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.

Carin Hellner

Stefan Christensen

Report RL 2007:11e	4
1	FACTUAL INFORMATION
1.1	History of the flight
1.2	Injuries to persons
1.3	Damage to aircraft
1.4	Other damage
1.5	Personnel information
1.5.1	Commander
1.5.2	Co-pilot
1.5.3	Cabin crew members
1.5.4	The crew members' duty schedule
1.6	The aircraft
1.7	Meteorological information
1.8	Aids to navigation
1.9	Communications
1.10	Aerodrome information
1.11	Flight recorders
1.11.1	Flight Data Recorder
1.11.2	Engine parameters
1.11.3	Cockpit Voice Recorder
1.12	Incident site
1.12.2	The aircraft
1.13	Medical information
1.14	Fire
1.15	Survival aspects
1.15.1	General
1.15.2	Actions by the rescue services
1.16	Tests and research
1.16.1	Settings of the engine controls
1.16.2	Runway edge lighting
1.17	Organisational and management information
1.18	Additional information
1.18.1	Equal opportunities aspects
1.18.2	Environmental aspects
1.18.3	Measures taken – by the company
1.18.4	Measures taken – by Luleå/Kallax airport
2	ANALYSIS
2.1	Approach and landing
2.2	Runway conditions
2.3	Engine controls rigging
2.4	The composition of the crew
3	CONCLUSIONS
3.1	Findings
3.2	Causes of the incident
3.3	Similar events
4	RECOMMENDATIONS

Report RL 2007:11e

L-29/06
Report finalised 19 July 2007

<i>Aircraft; registration and type</i>	SE-LNX, BAe Systems ATP
<i>Class/airworthiness</i>	Normal, valid Certificate of Airworthiness
<i>Registered owner/Operator</i>	Siemens Financial Services AB/West Air Sweden AB
<i>Time of occurrence</i>	13 October 2006, at 04:11 hours, in darkness <i>Note:</i> All times are given in Swedish daylight saving time (UTC + 2 hours)
<i>Place</i>	Luleå/Kallax airport, BD län county, (posn. N 65° 32.6' E 022° 07.4'; 10 m above sea level)
<i>Type of flight</i>	Commercial air transport
<i>Weather</i>	According to the SMHI (Swedish Meteorological and Hydrological Institute) METAR at 03:50: Wind 320°/4 knots, visibility 150 m in fog. RVR 550 m, vertical visibility 100 feet. Temperature/dew point +1/+1 °C, QNH 1027 hPa
<i>Persons on board:</i>	
<i>crew members</i>	2
<i>passengers</i>	–
<i>Injuries to persons</i>	None
<i>Damage to aircraft</i>	Limited
<i>Other damage</i>	One runway edge light damaged
<i>Commander:</i>	
<i>Sex, age, licence</i>	Male, 40 years, ATPL
<i>Total flying time</i>	3495 hours
<i>Flying hours previous 90 days</i>	124, all on type
<i>Number of landings previous 90 days</i>	102
<i>Co-pilot:</i>	
<i>Sex, age, licence</i>	Male, 32 years, CPL, IRME
<i>Total flying time</i>	1861 hours
<i>Flying hours previous 90 days</i>	109, all on type
<i>Number of landings previous 90 days</i>	89
<i>Cabin crew members</i>	-

The Swedish Accident Investigation Board (SHK) was notified on 24 October 2006 that an aircraft with registration SE-LNX had an incident at 04:11 hours on that day at Luleå/Kallax airport, BD county.

The incident has been investigated by SHK represented by Carin Hellner, Chairperson, and Stefan Christensen, investigator in charge.

The investigation was followed by Ulrika Svensson, Swedish Civil Aviation Authority.

Summary

The aircraft commenced approach to Luleå/Kallax runway 32 in fog. As it landed the aircraft veered towards the right and struck a runway edge light. During an after-landing check the crew discovered slight damage to one of the tyres on the right main landing gear. According to the data from the aircraft's flight data recorder the engine power had been asymmetrical, which contributed to the aircraft turning towards the edge of the runway during landing.

