



Investigation report

C1/2008L

Airliner wingtip collision with the Lappeenranta airport baggage shelter on 12 February 2008

Translation of the Finnish original report

OK-CCD

SAAB 340B

According to Annex 13 to the Convention on International Civil Aviation, paragraph 3.1, the purpose of aircraft accident and incident investigation is the prevention of accidents. It is not the purpose of aircraft accident investigation or the investigation report to apportion blame or to assign responsibility. This basic rule is also contained in the Investigation of Accidents Act, 3 May 1985 (373/85) and European Union Directive 94/56/EC. Use of the report for reasons other than improvement of safety should be avoided.

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SUMMARY

An incident occurred at Lappeenranta airport on Tuesday, 12 February 2008 at 00:19 Finnish time when the right wingtip of a SAAB 340B airliner collided with the roof corner beam of the airport terminal baggage shelter. There were nine passengers and three crew members onboard. Accident Investigation Board Finland appointed an investigation commission for this occurrence. Investigator Ari Huhtala was named investigator-in-charge, accompanied by investigators Hannu Halonen and Asko Nokelainen as members of the commission. Dr Päivikki Eskelinen-Rönkä and Mr Esko Lähteenmäki were invited as experts to the commission.

Job Air's scheduled flight JBR039 from Helsinki-Vantaa landed in Lappeenranta at 00:15. The flight was operated by Czech Job Air. During taxiing the flight crew reported hydraulic problems to the ATC and stopped the aircraft on the taxiway. Following this, they slowly taxied to the apron and parked a little farther away from the usual stand than normal. The flight crew began to turn off the engines by feathering the propellers. Suddenly the aircraft lurched forward towards the baggage shelter, adjacent to the terminal. The flight crew then turned the engines off by closing the fuel cocks. They managed to steer the aircraft slightly to the left, resulting in the right wingtip hitting the corner beam of the shelter roof. The aircraft came to rest with both engines turned off. The incident did not cause any injuries to persons. At 00:26 the air traffic controller at Lappeenranta reported the occurrence to the Area Control Centre (ACC) South Finland, which in turn alerted the Accident Investigation Bureau (AIB) Finland.

Investigation revealed that a brake line swivel from the inner wheel of the left main gear was fractured and that hydraulic fluid had leaked onto the ground during taxiing. There were traces of yellow paint on the broken swivel and on the landing gear.

The morning after the incident Helsinki-Vantaa airport maintenance personnel found a broken taxiway lighting fixture at the throat to taxiway WK. The yellow shaft of this fixture was scratched and had black rubber marks on it. Investigation revealed that the wheels of the left main gear had hit the taxiway lighting fixture during its previous landing at Helsinki-Vantaa airport. The result of this collision was that the brake line swivel of the left main gear's inner wheel had been fractured.

The incident was caused by the flight crew by not being careful enough when starting the shutting down procedure of the practically brakeless aircraft's engines too close to the terminal. This resulted in the engines momentarily providing increased thrust lurching the aircraft towards the baggage shelter.

The investigation commission issued two safety recommendations, the first advised the airline to make certain that their pilots have sufficient training with regard to abnormal situations. The second safety recommendation urged the airline to use adequately high-quality flight recorders.

Finnish aviation authority did not have anything to comment to the investigation report. Neither did Air Accident Investigation Institute of the Czech Republic and Swedish Accident Investigation Board have any comments. Finavia and the aircraft manufacturer did not have any comments. Job Air – Central Connect Airlines s.r.o. do have comments. Those comments have been taken into account in the Investigation report.



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SYNOPSIS

A Czech Job Air - Central Connect Airlines s.r.o. SAAB 340B airliner, registration OK-CCD, was on a scheduled flight from Helsinki to Lappeenranta on Tuesday, 12 February 2008. The call sign of the aircraft was JBR039. There were nine passengers and three crew members onboard.

As the aircraft was vacating the runway after landing, the flight crew received a hydraulic system caution. While the engines were being turned off the aircraft lurched forward and the right wingtip collided with the corner beam of the baggage shelter's roof. The wingtip was damaged, the corner beam was scratched and a terminal window dented. Passengers were then asked to enter the terminal and the aircraft was not moved.

