



Final report RL 2019:10e

Serious incident at Trollhättan/Vänersborg airport on 9 October 2018 involving the aircraft YL-RAI of the model ATR-72-202, operated by RAF-AVIA.

File no. L-145/18

5 September 2019

SHK investigates accidents and incidents from a safety perspective. Its investigations are aimed at preventing a similar event from occurring in the future, or limiting the effects of such an event. The investigations do not deal with issues of guilt, blame or liability for damages.

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General observations

The Swedish Accident Investigation Authority (Statens haverikommission – SHK) is a state authority with the task of investigating accidents and incidents with the aim of improving safety. SHK accident investigations are intended to clarify, as far as possible, the sequence of events and their causes, as well as damages and other consequences. The results of an investigation shall provide the basis for decisions aiming at preventing a similar event from occurring in the future, or limiting the effects of such an event. The investigation shall also provide a basis for assessment of the performance of rescue services and, when appropriate, for improvements to these rescue services.

SHK accident investigations thus aim at answering three questions: *What happened? Why did it happen? How can a similar event be avoided in the future?*

SHK does not have any supervisory role and its investigations do not deal with issues of guilt, blame or liability for damages. Therefore, accidents and incidents are neither investigated nor described in the report from any such perspective. These issues are, when appropriate, dealt with by judicial authorities or e.g. by insurance companies.

The task of SHK also does not include investigating how persons affected by an accident or incident have been cared for by hospital services, once an emergency operation has been concluded. Measures in support of such individuals by the social services, for example in the form of post crisis management, also are not the subject of the investigation.

Investigations of aviation incidents are governed mainly by Regulation (EU) No 996/2010 on the investigation and prevention of accidents and incidents in civil aviation and by the Accident Investigation Act (1990:712). The investigation is carried out in accordance with Annex 13 of the Chicago Convention.

The investigation

SHK was informed on 27 December 2018 that a serious incident involving an aircraft with the registration YL-RAI had occurred at Trollhättan/Vänersborg airport in Västra Götaland County, on 9 October 2018 at 18:58 hrs.

The incident has been investigated by SHK represented by Ms Helene Arango Magnusson, Chairperson, Mr Nicolas Seger, Investigator in Charge and Mr Alexander Hurtig, Investigator Behavioural Science.

Mr Visvaldis Trubs has participated as accredited representative on behalf of Latvian Transport Accident and Incident Investigation Bureau (TAIIB).

Mr Vincent Ecalte has participated as accredited representative on behalf of the French safety investigation authority (BEA).

Ms Alice Calmels and Ms Marine Jacob have participated as advisors from the type certificate holder ATR-GIE Avions de Transport Régional.

Mr Lars Kristiansson has participated as the advisor of the Swedish Transport Agency.

The following organisations have been notified: International Civil Aviation Organisation (ICAO), European Aviation Safety Agency (EASA), the European Commission, French safety investigation authority BEA, the Latvian safety investigation authority TAIIB and the Swedish Transport Agency.

Investigation material

- Reports from the airport and air traffic control
- Images from the airport
- Measurements from the airport
- Pilot reports to RAF-AVIA
- Operator's investigation
- Interviews with airport personnel, the pilots involved and two other pilots who were at the airport
- Information from the Latvian civil aviation agency regarding its audit of the operator's activities
- Information from ATR regarding the aircraft and its operation

A meeting with the interested parties was held on 7 May 2019. At the meeting SHK presented the facts discovered during the investigation, available at the time.

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Aircraft:	
Registration, type	YL-RAI, ATR-72
Model	ATR-72-202
Class, Airworthiness	Normal, Certificate of Airworthiness and Valid Airworthiness Review Certificate (ARC) ¹
Serial number	493
Operator	RAF-AVIA
Time of occurrence	9 October 2018, 18:58 hrs during darkness
	Note: All times are given in Swedish day-light saving time (UTC ² + 2 hours)
Place	Trollhättan/Vänersborg airport, Västra Götaland County, (position 5819N 01220E, 137 feet above mean sea level)
Type of flight	Commercial
Weather	According to METAR ³ : wind 230 degrees, 19 knots with gusts of 32 knots, visibility >10 kilometres, cloud 8/8 with bas at 3,000 feet, temperature/dewpoint +14/+10 °C, QNH ⁴ 1,012 hPa
Persons on board:	3
crew members including cabin crew	3
passengers	None
Injuries to persons	None
Damage to aircraft	None
Other damage	Damage to an airport runway edge light
Pilot in command:	
Age, licence	55 years, ATPL ⁵
Total flying hours	9,300 hours, of which 198 hours on type
Flying hours previous 90 days	91 hours, all on type
Number of landings previous 90 days	42
Pilot in command under supervision	
Age, licence	49 years, ATPL
Total flying hours	9,200 hours, of which 520 hours on type
Flying hours previous 90 days	91 hours, all on type
Number of landings previous 90 days	42

¹ ARC – Airworthiness Review Certificate.

² UTC – Coordinated Universal Time.

³ METAR – Aerodrome routine meteorological report.