The incident was caused by failure to maintain the correct heading during landing, probably caused by the differential power from the engines, combined with the limited experience of the pilots concerning this type of aircraft. A contributory factor was that the runway had no centreline lighting and that the runway edge lighting was located far out from the edge of the runway.

Recommendations

None.

1 FACTUAL INFORMATION

1.1 History of the flight

The aircraft departed from Umeå Airport for a freight flight to Luleå/Kallax airport. The co-pilot was the PF (Pilot Flying) for this particular sector. The weather was foggy with visibility of 550 metres along runway 32 at Kallax, which is the minimum permitted visibility for this type of ILS¹-approach.

The aircraft was cleared for approach and began its descent to the airport. The pilots noted that according to the engine instruments there was a difference in engine power, despite the fact that both Power Levers were in the same positions. The approach was carried out using the autopilot, and the pilots got contact with the approach lights at minimum height, whereupon the autopilot was disconnected. During the flare before landing the pilots noticed that the aircraft veered to the right when the engine power was reduced. Rudder control was applied, but the aircraft went out to the edge of the runway before it could be steered back to the centre of the runway.

Apart from the aircraft being to the right of the runway centreline, the pilots otherwise considered the landing to be normal. After taxiing in and parking, the pilots checked the exterior of the aircraft and discovered marks on the outside of the wheel on the right side main landing gear. The commander contacted the control tower, which ordered out a vehicle to check the runway and its lighting fixtures. The air traffic control officer called back to the commander and informed him that the checks had discovered a damaged edge light on the right side of the runway.

The incident occurred at N 65° 32.6' E 022° 07.4'; 10 m (33 feet) above sea level at 04:11 in darkness.

1.2 Injuries to persons

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

1.3 Damage to aircraft

Limited.

1.4 Other damage

One runway edge light fixture at the right side of runway 32 was damaged.

¹ ILS = Instrument Landing System

1.5 Personnel information

1.5.1 Commander

The commander, male, was 40 years old at the time and had a valid Airline Transport Pilot Licence.

<i>Flying hours</i>			
<i>previous</i>	<i>24 hours</i>	<i>90 days</i>	<i>Total</i>
All types	1.0	124	3495
This type	1.0	124	124

Number of landings this type previous 90 days: 102.

Flight training on type carried out on 24 July 2006.

Latest PC (Proficiency Check) carried out on 24 July 2006 on ATP.

1.5.2 Co-pilot

The co-pilot, male, was 32 years old at the time and had a valid CPL-IRME Licence.

<i>Flying hours</i>			
<i>previous</i>	<i>24 hours</i>	<i>90 days</i>	<i>Total</i>
All types	1.0	109	1861
This type	1.0	109	109

Number of landings this type previous 90 days: 89

Flight training on type carried out on 12 July 2006.

Latest PC (Proficiency Check) carried out on 12 July 2006 on ATP.

1.5.3 Cabin crew members

Not applicable

1.5.4 The crew members' duty schedule

This was the first flight on the night roster, and the first day after a planned rest period. The planned duties had been within the permitted limits.

1.6 The aircraft

<i>AIRCRAFT</i>	
<i>Manufacturer</i>	BAe Systems
<i>Type</i>	ATP
<i>Serial number</i>	2061
<i>Year of manufacture</i>	1993
<i>Flight mass</i>	Max. authorised take-off/landing mass 23680 kg, actual 19400 kg
<i>Centre of mass</i>	Index 74, within the permitted range of 55–84.
<i>Total flying time</i>	6228 hours
<i>Number of cycles</i>	4798
<i>Flying time since latest inspection</i>	117 hours
<i>Fuel loaded before event</i>	2500 litres

ENGINES

<i>Manufacture</i>	Pratt and Whitney	
<i>Model</i>	PW 126 A	
<i>Number of engines</i>	2	
<i>Engines</i>	<i>No. 1</i>	<i>No. 2</i>
<i>Total operating time, hrs</i>	5624	5909
<i>Operating time since overhaul</i>	5624	5909
<i>Cycles since overhaul:</i>	4420	4670

PROPELLERS

<i>Propellers</i>	Hamilton Sundstrand 6/5500/F1	
<i>Propeller 1</i>	6742 hours	
<i>Propeller 2</i>	1337 hours	

The aircraft had a valid Certificate of Airworthiness.