All times in the investigation report are in Finnish time. The occurrence took place at 00:19. The air traffic controller at Lappeenranta reported the occurrence to the Area Control Centre (ACC) South Finland, which in turn alerted the person on duty at Accident Investigation Bureau (AIB) Finland. Following this, the chief air accident investigator of AIB Finland phoned Lappeenranta ATC for additional information with regard to the occurrence. Lappeenranta state local district police investigated the scene and performed a breathalyzer test on both pilots. The results for each of them showed zero blood alcohol.

On 4 February 2008, based on additional information, Accident Investigation Board Finland appointed an investigation commission, C1/2008L, to this occurrence. Investigator Ari Huhtala was named investigator-in-charge, accompanied by investigators Hannu Halonen and Asko Noke-lainen as members of the commission. Dr Päivikki Eskelinen-Rönkä and Mr Esko Lähteenmäki were invited to participate as experts.

The course of events was established from the accounts of the pilots and airport maintenance personnel, marks left on the runway, the aircraft, terminal and apron as well as from the police patrol report. Saab Aerosystems AB downloaded the digital flight data recorder (DFDR) in Linköping, Sweden on 5.2.2008. Finnair Oyj downloaded the Cockpit Voice Recorder (CVR) data at Helsinki-Vantaa airport on 4.2.2008. Documents were used to determine the condition of the apron and the aircraft, crew proficiency and training as well as the operator's instructions at the time of the occurrence. The material used in the investigation is archived at Accident Investigation Board Finland.

Pursuant to the Accident Investigation Decree, a draft investigation report was promulgated for statement to the Finnish Civil Aviation Authority, Czech Air Accidents Investigation Institute, Swedish Accident Investigation Board (Statens haverikommission SHK), Finavia, Lappeenranta and Helsinki-Vantaa airports, the European Aviation Safety Agency (EASA) and to Job Air - Central Connect Airlines s.r.o. Statements and comments were received by 3.4.2009. The issues contained in the statements and comments have been taken into account in the investigation report.

The investigation was completed on 7.4.2009. The investigation report was translated into English.

1 FACTUAL INFORMATION

1.1 History of the flight

A scheduled flight from Helsinki-Vantaa landed in Lappeenranta at 00:15. There were nine passengers and three crew member onboard. After landing the ATC cleared the aircraft to taxi to the apron. As they entered the taxiway the flight crew reported hydraulic problems to the ATC and stopped the aircraft on the taxiway at the side of the apron. The ATC said that they could park the aircraft where they were, however, the pilots taxied closer to their usual stand.

The flight crew gave hand signals to the ground handler, indicating that they wanted him to move to the side while they were taxiing. They slowly taxied to the apron and parked a little farther away than normal from the usual stand. The flight crew began to turn off the engines by feathering the propellers. Suddenly the aircraft lurched forward towards the baggage shelter, adjacent to the terminal. The flight crew then turned the engines off by closing the fuel cocks. They managed to steer the aircraft slightly to the left, resulting in the right wingtip hitting the corner beam of the shelter's roof. The aircraft came to rest with both engines turned off.



Figure 1. The aircraft at a standstill after the collision



The passengers deplaned normally, obviating the need for any rescue operation. The air traffic controller at Lappeenranta reported the occurrence to the Area Control Centre (ACC) South Finland, which in turn alerted the Accident Investigation Bureau (AIB) Finland. Following this, the chief air accident investigator of AIB Finland phoned Lappeenranta ATC for additional information with regard to the occurrence. Lappeenranta state local district police investigated the scene and performed a breathalyzer test on both pilots. The results for each of them showed zero blood alcohol.

Pursuant to aviation regulation, the captain of the aircraft filed an air traffic incident report to the Finnish CAA. The air traffic controller filed a corresponding GEN M1-4-based ATS Occurrence Report (PHI reporting form). The Finnish CAA forwarded both reports to AIB Finland. The aircraft's flight recorders were removed on 12.2.2008 in Lappeenranta and handed over to AIB Finland.

1.2 Injuries to persons

None of the passengers or crew members was injured on the flight.

1.3 Damage to aircraft

The right wingtip was torn and a lighting fixture was broken.

1.4 Other damage

The corner beam of the baggage shelter's roof was scratched and a terminal window was slightly bent inwards.

1.5 Personnel information

OK-CCD pilot-in-command: Age 59

Licences: JAR Air Transport Pilot's Licence, valid until 30.9.2008

Medical certificate: JAR class 1, valid until 31.3.2008

Ratings: All required ratings were valid.

