AIRCRAFT ACCIDENT REPORT 1/2018

ACCIDENT INVESTIGATION DIVISION

Civil Aviation Department
The Government of the
Hong Kong Special Administrative Region

Report on the accident to Cessna 152
Registration B-HPA operated by the
Hong Kong Aviation Club Limited
at Shek Kong Airfield, Hong Kong
on 21 May 2016

Hong Kong
September 2018

In accordance with Annex 13 to the ICAO Convention on International Civil Aviation and the Hong Kong Civil Aviation (Investigation of Accidents) Regulations, the sole objective of this investigation is the prevention of aircraft accidents. It is not the purpose of this activity to apportion blame or liability.

民航處
CIVIL AVIATION DEPARTMENT
香港特別行政區政府
The Government of the Hong Kong Special Administrative Region

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23 August 2018

The Honourable Mrs Carrie Lam Cheng Yuet-ngor, GBM, GBS
The Chief Executive
Hong Kong Special Administrative Region
People's Republic of China

Dear Madam,

In accordance with Regulation 10(6) of the Hong Kong Civil Aviation (Investigation of Accidents) Regulations (Cap. 448B), I have the honour to submit an Inspector's Report by Mr Michael SK Yuen, Inspector of Accidents, of the accident involving a Cessna 152 aircraft (registration B-HPA), operated by the Hong Kong Aviation Club at the Shek Kong Airfield on 21 May 2016.

Yours faithfully,

(Simon Li)
Director-General of Civil Aviation

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GLOSSARY OF ABBREVIATIONS USED IN THE REPORT

CAD	Civil Aviation Department
EAP	Emergency Action Plan
ELT	Emergency Locator Transmitter
ft	feet
GFO	General Flying Order of the HKAC
HKAC	Hong Kong Aviation Club Limited
kg	kilogram(s)
km	kilometre(s)
m	metre(s)
MHz	Megahertz
POH	Pilot's Operating Handbook
PPL(A)	Private Pilot's Licence (Aeroplanes)
USG	U.S. Gallons
UTC	Co-ordinated Universal Time
VFR	Visual Flight Rules
VHF	Very High Frequency

Notes :

1. When abbreviations are used in this report, the full term is used in the first instance followed by the abbreviation in brackets.

2. All times in this Report are in Hong Kong Local Time, which is eight hours ahead of the Coordinated Universal Time (UTC).

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ACCIDENT INVESTIGATION DIVISION

CIVIL AVIATION DEPARTMENT
HONG KONG

Aircraft Accident Report 1/2018

Registered Owner:	Hong Kong Aviation Club Limited
Operator:	Hong Kong Aviation Club Limited
Aircraft Type:	Cessna 152
Nationality / Registration:	B-HPA
Place of Accident:	Shek Kong Airfield, Yuen Long New Territories, Hong Kong Latitude: 22° 26.2' N Longitude: 114° 04.8' E
Date and Time:	21 May 2016 at around 17:30 hours local time (0930 hours UTC)

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SYNOPSIS

On 21 May 2016, an accident occurred at Shek Kong Airfield, involving a Cessna 152 aircraft (registration mark B-HPA) operated by a student pilot ("Student") of Hong Kong Aviation Club Limited ("HKAC") during his second solo flight. The flight was uneventful until touch-down at Runway 11 when the aircraft bounced and lifted into the air again. Upon its second touch-down, the nose wheel of the accident aircraft hit the ground heavily. The aircraft then veered to the right and stopped at the runway in a nose down position. The Student climbed out uninjured. The propeller, nose landing gear and various parts of the aircraft were substantially damaged. There was no fuel leakage or fire.

The Chief Inspector of Accidents ("CIA") ordered an Inspector's Investigation into the accident in accordance with the Hong Kong Civil Aviation (Investigation of Accidents) Regulations (Laws of Hong Kong, Chapter 448B). The fundamental purpose of this investigation is to determine the circumstances and causes of the accident with a view to the preservation of life and the avoidance of accident in future, it is not the purpose of this activity to apportion blame or liability.

The following cause was identified:

After a bounced landing, the balked landing procedures, where go-around should be executed, were not performed. Upon its second touch-down, the aircraft had a hard nose landing, which resulted in the stoppage of the rotation of propeller after the blades contacting the ground (i.e. propeller strike), the collapse of the nose landing gear and the subsequent damage to the aircraft.

The investigation team has made three safety recommendations.

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1. FACTUAL INFORMATION

1.1 History of Flight

1.1.1 The pilot concerned was a student pilot of HKAC undergoing Private Pilot's Licence (Aeroplanes) ("PPL(A)") training. On the day of the accident, the Student completed a pre-solo flight assessment conducted by his instructor ("Instructor") and was considered as suitable for carrying out his second solo "circuit training", i.e. take-off then followed by flying a standard pattern visually to self-position for an approach and landing. Having reviewed the weather as suitable for the Student to conduct his solo circuit training, the Instructor authorized the solo flight which was planned to include two circuit patterns, with the first circuit being a "touch-and-go" (i.e. landing on a runway and take-off again without coming to a full stop), and the second circuit supposed to end with a full stop landing.

