Ultralight Aircraft Accident at Tampere-Pirkkala Airport on July 31, 2019

L2019-05

FOREWORD

Pursuant to section 2 of the Safety Investigation Act (525/2011), the Safety Investigation Authority of Finland (SIAF) decided to investigate an aircraft accident that occurred at Tampere-Pirkkala airport on July 31, 2019. The purpose of a safety investigation is to promote general safety, the prevention of accidents and incidents, and the prevention of losses resulting from accidents. A safety investigation is not conducted in order to allocate legal liability.

Master of Arts Kalle Brusi was appointed the investigation team leader. The team member was Executive Fire Officer, Master of Administrative Sciences Jaakko Niskala. The investigator-in-charge was Chief Air Safety Investigator Ismo Aaltonen, who was succeeded in August 2019 by Chief Air Safety Investigator Janne Kotiranta.

The European Aviation Safety Agency (EASA) appointed a technical advisor for the investigation.

The SIAF issued a safety alert with the aim of improving the ergonomics of the rudder pedal layout of the accident aircraft type.

The safety investigation examines the course of events, their causes and consequences, search and rescue actions, and actions taken by the authorities. The investigation specifically examines whether safety had adequately been taken into consideration in the activity leading up to the accident and in the planning, manufacture, construction and use of the equipment and structures that caused the accident or incident or at which the accident or incident was directed. The investigation also examines whether the management, supervision and inspection activity had been appropriately arranged and managed. Where necessary the investigation is also expected to examine possible shortcomings in the provisions and orders regarding safety and the authorities' activities.

The investigation report includes an account of the course of the incident, the factors leading to the incident, and the consequences of the incident as well as safety recommendations addressed to the appropriate authorities and other actors regarding measures that are necessary in order to promote general safety, prevent further accidents and incidents, prevent loss, and improve the effectiveness of search and rescue and the actions of other authorities.

An opportunity is given to those involved in the accident and to the authorities responsible for supervision in the field of the accident to comment on the draft investigation report. These comments have been taken into consideration during the preparation of the final report. A summary of the comments is at the end of the report. Pursuant to the Safety Investigation Act, no comments given by private individuals are published.

The investigation report was translated into English by TK Translations.

The investigation report and its summary were published on the SIAF's internet page at *www.turvallisuustutkinta.fi* on 18.06.2020.

Investigation designator: L2019-05
Investigation report 5/2020
ISBN: 978-951-836-573-3 (PDF)

Cover photo: Police

CONTENTS

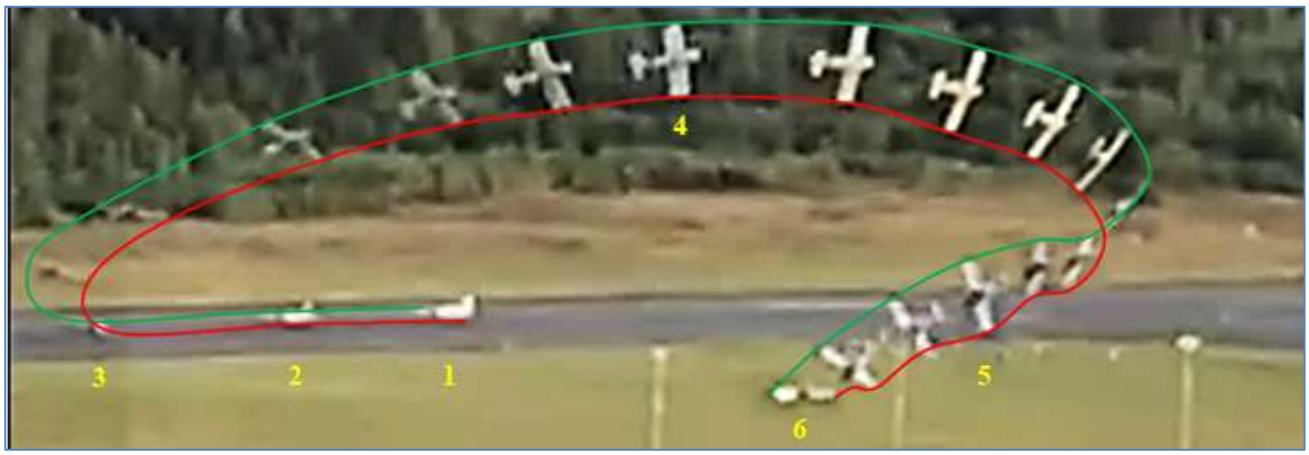
FOREWORD 2
1 EVENTS 4
1.1 Sequence of Events 4
1.2 Alerting and Rescue Operations 5
1.2.1 Alerting and Notification 5
1.2.2 Conduct of Rescue Operations 5
1.3 Consequences 6
2 BACKGROUND INFORMATION 7
2.1 Environment, Equipment, and Systems 7
2.1.1 Tampere-Pirkkala Airport 7
2.1.2 Aircraft 7
2.1.3 Wreckage and Impact Information 8
2.1.4 Ballistic Rescue Parachute System 9
2.2 Conditions 9
2.3 Recordings 9
2.4 Personnel, Organizations, and Safety Management 10
2.5 Alerting Procedures 11
2.6 Rescue Organizations and Their Preparedness 11
2.7 Rules, Regulations, Guidance, and Procedures 11
2.8 Other Research 12
3 ANALYSIS 13
3.1 Analysis of Occurrence 13
3.2 Analysis of Rescue Operation 14
3.3 Analysis of Authorities' Action 14
4 CONCLUSIONS 15
5 SAFETY RECOMMENDATIONS 16
5.1 Leisure Pilot Training 16
5.2 Training for Ballistic Rescue Parachute Systems 16
5.3 Safety Alert 16
5.4 Implemented Measures 17
SUMMARY OF COMMENTS TO DRAFT FINAL REPORT 19
Appendix 1: Airworthiness Directive M 3172/19 20

