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Safety Investigation Report

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Status: Final

Scope: Limited

As per ICAO Annex 13 and EU regulation EU 996/2010, decisions regarding whether to conduct a civil aviation safety investigation, and the extent of an investigation, are based on many factors, including the level of safety benefit expected to be drawn from such an investigation.
For this occurrence, a limited-scope, fact-gathering investigation and analysis was conducted in order to produce a short summary report. The investigation mainly focussed on the actions and conditions directly relating to the occurrence and might not cover all aspects of the aircraft operation and/or possible underlying safety factors due to the expected safety benefit of it and/or the extent of evidence/resources available.

SYNOPSYS

Occurrence class	Accident
Occurrence category	Abnormal runway contact (ARC)
Date and time[1]	29 May 2019 15:40 UTC
Location	Runway 21 of Aerodrome Genk/Zwartberg (EBZW)
Aircraft	Cessna 172S
Aircraft category	Fixed wing - Small aeroplane (MTOW ≤ 5700 kg)
Location of departure	Airport of Antwerp/Deurne (EBAW)
Planned destination	Idem
Type of operation	Non-commercial - Flight Training - Check
Phase of flight	Landing
Injuries	None
Aircraft damage	Minor

What happened

During a proficiency check for the renewal of a SEP (Single Engine Piston) rating, the aircraft experienced a tail strike.

AAIU(Be) learnt about the occurrence via the report that was sent 3 days later by the aircraft owner via the European Aviation Safety Reporting Portal. At that time it was categorized as “incident” because no damage and no injuries were reported. There was also no indication that an accident with injuries was “nearly avoided”. On 9 August of that year it was reported that structural damage to the tail cone was found. Based on that information the occurrence was re-classified as an accident. Because of that and because it was felt that some operational safety lessons could be learnt from this event, AAIU(Be) decided to initiate a safety investigation.

[1] All time data in this report are indicated in UTC, unless otherwise specified

Summary of factors

Organisational	Management – Policy/procedure – Availability of policy/procedures – Authority
Technical	Aircraft handling/service – Maintenance/inspections – Return to service – Inadequate inspection Aircraft operations – Control parameters – Glide – Attain/maintain not possible Aircraft operations – Control parameters – Pitch control – Incorrect operation
Human	Action/decision – Action – Incorrect action selection – Examiner Task performance – Communication – CRM techniques
Environmental	Conditions/weather/phenomena - Convective weather - Effect on operation

1. FACTUAL INFORMATION

1.1 History of the flight

The purpose of the flight was a proficiency check of the pilot (hereafter named 'applicant') holding a Private Pilot License and whose SEP (Single engine piston) rating had to be renewed[2] as it was expired since 31 January that year.
The route to be prepared to EBZW was communicated a few days in advance. The aircraft was rented from EuroPilot Center, a Belgian Approved Training Organization (ATO), based at the aerodrome of Antwerpen-Deurne (EBAW). The applicant and the flight examiner met over there and a short briefing was conducted.

A small navigation flight was done towards the airfield of Zwartberg-Genk (EBZW) to execute some manoeuvres. After 2 normal approaches (touch and go's) on runway 21, the Flight examiner (FE) initiated a simulated engine failure abeam the landing position at 1000 ft (low keypoint).

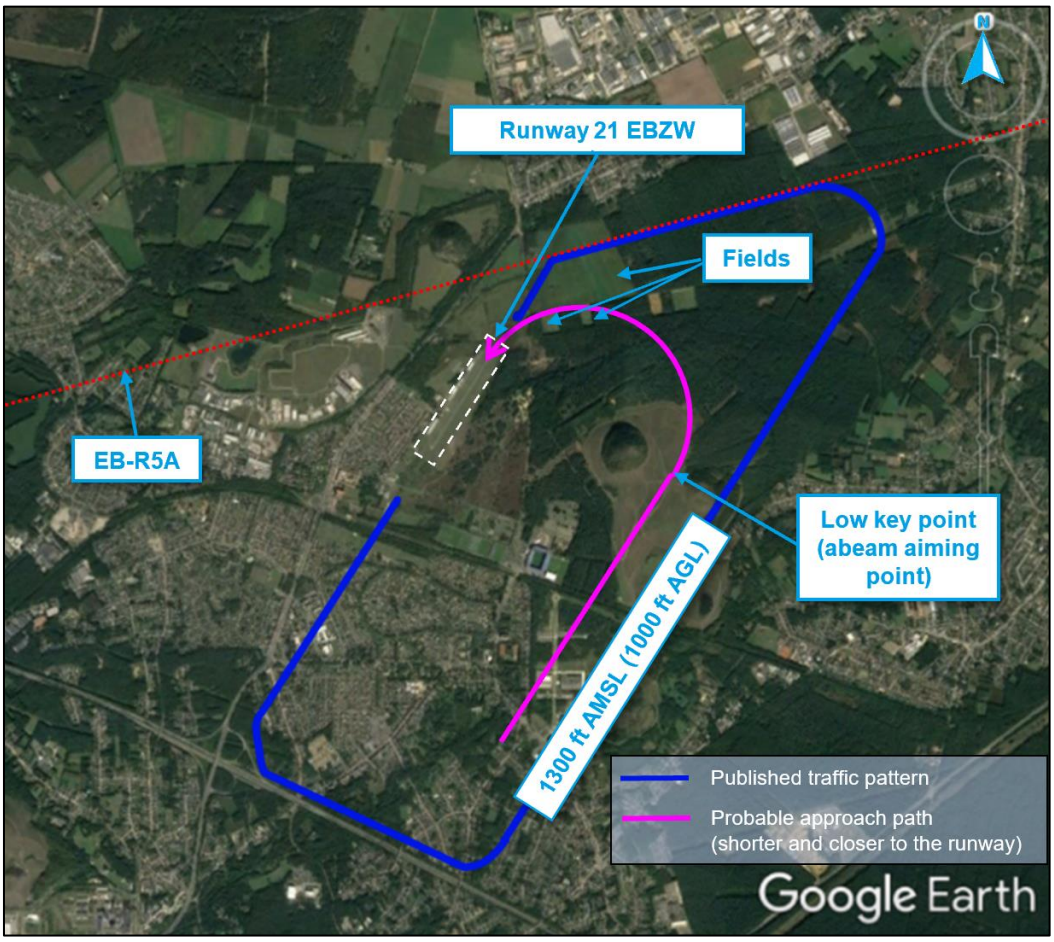

Figure 1: probable flight path (magenta) and traffic pattern (blue) as published by Jeppesen (formerly 'Bottlang')

[2] "Renewal" (of, e.g. a rating or certificate) means the administrative action taken after a rating or certificate has lapsed (i.e. out of the period of validity) for the purpose of renewing the privileges of the rating or certificate for a further specified period consequent upon the fulfilment of specified requirements.

With the engine at idle power, the applicant set the aircraft attitude to maintain best glide speed. During the turn towards the aiming point, variations in TAS occurred. Due to up- and downdrafts experienced during previous approaches, the examiner stated that he was not sure that they would make it, but that they “will see". After an updraft above a ploughed field, the applicant selected flaps 10°. However when flying over a wooded zone again, the aircraft experienced a downdraft. The applicant made clear that he couldn’t make the landing point and suggested to break off the forced landing. The applicant put more power to gain height, but the examiner requested to reduce the power setting again to idle. The examiner himself selected flaps 20°, followed by flaps 30° and insisted to continue the approach.

