The purpose of the Dutch Safety Board's work is to prevent future accidents and incidents or to limit their after-effects. It is no part of the Board's remit to try to establish the blame, responsibility or liability attaching to any party. Information gathered during the course of an investigation – including statements given to the Board, information that the Board has compiled, results of technical research and analyses and drafted documents (including the published report) – cannot be used as evidence in criminal, disciplinary or civil law proceedings.

GENERAL INFORMATION

Identification number:	2007044
Classification:	Serious incident
Date, time[1] of occurrence:	18 May 2007, 20.53 hours
Location of occurrence:	Groningen Airport Eelde (EHGG)
Aircraft registration:	OO-VLI
Aircraft model:	Fokker F27 MK50 (Fokker 50)
Type of aircraft:	Passenger Aircraft
Type of flight:	Scheduled passenger transport
Phase of operation:	Landing
Damage to aircraft:	Minor
Cockpit crew:	Two
Cabin crew:	One
Passengers:	Eleven
Injuries:	None
Other damage:	One runway edge light and a runway end light destroyed
Light conditions:	Daylight (sunset at 21.32 hours)

SUMMARY

A Fokker 50 made a flight from Amsterdam Schiphol Airport to Groningen Airport Eelde. After executing a visual approach to runway 05, the aircraft landed long (approximately halfway along the runway) and at high speed. The crew was unable to stop the aircraft within the remaining runway length. Subsequently, it ran off the end of the runway and came to a halt in the grass. None of the fourteen persons on board was injured. The aircraft sustained minor damage.

This report is mainly based on information from the flight data recorder and the cockpit voice recorder and interviews with the flight crew members.

[1] All times in this report are local times unless stated otherwise.

FACTUAL INFORMATION

History of the flight

A Fokker 50, with registration OO-VLI, was scheduled for a daytime flight under instrument flight rules from Amsterdam Schiphol Airport (EHAM) to Groningen Airport Eelde (EHGG). The crew reported for duty on time and the handling agent at EHAM prepared a load sheet. The aircraft departed from the gate ten minutes before the scheduled departure time with fourteen persons on board comprising two pilots, one cabin attendant and eleven passengers. The captain acted as the pilot flying (PF), the first officer as the pilot monitoring (PM). After take-off from EHAM at 20.31 hours the aircraft climbed to flight level[2] 90 (FL90) on a north easterly heading towards EHGG. Approaching their destination, the crew received the EHGG weather report and elected and requested to use runway 05 for landing.

After clearance from air traffic control the PF commenced the descent from FL90 to 2000 feet at 20.45 hours and 30 nautical miles (NM) from EHGG. During the descent a speed[3] of 220 knots was maintained. Passing FL70 at 20.47 hours and with 22 NM to go to the airport, the PF called for the approach checklist which was accomplished by the PM. At 20.51 hours and with 5 NM from the airport the aircraft levelled off at 2000 feet with 220 knots. The aircraft decelerated and was configured for landing; landing gear down and the flaps set at 25 degrees.