1 EVENTS

1.1 Sequence of Events

On Wednesday July 31, 2019, at 2053 h[1], a student pilot was departing on a solo instructional flight at Tampere-Pirkkala airport. His intention was to spend thirty minutes in the airport traffic circuit. The aircraft was an EV-97 Eurostar ultralight airplane.

The student conducted normal preflight preparation in the presence of the instructor. After lining up on runway 06, he added power smoothly (1). Before rotation[2], the aircraft yawed abruptly about 45° left (2). Liftoff occurred just before the aircraft reached the edge of the paved surface (3). The aircraft became airborne at a high angle of attack[3] and at a low airspeed. It continued flight in a left turn; the turn was initially unstabilized, and then became steeper, while the aircraft continued to climb.



Kuva 1. The aircraft's trajectory as derived from a video footage. The numbers refer to the text. (Source: eyewitness material)

The aircraft continued in the left turn, and by the time it had turned about 180° and was flying almost parallel to the runway, the bank angle had attained about 70° to the left (4), and the aircraft was more than 50 m above ground level (AGL). It then began to descend, and the bank angle reduced. By the time the aircraft was at about 20 m AGL, it was banked left more than 30° and descending on an easterly heading, which meant that the heading change during the turn was about 330°. The aircraft then stalled to the left (5), and the sink rate increased significantly.

The aircraft impacted terrain left wing first. On impact, the bank angle was over 70°, and the aircraft was in about 45° nose down attitude. The engine operated at maximum power until impact (6). After the initial impact with the left wing, the aircraft rotated approximately 180° about the vertical axis, and the nose hit the ground. The aircraft then bounced, tail first, about 5 m and came to rest upright with the nose pointing towards the east. The airborne time was about 20 s. The aircraft was destroyed by the impact, and the student pilot sustained fatal injuries.

---

1 All times are Finnish daylight saving time (UTC + 3 h).
2 Rotation is the phase of the takeoff run in which the pilot starts raising the aircraft's nose to the takeoff attitude.
3 Angle between the wing chord line and relative wind

1.2 Alerting and Rescue Operations

1.2.1 Alerting and Notification

The air traffic controller observed from the control tower the aircraft impacting terrain adjacent to the runway at 2054 h. He pushed the red button that automatically alerted the emergency response center (ERC) and the aerodrome rescue services of an aircraft accident. He then called the ERC immediately on the phone to report that an ultralight aircraft had been involved in an accident and hung up. He also notified the Aeronautical Rescue Coordination Center (ARCC) of the accident by a phone call.

At 2054 h, the ERC initiated a prescribed procedure for alerting rescue units to respond to *a major aircraft accident*[4]. The procedure is described in the directives of Pirkanmaa Rescue Department. In addition to the aerodrome rescue services, 15 rescue department personnel and units were alerted, including the on-duty fire chief, three executive fire officers, seven rescue units, three water tenders, and a recovery vehicle. The aerodrome rescue services rolled two foam tenders crewed by the shift supervisor and two firefighters.

In the meantime, the instructor called the controller to state that the aircraft had a single occupant on board and the aircraft was fitted with a ballistic rescue parachute system (BRPS). The controller passed this information to the aerodrome rescue services via the aeronautical radio network, and the shift supervisor then notified the rescue department accordingly. Based on this information, the executive fire officer who was directing the rescue operations in the situation center decided that the on-duty executive fire officer of Nokia fire station and the three closest rescue units proceed to the accident site.

The ERC alerted a paramedic field supervisor from Tampere, an ambulance from Pirkkala, and one rescue unit equipped for multipatient situations. At 2058 h, the ERC alerted a FinnHEMS emergency physician based at Tampere-Pirkkala airport.

At 2058 h, several police patrols of the Pirkanmaa Police Department were alerted. Once at the accident site, the police officers alerted police explosive disposal specialists from Tampere to disarm the BRPS. They also alerted technical investigators.