Flying experience	Last 24 hours	Last 30 days	Last 90 days	Total hours and landings
All types	4 h 35 min	41 h 10 min	134 h 35 min	17 000 h
Type in question	4 h 35 min	41 h 10 min	134 h 05 min	896 h

OK-CCD co-pilot: Age 44

Licences: JAR Air Transport Pilot's Licence, valid until 27.3.2011

Medical certificate: JAR class 1, valid until 29.6.2008

Ratings: All required ratings were valid.

Flying experience	Last 24 hours	Last 30 days	Last 90 days	Total hours and landings
All types	4 h 50 min	44 h 40 min	112 h 20 min	1845 h
Type in question	4 h 50 min	44 h 40 min	112 h 20 min	785 h

1.6 Aircraft information

Type SAAB 340B

Registration OK-CCD

Owner/operator Job Air-Central Connect Airlines s.r.o, Czech Republic

Manufacturer Saab Aircraft AB, Sweden

Serial number 161

The Saab 340B is a two-engine, low-wing, 33 seat turboprop aircraft. Its length is 19.73 m, wingspan 21.44 m and height 6.97 m. Maximum takeoff weight is 13,155 kg and maximum landing weight 12,930 kg.

1.6.1 Airworthiness

The certificate of registration Č. / no. 5280/1 was issued on 16.4.2007. The certificate of airworthiness was issued on 16.4.2007 and was valid until 15.4.2008.

1.6.2 Mass and balance

The mass and centre of gravity were within the permissible range. The fuel load was 1,150 kg (1,440 l) at the time of the occurrence.

1.7 Airport information

1.7.1 Lappeenranta airport

Finavia operates Lappeenranta airport. The single asphalt-paved runway, 06/24, is 2500 m long and 60 m wide. The apron in front of the terminal is approximately 100m x 200 m in size.

1.7.2 Helsinki-Vantaa airport

Helsinki-Vantaa airport is an airport operated by Finavia. There are three asphalt-paved runways as well as taxiways and aprons. RWY 04L/22R is 3060 m long, RWY 04R/22L is 3440 m long and RWY 15/33 is 2901 m long. All runways are 60 m wide.

1.7.3 Flight recorders

OK-CCD was equipped with Fairchild flight recorders, manufactured by L3 Communications Aviation Recorders (USA). The recorders were of the following type:

- Digital Flight Data Recorder (DFDR) Sundstrand (Honeywell), part no. 980-4100-DXUN, serial no. 3913, and
- Cockpit Voice Recorder (CVR), part no. 93-A100-83, serial no. 25994.

AIB Finland had the flight recorders removed from the aircraft. On 19.2.2008 Saab Aerosystems AB downloaded the Digital Flight Data Recorder (DFDR) in Linköping, Sweden in the presence of the investigation commission. The recording was unclear and of poor quality.

The CVR was not stopped immediately after the occurrence. However, the event itself was still audible on the tape. Finnair Oyj downloaded the Cockpit Voice Recorder (CVR) data at Helsinki-Vantaa airport on 19.2.2008 under the supervision of the investigation commission. The recording was extremely unclear and of poor quality.

The investigation commission analysed the recordings. They were instrumental in establishing the course of events.

1.8 Wreckage and impact information

1.8.1 Lappeenranta airport

After the occurrence there was a visible trail of hydraulic fluid on the ground in the movement area and on the apron. The trail began on the runway just before the taxiway to the apron and continued on the taxiway and the apron all the way to the spot where the aircraft finally came to rest. There was more fluid in places where the aircraft had stopped.

The stand area on the apron to which an airport maintenance worker, acting as a ground handler, intended to guide the aircraft was slightly slushy and wet. Braking action in the area was good. Elsewhere the apron was covered by a thin layer of wet snow and slush. When the right wingtip hit the corner beam of the baggage shelter's roof the beam was scratched and a terminal window was damaged.

1.8.2 Investigation of the aircraft

The right wingtip of the aircraft collided with the corner beam of the baggage shelter's roof. The wingtip, including navigation lights in it, broke. No other damage was detected elsewhere on the wing structure.

The brake line swivel of the left main gear's inner wheel was broken and the severed end of the line was on the ground behind the wheel. The hydraulic fluid had leaked onto the ground and the hydraulic system was empty.



Figure 2. The brake line broken at the swivel as well as a pool of hydraulic fluid on the ground

Traces of yellow paint were detected on the underside of the brake assembly, close to where the swivel was attached and on the swivel itself as well as on the threaded brake line coupling.



