Investigation report

D7/2010L

Accident during landing practice at Helsinki-Malmi aerodrome on 12 August 2010

Translation of the Finnish original report

OH-NTL

AS 202/18A4

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 the investigation report to apportion blame or to assign responsibility. This basic rule is also contained in the Investigation of Accidents Act (373/85) and Regulation (EU) No 996/2010 of the European Parliament and of the Council. Use of the report for reasons other than improvement of safety should be avoided.

Due to the nature of this incident the format of this investigation report diverges from that defined in Annex 13 to the Convention on International Civil Aviation. Accident Investigation Board of Finland uses the ICAO Annex 13 format in its A, B and C investigation reports

INVESTIGATION REPORT: D7/2010L **INVESTIGATORS**: Ismo Aaltonen and Pekka Alaraudanjoki

INVESTIGATION COMPLETED ON: 14.4.2011

Time:	12 Aug 2010 at 13:34 (Finnish time)
Place:	Helsinki-Malmi aerodrome
Registration:	OH-NTL
Powerplant:	Single Lycoming AEIO-360-B1F
Year of manufacture:	1988
Type of flight:	Second solo flight of a student pilot, landing practice
Damage to aircraft:	Aircraft damaged beyond repair. Left wing bent backwards, nose, including engine nacelle, bent to the left, propeller blades bent, left main landing gear broken and right wing skin damaged.
Number of persons onboard:	1
Pilot:	Student pilot, age 19
Licences:	Student pilot SP(A)
Flying experience:	**Total flight hours:** 21 hours 00 minutes, 79 landings **Type in question:** 21 hours 00 minutes, 79 landings
Meteorological information:	Terminal Area Forecast (TAF) for time of occurrence: Wind 140 degrees nine knots, CAVOK, occasional CB-clouds at 3500 ft. METAR at 13:20: Wind 110 degrees seven knots, variable between 070 degrees and 170 degrees, visibility over 10 km, a few clouds at 1900 ft, scattered clouds at 2700 ft, temperature 22 °C and dew point at 18 °C, QNH 1021 hPa

Translation: R&J Language Service

SYNOPSIS

An accident happened at Helsinki-Malmi aerodrome on 12 August 2010 at 13:34 Finnish time. An AS 202/18A4 BRAVO aircraft, registration OH-NTL, was damaged beyond repair during a touch-and go landing. There were no injuries to persons.

Helsinki-Malmi air traffic control sounded an alert which was followed by an immediate rescue operation. On 12 August 2010 the student pilot filed a GEN M1-4 report to the aviation authority (Trafi). Trafi relayed the report to Accident Investigation Board of Finland. On 13 August 2010 Accident Investigation Board of Finland appointed Investigators Ismo Aaltonen and Pekka Alaraudanjoki to set up investigation commission D7/2010L, tasked to carry out an investigation related to this occurrence.

1 FACTUAL INFORMATION

1.1 Pilot training and flying experience

The student pilot was part of a group of students from a foreign university who had enrolled on a private pilot licence (PPL) course at Patria Pilot Training Oy in Finland. He had begun his flight training in June 2010 and flew his first training flight on 8 July 2010. Training was provided in accordance with the PPL(A) flight training syllabus. Prior to beginning his flight training the student pilot had successfully passed the theoretical knowledge instruction included in the curriculum. Furthermore, he had flown a flight simulator for approximately 50 hours in his native country. Before his first solo flight the student pilot had amassed 20 h 19 min on training flights, including 73 landings.

1.2 Preparation for the flight

The student pilot was preparing to take off for his second solo flight at Helsinki-Malmi aerodrome. The topic of the flight was landing practice. On this day the 1024 metres long runway 09 was in use. The student pilot had not previously taken off from this runway, but instead, had always used the 1340 metres long runway 18/36. Prior to the flight his instructor pilot had elaborated on the traffic circuit landmarks for runway 09 and explained some the effects of a shorter-than-normal runway with regard to flight operations. Moreover, the student pilot had talked about the traffic circuit and landing on runway 09 with his peers who had previously taken off from this particular runway.

