Havarikommissionen
Accident Investigation Board Denmark

Bulletin 2023-271

Accident to D-EIRX (Reims F 172P) on Fur (EKFU) on 24-4-2023.

ISSUED AUGUST 2023

INTRODUCTION

This bulletin reflects the opinion of the Danish Accident Investigation Board regarding the circumstances of the occurrence and its causes and consequences.

In accordance with the provisions of EU Regulation 996/2010, the Danish Air Navigation Act and pursuant to Annex 13 of the International Civil Aviation Convention, the safety investigation is of an exclusively technical and operational nature, and its objective is not the assignment of blame or liability.

The safety investigation was carried out without having necessarily used legal evidence procedures and with no other basic aim than preventing future accidents and serious incidents.

Consequently, any use of this bulletin for purposes other than preventing future accidents and serious incidents may lead to erroneous or misleading interpretations.

CONTENTS

GENERAL

State file number:	2023-271
UTC date:	24-4-2023
UTC time:	12:55
Occurrence class:	Accident
Location:	Fur (EKFU)
Injury level:	None
Aircraft registration:	D-EIRX
Aircraft make/model:	Reims F 172P
Current flight rules:	Visual Flight Rules (VFR)
Operation type:	Private
Flight phase:	Take-off
Aircraft category:	Fixed wing
Last departure point:	EKFU
Planned destination:	Endelave (EKEL)
Aircraft damage:	Substantial
Engine make/model:	1 x Lycoming O-320-D2J

SYNOPSIS

Notification

All time references in this bulletin are Coordinated Universal Time (UTC).

The Area Control Center at Copenhagen Airport, Kastrup (EKCH), notified the Aviation Unit of the Danish Accident Investigation Board (AIB) of the accident on 24-04-2023 at 13:25 hours (hrs).

The Danish AIB notified the Danish Civil Aviation and Railway Authority (DCARA), the German Federal Bureau of Aircraft Accident Investigation (BFU), the US National Transportation Safety Board (NTSB), the European Aviation Safety Agency (EASA), and the Directorate-General for Mobility and Transport (DG MOVE) on 24-04-2023 at 21:27 hrs.

Summary

A take-off attempt under marginal conditions and a consequentially aborted take-off led to loss of directional control and a runway excursion.

This accident occurred in daylight and under Visual Meteorological Conditions (VMC).

FACTUAL INFORMATION

History of flight

The accident occurred during a private VFR flight from Fur (EKFU) to Endelave (EKEL).

Rainfall during the night and in the morning delayed the planned departure from EKFU.

Before departure from EKFU, the pilot took into consideration observed wind conditions ("wind direction 160°-170°, and the wind was calm") near Fur Harbour (visit at noon) and the runway dimensions, condition and slope.

The pilot decided to perform a take-off on runway 12 (downhill slope).

A pre-flight inspection of the aircraft did not give rise to remarks. The pilot noted that the grass was wet and slippery. Upon engine start, the pilot performed an engine run-up check without remarks.

While taxing uphill on runway 30, the pilot made a mental ground roll calculation and set a mentally predetermined stop/go decision point to be approximately 330-340 meters (m) from the beginning of runway 12.

If the indicated airspeed was less than approximately 60-65 knots (kt) at the mentally predetermined stop/go decision point, the pilot intended to abort the ground roll.

In take-off position for runway 12, the pilot applied full engine power, released the brakes, and the aircraft started accelerating.

Using a trained short field take-off procedure, the pilot at an indicated airspeed of approximately 20-25 kt extended the flaps to flap position 10°.

After passing the mentally predetermined stop/go decision point, the pilot noted an indicated airspeed of approximately 45 kt and decided to abort the ground roll.

During the aborted ground roll sequence, it was the perception of the pilot having applied full wheel brakes, and the experience of the pilot was an uncontrollably veering to the right.

The aircraft headed toward the right side of the runway.

In a sideway skid, the aircraft ran off the side of the runway into a soaked field. The nose wheel sunk into ground, and the aircraft rotated over the propeller and the left hand wingtip and came to rest upside down

The pilot and passenger evacuated the aircraft.

Witnesses observing the sequence of events launched a rescue mission.

Injuries to persons

Injuries	*Crew*	*Passengers*	*Others*
Fatal			
Serious			
None	1	1	

Damage to aircraft

The runway excursion into a soaked field with crops consequentially led to a rollover and substantial damages to the aircraft.

Figure 1. The aircraft in an upside down position on the accident site.

Figure 2. A drone photo of the accident site.

Personal information

License and medical certificate

The pilot – male, 67 years – was the holder of a valid German Private Pilot License (PPL (A)).

The rating Single Engine Piston (land) was valid until 31-8-2023.

The medical certificate (class 2) was valid until 6-8-2023.

Flying experience

	Last 24 hours	Last 90 days	Total
All types	02:07	02:07	690:15
This type	02:07	02:07	690:15
Landings this type	4	4	>1,100

Grass runway experience

The pilot had previous flying experience on grass runways.

The most recent grass runway flying experience was on 14-8-2022.

Operational knowledge of EKFU

Before arrival on 23-4-2023, the pilot had limited operational knowledge of EKFU (only information from a software application) and did not obtain operational information from the airstrip owner.

At arrival to EKFU and overflying the airstrip, the pilot noticed that no windsock was available.

With reference to nearby wind turbines, the pilot decided to land on runway 30 (uphill slope).

Aircraft information

General information

Manufacturer:	Reims Aviation
Type:	F 172P
Serial number:	F172-2109
Airworthiness Review Certificate:	Valid until 23-6-2023
Engine manufacturer:	Lycoming
Engine type:	O-320-D2J
Propeller manufacturer:	McCauley
Propeller type:	1C160/DTM7557
Maximum take-off mass (MTOM):	1089 kilos (kg)
Fuel on board at take-off:	160 litres (l)
Aircraft total flight hours:	6150:36
Technical status of the aircraft:	There were no technical log remarks, and the pilot experienced no technical deficiencies.

Mass and balance

The AIB made a mass and balance calculation based on:

- the latest mass and balance report issued on 1-6-2012
- the available mass and balance data in the onboard Pilot Operating Handbook (POH) (section 6)
- pilot supplied information about masses of onboard persons and baggage
- pilot supplied information about onboard fuel.

Description	Mass (kg)	Arm (m)	Moment (Kgm)
Empty mass	711.8		721.256
Front seats	207.0	1.000	207.000
Rear seat	10.0	1.850	18.500
Baggage	2.0	2.410	4.820
Fuel	115.2	1.220	140.544
Total	1,046.0	1.044	1,092.120

