FINLAND

Aircraft incident report

C 16/1999 L

Aircraft Incident at Lappeenranta TMA, Finland on 29 July 1999

Translation of the Finnish original report

OH-FAF, Saab 340B

OH-772, SZD-50-3 Puchacz

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ABBREVIATIONS

ACC	Area control centre, area control
ADIZ	Air defence identification zone
AIP	Aeronautical information publication
APP	Approach control office, approach control, approach control services
ATC	Air traffic control (in general)
CAVOK	Visibility, clouds and present weather better than prescribed values or conditions
CTR	Control zone
CVR	Cockpit voice recorder
EFES	Air navigation services centre for Southern Finland (Tampere ACC)
EFJO	Joensuu airport
EFKU	Kuopio airport
EFLP	Lappeenranta airport
FDR	Flight data recorder
FL	Flight level
hPa	Hectopascal
h	Hour
IFR	Instrument flight rules
kt	Knots
LAC	Lappeenranta Aviation Club
LPM	Local orders for an airport
MHz	Megahertz

MSL	Mean sea level
MSSR	Monopulse secondary surveillance radar
nm	Nautical mile
QFE	Atmospheric pressure at aerodrome elevation
QNH	Altimeter sub-scale setting to obtain elevation when on ground
TMA	Terminal control area
TWR	Aerodrome control tower or aerodrome control
UTC	Co-ordinated universal time
VAC	Visual approach chart
VDF	VHF direction finder
VHF	Very high frequency (30 - 300 MHz)
VFR	Visual flight rules
VMC	Visual meteorological conditions
VOR/DME	VHF omnidirectional radio range with distance measuring equipment

SYNOPSIS

On Thursday July 29, 1999 at 16.00 local time an aircraft incident took place at Lappeenranta TMA at an altitude of 4000 feet MSL. A Saab 340B aircraft OH-FAF, call sign Finnair 585, owned by Finnair and operated by Swedish Flying Enterprise Ab flying a scheduled flight for Finnair, and a private twin-seated glider SZD-50-3 Puchacz OH-772 on a local flight, passed each other on intersecting flight paths so near that the captain of OH-FAF made an avoiding action by pulling the aircraft from descent to climb. According to the report of OH-FAF the distance between the aircraft was around 100 metres. The pilot of OH-772 did not see the other aircraft at the moment of passing. There were altogether 22 persons on board.

On August 4, 1999 by letter C 16/1999 L, the Accident Investigation Board (AIB), Finland appointed Jouko Koskimies and Ari Huhtala to investigate the incident described above.

The draft of this incident report was sent on October 13, 1999 to the Finnish Flight Safety Authority and to the Swedish Accident Investigation Board for comments, according to ICAO Annex 13. The comments were received on November 22, and November 19, 1999. They have been taken into account in the report. The investigation was finished on December 9, 1999.

1 FACTUAL INFORMATION

1.1 Sequence of events (local time)

On the day of the occurrence air traffic control at Lappeenranta airport was open from 05.30 to 24.00, and TMA/CTR were controlled airspace, class D. Weather was good in VMC. At TMA there was some VFR glider activity by Lappeenranta Aviation Club (LAC).

At 15.06 the glider OH-772 asked and received a permission from TWR to enter runway 24 for towing. After that the towing aircraft OH-HCF filed a local flight plan by radio to TWR and got a clearance to taxi to runway 24. At 15.09 TWR asked OH-772 if the airspace south of the airport would be sufficient for his flight. OH-772 replied affirmatively, and TWR cleared OH-772 to the Lappeenranta TMA south of the airport below flight level 65, VFR. OH-772 read back the clearance inaccurately, but TWR accepted it. The glider pilot told that he had fully understood the clearance. The towing aircraft did not get any clearance to the TMA. Radio traffic was as follows (translated from Finnish):

TWR:	*772 cleared to Lappeenranta TMA south of the field, upper limit flight level 65, VFR.*
OH-772:	*(unclear...) 65, 772*
TWR:	*And QFE was 1001.*
OH-772:	*QFE 1001.*

At 15.12 the towing aircraft reported to be ready for towing and received a take-off clearance from TWR. After the towing at 15.18 OH-HCF reported to be on downwind for grass 24. TWR ordered OH-HCF to continue for landing on runway 24 and passed the wind information. OH-HCF acknowledged to continue for landing to grass 24. The towing aircraft did not ask for and TWR did not give the approach clearance, nor the landing clearance. According to the local orders of the airport, landing and take-off clearances are not given for the temporary take-off and landing area, which is situated south of the runway and reserved for glider activities.

At 15.24 OH-HCF informed TWR of the towing of a glider, OH-773. TWR issued clearance for OH-773. It read the clearance back rather hesitatingly and TWR had to correct it twice. After that TWR gave to OH-HCF the permission for towing, which it acknowledged with a shortened call sign. The radio traffic was as follows (translated from Finnish):

OH-HCF:	*OCF gonna tow, behind is glider 773, and from grass.*
TWR:	*OCF. OH-773, cleared to Lappeenranta TMA south of the field, upper limit flight level 65, VFR.*
OH-773	*... upper limit ... 7... can you say again the upper limit, 773.*
TWR:	*OH-773, upper limit flight level 65, VFR.*
OH-773:	*Upper limit 65, VFR, and below, 773.*
TWR:	*And the clearance area was Lappeenranta TMA, south of the field, QFE 1001.*

OH-773: *QFE 1001, TMA, south of the airport, 773.*
TWR: *Tower. And OCF, wind 250 degrees 10 knots, permission to tow.*
OH-HCF: *Okay. CF starts to tow.*

After towing, OH-HCF reported at 15.31 to be on downwind for grass 24. TWR ordered it to continue for landing to grass 24 and passed the wind information. OH-HCF acknowledged, using the shortened call sign. Radio traffic was as follows (translated from Finnish):

OH-HCF: *CF on downwind for grass 24, to the end of runway.*
TWR: *OCF, continue for landing grass 24, wind 280 degrees 9 knots.*
OH-HCF: *Continue for landing, CF.*

At 15.40 Tampere ACC reported to Lappeenranta ATC an estimated time of arrival for Finnair 585. It was descending to flight level 70 and estimating Lappeenranta VOR/DME at 16.05. TWR reported runway 24 to be in use. The flight was a scheduled Finnair flight operated by the Swedish Flying Enterprise Ab with a Saab 340B aircraft owned by Finnair.

At 15.41 the ground radio station of LAC advised the glider OH-773 to land. About a minute later OH-773 reported to be on downwind for grass 24. TWR ordered it to continue for landing to grass 24 and passed the wind information. OH-773 did not acknowledge the clearance. The ground radio station warned OH-773 of a strong surface wind, and the glider acknowledged by its call sign. The radio traffic took place on the frequency of Lappeenranta TWR. The local orders of the airport do not contain any instructions for LAC concerning the use of the ATC frequency.