1.1.2 The Student then taxied the aircraft to the "undershoot" (i.e. the area before the threshold) of Runway 11, where the Instructor disembarked with the engine running. The Student conducted the pre-flight checks again and the aircraft took off from Runway 11 at 1725 hours. No other aircraft was in the circuit throughout the accident flight.

1.1.3 The first circuit before landing was uneventful. The Student reported that the approach was stable with speed maintained at 60 knots on final and flap setting at 30°. All checks corresponding to the landing phase were completed and the aiming point was slightly beyond the runway threshold.

1.1.4 During the landing flare, engine throttle was set to idle by the Student. It was planned to be a touch-and-go, but the aircraft bounced upon touch-down and lifted into the air again. The Student did not immediately execute a go-around as required by HKAC's prescribed balked landing procedures. Upon the second touch-down, the aircraft had a hard nose landing, which resulted in the propeller strike and the collapse of the nose landing gear. The aircraft then veered to the right and stopped at the runway in a nose down position (See Figure 1).

1.1.5 The Student shut down the aircraft and climbed out, uninjured.

Figure 1 Aircraft stopped in a nose down position on Runway 11

1.2 Injuries to Persons

1.2.1 Nil.

1.3 Damage to Aircraft

1.3.1 The nose tire exhibited a cut, and the nose wheel assembly exhibited a rubber transfer mark (See Figure 2). The nose wheel assembly and wheel fork were found detached from the nose landing gear (See Figures 3 and 4).

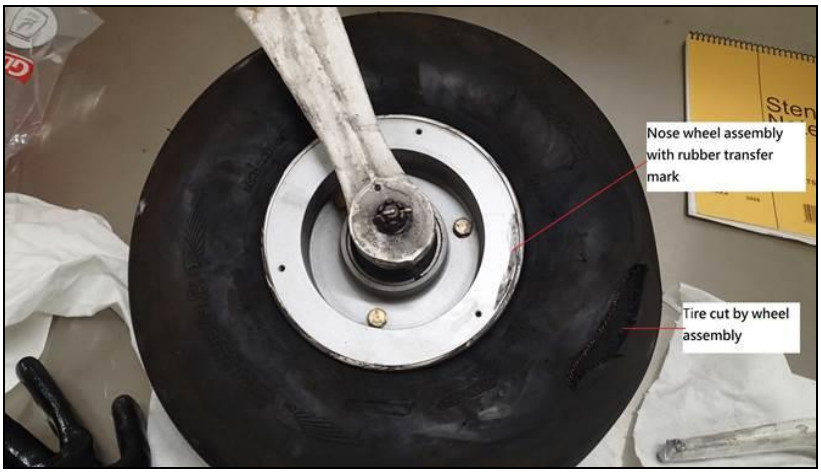

Figure 2 Damage on nose wheel assembly

Figure 3 Broken nose wheel fork

Figure 4 Broken nose gear fork at axle

1.3.2 The nose gear strut was broken and tilted rearward and to portside. The supporting strut was buckled and the left hand steering tube was broken. There was grinding damage on the broken nose gear strut (See Figure 5).

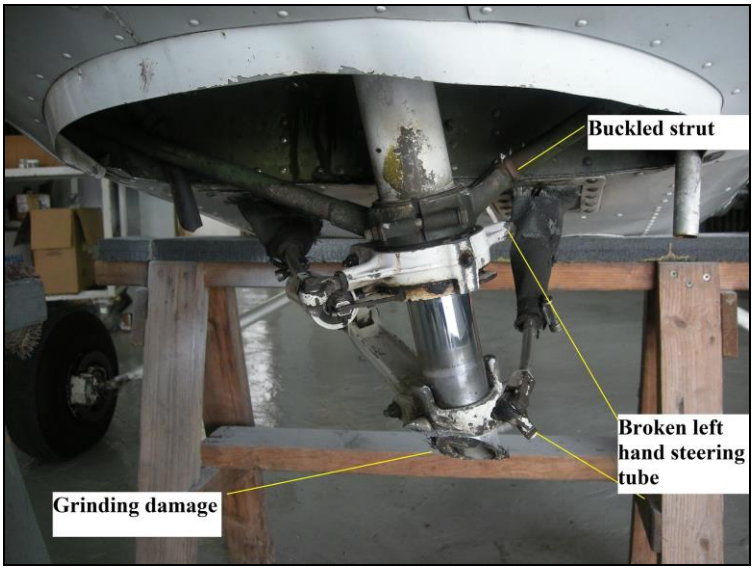

Figure 5 Damage of nose landing gear

1.3.3 The engine remained intact and secured to the aircraft structure. The engine mount truss was deformed. The left hand side of the truss had one cracked strut, one broken strut and two buckled struts (See Figures 6a and 6b). The fuel strainer bracket was flattened by the nose gear strut. Exhaust pipe also had grinding damage (See Figure 7).

1.3.4 Both propeller blades exhibited impact damage and the blade tips were bent rearward (See Figures 8 and 9). Rub marks were found on the engine cowling (See Figure 10).