The aircraft landed on the aiming point, but a tail strike occurred, which was felt by both occupants. As agreed before, this was followed by a go-around and a full stop landing at EBZW after which they inspected the damage. They finally returned to EBAW.

The applicant afterwards declared that in the final phase the FE added some back pressure on the stick but the FE firmly stated that he didn’t interfere with the (primary) flight controls and that he only selected the flaps.

1.2 Damage

Immediately after the event, a visual inspection revealed some chafing damage, but it was only during the next scheduled inspection (100 FH), after the aircraft had accumulated another 96 FH that it was determined that the aft section bulkhead (to which the vertical fin is attached) was damaged and had to be replaced.

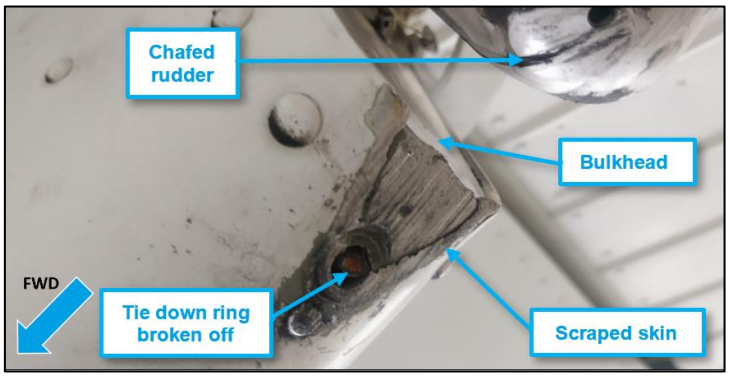

Figure 2

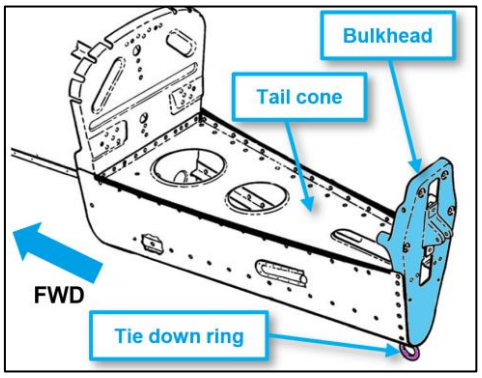

Figure 3

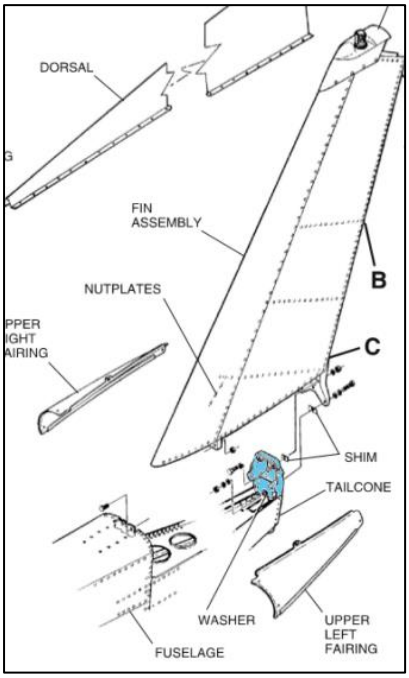

Figure 4

1.3 Pilot information

1.3.1 Applicant

Table 1 : General pilot data applicant

Age	39
License	PPL(A) initially issued on 17 January 2013
Ratings	SEP (land), expired at 31 January 2019 Night
Medical certificate	Valid Class 2

Table 2 : Flying experience pilot before the proficiency check

Aircraft:	C172
Total time:	58h30 hours as PIC, 77h12 hours dual
Total last year:	1h48 dual
Total last 90 days:	1h48 dual (training flight)

The applicant obtained his licence in 2013. In April-May of 2018 he did some extensive time building in the USA on the C172 but subsequently didn't flew for over a year. Prior to his proficiency check for the class rating renewal, he did a satisfactory refresher training flight with an instructor of ATO EuroPilot Center on 15 May 2019 of 1h48. It was a navigation flight from EBAW to the airfield of Sint-Truiden/Brustem (EBST) followed by a few exercices. This included a.o. a normal approach, a flapless approach and a forced landing.

1.3.2 Flight Examiner

Table 3 : General pilot data flight examiner

Age	56
License	PPL(A), initially issued on 24 September 1990 ATPL(A), initially issued on 29 September 2006
Ratings	SEP(A) MEP(A) Several Type Ratings FI(A) FE(A), initially issued in April 1997
Medical certificate	Valid Class 1

Table 4 : Flying experience flight examiner

Total time:	15485:37 hours
Total SEP(A):	+4200 hours
Total hours C172:	+1100 hours
Total hours C172 last year:	58:27 hours of which 24:10 instruction and 34:17 hours of checks
Total hours C172 last 90 days:	19:23 hours
Number of prof checks/skill tests 2018:	46
Number of prof checks/skill tests 2019 until 1 June:	20

1.4 Meteorological information

METAR reports for the time frame 15:20 – 16:00 UTC at EBLG (Airport of Liège, at 23 NM South of EBZW) and EBBL (Militairy airfield of Kleine Brogel, at 9,4 NM North of EBZW):

METAR EBLG 291520Z 28006KT 9999 BKN046 17/09 Q1021 NOSIG=
METAR EBBL 291525Z 26006KT 9999 SCT049 19/08 Q1021 BLU BLU=

METAR EBLG 291550Z VRB04KT 9999 SCT048 18/07 Q1021 NOSIG=
METAR EBBL 291555Z 18005KT 9999 SCT049 18/07 Q1021 BLU BLU=

So visibility more than 10 km, scattered clouds at 4800-4900 ft, temperature of about 18° degrees Celsius, barometric pressure 1021 hPa. The wind speed had a maximum of 6 kt locally at EBBL. Wind direction was very variable and moved from 260° degrees to 180° in EBBL. So there was some headwind and variable crosswind at runway 21 in EBZW. However no widespread gust was reported.

1.5 Airfield information

The Zwartberg airfield (EBZW) is located 5 km North of the city of Genk. It features a 799 m long asphalt runway. Its orientation is 034°/214°.

The use of the airfield is subject to prior permission from the airfield operator. The pattern of the airfield cannot be found in the Aeronautical Information Publication (AIP) but is published by private company Jeppesen on an aerodrome chart that is available via the website of the aerodrome. The pattern is depicted in Figure 1 (blue line) of this report and the altitude is 1300 ft AMSL. It features limitations due to the proximity of a military zone to the North (Restricted area EB-R5A).

Genk is a former coal mining region, and there is a coal mine spoil tip (identified as the “Terril van Waterschei” in Dutch on Figure 5 hereunder) remaining from these times, located east of the airfield at 1.15km from the runway, close to the pattern. The spoil tip culminates at 666 ft AGL. The elevation of the airfield is 278 ft.