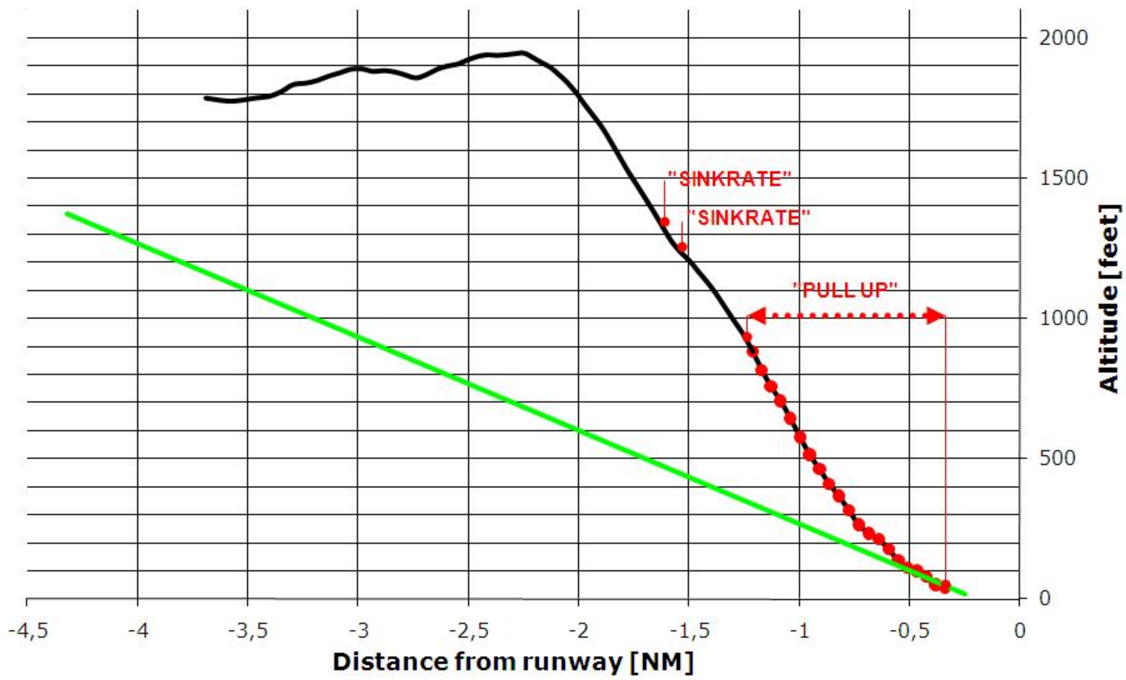

Illustration 1: side view of descent profiles

: reconstructed flight track using airspeed and altitude data from the flight data recorder
: normal 3.0 degree ILS[4] approach

The final descent started 2.1 NM from the airport, the crew completed the before-landing checklist and received landing clearance for runway 05. In the meantime, the aircraft descended at a rate that activated the enhanced ground proximity warning system (EGPWS). The system generated

[2] Standard nominal altitude of an aircraft, in hundreds of feet, relative to the international standard pressure datum of 1013 hPa.
[3] All airspeeds are indicated airspeeds, unless stated otherwise. Indicated airspeed is the airspeed read directly from the aircraft's airspeed indicator.
[4] Instrument landing system.

two ‘sink rate’ warnings followed by a series of ‘pull up’ warnings; see illustration 1. At 800 feet above ground the sink rate had increased to 4000 feet per minute. The PF positively identified both warnings, ordered to disregard them and continued the approach. During the final approach the pitch angle[5] varied between -2 and -20 degrees.

The aircraft crossed the threshold of runway 05 at 300 feet with speed of 150 knots and with a pitch of -12 degrees. The PF continued the approach, gradually raising the nose of the aircraft and, with airspeed of 118 knots, the aircraft nose wheel touched down with 890 metres of runway length remaining. The available landing distance for runway 05 is 1800 metres. With the main landing gear still in the air, the aircraft floated down the runway on its nose wheel while decelerating. With 320 metres remaining the left and right main landing gear sequentially touched down. With the main landing gear on the ground the PF was now able to use the wheel brakes and bring the throttles below flight idle. The aircraft decelerated and gradually veered to the left edge of the runway. The left main landing gear departed the runway, ran through the grass and re-entered the hardened surface on the taxiway. The PF steered the aircraft back towards the runway centre line and a short time later, at 20.53 hours, the aircraft overran the end of the runway on the left hand edge and came to a halt in the grass 60 metres beyond the end of the runway. See illustration 2. Subsequently the PF briefly addressed the passengers and requested assistance through air traffic control. He elected not to evacuate the aircraft.

There was no fire and the crew and passengers sustained no injuries. The aircraft sustained minor damage. A runway edge and a runway end light were destroyed.

Illustration 2: OO-VLI after the incident

Personnel and aircraft information
The captain held a valid air transport pilot licence and a valid medical certificate. He had accumulated a total of approximately 7000 flying hours of which approximately 5000 hours on the Fokker 50. He was also a qualified line training captain.[6]
The first officer held a valid air transport pilot licence and a valid medical certificate. He had accumulated a total of approximately 1810 flying hours of which approximately 335 hours on the Fokker 50.
Both pilots had recently followed their crew resource management training. All training and checking requirements were met.

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[5] Aircraft pitch is the angle between the horizon and the nose of the aircraft. Negative pitch means the nose is below the horizon and with positive pitch the aircraft’s nose is above it.
[6] A line training captain is an experienced captain, in charge of supervising the line training flight of another pilot.

The aircraft had a valid certificate of airworthiness and all required maintenance had been carried out.