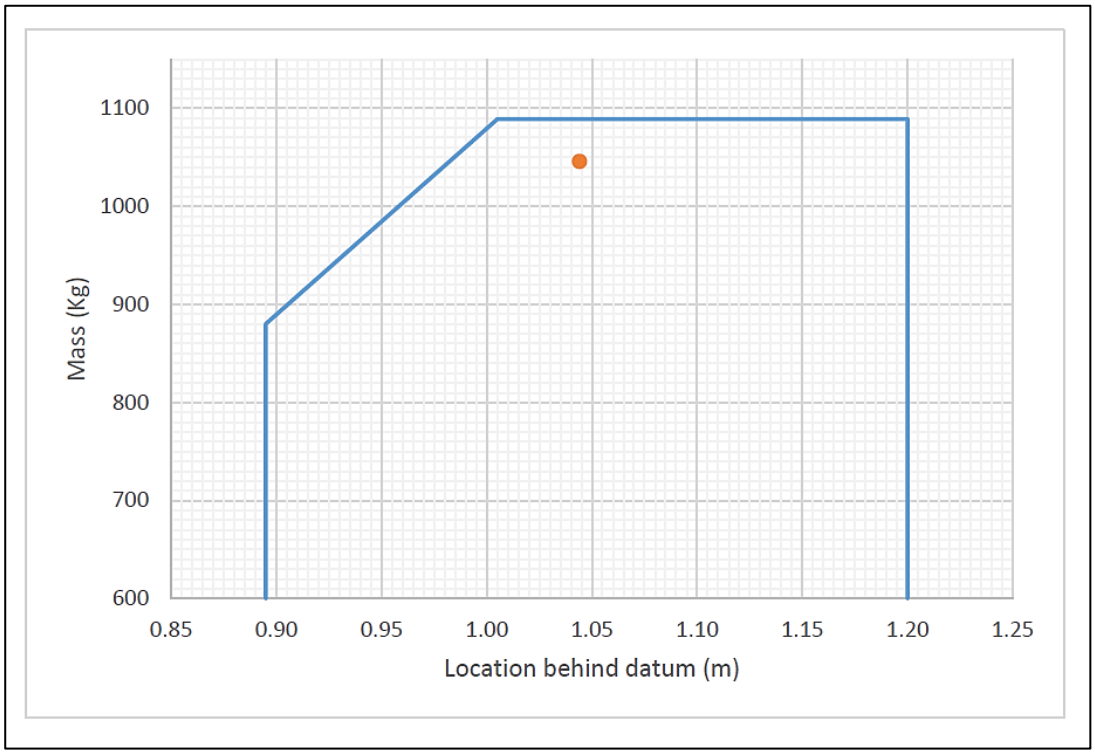


Figure 3. Mass and balance chart.

Pilot Operating Handbook (POH)

a. General.

The onboard POH, issued on July 1980, was in German.

For comparison, the AIB, from the aircraft manufacturer, obtained a POH in English.

In this bulletin, the AIB presents extracts from the POH in English.

The relevant extracts from the POH in German were consistent with the relevant extracts from the POH in English.

b. Short field take-off.

Section 4 – normal procedures.

Normal take-off

1.	Wing Flaps	0° - 10°.
2.	Carburetor Heat	COLD.
3.	Throttle	FULL OPEN.
4.	Elevator Control	LIFT NOSE WHEEL (at 55 KIAS).
5.	Climb Speed	70 - 80 KIAS.

Short field take-off

1.	Wing Flaps	10°.
2.	Carburetor Heat	COLD.
3.	Brakes	APPLY.
4.	Throttle	FULL OPEN.
5.	Mixture	RICH (above 3000 feet, LEAN to obtain maximum RPM).
6.	Brakes	RELEASE.
7.	Elevator Control	SLIGHTLY TAIL LOW
8.	Climb Speed	56 KIAS (until all obstacles are cleared).

c. Wing flaps settings.

Normal take-offs are accomplished with wing flaps 0° - 10°. Using 10° wing flaps reduces the ground roll and total distance over an obstacle by approximately 10 percent. Flap deflections greater than 10° are not approved for take-off. If 10° wing flaps are used for take-off, they should be left down until all obstacles are cleared and a safe flap retraction speed of 60 KIAS is reached. On a short field, 10° wing flaps and an obstacle clearance speed of 56 KIAS should be used.
Soft or rough field take-offs are performed with 10° flaps by lifting the airplane off the ground as soon as practical in a slightly tail-low attitude. If no obstacles are ahead, the airplane should be leveled off immediately to accelerate to a higher climb speed.
When departing a soft field with an aft C. G. loading, the elevator trim should be adjusted towards the nose down direction to give comfortable control forces during the initial climb.

d. Take-off performance.

Take-off distance for short field (relevant extracts).

CONDITIONS:

Flaps 10°
Full Throttle Prior to Brake Release.
Paved, Level, Dry Runway
Zero Wind

NOTES:

1. Short field technique as specified in section 4.
2. Prior to take-off from fields above 3000 feet elevation, the mixture should be leaned to give maximum RPM in a full throttle static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
4. For operation on dry, grass runway, increase by 15% of the "ground roll" figure.

WEIGHT LBS	TAKE-OFF SPEED KIAS		PRESS ALT FT	10°C	
	LIFT OFF	AT 50 FT		GRND ROLL	TOTAL TO CLEAR 50 FT OBS
2400	51	56	S. L.	860	1570
			1000	940	1725
2200	49	54	S. L.	700	1280
			1000	765	1405

Meteorological information

Significant Weather Chart (SIGWX)

A section of the SIGWX issued on 24-4-2023 at 12:00 hrs – see appendix 1.

Low Level Forecast

The overview (FBDN20) was valid for Denmark (Jutland and the islands), and the forecast (FBDN22) was only valid for Jutland. EKFU was located in the area 52d. See below.

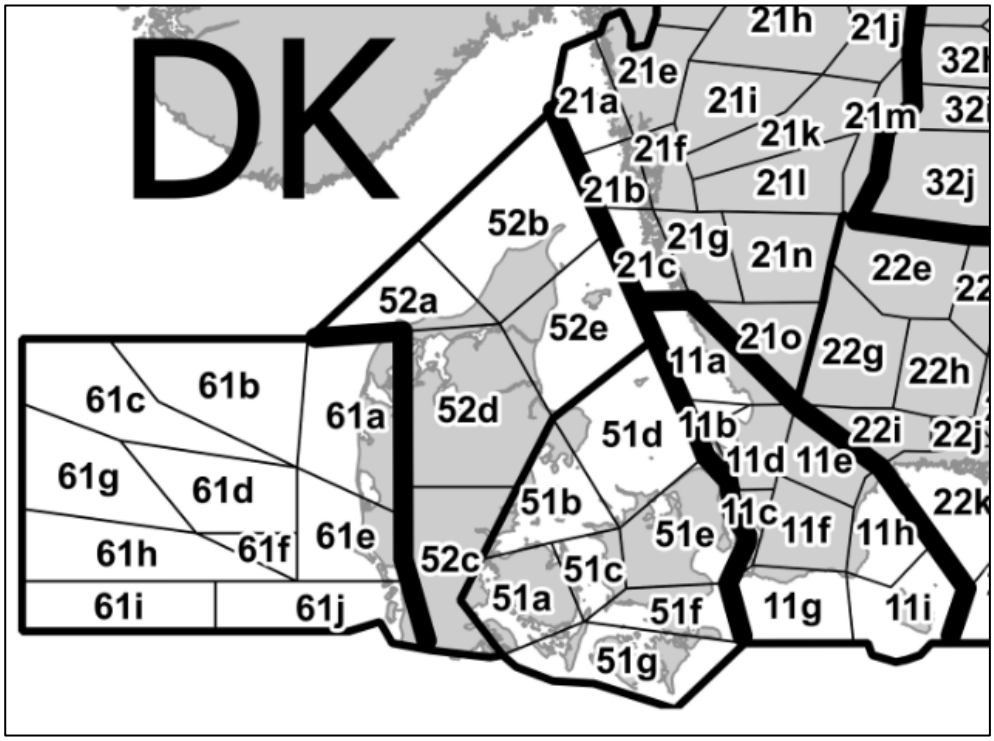


Figure 4. Meteorological weather areas valid for Denmark.

FBDN20 EKCH 241100.

Valid on 24-4-2023 between 12:00 and 20:00 hrs.

General:	A low over northern Jutland slowly moved toward the north. Associated front caused rain and mist many places. However, over the North Sea conditions gradually improved from the west.
Visibility:	12:00-16:00 hrs valid for the whole area.
	Below 5 kilometres (km) or ceiling below 1000 feet (ft).
Icing:	12:00-14:00 hrs valid for the whole area except dk51 (the islands).Moderate or severe icing.
	14:00-16:00 hrs valid for the whole area. Moderate or severe icing.
Turbulence:	Not expected in the forecasted period.