At 15.45 TWR informed OH-772 of the approaching Finnair 585 and, after a while requested the glider's position and altitude. The radio traffic was as follows (translated from Finnish):

TWR: *OH-772, for your information, Finnair Saab estimates to be here 05, correct time is 45.*
OH-772: *772*
TWR: *Tower.*

TWR: *772, report position and altitude.*
OH-772: *772, 12 kilometres west of the field to highway 6 direction, 10 - 12 kilometres.*

At 15.50 a glider registered OH-710 reported to TWR that its present position was south of Savitaipale and it was approaching the airport. (Savitaipale is a closed airfield some 25 kilometres north-west of Lappeenranta.) TWR gave to OH-710 the QFE setting and traffic information concerning the Finnair's Saab approaching from the direction of Helsinki. OH-710 read it back, but repeated the QFE setting incorrectly without any corrective action by ATC. After that TWR gave to OH-710 a clearance to Lappeenranta TMA

below flight level 65, VFR. OH-710 read it back, and informed the LAC radio ground station on ATC frequency that the glider would be free after 10 minutes.

At 15.54 TWR asked OH-772 if he was going to land before Finnair. OH-772 replied negatively.

At 15.55 OH-HCF reported to be again ready to tow the glider OH-773 airborne. At the same time the airport maintenance vehicle "Johto 1" requested permission to drive to the runway. TWR granted the permission to "Johto 1", gave to OH-773 the clearance and to OH-HCF wind information and permission to tow. OH-HCF acknowledged it. OH-773 did not read back its clearance, and TWR did not request it to do so. TWR used in its clearance the phrase "old clearance", which is against the orders. The radio traffic was as follows (translated from Finnish):

OH-HCF:	*CF is ready for towing, behind is glider 773.*
Johto 1:	*Tower, Johto 1, can I drive to the runway?*
TWR:	*OCF. Johto 1, drive to the runway.*
Johto 1:	*Johto 1 is driving.*
TWR:	*And OH-773, old clearance further on, and OCF, wind 280 degrees 7 knots, permission to tow.*
OH-HCF:	*And towing, CF.*

At 15.57 the glider OH-710 reported that it was approaching from north-west at two kilometres distance from the airport. TWR gave it a clearance for landing to "grass 24". OH-710 read the clearance back correctly only after TWR had repeated it.

At 15.58 Finnair 585 reported in English to Lappeenranta TWR to be at the distance of 18 nm and descending to flight level 70. ACC had cleared Finnair 585 to fly direct from reporting point MILSI to Lappeenranta. The normal ATS-route (W2) is going via Utti. TWR gave to Finnair 585 the clearance to continue descending to 1800 feet on QNH 1014 hPa, told it to expect a visual approach to runway 24 and reported that there was no delay. In addition TWR gave to Finnair 585 traffic information concerning the gliders in TMA with a remark that they are not on Finnair 585's flight path. Finnair 585 acknowledged it. The radio traffic was as follows:

TWR:	*Finnair 585, for your information, there are some gliders in Lappeenranta TMA, but not on your path.*
FIN 585:	*Thank you.*

The pilot of the glider OH-772 told that he had heard the clearance and the remark which was given to Finnair 585, and he got an impression that the passenger aircraft was approaching the airport from north-west. He tried to get the aircraft in sight without success. He did not know the Finnair 585's direct clearance from MILSI to Lappeenranta. Because of it the approach route was a bit more south than the normal one.

At 15.59 OH-710 reported to be on downwind leg for grass 24. TWR ordered it to continue for landing to grass 24, which OH-710 acknowledged. TWR gave it an additional warning that Finnair 585 was going to land within 3 - 4 minutes.

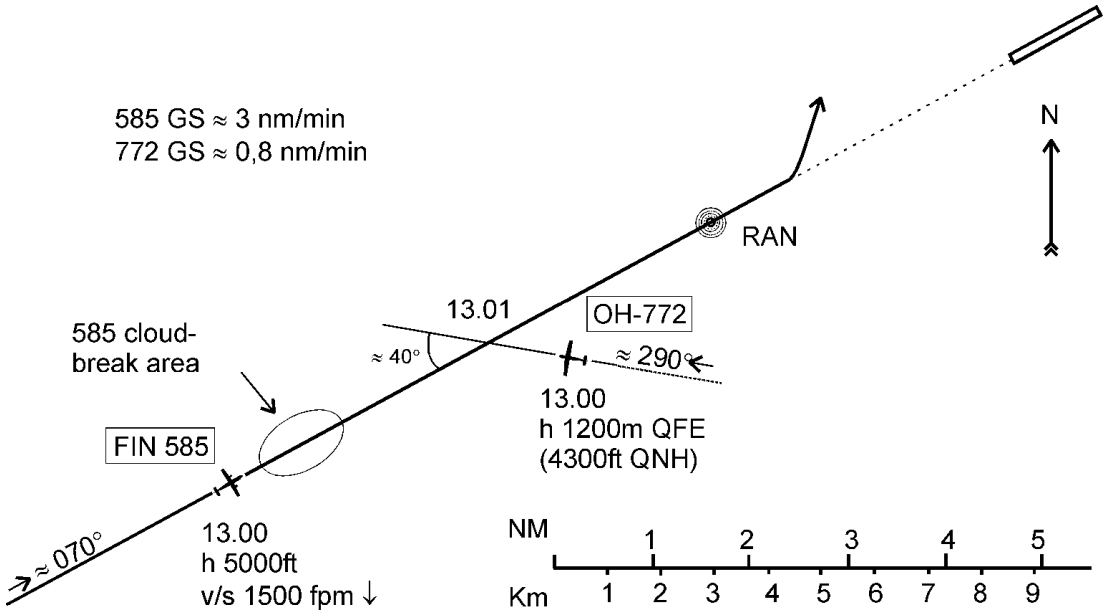
At 16.00 TWR requested the position of OH-772. It reported to be five kilometres north-west from the airport at an altitude of 1300 metres. In reality it was approximately 10 kilometres south-west of the airport nearly on the extended centreline of runway 06. TWR acknowledged the report and ordered the vehicle "Johto 1" to vacate the runway.

According to the air traffic controller the VDF bearing of OH-772 was 210-220 degrees. The bearing was in contradiction with the position report of OH-772. The air traffic controller told that he determined from the bearing that the glider was in south-west where it was cleared, and did not check the position report of OH-772.