⁴ QNH – Barometric pressure reduced to mean sea level.

⁵ ATPL – Airline Transport Pilot License.

SUMMARY

The incident occurred on 9 October 2018 in conjunction with a landing at Trollhättan/Vänersborg airport. The aircraft of model ATR-72-202 was operated by Latvian airline RAF-AVIA. There were two pilots and one technician on board.

During the landing, which took place with a crosswind from the left, the aircraft came off the runway on the left side, damaged a runway edge light and thereafter rolled back onto the runway.

The runway excursion was not reported by the crew. The damaged edge light and the tyre tracks were discovered by airport personnel, who noted that the tracks could only have been left by the aircraft in question. This was reported to the Swedish Transport Agency and to the operator.

SHK makes the assessment that the incident was caused by the following factors:

- The operator and the pilots had not read ATR's flight operations information message (FOIM) regarding recommended procedures for crosswind landings.
- The operator's pilots lacked full training in crosswind landings on the aircraft model.

Due to the incident, the Latvian civil aviation agency has carried out an inspection of the operator. This has led to a number of recommendations regarding measures for the operator to take, for example regarding reporting culture, risk assessments and training initiatives.

The type certificate holder of the aircraft has decided to introduce supplementary information on crosswind landings in the aircraft FCOM, in order to recall basic pilot training technique for crosswind landing.

The operator has introduced a number of training measures to improve safety in conjunction with crosswind landings on the aircraft type.

Safety recommendations

Considering the measures already taken and planned by the operator, the type certificate holder and the Latvian aviation agency, SHK has chosen not to issue any recommendations.

1. FACTUAL INFORMATION

1.1 History of the flight

1.1.1 *Conditions*

The flight began on 9 October 2018 from Stettin/Goleniów airport in Poland with destination Trollhättan/Vänersborg airport in Sweden. The flight, which was a commercial cargo flight, was operated by Latvian airline RAF-AVIA. There were two pilots and one technician on board. The technician was sitting in the cockpit jump seat⁶.

The flight was a LIFUS flight⁷. The pilot in the left seat was in training (PICUS⁸), while the pilot on the right was the pilot in command and line flying instructor.

The aircraft, model ATR-72-202, is manned by two pilots. The nose-wheel steering is controlled by the tiller on the left side of the cockpit. Therefore, on the ground and for speeds up to 70 knots, the pilot flying is the pilot in the left seat.

1.1.2 *Reporting by the airport*

During the airport weekly routine check on 11 October 2018, i.e. two days after the incident, it was discovered that a runway edge light outside the left part of the runway was lying on the grass. Upon closer inspection a few days later, it was discovered that the edge light had been run over. It was also noted that there were tyre tracks on the runway continuing out into the grass, past the edge light, and back onto the runway. The width of the tracks was measured to 4.1 metres. The only aircraft with the corresponding wheel width that had been to the airport in the last few days was the aircraft YL-RAI. The runway edge light and the tyre tracks were photographed by airport staff (see figures 1 and 2).

⁶ Jump seat – Seat at the back of the cockpit between the pilots.

⁷ LIFUS – Line Flying Under Supervision.

⁸ PICUS – Pilot in Command under Supervision.



Figure 1. Tyre tracks in the landing direction towards the left edge of the runway.
Photo: Trollhättan/Vänersborg airport.



Figure 2. Tyre tracks going past the hit runway edge light and back onto the runway.
Photo: Trollhättan/Vänersborg airport.

The airport's air traffic control ACR⁹ and the airport aviation safety coordinator reported the incident in the airport's management system. These reports were then forwarded to the Swedish Transport Agency. According to the reports, the radio communication recordings made by the ACR in conjunction with YL-RAI's approach and landing at the airport had been checked. The recordings showed that the air traffic controller reported a direct crosswind with a wind speed of 17 knots to the crew on three separate occasions just prior to touchdown.

The airport manager informed the operator RAF-AVIA of the incident on 18 October 2018. RAF-AVIA later conducted its own investigation of the incident.

⁹ ACR – Aviation Capacity Resources.

1.1.3 Reporting by the pilots

Each of the pilots submitted a report on the landing to RAF-AVIA. These reports are more or less identical and both are dated 18 October 2018. According to these reports, the landing was carried out without any deviations, with a wind direction of 250–290 degrees and a wind speed of 16–18 knots.

1.1.4 Operator investigation

RAF-AVIA's internal investigation of the incident is dated 13 December 2018. According to the investigation, there were difficulties keeping the aircraft on the runway centre line due to gusty crosswinds. During the rollout, the ailerons were not deflected against the wind, which contributed to the aircraft briefly coming off the runway to the left, out into the grass, and possibly damaging the runway edge light.

RAF-AVIA's report was submitted to the Latvian civil aviation agency¹⁰ on 18 January 2019.

1.1.5 Sequence of events according to interviews with the pilots

SHK conducted interviews with the pilots in February and March 2019. The pilots have said that there was a crosswind during the approach and that the landing took place in the dark on runway 33. The pilot in command, who was sitting in the right seat, was manoeuvring the aircraft during the approach and landing. In conjunction with the rollout, and at a speed of 70 knots, the pilot in the left seat took over the controls.