Figure 3. Yellow paint underside of the brake assembly

1.8.3 Helsinki-Vantaa airport

The previous flight of the aircraft (JBR 038) had been flown from Lappeenranta to Helsinki. After landing on RWY 04L the aircraft taxied via taxiways WK, W and Y to its stand at the southern end of the domestic terminal. Later in the evening, departing for Lappeenranta, the aircraft taxied via taxiways to RWY 22R from where it took off.

The morning after the incident Helsinki-Vantaa airport maintenance personnel found a broken taxiway lighting fixture at the throat to taxiway WK. The yellow shaft of the fixture was scratched and had black rubber marks on it.



Figure 4. A taxiway lighting fixture and its broken shaft (left)

1.9 Survival aspects

There was no need to launch a rescue operation.

1.10 Tests and research

1.10.1 The effect of the hydraulic fuel leak

The undercarriage, wing flaps, nose wheel steering and wheel brakes operate on hydraulic power. After landing in Lappeenranta the left main gear inner wheel's brake line swivel was broken. Hydraulic fluid leaked onto the ground every time the left brake was applied. Gradually the system drained, the hydraulic pump was not able to deliver sufficient pressure which resulted in a hydraulic caution.

There are also hydraulic pressure reservoirs in the system for different functions. Should the hydraulic pump malfunction, equipment can be operated by using the pressure therein. However, this pressure was also lost because of the fluid leak. After there was virtually no hydraulic fluid left in the system, brakes and nosewheel steering were no longer available.

1.10.2 Clarification of the failure mechanism of the brake line swivel

The broken swivel of the brake line from the left main gear's inner wheel was sent to the Technical Research Centre of Finland (VTT) for examination. The swivel was visually inspected and then examined with a stereo microscope as well as a scanning electron microscope.¹

Examination with a scanning electron microscope showed that the appearance of the main fracture surface area was dimpled, typical of ductile fracture. At a considerable portion of this ductile fracture surface area the dimples were orientated typically to a ductile shear fracture. The main part of both fracture surfaces was in an angle of about 45° compared to the tube axis and had a homogenous and matt appearance. The fracture surface contained an impact indentation with arched grooves corresponding to the appearance of the machined surface of the nut part. Examination also found that...this zone...contained radial ridges indicating numerous crack origins at the outer surface of the swivel as well as narrow parallel striations typical of fatigue fracture.

Discussion of the results states the following: *The examinations performed showed that the fracture surface of the examined swivel contains a narrow zone with an appearance typical of fatigue fracture. This finding indicates that a gradually growing fatigue crack has existed in the examined swivel. The origin of the fluctuated stresses causing the fatigue crack cannot be clarified on the basis of the investigations performed. The examinations did not either reveal signs of manufacturing defects or any other deviating features at the origin area of the fatigue crack. On the basis of the maximum crack depth (about 0.1 mm) and the width of the observed fatigue striation (about 0.5 µm) the minimum number of loading cycles during the crack growth stage has been about 200, but the real number may be even several orders of magnitude higher. During the final fracturing the depth of the fatigue crack has been small, the maximum depth being about 0.1 mm.*

Fracturing of the swivel has occurred suddenly as a ductile fracture. Since the fatigue crack was small and so the strength of the component has been reduced only to a very small amount, the fracturing must have been caused by high loadings during exceptional conditions and not during normal service. It is, however, apparent that without the occurred failure the fatigue crack would have continued the gradual propagation during service.

1.10.3 Audio investigation

Cockpit Voice Recorder (CVR) data were used to analyse technical sounds. It was detected that on the previous flight the aircraft's hydraulic pump was momentarily on before the flight crew selected gear down. No similar sound can be detected in the same

¹ The following italicized text is a direct quote and copied by permission from the report *Clarification of the failure mechanism of a swivel*, Research Report no. VTT-S-03748-08, Technical Research Centre of Finland, 22 April 2008.

phase of the flight in later recorded database samples of technical and aerodynamic sounds from the same aircraft.

During landing the aircraft's hydraulic pump came on 13 seconds after touchdown. First the pump was on for 16 seconds and then, after a pause of 6 seconds, for a further three seconds. After that the sound of the pump became louder, increasing in pitch. The pump was on for 16 seconds at a higher RPM. Following this, the sound of the hydraulic pump was no longer audible on recorded CVR data.

Due to the poor quality of the CVR recordings it was extremely difficult to make out what the pilots were saying while the engines were still running.

