MINISTRY OF TRANSPORT, INFRASTRUCTURE, HOUSING AND URBAN DEVELOPMENT
STATE DEPARTMENT OF TRANSPORT
AIR ACCIDENT INVESTIGATION

Telegrams: "TRANSCOMS". Nairobi

Telephone: (020) 2729200

Email: info@transport.go.ke

Website: www.transport.go.ke

TRANSCOM BUILDING

NGONG ROAD

P.O. Box 52592 - 00100

NAIROBI

FINAL ACCIDENT REPORT 5Y-BWL

09.10.2013

This investigation was carried out in accordance with Annex 13 to the Convention on International Civil Aviation; it is not the purpose of aircraft accident investigation to apportion blame or liability. The sole objective of the investigation and the Final Report is the prevention of accidents and incidents.

SEAMLESS CONNECTIVITY
MINISTRY OF TRANSPORT AND INFRASTRUCTURE
SEAMLESS CONNECTIVITY
MINISTRY OF TRANSPORT AND INFRASTRUCTURE
SEAMLESS CONNECTIVITY
MINISTRY OF TRANSPORT AND INFRASTRUCTURE
SEAMLESS CONNECTIVITY
MINISTRY OF TRANSPORT AND INFRASTRUCTURE

CIVIL AIRCRAFT ACCIDENT REPORT SUMMARY
CAV/ACCID/5YBWL/13

OPERATOR/OWNER	:	Skylink Flight Services Company Limited
AIRCRAFT TYPE	:	Cessna 172K
MANUFACTURER	:	Cessna Aircraft Company
YEAR OF MANUFACTURE	:	1969
AIRCRAFT REGISTRATION	:	5Y-BWL
AIRCRAFT SERIAL NUMBER	:	17257888
DATE OF REGISTRATION	:	26 January 2009
NUMBER AND TYPE OF ENGINE	:	1 Lycoming O-320-E2D
DATE OF OCCURRENCE	:	09 October 2013
TIME OF OCCURRENCE	:	0918 hours
LOCATION OF OCCURRENCE	:	Nairobi National Park (01°20'44"S, 36°48'26"E)
DEPARTURE AERODROME	:	Wilson Airport (HKNW)
DESTINATION AERODROME	:	HKNW
TYPE OF FLIGHT	:	Training
NUMBER OF PERSONS ON BOARD	:	Two
INJURIES	:	Fatal: 2
NATURE OF DAMAGE	:	Aircraft destroyed
CATEGORY OF OCCURRENCE	:	Accident
FLIGHT INSTRUCTOR	:	YK-6672-CL
STUDENT PILOT	:	YK-8533-SL
FI's FLYING EXPERIENCE	:	776 hours

Times given in this report are East African Local Time

OBJECTIVE

This report contains factual information which has been determined up to the time of publication. The information in this report is published to inform the aviation industry and the public of the general circumstances of accidents, serious incidents and incidents.

This investigation has been carried out in accordance with *The Kenya Civil Aviation (Aircraft Accident and Incident Investigation) Regulations, 2013 and Annex 13 to the ICAO Convention on International Civil Aviation.*

The objective of the investigation of an accident or incident under these Regulations shall be the prevention of accidents and incidents. It shall not be the purpose of such an investigation to apportion blame or liability.

TABLE OF CONTENTS

OBJECTIVE **3**
TABLE OF CONTENTS **4**
ABBREVIATIONS **6**
SYNOPSIS **8**
1. FACTUAL INFORMATION **9**
1.1. History of Flight 9
1.2. Injuries to persons 14
1.3. Damage to Aircraft 14
1.4. Other Damage 14
1.5. Personnel Information 14
1.5.1. Check-out Flight Instructor 14
1.5.2. Student Pilot 18
1.5.3. Regular Flight Instructor 22
1.6. Aircraft Information 24
1.6.1. General 24
1.6.2. Mass and Balance 26
1.6.3. Stall speeds for Cessna 172 27
1.6.4. Spin characteristics of Cessna 172 28
1.7. Meteorological Information 29
1.8. Communications 30
1.9. Aerodrome Information 30
1.10. Wreckage and Impact Information 31
1.11. Medical and pathological information 35
1.12. Fire 35
1.13. Survival Aspects 35
1.14. Recorded Information 36
1.15. Tests and Research 38
1.16. Organizational and Management Information 39
1.16.1. Kenya Civil Aviation Authority 39
1.16.2. Skylink Flight Services Limited 41
1.16.3. Change in experience requirements for PPL 47
1.17. Additional Information 48

1.17.1. Witnesses 48
1.17.2. Stall and Spin Awareness 49
2. ANALYSIS 53
2.1. General 53
2.2. Wreckage and Impact Information 54
2.3. Recorded Information 56
2.4. Aircraft Stall and Spin Characteristics 57
2.5. Flight Crew Qualifications and Training 58
2.5.1. Check-out Flight Instructor 58
2.5.2. Student Pilot 59
2.6. Organizational Influences 61
2.6.1. KCAA 61
2.6.2. Skylink Flight Services Limited 62
2.6.3. Change in experience requirements for PPL 65
3. CONCLUSIONS 67
3.1. Findings 67
3.2. Probable Cause 72
4. SAFETY RECOMMENDATIONS 73
APPENDICES 76
Wilson Airport Aerodrome Chart 76
Radar Data for 5Y-BWL on 09/10/2013 77
ATC Transcript 78
Skylink's Sample First Solo Check-out Form 79
Skylink's Sample First Solo Theory Exam 80
Criteria for First Solo Authorization 83
Skylink PPL Flight TP 85
Ground Accident Photographs 88

ABBREVIATIONS

AAID	-	Air Accident Investigation Department
AC	-	FAA Advisory Circular AC 61-67C
AGL	-	Above Ground Level
AMO	-	Approved Maintenance Organization
AMSL	-	Above Mean Sea Level
AOA	-	Angle of Attack
ATC	-	Air Traffic Control
ATO	-	Approved Training Organization
BWL	-	Short form for 5Y-BWL
CFI	-	Check-out Flight Instructor
CAS	-	Calibrated Airspeed
CG	-	Centre of Gravity
CPL	-	Commercial Pilot's License
CRS	-	Certificate of Release to Service
FAA	-	Federal Aviation Administration
FI	-	Flight Instructor
FIR	-	Flight Instructor Rating
GFT	-	General Flying Test
GS	-	Ground Speed
HKNW	-	ICAO Aerodrome Designation for Wilson Airport
IAS	-	Indicated Airspeed
ICAO	-	International Civil Aviation Organization
IR	-	Instrument Rating
KCAA	-	Kenya Civil Aviation Authority

KCAS	-	Knots Calibrated Airspeed
KIAS	-	Knots Indicated Airspeed
KWM	-	Short form of 5Y-KWM
KWS	-	Kenya Wildlife Service
MHZ	-	Mega Hertz
METARs	-	Meteorology Aerodrome Routine Weather Reports
PPL	-	Private Pilot's License
POH	-	Pilot's Operating Handbook
RFFS	-	Rescue and Fire Fighting Services
RFI	-	Regular Flight Instructor
ROC	-	Rate of Climb
RPM	-	Revolutions per Minute
SP	-	Student Pilot of the accident flight
SPL	-	Student Pilot's License
TAS	-	True Airspeed
TBO	-	Time between overhaul
TM	-	Training Manual
TP	-	Training Programme
TTR	-	Technical Type Rating
TWR	-	Wilson Airport ATC Tower

SYNOPSIS

At 0937 hours on 09 October 2013, the Air Accident Investigation Department was notified of an accident at the Nairobi National Park by Wilson Airport Air Traffic Control Tower. A safety investigation was commenced the same day with the arrival of a team of investigators at the accident site approximately thirty minutes after notification.