One of the pilots has also said that the ailerons were not sufficiently deflected into the wind in conjunction with the hand-over, which caused the aircraft to drift slightly to the left. However, according to him, the rollout proceeded normally after that. The aircraft was taxied back from the end of the runway to the apron, where it was parked. The other pilot has stated that he does not remember anything from the touchdown and rollout.

The pilots have furthermore stated that they conducted a routine check of the aircraft after the flight and found nothing out of the ordinary. The aircraft technical logbook was signed without remark.

1.1.6 Witnesses at the airport

The approach and landing were observed by two members of the airport staff, by two pilots on the apron and by the air traffic controller in the tower. Everyone has said that the landing appeared wobbly. The air traffic controller also observed that the touchdown occurred far into the runway. However, none of the witnesses observed the aircraft coming

¹⁰ Civil Aviation Agency, Republic of Latvia

off the runway. Some of them have stated that it would not have been possible to see from the position they were in.

The incident occurred in darkness at position 5819N 01220E, 137 feet above sea level.

1.2 Injuries to persons

	Crew members	Passengers	Total on-board	Others
Fatal	-	-	0	-
Serious	-	-	0	-
Minor	-	-	0	Not applicable
None	-	-	3	Not applicable
Total	0	0	3	-

1.3 Damage to aircraft

No damaged.

1.4 Other damage

Damage to runway edge light.

1.4.1 Environmental impact

None.

1.5 Personnel information

1.5.1 Qualifications and duty time of the pilots

The pilot in command

The pilot in command, was 55 years old and had a valid ATPL license with flight operational and medical eligibility. The pilot in command was a line flying instructor sitting in the right pilot's seat (CM2¹¹). During the approach and landing, the pilot in command was the PF¹², but then became the PM¹³ during the rollout at a speed of 70 knots.

Flying hours				
	24 hours	7 days	90 days	Total
All types	3	28	91	9,300
Actual type	3	28	91	198

Number of landings actual type previous 90 days: 42.

Type rating concluded on 31 May 2017.

Latest PC¹⁴ conducted on 23 May 2018 on ATR 72.

¹¹ CM2 (Crew Member 2) – Refers to the pilot in the right seat.

¹² PF (Pilot Flying) – The pilot who is manoeuvring the aircraft.

¹³ PM (Pilot Monitoring) – Pilot who is assisting the PF.

¹⁴ PC – Proficiency Check.

Pilot In Command Under Supervision

The PICUS was 49 years old and had a valid ATPL license with flight operational and medical eligibility and was sitting in the left pilot’s seat (CM1¹⁵). During the approach and landing, the PICUS was the PM, but then became the PF during the rollout at a speed of 70 knots.

Flying hours				
Latest	24 hours	7 days	90 days	Total
All types	3	28	91	9,200
Actual type	3	28	91	520

Number of landings actual type previous 90 days: 42.
 Type rating concluded on 30 May 2017.
 Latest PC conducted on 28 May 2018 on ATR-72.

1.5.2 Other personnel

Technician

The technician, 44 years old, had an eligible aircraft maintenance licence.

1.6 Aircraft information

ATR72 is a twin-engine, high-wing turboprop aircraft (see figure 3).



Figure 3. RAF-AVIA’s aircraft of type ATR72. Photo: RAF-AVIA.

¹⁵ CM1 (Crew Member 1) – Refers to the pilot in the left seat.

1.6.1 *Airplane*

Type certificate holder	ATR-GIE Avions de Transport Régional
Model	ATR 72-202
Serial number	493
Year of manufacture	1996
Gross mass (kg)	Max authorized take off/landing mass 22,000/21,350 kg, actual 15,833 kg
Centre of gravity	Within authorised limits.
Total flying time, hours	30,916
Number of cycles	60,522
Type of fuel loaded prior to the occurrence	Jet A-1
Deferred remarks	None

The aircraft had a Certificate of Airworthiness and a valid ARC.

1.6.2 *Description of parts or systems related to the occurrence*

On the ground, the aircraft is manoeuvred in the yaw axis both by means of the rudder through the pedals and by means of a tiller that hydraulically activates the nose wheel steering, and which is located to the left of the left pilot's seat.

Manoeuvring in the yaw axis can also be effectuated partly both through asymmetric thrust from the engine propellers and through asymmetric braking.

The thrust of the propellers is directed forwards during normal flight, and can also be directed backwards to slow down the aircraft through thrust reversal during landing and taxiing.

The maximum demonstrated crosswind component for the aircraft is 35 knots on a dry runway.

The aircraft has a ground clearance of approximately 40 cm measured at the open nose landing gear doors and at the bottom of the fuselage. The measurement can vary by more than 10 cm upwards or downwards depending on the landing gear shock absorbers and tire compression.

1.7 **Meteorological information**

According to METAR: Wind 230 degrees, 19 knots with gusts of 32 knots, visibility >10 kilometres, cloud 8/8 with bas 3,000 feet, temperature/dewpoint +14/+10 °C, QNH 1,012 hPa.