After passing a cloud layer in 5000 feet, Finnair 585 reported that they had the runway in sight. TWR cleared it to approach runway 24 via the right circuit, gave the QNH setting and requested it to report right downwind leg for runway 24. Finnair 585 read back the clearance. Simultaneously, when descending through 4000 feet, the pilots of Finnair 585 got a visual contact with a glider. It was on the extended centreline of runway 06 almost at the same altitude with them on an intersecting flight path from the right at a distance of approximately 200 meters. Captain of Finnair 585 made an avoiding action upwards and passed above the glider at a 100 meters' distance. The procedure was in accordance with Rules of the Air. Immediately after that at 16.02, Finnair 585 reported to ATC that they had made an avoiding action due to a glider. ATC acknowledged it.

The glider pilot did not see the approaching passenger aircraft until it had passed, and saw it rather far away at the rear right and below of him. The pilot told having been surprised that the passenger aircraft was flying on such flight path and so high even so near the airport.

In the figure below are described the probable sequence of events and the reciprocal positions of the aircraft.



Immediately after Finnair 585's report ATC requested the position of OH-773. It reported to be two kilometres south-west of the airport at 900 metres. OH-772 reported to ATC its position, still erroneously, to be five kilometres north-west at 1200 metres. OH-HCF position report was two kilometres south of airport in 400 metres, descending. TWR gave to OH-HCF approach number two and advised that number one was Finnair (585). OH-HCF acknowledged it.

At time 16.03 Finnair 585 reported right downwind leg for runway 24. TWR gave it wind information and landing clearance, which Finnair 585 acknowledged.

TWR had informed OH-772 and OH-710 of Finnair's Saab aircraft approaching Lappeenranta. Any other aircraft that were airborne before the occurrence had not received the traffic information. Finnair 585 got general traffic information about gliders at TMA and a remark that they would not be on its flight path.

1.2 Basic information

1.2.1 Aircraft information

Saab 340B is a twin-engine turboprop commercial aircraft. Length of the aircraft is 19.7 m, wing span 21.4 m, maximum take-off weight 12900 kg and maximum seating capacity 37 passengers.

Type:	Saab 340B
Nationality and registration:	Finnish, OH-FAF
Manufacturer:	Saab Aircraft Ab, Sweden
Owner:	Finnair Oyj
Operator:	Flying Enterprise Ab
Certificate of airworthiness:	valid until 20.11.2000

Puchacz is a twin-seated glider. Its length is 8.3 m, wing span 16.6 m and maximum take-off weight 550 kg.

Type:	SZD-50-3 Puchacz
Nationality and registration:	Finnish, OH-772
Manufacturer:	PDPS PZL-Bielsko, Poland
Owner and operator:	Lappeenranta Aviation Club
Certificate of airworthiness:	valid until 30.9.2000

1.2.2 Types of flights

Finnair 585 was a scheduled passenger flight from Helsinki to Lappeenranta. OH-772 was on a local recreational flight.

1.2.3 Aircraft occupants

There were 3 crew members and 17 passengers on board in Finnair 585. In OH-772 there were a pilot and a passenger.

1.2.4 Personnel information

The crew of Finnair 585

Captain, pilot-in-command:

Male, age 36, New Zealand citizen

Airline transport pilot's licence issued in New Zealand, valid until 29.11.1999

Valid Swedish SF34 type rating.

Flight experience:	Total	5000 h
	Last 12 months	600 h
	Last 3 months	150 h
	Saab 340	2000 h.

First officer:

Male, age 40, Finnish

Swedish airline transport pilot's licence, valid until 31.1.2000

Valid ratings: towing of gliders, instrument rating, single- and multi-engine land, SF34 type rating.

Flight experience:	Total	1390 h
	Last 12 months	440 h
	Last 3 months	210 h
	Saab 340	290 h.

The crew of OH-772

Pilot

Male, age 44, Finnish

Finnish glider pilot licence, valid until 12.5.2001

Flight experience:	Total	1570 h
	Last 12 months	8 h
	Last 3 months	8 h

Air traffic control personnel

The air traffic control in Lappeenranta was manned according to the shift list. At the time of occurrence, there worked an air traffic controller from Kuopio airport and an air traffic control trainee, who worked in Lappeenranta APP/TWR in order to get practical experience for an air traffic control licence rating.

Aerodrome/approach controller in duty

Air traffic controller, male, age 47, Finnish

Air traffic controller's licence, valid until 24.11.1999

Valid ratings: EFKU TWR/APP/TAR/PAR, EFLP TWR/APP, EFJO TWR/APP.

Air traffic controller trainee

Male, age 26, Finnish, no valid air traffic controller's licence.

1.2.5 Meteorological information

There was a scattered cloud area over southern Finland. The cloud base was 3000 - 4000 feet (900 - 1200 m) and the top at FL 50 - 60 (1500 - 1800 m). The meteorological report at Lappeenranta airport at 15.50 was:
- wind 230 - 310 degrees 13 knots
- CAVOK
- temperature +20°C, dewpoint +6°C
- QNH 1014 hPa
- 3CU050 (3/8 cumulus at 5000 feet)

1.3 Investigations

1.3.1 Location of the incident

The incident took place approximately 11 km south-west from Lappeenranta airport on the extended centreline of runway 06 at an altitude of 4000 feet (1200 m).

1.3.2 Lappeenranta airport

General description

The Finnish Civil Aviation Administration accomplished the latest air traffic control inspection in Lappeenranta in 1990. Based on that inspection, the Air Navigation Services Dept. (ANS) spicified in its letter dated July 9, 1990 the measures to be taken for the improvement of air navigation services.

Lappeenranta TMA is almost rectangular and 60 x 30 km in size. Its lower limit is 1200 feet (360 m) MSL and upper limit FL 95 (2850 m). Airspace classification is D when ATC is open. In south the TMA is bordered by an ADIZ, which is parallel to the state border. It is around 12 km wide and its distance from the runway is 10 km (5.5 nm). The airspace classification of ADIZ is G. Entering an ADIZ requires a remark in the flight plan, which must be submitted at least one hour in advance.

