Air Accident Investigation Unit Ireland

FACTUAL REPORT

ACCIDENT

Enstrom 280FX, N280CH

Near Carlingford, Co. Louth, Ireland

19 July 2015

An Roinn Iompair Turasóireachta agus Spóirt

Department of Transport, Tourism and Sport

Foreword

This safety investigation is exclusively of a technical nature and the Final Report reflects the determination of the AAIU regarding the circumstances of this occurrence and its probable causes.

In accordance with the provisions of Annex 13[1] to the Convention on International Civil Aviation, Regulation (EU) No 996/2010[2] and Statutory Instrument No. 460 of 2009[3], safety investigations are in no case concerned with apportioning blame or liability. They are independent of, separate from and without prejudice to any judicial or administrative proceedings to apportion blame or liability. The sole objective of this safety investigation and Final Report is the prevention of accidents and incidents.

Accordingly, it is inappropriate that AAIU Reports should be used to assign fault or blame or determine liability, since neither the safety investigation nor the reporting process has been undertaken for that purpose.

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[1] **Annex 13**: International Civil Aviation Organization (ICAO), Annex 13, Aircraft Accident and Incident Investigation.
[2] **Regulation (EU) No 996/2010** of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation.
[3] **Statutory Instrument (SI) No. 460 of 2009**: Air Navigation (Notification and Investigation of Accidents, Serious Incidents and Incidents) Regulations 2009.

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In accordance with Annex 13 to the Convention on International Civil Aviation, Regulation (EU) No 996/2010 and the provisions of SI 460 of 2009, the Chief Inspector of Air Accidents, on 25 July 2015, appointed Mr John Owens as the Investigator-in-Charge to carry out an Investigation into this accident and prepare a Report.

Aircraft Type and Registration:	**Enstrom 280FX, N280CH**
No. and Type of Engines:	**1 x Lycoming HIO-360-F1AD**
Aircraft Serial Number:	**2024**
Year of Manufacture:	**1988**
Date and Time (UTC)[4]:	**19 July 2015, 15.42 hrs**
Location:	**Approximately 1 Nautical Mile (NM) south of Carlingford, Co Louth, Ireland**
Type of Operation:	**General Aviation**
Persons on Board:	**Pilot - 1 Passengers - 0**
Injuries:	**Pilot - 0 Passengers - 0**
Nature of Damage:	**Substantial**
Commander's Licence:	**Student Pilot Certificate issued by the Federal Aviation Administration (FAA) of the United States of America (USA)**
Commander's Details:	**Male, aged 69 years**
Commander's Flying Experience:	**138 hours, of which 135 were on type**
Notification Source:	**Irish Coast Guard**
Information Source:	**AAIU Field Investigation** **AAIU Report Form submitted by the Pilot**

[4] **UTC**: Co-ordinated Universal Time. All timings in this report are quoted in UTC (local time minus one hour on the date of the event).

SYNOPSIS

The helicopter took off from a site adjacent to the Pilot's home near Carlingford, Co. Louth, in the Republic of Ireland. The Pilot's intention was to fly to Derryogue Airfield, Co. Down in Northern Ireland, from where he had flown earlier that day. Very shortly after take-off, the Pilot lost control of the helicopter and attempted a forced landing in a nearby field, which resulted in substantial damage to the helicopter. No injuries were reported to the Investigation.

1. FACTUAL INFORMATION

1.1 History of the Flight

Earlier on the day of the accident, the Pilot flew the helicopter from Derryogue Airfield to a prepared landing site located on his land adjacent to his house near Carlingford, Co. Louth. He reported that shortly after take-off for the return flight, as he was crossing over the boundary wall of his property in a south/south-easterly direction, he noticed an *'overboost'* warning light, indicating that the engine manifold pressure[5] was high. He said that when he checked the manifold pressure gauge it showed 40 IN.HG[6] (the red line limit is 39 IN.HG). The Pilot explained that he tried to reduce the manifold pressure by lowering the collective lever[7]. He said that as he did this, "*the revs* [engine and main rotor revolutions per minute - RPM] *naturally went up*" and that when he tried to reduce the engine (and main rotor) RPM, the helicopter "*kicked round*" because he "*didn't get enough pedal*[8] *in instantaneously*". He said he "*thought the best thing to do was just put it down where it came down*" and that it "*hit hard on the right hand skid*". The Pilot stated that he wasn't sure if there was "*a wind contributing or squall contributing factor*". However, he reported that the wind conditions were generally calm. He said that the helicopter yawed to the left as the RPM was reduced.