1.2.2 Conduct of Rescue Operations

The aerodrome rescue services units reached the accident site at about 2057 h. A rescueman began to perform first aid while the rescue services spread fire suppression foam around the aircraft. The emergency physician arrived at about 2101 h. A rescue unit from Pirkkala arrived at 2104, followed soon afterwards by the on-duty fire officer and other rescue units. At this point, the shift supervisor notified personnel about the BRPS and its danger areas. The FinnHEMS crew member moved to the victim to assess his condition. Personnel working in the vicinity of the victim was aware of BRPS hazard.

The executive fire officer directed the rescue unit crew members to stabilize the aircraft and plan the expeditious and safe evacuation of the victim. Paramedics soon established that the victim was beyond help, and focus shifted to rendering the BRPS safe.

No actual rescue operations were conducted. Communication between the aerodrome rescue services, the rescue department, police, paramedics, and other agencies and individuals was via a talkgroup established in the nationwide public safety network. Tower controllers

[4] An accident is classified as major when the number of persons to be rescued is 5 to 20. Additional paramedic units are alerted when the number of persons exceeds 20.

communicate with the aerodrome rescue services on the ground control frequency and maintain a listening watch on the public safety network.

The first police patrol arrived at 2106 h. The aerodrome rescue services and rescue department lacked the equipment and knowledge for BRPS disarming. After discussing the possibilities of disarming, local police officers decided to request an explosive disposal team and a defusing robot from Helsinki Police Department. These arrived in the early hours on August 1. Police officers removed the BRPS and detonated it within the aerodrome area at about 0700 h. The airport was subsequently reopened to air traffic.

1.3 Consequences

The student pilot sustained fatal injuries. A post-mortem examination consisting of an autopsy and associated microscopy and chemical tests was performed on the victim in order to determine the cause of death. The autopsy, done by a forensic pathologist, showed no signs of incapacitation. Blood samples taken from the pilot tested negative for alcohol, drugs, or other substances that could have impaired his performance.

The aircraft was destroyed. Damage to the aircraft is described in paragraph 2.1.3.

The airport remained closed for about ten hours, until the following morning, due to the BRPS disarming, which led to the cancelation of one scheduled flight.

2 BACKGROUND INFORMATION

2.1 Environment, Equipment, and Systems

2.1.1 Tampere-Pirkkala Airport

Tampere-Pirkkala airport is located in the municipality of Pirkkala 13 km southwest of Tampere. The airport is operated by Finavia, and continuous air traffic control services are provided by Air Navigation Services Finland (ANS Finland). Both are state-owned corporations. The airport is served by a single paved runway designated 06/24[5]. The airport is also the base for Satakunta Air Command of the Finnish air force.

2.1.2 Aircraft

The accident aircraft was an Evektor-Aerotechnik EV-97 Eurostar 2000R ultralight airplane[6]. It bore the registration OH-U438. The serial number of the 2002-built aircraft was 2002 1606. The aircraft had accumulated 2,067 h. It was fitted with a Magnum 450 BRPS.

The aircraft was properly maintained and airworthy. Weight and balance calculations showed that its center of gravity was within allowable limits on the accident flight. The aircraft type has dual controls, one set of controls for the pilot's position and the other for the copilot's position. The pedals[7] are interconnected mechanically. The right pedal of the pilot's position (left) is very close to the left pedal of the copilot's (right) position. There is no guard between the pedal assemblies to prevent incorrect pedal application (figures Kuva 2 and 3). Moreover, due to the shape of the pedals, the pilot may not feel an incorrect foot position through the shoe sole. The aircraft manufacturer has issued a non-mandatory service bulletin for the fitting of a barrier between the pedal assemblies to preclude incorrect pedal application[8]. The aircraft owners were aware of the bulletin but, because of its informative nature, had elected not to implement it.

One characteristic of the accident aircraft type is significant propeller torque that causes left yaw on takeoff. The pilot should counter this tendency by the carefully timed application of the right pedal.

[5] Runway designators indicate compass headings (060° and 240°).
[6] Light sport airplane that has a maximum takeoff mass not exceeding 450 kg and is not type approved
[7] The pedals operate the aircraft's rudder.
[8] Informative Bulletin No. EV 97 - 014b

Kuva 2. Correctly positioned feet on a pedal assembly. Photo: SIAF

Kuva 3. Right foot positioned incorrectly. Photo: SIAF

2.1.3 Wreckage and Impact Information

The aircraft's forward fuselage was crushed aft to the cabin section, and the engine mount was destroyed. The cowling and forward fuselage skin were almost completely separated. The cabin footwell showed significant compression damage. The fuselage was bent behind the

cabin and exhibited damage in the area below the fuel tank. The wing attachments were severely damaged, and the wings had sustained major damage. All propeller blades had separated at the root. A blade section of approximately one half of the blade length was located 30 m from the main wreckage. The tires were intact. The nose landing gear was bent, and the nosewheel steering system was damaged. The throttle was fully forward.