FBDN22 EKCH 241100.

Valid on 24-4-2023 between 12:00 and 20:00 hrs.

Visibility:	12:00-20:00 hrs valid for area dk52d.
	>8 km in rain, locally 5 km - 8 km in mist. Ceiling 1500 ft - 2000 ft, locally 500 ft - 1000 ft.
Icing:	12:00-20:00 hrs valid for area dk52d.
	Moderate ice 4000 ft - >Flight Level (FL) 125.
Turbulence:	Not expected in the forecasted period.
Cloud top:	12:00-20:00 hrs valid for area dk52d.
	>FL 125.
Surface winds:	12:00-20:00 hrs valid for area dk52d.
	South - southwest 4-14 kt, gusts up to 22 kt.
Lowest QNH:	12:00-14:00 hrs.
	995 Hectopascal (hPa).

Aviation Routine Weather Report (METAR)

Skive Helicopter Emergency Medical Service (HEMS) (EKSK).

METAR EKSK 241250Z AUTO 26009KT 220V290 9999 BKN013/// BKN039/// OVC058/// 11/11 Q0996=

METAR EKSK 241320Z AUTO 28009KT 240V310 2600 -RA BR BKN007/// BKN015///OVC020/// 10/10 Q0996=

Wind observations from other stations

Rønbjerg Huse Havn:	12:30 hrs 225° 8 kt gusting 11 kt
(Approximately 13 km northeast of the island of Fur)	12:40 hrs 225° 6 kt gusting 7 kt.
	12:50 hrs 225° 5 kt gusting 6 kt.
Note. Auto-SYNOP, the wind direction might not be reliable.	13:00 hrs 225° 4 gusting 5 kt.
	13:10 hrs 225° 7 kt gusting 11 kt.
Aars Syd:	12:30 hrs 167° 12 gusting 18 kt.
(Approximately 30 km southeast of the island of Fur)	12:40 hrs 174° 11 gusting 14 kt.
	12:50 hrs 180° 9 kt gusting 14 kt.
Note. Auto-SYNOP.	13:00 hrs 232° 6 kt gusting 14 kt.
	13:10 hrs 240° 3 kt gusting 6 kt.

Silstrup:	12:30 hrs 167° 12 gusting 18 kt.
(Approximately 25 km northwest of	12:40 hrs 174° 11 gusting 14 kt.
the island of Fur)	12:50 hrs 180° 9 kt gusting 14 kt.
Note. Auto-SYNOP.	13:00 hrs 232° 6 kt gusting 14 kt.
	13:10 hrs 240° 3 kt gusting 6 kt.

Wind observations in graphic.

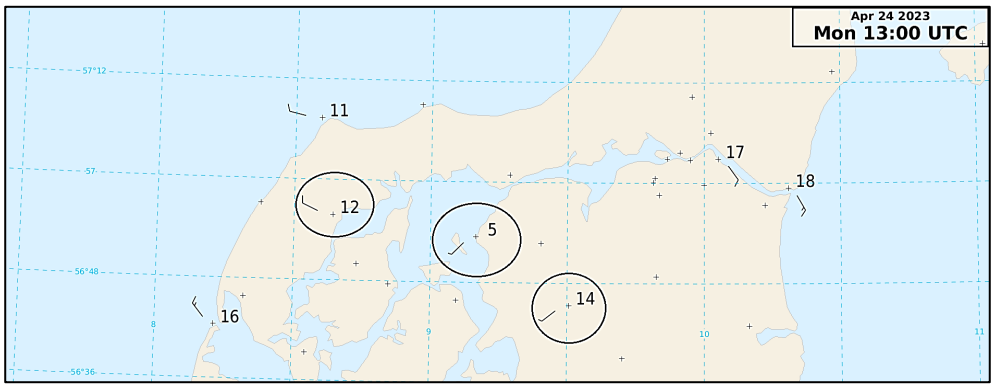


Figure 5. Observations of surface mean wind (wind barbs) and maximum wind "gusts" (black numbers).

Aftercast valid for EKFU

General:	A low-pressure system over northwestern Jutland (close to the island of Fur) moved slowly toward the north. In connection with the low, a front passed the island of Fur during the night with rain followed by rain showers from the south and the southwest. After the low, a northwesterly flow of more cool and unstable air with a few showers arose.
Visibility:	Generally good visibility, more than 10 km. However, locally mist occurred and in connection with showers visibility probably was down to 2-5 km.
Clouds:	Broken/overcast, in periods scattered of stratocumulus/cumulus and towering cumulus/cumulonimbus with base in 1000-3000 ft. In connection with showers base down to 500-800 ft.
Surface wind: (10 m above ground level)	Due to the low-pressure center being close to the island of Fur, the wind was relatively variable in the area. There were no observations at EKFU, but observations in the area indicated wind from 225° 5-12 kt northeast of the island of Fur, 170-240° 3-14 kt southeast of the island of Fur and 280-300° 8-13 kt northwest of the island of Fur.

	Comparing with the wind forecast by numeric weather models, the wind at EKFU was probably between 190-250° 3-14 kt. However, nearby showers could cause wind gusts. At exactly 13:00 hrs, a small shower passed the island of Fur and there were other showers in the area. Therefore, the wind at EKFU might have been more variable and maybe gusting up to approximately 20-25 kt. However, the showers in the area did not seem to be very intense and probably did not cause that much wind gust. The strongest wind gust measured in the area was 18 kt at Aars Syd (southeast of the island of Fur) at 12:30 hrs.
Turbulence/wind shear/microburst:	At 13:00 hrs, there was most likely nil or feeble/light turbulence at EKFU. However, there was a small probability that the showers in the area might have caused a downburst/downdraft over EKFU and thereby a significant wind shear. As mentioned above, the showers did not seem that intense and probably did not cause any strong downbursts.
Precipitation:	There was no measuring station located on EKFU, but there were measuring stations close to the island of Fur. The municipality of Skive, where the island of Fur was located, measured from 04:00 to 13:00 hrs 8.7 millimeters (mm) of rain. In the surrounding municipalities, Thisted measured 10.4 mm, Lemvig 8.5 mm and Jammerbugten 7.1 mm. At a measuring station (FM12 SYNOP Junget), approximately 10 km southeast of EKFU, 9.1 mm. At Nykøbing Mors water board, approximately 10 km west southwest of the island of Fur, 6.4 mm. So probably, 5-10 mm of rain fell on EKFU from around 03:30 hrs to 13:00 hrs. A road measuring station located on the island of Fur at Hvirpgade (Pumpehus), approx. 2.5 km east of EKFU indicated wet roads at 13:00 hrs.

Satellite image

See appendix 2.

Weather radar images

See appendix 3.

Aerodrome information

General information

EKFU:	Privately owned airstrip
Aerodrome Reference Point:	56° 49’ 27.58“N 8° 59’ 22.79“E (with reference to information from a private provider of aerodrome information)
Elevation:	30 ft (with reference to information from a private provider of aerodrome information)
Runway directions:	12/30
Runway dimensions	600 m x 20 m
Runway surface:	Grass
Wind sock:	Neither required by regulations nor available at the time of the accident
Airstrip information:	Via a dedicated website, the airstrip owner in Danish provided pilot information

Airstrip information

a. Danish aerodrome information.

The pilot had access to information from a Danish private provider of Danish aerodrome information.

However, the native language of the pilot was German, and the pilot did not read or understand Danish.

A note in Danish to the aerodrome information stated that no windsock was available from October until May.

Airstrip information about EKFU – see appendix 4.

b. Pilot software application (extract).