The helicopter impacted with sloping, uneven ground and came to rest on a heading of 310° magnetic, approximately 140 metres (m) to the south east of the departure site and pointing back towards it (**Photo No. 1**). The helicopter was substantially damaged as a result of the impact. The Pilot informed the Investigation that he was the sole occupant, that he had no problem in exiting the helicopter and that apart from a sore elbow, he was uninjured. The Pilot also stated that the helicopter had no technical defects prior to the accident. He reported that no flight plan was filed.

1.2 Damage to Aircraft

During the impact sequence, the rotating main rotor struck the uneven ground, resulting in severe damage to the blades. Damage was also sustained to the helicopter's right hand landing skid with associated damage to the right hand side of the fuselage.

[5] **Manifold pressure:** An indication of engine power, usually displayed in inches of mercury.
[6] **IN.HG:** Inches of mercury – Units of pressure.
[7] **Collective lever:** This lever simultaneously changes the pitch angle of all the main rotor blades, thereby increasing or decreasing lift/thrust.
[8] **Tail Rotor Pedals:** Depressing a pedal in a given direction changes the tail rotor blade pitch, increasing or reducing tail rotor thrust and making the nose yaw in the direction of the applied pedal, or maintaining heading when power is adjusted.

Photo No. 1: Final resting position of N280CH (The flight commenced from a landing site located uphill and approximately 140 metres to the right).

1.3 Location of Area used as a Helipad

The level area used as a helipad is located approximately 140 m above sea level on an elevated site on the side of a hill, adjacent to the Pilot's house. The surface is of compacted soil/hard core. The surrounding hillside slopes upwards to the west and downwards to the east and south.

1.4 Meteorological Conditions

Met Éireann, the Irish Meteorological Service, was asked to provide details on the weather conditions in the Carlingford area at the time of the accident. The aftercast obtained noted that the surface wind was 7-10 kts at 270^{o}, the temperature was approximately 17^{o} Celsius (C) and the visibility was 20-30 km.

1.5 Emergency Response

Emergency medical personnel attended the scene following a 999/112 call from a member of the public, reporting that a helicopter had crashed. When they arrived at the accident site, the helicopter had already been evacuated. The Advanced Paramedic (AP) met the Pilot in a nearby house. He was advised by the Pilot that medical attention was not required.

Regarding the weather conditions, the AP said he noticed that the windsock nearby was "*hanging down as there was no wind to inflate it*".

1.6 Aircraft Information

1.6.1 General

The Enstrom 280FX, a two-three seat helicopter, was manufactured in 1988. It was fitted with a Lycoming HIO-360-F1AD turbo-charged four cylinder engine, which powered a three-blade counterclockwise-rotating (as viewed from above) main rotor and a two-blade tail rotor. The '*Standard Airworthiness Certificate*' (Certificate of Airworthiness) for the helicopter was issued by the FAA on 18 July 2012 and had an expiry date of 30 June 2018. The Pilot reported that on the date of the accident, the helicopter had operated for a total time of 986 hours[9]. The helicopter log book records that the most recent Annual Inspection was performed on 20 Feb 2015, also at 986 hours.

An engine overboost warning system is fitted, which consists of a pressure switch installed in the intake manifold pressure gauge line and an amber light in the cockpit annunciator panel. The switch is designed to illuminate the warning light at between 36 and 40 IN.HG. When illuminated, the light warns that the manifold pressure maximum limits may be exceeded and that the manifold pressure gauge should be monitored.

1.6.2 Operating Procedures

Normally, a helicopter with a counterclockwise-rotating main rotor will have a tendency to yaw to the right as power is increased, or to the left as power is reduced. According to the Manufacturer, fly-weights are fitted to the tail rotor blade retention plates to ensure that when the helicopter is being flown with the engine set to approximately 29 IN.HG (medium power setting), the pedals are in the neutral position. The Manufacturer's Pilot training Guide for the helicopter type states that "*the aircraft requires very slight left pedal in hover and in climb, and significant right pedal in low power situations*".