Figure 5: Topographical map (NGI) with Jeppesen aerodrome chart superimposed on it

1.6 Aircraft information

Table 5: Airframe data

Model	Cessna 172S
Serial number	172S10958
Manufacturer	Cessna Aircraft Company (now Textron Aviation)
Year of manufacture	2009
Total airframe time	6629:30 flight hours
Certificate of Airworthiness	EASA Form 25 issued by the Luftfahrt-Bundesamt (LBA, the German CAA) on 16 September 2015
Airworthiness Review Certificate	Issued on 24 January 2019 by EASA Part-M subpart G organisation BE.MG.0111. Valid until 10 February 2020
Certificate of Registration	Issued by the LBA on 16 September 2015
MTOM	1156 kg / 2550 lb

Table 6 : Engine data

Type	Fuel-injected, direct-drive, air-cooled, horizontally opposed, normally aspirated, reciprocating four-cylinder
Model	IO-360-L2A
Performance	361-cubic inch displacement (5,9 litres), 180 hp rated
Serial number	L-1120-SlE
Manufacturer	Lycoming

1.7 Weight and balance

Table 7: Weight and balance

		Weight (lb)	Arm (inch)	Moment (Lb-in/1000)
Basic empty weight		1728	42,29	73,08
Usable fuel	53 US gal	318	48,00	15,26
Pilot and Front passenger		386	37,00	14,28
Rear passengers		0	73,00	0,00
Bagage area		33	95,00	3,14
		2465	42,90	**105,76**

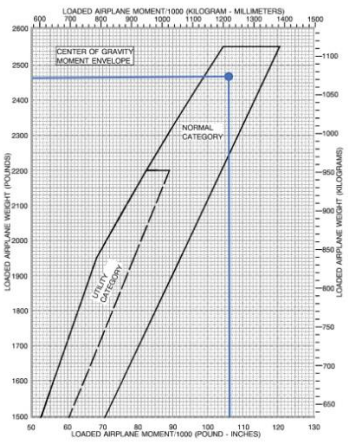

Figure 6: Centre of gravity moment Envelope

1.8 Flight recorders

The aircraft was not equipped with flight recorders, nor was it required by regulation. There were also no other recordings (like GPS) available. The sequence of events is based on the declarations of the crew.

1.9 Applicable EU Regulation

1.9.1 Pilot-in-command

In different Implementing Rules (IR), the Pilot-in-command (PIC) is defined as "the pilot designated as being in command and charged with the safe conduct of the flight".

Annex VII (Part-NCO) to Commission Regulation (EU) No 965/2012 - Air Operations (as amended) deals with non-commercial (under which training and checks) operations with 'other-than-complex motor-powered aircraft'. Rule NCO.GEN.105 handles about the Pilot-in-command responsibilities and authority:

> (a) The pilot-in-command shall be responsible for:
> (2) the initiation, continuation, termination or diversion of a flight in the interest of safety;
> ….

Annex I (Part-FCL) to Commission Regulation (EU) No 1178/2011 – Aircrew (as amended) deals with flight crew licensing (FCL) requirements for pilots flying EASA aircraft.

FCL.050 deals with the recording of flight time
AMC1[3] elaborates more on the logging of flight time as PIC.

> (b) Logging of time:
> (1) PIC flight time:
> (i) the holder of a licence may log as PIC time all of the flight time during which he or she is the PIC;
> (ii) the applicant for or the holder of a pilot licence may log as PIC time all solo flight time, flight time as SPIC and flight time under supervision provided that such SPIC time and flight time under supervision are countersigned by the instructor;
> (iii) the holder of an instructor certificate may log as PIC all flight time during which he or she acts as an instructor in an aircraft;
> (iv) the holder of an examiner's certificate may log as PIC all flight time during which he or she occupies a pilot's seat and acts as an examiner in an aircraft;
> (v) a co-pilot acting as PICUS on an aircraft on which more than one pilot is required under the type certification of the aircraft or as required by operational requirements provided that such PICUS time is countersigned by the PIC;

[3] AMC: Acceptable Means of Compliance

1.9.2 Rules related to the proficiency check

Implementing rule FCL.740 of Subpart H deals with the validity and renewal of class and type ratings. The following is stated:

> *(b) Renewal*
> *For the renewal of a class or type rating the applicant shall comply with all of the following:*
> *(1) complete a proficiency check in accordance with Appendix 9 to this Annex;*
> *(2) prior to the proficiency check referred to in point (1), complete a refresher training at an ATO if deemed necessary by the ATO to reach the level of proficiency to safely operate the relevant class or type of aircraft, except if it holds a valid rating for the same class or type of aircraft on a pilot licence issued by a third country in accordance with Annex 1 to the Chicago Convention and if it is entitled to exercise the privileges of that rating. The applicant may take the training:*
> *(i) at a DTO or at an ATO, if the expired rating concerned a non-high-performance single-engine piston class rating, a TMG class rating or a single-engine type rating for helicopters referred to in point DTO.GEN.110(a)(2)(c) of Annex VIII;*
> *(ii) at a DTO, at an ATO or with an instructor, if the rating expired no more than three years before and the rating concerned a non-high-performance single-engine piston class rating or a TMG class rating*

The AMC of this rule state that the amount of refresher training needed should be determined on a case-by-case basis by the ATO, the DTO or the instructor, as applicable, taking into account some specified factors like amongst others the experience of the applicant and the amount of time elapsed since the privileges of the rating were last used.

Appendix 9 to Part-FCL elaborates more on the content, conduct and requirements of the proficiency check.

Some relevant extracts:

> **A. GENERAL**
>
> *2. Failure to achieve a pass in all sections of the test in two attempts will require further training.*
> *3. There is no limit to the number of skill tests that may be attempted.*
>
> *9. **At the discretion of the examiner**, **any manoeuvre or procedure of the test may be repeated once by the applicants**. The examiner may stop the test at any stage if it is considered that the applicants' demonstration of flying skill requires a complete retest.*
> *10. Applicants shall be required to fly the aircraft from a position where the PIC or co-pilot functions, as relevant, can be performed. Under single-pilot conditions, the test shall be performed as if there was no other crew member present.*
> *11. During preflight preparation for the test, applicants are required to determine power settings and speeds. Applicants shall indicate to the examiner the checks and duties carried out, including the identification of radio facilities. Checks shall be completed in accordance with the checklist for the aircraft on which the test is being taken and, if applicable, with the MCC concept. Performance data for take-off, approach and landing shall be calculated by applicants in compliance with the operations manual or flight manual for the aircraft used. Decision heights/altitudes, minimum descent heights/altitudes and missed approach point shall be agreed upon with the examiner.*
> *12. The examiner shall take no part in the operation of the aircraft except where intervention is necessary in the interests of safety or to avoid unacceptable delay to other traffic*

B. Specific requirements for the aeroplane category

1. *In the case of single-pilot aeroplanes, with the exception of single-pilot high-performance complex aeroplanes, applicants shall pass all sections of the skill test or proficiency check. Failure in any item of a section will cause applicants to fail the entire section. If they fail only one section, they shall repeat only that section. Failure in more than one section will require applicants to repeat the entire test or check. Failure in any section in the case of a retest or recheck, including those sections that have been passed on a previous attempt, will require applicants to repeat the entire test or check again. For single-pilot multi-engine aeroplanes, Section 6 of the relevant test or check, addressing asymmetric flight, shall be passed.*

Section 5 of the content of both the training and proficiency check deals with emergencies. Manoeuvre 5.3 is the 'Simulated forced landing without power' and is considered as a mandatory item. No further information or guidelines on how to execute and evaluate this manoeuvre.