At 0918 hours on 09 October 2013, a Cessna 172K of registration 5Y-BWL operated by Skylink Flight Services Company Limited crashed on the downwind leg of runway 07 of Wilson Airport during the conduct of training circuit flights. On initial downwind 07, the aircraft pitched up and climbed at a high rate of climb. At approximately 6200 feet AMSL, it stalled and the right wing dropped as the aircraft entered into an incipient spin that degenerated into a spiral dive. The aircraft impacted the ground at an almost vertical nose-down attitude. The flight instructor and student pilot sustained fatal injuries, and the aircraft was destroyed by the impact.

The probable cause of the accident was determined as loss of control at low altitude resulting in an inadvertent spin and subsequent spiral dive which was unrecoverable. Contributory factors included: insufficient recovery altitude; lack of training on recovery from stall/spin conditions at low level; limited instructional experience; inadequate system of release of student pilots for first solo check-out.

1. FACTUAL INFORMATION

1.1. History of Flight

On 09 October 2013 at 0937 hours, the Air Accident Investigation Department (AAID) was notified of an accident at the Nairobi National Park by the Wilson Airport Air Traffic Control Tower (TWR). A Cessna 172K of registration 5Y-BWL (BWL) operated by Skylink Flight Services Company Limited (Skylink) was reported to have crashed at the National Park during the conduct of circuit training flights at Wilson Airport (HKNW).

The accident flight was the second flight of the day for the Flight Instructor (CFI) on BWL. According to Skylink personnel, the CFI reported on duty particularly early at approximately 0635 hours on the day of accident. He had scheduled an early morning flight. Air Traffic Control (ATC) records indicated that BWL initially took off from runway 14 of HKNW at 0804 hours with two persons on board – the CFI and a student pilot. They did approximately 40 minutes of circuit training flights at HKNW before landing at 0843 hours. The aircraft was then taxied to Apron 1 of the Airport where another Student Pilot (SP) was waiting for his flight.

The second flight on BWL was to involve the same CFI but with a different student. According to Skylink, the SP was ready for his first solo and needed a senior and more experienced FI for check-out. The senior FI would assess the SP's performance and if

satisfied, clear him for first solo. The purpose of the flight, therefore, was to assess the SP's readiness for release on first solo. They were to perform normal check-out takeoffs and landings on both runways 14 and 07. The flight was a second attempt at first-solo check-out for the SP. The student was reported to have failed in the first attempt at first solo checkout and needed to undergo further training before being released for the second attempt at first solo checkout.

Between approximately 0845 hours and 0854 hours, Skylink ground personnel checked the fuel level on BWL after the first flight. The aircraft had approximately 75 liters and it was topped up with 66 liters of Avgas by a Shell bowser truck under the supervision of the CFI and Skylink ground personnel. The SP was reported to have conducted his pre-flight checks and collected a fuel sample for visual examination prior to the flight. Skylink reported that oil level was also checked by the ground crew. According to the Skylink ground personnel, the general condition of the pilots prior to the flight was normal. BWL was also reported by ground personnel to have been in a satisfactory condition for the flight. It had undergone a check II in August 2013.

At 08:54:38 BWL requested TWR Ground for start-up with the intention of conducting thirty minutes of training circuits. There were two persons on board and the airplane initially reported to have three hours of fuel endurance. At 08:54:45 TWR Ground approved the aircraft start-up and QNH was indicated as 1023.

BWL was ready for taxi at 09:01:23 and it was authorized by TWR Ground to taxi from Apron 1 to the holding point of runway 14. At 09:01:37 TWR Ground again requested for confirmation of fuel endurance and intended duration in the circuit. At 09:01:56 the SP confirmed that there were two souls on board with five hours endurance and they intended to be in the circuit for thirty minutes. The SP was flying the aircraft and handling radio communication during the flight.

Upon arrival at the holding point of runway 14 at 09:05:48 BWL requested TWR Ground for frequency change from the ground frequency of 121.9 MHZ to 118.1 MHZ air frequency. This was approved and at 09:07:14 BWL informed TWR that it was ready for departure. At 09:07:18 BWL was positioned at number three for departure. BWL was lined-up on runway 14 for departure at 09:12:12.

At 09:14:04 BWL was cleared for take-off on runway 14 with a right turn-out. According to ATC transcript winds were reported to be calm at take-off. At 09:15:48 BWL reported to be right downwind runway 07 for a touch-and-go. At 09:15:51 TWR instructed BWL to report final number two. At 09:15:52 the aircraft appeared on radar at an altitude of 5800 feet and a ground speed of 72 knots at 171° heading. At 09:15:57 BWL read back TWR instructions to report final number two. On radar at 09:16:15, the aircraft ground speed is observed to increase to 105 knots and its heading changed to 251° as the altitude increased to 5900 feet. The last words from

BWL recorded on the ATC transcript were “Whiskey Lima……” at 09:16:33. Further efforts by TWR to raise BWL on radio were unsuccessful.

At 09:16:43 BWL’s rate of climb (ROC) on radar is observed to suddenly increase from a negligible figure to 1300 feet per minute. At this point BWL was at an altitude of 6200 feet AMSL and its ground speed had dropped to 088 knots. It was flying at a heading of 245°. At 09:17:06, BWL’s ROC was recorded as 1300 feet per minute as its ground speed remained at 088 knots at a heading of 246°. At 09:17:08, the aircraft disappeared from the radar with the last ground speed recorded being 088 knots at a heading of 246°.

At 09:17:16 a helicopter of registration 5Y-KWM (KWM), which had taken off at 0914 hours for Amboseli, informed ATC that BWL had made a Mayday call. The Mayday call was, however, not copied by TWR and was not recorded by the ATC transcript. At 09:17:22, KWM asked TWR repeatedly for the last location of BWL but there was no immediate response. At 0919 hours TWR reported that BWL was no longer visible on the downwind leg of runway 07. TWR then advised Rescue and Fire Fighting Services (RFFS) that BWL could not be sighted on the circuit and they were put on standby for further instructions from TWR.

At 0919 KWM decided to turn back and checkout on BWL. At 09:21:39, KWM reported to have sighted the BWL wreckage at the Nairobi National Park. At 09:21:52, KWM advised TWR that BWL had crashed at the Park and they were landing. At 0924 hours,

emergency procedures for an aircraft accident were initiated and RFFS were advised to respond to the accident site.

According to eyewitness accounts, as BWL flew on the downwind leg of runway 07, it was observed to bank sharply to the right until the wings were almost vertical to the ground level. The aircraft then slipped before the nose started moving downwards. It then started spinning in the right hand direction until it hit the ground.

According to radar data, BWL was last recorded at 09:17:18 before it disappeared. BWL crashed during the hours of daylight at geographical coordinates of 01°20'44"S, 36°48' 26" E.

Figure 1: Aircraft Flight Path

1.2. Injuries to persons

Injuries	Crew	Passengers	Others	Total
Fatal	2	-	-	2
Serious	-	-	-	-
Minor/None	-	-	-	-
Total	2	-	-	2

1.3. Damage to Aircraft

The aircraft was destroyed by impact forces. There was no post-crash fire.

1.4. Other Damage

There was no other significant damage as a result of the accident.

1.5. Personnel Information

There were two pilots operating BWL at the time of accident. The SP was flying the aircraft under the supervision of the CFI. The SP and CFI respectively occupied the left and right seats. The SP's regular FI (RFI) had released the student to the CFI for a second attempt at first-solo check-out. The RFI needed to get a second opinion from a senior FI on the SP's competence, performance and readiness for release on a first-solo flight.

1.5.1. Check-out Flight Instructor

The CFI was a Kenyan national aged 24 at the time of accident. He held a valid Commercial Pilot's License (CPL) № YK-6672-CL issued on 31 May 2011 by Kenya Civil Aviation Authority (KCAA) after

passing technical examinations. The CPL was endorsed with two type ratings on Piper PA-28 and Cessna C-172. The C-172 rating was issued on 21 September 2012 after Technical Type Rating (TTR) examination was passed and check-out was done. The CFI neither held an instrument rating nor a multi-engine rating.