Pursuant to Patria Pilot Training Oy's syllabus the student pilot's two first solo flights must always be supervised by his own flight instructor. The first solo flight is to be supervised from the air traffic control tower; the remaining solo flights must be supervised in such a manner that, if needed, the flight instructor can be in radio contact with the student pilot. During this particular flight the flight instructor was inside the flight training organisation's premises and, hence, did not witness the occurrence.

1.3 Events during the flight

The student pilot took off with the Helsinki-Malmi aerodrome landing chart, with which he attempted to fly the traffic circuit. He said that his downwind leg was a little longer and wider at the end than that of the landing chart. He thought that the onset of his final approach was pretty good; according to the PAPI lights he was at the right position and altitude. The final approach was flown in accordance with standard procedure, with the

trailing edge flaps fully extended (41°). As per his account, due to the short runway, the student pilot tried to land closer than usual to the threshold. He said that once he had cleared the threshold he slowly pulled the throttle to idle and concentrated on flaring out the aircraft. According to eyewitnesses the aircraft touched down approximately 50 metres after the threshold and the end sink rate seemed to be high. Following this, the aircraft appeared to bounce to an approximate height of 0.5 metres. The student pilot did not manage to gain full control of the aircraft; instead, the aircraft bounced several times, rocking from side to side and from one wheel to another. After approximately 100 metres of landing roll an increase in engine power could be heard and the aircraft suddenly turned to the left. The aircraft took to the air in a fairly steep climb while turning to the left at the same time. Eyewitnesses felt that the airspeed was quite low at that point in time. The student pilot said that he immediately received a stall warning during the initial climb. Once the aircraft had steeply climbed to an approximate height of 10 metres it suddenly rolled to the left, lost altitude and ultimately crashed into the ground left wing first. Following this the nose and the right wing hit the ground. The aircraft did not tip over but skid tail first for 20–30 metres. The engine was running until its collision with the ground. When the aircraft came to a standstill the student pilot got out of the cockpit and ran away from the aircraft towards the edge of the nearby woods.

Having witnessed the collision with the ground, the air traffic controller sounded the alert. The rescue units that arrived at the site made certain that the pilot was OK and prevented any risk of fire by closing off the fuel cocks. Moreover, they applied foam on the ground in the direction from where the aircraft had come. The accident investigators who arrived later at the site switched off the aircraft's magnetos and disconnected the battery cables.