Aircraft operational data

The following data was retrieved from the Aircraft Flight Manual Fokker 50 (AFM F50), the Aircraft Operating Manual Fokker 50 (AOM F50) and information provided by the operator.

		retrieved from
Maximum tail wind component	10 knots	AFM F50
Landing reference speed (V_{REF})[7]	97 knots	AFM F50
Recommended final approach speed[8]	107 knots	AOM F50
Landing mass	16,799 kilogram	Operator
Required landing field length[9], no wind	1070 metres	AFM F50
Actual landing distance[10], no wind	642 metres	AFM F50

Table 1: aircraft operational data

Meteorological information

- EHGG is equipped with an automatic terminal information service (ATIS), which transmitted the latest available airport and weather information preceded by a letter code. When the mishap occurred, ATIS Information 'G' was valid, reporting runway 23 in use. Only the applicable items are listed below.

Wind	200 degrees at 10 knots, variable between 170 and 230 degrees
Visibility	10 kilometres or more
Clouds	Few at 3300 feet, scattered at 3800 feet

Table 2: ATIS information 'G'

- Information from the Royal Netherlands Meteorological Institute valid during the flight concerned showed the following forecast wind information.

Altitude	Wind (direction and speed)
10,000 feet	230 degrees at 35 knots
5000 feet	220 degrees at 30 knots
3000 feet	215 degrees at 30 knots
1500 feet	205 degrees at 27 knots
500 feet	200 degrees at 20 knots
350 feet	210 degrees at 20 knots

Table 3: forecast wind information

- The incident happened during daylight conditions.

- Air traffic control at EHGG reported runway 23 in use with a surface wind of 210 degrees at 2 knots.

Airport and operational information

The airport has two intersecting runways. Runway 05/23 is 1800 metres long and 45 metres wide. Runway 01/19 is 1500 metres long and 45 metres wide. Both runways have an asphalt surface. For

[7] V_{REF} is the landing threshold speed during final approach at a height of 50 feet above the runway.

[8] Recommended final approach speed is V_{REF} plus 10 knots.

[9] The required landing field length is the actual landing distance divided by a factor of 0.6 for an intended destination airport. Its value can be obtained from the performance graph in the AFM entitled "required landing field length" and is used for selecting destination and alternate airports.

[10] The actual landing distance is the distance to land and come to a complete stop from a point at 50 feet height above the runway.

runway 05 a VOR-DME instrument approach procedure is published. Runway 05 is equipped with precision approach path indicators (PAPI) set at 3.0 degrees.
EHGG is equipped with an instrument landing system and a marker beacon for runway 23, a VOR-DME beacon situated 4.6 NM northeast of the airport, two NDB's around eight NM from the airport.

At the time of the incident the runways, taxi ways and apron were dry. The airport elevation is 17 feet above mean sea level (AMSL).

Flight recorders
The four-channel, 30-minute cockpit voice recorder and the 25-hour flight data recorder were removed from the aircraft. Subsequently the data was downloaded and determined to be usable.

Tyre skid marks on the runway and the taxiway
The aircraft left several skid marks on the runway. Initially a 22 meter skid mark from the left main landing gear was found starting 490 metres before the departure end of runway 05. Left and right main landing gear tyre tracks started approximately 320 metres before the runway end and both tracks veered off to the left of the runway. The left main landing gear tyre track went off the left hand edge of the runway, destroyed a runway edge light, and ran through the grass for a short distance before it reappeared on the concrete surface of the taxiway (illustration 3). It proceeded onto the intersecting taxiway, just one metre outside the westerly edge of the runway. With the right main landing gear destroying a runway end light, the aircraft left the runway end and came to a halt in the grass after approximately 60 metres near a row of approach lights and with the right hand main landing gear just in front of embedded heavy concrete constructions.

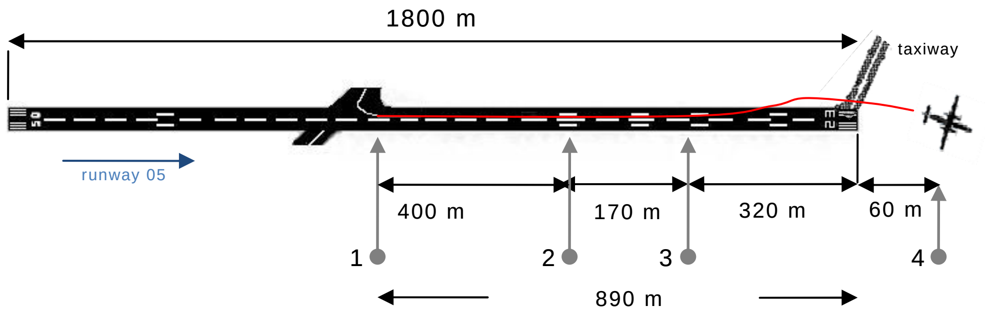

Illustration 3: runway 05/23 at EHGG (not to scale)

Legend (positions are estimated):
1 : Nose wheel touchdown
2 : First skid mark left main landing gear
3 : Skid marks left and right main landing gear
4 : Aircraft position after the incident
—— : Aircraft ground track

Survival aspects
The captain elected not to evacuate the passengers after the aircraft came to a stop. He addressed the passengers explaining the reason for the discomfort. After arrival of the fire brigade the passengers left the aircraft.