Caution:

Various wind farms up to 266 feet in closer & more distant vicinity of AD.
Upslope RWY 30.
When departing from 12 make right turn to avoid overflying Debel village.

Overview of EKFU

See appendix 5.

AIB safety investigation

Operational safety investigation

a. Witness observations.

- Witnesses noted that from the time of accident until the arrival of the AIB at 18:45 hrs, it had not been raining.
- A witness observed the engine start up and the initial uphill taxi. To the witness, the pilot surprisingly started on runway 12. A pennant in the garden of the witness indicated light wind from the west.

- The witness observed the downhill ground roll and noted that if the aircraft got airborne, it would probably collide with the row of trees east of runway 12.

b. Ground roll and runway excursion.

- Aircraft tire marks from the beginning of the ground roll until the aircraft came to rest in a field were clearly visible.
- During the initial ground roll, the pilot had directional control along the runway centreline.
- After the pilot predetermined stop/go decision point (approximately 330-340 m), the aircraft started veering slightly to the left of the runway centreline.
- After a ground roll of approximately 385 m, the nose wheel was off ground, while the main wheels still were on ground.
- After approximately 414 m, while the nose wheel was off ground and the main wheels still were on ground, the tail section stroke the ground over a distance of 5.7 m. The aircraft was in a significantly veering turn to the right.
- After approximately 430 m, the main wheels and the nose wheel were on ground. The aircraft headed toward the right side of the runway.
- The aircraft started skidding sideways to the right.
- After approximately 487 m, the aircraft ran off the side of the runway into a field.
- After an approximately 45 m sideway skid into the field, the nose wheel sunk into ground, and the aircraft rotated over the propeller and the left hand wingtip and came to rest upside down.

The ground roll sequence and runway excursion – see appendix 5 and appendix 6.

c. Accident site.

- The AIB measured the runway dimensions to be 608 x 20 m.
- There were runway edge markings (road marking poles) for each approximately 50 m. There was no midway runway marking.
- The surface was short cut grass with minor piles of wet grass clippings.
- Upon AIB arrival at 18:45 hrs, the AIB assessed the runway still to be wet, soft and in some areas soaked.
- 52 m east of runway 12, there was a row of trees with heights up to approximately 12-15 m.
- The aircraft ended up in a soaked field with crops in an upside position.

d. Runway slope.

Based on contour lines developed by the Danish Agency for Data Supply and Infrastructure, the AIB calculated the average downslope of runway 12 to be 1.97%

$$\frac{(30.5\ \text{m} - 18.5\ \text{m})}{608\ \text{m}} \times 100 \approx 1.97$$

e. Graphic illustration of downslope of runway 12.

See appendix 7.

f. AIB calculations of ground roll and take-off distances.

Conditions:

- POH take-off performance data.
- Linear interpolation and rounding of numeric values to nearest higher value.
- Take-off mass of 2306 lbs.
- Outside temperature +10°C (EKSK).
- QNH at sea level 996 hPa (EKSK).
- Airstrip elevation 30 ft.
- 1 hPa equals 30 ft.
- Flap setting 10°.
- Varying wind at EKFU between 190° and 250° - in average 8 kt.
- Wet, soft and in some areas soaked grass.
- DCARA safety information in Aeronautical Information Circular (AIC) B 02/23 (in Danish only) on take-off calculations for grass runway operations. AIC B 02/23 recommended pilots to increase the take-off distance by 25-50% for operations on soft grass runways. The AIC B 02/23 principle for calculation was to add the calculated difference in take-off distances between take-off on a dry grass runway and on a soft grass runway to the ground roll distance for take-off on a dry grass runway and thereby obtaining a new calculated ground roll distance.
  A note to AIC B 02/23 advised pilots against a take-off on a soft grass runway, if pilots had doubts about a successful outcome.

See appendix 8.

Technical safety investigation

a. Primary and secondary flight controls.

Because of the sequence of events, the AIB technical safety investigation mainly focussed on aircraft flight controls and configuration.
A preliminary and later a thorough onsite inspection of aircraft primary and secondary flight controls gave no rise to remarks.
From a technical point of view, the aircraft was controllable throughout the sequence of events.
The flap setting was 10°.

b. Engine power.

The pilot stated that the engine at full power delivered as expected.
Damages to the propeller indicated low engine power at propeller ground contact in the field.

c. Emergency Locator Transmitter (ELT).

General.

Manufacturer:	Ameri-King Corp.
Model:	AK-451-21
Part number (P/N):	P/N AK-451-(AF)(AP)(S)
Serial number (S/N):	5474
Transmissions:	121.500 Megahertz (MHz), 243.000 MHz, and 406.028 MHz

- The onboard ELT was in the OFF position.
- The pilot stated not having interfered with the onboard ELT before, during or after the sequence of events.
- The onboard checklist did not stipulate the pilot to arm the ELT before take-off.
- The onboard ELT was mounted between the front seats with the forward arrow, which was printed on the battery case, pointing upwards.
- Half of the ELT antenna was missing.
- See appendix 9.
- The AIB did an onsite ELT manual activation test without remarks.
- It was not possible for the AIB, neither from the aircraft owner nor the aircraft maintenance organization, to track the documentation on ELT installation and maintenance.

ELT installation and operations manual.

The installation and operation manual for the model AK-451-( ) series (Document No. IM-451 REV NC-4.1h, dated July 5, 2014) stated (extracts):

> The ELT must be mounted with the arrow, which is printed on the battery case, pointing in the direction of flight.
> The ELT should be mounted with its longitudinal axis aligned within 10 degrees of the longitudinal axis of the aircraft fuselage. Avoid mounting the ELT near sources of strong EMI/RFI radiation.
> In normal configuration, the main switch located on the ELT main unit, must be selected at “ARM” at all times.

Survival aspects

General

The pilot and the passenger used lap and shoulder harnesses.

The rotation of the aircraft into an upside down position did not overstress the lap and shoulder harnesses, and the lap and shoulder harnesses did not suffer from malfunctioning.

During the evacuation sequence, the pilot and passenger experienced no hindrances to free movement.

Search and rescue

At 13:01 hrs, witnesses alerted the emergency dispatch centre.

When Danish Police arrived at the accident site at 13:31 hrs, the local fire and rescue services, an ambulance, and a search and rescue helicopter were already there assisting the pilot and the passenger.

ELT

The ELT did not activate the International Satellite System for Search and Rescue Services (COSPAS-SARSAT).

Additional information

EASA requirements (extracts)

a. Non-commercial operations with other than complex-motor-powered aircraft (Part-NCO).

PART NCO.GEN.105 Pilot-in-command responsibilities and authority.

(a) The pilot-in-command shall be responsible for:

(4) only commencing a flight if he/she is satisfied that all operational limitations referred to in 2.a.3 of Annex IV to Regulation (EC) No 216/2008 are complied with, as follows:

(vi) the aircraft operating limitations as specified in the aircraft flight manual (AFM) will not be exceeded at any time during the flight.

Part-NCO.IDE.A.170 ELT.

(a) Aeroplanes shall be equipped with:

(1) an ELT of any type, when first issued with an individual CofA* on or before 1 July 2008;

(2) an automatic ELT, when first issued with an individual CofA after 1 July 2008; or

(3) a survival ELT (ELT(S)) or a personal locator beacon (PLB), carried by a crew member or a passenger, when certified for a maximum passenger seating configuration of six or less.

(b) ELTs of any type and PLBs shall be capable of transmitting simultaneously on 121.5 MHz and 406 MHz.

*Certificate of Airworthiness (CofA)

b. Airworthiness for Light Aircraft (Part-ML)
Part-ML. A.903 Airworthiness review process.