Continuity was established between the cockpit controls and the ailerons. During the examination of components located below the fuel tank, damage was found in the eye-end of a push-pull rod of the elevator control system, and similar damage was evident in an eye-end of the flap control system. In both cases, damage was not consistent with a fatigue fracture. The flap torque shafts had separated from their attachments at the wing roots. No indication of wear or pre-impact separation was found in these parts. The trim control cables were in working order. Continuity was established between the cockpit controls and the rudder. The pedals were distorted, while the control stick was partially jammed. When checking the areas around these controls, the investigators found no loose articles that could have caused control restriction. Flight control system damage was concentrated in the area where the fuselage had received major impact damage.

All damage had very likely resulted from the ground impact. The investigation determined that no pre-accident technical fault had existed in the aircraft.

2.1.4 Ballistic Rescue Parachute System

The aircraft had been retrofitted with a ballistic rescue parachute system. The purpose of the BRPS is to bring the aircraft safely to the ground if flight cannot be continued. The system's parachute is stowed in a container installed in the fuselage. When a cockpit handle is operated, a rocket pulls a parachute, which is stowed in a protective sleeve, out of the aircraft.

These systems have been installed in some two hundred Finnish-registered general aviation and light sport aircraft, and the number is on the increase. Airworthiness regulations state that specific externals markings must be displayed on BRPS-equipped aircraft. In cases where the system is not activated intentionally or on impact, the rocket may fire and result in fatal injuries to personnel within its danger area.

The BRPS container was located in the nose of the accident aircraft and was marked properly. However, the placards were difficult to see after the impact due to structural deformation and other damage to the airframe. On the other hand, the damage had exposed the container.

2.2 Conditions

Weather at Tampere-Pirkkala airport was good. Temperature was 16 °C in almost calm winds and good visibility.[9]

2.3 Recordings

Audio recordings and ERC alert logs contained information on the alert call and the establishment of communication between the rescue and paramedic units.

The accident flight was captured on video, and the investigators used the footage to determine the aircraft's attitude and trajectory.

[9] Meteorological report for Tampere-Pirkkala airport at the time of the occurrence: METAR EFTP 311850Z AUTO 36002KT CAVOK 16/05 Q1015=

2.4 Personnel, Organizations, and Safety Management

The student pilot, aged 50 years, was the pilot-in-command (PIC) on the accident flight. His flight training had started in 2013, and he had logged a reasonably high number of flight hours[10], but his PIC experience was limited considering the total number of hours. Table 1 shows his annual flight hour accumulation and flight periods. It is evident from table 2 that he had logged little PIC time in 2018. Also, the total hours for 2018 and 2019 had fallen short of the previous years, in particular with regard to solo flights, and a lengthy break from flying is evident between the foregoing periods. The student had undertaken a proficiency check under the supervision of the instructor on July 22, 2017. The common duration of a training course is one or two seasons.

In the course of the training, the instructor had assigned the student additional flight hours and landings. The student was reputed to have been of a meticulous character, and with the exception of the small number of flight hours per flight periods, he had encountered no major issues during training. He had no previous history of operating the pedals on the instructor's side. Flying periods had not begun with solo flights, and previously taught learning objectives had been reviewed at the beginning of each period. The student had completed all exercises included in the training syllabus. Many solo flights had been preceded by the same exercise in the instructor's presence. The instructor had in a previous case terminated the training of another student.

Taulukko 1. Student's flying experience

Flying experience	Last 24 h	Last 30 d	Last 90 d	Total hours and landings
On all types	0 h	4 h	4 h	57 h 341
On accident type	0 h	4 h	4 h	57 h 341

Taulukko 2. Student's flying experience per year. Flight time means hours accumulated by the student. Flight time as PIC means flying time without the instructor's presence.

Year	Flight time	Landings	Flight time as PIC	Landings as PIC	Flights conducted between
2019	4 h	9	1 h 40 min	2	Jul 11 to Jul 29
2018	6 h 15 min	31	30 min	6	May 14 to Sep 7
2017	11 h 55 min	95	3 h 5 min	22	May 21 to Oct 20
2016	12 h	71	0 h	0	May 3 to Sep 6
2015	13 h 55 min	85	0 h	0	May 17 to Aug 20
2014	3 h 45 min	21	0 h	0	May 7 to Jul 6
2013	5 h 15 min	29	0 h	0	Apr 4 to Jun 25

Properly completed records were available on the training the student had received within the approved training organization. The training program, which is in common use for ultralight pilot training, is approved by the competent authority.

[10] 25 h of flight time shall be completed to qualify a student for a licence. In practice, safe completion of flight training often requires more than 25 h of flight time.

2.5 Alerting Procedures

Alerting procedures for a full emergency and an aircraft accident have been agreed between Pirkanmaa Rescue Department and Tampere-Pirkkala airport. The procedures call for the controller to activate an alert by pushing a button in the control tower. This will always initiate a response to *a major aircraft accident*. Upon subsequently receiving additional information on the occurrence, the rescue department may reduce the number of responding units as appropriate.