According to AWOS¹⁶: Averaged wind speed in the two minutes prior to the incident: 17 knots.

¹⁶ AWOS – Automated Weather Observation System.

The air traffic controller gave the crew an instantaneous wind report of 17 knots direct crosswind on three occasions just prior to the landing.

The incident occurred during darkness.

1.8 Aids to navigation

Not applicable.

1.9 Communications

Recordings of the air traffic control radio communications are normally saved for three months. When SHK was informed of the incident, there were no saved recordings left.

1.10 Aerodrome information

The airport is an approved instrument aerodrome according to AIP¹⁷.

The runway is 1,710 metres long and 30 metres wide. The available landing distance on runway 33 is 1,501 metres, due to the threshold having been moved in onto the runway (see figure 4).

The runway is equipped with low and high-intensity approach and runway lights.

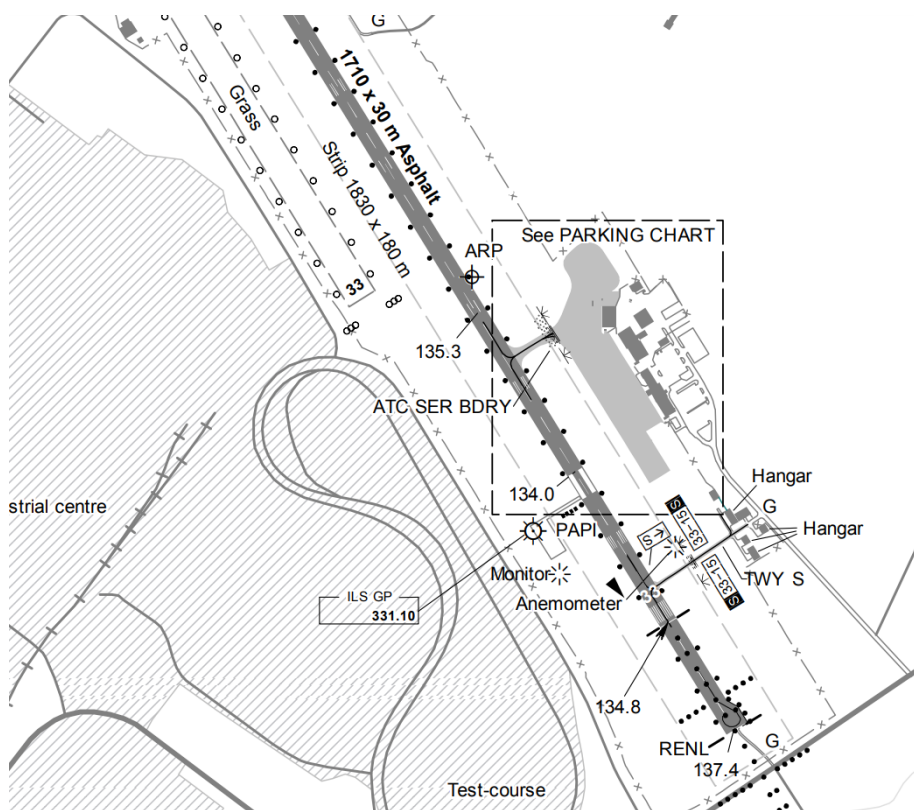


Figure 4. Aerial map of parts of Trollhättan/Vänernsberg airport (sectioned off).
 Source: AIP Sverige.

¹⁷ AIP – Aeronautical Information Publication.

1.11 Flight recorders

When SHK was informed of the incident, there were no registered flight recordings left.

1.12 Site of occurrence

The incident occurred on the runway and strip of Trollhättan/Vänersborg airport.

1.13 Medical and pathological information

Nothing indicates that the mental and physical condition of the pilots were impaired before or during the flight.

Both pilots were on their first shift after three days' leave when the incident occurred. Their flying hours over the last seven days prior to the incident amounted to just over 14 hours divided over five flights. During the day in question, the pilots had flown for just over three hours, divided over two flights.

1.14 Fire

No fire broke out.

1.15 Survival aspects

1.15.1 Rescue operation

No rescue operation was initiated.

The ELT¹⁸ was not activated.

1.16 Tests and research

Not applicable.

1.17 Organisational and management information

RAF-AVIA is a Latvian airline with a valid Air Operator Certificate (AOC) issued by the Latvian civil aviation agency.

The certificate covers ten turboprop aircraft of the types SAAB 340, Antonov 26 and ATR 42/72.

At the time of the incident, RAF-AVIA had been operating the aircraft model ATR 72 for roughly one year and a half.

¹⁸ ELT – Emergency Locator Transmitter.

1.18 Additional information

1.18.1 ATR's operational procedures for crosswind landings

The flight crew operation manual (FCOM) provided by the type certificate holder (ATR-GIE Avions de Transport Régional, hereafter ATR) describes the procedure to use for landings as follows.