(a) To satisfy the requirement for the airworthiness review of an aircraft referred to in point ML.A.901, the airworthiness review staff shall perform a documented review of the aircraft records to verify that:

(1) airframe, engine and propeller flying hours and associated flight cycles have been properly recorded;
(2) the flight manual is applicable to the aircraft configuration and reflects the latest revision status;
(3) all the maintenance due on the aircraft according to the AMP* has been carried out;
(4) all known defects have been corrected or deferred in a controlled manner;
(5) all applicable ADs** have been applied and properly registered;
(6) all modifications and repairs made to the aircraft have been registered and are in compliance with Annex I (Part-21) to Regulation (EU) No 748/2012;
(7) all service-life-limited components installed on the aircraft are properly identified, registered and have not exceeded their approved service life limit;
(8) all maintenance has been certified in accordance with this Annex;
(9) if required, the current mass-and-balance statement reflects the configuration of the aircraft and is valid;
(10) the aircraft complies with the latest revision of its type design approved by the Agency;
(11) if required, the aircraft holds a noise certificate corresponding to the current configuration of the aircraft in compliance with Subpart I of Annex I (Part-21) to Regulation (EU) No 748/2012.

* Aircraft Maintenance Programme

** Airworthiness Directive

EASA Airworthiness Directive (AD)

On 20-9-2017, EASA issued AD US-2017-16-01 (Ameri-King ELT). Effective date was 24-10-2017.

Within 12 months after the effective date of the AD, the AD required general visual inspections of the ELT for discrepancies, checks, tests, and verifications to ensure the ELT functioning.

All applicable corrective actions, in accordance with "Periodic Maintenance (Instructions for Continued Airworthiness)," Ameri-King Corporation Document IM-451, "INSTALLATION AND OPERATION MANUAL," Revision NC-4.1h, dated July 5, 2014, were to comply with the AD.

Repetition of the inspections and applicable checks, tests, and verifications were to take place at intervals not exceeding 12 months.

An owner-declared maintenance programme controlled the aircraft continued airworthiness.

Neither the Combined Airworthiness Organisation (CAO) performing the annual Airworthiness Review Certificate inspections nor the owner identified the ELT AD.

ANALYSIS

General

The pilot was properly licensed.

The technical status of the aircraft had no influence on the sequence of events, and the technical safety investigation revealed availability of full aircraft control during the sequence of events.

The aircraft mass and balance was within manufacturer prescribed limitations.

The pilot extended the flaps to flap position 10°. Though, the actual pilot setting of take-off flaps during the initial ground roll did not comply with the manufacturer short field take-off procedure, the AIB does not consider this finding to be causal.

The forecasted weather conditions at EKFU were generally consistent with the actual weather.

EKFU

EKFU was a privately owned airstrip.

The AIB would like to highlight the decisive differences between certified and non-certified aerodromes:

- Certified aerodromes complies with international and authority approved aviation standards ensuring uniformity.
- Non-certified aerodromes (like privately owned airstrips) are mainly governed by regional and/or local political decision-making not taking into account aviation standardized uniformity.

These decisive differences, when operating on privately owned airstrips, requires even more thorough pre-planning and might mentally stress the individual decision-making processes.

Runway edge markings were available. However, midway runway markings were not available and would likely have increased pilot situational awareness during the ground roll and supported his decision-making on either an aborted or a continued take-off.

Limited operational knowledge of EKFU combined with a language barrier adversely impacted the pilot pre-planning and handling of the flight to and from EKFU.

Though not required for a privately owned airstrip, the AIB considers the non-availability of a wind sock (approximately 7 months per year) to be a significant downgrade of flight safety and to be causal to the sequence of events.

Take-off on runway 12

Rainfall during the night and in the morning (wet, slippery, soft and sporadically soaked grass) in combination with AIB assumed wind conditions (potential tailwind) at the time of departure adversely impacted take-off performance.

To the AIB, the projection of pilot observed wind conditions at Fur Harbour at noon onto assumed and non-objective wind conditions at time of departure induced a latent flight safety risk.

The projection of wind conditions impacted pilot decision making processes.

The pilot did a mental ground roll distance calculation and set a mentally predetermined stop/go decision point.

However, the AIB finds it possible that this mental calculation (330-340 m) missed the actual runway condition (wet and sporadically soaked grass), wind conditions (potential tailwind), and a consequentially increased ground roll (401-673 m) and take-off distance (604-935 m).

The total distance, from the beginning of runway 12 to high trees (12-15 m) east of runway 12, was 660 m.

Taking into consideration the combination of an adversely impacted take-off performance and high trees close to the end of runway 12, the AIB considers the take-off to be marginal.

Given the runway marks, a likely take-off scenario was:

- During the initial ground roll, the pilot had directional control.
- The aircraft acceleration was slower than expected.
- Having passed the downhill mentally predetermined stop/go decision point at a low airspeed and now approaching the runway end (close to high trees), the pilot aborted the take-off attempt (engine power to idle).
- In order to optimise braking capability, the pilot likely and unintendedly applied too much control wheel backpressure causing a tail strike.
- The aircraft was in an uncontrollably veering right turn.
- The pilot applied full wheel brakes (potentially uneven wheel braking).
- The aircraft ran off the side of the runway in a sideways skid.

Threat and error management

Latent threats most likely reduced the decision-making competence of the pilot and unknowingly provoked a decision on taking off under marginal conditions.

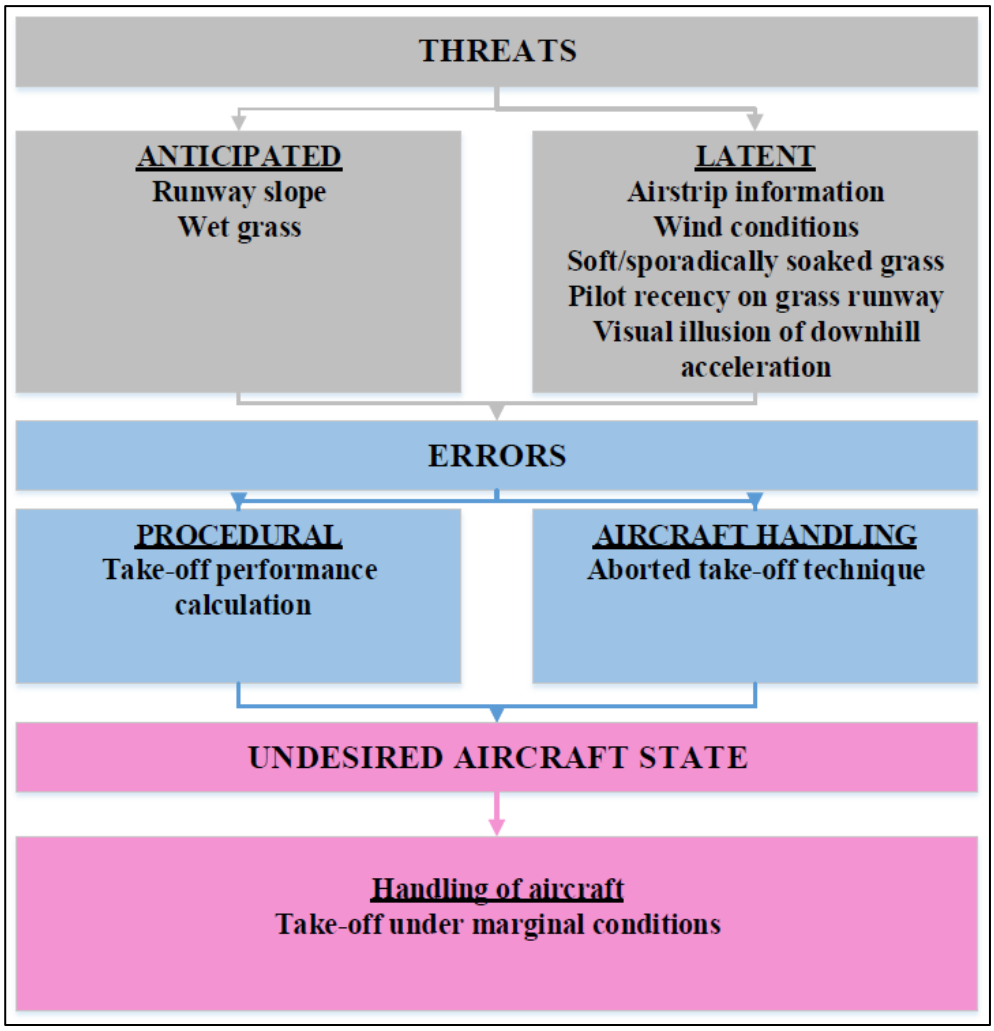


Figure 6. Threat and error management.