The CFI joined Skylink for his flight instructor's training on 20 September 2012. He completed his flight instructor's training on 22 November 2012 after 60 hours of ground training and 20.35 hours of flight training. The CFI's CPL was endorsed with the flight instructor's rating (FIR) on 13 December 2012 by KCAA. According to documentation from KCAA, the FIR was initially issued with limitations for the CFI not to instruct on multi-engine aircraft, instruments leading to initial IR, formation and aerobatic flying, low-level flying and he was not to release students on first solo. CFI was only entitled to exercise the privileges of FIR on C-172 and PA-28. The CFI was employed by Skylink as a flight instructor in January 2013 after getting his FIR. According to Skylink, this was the CFI's first employment as a flight instructor.

On 24 July 2013, the CFI passed a practical test for FIR upon which he qualified to perform the duties of a full flight instructor on single engine airplanes endorsed on the CPL. After the practical flight test which took 50 minutes, the examiner recommended for removal of FIR limitations. This test also included a proficiency check on items of theoretical knowledge, preflight briefing and post flight debriefing. On 26 July 2013, the CFI applied for a full FIR

from KCAA. The CFI applied for the removal of FIR limitations. The CFI's total instruction experience at this time was 392 hours. The limitation of "Not to release students on first solo" was removed on 26 July 2013 by KCAA.

The CFI started his flying career in 2009 with a Private Pilot's License (PPL) training at Kenya School of Flying. After passing General Flying Test (GFT) and technical examinations for PPL, the CFI applied for PPL which was issued on 10 August 2009. The GFT included precautions before spinning, recovery from spin, precautions before stalling and stall recovery. The CFI then moved to CMC Flying School for CPL training. KCAA records indicated that the CFI did GFT revision at Skylink on 18 May 2011. On 19 May 2011, the pilot did practical test for issuance of CPL which indicated average pilot performance relative to the experience held. The CFI was recommended for issuance of CPL with PA-28 rating after this test and upon passing technical examinations. Pilot records indicated that the CPL issue flight test was conducted on a PA-28 and included tests on flight at critically low airspeed, recognition and recovery from incipient and full stall, turns including turns in landing configuration, steep turns, flight at critically high airspeeds, including recognition of and recovery from spiral dives.

According to KCAA records, the CFI was examined for Cessna 172 rating on 18 September 2012. During the practical flight test, the pilot was examined on steep turns, flight at critically high speeds,

including recognition and recovery from spiral dives, simulated engine failure, flight at critically low airspeed including recognition and recovery from incipient and full stalls.

At the time of accident the CFI was actually the Deputy Chief Flight Instructor at Skylink. Colleagues spoke of CFI as one of the best instructors in the company. CFI was described as hardworking, organized and dedicated to flying as a career. The CFI had never flown with the SP before the accident flight.

Date of Birth	9 May 1989
Sex	Male
Nationality	Kenyan
License No.	YK-6672-CL
Type of License	CPL (Aeroplanes)
Validity of license	Valid until 29 March 2014
Ratings	Cessna 172 (Issued on 21 Sept 2012); Piper PA28 (Issued on 31 May 2011)
Proficiency check	24 July 2013 – Practical Test for FIR 18 September 2012 – Practical Test for C-172 rating
Total Flying Hours	776
Total Instruction Hours	521.9
Total Instruction Hours as a fully qualified Instructor	129.75
Total hours in Oct 2013 (Instruction Hours)	5.2

Total hours in Sept 2013 (Instruction Hours)	68.55
Total hours in August 2013 (Instruction Hours)	56
Total hours in July 2013 (Instruction Hours)	49.33
Total Hours as PIC	660
Medical Certificate (Class/Valid Date)	Class 1 Medical Certificate. Issued on 26/03/2013; Valid till 29 Mar 2014 (Pilot was to use corrective lenses at all times)
Flight Radio Telephony Operator's License: YK-6672-RL	Initial issue: 10 Aug 2009 Valid till: 08 July 2014

Table 1: Summary of CFI Information

1.5.2. Student Pilot

The SP was a Kenyan national aged 19 at the time of accident. The SP held a valid Student Pilot's License (SPL) № YK-8533-SL issued on 18 February 2013 by KCAA. According to records provided by the ATO, the SP joined Skylink in January 2013. Prior to that, however, the SP had applied for a SPL on 23 September 2012, which was officially received by KCAA. Another application for SPL dated 18 February 2013, which was not officially received, was found in KCAA records. According to Skylink, the SP started flying while still in High School in January 2013. Records from Skylink,

however, indicated that the SP filled the application form for PPL training on 5 August 2013. The SP was medically examined on 20 September 2012 and issued with a Class 2 medical certificate. The medical certificate was valid until 19 September 2014.

Based on the SP's records provided by the ATO, the SP had a total of 15.9 hours at the time of accident. The SP's logbook, albeit undated, indicated a total of 14.3 hours flying experience. Based on the SP's logbook information, he had 11.8 hours on Cessna 172 aircraft type at the time of occurrence.

Based on ATO training records, the SP's familiarization flight was on 20 January 2013 for 0.5 hours. Comments by the instructor at the time indicated that the SP was eager to fly. Most of the SP's flights from January to September 2013 were instructed by the same RFI. Upon accomplishment of 10 exercises after the familiarization flight, the SP was declared ready for circuits by the RFI after having captured the local area well. The last flight conducted by the SP prior to the accident was on 19 September 2013 and it lasted for 1 hour. At the end of this flight, the RFI commented that the SP needed to improve on his landings, approach to land and checks. Landings, rollers, look-out, orientation, normal circuits, straight & level and medium turns were rated by the RFI as average at the end of this last flight. During the SP's training from January to September 2013, areas of improvement noted by the RFI included: turns, look-out,

awareness, landings, rollers, checks, orientation, approaches and observation of aircraft limits.

The SP was reported to have been initially trained on the handling part of the airplane in the air exercises before moving to the circuit pattern to train the SP on how to take-off and land in the circuit. Based on RFI's assessment, the SP's handling of the aircraft was inconsistent. On one flight the SP would perform really well and on the next his performance would be dismal. The SP's training records indicated that he had done his first solo theory exam on 14 September 2013 and it had been marked. Details of how the student performed in the exam were, however, not available. The RFI needed a second opinion from a senior instructor to see what the SP should improve on and assess readiness for first solo.

The first attempt at first solo check-out for the SP was done in September 2013 by a senior flight instructor on BWL. During this flight, the check-out instructor reported that as they approached to land, the SP panicked after encountering a crosswind. After touchdown, the SP was reported to have slammed on the rudder pedal and the aircraft swerved. The instructor acted quickly to restore directional control. The SP, therefore, failed to be cleared for first solo. According to the RFI, the SP was devastated by the incident.

After this incident, the RFI reported that they conducted three more flights with the SP and there was a bit of improvement. The RFI tried to get the instructor who had done the initial first solo

checkout to fly with the SP on the second attempt at first solo check-out. However, the instructor was always busy and the RFI did not want the SP to stay for long without flying. That is when the RFI requested CFI to conduct the second attempt at first solo for the SP. According to RFI, they spoke with CFI on phone the night before the day of the accident. During this conversation, the RFI requested CFI to conduct a first solo check-out on the SP the following day and he agreed. RFI reportedly informed CFI that the SP was not really good and reminded him of a previous incident with the first check-out instructor. RFI reportedly told CFI to be on high alert on approach to land.

Some other incidents regarding the SP training record were reported by other instructors. In one case, the SP was reported to have jammed on the rudder pedal after landing in Nakuru, Lanet Airstrip. The aircraft veered off the runway and hit some bushes dislodging the port navigation light before the instructor managed to bring the aircraft to a stop. On another occasion, it was reported that during approach to land with a crosswind, the airplane was pushed to the side, and instead of correcting the situation, the SP was scared and let go of the controls. The instructor had to immediately take over the controls and they executed a missed approach.

According to the RFI, the SP's awareness was on and off. Sometimes he would just freeze on the turn and continue banking until you force him to turn in the opposite direction. According to the RFI,

sometimes you had to tell the SP what to do and what not to. If the instructor were to remain silent, the SP would not self-correct.