After landing, PF (the pilot manoeuvring the aircraft) is to reduce the engine power to ground idle. PM (the pilot assisting PF) is to monitor that the thrust reversal system function is normal and call out “two low pitch” after which PF activates the thrust reversal. At an indicated speed of 70 knots, PM is to call out “seventy knots”, which means that the pilot on the left assumes the controls and handles the tiller while the pilot on the right handles the control wheel and deflects the ailerons into the wind.

The pilot then confirms to one another who is manoeuvring the aircraft. If the pilot on the right has been PF, he must call out “You have control”, to which the pilot on the left must respond “I have control”. If the pilot on the left has been PF, he simply states “I have control”.

After touch down :

- PNF** - IDLE GATE AUTOMATIC RETRACTION CHECK
- PF** - PL GI
- PNF** - BOTH LOW PITCH LIGHT CHECK
- PNF** - “2 LOW PITCH” ANNOUNCE

ENGINES	LO PITCH LIGHT	PNF ANNOUNCE	PF ACTION on REVERSE
2 ENGINES	2 illuminated	“2 LOW PITCH”	Normal use
	1 illuminated	“NO REVERSE”	No REVERSE
1 ENGINE	1 illuminated	“ONE LOW PITCH”	Use with care

- R PF** - REVERSE USE AS RQD
 - R PNF** - “SEVENTY KNOTS” ANNOUNCE
 - CM1** - NOSE WHEEL STEERING CONTROL
 - CM2** - CONTROL WHEEL HOLD INTO THE WIND
 - ALL** - “I HAVE CONTROL” / “YOU HAVE CONTROL” ANNOUNCE
- If PF is CM1, CM1 announce only “I HAVE CONTROL”
If PF is CM2, CM2 announce “YOU HAVE CONTROL” & CM1 answer :
“I HAVE CONTROL”

Figure 5. Excerpt from flight manual. Source: ATR.

The manual also shows that the pilot on the left must be prepared to use the tiller immediately after the nosewheel hits the ground, when the aircraft is being operated on narrow runways of a width less than 30 metres. This applies regardless of which pilot is PF. However, the runway in question is exactly 30 metres wide, thus not of a width less than 30 metres.

In 2016, ATR also published a flight operations information message (FOIM) due to a number of runway excursions involving the aircraft model. In the message, ATR highlights the risks of crosswind landings and underlines the importance of accuracy in managing ailerons into the wind, rudder and nosewheel steering (see figure 6 for examples). The message also emphasises the importance of bringing the control wheel forward after landing, in order to increase the steering capacity of the nosewheel.

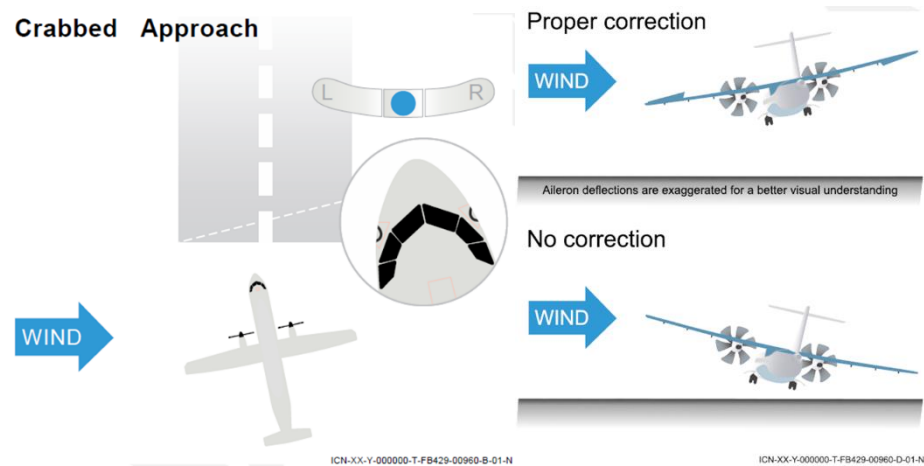


Figure 6. Images from the FOIM stating that approach is to be carried out with wind correction and crabbing into the wind. Source: ATR.

The information from ATR's FOIM will be introduced in the aircraft model flight manual in June 2019. The reason for the delay, according to ATR, is a time-consuming update to the software used to manage the aircraft documentation.

1.18.2 *RAF-AVIA's operational landing procedure*

At the time of the incident, the operator's manual described the procedures in the same way that ATR does in its manual, with the exception that the crosswind limitation was set to 30 knots rather than 35 knots on a dry runway (the limitation was thus lower than that in the type certificate holder ATR's own manual). The operator was not aware of the information in ATR's FOIM regarding the risks of and recommendations for crosswind landings. The information from the FOIM was thus not incorporated into the operators manual.

1.18.3 *RAF-AVIA's safety management system*

In accordance with Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council¹⁹ the operator must implement and maintain a management system.

¹⁹ Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC.

SHK has read the manual that describes RAF-AVIA's SMS²⁰. According to the manual, the operator has an open reporting culture that encourages free and honest reporting through a just culture. It also states that the reporting policy is non-punitive and that each employee is responsible for communicating information that may affect the health and safety of staff in all the operator's activities. Such communication is to be free of any form of reprisals.