1.9.3 Rules related to examiners

Subpart K of Part-FCL contains all rules about all examiners (so not only flight examiners, but also type rating examiners, instrument rating examiners,…):

- FCL.1015
  This rules handles about examiner standardisation and describes the obligation to undertake a standardisation course and the content thereof.

  AMC1 of this rules states that practical training consisting of at least:
  (i) knowledge and management of the test for which the certificate is to be sought. These are described in the relevant modules in the FEM[4];
  (ii) knowledge of the administrative procedures pertaining to that test or check.

  AMC2 of this rule provides a list on how to conduct a test, how the examiner has to prepare the check, which assessment system has to be used and what the contents of a test are. It briefly describes what each step of the test (oral examination on the ground, pre-flight briefing, in-flight exercises and post-flight debriefing) should include, without going to much in detail.

[4] FEM: Flight Examiner Manual

- FCL.1025
  This implementing rule deals with the validity and revalidation of examiner certificate. An examiner certificate shall be valid for 3 years. Before the expiry date of the certificate, the holder shall have conducted at least six skill tests, proficiency checks or assessments of competence. One of the skill tests, proficiency checks or assessments of competence shall take place in the period of 12 months immediately preceding the expiry date of the examiner certificate and shall have been assessed by an inspector from the competent authority. Also in the period of 12 months immediately preceding the expiry date of the certificate, the examiner shall have completed an examiner refresher course which is provided or approved by the competent authority.

Rules specifically for flight examiners:

- FCL.1005.FE FE
  (a) FE(A). The privileges of an FE for aeroplanes are to conduct:
  (1) skill tests for the issue of the PPL(A) and skill tests and proficiency checks for associated/ single-pilot class and type ratings, except for single-pilot high performance complex aeroplanes, provided that the examiner has completed at least 1 000 hours of flight time as a pilot on aeroplanes or TMGs, including at least 250 hours of flight instruction;

- FCL.1010.FE FE

This implementing rule states that an applicant for an FE certificate shall hold an FI certificate in the appropriate aircraft category.

1.9.4 Rules related to the competent authority

Annex VI (Part-ARA) to Commission Regulation (EU) No 1178/2011 – Aircrew (as amended) deals with deals with EASA member states Authority Requirements for Aircrew.

Rule ARA.FCL.210 Information for examiners.

(a)	The competent authority shall notify the Agency of the national administrative procedures, requirements for protection of personal data, liability, accident insurance and fees applicable in its territory, which shall be used by examiners when conducting skill tests, proficiency checks or assessments of competence of an applicant for which the competent authority is not the same that issued the examiner's certificate.
(b)	To facilitate dissemination and access to the information received from competent authorities under (a), the Agency shall publish this information according to a format prescribed by it.
(c)	The competent authority may provide examiners it has certified and examiners certified by other competent authorities exercising their privileges in their territory with safety criteria to be observed when skill tests and proficiency checks are conducted in an aircraft.

In accordance with the provisions contained in ARA.FCL.210 EASA has issued the *Examiner Differences Document* (latest revision 01/2021) . In accordance with FCL.1015(b)(4) and (c), this document contains the latest available information on the relevant national administrative procedures, requirements for protection of personal data, liability, accident insurance and fees for each EASA Member State (MS) for which the competent authority is not the same that issued the examiner's certificate. It is intended for use by examiners with a Part-FCL examiner certificate conducting a test, check or assessment of competence on a Part-FCL licence holder whose licence was issued by a competent authority (CA) other than their own.

Section 2.2 of this document handles about liability and insurance;

> In general, the CA of an EASA MS does not provide liability or accident insurance during the conduct of skill tests, proficiency checks or assessment of competence. It is therefore the responsibility of the examiner to ensure that he/she is adequately insured against incident, accident or liability issues. Furthermore, the examiner is fully responsible for the safety during the skill test, proficiency check or assessment of competence, either in an flight simulation training device (FSTD) or when acting as pilot-in-command (PIC) in an aircraft. There are two principal types of risk against which an examiner should consider insuring himself/herself. First, the direct involvement during flying tests might lead to an accident and a claim for damages for loss or injury ensuing as a result of the accident. Secondly, professional indemnity, for example a claim made against the examiner by an applicant for an inadequate examination, or breach of contract. Examiners are advised to seek professional advice concerning appropriate insurance covering their activities as certified examiners.

1.10 Specific application by EASA member states

1.10.1 BCAA

Belgian Civil Aviation Authority (BCAA) is the competent authority in Belgium for the issuance of examiner certificates and the standardization of the Belgian licenced examiners. Currently, no BCAA-endorsed *Flight Examiner Manual* (FEM) exists for the purpose of describing the operational side of tests and checks. However, a 24-page guidance document called '*Examiner Procedures'*, is available and covers essentially the administrative procedures.

Chapter 1.2. touches briefly the role of the examiners;

> In order to meet this overriding objective in terms of aviation safety, the Authority uses experienced pilots with an examiner's licence. Their role is to carry out competency checks in accordance with the applicable regulations. When exercising their privileges, the examiners must take into account that they apply the regulations in order to maintain a high level of safety in civil aviation and that they represent the BCAA and therefore the Authority….
> They must be honest, objective and not have incurred any criminal conviction or violation of aviation regulations. In addition, the General Director shall take into account the personality and character of the candidate examiner and his collaboration with the BCAA.

Chapter 1.3 handles about the insurance. This text is a full copy of section 2.2 of the EASA *Examiner Differences Document*. See also 1.9.4 of this report.

1.10.2 Other member states

In the section on Finland in the EASA *Examiner Differences Document* the following is stated:

> The examiner usually acts as PIC, but when revalidating a rating on a proficiency check, the examinee may act as PIC if he/she holds the required ratings. The command responsibility must be determined at the latest during flight preparation and stated in the flight plan. Responsibility for operational safety during the flight rests with the PIC.
>
> Examiners shall make sure that they have the right to act as PIC for the flight in question

In conjunction with the Examiner Differences Document, the Irish Aviation Authority (IAA) has issued the *Pilot Examiner Standardisation Briefing Document.* Appendix 2 of this document handles amongst others about liability and insurance. The following is stated:

> When conducting a test in an aircraft, the Examiner is normally designated as the Pilot in Command (PIC). In this case, the Examiner must ensure that the aircraft is covered by the minimum insurance required by EU regulations or in the case of a 'Third Country' the minimum legal insurance required in that jurisdiction.

1.11 Regulations at non-European states

1.11.1 USA

Section 61.47 of Title 14 of the Code of Federal Regulations (CFR) defines the status of an examiner. § 61.47(b) states that the examiner is not the pilot in command of the aircraft during the practical test unless the examiner agrees to act in that capacity for the flight or for a portion of the flight by prior arrangement with:
(1) The applicant; or
(2) A person who would otherwise act as pilot in command of the flight or for a portion of the flight.