According to the RFI, the SP really wanted to improve and achieve better flying skills. The SP had a bit of fear which the RFI was trying to remove in the course of training to restore self-confidence. Prior to the accident flight, it was reported that the SP had expressed concerns about missing flights. Sometimes the SP would come for classes but fail to be slotted to fly.

Month (2013)	№ of Flights	Total Flight Time (Hours)
January	5	3.9
February	3	1.9
March	6	4.7
April	0	0
May	2	1.3
June	0	0
July	0	0
August	2	2.1
September	2	2
October	0 (Except for the accident flight)	0 (Except for the accident flight)

Table 2: Summary of SP's flights up to the time of accident

1.5.3. Regular Flight Instructor

The RFI was hired by Skylink as a flight instructor in March 2013 after accomplishing flight instructor's training in the same ATO and

getting an FIR endorsement from KCAA. RFI started undergoing PPL training at CMC Flying School in 2009 after finishing High School. The RFI finished the PPL training in September 2010 and in 2011 started CPL ground training at CMC Flying School. After CMC Flying School went under, the RFI moved to Skylink to continue with the CPL training. The RFI was issued with a CPL in September 2012 and thereafter, started the flight instructor's course at Skylink. RFI finished the flight instructor's training in February 2013.

At the time of occurrence, the RFI's total flying experience was approximately 600 hours. RFI was rated on both Cessna 172 and Piper PA28 at the time of occurrence. Most of RFI's flying hours were on the Cessna 172.

Based on SP's training records, the RFI first flew with the SP on 20 January 2013. Based on Skylink records, all the SP's flights were instructed by the RFI with the exception of the first solo check-out flights.

1.6. Aircraft Information

1.6.1. General

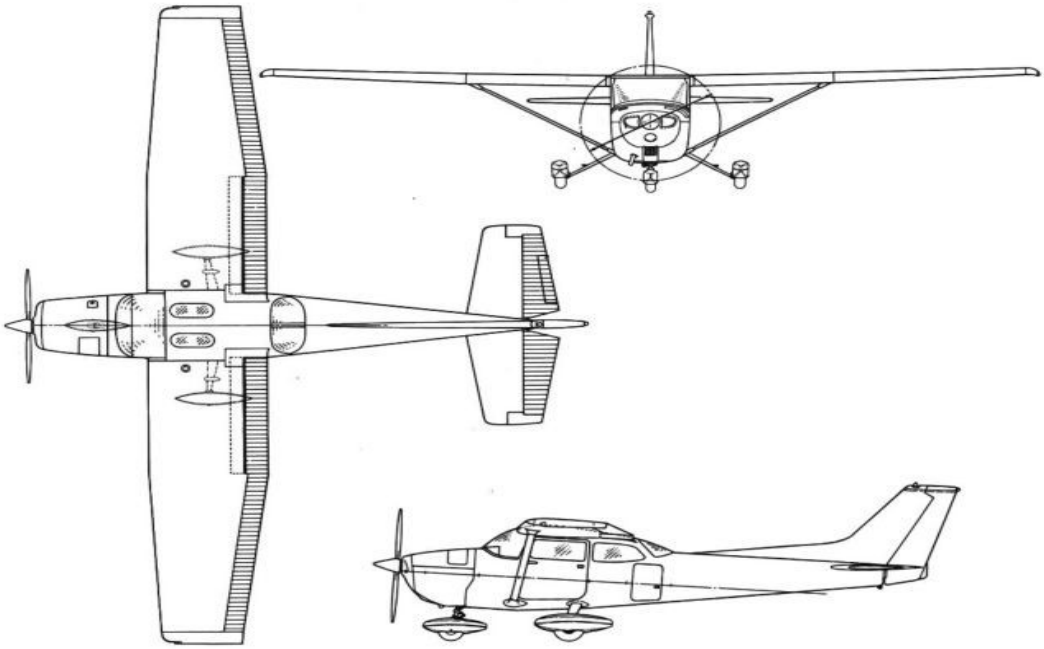


Figure 2: Cessna 172 3-View Schematic

Manufacturer	Cessna Aircraft Company
Type, model, and registration	Cessna 172K, 5Y-BWL
Serial number	17257888
Year of manufacture	1969
Engine type (number of engines)	1 Lycoming O-320-E2D
Total airframe hours	6670.6
Certificate of airworthiness	Valid until: 23 April 2014
Certificate of registration	Date of Issue: 26 January 2009
Propeller type	McCauley IC160

Table 3: General Aircraft Information

BWL had been operated by Skylink since the company inception in 2011 when the aircraft was acquired. Previously BWL was operated by CMC Flying School. All instructors in Skylink were rated on Cessna 172 and had flown BWL. Those interviewed stated that BWL was one of the favourite for most students and instructors.

The last inspection performed on BWL was a Check II in August 2013. After this inspection, a Certificate of Release to Service (CRS) dated 29 August 2013 was issued by the Approved Maintenance Organization (AMO). The CRS was valid until 27 November 2013 or at 6685.2 total airframe hours. At the time of accident BWL had flown for 63.5 hours since the Check II. It had 14 hours left to the next check.

Based on BWL technical logbook information and pilot reports, there were no defects noted on the aircraft from the time of Check II Inspection. Maintenance records and logbooks indicated that no other maintenance work was performed on BWL since the Check II.

At the time of occurrence, the Lycoming O-320-E2D engine of serial number L-24453-27A had 4564.8 hours run since new. The engine had been run for 642.4 hours since the last overhaul which was completed on 24 April 2012. The TBO for this type of engine was indicated as 2000 hours. The last maintenance work on the engine was done during the Check II inspection in August 2013. Engine compression checks, change of engine oil and filter, and ground runs were performed. According to the FI who last flew the aircraft

on 8 October 2013, the static RPM noted was 2350 while the left and right magdrops were 110 and 120 respectively.

According to the AMO which had been maintaining BWL for about one year up to the time of occurrence and based on maintenance records, BWL did not have many snags during the time. Recent maintenance work done on the aircraft included a Check II, Inspection, heavy landing inspection and windshield change in August 2013, and a Check I Inspection in April 2013. During the Check I, flight controls travels and cable tension checks were done. Everything was satisfactory.

1.6.2. Mass and Balance

Based on information provided by the operator, BWL was last weighed on 19 March 2009. BWL's basic weight at the time was 1450 lbs. Maintenance records did not indicate any major modification on BWL that was likely to affect the basic weight up to the time of accident. At the time of accident, the following mass and balance calculations were applicable for BWL:

	Mass (lbs)	Arm (inches)	Moment (in-lb)
Aircraft Basic Weight	1450	+38.96	56492
SP	120	+36	4320
CFI	137	+36	4932
Fuel	222	+48	10656
Luggage	10	+95	950
	1939		77350

Table 4: Mass and balance calculations for 5Y-BWL

Based on the above data, the loaded Centre of Gravity (CG) at the time of occurrence was 39.89 inches aft of datum.

According to the POH, the forward CG limit at 1950 lbs. or less is 35.0 inches aft of datum. The aft CG limit is indicated as 47.3 inches aft of datum at all weights. This data applies to a normal category aircraft.

1.6.3. Stall speeds for Cessna 172

According to radar data, the last recorded Ground Speed (GS) was 88 knots at a point when the aircraft ROC was 1300ft/min. The True Airspeed (TAS) was therefore slightly lower than the GS considering the wind speed vector. IAS and CAS values would also be lower than the TAS value.

The POH prescribes the following stall speeds for various configurations and CG positions under power off conditions.

Weight LBS	Flap Deflection	Angle of Bank							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
2300	UP	42	50	45	54	50	59	59	71
	10°	47	47	40	51	45	56	54	66
	40°	36	44	38	47	43	52	51	62

Table 4(i): Stall speeds at the most rearward CG

Weight LBS	Flap Deflection	Angle of Bank							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
2300	UP	47	53	51	57	56	63	66	75
	10°	44	51	47	55	52	61	62	72
	40°	41	47	44	51	49	56	58	66

Table 4(ii): Stall speeds at the most forward CG

1.6.4. Spin characteristics of Cessna 172

According to the Pilot's Operating Handbook (POH), intentional spins are approved on the Cessna 172 within certain restricted loadings. Spins with baggage loadings or occupied rear seat(s) are not approved. No spins should be attempted without having received dual instruction both in spin entries and spin recoveries from a qualified instructor who is familiar with the spin characteristics of Cessna 172.