2.6 Rescue Organizations and Their Preparedness

Pori Emergency Response Center provides ERC services in Pirkanmaa region by alerting rescue units in accordance with procedures established by the competent authority.

Finavia maintains regulatory rescue services at Tampere-Pirkkala airport. The minimum operational manning of the service is three persons assigned to two foam tenders. One of them is the designated shift supervisor. Rescue services personnel are drawn from the aerodrome maintenance staff. The supervisor directs rescue operations until the rescue department is notified of the occurrence.

Finavia issued in 2014 instructions that require airport operators to address the risks posed by ballistic rescue parachute systems installed in light aircraft in their emergency plans and rescue procedures. The matter is also brought up in rescue personnel training.

Pirkanmaa Rescue Department is in charge of rescue operations at Tampere-Pirkkala airport. The department has prepared, together with the police department, a joint contingency plan for the authorities' actions in the event of an aircraft accident at the airport. The nearest fire station is in Pirkkala about 9 km from the airport. The department is a regular participant in SAR[11] exercises conducted at the airport.

Pirkanmaa Health Care District is in charge of paramedic operations in Pirkanmaa region. The district has in place instructions for paramedic response to an aircraft accident or a full emergency at Tampere-Pirkkala airport. The district and its paramedic units participate in annual SAR exercises at the airport.

Central Finland Police Department is in charge of police operations in Pirkanmaa region. The department has prepared, together with Pirkanmaa Rescue Department, a joint contingency plan for the authorities' actions in the event of an accident at the airport.

2.7 Rules, Regulations, Guidance, and Procedures

The responsibilities of air traffic service units in the event of an aircraft accident are prescribed in an alerting service manual issued by ANS Finland[12]. The controller should first use the pushbutton-operated system to alert the aerodrome rescue services. Additional information should then be passed to the rescue services either via a public address system or by radio on the ground control frequency. Then, the ERC and the ARCC should be alerted. Local supplementary procedures[13] prescribe that an alert should be made by operating the alert pushbutton. The alert is received at the aerodrome rescue station, the aircraft rescue and firefighting facility of Satakunta Wing, and the ERC. An alert call to the ERC should be made only if a known malfunction in the automatic alert system exists.

---

[11] Search and rescue. The EASA uses the term *full scale aerodrome emergency exercise*.
[12] ANS Finland Alerting Service Manual; February 13, 2019
[13] ANS Finland Procedure EFTP-OPS for Tampere-Pirkkala air traffic service units; January 31, 2019

Provisions governing ultralight pilot licensing are in aviation regulation PEL M2-70. A license may be granted after the applicant has completed at least 25 hours of flight time, but in practice applicants' flight hours exceed this minimum requirement. In order to maintain recency, license holders shall complete, in the last 24 months, at least 12 h of flight time as PIC, 12 takeoffs and landings, and a refresher training flight with an instructor or a proficiency check with an examiner. A student pilot is not considered a license holder. The regulation contains no requirements pertaining to the duration of, or breaks during, training.

Leisure pilot training is governed by aviation regulation TRG M1-7. The regulation contains a requirement for the maximum accumulation of flight hours for a 24 h period[14] but no mention is made about breaks in training.

Aviation regulation M 3102/06 requires that the cockpit-mounted BRPS operating handle shall be clearly marked with a high-visibility color. A clearly legible placard with text BALLISTIC PARACHUTE (or equivalent) shall be displayed on the handle or in its vicinity. The cover of the parachute exit hatch should be highlighted using a black and yellow explosive warning triangle bordered along its three sides by the texts VAARA – FARA – DANGER. Yellow and black warning triangles shall also be placed on each side of the fuselage at a distance of about 0.5 m from the parachute exit hatch in such a manner that they are visible to rescuers who approach the aircraft from the side. The text RAKETTIPELASTUSVARJO – BALLISTIC FALLSKÄRM – BALLISTIC PARACHUTE shall be displayed below the triangles.

The training program for the accident pilot is in common use in Finland and has been approved by the competent authority. The program consists, among other topics, aborted takeoff and low-speed exercises. Stall exercises are terminated prior to spin entry. The program contains no mention about breaks that may occur during training.