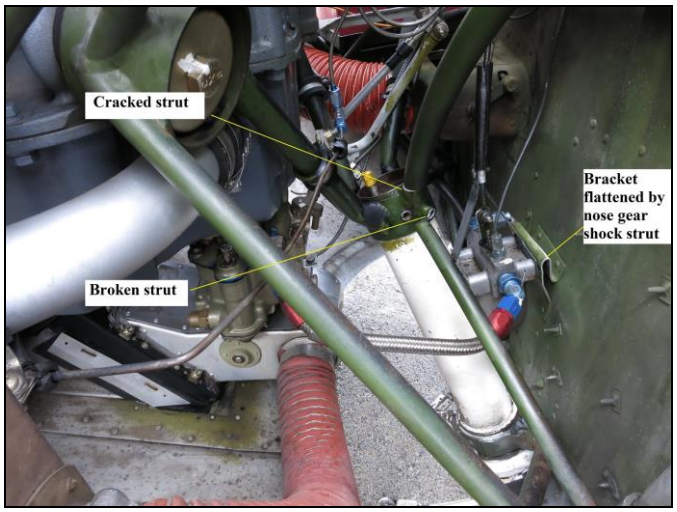

Figure 6a Damaged engine mount truss

Figure 6b Buckled struts of truss

Figure 7 Grinding damage of exhaust pipe

Figure 8 Propeller blades bent rearward

Figure 9 Damage of propeller blade

1.3.5 There was minor wrinkled damage on the skin surface around the attachment point of the rudder and rudder control cable (See Figure 11).

Figure 10 Rub mark on engine cowling

Figure 11 Wrinkled damage on the skin surface around the attachment point of rudder and rudder control cable

1.4 Other Damage

1.4.1 The broken nose gear strut left an impact point and a continuous ground mark along the track of the aircraft on the runway pavement surface. The team also found a few slash marks caused by the propeller blades striking the surface. See Section 1.12 "Wreckage and Impact Information" for details.

1.5 Personnel Information

1.5.1 The Student

1.5.1.1 The Student was the only person on board the aircraft during the accident. He was a student pilot of HKAC undergoing his PPL(A) training. He held a Hong Kong Class 2 Medical Certificate, valid until 31 December 2016. In accordance with the CAD licensing requirements, the Student was entitled to act as pilot-in-command of the accident solo flight with his valid Hong Kong Class 2 Medical Certificate.

1.5.1.2 Before joining HKAC, the Student had accumulated 16.0 hours (dual) / nil (solo) of flying experience overseas. He started his PPL(A) training at HKAC in June 2015 and his first solo flight was conducted on C152 aircraft on 2 January 2016. During the training period at HKAC, he had 16.3 hours (dual) / 0.4 hours (solo) of flying. In total, the Student had 32.7 flying hours.

1.5.1.3 The Student's last three flights were all dual flights on C152 aircraft,

respectively on 9 January, 9 April and 7 May 2016.

1.5.2 The Instructor

1.5.2.1 The Instructor had been a flying instructor of HKAC since 2005. He held a Hong Kong Flying Instructor (FI) rating, valid until 7 March 2017, which entitled him to deliver flying training on small single-engine aircraft, including the type of the accident aircraft, on the day of the accident. The most recent FI renewal test was conducted by Civil Aviation Department ("CAD") Authorized Examiner on 12 February 2015. His logbook revealed that he had conducted training flights with his HKAC student pilots in the last three consecutive weekends preceding the accident flight, respectively on 30 April, 7 and 8 May, and 15 May 2016.

1.5.2.2 The Instructor had accumulated about 800 instructional hours from training flights. He had 14.6 hours of dual flight with the Student preceding the accident flight.

1.6 Aircraft Information

1.6.1 Aircraft and Engine

Manufacturer:	Cessna Aircraft Company
Type:	C152
Serial number:	15284602
Year of manufacture:	1980
Nationality / Registration Mark:	Hong Kong, China / B-HPA
Name of Owner	HKAC
Certificate of Registration:	Issued on 16 December 2005
Engine:	1 x Lycoming O-235-L2C piston engine
Airframe hours:	10,700 hours
Engine hours:	467.3 hours since overhaul

1.6.2 Airworthiness and Maintenance of Aircraft

1.6.2.1 At the time of the accident, the aircraft had a valid Certificate of Airworthiness in the Transport (Passenger) Category issued by CAD on 16 June 2015, with validity period until 15 June 2016. A review of the aircraft records indicated

that the aircraft had no outstanding defects prior to the accident flight. The aircraft had also been maintained in accordance with the CAD approved maintenance schedule. The most recent scheduled maintenance check was a 50-hour inspection on 29 April 2016.

1.6.3 Fuel

1.6.3.1 According to the loading record, the fuel loaded on board the aircraft was 27 USG (102.6 litres) on the day of the accident. After the accident, 13 USG (49.2 litres) of fuel was drained from the aircraft.

1.6.4 Weight and Balance

1.6.4.1 The aircraft was operating within its weight and centre of gravity limits throughout the accident flight.

1.7 Meteorological Information

1.7.1 Meteorological Information obtained from Hong Kong Observatory (HKO)

1.7.1.1 There was no significant weather reported near Shek Kong at the time of the accident. Visibility was more than 5 km and up to 8 km. The Automated Weather Station at Shek Kong recorded nil wind at the time of the accident.