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The '*Operator Manual and FAA Approved Rotorcraft Flight Manual*' for the helicopter describes the normal take-off procedures to be followed. It states that when the helicopter is lifted "*light on the skids*", the throttle should be adjusted to maintain engine RPM in the green band (2,900–3,050 RPM), before raising the collective lever to lift the helicopter off the ground.

The Manufacturer's '*Piston Helicopter Pilot Training Guide*' recommends setting the engine at 3,050 RPM and to "*roll off the throttle slowly*" to maintain the RPM in the green band as the collective lever is raised. It is noted that the helicopter is fitted with a mechanical throttle correlator, which will automatically maintain the engine RPM when the pilot makes adjustments to the blade pitch with the collective lever. The Operator Manual procedure continues by stating that the power required to hover should be checked and that as the helicopter begins to move forward, the acceleration rate should be adjusted so that "*approximately 1-2 inches of manifold pressure over hover power is required*".

[9] The Pilot subsequently advised the Investigation that he had flown the helicopter for an additional 2.3 hours in April 2015, resulting in a total operating time of approximately 988 hours.

The Manufacturer's Pilot Training Guide warns that "*it is important for the pilot not to chase RPM with throttle. If an adjustment is needed to the throttle to maintain blade RPM in the green, gently squeeze on or off a slight bit of throttle and pause to allow the blade RPM to catch up. The Enstrom has extremely high inertia blades and the most effective way to adjust blade RPM is by manipulating the collective in addition to making throttle changes*". It also states: "*During smooth transition into a climb from a hover, it is common for the RPM to climb and exceed the red line. The pilot should compensate by squeezing off a slight bit of throttle and then pause to see the effect of the change before adjusting the throttle further*".

1.7 Aircraft Weight and Performance

The FAA-approved Flight Manual notes that the maximum gross weight of the helicopter is 2,600 lbs. However, this limit is affected by local conditions such as pressure altitude and air temperature. The Pilot advised the Investigation that he was the only person on board and he estimated the helicopter weight as follows:

Empty Weight:	1,749 lbs (793.3 kgs)
Pilot:	200 lbs (90.7 kgs)
Fuel:	150 lbs (68 kgs or 94.44 litres at 0.72 kgs/litre)
Total:	2,099 lbs (952 kgs)

In the absence of translational lift[10] (notwithstanding any prevailing wind), more power is required during the hover phase of flight than in any other phase. Therefore, one of the principal limiting factors for helicopter performance is whether or not the helicopter can hover at a particular gross weight. An increase in pressure altitude and/or air temperature will reduce the maximum allowable gross weight.

A hover is said to be '*In Ground Effect*' (IGE) when it is performed close to the ground, usually at a height equal to or less than the main rotor diameter. The hover is '*Out of Ground Effect*' (OGE) above this height. Hovering IGE leads to a cushioning effect and results in the generation of more lift for a given blade angle. Therefore, an OGE hover requires more power than an IGE hover.

Tables contained in the '*Operator Manual and FAA Approved Rotorcraft Flight Manual*' for the helicopter show that at a pressure altitude of 460 ft (Approximately 140 m) on a standard day (15°C), the helicopter can hover IGE at its maximum allowable gross weight of 2,600 lbs. For OGE hovering in the same conditions, the maximum allowable gross weight is approximately 2,460 lbs.

1.8 Personnel Information

Total all types:	137.9 hours
Total on type:	135.3 hours
Total P1 on type:	14.5 hours
Last 90 days:	2.3 hours
Last 28 days:	1 hour

[10] **Translational Lift:** The additional lift (or rotor thrust) obtained from horizontal airflow across the main rotor, due to helicopter movement or the effect of wind.

The Pilot held a '*Medical Certificate Second Class and Student Pilot Certificate*' issued by the FAA (FAA Form 8420-2). The associated medical examination was dated 1 October 2013. The expiry date of the certificate was 31 October 2015. The Student Pilot Certificate section contains a table to record the '*Certificated Instructor's Endorsement for Student Pilots'*. Part A of this table is used to record endorsements for solo flights. An endorsement was issued by an instructor on 29 April 2014 for solo flights on the Enstrom 280FX helicopter type. A further endorsement for the helicopter type was issued on 28 July 2014. The Pilot's log book records several solo flights from Derryogue during August 2014. Part B of the endorsements table is for instructor endorsement of '*Solo cross-country flights*'. There were no endorsements recorded in this section.