In the *General Aviation Airman Designee Handbook 8900.2C* with effective date of 26 June 2018 the FAA even literally 'strongly recommends that an examiner not agree to act as PIC of a flight during a practical test'.

The CFR defines the Pilot in Command as the person who:
(1) Has final authority and responsibility for the operation and safety of the flight;
(2) Has been designated as pilot in command before or during the flight; and
(3) Holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight.

1.11.2 Canada

In the subchapter Pre-Test Briefing of the *Flight Test Guide – Private Pilot Licence – Aeroplane* the following is stated about the PIC during a flight test:

> (c) **Who is pilot-in-command?** The examiner will be the pilot-in-command (PIC), pursuant to CAR sections 401.03 and 401.19 – Student Pilot Permit - Privileges, as amended in 2014. In all cases, the examiner reserves the right to exercise all reasonable duty of care to ensure safe flight by intervening or taking control of an aircraft when any action or lack of action by the candidate seriously jeopardizes flight safety or if a breach of regulation is imminent.
>
> (i) Pursuant to the Aeronautics Act: "pilot-in-command" means, in relation to an aircraft, the pilot having responsibility and authority for the operation and safety of the aircraft during flight time.
>
> (ii) The responsibility and authority of an examiner, while conducting any flight test, is illustrated by the following non-exhaustive list. An examiner:
>
> (a) determines the route of the aircraft;
> (B) establishes the conditions for the take-off and landing;
> (C) directs the candidate when conducting air exercises;
> (D) manipulates the flight and power controls at their own discretion when preparing for certain exercises;
> (E) intervenes, when necessary and at any time, to ensure the safe continuation of the flight;
> (F) makes decisions with respect to the continuation or termination of the flight.
>
> (iii) If the examiner performs the duties listed in the short list above, the examiner is the Pilot-in Command. In any case, the examiner, as the most qualified on board and may be held responsible for any negligence or for not exercising all reasonable duty of care as any other reasonable person in the same position would have exercised.

1.11.3 Australia

In the subchapter *Pre-flight briefing* of both chapter 7 *Private Pilot License – Aeroplane* and chapter 14 *Class Rating – Single Engine Aeroplane* of the *CASA Flight Examiner Handbook* it is stated that the examiner must brief the applicant on amongst other transfer of control, simulating emergencies, pilot in command,..

The Civil Aviation Safety Regulation only state the following on flight examiner flight time.

> 61.080 Definition of flight time as pilot for Part 61
>
> A person's flight time as a pilot is:
>
> (a) the duration of the following flights:
> (i) a solo flight by the person;
> (ii) a flight in which the person receives flight training;
> (iii) if the person is a flight instructor—a flight during which the person exercises the privileges of his or her flight instructor rating;
> (iv) if the person is a flight examiner—a flight during which the person exercises the privileges of his or her flight examiner rating; and
> (b) the person's flight time as pilot in command; and
> (c) the person's flight time as pilot in command under supervision; and
> (d) the person's flight time as a co-pilot.

1.12 JAA

Before EASA was established, the works of developing and implementing common safety regulatory standards and procedures in Europe were done by the Joint Aviation Authorities (JAA), a body representing the civil aviation regulatory authorities of a number of European States (including Belgium). Unlike with current European regulation, the proposed rules needed to be adopted by each individual EU member state.

Amongst other JAA developed a draft Flight Examiner Manual.

In Module 2 *Examiner Training* of this manual reference was made to JAA AMC FCL 1.425/2.425 paragraph 19 stating that 'the examiner shall be the pilot-in-command, except in circumstances agreed by the examiner'.

Module 6 was a guide to the structure of the PPL skill test. The following was stated concerning simulated emergency landings;

> 6.3.1.14 Simulated Precautionary Landing
> When requesting this exercise be specific when outlining the reasons requiring a landing; if it is due to simulated weather conditions, then clearly specify the simulated ceiling, visibility, etc., and do not alter them during the procedure.
>
> Remember, the aim of the exercise is to carry out the procedures for safe landing in a suitable area and provided the procedure used is organised and logical and the aircraft configuration is as stipulated in the Pilot Operating Handbook, examiners should not be adversely influenced if the procedure varies slightly from their own procedure. If a suitable aerodrome is available, it is desirable to ask the applicant to carry the approach through to a landing. This will enable the examiner to assess ability to carry out a short or soft field landing with this exercise.

> 6.3.1.15 Simulated Forced Landing
> The engine failure will be simulated in accordance with the method recommended by the manufacturer. Engine failure should be simulated from sufficient height to permit the applicant time to clearly demonstrate his knowledge of procedures and skill. The practise should be given without advance warning from the examiner, however, the examiner should ensure that some choice of landing area exists within the field of vision of the applicant and within gliding range of the aircraft. Provided the aim of the exercise is accomplished in an organised manner, the examiner should not be adversely influenced if the procedure used varies slightly from the examiner's own procedure.
>
> The examiner will take care of the engine during the descent so as to ensure safety in the go around. The practice of leaving some power on and achieving a normal descent angle and airspeed by using flap is acceptable. Examiners should determine the applicant's intention with regard to the procedure to be used during this exercise during the pre-flight briefing.

1.13 ATO and training 'applicant'

The applicant did his initial training, hour building and refresher training for the renewal within the same ATO. The execution of the emergency approach and landing and their pitfalls during the exercise are thoroughly described in the briefings. It is also repeatedly stated that whenever doubt arises about the safe outcome of the emergency exercise, that *a go-around should be initiated without delay.*

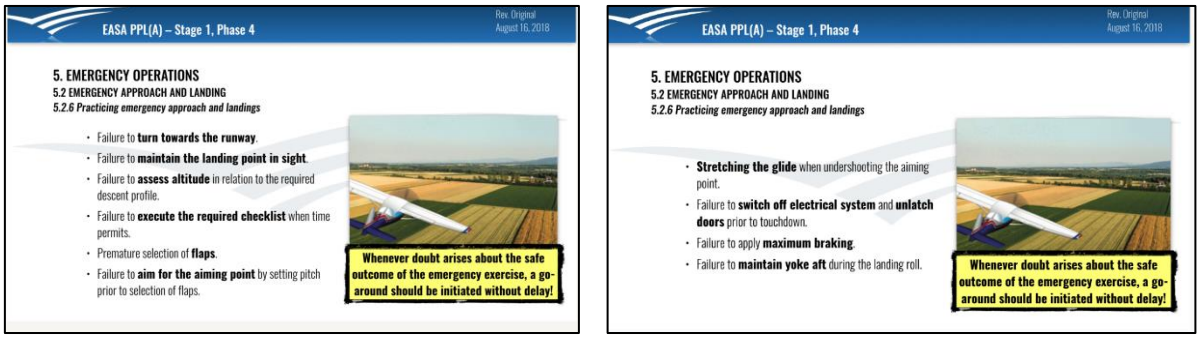

Figure 7: extracts from the ATO's briefing on emergency landings.