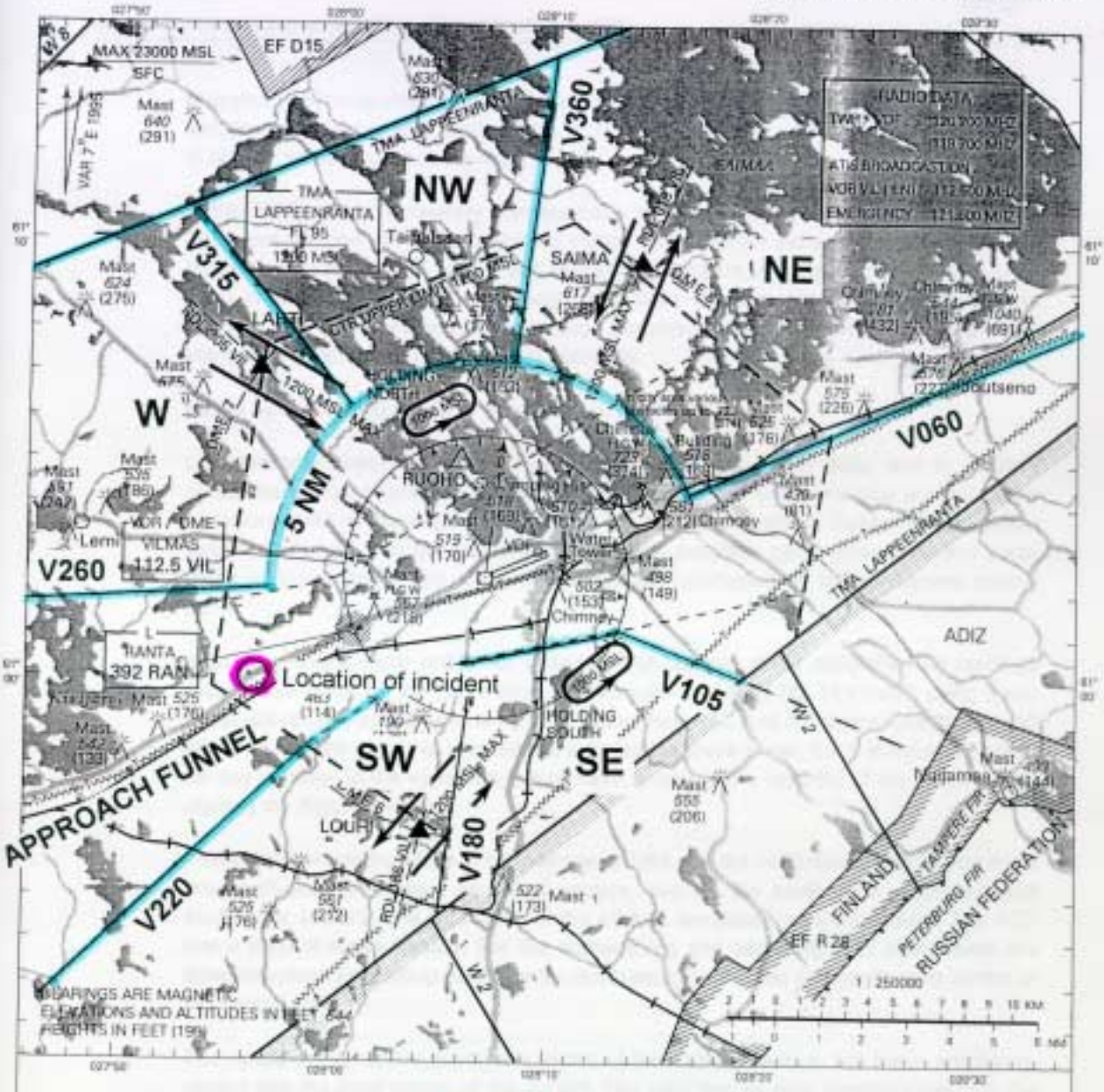
The equipment and navigational aids are listed in the Finnish AIP. According to the environmental agreement of the airport runway 24 is recommended to be used for all take-offs and runway 06 for all landings. Based on the same agreement the following activities are not acceptable at the airport during night time between 22 and 07: practice landing circuits, towing of gliders and parachute jumping except for training flights that have been notified in advance.

The air traffic control tower is a low building. From TWR the controllers can to see without obstruction the northern traffic circuit, but not the southern circuit. There are also high trees on the south side of the tower building. The tower has a monitor of an MSSR situated in Savonlinna, but it is capable to show only those aircraft with a transponder. In Lappeenranta area the radar does not cover altitudes below 2500 - 3000 feet. The technical equipment of the ATC are mainly old with some shortcomings, and needs im-

VISUAL
APPROACH CHART - ICAO

ELEV 349 FEET
HEIGHTS RELATED TO
AERODROME ELEV

LAPPEENRANTA AERODROME
LAPPEENRANTA, FINLAND



Tulo- ja lähtöreitit

Ilmoittautumispaikka

Odotuskuvio

Training sectors

Approach and Departure Routes

Approach Funnel

Reporting Point

Holding Circuit

ILMATILALUOKITUS

Lappeenrannan lähialue (CTR) ja lähestymisalue (TMA) alle FL 65 kuuluvat Lappeenrannan lennonjohdon toiminta-aikana ilmatilaluokkaan D. Muina aikoina ilmatilaluokka on G.

ATS AIRSPACE CLASSIFICATION

During the operational hours of Lappeenranta TWR, Lappeenranta CTR and the portion of Lappeenranta TMA below FL 65 are airspace class D.
During other times the airspace class is G.

provement. Among other things the quality of radio equipment is rather low, the use of earphones is not possible, by-listening is not always possible and the air traffic controller in duty is not able to close the internal phone.

In the MET/briefing temporary workers have to be used besides the permanent ones. Therefore the operation of the working station varies, which increases ATC workload at times. Due to the lack of permanent air traffic controllers, ATC officers also have to be used in temporary duty. Even though they have the competence and qualifications needed, they may not always have enough commitment and knowledge of local circumstances to maintain the quality of ATC services.

Flight operations and use of airspace

Lappeenranta airport has several scheduled passenger flights daily, and in addition some charter, cargo and training flights from time to time. There are also two helicopter operators. One of them performs quite a lot helicopter training flights for the armed forces. There are also general aviation activities, including glider operations and parachute jumping. Some sea plane operations are conducted at the aerodrome control zone.

According to the local orders of Lappeenranta airport, glider take-offs and landings mainly take place on the grass area to the south of runway 06. The traffic using these areas will receive all the necessary information from ATC, but not clearances for take-off and landing. The airport is in charge of maintaining these areas, but it is not responsible for any damage to the operators, which have to ensure the usability of the areas before starting the flight activities.

There are five training areas in Lappeenranta TMA. On the north side of the airport there are north-east, north-west and west sectors, and on the south side south-east and south-west sectors. The side limits of the sectors are based on VOR radials. The ATC has a map of these sectors. For the approaching and departing VFR traffic there are three mandatory reporting points on the north-east, north-west and south-west border of the control zone.

The operators using the airport are aware of the training sectors, but these are not included into the local orders of the airport. The LAC has its own briefing room with the maps and figures of the training sectors on its notice board. There is no other written information available. The briefing room is also used by other aviators flying from Lappeenranta airport.