Illustration 4: tyre skid marks looking towards the west

Stabilised approach
To aid operators in reducing landing accidents, the Flight Safety Foundation ‘Approach-and-landing Accident Reduction (FSF ALAR) Tool Kit’ suggests the following stabilised approach criteria:

All flights must be stabilised by 1000 feet above airport elevation in instrument meteorological conditions and by 500 feet above airport elevation in visual meteorological conditions. An approach is stabilised when all of the following criteria are met:

- The aircraft is on the correct flight path;
- Only small changes in heading and pitch are required to maintain the correct flight path;
- The aircraft speed is not more than V_{REF} plus 20 knots and never less than V_{REF};
- Sink rate is no greater than 1000 feet per minute. If an approach requires a sink rate greater than 1000 feet per minute a special briefing should be conducted;
- Power setting is appropriate for the aircraft configuration and is not below the minimum power for approach as defined by the aircraft operating manual;
- All briefings and checklists have been conducted;
- Specific types of approach are stabilised if they also fulfil the following: ILS approaches must be flown within one dot[11] of the glide slope and localizer; a category II or a category III ILS approach must be flown within the expanded localizer band; during a circling approach, wings should be level on final when the aircraft reaches 300 feet above airport elevation; and,
- Unique approach procedures or abnormal conditions requiring a deviation from the above elements of a stabilised approach require a special briefing;
- An approach that becomes unstabilised below 1000 feet above airport elevation in instrument meteorological conditions or below 500 feet above airport elevation in visual meteorological conditions requires an immediate go around.

In 2005 the aircraft manufacturer issued an All Operators Message AOF50.038 “Approach and landing incidents and accidents”. In this message the importance of a stabilised approach was emphasised with reference to the Fokker 50 approach procedure, as published in the AOM chapter 7.05.01 Flight Techniques. The message stated that ‘deviation from these procedures might cause the aircraft to enter a condition from which a landing is not possible or which will cause a landing with a significant longer landing distance’. This message was received by the operator, but this

[11] One dot (the inner of two equidistant markings on the instrument displaying the ILS) indicates deviation from the glide slope (vertical path) or the localizer (horizontal path).

information was not known to all flight crew members. The crew's Operating Manual did not contain the 'stabilised approach' criteria.

INVESTIGATION AND ANALYSIS

Investigation

After the incident, investigators from the Dutch Safety Board started a field investigation.

Publications
During the investigation the following publications were consulted:
- Operating Manual, part A and B, of the operator;
- Manufacturer's Aircraft Flight Manual Fokker 50;
- Manufacturer's Aircraft Operating Manual Fokker 50.

Technical investigation
The brake system, the ground/flight switch and the ground idle stops were tested by personnel from Fokker Services:
- During the testing of the brake system, maintenance personnel noticed that a wire harness on the left main landing gear was not wired correctly. Although the wiring was incorrect, Fokker Services concluded it did not degrade the operation of the braking system;
- The ground/flight switch was functionally tested and found operational;
- The ground idle stops were functionally tested and found operational.

Radar plot data
The radar plot data received from Air Traffic Control the Netherlands shows altitude and ground speed data from 1915 to 315 feet AMSL. The radar plot times are 20 seconds ahead of the flight data recorder timing. These 20 seconds are subtracted from the plot times to produce the corrected timing reflected in table below.

FDR time	FDR ref	altitude (feet)	ground speed (knots)
20.51:42	14904	1915	211
20.51:46	14908	1915	197
20.51:51	14914	1815	189
20.51:56	14918	1615	178
20.52:01	14923	1415	170
20.52:06	14928	1315	169
20.52:10	14932	915	172
20.52:16	14938	715	169
20.52:20	14942	515	173
20.52:24	14946	315	171

Table 4: Radar plot data

The groundspeed at a certain altitude is a function of the aircraft's true airspeed[12] and the head- or tail wind component at that altitude. For example a true airspeed of 220 knots and a 40 knots tail wind add up to a groundspeed of 260 knots.