The POH recommends under normal procedures that spin entries should be accomplished at high enough altitude for recoveries to be completed 4000 feet or more above ground level. According to the POH, at least 1000 feet of altitude loss should be allowed for a 1-turn spin and recovery, while a 6-turn spin and recovery may require more than twice that amount. The POH further recommends that in any case, spin entries should be planned so that recoveries are completed well above the minimum 1500 feet above ground level. The POH also indicates that during extended spins of two to

three turns or more, the spin will tend to change into a spiral, particularly to the right. The spiral will be accompanied by an increase in airspeed and gravity loads to the plane. In the event that this occurs, the POH indicates that recovery should be accomplished quickly by leveling the wings and recovering from the dive.

Under the Emergency Procedures' section of the POH, the following recovery procedure is stipulated for use in case of an inadvertent spin on a Cessna 172:

1. *Retard the throttle to idle position.*
2. *Place ailerons on neutral position.*
3. *Apply and hold full rudder opposite to the direction of rotation.*
4. *Just after the rudder reaches the stop, move the control wheel briskly forward far enough to break the stall.*
5. *Hold these control inputs until rotation stops.*
6. *As Rotation stops, neutralize the rudder, and make a smooth recovery from the resulting dive.*

1.7. Meteorological Information

Weather information was available to the crew from ATC. Official Meteorology Aerodrome Routine Weather Reports (METARs) for HKNW were issued hourly and sometimes as conditions may warrant, such as during wind shift, change in visibility or cloud cover.

The 0900Z METAR for HKNW on 09 October 2013 indicated that the wind speed was 5 knots from the direction of 180° and visibility was better than 10 km. Outside air temperature was recorded as 18°C, the dew point was 13°C, and QNH was 1023.5 hPa at the time. The average humidity was recorded as 77%. Clouds were broken at 1800 feet.

1.8. Communications

Normal radio communications were maintained between BWL and TWR from taxi up to the time when the aircraft was on the downwind leg of runway 07. The last complete transmission recorded from BWL happened as it read back TWR instructions to report final number two. Thereafter, the last record was "Whiskey Lima……." However, the mayday call from BWL, which was overheard by KWM, was neither received nor recorded by TWR. A complete recording of both the voice recording and transcript of the radio transmissions between the BWL and TWR was made available for the investigation. There were no background sounds that could be heard on the voice recording during the last transmissions of BWL.

1.9. Aerodrome Information

Wilson Airport (ICAO designation HKNW) is located at latitude 01° 19' 18.19" S and longitude 036° 48' 53.40" E at an elevation of 5546 feet AMSL. The airport has two asphalt runways 07/25 (4800×79

ft.) and 14/32 (5118×75 ft.). The airport is equipped with an air traffic control tower manned by controllers on shift basis.

Training flights are among the most common at HKNW. The majority of Kenya's flight training schools are based in the Airport. Training circuits at the Airport would normally be conducted on both runways 14 and 07 for take-offs, landings and touch-and-goes.

The common circuit pattern for training flights at HKNW would normally start with a takeoff from runway 14 followed by a right turn out into the downwind leg of runway 07 after initial climb. The aircraft would then transition to the base leg and finals 07. The required normal circuit pattern altitude for HKNW is 6300 feet AMSL for fixed wing aircraft on a right turnout.

1.10. Wreckage and Impact Information

The aircraft wreckage was located at latitude 01°20'44"S and longitude 36°48'26"E in the Nairobi National Park. The accident site was located approximately 1.6 nm from HKNW at a bearing of 196°. The aircraft crashed almost abeam the threshold of runway 07 at a distance of 1.23 nm from the threshold. The aircraft struck the ground in an almost vertical, nose-down attitude on a relatively flat terrain with a few shrubs and bushes. The site elevation was 5510 feet AMSL. Wreckage debris was distributed over a distance of 17 meters from the initial point of impact in a direction of 120° East of South East.

The initial impact mark on the ground was that of both wings and the propeller. There was a distinctive ground mark indicative that both wings hit the ground almost simultaneously. The front of the aircraft including the leading edge of the wings was found severely crashed and deformed. The propeller was found detached from the engine at the point of initial impact.

Figure 1: Initial Impact point and direction of debris flow

Glass fragments consistent with the windshield and a section of the spinner were found close to the point of separation of the propeller from the engine in the direction of debris flow. Further along the

debris trail was a detached section of the engine cowling located 3 meters from the propeller. A section of the front fuselage skin was also found separated 3.5 meters from the propeller.

The main wreckage which included the nose wheel, engine, wings, fuselage and empennage was located 5 meters from initial point of impact. The tail section was located 10 meters from the propeller. The tail section was found to have broken from the main wreckage at about Fuselage Station FS 108.00. Other sections of the tail were found generally intact. Wingtips, left cabin door and right cabin door were found separated from the main structure. The right hand cabin door was found furthest from the initial point of impact at 17 meters from the propeller.

The right wing moved in a clockwise direction from the point of initial contact through an arc of 36° relative to the ground mark of initial impact. The left wingtip section remained relatively in the same position of initial impact as the rest of the aircraft moved in a clockwise direction. The right wing fuel tank was found ruptured and fuel was found released at high force into surrounding vegetation in the direction of debris movement. Evidence of discoloured brown vegetation in the direction of debris flow was found at the site.

The cockpit area of the aircraft was found badly damaged and disrupted as a result of the ground impact. There was significant damage to the rudder, aileron and elevator controls. Flaps were found in the full up position. The elevator was not trimmed and the

rudder did not appear jammed. A preliminary visual examination on the continuity and integrity of the flight control systems was done at the crash site to the extent possible considering the damage. Nothing significant was noted.

The propeller assembly separated from the engine at the hub at the point of initial impact. Further examination of the aircraft propeller at the accident site revealed that the blade which rested on the right side of the aircraft was bent close to the hub and had some chordwise scratches. The other blade was relatively intact with no substantial bending or twisting.