Norms and documentation

The local orders of Lappeenranta airport were last renewed on May 5, 1998. The airport does not yet have an Airport Operating Manual, which is required by the Aviation Regulation AGA M3-3, dated 23.1.1997, and entered into force early this year. The present local order collection is insufficient because of e.g. a lack of detailed instructions on training areas and local flight operations.

In summer 1999 Lappeenranta ATC has given oral instructions, which state highway 6 as the north border of southern training sectors, if there is no IFR traffic. Parts of highway 6 are on the extended centreline of runway 06. If IFR traffic exists, gliders have to keep themselves outside of the IFR approach funnel, which can be found in the EFLP VAC. These instructions are rather like an oral agreement, and they are recorded nowhere. LAC pointed out, however, that it has been impressed on all pilots during training, refresher flights and meetings, how essential it is to comply with these instructions.

1.3.3 Navigational aids, radio facilities and radar

According to the entries in air traffic log, there were no reported faults in navigation and approach equipment of Lappeenranta airport during the time of the incident. There is no reason to suspect any such malfunctions or faults in the equipment that would have contributed to the incident. The radar monitor in the tower showing the radar image of Savonlinna MSSR was operative. The MSSR belongs to the radar network of EFES.

The aircraft equipment was not checked, but there were no reported faults and nothing indicates malfunctions.

1.3.4 Communications and radar recordings

The recordings of Lappeenranta ATC radio and telephone conversations were used as source material in the investigation.

The MSSR network is only capable of observing those aircraft equipped with an SSR transponder. The gliders were not equipped with transponder.

1.3.5 Flight recorders and reporting

OH-FAF has a flight data recorder (FDR) and a cockpit voice recorder (CVR). The crew did not stop the CVR, and the information recorded during the incident was erased automatically after 30 minutes recording time. The FDR was not removed and the recorded information was not read out. Thus it was not available for the investigators.

The captain of Finnair 585 filed an incident report to his own company. The company sent it to the Finnish Flight Safety Authority.

The air traffic controller filed an incident report according to the Aviation Regulation GEN M1-4, dated 24.6.1999, and made an entry in the air traffic control log. He did not file an occurrence and observation report (PHI) required by the Air Navigation Services Dept.

The pilot of OH-772 did not report the occurrence at all. He told that the air traffic controller had said him that that he had no obligation to file an incident report, because the air traffic controller did it.

2 ANALYSIS

2.1 Events before the incident

Weather in Lappeenranta area was good. Glider flying in VMC was possible at Lappeenranta TMA. A cumulus layer at 5000 feet, however, restricted gliders' flight altitude, and glider pilots could not see aircraft flying above clouds. The gliders used metric altitudes and QFE setting, while the other traffic used feet altitudes and QNH setting. The air traffic controller should make the conversions. In this case he issued the altitude limits to gliders in feet even though they should have been in meters.

There are some guidelines in the local orders of Lappeenranta airport concerning the usage of temporary take-off and landing areas in the grass on the runway strip. The guidelines, however, only determine the division of responsibility between the operators and the airport. The local orders do not contain any written regulations for training areas and local flight operations at TMA and CTR. The present arrangement has developed through the common practice. The briefing room of Lappeenranta Aviation Club (LAC) has the necessary maps, where the training sectors have been marked. In addition, many pilots have drawn the borders of training sectors in their own maps. According to the rules of LAC, the pilots who are flying with gliders owned by LAC have to fly every spring a refresher flight with an instructor. In connection with that flight the instructor revises the essential local regulations for glider flying. Among other things the instructions concerning flying inside the IFR approach funnel has been impressed on all pilots during training, refresher flights and meetings.

The radio traffic was in Finnish except with Finnair 585 in English. The investigation showed that the language used was not a factor in this incident.

The home base of the pilot of OH-772 was Immola (an uncontrolled aerodrome 45 km east of Lappeenranta) but he was also a member of LAC. In recent years he had been flying only occasionally due to personal reasons. He had flown the refresher flight in spring. According to the instructor his knowledge of regulations was normal. He was an experienced glider pilot with many distance flights and competitions. The pilot told to have prepared his flight normally, and he had a friend of his as a passenger. The towing aircraft took OH-772 to the southern training area at TMA as cleared by ATC. There was a line of clouds, which the pilot estimated to be at an altitude of 1500 - 1600 metres. He told that he flew in thermal lifts at a distance of 5 - 17 km from the airport at 800 - 1300 metres' altitude to maintain VMC. He kept continuous lookout, and saw the both gliders flying in the vicinity. He pointed out that he feels himself safe while seeing the other aircraft which are in the air. This is important in glider operation e.g. when flying on the same lift. According to what he told, he had not received any geographical restrictions from ATC.

Finnair 585 was on a scheduled flight from Helsinki to Lappeenranta. Tampere ACC gave its estimate to Lappeenranta 25 minutes before arrival, which is normal.

Lappeenranta ATC was manned according to the shift list. The air traffic controller in duty normally works in Kuopio, but he was in Lappeenranta under a temporary order due to a lack of controllers. He had a valid air traffic controller's licence and a rating for Lappeenranta airport. In the tower there was also an air traffic controller trainee, who worked at the controller position under supervision of the controller in duty. The trainee had just passed the air traffic controller course and worked in order to get practical experience for Lappeenranta rating. There were some difficulties with the supervision because the control board was old and somewhat deficient. For example, the voice quality in radios was unsatisfactory, and it was not possible to use headsets in air traffic control work. It actually seems that the controller in duty was not able to fully supervise the work of the trainee, nor did he always correct the errors which he may have noticed. For example, he did not react when OH-710 read back the given QFE setting of 1001 hPa incorrectly as 1015 hPA.

2.2 Origin of the incident and subsequent action

OH-772 had received from ATC a report of estimated arrival time (ETA) of Finnair 585, which was intended as traffic information. ATC passed it 20 minutes before arrival time. In addition of ETA and type of the aircraft the information should have included the arrival direction and altitude. Because the approach route of Finnair 585 was a bit more south than normal, the information of the approach direction should have been important. The ATC report did not give OH-772 pilot a clear image of the approach direction and altitude of Finnair 585. Due to the cloud layer the glider pilot would have been able to see the arriving aircraft only it had descended below clouds.