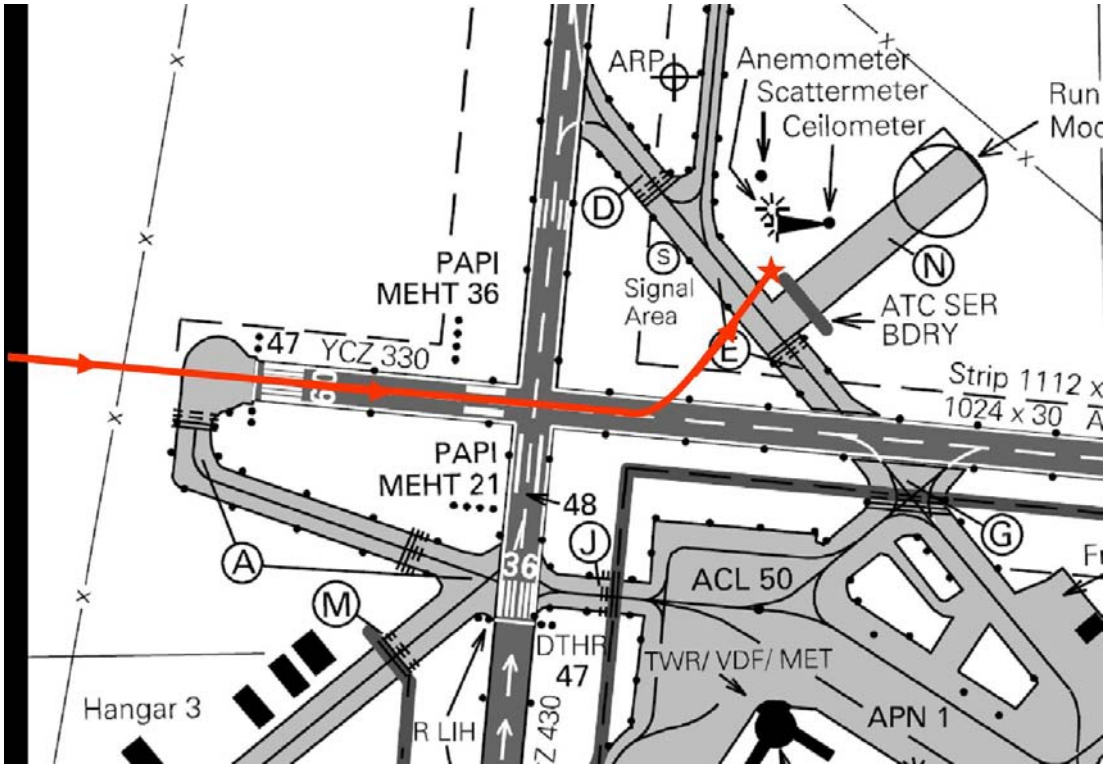

Figure 1. The site of the accident and the aircraft's estimated track during the final phase of the flight. © Finavia Corporation, permission L7027/07

1.4 Aircraft information

Judging from the aircraft's documents and its technical inspection the aircraft was airworthy prior to the accident. All detected damage to the aircraft occurred during the collision with the ground. The airworthiness certificate, issued on 22 Aug 2008, was valid. The aviation authority had issued an airworthiness review certificate on 7 Jul 2009, valid until 31 Aug 2010.

The European Aviation Safety Agency's (EASA) Special Airworthiness Directive EASA.SAS.A.067, ISSUE 03, 3 Nov 2009, Section 4, which also applies to AS202 aircraft, contains the following caveat: This aircraft is limited to non-commercial operation. According to the Finnish aviation authority's notification, the scope of this directive with regard to AS202 aircraft will be further specified in future EASA directives which apply to commercial aviation.

Figure 2. The aircraft after the accident.

1.5 Flight training organisation

The student pilot was participating in Patria Pilot Training Oy's private pilot licence (PPL) course. Flight training was organised in accordance with Patria's approved training manual. Pursuant to aviation regulations, a flight instructor was assigned to the student pilot, who trained him all the way to the solo flying phase.

Patria Pilot Training Oy's flight training organisation and nominated postholders are approved by the aviation authority. The company has appointed an accountable manager, head of training, chief flying instructor, chief ground instructor, quality manager, flight operations manager, maintenance manager, flight instructors and ground instructors as well as a safety standards supervisor and course leaders.

The head of training carries overall responsibility for the harmonisation of flight training, synthetic training and theoretical knowledge instruction as well as supervising the progress of individual students. The chief flying instructor is responsible for the quality of flight instruction and the contents of flight training syllabi as well as for maintaining and improving the professional skills of flight instructors and simulator instructors. He is also tasked with organising, directing and supervising the student pilots' skills tests.

The course leader is responsible for his course's progress and daily tasks. He reports to the chief flying instructor (CFI) and his primary task, in addition to flight training, is to monitor the progress of his course. Flight instructors report also to the CFI. Their responsibility is to provide appropriate instruction and to fly training flights with student pilots in accordance with the curriculum.

The company's management convenes three times each week to process both general and training matters. The head of training, the chief flying instructor and the chief ground instructor convene once a week to discuss mainly about the student pilots and courses. The chief flying instructor and the flight instructors also meet every week to process the matters at hand. Prior to this accident the progress of the student pilot in question was discussed during these meetings.