Time (Local Time)	10-min mean wind direction and speed (degrees / knot)	10-min gust (knot)
17:25	0 / 0	0
17:30	0 / 0	0
17:35	0 / 0	0

1.7.2 Meteorological Information obtained by the Instructor and Student

1.7.2.1 HKAC's General Flying Orders (GFO) requires their pilots to obtain the latest weather conditions from HKO website prior to flight.

1.7.2.2 According to the Instructor, the HKO forecast and the actual weather by his visual inspection were within the limits for operations under Visual Flight

Rules ("VFR"). The weather conditions were considered suitable for the Student to conduct his solo circuit flight.

1.7.2.3 The Student also indicated that he had checked the weather conditions of Shek Kong prior to flight.

1.8 Aids to Navigation

1.8.1 Not applicable. The accident flight was operated under VFR, during which the aircraft was required to remain clear of cloud and in sight of the surface.

1.9 Communications

1.9.1 The aircraft was equipped with Very High Frequency ("VHF") radio. The Student made standard radio calls for reporting his positions on Shek Kong VHF frequency 123.6 MHz[1] during the accident flight. The Instructor, equipped with a two-way transceiver, was on ground monitoring the flight. Right after the accident, the Instructor made a "May-Day" call on 123.6 MHz.

1.9.2 HKAC had an Emergency Action Plan ("EAP") in place to facilitate its response to emergency situations at Shek Kong. Immediately after the accident, emergency calls had been made to Fire Services Department and Air Traffic Control in accordance with the EAP. The Chief Flying Instructor and engineering team of HKAC had also been informed and arrived at the scene right after the accident.

1.10 Aerodrome Information

1.10.1 Shek Kong Airfield is a military airfield which is normally open to HKAC to operate during weekends subject to military operations. The airfield has a single runway orientated in the direction of 290/110 degrees with a total length of 4,143 ft (1,263 m) and a width of 110 ft (33.5 m).

[1] There is no Air Traffic Control Service provided in Shek Kong Airfield. Pilots use 123.6 MHz to broadcast their intentions and locations so as to keep other pilots using the airfield aware of the traffic situation.

1.11 Flight Recorders

1.11.1 Not applicable. Flight recorders are not required for this category of aircraft.

1.12 Wreckage and Impact information

1.12.1 The main body of the aircraft was intact, except that the nose wheel assembly and nose wheel fork were detached and found on the runway. An impact point was located near the second centerline marking of Runway 11. Right after the impact point, a 0.9 m long gouge mark was found while the remaining ground mark was a scratch mark continuing to the final position of the aircraft. Three slash marks were found (See Figure 12).

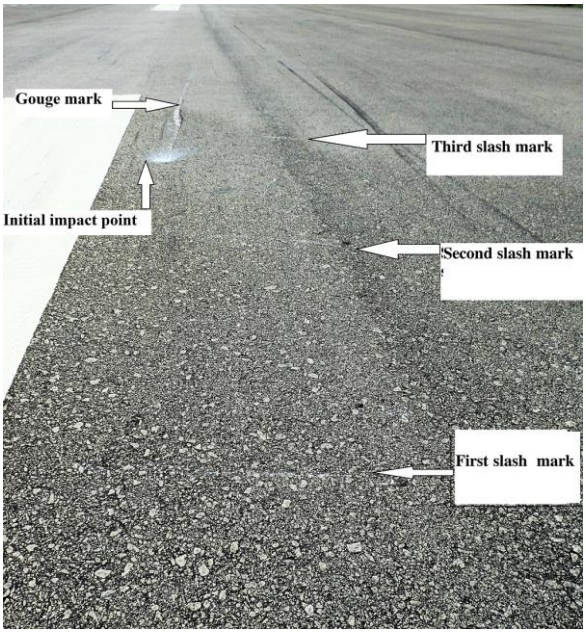

Figure 12 Impact point and slash marks

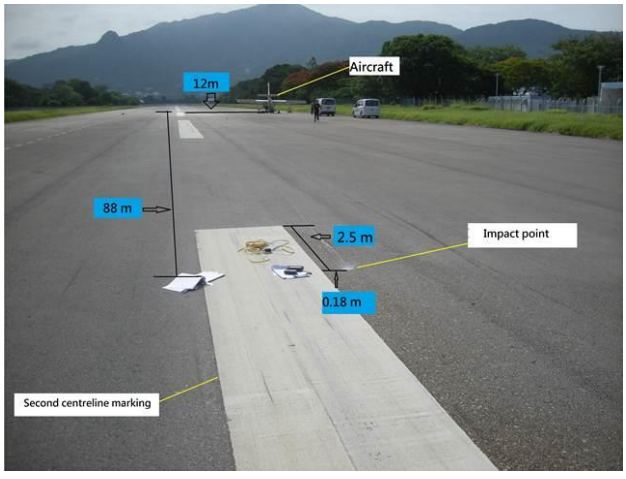

Figure 13 Aircraft final position

1.12.2 The aircraft moved forward for approximately 88 m and finally stopped at 12 m to the right of the runway centerline. No tire mark was found. (See Figure 13 - aircraft final position and Figure 14 - wreckage plot.)