After Finnair 585's initial contact Lappeenranta ATC gave it the approach clearance and traffic information concerning gliders at TMA with a remark that they would not be on the flight path of Finnair 585. The remark was misleading, because the controller asked the position of OH-772 only after that. It replied erroneously that it was in north-west, while the actual position was in south-west at an altitude of 1300 metres. The pilot told that he later realised his confusion between north-west and south-west. ATC noticed that the VDF bearing of OH-772's transmission was 210 - 220 degrees and that it was in contradiction with the glider's position report. He determined, however, from the bearing that the glider actually was in south-west. The air traffic controller did not revise the traffic information to Finnair 585, even though the bearing indicated that OH-772 could have been on the flight path of Finnair 585. The position report "in north-west" should have been checked, because the clearance for OH-772 was "south of the airport". ATC did not give Finnair 585 any traffic information concerning the tow combination OH-HCF/ OH-773 which was climbing at the TMA, nor did he inform the tow combination of the arriving Finnair 585. Even though, in those meteorological conditions, it was not necessary to separate IFR traffic from VFR in class D airspace, traffic information should still have been provided.

Finnair 585 was approaching locator RAN in accordance with the clearance and was preparing for a right hand circuit and visual approach to runway 24, when the pilots observed a glider. It was on their fore right side at a distance of 200 metres and almost at the same altitude of 4000 feet. The glider was on intersecting flight path, heading west-

north-west. To avoid collision, the captain of Finnair 585 disconnected the autopilot and made an immediate evasive action by pulling the aircraft to climb. The distance between the aircraft at the moment of passing was about 100 metres according to what they reported. Finnair 585 immediately reported the incident to ATC. In spite of having received misleading traffic information, the crew of Finnair 585 maintained a sharp lookout and could thus avoid the risk of collision.

The pilot of OH-772 heard the radio traffic between ATC and Finnair 585. He had understood that Finnair 585 was approaching via the right circuit to runway 24, and imagined that it was coming from north-west to right downwind 24 at the normal traffic circuit altitude. He told that he was familiar with the approach routes of the passenger aircraft, but he could not explain, why he now thought like he described. He tried to get a visual contact with the passenger aircraft in the direction he supposed. While flying a couple of minutes direct to north-west he got into the extended centreline of runway 06. He told that he had flown approximately in the same area for the whole of his flight. However, he did not see the passenger aircraft which now had come below clouds and was approaching from the fore left of him, because he tried to find it at his right side and below his own altitude. He did see the passenger aircraft, when it had passed above him, only after it was rather far away at the rear right and below of him. His passenger saw first the passenger aircraft.

Immediately after Finnair 585's radio message ATC asked the position of OH-773, which was now flying independently. It reported to be two kilometres south-west from the airport at 900 metres. If the distance was correct, the position was also a bit inside of the approach funnel. OH-772 reported again erroneously to be five kilometres to north-west at 1200 metres. Finnair 585 determined in its incident report that the location of the incident was 2 - 3 nm before locator RAN on the extended centreline of runway 06. Because of its VOR/DME equipment, the position report can be considered reliable.

2.3 Contributing factors to the incident

In connection with the traffic information, ATC passed to Finnair 585 a remark that the gliders would not be on its flight path. The remark was misleading, because the air traffic controller had not checked the positions of the gliders.

The traffic information to OH-772 was inadequate and the glider pilot did not get a clear image, from which direction and altitude the passenger aircraft was coming. Additionally the information was given as early as 20 minutes before Finnair 585's arrival.

After the passenger aircraft had descended below clouds, the glider pilot should have had seen it. Sun was on the same direction, but according to the glider pilot it had no effect. Because of the glider pilot had an incorrect image of the approach direction and altitude of Finnair 585, he did not keep lookout in the correct direction. However, the glider tried to maintain a 300 metres' vertical distance to the clouds, which gave Finnair 585 enough time to avoid it.

The glider pilot gave ATC twice the wrong position report. He told that he had very soon understood that he had been confused with north-west and south-west. However, he could not explain why he had not been complying the instructions concerning flights inside the IFR approach funnel. He was the whole time aware of the arriving passenger aircraft. Either the weather conditions did not compel him to fly inside the IFR approach funnel.

2.4 Suggestions for eliminating the incident factors

General air traffic service instructions have not been issued for glider operations. Therefore the operational procedures and working practices seem to be very local. Lappeenranta airport has not an Airport Operations Manual as required by Aviation Regulation AGA M3-3, dated 23.1.1997. It shall be drawn up in accordance with the model given by the Airports Department of Finnish Civil Aviation Administration. The “Flight Operations” section shall include detailed instructions for local flight operations. Although the Operations Manual is mainly intended for he operator of the airport, it is essential that also the local flight operators are well informed about the regulations and instructions concerning to them and contained in the Airport Operations Manual.

The investigators found that the current instructions were not adequately followed. As some examples it may be mentioned that the glider flight operating procedures and training areas were not included in the local orders of the airport, use of the grass area for glider operations had not been clearly defined, the towing aircraft did not get any clearance to TMA and it was not obliged to request an approach clearance back from TMA as would have been required for class D airspace, traffic information was inadequate, shortened non-standard call sign was used in radio traffic, and the LAC ground radio station used the ATC frequency without a specific permission. The airport should draw attention to eliminate these defects.

With its own quality assurance system, the airport should be able to maintain all instructions and regulations current and in line with general regulations and local circumstances.

3 CONCLUSIONS

3.1 Findings

1. The pilots had valid licences and were qualified for the flight.

2. The air traffic controller had a valid licence and qualification, and the trainee was under supervision. Air traffic control was manned according to the shift list.

3. Both aircraft and their equipment were serviceable. The certificates of airworthiness were valid.

4. The equipment and navigational aids of the airport were operating normally.

5. Weather was good, but the cloud layer at 5000 feet prevented the pilot of OH-772 from seeing Finnair 585 before it descended below clouds.

6. Finnair 585 flew in accordance with its clearance.

7. The glider OH-772 reported twice erroneously to be in north-west while its actual position was in south-west.

8. ATC informed OH-772 of Finnair 585's arrival time, but not of its arrival direction and altitude.

9. Due to inadequate traffic information the pilot of OH-772 kept lookout to the wrong direction.

10. OH-772 did not move outside of the approach funnel, when it was informed of arriving IFR traffic, nor did ATC request it to do so.

11. OH-710 read back the given QFE setting (1001 hPa) incorrectly (1015 hPa) without any corrective action by ATC.

12. The radio phraseology of glider pilots was deficient.

13. The towing aircraft OH-HCF flew without appropriate take-off and approach clearances according to an established practice used at the airport.

14. OH-HCF used a shortened non-standard call sign.

15. Air traffic control did not issue traffic information to all aircraft.

16. The air traffic controller on duty did not notice or was not able to correct all errors made by the air traffic controller trainee.

17. The LAC's ground radio station used the frequency of Lappeenranta tower.

18. The air traffic controller made an entry of the incident in the air traffic control log and filed an incident report according to the Aviation Regulation GEN M1-4, but did not make an occurrence and observation report as required by the Air Navigation Services Department.