1.14 Previous similar accident during check flight in Belgium

On 8 February 2011 an accident occurred with a Piper PA-28 during a skill test for the issuance of a PPL.
The aircraft was flying at 1550 ft AGL, overhead the aerodrome of Kiewit-Hasselt (EBZH), when the Flight Examinator initiated a simulation of a Practiced Forced Landing (PFL). During final approach, the applicant noticed he was too low, and decided to abort the landing. When applying gently more throttle, the engine did not respond, and stayed at low rpm. The Flight examinator took over in an attempt to reach the airfield. The airplane touched down in the field in front of the airfield, crossed a road, and came to a stop, after hitting concrete pillars and barbed wires. The cause was determined as a too low approach combined with the actual failure due to carburettor icing.
(AAIU(Be) report 2011-01 issued on 8 April 2011)

1.15 Other references

Back in November 2015, the former European Helicopter Safety Team (EHEST) published a leaflet on the training and testing of emergency and abnormal procedures in helicopters. However the different safety messages included could also be extended to fixed-wing aircraft. Chapter 4 handles about safety tips for both instructors and examiners. It is stated that before the flight a risk assessment should be conducted in accordance with the ATO SMS (Safety management system) to consider the following.

- weather – wind velocity, visibility, light levels, sun glare/shadow, precipitation
- the landing area surface - size/level/flat/firm/wet/dry.
- ATC/Airfield operations – ability to approach and land into wind (if different to the established circuit direction), other local traffic, availability of rescue and fire-fighting services
- the currency of the instructor/examiner – when last flown SEOL (simulated engine off landing)
- aircraft suitability –weight, equipment fit, insurance
- briefing – verbal commands, throttle/flight control lever (FCL) drills, touch drills, take over/ go-around procedures and acceptable rate of descent (ROD)

2. ANALYSIS

2.1 Prerequisites for the proficiency check

The applicant had a valid PPL of which the SEP rating had expired. He had completed refresher training with an ATO approved by the BCAA in accordance with FCL.740.

The examiner had an FI licence and recent experience as an instructor on the C172. He also had extensive recent experience as a flight examiner.

2.2 Operational

The route to be prepared to EBZW was communicated a few days in advance. According to the applicant, the pre-flight briefing took place while walking to the aircraft at EBAW airport. There was a short briefing on how the examiner would view and assess the flight. However, nothing was said about the role of PIC and the transfer of controls. No flight plan, on which the name of the PIC would in that case be indicated, was submitted. This was however not required as it concerned a domestic VFR flight.

From EBAW there was a short navigation flight to EBZW where some exercises were performed on request of the examiner. For the simulated forced landing it was briefed that this would be initiated at 1000 ft abeam the threshold. The exercise would proceed up to the actual landing after which the aircraft would immediately take off again (touch and go). Nothing was said about the possibility of repeating this exercise. When the applicant felt that they would not reach the threshold, he indicated this by saying that he wanted to perform a go-around.
The applicant put more power to gain height, but the examiner requested to reduce the power setting again to idle. The examiner selected flaps 20°, followed by flaps 30° and insisted to continue the approach. The aircraft landed on the aiming point, but a tail strike occurred.

Because of the previous 2 approaches already performed, the presence of downdrafts was known to both the applicant and the flight examiner. These convective currents are also not abnormal and can be explained by the particular landscape near the aerodrome. Convective currents are most active on warm summer afternoons when winds are light. Heated air at the surface creates a shallow, unstable layer, and the warm air is forced upwards. Barren surfaces such as sandy or rocky wastelands and ploughed fields become hotter than open water or ground covered by vegetation (such as woods) . Thus, air at and near the surface heats unevenly. Because of uneven heating, the strength of convective currents can vary considerably within short distances leading to a ballooning (warm air rising) and sinking (less warm air) effect when flying near the surface.

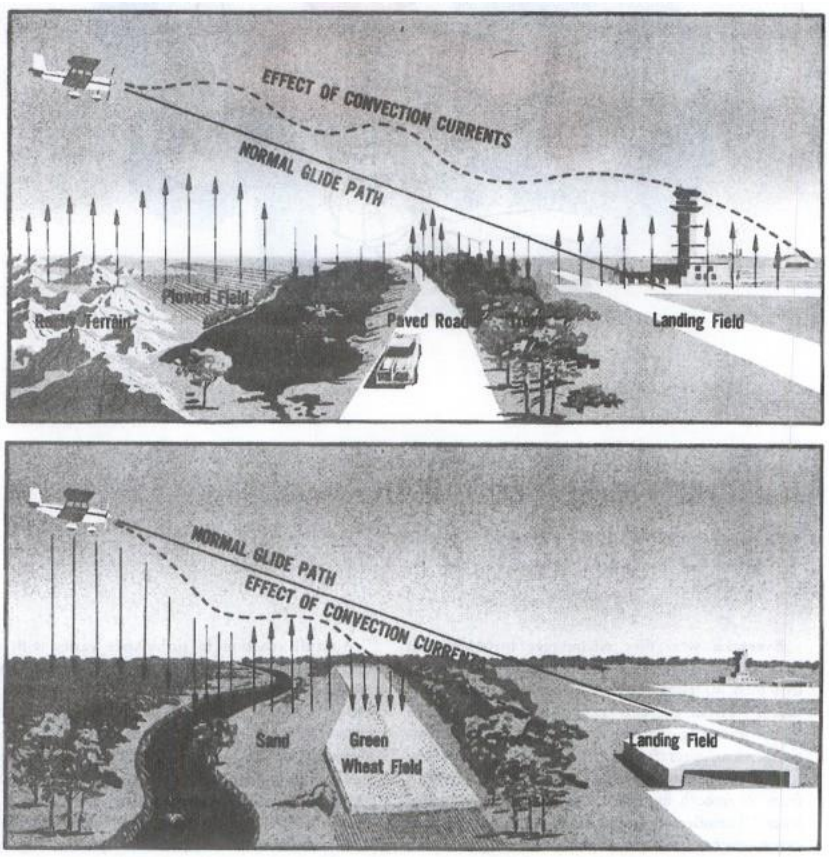

Figure 8: effect of convective currents (source: FAA)

To anticipate the effect of the convective currents, the simulated landing could have been initiated higher or closer to the runway. However, once in idle and flying at best glide speed without flaps, there were no means to correct a too low approach, unless applying power. Which, of course, would not be possible in an actual forced landing.

The applicant's decision to abort the exercise can be considered as adequate and in consistency with the training he had. However, the examiner wanted to continue the exercise. As no recording on speed and glide path is available, it is impossible to analyse in detail what went wrong.
Perhaps the flaps and ground effect were used to 'stretch' the glide. However, this required an increased pitch angle to generate sufficient lift. The damage to the tail shows that the pitch was at least 12,5 degrees.