[12] True airspeed (TAS) is the indicated airspeed corrected for instrument and installation error, compressibility and air density. In the standard atmosphere (15 degrees Celsius and 1013 hPa) the TAS at 2000 feet AMSL is approximately 4 knots higher than the indicated airspeed.

Analysis

The following paragraphs cover the analysis of the incident. The analysis will discuss the descent, the final approach and the landing. The final paragraph includes remarks concerning underground structures in the overrun area.

The descent
After the climb the PF levelled off at FL90 and continued towards EHGG on a north easterly heading. The en route weather situation was such that during the flight a moderate south westerly airflow presented a tail wind during the descent and approach.

Prior to descent the crew recorded EHGG ATIS message ‘G’, stating runway 23 in use and a surface wind of 200 degrees at 10 knots, variable between 170 and 230 degrees. During the interview the PF stated that from their position they were conveniently aligned with runway 05. He also was aware that the maximum tail wind component for the Fokker 50 was 10 knots. Therefore the PF decided to opt for runway 05 instead of runway 23. Normally a landing with a tail wind can be executed successfully provided the landing distance available is sufficient, the aircraft crosses the threshold at approximately 50 feet at the desired landing speed (V_{REF} -10 knots) and lands in the desired landing zone, which is normally 1000 to 2000 feet (300 to 600 metres) beyond the threshold.

The descent towards EHGG started at 20.45 hours and 30 NM from the airport. This distance should have given the crew enough time to reach their cleared altitude of 2000 feet, the final approach altitude for runway 05, at a distance of approximately 10 NM from the airfield to configure the aircraft for landing and start a stabilised approach. Instead the aircraft was level at 2000 feet at approximately 5 NM from the threshold and had already passed the point of descent for a final approach along a 3 degrees glide path.

The radar plot shows a recorded ground speed of 266 knots at 5 NM from the threshold. From the flight data recorder an indicated airspeed of 222 knots was derived, equating to 226 knots true air speed at 2000 feet. This implies that the aircraft was under the influence of a 40 knots tail wind component (266 knots groundspeed minus 226 knots true airspeed) and shows that the tail wind was of greater influence on the descent than the crew expected or realised. During the interviews neither pilot mentioned that the approach was affected by tail wind.

The table below shows the forecast winds for EHGG. The derived tail wind component indicates the forecast tail wind conditions during the approach to runway 05. This is corroborated by the groundspeed information from the radar plot and could explain why the PF misjudged the available distance to the airfield in order to configure the aircraft for landing prior to intercepting a visual three degrees glide path.

Altitude	Wind (direction and speed)	Tail wind component runway 05
1500 feet	205 degrees at 27 knots	24 knots
500 feet	200 degrees at 20 knots	17 knots
350 feet	210 degrees at 20 knots	19 knots

Table 5: Forecast winds for EHGG

The speed reduction started around 5 NM from the threshold and the aircraft was configured for landing and the final descent commenced at 2000 feet. The distance had by then decreased to 2.1 NM from the threshold with airspeed of 140 knots. From that position, the required glide path angle was at least 10 degrees, more than three times the gradient for a normal 3 degrees visual approach. After landing the PF stated he should have executed a go-around.

The crew was familiar to the approaches at London City Airport. This airport distinguishes itself from most other airports for its approaches with a glide path angle of 5.5 degrees. The majority of the operator's crews were used to flying into this airport and many pilots had become comfortable flying these steep approaches. Even a glide path angle of more than 5.5 degrees is not necessarily perceived as unusual or hazardous. It is therefore most likely that the crew did not perceive any hazard during the steep approach at EHGG.

It is concluded that the crew was not aware of the prevailing tail wind component during their descent inbound EHGG. This resulted in a delayed descent and a steep approach, which was not perceived as unusual by the crew. Eventually the approach did not meet the stabilised approach criteria.

Final approach
The aircraft descended in a nose low attitude around 150 knots, which was 43 knots (= 40 percent) above the recommended final approach speed of 107 knots. The 20 knots tail wind component on final resulted in a ground speed of around 170 knots. This is supported by the data from the radar plot provided by Air Traffic Control the Netherlands. While descending and closing in to the runway, the PF possibly realised his planned touchdown point was shifting further down the runway. Although this phenomenon can be corrected for, it becomes more pronounced with a steep descent, a tail wind and an airspeed increasing well above the recommended V_{REF}. To preserve the initial aim point the aircraft's pitch varied between -15 and -20 degrees. The resulting high sink rate and proximity to the ground triggered the EGPWS to produce 'sink rate' and 'pull up' warnings.