Survival aspects

Low speed when tipping over combined with no hindrances to free movement during aircraft evacuation made the accident survivable.

To the AIB, the rescue mission by involved stakeholders was effective.

The onboard checklist did not stipulate the pilot to arm the ELT before take-off, and the ELT remained in the OFF position.

The AIB onsite ELT manual activation test was without remarks. However, regarding installation, inspection and maintenance of the onboard ELT, the AIB questions compliance with EASA requirements and the issued ELT AD.

The AIB would like to take the opportunity to strongly emphasize the importance of an authorized and per design functioning onboard ELT.

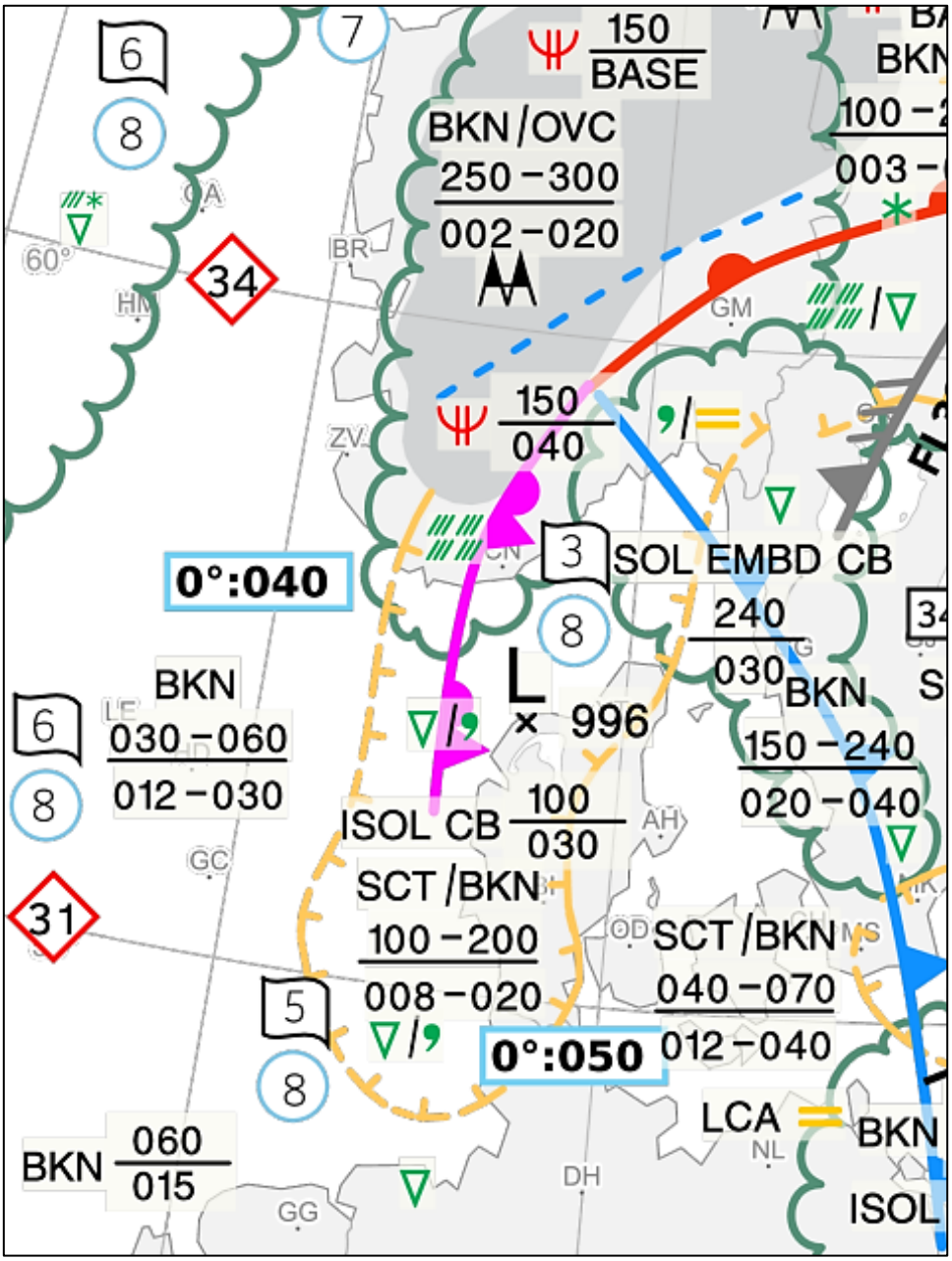
CONCLUSIONS

Summary

A take-off attempt under marginal conditions and a consequentially aborted take-off led to loss of directional control and a runway excursion.