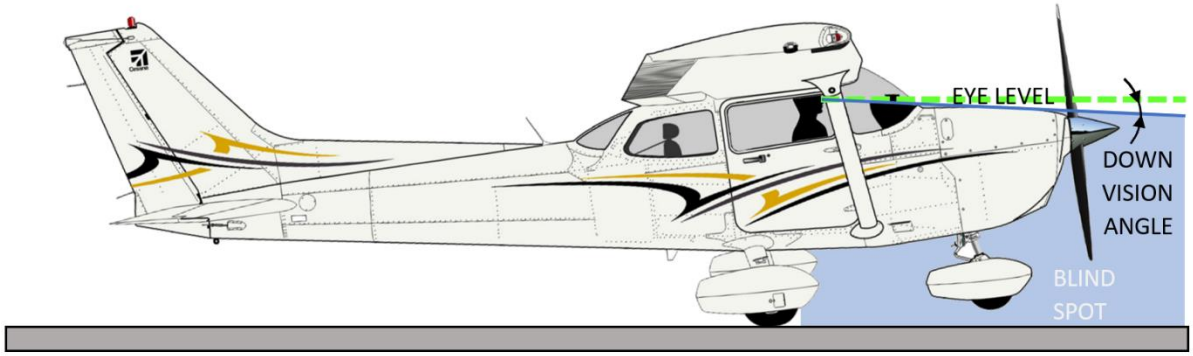

Figure 9: normal touchdown with still a 'down vision angle', still seeing the end of runway

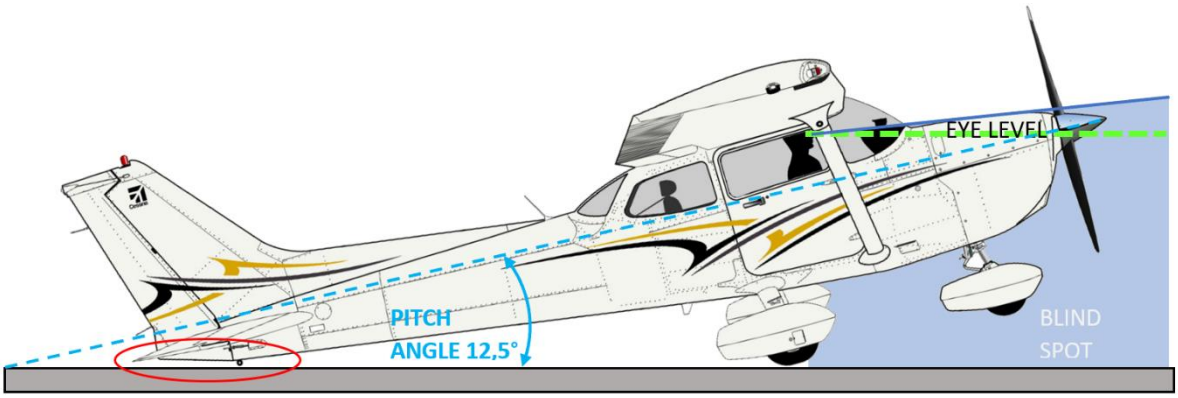

Figure 10: to high pitch attitude resulting in tail strike. Runway end not visible in the cockpit

This situation would also have been recognizable in the cockpit before touch down due to stall warning and the view on the horizon blocked by the dashboard (see Figure 10). Despite the tail strike which was felt by the occupants, the aircraft took off again and flew a new circuit before landing with a full stop at EBZW.

The applicant afterwards declared that in the final phase the FE added some back pressure on the stick but the FE firmly stated that he didn't interfere with the (primary) flight controls and that he only selected the flaps.

Besides the possible interference of the FE on the steering wheel, some questionable decisions can be noted here;

- The intervention of the examiner in the controls (at least the operation of the flaps) during an exam for a single pilot operation, not necessary made for ensuring the safe execution of the flight (on the contrary).
- The action of the FE insisting and interfering to continue an approach with the risk of undershooting the runway, without a clear reason. Did the examiner want to give a demonstration or avoid having to give the applicant a fail for this item of the proficiency check? Although the regulations state that an examiner may on his discretion allow one retake per item.
- Taking off again knowing there was damage (at least to the skin of the tail).

2.3 Pilot-in-command

The student received a "pass" score for the check and was allowed to log flight time as PIC in his logbook. However, nothing was clearly agreed beforehand between the applicant and the examiner as to who the PIC was during the flight. The AAIU(Be) is of the opinion that this lack of clarity also played a role in this incident. Should the applicant have really known before the flight that he was designated as a PIC, he might have been more firm in applying his decisions and eventually performing a go around against the suggestion of the examiner.

There's a difference between "role-playing" as a PIC (what is expected from the examinee in single pilot operations to show his skills) and being designated as the actual PIC.

It is stated in both the EASA *Examiner Differences Document* and the BCAA *Examiner Procedures* that "… *the examiner is fully responsible for the safety during the skill test, proficiency check or assessment of competence, either in an FSTD or when acting as pilot-in-command (PIC) in an aircraft*".
So the previous is a conditional sentence; neither the existing EU regulations nor the existing BCAA guidelines provide an unambiguous statement on the designation of the PIC during proficiency checks.

There are several possible approaches:

- Unless otherwise agreed, the applicant is always the PIC (FAA USA approach)
- The examiner is always the PIC (ao Transport Canada and former JAA approach, EASA member states Finland and Ireland approach)
- No standard rule who the PIC is, but it must be clearly discussed before the flight (Australia)
- The examiner takes the back seat (like a practical driving test) and a flight instructor in the front takes the role of both safety pilot and PIC.

There are pros and cons for all four possibilities. The FAA's opinion is mainly based on liability issues. Their reasoning is that an unrated pilot is qualified to act as PIC during a practical test because that pilot possesses the appropriate experience prior to the practical test for the particular certificate or rating.

The reasoning of Transport Canada is reflected in their Flight Test Guide. Since the examiner is responsible to ensure the safe continuation of the flight, he takes the decisions with respect to the continuation or termination of the flight and therefore he is in any case the PIC.

The AAIU(Be) is of the opinion that, in terms of safety, the latter approach is the best.
In Appendix 9 to Part-FCL it is already stated the examiner can intervene "where intervention is necessary in the interests of safety", which can be read as "being charged with the safe conduct of the flight" (definition of Pilot-in-command).
Furthermore, rule NCO.GEN.105 states that the PIC shall be responsible for the initiation, continuation, termination or diversion of a flight in the interest of safety, which is exactly what an examiner does.

In a real emergency situation, the more experienced pilot (examiner) will always take over the controls anyway. One should also not forget that the applicant would normally be more stressed than normal, due to the testing situation and that the examiner, by nature, will most likely be the most restrained and mature one.

Next to that, there is a confusion possible between the designation of the PIC for a given flight and the recording of the flight time as 'PIC' in the individual log book. FCL.050 (b)(1)(ii)(iii) states that, although the instructor is the PIC on board, both he and the student may enter joint (instruction) flight time as PIC flight time on their logbook.

For examination flights this is not clear, although it is said that an examiner “may” log all flight time as PIC time. Nothing is said about the role and logging of flight time for the applicant. The “may” can be read here as the examiner isn’t the designated PIC whatsoever.

So although one can deduct from the responsibilities of the FE and the definition of PIC, that the FE is in fact always the PIC, the note about logging flight time still leaves some room for interpretation.

EASA Member State Finland is more clear about this:

> The examiner usually acts as PIC, but when revalidating a rating on a proficiency check, the examinee may act as PIC if he/she holds the required ratings. The command responsibility must be determined at the latest during flight preparation and stated in the flight plan. Responsibility for operational safety during the flight rests with the PIC.

So, in Finland, the examiner is usually the PIC with the exception that the examinee may act as a PIC provided that:

- He holds the required ratings;
- It concern a revalidation (so not a renewal as it was the case with this accident);
- Who is in command must be determined at the latest during flight preparation.