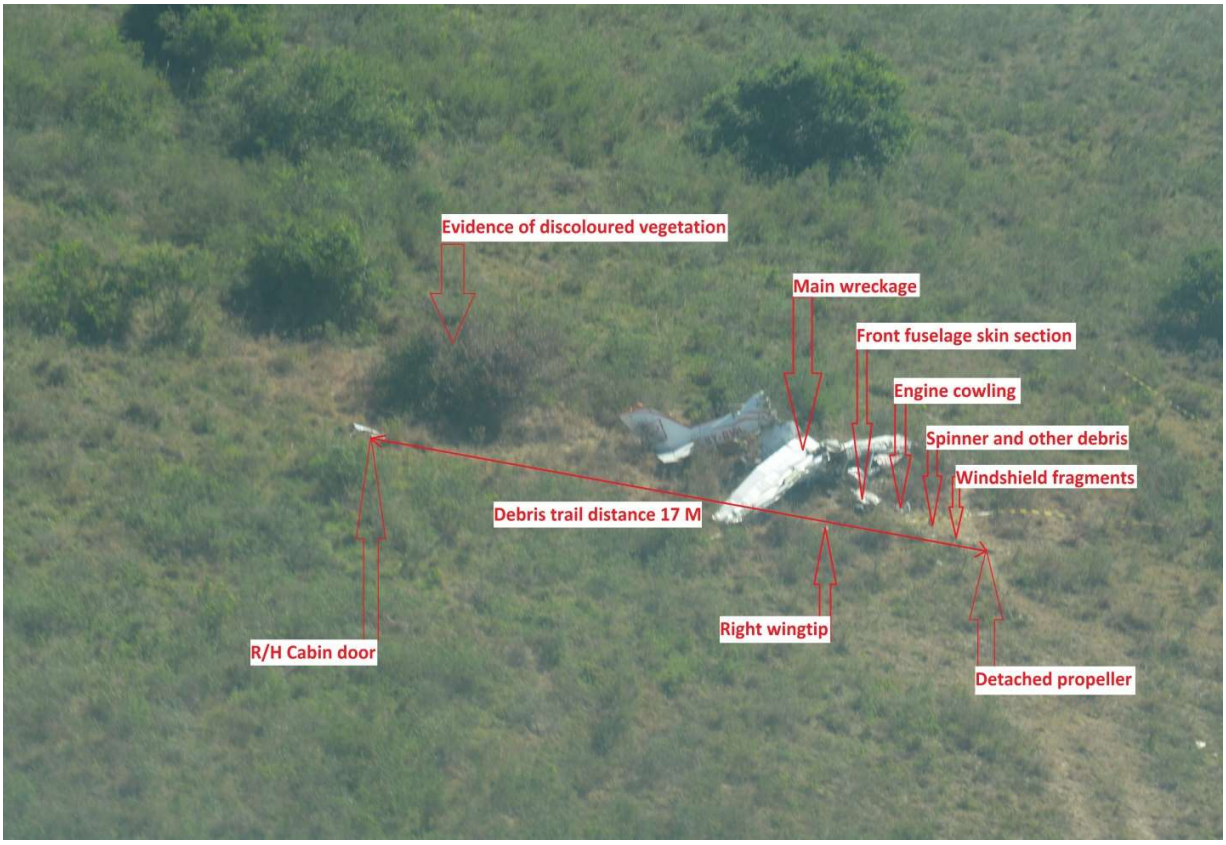


Figure 2: Wreckage debris trail at the accident site

1.11. Medical and pathological information

The aircraft was in a nose-down attitude as it struck the ground and the front cockpit section was subjected to greater impact forces than the rear. Both the CFI and the SP sustained fatal injuries as a result of the accident. Results of medical and pathological examination were not available for this investigation.

1.12. Fire

There was no evidence of fire in flight or after impact.

1.13. Survival Aspects

Search and rescue efforts were voluntarily initiated by a KWS helicopter KWM that overheard the mayday call from BWL. The helicopter identified the wreckage in the Nairobi National Park approximately four minutes after the occurrence. After landing close to the accident site and verifying the status of the occupants, the pilot of KWM advised TWR that both occupants had sustained fatal injuries. Thereafter, emergency procedures for an aircraft accident were initiated and RFFS was advised to respond to the accident site.

The SP and CFI occupied the left and right seats respectively in the cockpit during the flight. The nose section and cockpit area of the aircraft received substantial crushing damage that destroyed livable volume surrounding the occupants. Both pilots were found with their seat belts still on. The accident was not survivable.

1.14. Recorded Information

Radar data for the accident flight was recorded and made available to the investigation by the ATC. The recorded information included time, distance and bearing from HKNW, ROC, altitude, ground speed, heading, and coordinates.

The aircraft appeared on radar at 09:15:52 while on the right downwind leg of runway 07 at an altitude of 5800 feet AMSL. The aircraft continued to climb normally until 09:16:43 when its ROC suddenly rose to 1300ft/min while at an altitude of 6200 feet AMSL. The aircraft continued to climb at 1300ft/min until it disappeared from radar at 09:17:08. The aircraft heading did not change substantially with the final heading recorded at 246°. The GS based on radar data remained constant at 88 knots from 09:16:43 until when the aircraft disappeared from radar. Figure 3 below indicates the aircraft flight track based on radar data.

Figure 3: Accident Flight Track based on radar data

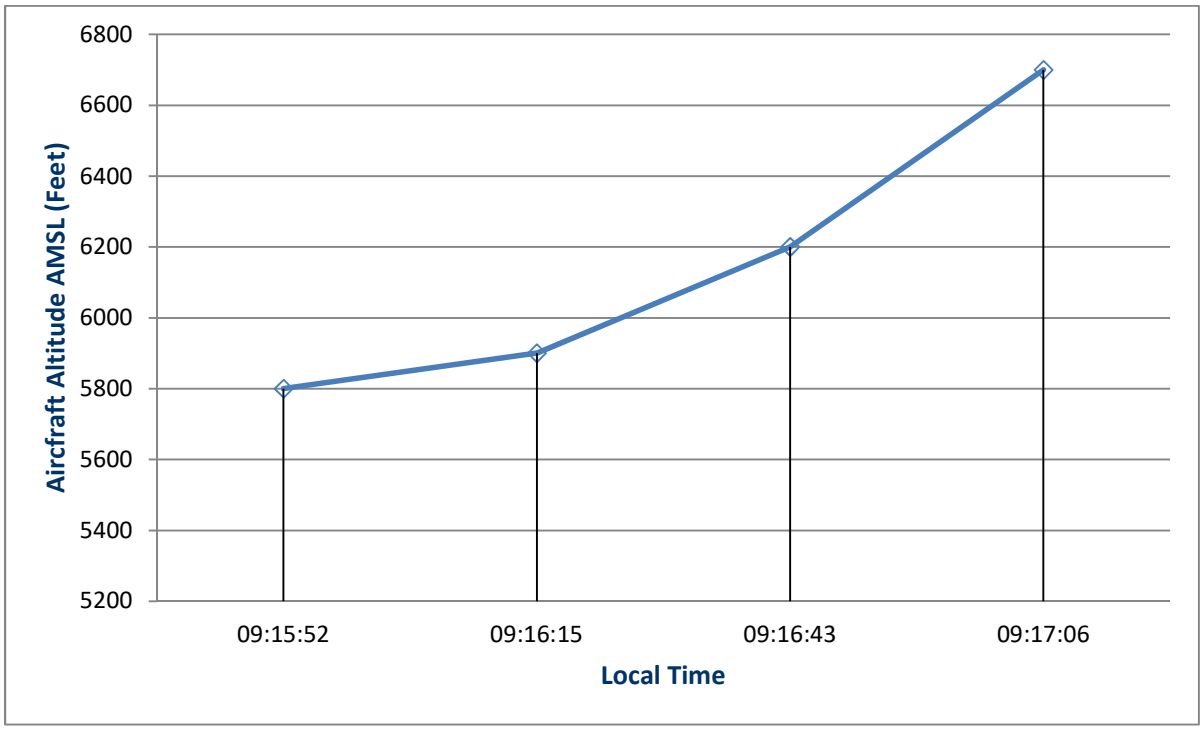


Figure 4: Change in altitude over time for the accident flight

1.15. Tests and Research

During the investigation, a flight was conducted to simulate a normal circuit pattern used for training flights at HKNW and compare it with the accident flight. The flight was conducted on a similar aircraft and with a FI. During the flight, take off was conducted from runway 14 with a right turn-out to the downwind leg of runway 07, then to the base leg and finals 07 for a touch and go. It was noted that variations do occur in the flights at the circuit pattern at HKNW, but the general pattern was always similar. The flight also provided for aerial photography of the accident site. Figure 5 below shows a comparison of the normal circuit pattern of the simulated flight with the flight track of the accident flight.