1.7 Meteorological information

According to the SMHI (Swedish Meteorological and Hydrological Institute) METAR:

Wind 320°/4 knots, visibility 150 m in fog. RVR 550 m, vertical visibility 100 feet. Temperature/dew point +1/+1 °C, QNH 1027 hPa.

1.8 Aids to navigation

The aircraft performed a normal ILS approach to runway 32. No faults or abnormalities were found concerning the ground equipment or the aircraft's navigational equipment.

1.9 Communications

Not applicable.

1.10 Aerodrome information

The airport status was in accordance with AIP²-Sverige/Sweden. Runway 32 dimensions are 3450 x 45 metres, laid with asphalt. The lighting consisted of controllable low and high intensity lamps on the approach and along the edges of the runway. The runway had a painted centreline without centreline lighting. The ground beyond the edges of the runway consisted of gravel and sand, of variable loading capacity.

At the time of the incident the runway was damp but not wet. There was no record of the braking friction being reduced.

² AIP – Aeronautical Information Publication (Aeronautical information of a long term nature)

1.11 Flight recorders

1.11.1 Flight Data Recorder

The Fairchild type FDR (Flight Data Recorder) on the aircraft was retrieved after the incident. Certain parameters were printed out and are shown as Figure 1 below.

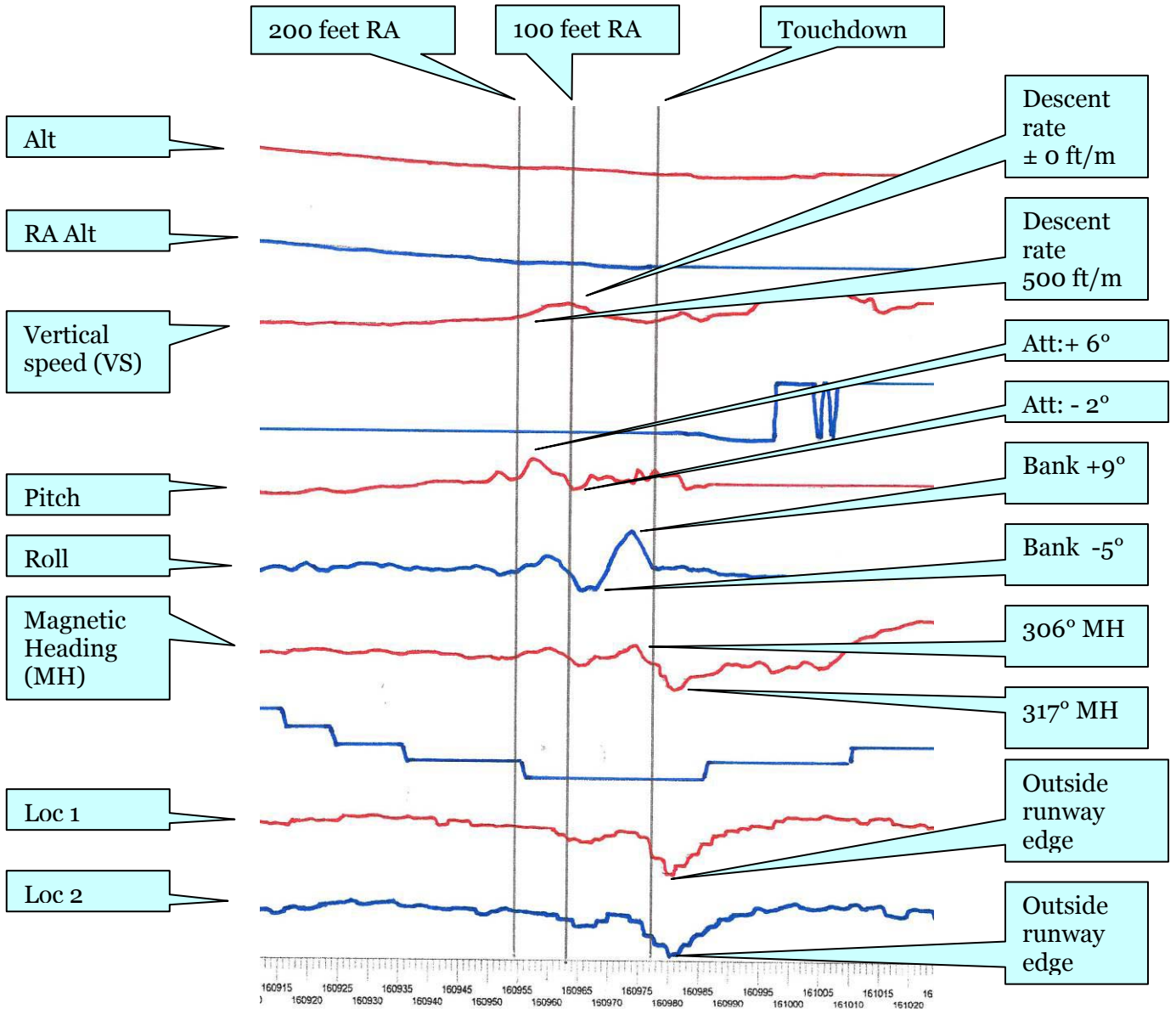


Fig 1. Flight information parameters from the FDR.

- Alt: Barometric height