Figure 14 Wreckage Plot

1.13 Medical and Pathological Information

1.13.1 There was no evidence to suggest that the performance of the Student had been affected by fatigue, alcohol, drugs and/or medication at the time of the

accident.

1.14 Fire

1.14.1 There was no fire or fuel leakage.

1.15 Survival Aspects

1.15.1 The Student on board survived and climbed out the aircraft, uninjured. The seats and harness were all intact and showed no sign of damage.

1.15.2 The Emergency Locator Transmitter ("ELT") was activated after the accident and was switched off by the engineering personnel arrived on the scene.

1.16 Tests and Research

1.16.1 Microscopic inspection of the fractured surfaces indicated that there was no pre-existing failure on the nose wheel fork and the failure was due to overload (See Figures 15 and 16).

1.16.2 The investigation team also approached Cessna, the aircraft manufacturer, to study the failure mode of the nose wheel fork. Cessna made the same conclusion.

Figure 15 Broken nose gear fork at axle

Figure 16 Broken nose gear fork at strut

1.17 Organisational and Management Information

1.17.1 HKAC operated at Shek Kong Airfield during weekends and sometimes on public holidays, mainly for its members to conduct general aviation or training flights in fixed-wing aircraft and helicopters. Operationally, HKAC had a

number of flying instructors, under the direction of Chief Flying Instructor (Aeroplanes) and Chief Flying Instructor (Helicopters) to conduct PPL training at HKAC. HKAC had an in-house engineering team to maintain its own aircraft under the direction of a Chief Engineer.

1.17.2 HKAC had set up its own Safety Management System to promote safety culture and identify areas for improvement. Reports on safety concerns, hazards and incidents, would be kept confidential and reviewed by a Safety Committee of HKAC for follow up. Two designated safety officers were appointed to administer flight operations and engineering/ground related safety issues.

1.18 Additional Information

1.18.1 HKAC's PPL Training

1.18.1.1 The flying training syllabus of HKAC's PPL course had been examined. The syllabus is easily accessible as it is printed on each student pilot's training record, covering the flying lessons to be taught in the PPL course (See Figure 17).

1.18.1.2 After each flying lesson, instructors are required to complete student pilots' training records, filling in details such as date and duration of flying lesson, type of training, and instructors' comments on the flying lessons. The training record is in the form of a summary sheet (See Figure 18), such that instructors can trace student pilots' training history at HKAC.

1.18.1.3 Instructors' comments are recorded in the comment box of the training record (See Figure 18). At present, HKAC have not established any grading system or mechanism for instructors to evaluate student pilots' performance during the lesson.

1.18.1.4 Student pilots' training records also include a checklist of emergency manoeuvres required to be completed before solo flights (See Figure 19). Instructors must ensure that all the manoeuvres in the checklist have been signed off before sending a student pilot to conduct any solo flight. Specifically, simulated bounced landing, balked landing procedures and go-around manoeuvres are included in that checklist.

FLIGHT OPERATIONS DEPARTMENT

HONG KONG AVIATION CLUB LTD.

Sung Wong Toi Road
Kowloon

CONFIDENTIAL

Telephone:
Flt Ops 27115555
Admin 27135171
Fax 27619511

STUDENT PILOT'S RECORD

Name.....
Address .....
.....
Telephone No. Home.....
Office.....

Membership Number .....
Date Medical Passed .....
Licence Number (Student) .....
Date of Expiry.....

PRIVATE PILOT'S LICENCE COURSE – H.K.A.C. SYLLABUS
FLYING TRAINING CURRICULUM
EXERCISE NUMBERS

1. FAMILIARISATION WITH THE AIRCRAFT
   - 1. 1 Aircraft, general
   - 1. 2 Aircraft systems, normal and abnormal operation
   - E1. 3 FIRE DRILLS
   - E1. 4 EMERGENCY DRILLS
2. PREPARATION FOR FLIGHT AND ACTION AFTER FLIGHT
   - 2. 1 Pre and post flight procedures
3. AIR EXPERIENCE
   - 3. 1 Familiarisation flight
4. EFFECTS OF CONTROLS
   - 4. 1 The flying controls
   - 4. 2 The trim, engine and ancilliary controls
5. TAXYING
   - 5. 1 Basic control technique, precautions and taxying checks
   - 5. 2 Airfield procedures
6. STRAIGHT AND LEVEL FLIGHT
   - 6. 1 Basic control technique
   - 6. 2 Precision exercises
   - 6. 3 Performance applications
7. CLIMBING
   - 7. 1 Basic control technique
   - 7. 2 Performance applications
8. DESCENDING
   - 8. 1 Basic control technique
   - 8. 2 Performance applications
   - E8. 3 EMERGENCY DESCENT
9. MEDIUM TURNS
   - 9. 1 Basic control technique
   - 9. 2 Precision exercises
   - 9. 3 Abnormal (DI failure) procedures
10. STALLING
    - 10. 1 Basic Stalls
    - 10. 2 Advanced Stalls
11. SPINNING
    - 11. 1 Basic Spins
    - 11. 2 Advanced Spins
12. TAKE-OFF AND CLIMB
    - 12. 1 Take-off into wind
    - E12. 2 ENGINE FAILURE AFTER TAKE-OFF
    - 12. 3 Take-off out of wind
    - 12. 4 Performance take-off
13. APPROACH AND LANDING
    - 13. 1 Airfield procedures
    - 13. 2 Engine assisted approach and landing
    - E13. 3 MISSED APPROACH/LANDING PROCEDURE
    - 13. 4 Glide approach and landing
    - 13. 5 Wheel landing (Tailwheel aircraft)
    - 13. 6 Out of wind circuit and landing
    - 13. 7 Flapless landing
    - 13. 8 Landing on alternative surface, grass/runway
    - 13. 9 Performance (minimum landing distance) application
14. FIRST SOLO
15. ADVANCED TURNING
    - 15. 1 Basic control technique
    - 15. 2 Precision exercises
16. OPERATION AT MINIMUM LEVEL
    - 16. 1 Basic technique
    - 16. 2 Weather operation
    - 16. 3 Low Level navigation
    - 16. 4 Airfield procedures