19. The captain of Finnair 585 filed an incident report.

20. The pilot of the glider OH-772 did not file an incident report after discussing about the occurrence with the air traffic controller.

3.2 Probable cause

The pilot of the glider OH-772 flew in the area south of the highway 6, which was near the extended centreline of runway 06. The clearance given entitled him to do so. According to the current local instruction, he should have moved outside the approach funnel because of arriving IFR traffic. He did not do that, however, and so he got into the flight path of Finnair 585 without seeing it. The air traffic controller did not check the actual location of OH-772. The pilot of OH-772 received information from ATC concerning Finnair 585's estimated time of arrival, but not its approach direction and altitude. So he had an incorrect image of the location of the passenger aircraft, and tried to find it in the wrong direction.

A contributing factor was the cloud layer at 5000 feet, which prevented the glider pilot from seeing the passenger aircraft before it had descended below clouds. The sharp lookout of the crew of Finnair 585 and its immediate avoiding action prevented the impending collision.

An additional factor was that the local orders of Lappeenranta airport did not contain any regulation concerning local flight operations and training sectors within the airspace around the airport.

4 RECOMMENDATIONS

1. Airport Operations Manual as required by Aviation Regulation AGA M3-3, dated 23.1. 1997, shall be drawn up for Lappeenranta airport in accordance with the model given by the Airports Department of Finnish Civil Aviation Administration. The “Flight Operations” section shall include reasonably detailed instructions for local flight operations. The local operators shall be informed in the regulations and instructions concerning to them and contained in the Airport Operations Manual.

2. The importance of correct traffic information in class D airspace shall be emphasised both in the training and daily work of air traffic controllers

3. The knowledge about air traffic control clearances, flying in controlled airspace and the compliance of correct radio phraseology shall be increased among the general aviation pilots. The non-standard radio phraseology has been found at least a contributing factor in several incidents.

4. The working conditions in Lappeenranta air traffic control shall be improved by modernising the telephone and radiotelephone equipment and other technical facilities as instructed by the Air Navigation Services Department.

Helsinki, on December 9, 1999

Jouko Koskimies Ari Huhtala

Appendix 1

RADIO COMMUNICATIONS ON LAPPEENRANTA TWR/APP FREQUENCY 120,20 MHz ON 29 JULY 1999 AT 12.05 - 13.22 UTC (AT 15.05 - 16.22 LT)

Time (UTC)		Translation from Finnish radio traffic
		772
12.05	TWR:	OH-772 tower, go ahead.
	OH-772:	Can I push to the runway?
12.06	TWR:	OH-772 transfer to runway 24
	OH-772:	772
	TWR:	772...present QFE 1001.
	OH-HCF:	OH-HCF on the apron Bravo.
	TWR:	OH-HCF tower, go ahead.
	OH-HCF:	OCF request taxi to runway for towing the glider, endurance 45 minutes and one person, pilot NN.
	TWR:	OCF taxi to runway 24, information Hotel, QFE 1001.
	OH-HCF:	QFE 1001 … taxiing to runway 24.
	TWR:	Tower.
12.09	TWR:	772, tower.
	OH-772:	772, go ahead.
	TWR:	772 do you accept south of the field?
	OH-772:	That is okay for me.
	TWR:	772 cleared... to Lappeenranta TMA south of the field, ... upper limit flight level 65, VFR
	OH-772:	(unclear...) 65, 772.
12.10	TWR:	And QN… QFE was 1001.
	OH-772:	QFE 1001.
12.12	OH-HCF:	OCF is ready to tow.
	TWR:	OCF wind 270 degrees 9 knots, cleared for take off for towing run…
	OH-HCF:	Cleared to tow, CF.
	TWR:	Tower.
12.18	OH-HCF:	CF on downwind, to grass 24 and long landing.
	TWR:	OCF, continue for landing runway 24, wind 260 degrees 12 knots.
	OCF:	Will continue for landing to grass 24, CF.
		- - - - - - - - -
12.24	OFC:	OCF gonna tow, behind is glider 773, and from grass.
	TWR:	OCF. OH-773, cleared to Lappeenranta TMA south of the field, upper limit flight level 65, VFR.
	OH-773:	... upper limit... 7 ... can you say again the upper limit, 773.
	TWR:	OH-773, upper limit flight level 65, VFR.

	OH-773:	Upper limit 65, VFR, and below, 773.
	TWR:	And clearance area was Lappeenranta TMA, south of the field, QN ... QFE 1001.
	OH-773:	QFE 1001, TMA, south of the field, 773.
	TWR:	Tower. And OCF, wind 250 degrees 10 knots, permission to tow.
12.25	OCF:	Okay. CF starts to tow.
		- - - - - - - - -
12.31	OCF:	CF on downwind to grass 24, long landing.
	TWR:	OCF, continue for landing grass 24, wind 280 degrees 9 knots.
	OCF:	Continue for landing, CF.
	TWR:	Tower.
		- - - - - - - - -
12.40		
	TWR:	Duty, tower.
	Duty:	Duty listening.
	TWR:	Finnair Saab 05.
	Duty:	Saab 05, duty.
	LAC:	773, come down to circuit.
12.42	OH-773:	Lappeenranta tower, 773, left downwind to grass 24.
	TWR:	OH-773, continue for landing grass 24, wind 250 degrees 14 knots, maximum 20.
	LAC:	Mind for short landing, we have strong surface wind.
12.43	OH-773:	773
12.45	TWR:	OH-772 for your information, Finnair Saab estimates here 05, correct time 45.
	OH-772:	772.
	TWR:	Tower.
	TWR:	772, report position and altitude.
	OH-772:	772, 12 kilometres west of the field on highway 6 direction, 10 - 12 km.
	TWR:	772
12.46		
		- - - - - - - - - -
12.50	OH-710:	Tower, OH-710 is here south of Savitaipale, coming to the field.
	TWR:	OH-710, QFE 1001, and for your information there is Finnair Saab approaching from Helsinki. Estimates to field 05.
	OH-710:	1015 and will mind that Saab.
	TWR:	OH-710 cleared to Lappeenranta TMA, upper limit flight level 65, VFR.
	OH-710:	65, VFR, 710. And is "Glider - Ground" listening 710?
	LAC:	Yes, ground is listening.
12.51	OH-710:	Ten minutes, and the plane is available. I’m coming down soon.
	LAC:	Okay.
	TWR:	710, confirm that you are landing in 10 minutes.