1.18.4 Duty to report

In accordance with Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation, any landing-related occurrences that poses a significant risk to aviation safety must be reported by the pilot in command, or any other crew member next in the chain of command. Such occurrences are to be reported within 72 hours to the supervisory authority. No such report was made to the supervisory authority within the given time.

1.18.5 Reporting by the pilots

As indicated above, the pilots stated in their respective reports to RAF-AVIA dated 18 October, i.e. nine days after the incident, that the landing was carried out without any deviations.

1.18.6 RAF-AVIA's contacts with BEA and ATR

As France is the state of manufacture for the aircraft type involved, SHK notified the French safety investigation authority BEA of the incident on 17 January 2019. Based on this notification, BEA contacted the type certificate holder ATR for being their technical advisor and provide assistance to the investigation.

Following this notification, ATR customer support sent to RAF-AVIA the recommendations for technical inspection of the aircraft following a runway excursion. The inspection was carried out by Rheinland Air Service at Frankfurt-Hahn airport, including a check of the condition and function of the landing gear. The inspection was completed without remarks.

1.18.7 Action taken

RAF-AVIA conducted its own investigation after the report of the incident was sent by Trollhättan/Vänernsberg airport to the Latvian civil aviation agency. The agency received the investigation report on 18 January 2019.

²⁰ SMS – Safety Management System.

The investigation, dated 13 December 2018, includes aspects of crew resource management (CRM), and mentions shortcomings in the management of the nosewheel steering following the crosswind landing as well as in the interaction between PF and PM as possible causes in its analysis of the incident.

As a result of the incident, RAF-AVIA has issued the following recommendations:

- The flight crews are requested to study the sections of the operator's manual for ATR72 that relate to landing and rollout, handing over controls during landing and crosswind landings.
- The Chief Pilot for ATR42/72 is to ensure that:
 - narrow runways are used in simulator training,
 - the pilot on the left is flying when landing on narrow runways in order to avoid handing over the controls,
 - PICUS in the left seat is not landing on narrow runways,
 - a culture is created in which pilots land on and maintain the runway centre line also at larger airports,
- The Chief Pilots for ATR42/72 and SAAB 340 will organise line oriented safety audits (LOSAs) for affected pilots.
- In upcoming proficiency checks, all crews must practice scenarios similar to the one in question in a simulator.

The operator has also indicated to SHK that special training measures will be implemented in regard to crosswind landings on the aircraft model. The operator has furthermore indicated that they have begun regularly downloading data from QAR²¹. ATR has offered support for Flight Data Monitoring (FDM) Service and for Flight Operational Analysis. FDM is not a requirement according to current regulations for aircraft with a take-off mass of less than 27,000 kg.

1.18.8 *The Latvian civil aviation agency's audit of RAF-AVIA*

Between 3 and 12 January 2019, the Latvian civil aviation agency conducted a planned audit of RAF-AVIA at the operator's bases in Riga and Frankfurt-Hahn, in accordance with the agency's programme to verify RAF-AVIA's compliance with the EASA regulations for air operations outside of Latvia. In conjunction with this audit, the agency noted that the excursion had not been reported in accordance with the provisions of Regulation (EU) No 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation.

²¹ QAR – Quick Access Recorder.

The agency received the operator's own internal investigation report regarding the incident on 18 January 2019. The agency noted that there were safety issues relating to the incident. At the same time, it was noted that these were investigated by the operator. The investigations would involve a safety issue risk assessment (SIRA), among other things.

RAF-AVIA thereafter conducted SIRAs relating to four safety issues. The aviation agency's principal inspector for RAF-AVIA was ordered to issue a follow-up report on flight safety in regard to the implemented SIRAs and to monitor the progress of the measures being implemented.

In addition, RAF-AVIA was asked to:

- Submit documentation to the civil aviation agency in regard to all registered measures, with relevant information on safety issues and assessed risk levels (safety issues, risk-based established measures, persons responsible for these and timelines as well as the progress regarding measures and their impact on risk levels).
- Give a report to the civil aviation agency on which measures have been taken or are planned in order to solve the problems within the most important risk areas and how the effect of these measures will be monitored in accordance with RAF-AVIA's SMS manual.
- Complete the questionnaire regarding operator measures for the implementation of EPAS²² 2019–2023.
- Improve the procedures for safety risk management, i.e. carefully describe the risk assessment method.

The agency completed its follow-up report on 13 May 2019. The report refers, among other things, to the runway excursion at Trollhättan/-Vänernsberg airport and to an excursion at Savolinna airport in Finland on 7 January 2019 with an aircraft of the type SAAB 340B, which is being investigated by the Finnish safety investigation authority. The report shows that the agency deems the measures taken by RAF-AVIA in response to these two serious incidents to be acceptable. However, the agency has still issued the following recommendations to improve flight safety with the operator:

- Ensure that the Flight Safety Programme Manager becomes a licensed pilot in order to enable permanent and independent work as a safety analyst.
- Consider the possibility of fully or partially implementing flight data monitoring (FDM).

²² EPAS – European Plan for Aviation Safety.