17A FORCED LANDINGS WITHOUT POWER
- 17A. 1 Approaches from 1000 ft.
- 17A. 2 Full forced landing procedure

17B. FORCED LANDING WITH POWER
- 17B. 1 Abnormal (precautionary landing) procedure

18. PILOT NAVIGATION
    - 18. 1 Course steering and use of map
    - 18. 2 Route procedure, map reading and D.R. Navigation, Use of Flight Plan & Log
    - 18. 3 Hazard avoidance
    - 18. 4 En-route use of radio bearings
    - 18. 5 Instrument navigation, FIR procedures
    - 18. 6 Abnormal (position doubtful or lost) procedure
    - E18. 7 EMERGENCY, FUEL SHORTAGE OR WEATHER DETERIORATION LANDING AS EXS. 17A & B

19A. INSTRUMENT FLYING, BASIC, FULL PANEL
- 19A. 1 Basic control technique
- 19A. 2 Precision exercises

19B INSTRUMENT FLYING, ABNORMAL (PARTIAL PANEL) OPERATION
- 19B. 1 Basic control technique
- 19B. 2 Unusual attitude recoveries

19C INSTRUMENT FLYING, ADVANCED, FULL PANEL
- 19C. 1 Precision exercise, pre night and procedure flying training
- T19C. 2 Abnormal (asymmetric) operation

19D INSTRUMENT FLYING, APPLIED
- 19D. 1 Instrument/radio tracking
- 19D. 2 (No.....) Airways procedure
- 19D. 3 Holding procedures
- 19D. 4 (Aid.....) Airfield/runway approach and missed approach procedure
- 19D. 5 Abnormal (partial panel and asymmetric) procedures

20. NIGHT FLYING
    - 20. 1 Basic technique
    - E20. 2 EMERGENCY PROCEDURES
    - T20. 3 Abnormal (asymmetric) operation
    - 20. 4 Night navigation
21. AEROBATICS
    - 21. 1 (.....) Basic control technique

Figure 17 Training syllabus of HKAC's PPL course

FLYING INSTRUCTION RECORD

Date	Exercise	Dual	Solo	Total		Remarks	Instructor's Initials and Lic. No.
				Dual	Solo		

Figure 18 Student pilot's training record to be completed by instructor at HKAC

EMERGENCY CHECK LIST
PRE-SOLO STAGE

EMERGENCY	INSTRUCTOR
ENGINE FIRE ON GROUND	
CABIN FIRE ON GROUND	
ELECTRICAL FIRE ON GROUND / IN AIR	
ESCAPE DRILL (On Ground)	
ENGINE FIRE IN AIR	
ABANDON TAKE OFF	
ENGINE FAILURE AFTER T/O	
SIMULATED BOUNCED LANDING & RECOVERY	
RECOVERY FROM BALLOON ON LANDING	
GO AROUND PROCEDURE	
CAPTAINS BRIEFING BEFORE TAKE OFF	
EXCESS SPEED AT THRESHOLD	

Figure 19 Emergency checklist included in the student pilot's training record

1.18.1.5 The Student's training records had been examined. His flying lessons were primarily conducted by the same instructor with only two lessons by other instructors. He had been commented in the training records of being too tense and should only make small and minor corrections on final. However, there were no recorded deficiencies concerning his emergency manoeuvres, bounced landing or improper landing flare handling.

1.18.1.6 As confirmed by the instructor, the Student had been taught the balked landing procedures (i.e. an immediate go-around following a bounced landing) during training. As revealed in the Student's training records, go-around manoeuvres had been practised on 14 November 2015 and during the pre-solo assessment

flight preceding the accident solo flight.

1.18.2 Previous Safety Recommendation

1.18.2.1 A review of previous Safety Recommendations revealed that HKAC had been recommended to review its training programme to improve its student pilots' readiness to execute emergency manoeuvres, and to properly record training on emergency manoeuvres in the pilots' training files.