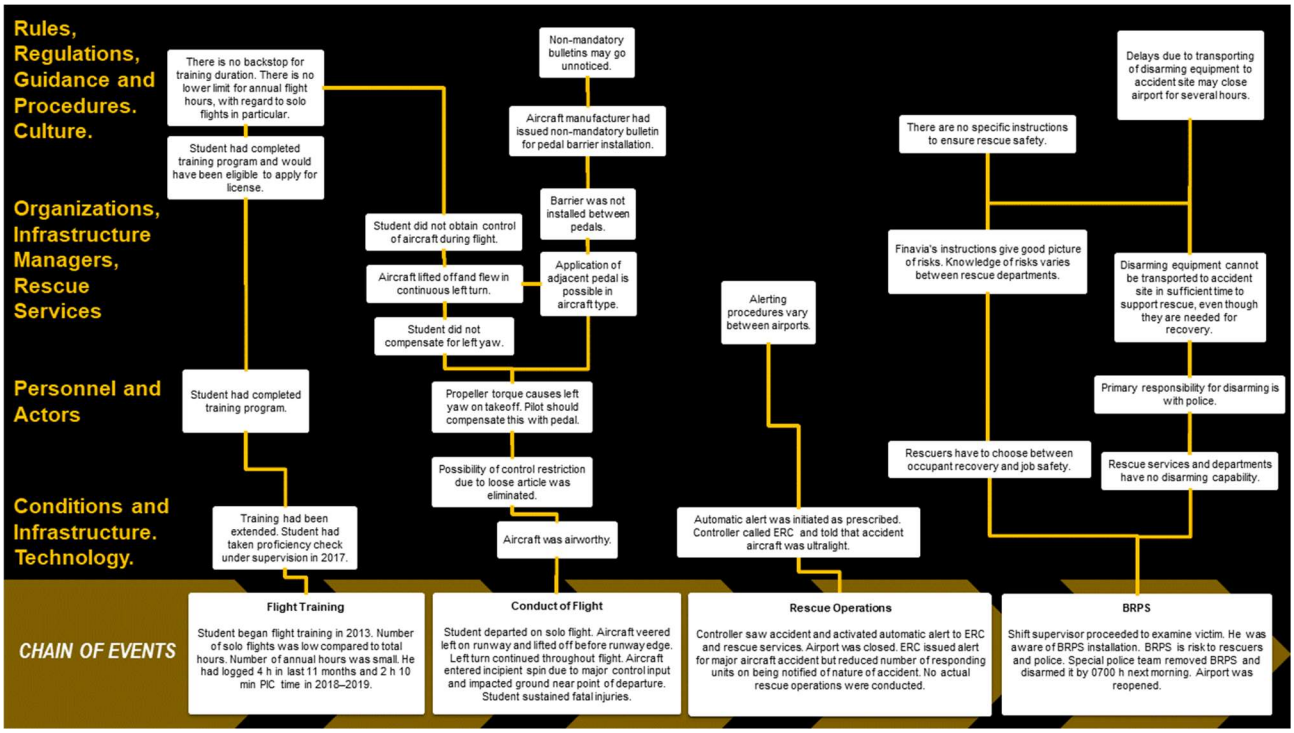
2.8 Other Research

The SIAF has previously published two investigation reports that look into BRPS-related matters[15 and 16]. These systems cause a risk of explosion and thereby hamper rescue operations and wreckage recovery. A BRPS installation is indicated by warning triangles displayed on the external surfaces of the aircraft[17].

[14] A student undertaking basic flight training is allowed to fly no more than 1.5 h during a 24 h period. This time shall be split between three sessions of about 30 min duration or two sessions of about 45 min duration.
[15] L2014-01 *Experimental Aircraft Accident and Risk of Explosion at Nummela Aerodrome on 27 March, 2014*
[16] L2017-02 *Ultralight aircraft accident in Laajasalo, Helsinki on 30.5.2017*
[17] Airworthiness Directive M 3102/06

3 ANALYSIS

3.1 Analysis of Occurrence



Kuva 4. AcciMap Diagram.

Flight Training

The student's training course had been of an exceptionally long duration. Lengthy breaks had occurred between the flying periods, and the number of flight hours per period had been low. These factors affect the learning process. The instructor had compensated for the slow accumulation of flying time by assigning the student additional flying hours, which had led to the higher-than-normal total number of hours during training. The total and solo flying experience that the student had accumulated during 2018 and 2019 in particular possibly precluded the learning of new skills and the maintenance of the existing skill level.

Aviation regulations and the ultralight pilot training program do not take into account extended breaks in training or the small number of flights undertaken during a specific period. Solo instructional flights are an essential part of training, but extended breaks may increase the accident risk. It is therefore important to monitor the accumulation of students' flight hours per period and the length of breaks between periods. There are no provisions governing the number of solo flights in the event of the slow accumulation of flight hours.

Conduct of Flight

Investigation found no anomalies in the accident aircraft's flight control system, and the pilot was able to make control inputs during the flight. Because the investigators found no loose articles that could have caused control restriction, it was determined that abnormal rudder

application initiated the chain of events that led to the accident. Incorrect rudder operation probably put the aircraft into a sustained left turn.

A factor contributing to the abnormal rudder operation could have been an incorrect foot position made possible by the pedal configuration of the accident aircraft type. It is likely that the student was inadvertently resting his right foot on the left pedal of the copilot's (right) pedal assembly and applied pressure on this pedal. The aircraft manufacturer has designed a barrier that can be retrofitted between the pedal assemblies to prevent such a foot position[8]. However, since the associated service bulletin is non-mandatory, some aircraft owners elect not to implement it, although the modification would enhance safety, especially in aircraft that are used for training.