2 ANALYSIS

2.1 Pilot training

Since the student pilot's travel documents were to expire at the end of September 2010 there was an attempt to complete his training without pauses. The student pilot would fly a maximum of two flights per day. In accordance with the curriculum he flew 16 training flights before the progress check flight VTL1, which was to be flown prior to his first solo. He passed the VTL1 check flight on his third attempt. Following each of the failed skills test flights the student flew one refresher flight with his own flight instructor. This flight instructor had planned the content for both refresher flights on the basis of information received from the flight examiner. The head of training approved the content for extra training flights.

The main reasons for failing the skills tests included the loss of too much altitude during stall recovery, inadequate airspace monitoring during the flight as well as problems arising during the flare-out. The student pilot found it challenging to correctly time the flare-out, which resulted in bounced landings at the beginning of the landing rolls. On training flights the student pilot had exhibited the proclivity of preventing bounced landings by pushing the control stick forwards during the landing roll.

2.2 The accident flight

As the student pilot was preparing for the flight his flight instructor participated in the briefing and provided instructions on how to fly the runway 09 traffic circuit. They went through the landmarks and the procedures at each phase. The instructor had stressed that the circuit was short and that one must execute each procedure expeditiously so as to have enough time to complete them at the correct juncture. The student pilot had not flown a single takeoff or landing from runway 09/27 during his entire flight training. Runway 09/27 is 316 metres shorter than runway 18/36. The shorter runway increased the stress level of the student pilot. He had also asked his peers about landing on runway 09 as well as flying the traffic circuit.

Runway 09/27 easily meets the runway requirements of the aircraft type in question. It is possible to fly a touch-and-go landing using standard procedures. When it comes to this situation, the student pilot may have been sidetracked by his limited flying experience and his first landing on the runway in question as well as the ground obstacles beyond the end of runway 09, which make the runway seem shorter than it is.

The student pilot took off from runway 09 and the takeoff was uneventful. He said that it was easy to maintain position within the traffic circuit as per the landing chart. In order to prevent an overly close final approach he decided to fly a slightly wider and longer downwind leg. He thought that he managed to fly to the correct position for the final approach. The final approach was normal, in accordance with the PAPI lights. Since the runway was short the student pilot said that he attempted to land close to the threshold. In order to do so he increased the glide path angle just before the critical phase of the landing. Due to his limited flying experience he failed to flare out at the correct height, which resulted in a landing at a higher-than-normal sink rate. After touchdown the aircraft bounced and, as per his account, the student pilot tried to prevent any additional bouncing by pulling on the control stick, to no avail. At this time he decided to increase to full power and continue the landing as a touch-and-go even though he had not managed to stabilise the landing roll. The bouncing was caused by the pilot's incorrect longitudinal flight control inputs. The investigators believe that the minor surface undulations in the beginning of the runway were not the cause of the bouncing.

The student pilot's decision to increase to full power too early was probably influenced by his partial loss of control following touchdown as well as a seemingly short runway. He assumed that by doing so he would gain control of the aircraft. The combined effect of full power and inadequate flight control inputs resulted in the aircraft turning towards the rotation of the engine, i.e. the obstacles on the left side of the runway, the windsock and the anemometer mast. At this time the student pilot instinctively pulled the aircraft into the air, at low airspeed and at a steep climb angle. Simultaneously he selected takeoff flaps (15°). Inadvertently, however, he selected zero flaps. This resulted in an increase in the stalling speed. Once the aircraft was in a clean configuration it also cleared the ground effect which only further increased the stalling speed. Because of the steep climb angle the aircraft could not sufficiently accelerate, which resulted in a stall and a roll over the left wing. Due to the low altitude the student pilot was in no position to complete the requisite upset recovery prior to colliding with the ground.