1.18.2.2 In the Aircraft Accident Report 2/2015, involving a C172 aircraft at Shek Kong Airfield on 28 September 2013, Safety Recommendation 2015-4 was made:

> *'The HKAC should review and revise its training programme to include the execution of an unplanned balked landing manoeuvre in Shek Kong Airfield with special attention to its surrounding development.'*

1.18.2.3 In response to the Safety Recommendations concerning balked landing procedures, HKAC had put in place the following measures:

- On 1 November 2013, HKAC had publicized in its GFO No. 29 reminding its members to immediately execute a go-around following a bounced landing and to familiarize with the balked landing procedures.

- On 20 September 2014, HKAC had tightened the requirement in the GFO No. 15 mandating that instructors concerned should ensure student pilots' readiness to execute go-around and recovery from balked landing procedures through appropriate means before all subsequent solo flights, in addition to first solo.

- On 1 April 2016, HKAC had mandated in the GFO No. 14 requiring simulated balked landing as a test item in the Annual Flight Review assessment.

1.18.2.4 CAD's regular audits and inspections confirmed that HKAC had implemented the previous safety recommendations.

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2. ANALYSIS

2.1 General

2.1.1 The weather conditions at the time of accident were within the limits for operations under VFR and considered suitable for the Student to conduct his solo circuit flight.

2.1.2 Pre-flight checks were conducted prior to the pre-solo flight assessment and the accident flight. No anomalies were reported and these checks were considered unrelated to the accident.

2.1.3 With no traffic in the circuit, there was no evidence to suggest that the Student was being distracted at the time of the accident.

2.2 Licensing Aspects

2.2.1 The Student was entitled to act as pilot-in-command of the accident solo flight with his valid Hong Kong Class 2 Medical Certificate. The Instructor was properly licenced and suitably qualified to authorize the accident solo flight.

2.3 Engineering Aspects

2.3.1 The aircraft had a valid Certificate of Airworthiness at the time of the accident, and no anomalies were found in the maintenance history.

2.3.2 The aircraft had no outstanding defects and was serviceable for the accident flight.

2.4 Analysis of the Accident Flight

2.4.1 The Landing Flare and Bounced Landing

2.4.1.1 A bounced landing can be caused by an improper flare and/or an incorrect landing airspeed. The Student recalled that the final approach was stable with correct airspeed upon touch-down. In a separate interview with the Instructor, he also reported that the aircraft was not landing at a high airspeed based on his observation. If the airspeed upon touch-down was correct, the bounced

landing was probably caused by an improper flare, where the flaring action was too late ("late flaring") or too flat ("under flaring"), that resulted in the bounced landing upon touch-down.

2.4.1.2 The balked landing procedures following a bounced landing involves an immediate go-around, as required by HKAC and laid down in their GFO No. 29 dated 1 November 2013. As confirmed by the Instructor, the Student had demonstrated such procedures to a satisfactory standard before he was authorized for his solo flight. As revealed in the Student's training records and confirmed by the Instructor, go-around manoeuvres were conducted during the pre-solo assessment flight preceding the accident solo flight. During the interview, the Student reported that he had been taught to execute a go-around following a bounced landing during his PPL training, however, it all happened so fast that he did not execute the go-around.

2.4.2 Second Touch-down

2.4.2.1 Following the bounce and upon the second touch-down, the Student was unsure if the aircraft had a hard nose landing. There was no other eyewitness on the ground as the Instructor reported that his sight had been away from the aircraft at that moment, and he only witnessed the aircraft veering off the runway centerline.

2.4.3 Collapse of the Nose Landing Gear

2.4.3.1 Both Cessna's report and the microscopic inspection of the fracture surfaces of the nose wheel fork were consistent. There was no pre-existing failure, and the fracture of the nose wheel fork was due to overload. Examination of the detached nose wheel assembly revealed a cut exhibited on the nose tire and a rubber transfer mark on the nose wheel assembly. The cut and transfer mark indicated that the aircraft had experienced a hard nose landing, in which the tire was compressed and/or folded over and made contact with the nose wheel assembly. The deformed engine mount truss also incurred substantial damage with broken and buckled struts due to high impact load.

2.4.3.2 The ground marks were consistent with the damage to the aircraft. The first slash mark was located near the second runway centerline marking. A total of three slash marks were found along the centerline, separated slightly apart from

each other. These slash marks were consistent with the propeller striking the runway surface. From examination of the propeller blades, the backward bending indicated forward aircraft speed, whereas bending of more than one blade indicated that the engine was still running at the time of impact. With only three slash marks found, it indicated that the engine stopped shortly after the propeller strike.

2.4.3.3 Near the slash marks, an impact point was found on the runway centerline. The impact point was covered by a piece of metal, indicating a very high impact force when the nose gear strut pressed on the runway surface.

2.4.3.4 From examining the aircraft damage and ground marks aforesaid, it was determined that the aircraft had a hard nose landing upon the second touch-down, resulting in the collapse of the nose landing gear.

2.4.4 Aircraft Movement

2.4.4.1 The track of the aircraft could be traced by a ground mark continuing from the impact point to the final stop position. The first 0.9 m segment of the ground mark was a gouge mark while the remaining was a scratch mark. The gouge mark revealed that the broken nose gear was pressing on the runway surface. The gouge mark was subsequently lightened to scratch mark, showing that a reduction in force exerted by the nose gear on the surface, partially shared by the main landing gears.