1.9 Pilot Licensing Requirements

1.9.1 Requirements of the United States of America

Part 61 of Title 14 (Space and Aeronautics) of the USA's Code of Federal Regulation (CFR) describes the requirements for the certification of pilots, flight instructors and ground instructors.

Sub-part C (student pilots), Section 61.87, paragraph (n) describes the '*Limitations on student pilots operating an aircraft in solo flight'.* This Section states:

> *A student pilot may not operate an aircraft in solo flight unless that student pilot has received an endorsement in the student's logbook for the specific make and model aircraft to be flown by an authorized instructor who gave the training within the 90 days preceding the date of the flight.*

Section 61.89 prohibits the carriage of passengers by student pilots. International flights are also prohibited.

Section 61.93 describes the *'Solo cross-country flight requirements',* for flights including:

> *(i) Conducting a solo cross-country flight, or any flight greater than 25 nautical miles from the airport from where the flight originated.*
>
> *(ii) Making a solo flight and landing at any location other than the airport of origination.*

Paragraph (b) of this Section relates to '*Authorization to perform certain solo flights and cross-country flights'.* It states *that "a student pilot must obtain an endorsement from an authorized instructor to make solo flights from the airport where the student pilot normally receives training to another location* […]*".*

It also states the following:

> *Solo flights may be made to another airport that is within 25 nautical miles from the airport where the student pilot normally receives training, provided—*
>
> *(i) An authorized instructor has given the student pilot flight training at the other airport, and that training includes flight in both directions over the route, entering and exiting the traffic pattern, and take-offs and landings at the other airport.*

(ii) The authorized instructor who gave the training endorses the student pilot's logbook authorizing the flight;

Paragraph (c) states that an endorsement is required for "*each cross-country*" flight (subject to specific restrictions, repeated cross-country flights between the same points do not require separate endorsements). The Pilot provided the Investigation with no evidence of endorsements, other than those contained on his student pilot certificate.

1.9.2 European Requirements

The Enstrom 280FX type is included on the '*EASA Type Rating & License Endorsement List – Helicopters*'. As such, it is subject to the requirements of Regulation (EU) No 1178/2011, which lays down the technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament. FCL.020 relates to Student Pilots, It states: "*A student pilot shall not fly solo unless authorised to do so and supervised by a flight instructor"*.

The date of entry into force of the requirements of Regulation (EU) 1178/2011 regarding pilots holding a licence and associated medical certificate issued by a third country involved in the non-commercial operation of aircraft specified was extended until 8 April 2016 by Regulation (EU) 2015/445. Therefore, for aircraft operating within the Republic of Ireland, the provisions of Statutory Instrument (SI) 333 of 2000 (Personnel Licensing) applied on the date of the accident.

1.9.3 Requirements within the Republic of Ireland

The IAA informed the Investigation that as per Article 5 (10) of SI 333 of 2000, a Student Pilot licence issued by a foreign state is not valid in the Republic of Ireland (See **Appendix A**).

1.9.4 Requirements within the United Kingdom

Because the date of entry into force of the requirements of Regulation (EU) 1178/2011 regarding specific non-commercial flights was extended until 8 April 2016 by Regulation (EU) 2015/445, national legislation regarding Flight Crew Licensing also applied within the UK at the time of the accident.

Part 6, Section 61 of the Air Navigation Order (2009) on the '*Requirement for appropriate licence to act as member of flight crew of aircraft registered elsewhere than in the United Kingdom*' permits a person to act as a member of the flight crew in an aircraft registered in a country other than the UK, providing that the person is "*the holder of an appropriate licence granted or rendered valid under the law of the county in which the aircraft is registered"* and that the UK Civil Aviation Authority (CAA) has not given a direction to the contrary.

The CAA advised the Investigation that the Air Navigation Order does not recognise FAA student pilot licences. By way of explanation they stated that the "*FAA has not rendered valid any licence in issuing a Student Pilot Certificate but has issued a sub-ICAO licence which the UK will not render valid itself*".

Regarding flight instruction, the CAA stated that, if there is remuneration for such activity, it is considered to be '*Aerial Work*'. In accordance with Article 225 of the Air Navigation Order, special permission is required for '*Aerial Work*' for aircraft registered elsewhere than in the United Kingdom.