- Establish, maintain and subsequently improve the reporting culture in the company.
- Improve the management of the operation and planning process, especially in regard to contractual activities.
- Adapt training processes to the airports being used. Factors that can lead to excursions should be identified and included in the training programmes.
- Continued implementation of SIRA. All measures are to be handled through the operator's SIRA register, which contains all information on safety issues and assessed risk levels.

1.19 Special methods of investigations

Not applicable.

2. ANALYSIS

2.1 Sequence of events

The flight took place on 9 October 2018 and was a commercial cargo flight from Stettin/Goleniów airport in Poland with destination Trollhättan/Vänersborg airport in Sweden. It was a LIFUS flight, which meant that the pilot in the left seat was a pilot in command under supervision (PICUS), while the pilot on the right was the pilot in command and line flying instructor.

The nosewheel steering of the ATR72-202 is controlled by the tiller located on the left side of the cockpit. Therefore, on the ground and for speeds up to 70 knots, the pilot flying is the pilot in the left seat.

A few days after the aircraft had landed in Trollhättan, the airport staff discovered that a runway edge light had been damaged. There were also tyre tracks on the runway indicating that there had been an excursion.

The distance between the tyre tracks was 4.1 metres, which only corresponded to the wheel width of an ATR-72. The only aircraft of that model that had been at the airport since the last runway inspection was the aircraft subject to this report, with registration YL-RAI. SHK shares the assessment made at the airport that the tyre tracks must have been left by this aircraft, which consequently also made the runway excursion.

The ground clearance for the aircraft model at the nose landing gear doors and the underside of the fuselage is approximately 40 cm, and the runway edge light is 50 cm high. Considering the placement of the tyre tracks in relation to the runway edge light, SHK considers it established that the light was damaged in conjunction with the excursion.

In conclusion, SHK makes the assessment that the aircraft YL-RAI came off the runway during the landing, damaged the edge light and thereafter rolled back onto the runway.

2.2 Reporting

2.2.1 Reporting by the airport

The airport's air traffic control ACR and aviation safety coordinator reported the incident to the Swedish Transport Agency. According to their reports, recordings showed that the air traffic controller reported a direct crosswind with a wind speed of 17 knots to the crew on three separate occasions just prior to touchdown.

SHK notes that the reported wind speed coincides with the average wind speed registered by the automated weather observation system (AWOS) during the two minutes prior to the landing, and that these values are well below the maximum allowable crosswind component for the aircraft model.

2.2.2 Pilot reporting and interviews

According to the pilots' reports, which are dated 18 October 2019, i.e. nine days after the incident, the landing was carried out without any deviations. One of the pilots has later stated in an interview that the aircraft drifted slightly to the left during landing, due to insufficient aileron deflection into the wind. The other pilot has stated that he does not remember anything from the incident.

SHK finds it unlikely that the crew failed to notice that the aircraft had come off the runway, particularly as the runway edge lights, which were lit, form a clear line of lights which would have been straight ahead of the aircraft during the excursion and thus in the pilots' line of sight.

2.2.3 Reporting by the operator RAF-AVIA

The aircraft was operated by Latvian airline RAF-AVIA. The operator completed an investigation report on the incident on 13 December 2018. According to the investigation analysis, there were difficulties keeping the aircraft on the runway centre line due to gusty crosswinds. During the rollout, the ailerons were not applied against the wind, which contributed to the aircraft briefly coming off the runway to the left, out into the grass, and possibly damaging the runway edge light. The report also contains the recommendations described in section 1.18.7, which are analysed in more detail in section 2.6 and 2.7 below.

2.2.4 Witnesses at the airport

The approach and landing were observed by two members of the airport staff, by two pilots on the apron and by the air traffic controller in the tower. Everyone has said that the landing appeared wobbly. The air traffic controller also observed that the touchdown occurred far into the runway. None of the witnesses were able to see the aircraft coming off the runway, which can be explained by it being dark and by all the witnesses being located perpendicular to the runway on the opposite side of where the excursion happened. Witnesses were thus only looking at the right side of the aircraft, whereas the excursion was to the left.

2.3 The crew

The flight in question was a LIFUS flight, during which the pilot in the left seat was undergoing training to become a pilot in command. His experience of being in the left seat of this aircraft type was therefore limited. In combination with the crosswind and darkness, this may have meant that the degree of difficulty in maneuvering during the landing was relatively great for the pilot.

2.4 Crosswind landings on the aircraft model

The aircraft can be controlled on the ground by means of the pedals that control the rudder, or by means of a tiller on the left-side console, which controls the nosewheel steering. At lower speeds, the aerodynamic forces diminish, which makes the rudder less effective. This is the reason why the pilot on the left is to manoeuvre the aircraft on the ground at speeds under 70 knots. This in turn means that the pilots need to manoeuvre the aircraft together in the final stage of the landing.

If the pilot on the left is landing, he must keep his left hand on the control wheel and the right hand on the throttle. At 70 knots, the pilot on the left is to control the tiller with the left hand and maintain control of the throttle, while the pilot on the right is to take over the control wheel to apply ailerons into the wind while pushing the wheel forward to increase pressure on the nosewheel for improved friction against the ground.