2.4.4.2 No tire mark was found, which was consistent with the Student's statement that he did not apply any rudder or brake. The aircraft moved forward for approximately 88 m and finally stopped at 12 m to the right of the runway centerline.

2.5 Pilot Action

2.5.1 Despite the Student had been trained to execute go-around manoeuvres during training, the startle factor when encountering an actual balked landing situation, especially if the involved Student did not have much flying experience, could possibly contribute to any delay, deviation or lapse from executing the required procedures.

2.6 PPL Training at HKAC

2.6.1 In response to the previous Safety Recommendations concerning balked landing procedures, HKAC was aware of the risks associated with balked landing and had put in place several mitigating measures such as publicizing a reminder to all HKAC pilots to familiarize with balked landing procedures. For the Annual Flight Review ("AFR") assessments on their licensed pilots, balked landing procedures had also been mandated as a test item during the AFR assessments.

2.6.2 However, it was noticed that the extent, frequency and duration of the training on emergency manoeuvres such as go-around or balked landing procedures were at the discretion of individual instructors and HKAC had not specified such training requirements in details in its PPL syllabus.

2.6.3 As revealed in the Student's training record, his checklist of emergency manoeuvres had been completed before first solo. However, his first solo was conducted on 2 January 2016, more than half year before the accident flight, and HKAC had no requirements to have any emergency manoeuvres completed within a short time frame before subsequent solo flights. Albeit a requirement under GFO No. 15 to ensure student pilots' readiness to execute go-around or balked landing procedures before solo flights, HKAC had not published any guidelines or test items for instructors to follow when conducting pre-solo flight check.

2.6.4 It was also noticed that HKAC had not put in place any grading system or mechanism to enable a more objective assessment of student pilots' performance throughout his PPL training. Despite the Student had been commented in his training record of being too tense and should only make small and minor corrections on final, no record of follow-up or remedial actions could be found showing that the Student had corrected or improved in subsequent lessons. Limited by the relatively small-sized comment box of the training record, more detailed comments or deficiency reports could only be made in a supplementary page, which was rarely adopted in practice.

3. CONCLUSIONS

3.1 Findings

3.1.1 The weather conditions at the time of accident were within the limits for operations under VFR and considered suitable for the Student to conduct his solo circuit flight.

3.1.2 The aircraft had a valid Certificate of Airworthiness and was maintained and certified in accordance with the regulatory requirements.

3.1.3 The aircraft had no outstanding defects and was serviceable for the accident flight.

3.1.4 The aircraft was operating within its weight and centre of gravity limits.

3.1.5 The Student held a valid Hong Kong Class 2 Medical Certificate which entitled him to act as the pilot-in-command of the accident solo flight.

3.1.6 The Instructor was properly licenced and suitably qualified to authorize the solo flight.

3.1.7 In the pre-solo flight assessment, the Student was checked by the Instructor and was considered suitable for undergoing his solo circuit flight. As revealed in the Student's training records and confirmed by the Instructor, go-around manoeuvres had also been conducted in the pre-solo assessment flight.

3.1.8 The solo flight was uneventful until touch-down in the first circuit, when the aircraft was bounced and lifted into the air again.

3.1.9 The balked landing procedures, where go-around should be immediately executed after a bounced landing, were not performed.

3.1.10 Upon the second touch-down, the aircraft had a hard nose landing, which resulted in the propeller strike, collapse of the nose landing gear and subsequent damage to the aircraft.

3.1.11 The collapse of the nose landing gear and damage to the engine mount truss was due to overload during the hard nose landing.

3.1.12 The aircraft veered to the right and stopped at the runway in a nose down position.

3.2 Cause

3.2.1 After a bounced landing, the balked landing procedures, where go-around should be executed, were not performed. Upon its second touch-down, the aircraft had a hard nose landing, which resulted in the propeller strike, the collapse of the nose landing gear and the subsequent damage to the aircraft. (Paragraphs 2.4.1.2, 2.4.3.4)

3.3 Contributing Factors

3.3.1 Given the pilot's limited flying experience, the startle factor when encountering an actual balked landing situation could possibly contribute to any delay, deviation or lapse from the required procedures. (Paragraph 2.5.1)

4. SAFETY RECOMMENDATIONS

4.1 Recommendation 2018-1

It is recommended that HKAC specifies the detailed training requirements (such as the extent, frequency and duration of the training) on balked landing procedures in its PPL syllabus, to ensure a standardized training process for student pilots on practising balked landing procedures. (Paragraph 2.6.2)

4.2 Recommendation 2018-2

It is recommended that HKAC reviews and publishes guidelines or checklists to standardize the assessment criteria and method, be it a physical demonstration of skill(s) and / or vetting of training records, when conducting pre-solo flight assessments. (Paragraph 2.6.3)

4.3 Recommendation 2018-3

It is recommended that HKAC reviews its training record system, to include at least the following:

- A grading system or mechanism for assessment of student pilots' performance during the training lesson;
- Training reports to log instructors' feedbacks and necessary follow-up in areas for improvement.

(Paragraph 2.6.4)

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