The operator's procedures (Operating Manual, part A, 8.3.5) stated that 'whenever a GPWS warning is observed a go-around shall be initiated'. The procedures from the manufacturer (AOM 7.08.01 page 1) stated that 'in the event of a GPWS "PULL UP" or "TERRAIN" warning, a go-around shall be initiated'.
However, it must be noted that Operating Manual, part A, 8.3.5 also stated that, 'when a warning occurs during daylight VMC[13] conditions, if positive verification is made that no hazard exists, the warning may be considered cautionary. A go-around shall be initiated if cause of warning cannot be identified immediately'.

The crew did not correct for the warnings produced by the EGPWS during the final approach. This may have been caused by the crew's familiarity with flying steep approaches, similar to the approaches at London City Airport, and therefore not perceiving any hazard during the steep approach at EHGG. The EGPWS warnings were acknowledged by the PF and the approach was continued.

As it appears from international literature, the actions of the crew were not unique. The Flight Safety Foundation financed research at the end of the nineties into approach and landing accidents.[14] The research indicated that many landings were made after approaches that had not been fully stabilised. The Flight Safety Foundation research indicated also that crews make their decision based not so much on stabilised approach criteria, as on continuous assessment of the possibility of continuing the approach.

Although no hazard was perceived, the aircraft was approaching the surface with a vertical speed of between 3000 and 4000 feet per minute at 800 feet above the ground. This vertical velocity

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[13] VMC stands for visual meteorological conditions.
[14] Khatwa, R. & Helmreich, R. (1998). Analysis of critical factors during approach and landing in accidents and normal flight. *Flight Safety Foundation's* Flight Safety Digest. 17, 1-256.

gradually decreased as the approach progressed. A descent rate of between 3000 and 4000 feet per minute so close to the ground should have been treated as a hazard and acted upon accordingly.

It is concluded that, although the crew did not perceive the situation as a hazard, the continuous EGPWS warnings close to the ground should have been treated as hazardous and corrected by executing a go-around.

Landing
The flight technique in the AOM F50 for a visual approach and landing for a normal circuit suggests to; *aim to be established on final on a three degree glide path at approximately 500 feet and reduce speed to cross the threshold at approximately 50 feet and at* V_{REF}. These techniques are incorporated into the operator's operating manual.

In 2005 the aircraft manufacturer amplified the importance of these techniques by sending an *all operators message AOF50.038 "approach and landing incidents and accidents"*, stating that; *deviation from the approach procedures in the AOM may cause the aircraft to enter a condition from which a landing is not possible or which will cause a landing with a significant longer landing distance*. The *all operators message* that was sent by the aircraft manufacturer was received by the operator, but it appeared that this information was not known to all flight crew members.

Whether the crew was familiar with the flight techniques in the AOM and the companies OM or not, they were not fully aware of the implications the speed and altitude deviations had on the intended landing performance. The PF continued the approach and the aircraft crossed the threshold at 300 feet above the ground and with 150 knots indicated airspeed (55 percent higher than V_{REF}), whereas it should have been at approximately 50 feet and at the reference speed of 97 knots. Hence a difference between the desired flying parameters from the AOM F50 and the actual flying parameters.

Research by the Flight Safety Foundation shows that the following variables cause an increase in actual landing distance:
- Crossing the runway threshold at 100 feet (50 feet higher than recommended) will increase the landing distance by 305 metres;
- Every 10 percent increase in speed results in a 20 percent increase in landing distance;
- Every 10 knots of tail wind will increase the actual landing distance by 20 percent, provided the aircraft lands on speed and in the desired landing zone.

The excess threshold crossing height will add at least 305 m (since the threshold was crossed at 300 feet the penalty is probably more, but cannot be determined exactly), the excess threshold speed will add 706 metres and a 10 knots tail wind component will add 128 metres to increase the actual landing distance from 642 to at least 1781 metres. The landing distance available at EHGG is 1800 metres.

Due to the high airspeed the aircraft was aerodynamically not ready to be flared. Instead the PF had to actively fly the aircraft towards the runway resulting in the nose wheel to touch down on the runway first with the main landing gear remaining in the air (also called 'wheel-barrowing'). Since the main landing gear was still in the air, braking was not possible and the automatic flight idle stop solenoids prevented the selection of ground idle. The 'flight idle stop solenoids' operate movable lock levers on the engine throttle controls that are disengaged when wheel spin up signals or *ground/flight switch in ground* signals are sent to the ground control relay. Only after the lock levers are disengaged, is the selection of ground idle possible.