- RA: Radar height above the underlying terrain
- Pitch: The longitudinal angle of the aircraft
- Roll: The lateral angle of the aircraft
- MH: Magnetic heading
- Loc: Instrument Landing System (ILS) localizer signal

The printout shows that there were very large variations in the aircraft attitude and pitch during the final part of the approach, down to touchdown. The FDR recorded a strong deviation of heading to the right, starting at about 30 feet height, until about five seconds after touchdown.

1.11.2 Engine parameters

RA Alt. (feet)	150	125	100	75	50	25	0
L eng (Tq)	11.6	25.0	52.2	36.6	28.0	8.0	4.2
R eng (Tq)	19.1	33.5	69.9	66.6	50.2	18.8	17.0

Fig 2. Engine parameters from the FDR.

The table in Figure 2 above shows the engine torque values as recorded by the aircraft FDR from 150 feet height until touchdown on the runway. The values for the left (L eng) and right (R eng) engines respectively show the recorded power as Torque (Tq), measured at the respective engine propeller shafts.

Throughout the recordings it is evident that the right engine was delivering more power than the left engine. At about 100 feet height power was increased on both engines, and within the range 50-25 feet power was reduced to flight idle.

1.11.3 Cockpit Voice Recorder

The aircraft was equipped with a Fairchild type Cockpit Voice Recorder. Because of the delay in reporting the incident to the SHK, no relevant information could be retrieved from the Cockpit Voice Recorder (CVR).