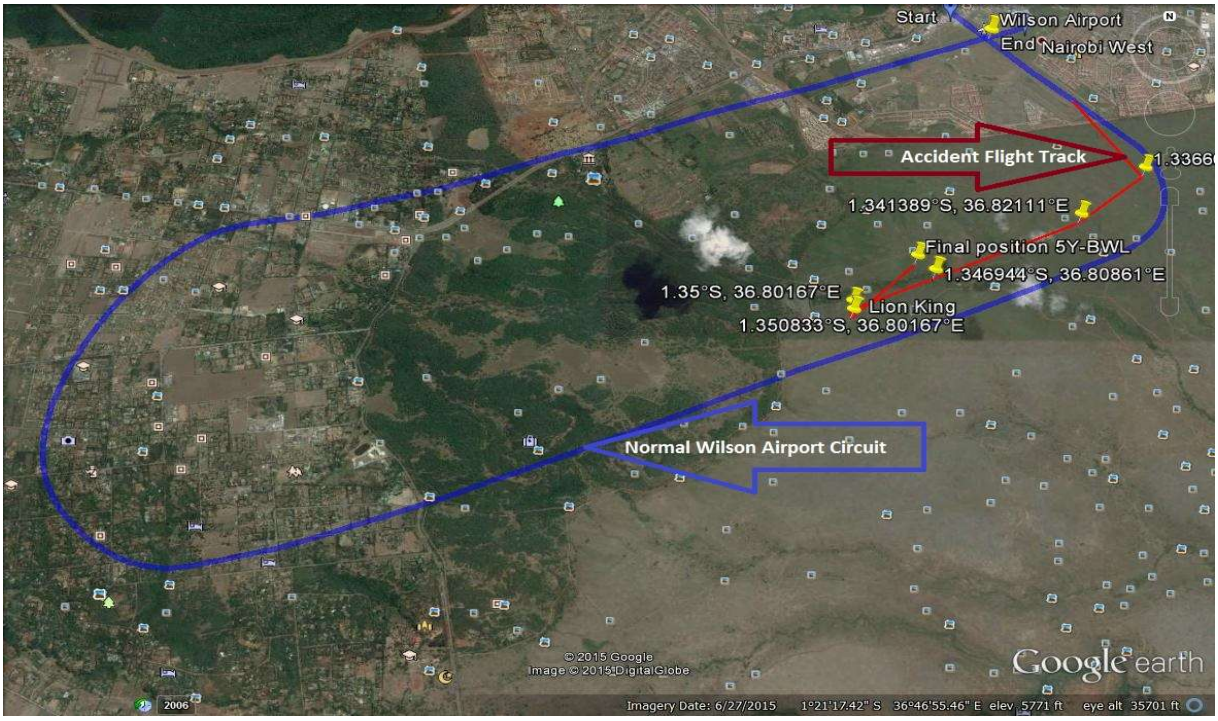


Figure 5: A comparison of the accident flight track with a simulated normal circuit pattern at HKNW

1.16. Organizational and Management Information

1.16.1. Kenya Civil Aviation Authority

The Civil Aviation (Personnel Licensing) Regulations, 2013 outlines the eligibility requirements for flight instructor rating. According to Regulation 81(1)(g) the following provisions are applicable to be eligible for a FIR:

> *81. (1) To be eligible for a flight instructor rating an applicant shall-*
>
> *(g) have accomplished the following for a flight instructor rating with an aircraft rating-*
>
> *(i) receive a logbook endorsement from an authorized instructor indicating that the applicant is competent and possesses instructional proficiency in stall awareness, spin entry, spins, and spin recovery procedures after receiving flight training in those training areas in an aircraft, as appropriate, that is certificated for spins; and*
>
> *(ii) demonstrate instructional proficiency in stall awareness, spin entry, spins, and spin recovery procedures;*

A review of KCAA records on the CFI's application for a FIR on 26 July 2013 indicates the results of the practical test conducted on 24 July 2013. According to the Practical Test Report, the following remarks were made by the examiner after the test:

> *Qualified to carry out the duties of a full instructor on single engine aeroplanes on licence. Limitations removed.*

According to KCAA records, the only limitation removed on 26 July 2013 was the one preventing the CFI from releasing students on first solo. At the time of accident, the CFI was still not eligible to instruct on multi-engine airplanes, instruments leading to initial IR, formation and aerobatic flying and low level flying.

Based on the Practical Test Report for FIR and the CFI's logbook, there was no indication that the CFI had met the provisions stipulated on Regulation 81(1)(g)(i) & (ii). Part 3 of the Practical Test Report indicated the areas tested during the flight and included Arrangement Demo, Synchronization of Speech with Demo, Correction of Faults, Aircraft Handling, Instructional Technique, General Airmanship/Safety, Positioning and Use of Airspace. There was no evidence that, at the time of occurrence, CFI was competent and possessed instructional proficiency in stall awareness, spin entry, spins, and spin-recovery procedures after receiving flight training in those training areas in an aircraft, as appropriate, that is certificated for spins. There was no clear demonstration of instructional proficiency in stall awareness, spin entry, spins, and spin recovery procedures as per the documents submitted for application for a FIR.

Regulation 88 of the Civil Aviation (Personnel Licensing) Regulations, 2013 has outlined the limitations imposed on flight instructors. Regulation 88 (4) (a) & (c) states as follows:

88(4). A flight instructor shall not endorse:-

(a) a student pilot's logbook for solo flight privileges, unless that flight instructor has- (ii) determined that the student is prepared to conduct the flight safely under known circumstances, subject to any limitations listed in the student's logbook that the instructor considers necessary for the safety of the flight;

(c) a logbook of a pilot for a flight check-out, unless that instructor has conducted a review of that pilot in accordance with the requirements of regulation 29;

At the time of occurrence, the SP still had some known weaknesses. However, according to Skylink, the SP was ready for first solo check-out.

At the time of occurrence, air traffic at the TWR was being manned by a trainee Air Traffic Controller. There was busy air traffic at the time and the trainee controller only observed that the aircraft was no longer on downwind at 0919 hours. KWM had to ask the controller repeatedly for the location of BWL.

1.16.2. Skylink Flight Services Limited

1.16.2.1. General

Skylink Flight Services Company Limited was incorporated in 2011 with the core business of conducting flight training as an Approved Training Organization (ATO). At the time of occurrence, the company held an approval certificate issued by KCAA to operate as an ATO from 24 December 2012 to 23 December 2013. According to KCAA Air Service License in force at the time of accident, the ATO

was authorized to operate Cessna 172, Cessna 150, Cessna 152, Piper PA28, PA44, Cessna 208, and Cessna 206 aircraft types. The company had six active instructors at the time of occurrence, with a provision for freelance instructors in the Training Manual (TM). The CFI was among the six active instructors hired by the company. Skylink had entered into a maintenance agreement with Hawk Aviation Limited to maintain its aircraft fleet.

1.16.2.2. Training Records

According to the Skylink TM, the ATO was to maintain and retain training records which include details of training given to individual students, records of progressive assessments, regular progress tests, and examinations, and trainee information. The TM also indicated that a system for recording and retaining the qualifications and training of instructors was in place in the company. However, the student records provided by Skylink only indicated details of progressive assessments and trainee information. There were no details of regular progress tests and examinations as per the TM. The results of the SP's first solo theory exam were not captured in the records. In addition, the SP's records did not indicate the various incidents and weaknesses that the SP was reported to have had before the first solo check-out. The initial attempt at first solo that almost resulted in a runway excursion was not captured in the training records or in any other company documentation. A 7-hour check was conducted based on the SP's training records. However, the 10-hour check ride stipulated in the

TM to determine if the SP had the ability to pursue flying or not appears not to have been conducted based on the records.

According to the TM, instructors were to undergo a proficiency check every 6 months, standardization training and an upgrading training for assistant flight instructors. However, based on the records provided by the ATO, there was no evidence that the CFI had undergone these trainings. The only record of recent training for the CFI was an initial FIR practical test on 10 December 2012 and another practical test for full FIR on 24 July 2013.

1.16.2.3. Training Programme

The Skylink TM outlined a training programme (TP) for both PPL ground school and PPL flight training. PPL ground school was for 220 hours and the flight training was to be covered in 45 hours. However, it was not clear from the TP how both trainings would be conducted systematically for a student pilot to progressively qualify for PPL. According to Skylink, the SP was ready for first solo at the time of occurrence. Based on the TP presented in the TM, the SP should have therefore accomplished preparations for first solo in the aerodrome circuit. The total hours flown by the SP should have been twenty if the training was conducted systematically and sequentially as per the TP. The PPL flight TP did not indicate the order in which exercises would be conducted.

According to the PPL flight TP, training on recovery from stalls, unusual attitudes, medium turns, steep turns and forced field

landing was the next exercise after preparation for first solo. In addition, the TM indicated that students were to receive and log flight training from an authorized instructor on, among others, flight at critically slow speeds, recognition of, and recovery from, incipient and full stall and also on flight at critically high speeds, recognition of, and recovery from, spiral dives. However, the PPL flight TP did not include the exercise on recognition of and recovery from spiral dives.