If on the other hand, the pilot on the right is landing, he will have his right hand on the control wheel and his left hand on the throttle. At 70 knots, he maintains control of the control wheel, while the pilot on the left assumes control of the throttle and steering with the tiller. During a crosswind landing, this may pose a risk, if there is a glitch in the handover of controls. Another condition for a safe handover is clear communication between the pilots according to ATR's procedures.

Due to a number of excursions on the aircraft type, ATR has issued a flight operations information message highlighting the risks of crosswind landings and underlining the importance of carefully managing ailerons, rudder and nosewheel steering. The message also emphasises

the importance of bringing the control wheel forward after landing, in order to increase the steering capacity of the nosewheel.

2.5 The landing in question

At the time of the incident, the operator RAF-AVIA had not yet seen ATR's message regarding crosswind landings nor integrated the recommendations in its manual system, which may partly have contributed to how the aircraft was managed during the landing. The pilots had consequently had no training according to the recommendations in the message.

One of the pilots has stated that insufficient aileron into the wind was applied during rollout. The flight operations information message from ATR emphasises in particular that aileron deflection into the wind is to be gradually increased as the speed is reduced, all the way to fully deflected ailerons if necessary. The message also emphasises that the control wheel must be brought forward in order to increase the contact between the nosewheel and the asphalt, thereby increasing the steering capacity.

SHK finds it established that there was insufficient aileron applied into the wind. It is furthermore likely that the control wheel was not sufficiently pushed forward during the rollout.

2.6 Safety management system and reporting

RAF-AVIA has a safety management system (SMS) in accordance with current regulations. According to the SMS manual, the operator has an open reporting culture that encourages free and honest reporting through a just culture. The reporting policy is non-punitive and each employee is responsible for communicating information that may affect the health and safety of staff in all the operator's activities. Such communication is to be free of any form of reprisals.

It can be noted that the crew didn't report the incident within the prescribed time. The fact that the incident was noted at all is because the airport's air traffic control ACR and flight aviation safety coordinator reported the incident to the Swedish Transport Agency and to the operator upon discovery of a damaged runway edge light and tyre tracks on the runway.

The fact that the runway excursion was not reported by anyone in the crew could of course be an indication that there are shortcomings in the reporting culture within the company, despite the directives in the operator manuals. However, it has not been possible for SHK to investigate more closely or clarify why the incident was not reported. Nor has SHK identified anything during its investigation in the operator's approach to incident reporting that would deter the staff in this regard.

Incident reporting is an important part of flight safety, as it contributes to the investigation of incidents and rectification to prevent their recurrence. A delay in the reporting also makes investigation much more difficult since data from various recording devices are no longer available, which in turn makes it more difficult to identify and take relevant measures to increase flight safety.

The Latvian civil aviation agency noted already in its initial inspection that the incident had not been reported in accordance with current regulations. In its follow-up report, the agency has especially recommended RAF-AVIA to establish, maintain and improve its reporting culture.

2.7 Actions taken

RAF-AVIA has taken a number of measures in response to the serious incident (see section 1.18.7). In summary, these measures entail reinforcing the theoretical and practical training in regard to landings with crosswinds and on narrow runways, and the operator initiating a project for the regular downloading of QAR data and the introduction of flight data monitoring.

The Latvian civil aviation agency has furthermore taken several supervisory measures, as described in section 1.18.8. The measures, which are to be followed up by the agency, entail requirements for the operator to improve its risk management and monitoring of the impact of the safety management system.

The type certificate holder of the aircraft, ATR, has decided to introduce supplementary information on crosswind landings in the manual for the aircraft type.

3. CONCLUSIONS

3.1 Findings

- a) The pilots were qualified to perform the flight.
- b) The aircraft had a Certificate of Airworthiness and valid ARC.
- c) The aircraft came off the runway in conjunction with a landing at Trollhättan/Vänersborg airport, at which point a runway edge light was damaged.
- d) No one was injured.
- e) The incident was not reported by the crew within 72 hours.
- f) The excursion was reported by the airport's air traffic control ACR and flight aviation safety coordinator to the Swedish Transport Agency and to RAF-AVIA.
- g) Flight data and voice recordings were no longer available when SHK became aware of the incident.
- h) RAF-AVIA conducted its own investigation of the incident.
- i) RAF-AVIA did not review ATR's flight operations information message regarding crosswind landings.
- j) ATR had not entered the flight operations information message into the flight crew operation manual (FCOM).

3.2 Causes/Contributing Factors

SHK makes the assessment that the incident was caused by the following factors:

- The operator and the pilots had not read ATR's flight operations information message (FOIM) regarding recommended procedures for crosswind landings.
- The operator's pilots lacked full training in crosswind landings on the aircraft model.

4. SAFETY RECOMMENDATIONS

Considering the measures already taken and being planned by the operator, the type certificate holder and the Latvian aviation agency, SHK has chosen not to issue any recommendations.

On behalf of the Swedish Accident Investigation Authority,

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Nicolas Seger