1.12 Incident site

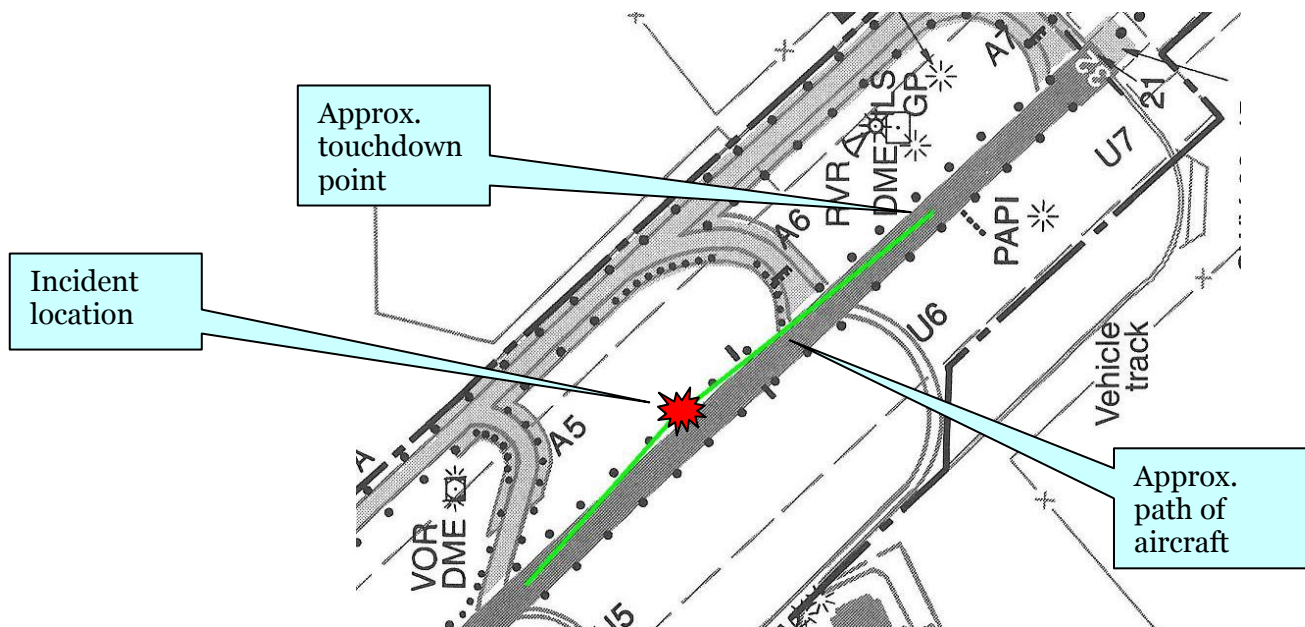


Fig 3. Luleå/Kallax airport, runway 32.

1.12.2 *The aircraft*

After the incident, damage was discovered to one of the tyres on the right side main landing gear. No other damage to the aircraft was found.

1.13 **Medical information**

Nothing indicates that the mental and physical condition of the pilot was impaired before or during the flight.

1.14 **Fire**

There was no fire.

1.15 **Survival aspects**

1.15.1 *General*

The Emergency Locator Transmitter (ELT) of type Artex was not activated in the incident.

1.15.2 *Actions by the rescue services*

Not applicable

1.16 **Tests and research**

1.16.1 *Settings of the engine controls*

After the incident, the engine control settings (rigging) were inspected by the company's technical department. The checks were performed on ground. The highest permitted difference between engine power outputs at identical positions of the power levers is 10 %. According to the company the measured difference during the check was less than 10 %.

Despite the engine values being within the 10% tolerance, the engine controls were re-rigged after the incident. SHK has not been able to obtain any data from the company in respect of this rigging check.

1.16.2 *Runway edge lighting*

According to BCL³ F 2.2 item 26.1.1, the runway edge lighting shall be arranged as follows:

Runway edge lighting must be located outside the complete runway in two parallel lines, and symmetrical in relation to the centreline of the runway. The lines of lights must be located along the edges of the area that has been defined as the runway or at a distance of not more than 3 metres from that edge.

The runway edge lights at Luleå/Kallax airport are 4 metres away from the asphalt-covered edge of the runway. At the time of the incident, as far as SHK can ascertain, no application had been sent to the supervisory authority for a dispensation.

³ BCL – Bestämmelser för Civil Luftfart (Civilian Aviation Regulations)

1.17 Organisational and management information

The company's head office is located in Gothenburg. The technical and operational departments are localised at Lidköping. The business is mainly concerned with flying mail as an entrepreneur, along trunk routes in Sweden and Norway. As a complement to the mail flights, extensive *ad hoc* operations are carried out in the form of freight charter flights.

1.18 Additional information

1.18.1 *Equal opportunities aspects*

Not applicable.

1.18.2 *Environmental aspects*

No known environmental effects.

1.18.3 *Measures taken – by the company*

The commander received additional training after the incident. The company rules for crew composition were tightened after the incident.