To conclude, AAIU(Be) believes that such a position is currently lacking in Belgium and that the BCAA should provide more clarity on this. They should clearly state who in general is acting as Pilot-in-command during test and check flights and also in which cases an exception to this is allowed. They also should advise that the role of the PIC has to be clarified before the flight for both parties (examinee and examiner).

2.4 Execution of simulated emergency landings

Apart from the role of the PIC, there is also little to no guidance available on simulated emergency landings during checks. Opinion on the subject varies and one can argue whether there is any added value in having to perform a simulated forced (so without or with very limited power) landing up to and including touchdown. Ultimately, the primary aim of the exercise is to be able to survive a real emergency landing and to have the applicant demonstrate how he chooses his field, within which range, and at what airspeed he flies,.. and keeping the aircraft all times under control up to a predetermined altitude. Having a not perfect touchdown during a genuine forced landing with perhaps some material damage is of secondary importance. The risks of an exercise should always be weighed against the benefits it would have in a real situation.

Although another cause and conditions (carburetted engine versus a fuel-injected in the case), the accident in EBZH with the PA-28 during a skill test in 2011 also indicated there’s a lack of procedure and standardization concerning the execution of simulated forced landings during SEP check and test flights. In this case the examiner did not regularly warm up the engine during the glide as was described in the manual of the concerned flight school.

The AAIU(Be) is of the opinion that JAA Flight Examiner Manual (FEM) provided some relevant guidance in this respect and that this guidance is currently lacking. In this document, a distinction was made between a forced landing, which could proceed up to a go-around, and a precautionary landing, where power may be used and where the landing must be made at a predetermined aiming point or within a certain distance on the runway.

Also a thorough and formalized prefight risk assessment (see chapter 1.14 of this report) including the consideration of weather, briefings and currency of the examiner concerning the exercise could help to avoid future similar events.

2.5 Technical

Despite the potential damage incurred, the aircraft continued to fly another circuit before landing and performing a visual inspection to assess the possible damage. One part, the tie-down ring, was found missing, broken off. But the loss was not reported to the airfield and therefore impeded a check for the presence of any possible debris on the runway. The damage was visually checked again in EBAW upon arrival and the aircraft was considered to be airworthy. About 100 flight hours later, hidden structural damage was found during the scheduled maintenance.
All this is an indication that within general aviation a tail strike is generally considered as a minor event (examiner, ATO, Maintenance Organization,…).

Upon asked how to approach the airworthiness after a tail strike with a Cessna 172, Textron Aviation answered:
"We would defer this to the structures team for assessment, but loss of the both skin thickness and some of the bulkhead flange would not be considered acceptable for continued operation. There is no published inspection procedure after the tail strike, but would recommend a visual inspection of the tail cone for wrinkling or buckled skins / frames, and repair of the damage prior to continued operation."

3. CONCLUSIONS

3.1 Findings as to causes and contributing factors

- The tail strike occurred due to the decision to continue a powerless approach, which was unstable, where a risk of undershooting the runway existed
  [cause]
  [Action/decision – Action – Incorrect action selection – Examiner]
  [Aircraft operations – Control parameters – Glide – Attain/maintain not possible]
  [Aircraft operations – Control parameters – Pitch control – Incorrect operation]

- The local convective currents played a role, although this could be both anticipated and overcome by executing a go-around
  [contributing factor]
  [Conditions/weather/phenomena - Convective weather - Effect on operation]
- There was no clear prior agreement on who the pilot in command was
  [contributing factor]
  [Task performance – Communication – CRM techniques]
- No clear instructions or guidelines on assignment of PIC during check flights
  [contributing factor] ***[See Safety Issue 4.1]***
  [Management – Policy/procedure – Availability of policy/procedures – Authority]
- Currently no Flight Examiner Manual (FEM) exists which causes a lack of standardization
  [contributing factor] ***[See Safety Issue 4.2]***
  [Management – Policy/procedure – Availability of policy/procedures – Authority]

3.2 Findings as to factors that increase(d) risk

- Leaving the aerodrome unaware of the occurrence of a tail strike
- The continuation of flying with hidden structural damage
  [Aircraft handling/service – Maintenance/inspections – Return to service – Inadequate inspection]
- Currently no guidelines, including a formalized risk assessment (weather, terrain, currency of the examiner, briefing,…) exist on how to execute simulated emergency landings during PPL/SEP check flights

3.3 Other findings

- The examiner was duly qualified had enough recent experience according to the prevailing regulations
- The applicant had little recent flight experience but followed a refresher training within an ATO prior to the proficiency check as prescribed by the regulations
- The aircraft was airworthy
- The weight and balance was within limits

4. SAFETY ACTIONS AND RECOMMENDATIONS

*A **safety issue** is a safety factor that*
(a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and
(b) is a characteristic of an organization or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time

*A **safety recommendation** is defined as being a proposal of a safety investigation authority based on any information derived from an investigation and/or study. The sole purpose of a safety recommendation is the prevention of accidents or incidents and the reduction of the consequences of such occurrences. It, in no case has the purpose of creating a presumption of blame or liability for an accident or incident. Neither does it reflect the level of contribution to a specific accident or incident.*

4.1 Safety issue: Unclarity about the Pilot-in-command during examination flights

Safety recommendation BE-2021-02:

It is recommended that BCAA, like other EASA member states, clarifies the designation of the Pilot-in-command during check flights; who in general is designated as Pilot-in-command during test and check flights and also in which cases an exception to this is allowed. They must ensure that in any case this has been clarified and agreed before the flight for both parties (examinee and examiner).

4.2 Safety issue: Lack of standardization and guidelines for the conduct of examinations

Currently still no Flight Examiner Manual (FEM) exists. However in EASA's European Plan for Aviation Safety (EPAS) 2021-2025 Volume II the safety promotion task SPT.0111 has been incorporated; This SPT entails the development of the EASA FEM that provides guidelines to flight examiners on the conduct of examinations with a view to improving the standardisation and fairness of examiners at EU level. Expected output of this FEM is 2021.

Safety recommendation BE-2021-03:

It is recommended that EASA incorporates in the projected EASA FEM:

- a thorough description on which items to be included in the pre-flight briefing (such as the designation of the PIC, handover of controls, the roles in the event of an actual emergency, method of simulated emergencies..)
- the guidelines (that were part of the former JAA FEM) and a formalized prior risk assessment on performing simulated emergency landings during PPL test and SEP check flights.

Safety recommendation BE-2021-04:

It is recommended that the BCAA, awaiting the EASA FEM and in consultation with flight examiners already produces guidelines elaborating more on the conduct of the check and skill test. These guidelines should cover amongst other:

- a thorough description on which items to be included in the pre-flight briefing (such as the designation of the PIC, handover of controls, the roles in the event of an actual emergency, method of simulated emergencies..)
- the performance and the prior risk assessment (terrain, weather, currency of examiner,..) of simulated emergency landings during PPL test and SEP check flights (as in the former JAA FEM). The latter should be in line with how it was trained at the ATO.

When the EASA FEM is issued these guidelines could be either replaced by the FEM or formalized and used in addition to the EASA FEM.