The left main landing gear touched down for the first time approximately 490 metres before the end of the runway. The right main landing gear touched down with a speed of 100 knots and with approximately 320 metres to go to the end of the runway. At this time the required electrical signals allowed for disengagement of the lock levers and subsequent ground idle selection. The PF brought the throttles in the ground range and applied the brakes in order to slow down the aircraft. Although the crew did not sense that the braking was effective, this deceleration was corroborated by the recorded flight data. The PF stated he did not use alternate brakes, since the absence of anti-skid may have caused one or more tyres to blow.

The aircraft veered to the left and the left hand main landing gear departed and paralleled the runway just outside the hardened surface. The left main landing gear subsequently destroyed a runway edge light. This event most probably caused the failure of the left outside tyre.

There is no conclusive evidence to explain why the aircraft veered to the left. The PF reached for the tiller and steered the aircraft towards the runway centre line, but was unable to stop the aircraft in the remaining runway length and the aircraft came to a halt 60 metres beyond the end of the runway.

It is concluded that the PF misjudged the landing on runway 05. Eventually the landing distance required exceeded the landing distance available.

Overrun area
The area beyond the end of the runway, i.e. the 'overrun area', contained underground concrete structures, containing electrical transformers, in soft soil. It is likely that such a combination (*underground* structures and soft soil) entails a substantial fire hazard for the aircraft and its occupants in the event of a collision (the aircraft fuel, the risk of ignition of sparks and the temperature of the engines).

Illustration 5: embedded construction in front of Fokker 50

This finding was also mentioned in report number 2003071 of the Dutch Safety Board regarding an aircraft accident on 17 June 2003 involving an MD-88 that overran the runway at Groningen Airport Eelde during a take-off abort. In 2006 it was recommended to the Dutch Minister of Transport, Public Works and Water Management to investigate to which extent the requirements concerning the underground infrastructure in the direct vicinity of start and landing runways have to be stepped up to prevent serious damage to aircraft that overrun the runway. In November 2007, six months after the Fokker 50 incident, the Minister stated it will add the survey of underground infrastructure in close proximity to runways to its inspection program.

Illustration 6: right hand main landing gear Fokker 50 facing the embedded construction

CONCLUSIONS

Cause

The incident was caused by the decision of the PF to land the aircraft while the aircraft was not in a stabilised condition, resulting in a long landing and an overrun.

Contributing factors

The crew was not aware of the prevailing tail wind component during their descent inbound EHGG. This resulted in a delayed descent and a steep approach, which was not perceived as unusual by the crew. Eventually the approach did not meet the stabilised approach criteria.

The crew should have treated the continuous EGPWS warnings as hazardous and executed a go-around.

The PF misjudged the landing on runway 05. Eventually the landing distance required exceeded the landing distance available.

Note: This report has been published in the English and Dutch language. If there are differences in interpretation the Dutch text prevails.

APPENDIX A: FLIGHT DATA

The figure represents the final approach and landing phase and starts at 14900 (= 20.51:38 hours) and ends one minute and forty seconds later at 15000 (= 20.53:18 hours); interval on the time axis is five seconds.