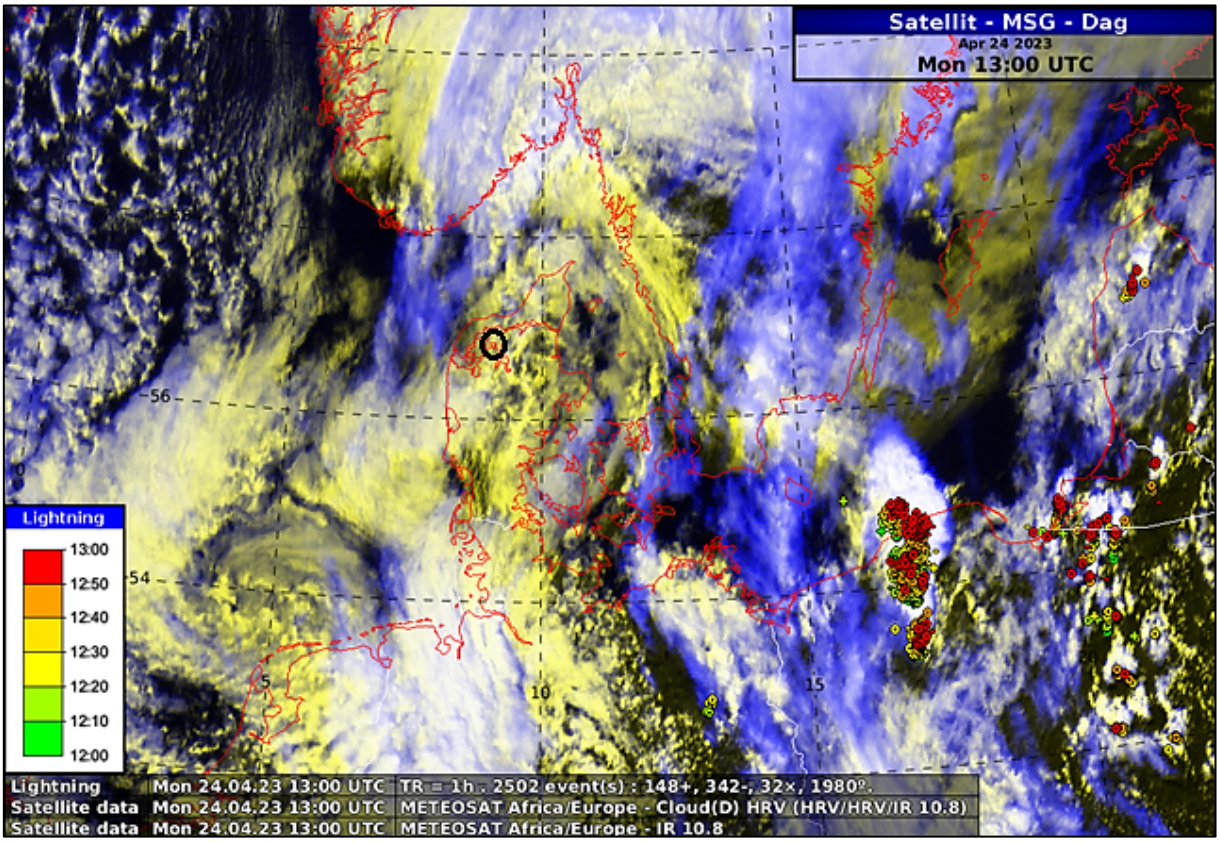
APPENDIX 1

Return to SIGWX



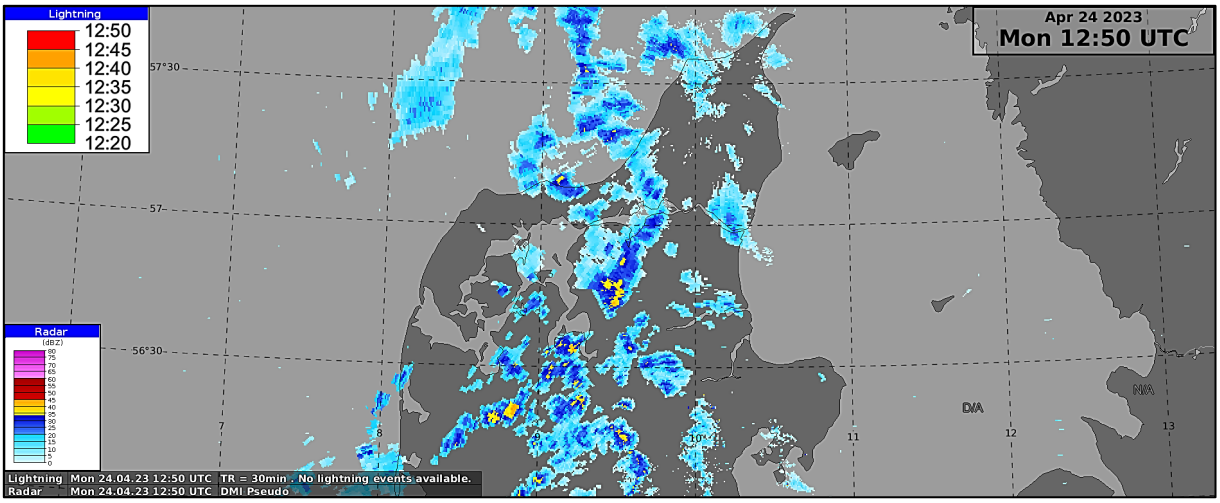
APPENDIX 2

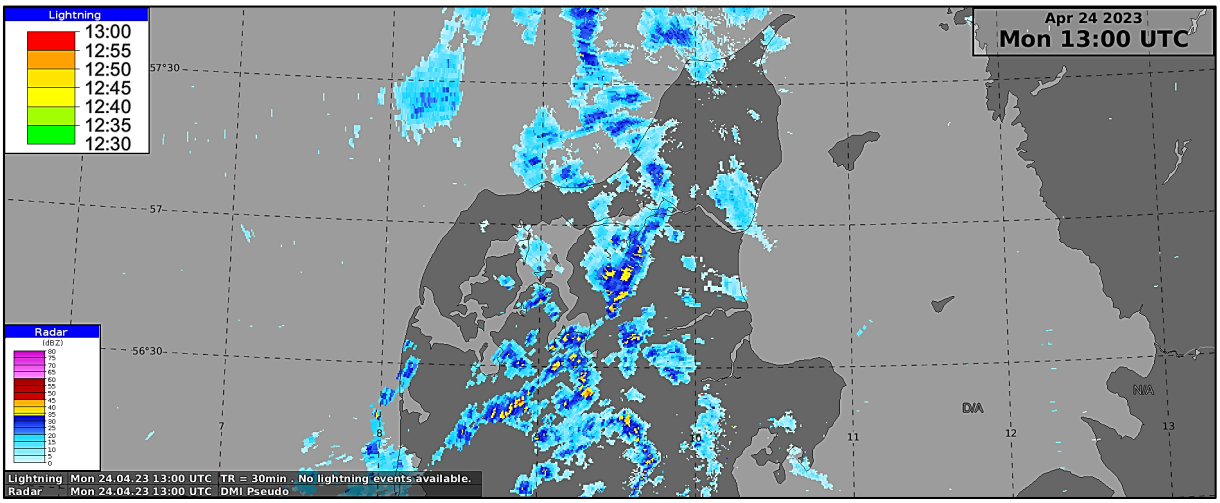
Return to satellite image

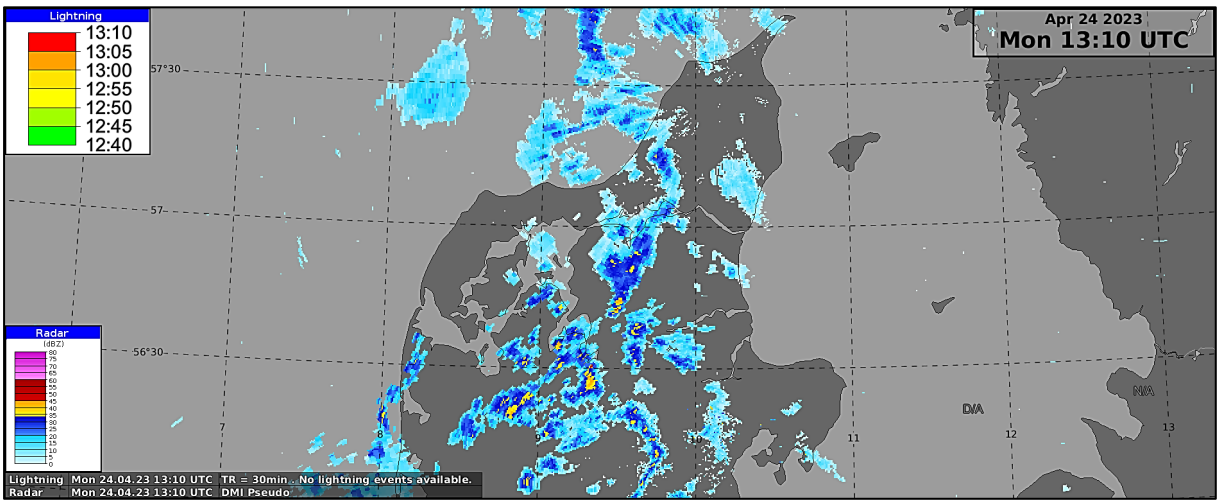


APPENDIX 3

Return to weather radar images







APPENDIX 4

Return to airstrip information

Fur EKFU

PPR: Nej	Afgift: 50,00	FUEL: Nej	Info Tlf.: +45 4058 3245
Pos: 1.3 NM VNV for Nederby. 56° 49' 27.58" N 8° 59' 22.79" E			Elev: 30 fod
Radio: Ingen		NAV: Ingen	
Debel 23, 7884 Fur.		Taxi: Fur Taxi : +45 9753 5311	
www.fur-flyveplads.dk www.ekfu.dk www.furnyt.dk			2022
Told: Nej	Café : Nej	Hangar: Nej	WC: Ja

FG

❶ Der findes 13 nyere cykler på pladsen, som kan lejes for Dkr 50,00 pr dag. ❷ Undgå overflyvning af Debel by. Specielt ved start bane 12, lav højre drej. ❸ Høje træer for baneenderne. ❹ Vindposen er nedtaget fra ca. october til ca. maj.