2. AAIU COMMENT

2.1 General

The meteorological report received from Met Éireann for the Carlingford area around the time of the accident, stated that winds were 7-10 kts at 270°. Notwithstanding this, reports received from the Pilot and medical personnel who attended the accident indicate that the wind conditions were generally calm at the time. Such conditions can adversely affect helicopter performance due to reduced translational lift. Furthermore, the helicopter commenced its flight over ground that was sloping downhill, which would have resulted in a reduction in ground effect and may have necessitated an increased power requirement to maintain height above ground level. However, according to the figures supplied by the Pilot, the take-off weight of the helicopter was 2,099 lbs. For the prevailing conditions at the time of the accident, this should have been well within the 2,460 lbs limit for OGE hover, a flight regime that has higher power requirements.

The Manufacturer's '*Operator Manual and FAA Approved Rotorcraft Flight Manual*' notes that the power required to hover should be checked and that as the helicopter begins to move forward during take-off, the acceleration should be set so that approximately 1-2 inches of manifold pressure over hover power is required. Operating in accordance with these procedures should prevent an unexpected '*overboost*' warning. However, the Pilot reported that the '*overboost*' warning light illuminated in the early stages of forward flight. In an attempt to address the warning received, the Pilot said he lowered the collective lever and that when he did this, the RPM increased. When he then tried to reduce the RPM, he said the helicopter "*kicked round*" because he "*did not get enough pedal in instantaneously*" and that the yaw was to the left. The Manufacturer's Pilot Training Guide states that significant right pedal is required in low power situations to prevent a yaw to the left. The Training Guide also warns against chasing RPM with throttle adjustments due to the inertia of the main rotor blades.

2.2 Student Pilot Certificate

The Pilot was operating using a '*Medical Certificate Second Class and Student Pilot Certificate*' issued by the FAA. In accordance with Article 5 (10) of SI 333 of 2000, a '*student*' licence issued by another State is not valid for flights in the Republic of Ireland. Therefore, the Pilot's Student Pilot Certificate was not valid for the accident flight.

There was no evidence of an endorsement for cross-county solo-flying as required by Section 61.93 of the USA CFRs. Furthermore, US legislation prohibits the holder of a Student Pilot Certificate from operating international flights. In any case, according to the CAA, the UK Air Navigation order does not recognise student pilot licences issued by the FAA. Therefore, the Pilot's Student Pilot Certificate was not valid for the earlier flight from Derryogue to Carlingford.

The purpose of a Student Pilot's Licence is to allow a student to gain experience and proficiency under the supervision of a qualified Flight Instructor. The AAIU previously investigated a helicopter accident, which resulted in serious injury, where significant issues relating to licensing were identified (**AAIU Report No. 2008-015**). Although there were no reported injuries in the case of N280CH, the accident demonstrates the risks associated with not adhering to licensing requirements.

Appendix A

Extract from Statutory Instrument (SI) 333 of 2000

Article 5 (*Flight Crew Members to be Licensed*) (2):

> *A person shall not, within the territorial limits of the State, act as a flight crew member of an aircraft registered in any other state unless —*
>
> *(a)* […]
> *(b)* *in the case of a private aircraft, that person is the holder of an appropriate licence, issued or validated by the competent licensing authority of the state in which the aircraft is registered or by the Authority, or a JAA* [EASA] *licence.*

Article 5 (10) states:

> *For the purposes of this Article, a valid and subsisting licence, other than a JAA* [EASA] *licence, issued by any other state which is a member of the International Civil Aviation Organisation in conformity with Annex I (Personnel Licensing) to the Chicago Convention purporting to authorise the holder thereof to act as a flight crew member of an aircraft,* ***not being a licence purporting to authorise that holder to act as a student pilot only*** [emphasis added], *shall be deemed to be a licence validated by the Authority under the provisions of this Order entitling the holder thereof to fly as a member of the flight crew of a private aircraft insofar as the holder is permitted to do so by the terms of the licence and by the law of the state by which it was issued*.

- END -

In accordance with Annex 13 to the Convention on International Civil Aviation, Regulation (EU) No. 996/2010, and Statutory Instrument No. 460 of 2009, Air Navigation (Notification and Investigation of Accidents, Serious Incidents and Incidents) Regulation, 2009, the sole purpose of this investigation is to prevent aviation accidents and serious incidents. It is not the purpose of any such investigation and the associated investigation report to apportion blame or liability.

A safety recommendation shall in no case create a presumption of blame or liability for an occurrence.

Produced by the Air Accident Investigation Unit

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