The student's actions also contributed to the accident. For an undetermined reason, the student did not abort takeoff even though the aircraft started veering left while still on the runway. The engine was at maximum power throughout the flight, and at no stage during the flight was the student able to regain control of the aircraft.

3.2 Analysis of Rescue Operation

The controller operated the alert button upon observing the accident. The ERC alerted the predetermined units, which were adequate to cater for the situation. The controller closed the airport to air traffic. The two foam tenders deployed by the aerodrome rescue services reached the accident site within about 2 minutes; this response time would have been sufficient even in a transport category aircraft mishap. The rescue department units could access the accident site without delay.

No actual rescue operations were conducted, and rescue crews could focus on assessing the crash victim's condition. Even though the shift supervisor was aware of the aircraft being fitted with a BRPS and of the associated risks, he deliberately proceeded to examine the victim. The emergency physician determined that the victim had sustained fatal injuries.

The BRPS posed an occupational safety hazard to the rescue crews. The present procedures contain information on BRPS and related danger areas.

3.3 Analysis of Authorities' Action

On completion of the rescue phase, the police assumed operational control and began to investigate the event, and also looked into possibilities to disarm the BRPS. The investigation into this particular occurrence showed that disarming equipment cannot be transported to an accident site in sufficient time to support rescue, even though they are needed for recovery. Disarming was completed successfully by the following morning.

BRPS disarming using the present procedure may take an excessively long time; this will not be an issue under normal circumstances, but a ten-hour closure of an airport will cause problems. Centralized knowledge of safe and simple disarming procedures is lacking in Finland.

4 CONCLUSIONS

Conclusions encompass the causes of an accident or a serious incident. Causes mean the different factors leading to an occurrence as well as the relevant direct and indirect circumstances.

1. The pilot's flight training had extended over a period of several years. Periodical flight hour accumulation had occasionally been low, and lengthy breaks had occurred, between solo exercises in particular.

   Conclusion: *Leisure pilot training programs lack procedures that would govern the assignment of solo instructional flights in cases where a student's annual flight hour accumulation is low. Neither do the programs address issues related to extended training.*

2. The pilot lost control of the aircraft, apparently due to incorrect pedal application. The aircraft manufacturer has issued a non-mandatory service bulletin with the purpose of improving the ergonomics of the pedal assemblies.

   Conclusion: *The pedal assemblies are located very close to each other. This configuration is conducive to incorrect pedal application.*

3. No procedures for the disarming of expeditious ballistic rescue parachute systems are available in Finland. This may pose an occupational safety hazard to rescue crews.

   Conclusion: *The use of the current procedures may result in delays in rescue operations and extended disruption of airport operations.*

5 SAFETY RECOMMENDATIONS

5.1 Leisure Pilot Training

Leisure pilot training programs do not address lengthy breaks that may occur during training. Extended breaks between flights combined with a low annual accumulation of flight hours will increase the accident risk. It is therefore important to monitor the accumulation of flight hours per flying period and the length of breaks between periods.

The Safety Investigation Authority Finland recommends that

the Finnish Transport and Communications Agency Traficom reviews the criteria for assigning solo instructional flights during ultralight pilot license training in cases where safety matters may emerge due to breaks from training and amends the applicable regulations so that these matters will be addressed. [2020-S17]

5.2 Training for Ballistic Rescue Parachute Systems

Accidents involving BRPS-equipped aircraft are relatively rare. They may happen anywhere, also outside aerodromes. Procedures for BRPS-related risk assessment and safe and expeditious BRPS disarming should be developed nationally.

The Safety Investigation Authority Finland recommends that

the Ministry of the Interior and the Finnish Transport and Communications Agency Traficom together ensure that current knowledge and training on BRPS disarming are available to the organizations that are in charge of aircraft accident rescue operations and to police departments. [2020-S18]

5.3 Safety Alert

The SIAF issued on November 7, 2019, a safety alert to the Light Aircraft Association of the Czech Republic (Letecká Amatérská Asociace ČR, LAA ČR) due to an accident risk identified during the investigation.

The pilot lost control of the aircraft, apparently due to incorrect pedal application. The pedal assemblies of the accident aircraft type are located very close to each other, and this configuration is conducive to incorrect pedal operation. The aircraft manufacturer has issued a non-mandatory service bulletin with the purpose of improving the ergonomics of the pedal assemblies.

The Safety Investigation Authority Finland recommends that

the LAA ČR issues a mandatory service bulletin for the installation of a barrier between the pedal assemblies of Evektor-Aerotechnik EV-97 aircraft. The modification would prevent the pilot from operating the adjacent pedal assembly. [2019-S50]

The LAA ČR stated that it will not implement the recommendation given in the safety alert.

5.4 Implemented Measures

The Finnish Transport and Communications Agency Traficom issued, on December 17, 2019, airworthiness directive M 3172/19, which mandates the installation of a pedal assembly barrier in EV-97 aircraft used for training. The directive became effective on December 31, 2019.