1.10.4 Helsinki-Vantaa airport taxiing arrangements

In the Helsinki-Vantaa movement area the rapid exit taxiway WK is on the right side of RWY 04L, approximately 1860 metres from the threshold. Approximately 350 m before it the intersection to TWY WM was under construction. The area between TWY WK and the threshold of RWY 04L is extensively paved. Four taxiway throats as well as the one to TWY WM, under construction at the time, are in that area.

1.11 Organizational and management information

1.11.1 Fly Lappeenranta

Oy Fly Lappeenranta Ltd is a company providing scheduled traffic between Helsinki-Vantaa and Lappeenranta, including customer service. The company's marketing name is Tango. Shareholders include *Lappeenrannan Kaupunkiyhtiöt Oy* as well as two individual investors. The company has selected the Czech Job Air - Central Connect Airlines (CCA) to fly the scheduled routes.

In addition to the managing director there are sales personnel and office staff in Lappeenranta. Office personnel were being trained for cabin duties at the time of the occurrence. Ground services at Helsinki-Vantaa were procured from a company called Touch'n Go.

1.11.2 Job Air

The Czech Job Air - Central Connect Airlines s.r.o flew the scheduled flights between Helsinki-Vantaa and Lappeenranta with a SAAB 340B turboprop aircraft. The company's principal place of business is Ostrava, Czech Republic. At the time of the occurrence the airline's fleet comprised six SAAB 340 A/B and two Let L-410 turboprop aircraft. The airliner's JAR OPS 1-based Charter as well as Operating Licence no. 13E, issued on 5.12.2007, were valid. The Air Operator Certificate, no. CZ-57 was valid until 31.3.2008. The company had prepared instructions for operations in Finland.



Central Connect Group a.s. owns Job Air Airlines. Moreover, Central Connect Group a.s. owns an aircraft maintenance company, a company that sells spare parts and provides logistics services as well as a company that provides flight and ground crew training services.

The company's line maintenance in Lappeenranta was the responsibility of Central Connect Group's aircraft maintenance subsidiary. The company's PART 145 licence number was cz.145.0030. The company used an airport hangar owned by *Lappeenrannan Kaupunkiyhtiöt Oy* for line maintenance. Together with the Finnish CAA the Czech aviation authority audited the line maintenance facilities on 26.2.2008.

2 ANALYSIS

2.1 Swivel fracture

The previous flight of the occurrence aircraft had been flown from Lappeenranta to Helsinki-Vantaa. After the landing the aircraft exited RWY 04L via taxiway (TWY) WK. The morning after the incident occurred Helsinki-Vantaa airport maintenance personnel inspected the area and found a broken taxiway lighting fixture at the throat to taxiway WK. The yellow shaft of this fixture was scratched and it had black rubber marks on it. Airport maintenance personnel say that they find toppled taxiway lighting fixtures in this area from time to time. Investigation revealed that the area preceding TWY WK can be difficult to taxi, especially, at night or in poor visibility.

The inner wheel brake line swivel on the left main gear broke when it hit the aforementioned taxiway lighting fixture. Traces of similar yellow paint with which the broken taxiway lighting fixture was painted were found on the underside of the brake cylinders, close to where the swivel was attached, as well as on the swivel itself and on the threaded brake line coupling.

The flight crew did not notice anything out of the ordinary with the undercarriage during the pre-flight inspection. Because the swivel at the end of the brake line was damaged and there were scuff marks on the brake assembly it is evident that the swivel was already broken during the flight. There was little need to use brakes during taxiing after the landing, or while taxiing to the runway a little later before the next takeoff. And since there was only a little pressure in the brake system when the aircraft taxied, no major hydraulic leaks occurred.

After the takeoff from Helsinki-Vantaa the landing gear came up normally because there was still enough hydraulic fluid and sufficient pressure in the system. However, the possible use of brakes on the ground as well as the automatic braking which occurs when landing gear is retracted reduced the amount of hydraulic fluid in the system. This view is also supported by the audio investigation which established that the hydraulic pump was momentarily on during the approach before the landing gear was selected down. No similar sound was detected in the same phase of the flight in the recorded database samples of technical and aerodynamic sounds.