2.3 Flight training organisation

During issues discussed in weekly meetings and when they assigned him with additional refresher flights as per the flight instructors' proposals, the persons accountable for the aviation academy's flight training had become cognisant of the student pilot's problems. The flight instructor's records of progress on the flight training syllabus were inadequate or, in the case of some flights, completely missing. The student pilot's logbook records also contained shortcomings and irregularities.

The student pilot clearly had more trouble than most in absorbing certain information. This being the case the flight training organisation should have delved deeper into the causes of these problems. Perhaps the reason lay in the quality of instruction or procedures. Maybe the student pilot's capacity to absorb information or his motivation could be out of the ordinary. Possibly there were yet other reasons that should have been established and sorted out.

2.4 Rescue operations and survival aspects

The first rescue units arrived at the site about a minute after the accident. They made sure that the pilot was OK and took him to the hospital for a further check-up. When the investigators arrived at the scene the aircraft magnetos were in the BOTH position and the battery cables were still connected. Rescue personnel do not have dedicated instructions on what parts of wreckage they are allowed to manipulate, for example, to prevent the risk of fire. Finavia Corporation has published instructions on the most common aircraft types, which also show the location of the most important switches in the cockpit.

3 CONCLUSIONS

3.1 Findings

1. The student pilot had the required student pilot licence.

2. The airworthiness certificate and the airworthiness review certificate were valid.

3. Meteorological conditions were good.

4. This was the student's first landing on runway 09, which is shorter than runway 18/36 which he had previously used.

5. The student pilot attempted to land close to the threshold of the runway, which resulted in higher-than-normal sink rate at the moment of touchdown.

6. Following the student pilot's incorrect flight control inputs the aircraft bounced several times after touchdown.

7. The student pilot added full power even though he had not stabilised the aircraft in a normal landing roll.

8. During the rapid power increase the student pilot did not gain control of the aircraft. Instead, the aircraft turned towards the left side of the runway.

9. In order to avoid the obstacles ahead the student pilot pulled the aircraft into a steep climb at a low airspeed. As a result, the aircraft did not accelerate.

10. The student pilot had inadvertently selected zero flaps instead of middle flaps (15°). This resulted in a higher stalling airspeed.

11. Once the aircraft cleared the ground effect at the approximate height of 10 metres it stalled and collided with the ground approximately 120 metres left of the runway.

12. The aircraft skidded on the ground, tail first, for 20–30 metres. However, it stayed upright.

13. The aircraft was damaged beyond repair.

14. There were no injuries to persons.

15. The rescue personnel took the pilot to the hospital for a check-up.

16. The rescue personnel did not switch the magnetos into the OFF position, nor did they disconnect the battery cables.

3.2 Probable cause

As a result of incorrect flight control inputs the student pilot lost control of the aircraft during a touch-and-go landing.

Contributing factors:
- Due to the contour of the terrain at the opposite end of the runway it seems shorter than it really is.
- The student pilot attempted to land close to the threshold of the runway, which resulted in higher-than-normal sink rate at touchdown.
- It was the student pilot's first traffic circuit and landing on runway 09. This placed additional stress on the student pilot.

4 SAFETY RECOMMENDATIONS

4.1 Action taken during the investigation

Since the occurrence Patria Pilot Training Oy has changed its procedures in the following way: when a student pilot fails to pass a progress check flight (VTL1) for the second time the chief flying instructor flies the refresher flight with the student pilot.

4.2 Safety recommendations

Since the aviation regulations pertaining to private pilot licence training are already sufficient, the investigators did not make any safety recommendations.

4.3 Additional observations and recommendations

Training organisations should make student pilots sufficiently familiar with all runways at their training aerodromes prior to their first solo flights.

In its revalidation training the aerodrome's rescue personnel should be familiarised with the location and use of fuel levers and electric switches in the cockpits of the most common types of aircraft so as to prevent the risk of fire.