After the incident the company informed its group of pilots about the events. The proficiency checks/operator's proficiency checks have been complemented by an element containing approaches and landings on a runway without centreline lighting in minimum visibility conditions.

1.18.4 *Measures taken – by Luleå/Kallax airport*

After the incident an application was sent in from Luleå/Kallax airport to the Swedish Civil Aviation Authority requesting dispensation from the BCL F requirements. The application was received on 31 October 2006. It was approved and issued by the Swedish Civil Aviation Authority on 13 November 2006.

2 ANALYSIS

2.1 Approach and landing

The FDR printouts show that the final part of the approach was not stabilised, and that there were large fluctuations at low height in respect of both pitch and roll. From about 200 feet height, when the autopilot was disconnected, the heading varied by more than 10° until touchdown, which is a remarkable heading deviation when landing in 550 m RVR. The pilots stated that the engine powers differed at similar throttle lever positions, and that this was the reason for the unstable approach.

Analysis of the engine power outputs during the final stage of the approach showed that the right engine delivered more power at every step throughout the recording. In order to compensate for this asymmetric thrust, the rudder has to be used to maintain the desired heading. If the right engine is delivering more power, the aircraft will tend to turn to the left. This must be balanced by an equal force by applying more right rudder. With varying power output in the final stage of the approach, the amount of right rudder

movement also varied, which probably resulted in the large variations in aircraft heading.

On the reduction of power to flight idle, which took place at 50-25 feet height, the difference in engine power reduced. SHK finds it probable that the pilot, in connection with the power reduction, did not reduce the amount of rudder to less than had been necessary earlier, with the result that the aircraft, as power reduced, began to move to the right. According to the FDR the misalignment with the runway began at a height of 30 feet.

2.2 Runway conditions

When approaching a runway in conditions of marginal visibility, it is very important that the aircraft heading is stable. When the pilots at, or just before, reaching the minima, go over to visual references, the conditions of the runway in respect of markings and lighting are the most important aids to a safe landing.

At Luleå/Kallax there were no centreline lights on the runway, which probably contributed to the pilots realising too late that the aircraft was far out to the right of the runway centreline. The fact that the edge lights were located four metres beyond the edge of the runway may have contributed to the pilots not realising in time that they were too close to the runway edge.

2.3 Engine controls rigging

The engine values that were recorded by the FDR during the final stage of the approach showed that the rigging of the engine controls was, in the judgement of SHK, incorrect. The values that were measured show a difference in power that can be considered very large. Performing an approach in marginal visibility with such a large difference in engine power means that a further workload was placed on the pilots.

SHK cannot assess the inspection that the company technical department carried out after the incident, but can say that the imbalance between the result of the inspection and the actual power differences (as recorded by the FDR) witness that the company procedures could probably be improved in this area.

2.4 The composition of the crew

The commander of this particular flight had barely three months of experience on type. The co-pilot had been checked out for three months. No restrictions had been placed on the pilots in respect of, for example, minima.

The limited experience on type of the pilots may have contributed to making their ability to manage the aircraft's characteristics in changing circumstances too low.

3 CONCLUSIONS

3.1 Findings

- a) The pilots were qualified to perform the flight.
- b) The aircraft had a valid Certificate of Airworthiness
- c) Large power variations were recorded during the approach
- d) The engine controls were re-rigged after the incident
- d) The pilots had limited experience of the aircraft type
- e) The runway edge lighting at Luleå/Kallax did not meet the BCL F requirements.

3.2 Causes of the incident

The incident was caused by failure to maintain the correct heading during landing, probably caused by the differential power from the engines, combined with the limited experience of the pilots concerning this type of aircraft. A contributory factor was that the runway had no centreline lighting and that the runway edge lighting was located far out from the edge of the runway.

3.3 Similar events

A similar incident occurred on 19 September 2006 at Umeå airport to an aircraft of the same type, operated by the same company. Refer to the SHK Report RL 2007:10e.

4 RECOMMENDATIONS

None.