APPENDIX 5

Return to overview of EKFU Return to operational safety investigation

Note. The overview is not to scale.

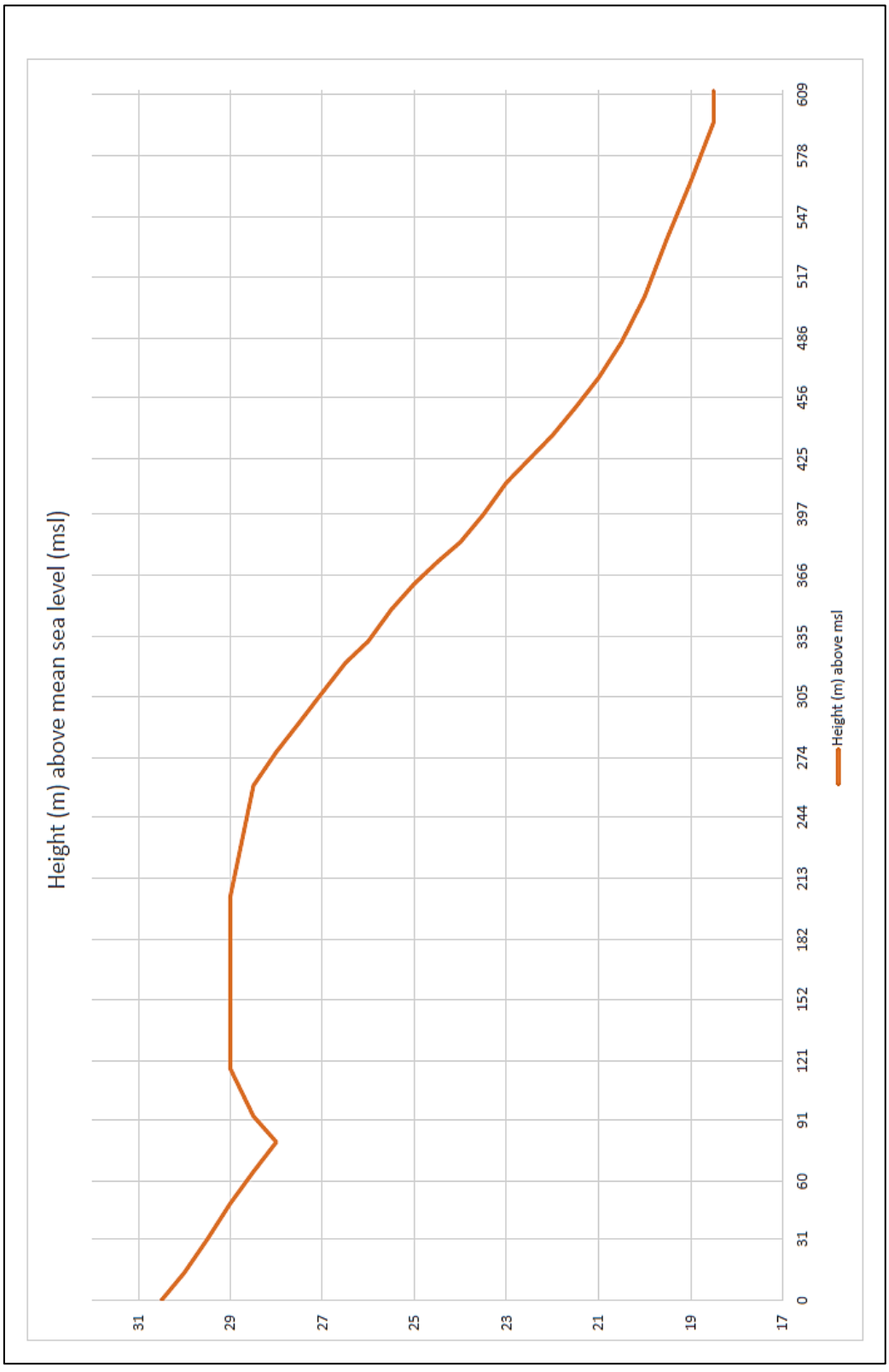
APPENDIX 6

Return to operational safety investigation

APPENDIX 7

Return to operational safety investigation

Note. The graphic illustration is not to scale.



APPENDIX 8

Return to operational safety investigation

Take-off performance data

Mass (lbs)	Pressure Altitude (PA)	+10°C					
		Ground roll	PA	Ground roll (corrected)	Total to clear 50 ft obstacle	PA	Total to clear 50 ft obstacle (corrected)
		ft	ft	ft	ft	ft	ft
2400	Sea level	860	**540**	**903.20**	1570	**540**	**1,653.70**
	1000 ft	940			1725		
2306				**824 (251 m)**			**1,510 (460 m)**
2200	Sea level	700	**540**	**735.10**	1280	**540**	**1,347.50**
	1000 ft	765			1405		

Operation on dry grass runway.

For operation on dry, grass runway, increase by 15% of the “ground roll” figure (cf. POH).

Calm wind	Distances	
	Ground roll	Total to clear 50 ft obstacle
	m	m
	251 + 38 **289**	460 + 38 **498**

Wind correction

For operation on dry, grass runway, increase by 15% of the “ground roll” figure (cf. POH).

Decrease distances 10% for each 9 knots headwind (cf. POH).

For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots (cf. POH).

Headwind speed (or tailwind) = wind speed × cos (α)

Wind correction (190°/8 kt) for takeoff on runway 12.

Headwind = 8 kt x cos 70° = 3 kt.

Wind correction (250°/8 kt) for takeoff on runway 12.

Tailwind = 8 kt x cos 130° = 5 kt.

Headwind (3 kt)	Distances	
	Ground roll	Total to clear 50 ft obstacle
	m	m
	251 + 38 **289** - 9 **280**	460 + 38 **498** - 15 **483**

Tailwind (5 kt)	Distances	
	Ground roll	Total to clear 50 ft obstacle
	m	m
	251 + 38 **289** + 72 **361**	460 + 38 **498** + 125 **623**

Operation on soft runway

Increase takeoff distance by 25-50% (cf. DCARA AIC B 02/23).

Headwind (3 kt) Soft (25%)	Distances	
	Ground roll	Total to clear 50 ft obstacle
	m	m
	251 + 38 **289** - 9 **280** + 121 **401**	460 + 38 **498** - 15 + **483** + 121 **604**

Headwind (3 kt) Soft (50%)	Distances	
	Ground roll	Total to clear 50 ft obstacle
	m	m
	251 + 38 **289** - 9 **280** + 242 **522**	460 + 38 **498** - 15 + **483** + 242 **725**

Tailwind (5 kt) Soft (25%)	Distances	
	Ground roll	Total to clear 50 ft obstacle
	m	m
	251 + 38 **289** + 72 **361** + 156 **517**	460 + 38 **498** + 125 + **623** + 156 **779**

Tailwind (5 kt) Soft (50%)	Distances	
	Ground roll	Total to clear 50 ft obstacle
	m	m
	251 + 38 **289** + 72 **361** + 312 **673**	460 + 38 **498** + 125 + **623** + 312 **935**

APPENDIX 9

Return to technical safety investigation