	OH-710:	Confirm. Hardly even so long.
12.52	OCF:	CF, do we manage to snap yet one glider up? It takes hardly three minutes.
	TWR:	OCF, sure you manage. And behind is 773?
	OCF:	Yes, but still some preparing. Three minutes.
12.53	TWR:	OCF
12.54	TWR:	OH-772, tower.
	OH-772:	772, go ahead.
	TWR:	Is 772 going to land before Finnair?
	OH-772:	Negative.
	OCF:	CF is ready for towing, behind is glider 773.
12.55	Johto 1:	Tower, Johto1, can I drive to the runway?
	TWR:	OCF. Johto 1, drive to the runway.
	Johto 1:	Johto 1 is driving.
	TWR:	And OH-773, old clearance further on, and OCF, wind 280 degrees 7 knots, permission to tow.
	OCF:	And towing, CF.
	TWR:	Tow...
		- - - - - - - - - -
12.57	OH-710:	710.
	TWR:	710, tower.
	OH-710:	And 710 is now 2 kilometres from the field and is approaching from north-west. Request to make a low pass over the glider area at speed and then go around and turn to landing.
	TWR:	To grass 24.
	OH-710:	24. 710.
	TWR:	OH-710, clearance was to grass 24.
	OH-710:	Yes, and to grass 24.
	TWR:	710, continue for landing grass 24. And present wind is 260 degrees 14 knots.
	OH-710:	Continue for landing, 710.
12.58	FIN 585:	Good afternoon, Lappeenranta tower, Finnair 585, down to forty, 18 miles and cleared to 70.
	TWR:	Finnair 585, cleared to Ranta. Continue to descend 1800 feet. QNH 1014. Expect visual approach runway 24, no delay.
	FIN 585:	Cleared to Ranta eighteen hundred, 1014, and using runway 06 - sorry, 24 is possible, Finnair 585.
12.59	TWR:	Finnair 585, information Juliet.
	FIN 585:	We have got Juliet, Finnair 585.
	TWR:	Finnair 585, for your information, there are some gliders in Lappeenranta TMA, but not on your path.
	FIN 585:	Thank you.
	OH-710:	710 is left base grass 24.
	TWR:	710, continue for landing to grass 24. Wind 240 degrees 13 knots.
	OH-710:	Continue for landing, 710.

	TWR:	And Finnair is coming to land in three - four minutes.
13.00	TWR:	772, report position.
	OH-772:	772, five kilometres north-west of field, altitude 1300.
	TWR:	772.
	TWR:	Johto 1, vacate the runway.
	Johto1:	Johto 1 is vacating the runway, and at present there are not birds on runway.
	TWR:	Johto 1.
	Johto 1:	And tower, Johto 1 has vacated the runway.
	TWR:	Johto 1.
	FIN 585:	Lappeenranta tower, Finnair 585 have runway in sight. Which kind of circle you want us to do?
	TWR:	Finnair 585, cleared visual approach runway 24, right circuit. And QNH 1014, report right downwind 24.
13.01	FIN 585:	Right hand circuit, and report right downwind 24, Finnair 585.
	TWR:	Finnair 585, QNH 1014.
	FIN 585:	1014, Finnair 585.
	FIN 585:	Finnair 585, we past approximately said one hundred meters of a glider.
13.02		
	TWR:	Finnair 585.
	TWR:	And OC... OH-773, report position.
	OH-773:	Two kilometres south-west of the field, altitude 900.
	TWR:	And 772, report position.
	OH-772:	772 is north-west of the field five kilometres, 1200 metres.
	TWR:	772.
	OCF:	And CF is 2 kilometres south of the field and 400 metres, coming down.
	TWR:	OCF. - OCF, you are number two, number one is Finnair.
	OCF:	Number 2. Number 1 is Finnair, OCF.
13.03		
	FIN 585:	Finnair 585 now turning to right base 24.
	TWR:	Finnair 585, wind 250 degrees 12 knots. Cleared to land runway 24.
	FIN 585:	Cleared to land 24, Finnair 585.
13.06	TWR:	Finnair 585 landed 06. Taxi back track to apron.
	FIN 585:	Back track to apron. Should we come to tower to explain the situation.
	TWR:	Yes, please.
	FIN 585:	Yeah, wilco.
	TWR:	Finnair 585, stand one and ten meters forward, there are line crossing.
	FIN 585:	Say again. Stand one and rest of then?
	TWR:	Ten meters forward from the cross line in front of number one.
	FIN 585:	Copy, Finnair 585.

13.07		
13.08	OCF:	CF, request permission to drop the rope onto the grass 06, and after that go around and landing runway 24.
	TWR:	OCF, stand by for a minute.
	OCF:	Standing by for a minute, CF.
	TWR:	OCF, permission to drop the rope onto the grass granted.
13.09	OCF:	Coming to drop the rope onto the grass 06, CF.
	TWR:	Tower
	OH-773:	Lappeenranta tower, 773 on downwind to grass 24, to the end of 06.
	TWR:	OH-773, continue for landing to grass and observe that CF that just dropped the rope.
	OH-773:	Will continue for landing and observing the towing aircraft. Oscar 773.
	TWR:	Tower. And wind is 250 degrees 13 knots.
13.11		
	OCF:	CF is on downwind runway 24.
	TWR:	OCF, continue as number two, number one is glider on base leg to grass 24.
	OCF:	Continuing as number two, and I am coming to land runway 24.
	TWR:	And runway 24 is granted, but as number two.
	OCF:	Number two, CF.
	TWR:	Tower.
13.12		
	OCF:	CF on final runway 24.
	TWR:	OCF, wind 250 degrees 14 knots, cleared to land runway 24.
	OCF:	Cleared to land, runway 24, CF.
	TWR:	Tower.
13.13		
	TWR:	OCF, landing was 13. Do you taxi to apron or to hangar?
13.14	OCF:	Landing was 13, and I am going to taxi there to apron and I'm gonna refuel.
	TWR:	OCF, taxi to Delta.
	OCF:	Taxiing to Delta, CF.
		- - - - - - - -
13.22	OCF:	Tower, CF. Request taxi via runway to that glider area.
	TWR:	OCF, taxi via runway to the glider area.
	OCF:	Taxiing via runway, CF.
	TWR:	Tower.
	TWR:	OH-772, report present position.
	OH772:	772 is at 1200 metres south of the field, 5 kilometres.
	TWR:	772.
		END OF RECORDING

Appendix 2

TELEPHONE COMMUNICATIONS IN THE LAPPEENRANTA TWR/APP ON 29 JULY 1999 AT 12.42 - 13.31 UTC (15.42 - 16.31 LT)

Aika (UTC)		Translation from Finnish language
12.40	ACC:	(Calling) 585, 13.05 VIL, to 70, runway?
	TWR:	06 - correction, now is runway 24.
	ACC:	24, and 57 contact/release.
	TWR:	57 contact/release. 13.05 Vilmas and down to 70. That's clear.

- - - - - -

END OF RECORDING