REFERENCES

Written Material

- ANS Finland Alerting Service Manual (HPO); April 8, 2018
- ANS Finland Procedure EFTP-OPS for Tampere-Pirkkala air traffic service units; January 31, 2019
- Informative Bulletin No. EV 97 - 014b
- Aviation regulation PEL M2-70; June 5, 2019, Finnish Transport and Communications Agency Traficom
- Police report S/5680/16060/19; August 12, 2019
- Joint contingency plan of emergency response center and police department for Tampere-Pirkkala airport; January 3, 2018
- Airworthiness Directive M 3102/06, Finnish Civil Aviation Authority
- Airworthiness Directive M 3172/19, Finnish Transport and Communications Agency Traficom
- Investigation report L2017-02 *Ultralight aircraft accident in Laajasalo, Helsinki on 30.5.2017*
- Investigation report L2014-01 *Experimental Aircraft Accident and Risk of Explosion at Nummela Aerodrome on 27 March, 2014*

Investigation Material

- Occurrence reports
- Emergency response center alert logs and related reports
- Emergency response center recordings as applicable
- Photographs, diagrams, and other material produced during on-site investigation
- Weather information
- Interviews
- Student's training and medical records

SUMMARY OF COMMENTS TO DRAFT FINAL REPORT

The SIAF requested comments to the draft final report from the following organizations: Finnish Transport and Communications Agency Traficom, Air Navigation Services Finland (ANS Finland), Finavia, Pirkanmaa Rescue Department, National Police Board of Finland, European Aviation Safety Agency (EASA), the Air Accident Investigation Institute of the Czech Republic (Ústav pro Odborné Zjišťování Příčin Leteckých Nehod, ÚZPLN), Light Aircraft Association of the Czech Republic (Letecká Amatérská Asociace ČR, LAA ČR), Emergency Response Centre Administration Finland, and the flight club that was the registered owner of the accident aircraft.

Traficom and **Finavia** proposed a number of minor changes to the report.

EASA and **ANS Finland** had no comments to the report.

Pirkanmaa Rescue Department proposed additional detailed information of communication procedures as seen from the on-site commander's point of view and highlighted the significance of hearing the on-site commander during similar accidents. The department also brought up the need for information of the aircraft types operating from the aerodrome and associated hazards to facilitate the planning of rescue tactics. The department stated that communications between the involved organizations should have been looked at during the investigation.

National Police Department of Finland states that the draft report's observations of ballistic rescue parachute systems are significant since they present an occupational safety hazard to police officers and disarming of these systems will present particular challenges. The department endorses the safety recommendation for making current knowledge and related training available to the rescue organizations and police departments.

Appendix 1: Airworthiness Directive M 3172/19

TRAFICOM
Liikenne- ja viestintävirasto

FINNISH TRANSPORT AND COMMUNICATIONS AGENCY

M 3172/19

AIRWORTHINESS DIRECTIVE

17 December 2019

The continuing airworthiness of an aircraft is conditional on compliance with the provisions laid down in the Airworthiness Directive. The measures specified in the Directive may, unless otherwise provided therein, be implemented by persons qualified to carry out scheduled maintenance of the aircraft or equipment in question under the Aviation Regulation AIR M1-5 or Commission Regulation (EU) No 1321/2014. Implemented measures shall be entered in the aircraft's technical records. The Airworthiness Directive has been issued on the basis of section 33 of the Aviation Act (864/2014).

EVEKTOR - AEROTECHNIK a.s. Installation of a barrier between rudder pedals

Concerning: EV-97 EUROSTAR ultralight aircraft (all models except Model 97, Model 99).

Entry into force: 31 December 2019

Reference: INFORMATIVE BULLETIN No. EV 97 - 014 b / SPORTSTAR - 013 b Installation of a barrier between pilot's and co-pilot's rudder pedals https://www.evektor.cz/en/bulletin/sportstar-013b (hereinafter *Informative Bulletin)*, and user experiences in Finland.

Period of validity: The Directive will remain in force until further notice.

Measures required by the Airworthiness Directive:

Implement the measures required by the manufacturer's service bulletin Evektor – Aerotechnik a.s. Informative Bulletin No. EV 97 - 014 b / SPORTSTAR - 013 b (or later revision) within 20 flight hours or 5 months of the entry into force of this Directive, whichever comes first. Solo flights that are part of basic flight instruction may not be carried out before the measures specified by this Airworthiness Directive are implemented from the date on which the Directive enters into force.

In accordance with the specifications set forth in the Informative Bulletin, install a barrier between the pedals of the aircraft in order to ensure that the pilot seated on the left does not push the left-hand pedal on the cockpit's right side with his or her right foot. If necessary, change the pilot's right-hand pedal and the co-pilot's left-hand pedal as specified in the Informative Bulletin so as to accommodate the barrier.

The implemented measure, the number of this Airworthiness Directive and the number of the Informative Bulletin shall be entered in the technical records of the aircraft.

Jarkko Saarimäki
Deputy Director-General

Pekka Henttu
Director General of Civil Aviation