2.2 Post-landing events

When the pilots applied brakes during the landing roll in Lappeenranta, hydraulic fluid began to gush from the broken swivel. The fluid level in the system fell and hydraulic pressure dropped so much that it triggered the hydraulic pump. First the pump was on for 16 seconds and then, after a pause of 6 seconds, a further three seconds. Then the sound of the pump became louder, increasing in pitch. This happened because there was no hydraulic fluid left in the reservoir. As hydraulic pressure dropped, the system flashed a caution to the pilots. They brought the aircraft to a halt at the side of the apron.



However, they then decided to taxi closer to the stand, probably in an attempt to spare the passengers from a nonstandard deplaning to the terminal.

They carefully taxied forwards, stopping a little short of their normal stand. According to the pilots' account they still had hydraulic pressure in the outer wheels' brake system. Following this, the flight crew began to turn off the engines. Propeller controls were pulled back into the feather position, which moves the blades parallel with the line of flight, into a position of minimum air resistance. Suddenly the propellers provided a momentary increase in thrust, causing the aircraft to lurch forwards. This phenomenon is normally prevented by using the parking brake. However, in this case the parking brake was virtually useless because the hydraulic fluid reservoir was empty. Hence, the aircraft unexpectedly lurched forwards, at first turning to the right. Then, a slight nosewheel steering effect managed to turn it a little to the left before the wingtip collided with the corner beam of the baggage shelter's roof. While this was happening the pilots pulled the prop controls fully backwards into the fuel-off position, thereby closing the fuel cocks and turning the engines off.

According to the aircraft manufacturer's instructions they should have at the very latest parked the aircraft on the taxiway and turned the engines off. Prior to turning off the engines they should have exercised particular caution by following the Operations Manual and checklists when they pulled the prop controls into the feather position.

It is possible that a serious incident and the ensuing publicity that involved the company on the same route only 12 days before influenced the pilots to taxi closer to the terminal and the normal stand. At the time of the prior incident the aircraft veered off the runway during landing. By parking far from the terminal they could have attracted adverse attention among the passengers and thereby possibly damage the company's image.

3 CONCLUSIONS

3.1 Findings

1. The certificate of registration and the airworthiness certificate were valid.
2. The pilots had valid licences and the required qualifications.
3. The flight was a scheduled flight. Night conditions prevailed.
4. The mass of the aircraft and centre of gravity were within the permissible range.
5. During the previous landing at Helsinki-Vantaa airport the left main gear wheels hit a taxiway lighting fixture.
6. As a result of the aforementioned collision the left main gear's inner wheel brake line swivel broke.
7. The stand at Lappeenranta airport was snowless, although wet. Braking action was good on the apron.
8. During taxiing the pilots received a hydraulic system caution. Nevertheless, they decided to taxi closer to their normal stand.
9. After the occurrence there was no fluid left in the hydraulic system.
10. As the engines were being turned off the aircraft suddenly lurched towards the airport terminal.
11. The pilots tried to steer the aircraft to the left, away from the terminal. However, they did not manage to avoid a collision.
12. The right wingtip of the aircraft collided with the corner beam of the airport terminal baggage shelter's roof. The wingtip and the navigation light broke.
13. The corner beam of the baggage shelter's roof was scratched and a terminal window slightly bent inwards and partly loosened.
14. The pilots did not comply with the Operations Manual or the checklists upon receiving the hydraulic system caution.
15. The quality of the Digital Flight Data Recorder (DFDR) and the Cockpit Voice Recorder (CVR) recordings were extremely poor.
16. No persons were injured in the incident.
17. There was no need to launch a rescue operation.
18. According to ICAO Annex 13 the classification of this occurrence is Incident.



3.2 Probable cause

The incident was caused by the flight crew by not being careful enough when starting the shutting down procedure of the practically brakeless aircraft's engines too close to the terminal. This resulted in the engines momentarily providing increased thrust lurching the aircraft towards the baggage shelter.

4 RECOMMENDATIONS

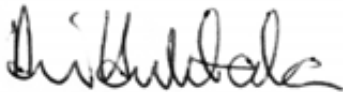
When the pilots received the hydraulic system caution they should have brought the aircraft to a halt and turned off the engines as per instructions and far enough away from any structures.

1. The airline shall ensure that their pilots have sufficient training for abnormal situations.

The recordings of the Digital Flight Data Recorder (DFDR) and the Cockpit Voice Recorder (CVR) were poor in quality and unclear.

2. The airline shall ensure that they use sufficiently high-quality flight recorders.

Helsinki 7.4.2009



Ari Huhtala



Hannu Halonen



Asko Nokelainen