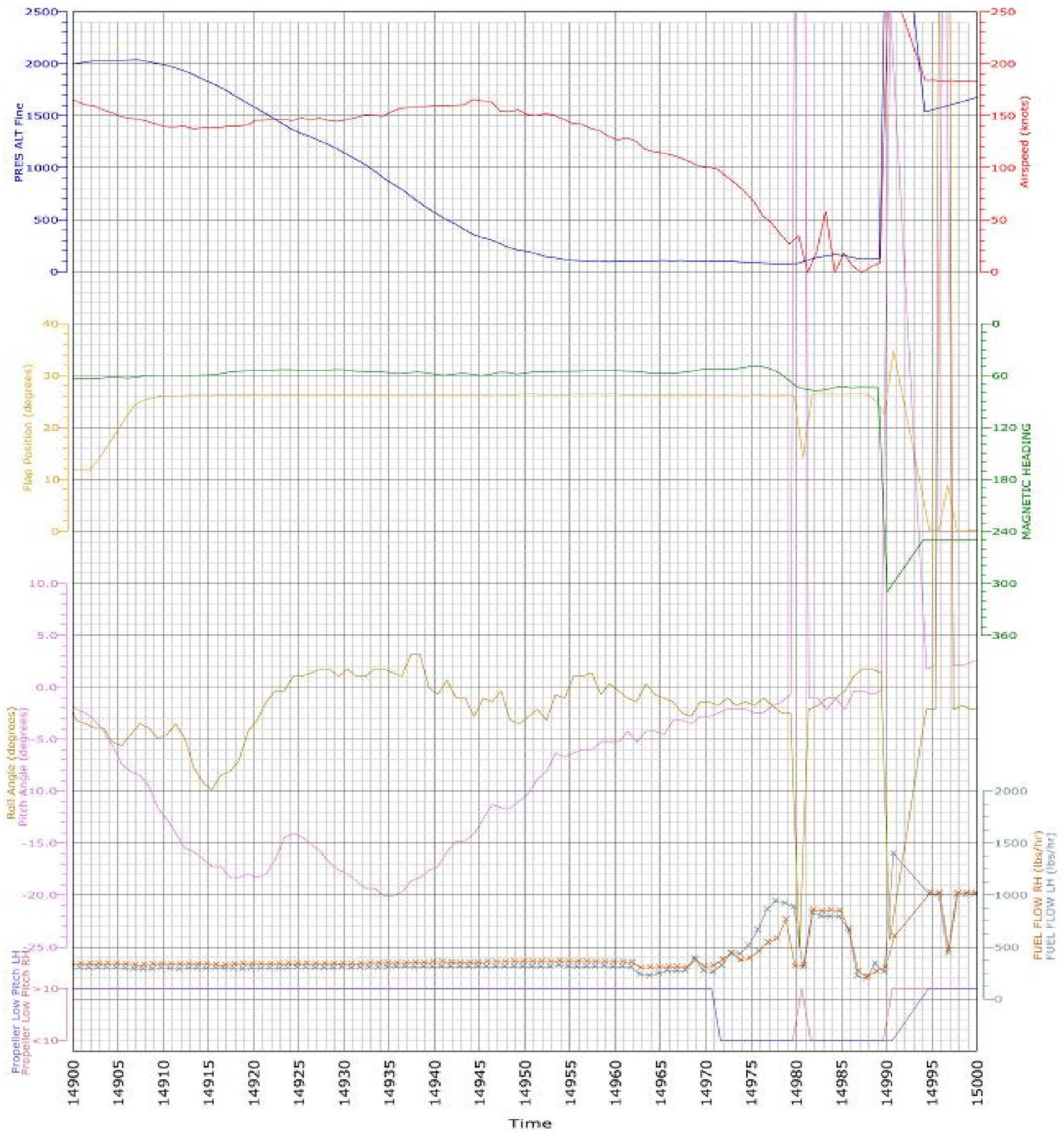

Illustration 7: flight data presentation starting approximately two minutes prior to landing at EHGG

Actual time	FDR time
20.51:42	14904
20.51:46	14908
20.51:51	14914
20.51:56	14918
20.52:01	14923
20.52:06	14928
20.52:10	14932
20.52:16	14938
20.52:20	14942
20.52:24	14946

Table 6: reference between actual and flight data recorder time

APPENDIX B: COMMENTS OF PARTIES INVOLVED

The Dutch Safety Board has sent the draft report to the parties involved. They may comment in writing. If the comments made should give rise to it, the Board may adjust the report. If the report is not adjusted in conformity with the essence of the comments, the Board shall indicate the reasons for this in the report.[15]

General

In the report the Board primarily deals with the consequences of the behavior and or actions of the flight crew. No investigation was started if the role of corporate culture - the pattern of norms, values and behaviors – may have influenced the actions of the flight crew.

Comments that led to adjustment of the report were submitted by the captain, the first officer, the airline, the aircraft manufacturer and the Belgian federal government mobility and transportation service. Two remarks of the manufacturer of the aircraft have not been processed in the draft report.

Aircraft manufacturer

1. Remark:
Page 10 (Board: changed to "page 13"), add:

Flight Data Monitoring
Flight data monitoring (FDM) is the pro-active use of digital flight data from routine operations to improve aviation safety. FDM consists of downloading and analysing aircraft data on a routine basis. FDM records all flight data continuously, and triggers events for evaluation. The purpose is to analyse collected flight data to detect flight operations trends, identify risk precursors, and take the appropriate remedial action.

2. Remark:
Page 11 (Board: changed to "page 14") Conclusions, add:

VLM did not have a FDM program in place at the time of the accident.

Response of Board:
The text of both comments is not added.
Explanation: The Board did not initiate an investigation into the presence of a flight safety program within the airline company or the resources that could support such a program. It has come to the attention of the Board that since 2010 the company has performed an FDM program for trend analysis.

[15] Kingdom Act concerning Safety Investigation Board, Article 56.