According to the TM, students are to be briefed and debriefed on various air exercises including sides-slipping, spinning (how to avoid it), steep turns, unusual attitudes, stalling among others. However, it was not clear how these briefings and debriefings were being implemented in the TP. A copy of Skylink PPL flight TP has been appended in this report.

1.16.2.4. First solo flight preparations and check-out

According to the Skylink TM, no solo flights are to be authorized unless the student has satisfied specified criteria which include flights at various airspeeds from cruise to slow flights, stall entries from various flight attitudes and power combinations with recovery being initiated at first indication of stall, and recovery from full stall, emergency procedures, among others. However, the standards to be met by the student have not been specified in the TM. A copy of the criteria for authorization for first solo has been appended in this report.

According to Skylink, it was an organizational policy for students who were deemed to be ready for first solo flight by the regular FI to be checked out by a different instructor, usually a more senior instructor. However, the TM was silent on this policy. First solo check-out procedures were not very clear on which instructor would conduct the first solo check-out flights. The process of handing over the student from the regular instructor to the check-out instructor, who may never have flown with the student before, was not clearly stipulated.

According to the ATO, before first solo check-out flights, students at Skylink sit for a theory exam which is marked and the results are made available to the check-out flight instructor. The check-out instructor would usually go through the results of the theory exam on the first solo check-out form and review the student training records before the flight. The first solo check-out form was basically a questionnaire that enabled the instructor to know if the student has been taken through all the necessary trainings for first solo. The check-out instructor would also receive briefing on the student from the regular instructor. For first solo flight clearance, the student would go through the first solo-check-out form practically in the aircraft during flight. A sample of the first solo check-out form is appended in this report.

According to Skylink, first solo check-out of students in the company was carried out on both runways 14 and 07 of HKNW. Students would normally be checked out for any possible

emergency procedures like engine failure, flapless approaches, crosswind landing, normal landing, high approaches, low approaches, high and low level go-around, student briefings in the event of system failure, engine failure after takeoff, and student briefings on high speed landings. Engine failure simulations would usually be conducted after takeoff during first solo check-outs. According to Skylink stall checks would not normally be conducted in the HKNW circuit but in the local area.

The company had a checklist to assist instructors conduct first solo check-out flights systematically. However, according to Skylink, the sequence of conducting the first solo check-out may vary depending on the circumstances of the flight. The check-out flight instructor may change the sequence of the exercises.

According to Skylink, it had been agreed during a company safety meeting that instructors would not conduct emergency checks or simulations on the first circuit of first solo check-out. The first circuit would normally be a normal circuit with no emergency checks. However, evidence of this agreement was not available.

Downwind checks on a normal circuit would usually be done by the student in preparation for the base leg and finals for a touch-and-go. Normally the student would check that the engine is running smoothly and confirm that they are in the circuit altitude which should 1000 feet above ground (approximately 6300 feet AMSL). The aircraft should be configured for cruise on the downwind leg. Altitude on the downwind leg would normally only change as the

aircraft turns for the base leg. Normally, the pilot would reduce the throttle while maintaining the pattern altitude; maintain a constant speed; maintain a constant distance from the runway along the downwind leg; inform ATC that the aircraft is established on the downwind leg.

1.16.3. Change in experience requirements for PPL

Regulation 44 of the Civil Aviation (Personnel Licensing) Regulations, 2013 has outlined the aeronautical experience and skill requirements for PPL.

44. (1) An applicant for a Private Pilot Licence (PPL) with an aeroplane category rating shall have completed-

(a) for a single engine class rating for each category rating sought:

(i) not less than 40 hours of flight time as pilot of aeroplanes, a total of 5 hours may have been completed in a synthetic flight trainer; and

(ii) not less than 10 hours of solo flight time under the supervision of an authorized flight instructor, including 5 hours of solo crosscountry flight time with at least one crosscountry flight totalling not less than 270 km (150 NM) in the course of which full-stop landings at two different aerodromes shall be made;

According to Skylink, since KCAA reviewed the minimum hours of flight time for PPL from 55 hours to 40 hours, there has been a lot pressure on instructors and ATO's to meet this requirement without

compromising on the quality of training. ATO's are now conducting first solo check-outs earlier than before the change in this regulation. This is because students are required to have 10 hours of solo flight for both crosscountry and local area circuit training.

Majority of ATO's in Kenya are located at and operate from Wilson Airport. The busy air traffic and ground congestion at Wilson means that training aircraft conduct less number of circuits per unit time at Wilson compared to other less busy aerodromes. The quality of training achieved may thus be affected.

Due to the competitive nature of pilot training at Wilson, ATO's strive as much as possible not to exceed the minimum requirement of 40 hours for PPL. This is likely to compromise on the quality of training as students may be pushed through the process without necessarily being competent enough. ATO's whose students consistently exceed the threshold are financially unattractive to prospective students, who do not want to pay for more than 40 hours to get the PPL.

1.17. Additional Information

1.17.1. Witnesses

The helicopter pilot of KWM was the first person to arrive at the accident site. The helicopter had taken off from HKNW at 0914 heading for HKAM just before BWL. The pilot reported that he overheard on the radio as BWL made a mayday call. According to the pilot, the exact words overheard were: *"Mayday Mayday*

Mayday, Bravo Whiskey Lima". KWM at the time was past Nazarene Visual Marker. The pilot made a voluntary decision to check-out on BWL after picking the distress call. According to the helicopter pilot, he made minimal disturbance on the wreckage to check on the condition of BWL occupants.

Another key witness was an aircraft dispatcher who was located at Apron 1 of HKNW at the time of accident. The witness position was approximately 1.6 nm from the accident site. According to the witness, they were preparing to fuel an aircraft outside the hangar. The eyewitness reported that he initially saw the aircraft bank to the right. The aircraft continued to bank until he could see the entire aircraft upper surface and both wings almost in a vertical position. The witness reported that he then saw the aircraft slip before its nose started moving downwards. The witness then observed that the aircraft started spinning towards the right hand direction. According to the witness, he could literally see both aircraft wings rotating in a circular pattern until it disappeared.

Several other witnesses including tourists and game wardens at the Nairobi National Park also saw the aircraft in a spin.

1.17.2. Stall and Spin Awareness

The State of aircraft manufacture through the Federal Aviation Administration (FAA) had published an Advisory Circular AC 61-67C on Stall and Spin Awareness. The material in this section is based on information from this AC.

According to the AC, a stall is a loss of lift and increase in drag that occurs when an aircraft is flown at an angle of attack (AOA) greater than the angle for maximum lift. If recovery from a stall is not effected in a timely and appropriate manner by reducing the AOA, a secondary stall and/or a spin may result. All spins are preceded by a stall on at least part of the wing. The AC emphasizes that the stall is the result of excessive AOA - not insufficient airspeed. A stall, therefore, can occur at any airspeed, in any attitude, and at any power setting.

Accelerated or inadvertent stalls can occur at higher-than-normal airspeeds due to abrupt and/or excessive control applications. These stalls may occur in steep turns, pullups, or other abrupt changes in flightpath. Accelerated stalls usually are more severe than unaccelerated stalls and are often unexpected because they occur at higher-than-normal airspeeds.

A spin in a small airplane or glider is a controlled (recoverable) or uncontrolled (possibly unrecoverable) maneuver in which the airplane or glider descends in a helical path while flying at an AOA greater than the critical AOA. Spins result from aggravated stalls in either a slip or a skid. If a stall does not occur, a spin cannot occur. In a stall, one wing will often drop before the other and the nose will yaw in the direction of the low wing.

According to the AC, a spin would normally occur in two portions. An incipient spin is that portion of a spin from the time the airplane stalls and rotation starts, until the spin becomes fully developed.

Incipient spins that are not allowed to develop into a steady state spin are commonly used as an introduction to spin training and recovery techniques. A fully developed, steady state spin occurs when the aircraft angular rotation rate, airspeed, and vertical speed are stabilized from turn-to-turn in a flightpath that is close to vertical.

According to the AC, many airplanes will enter a spin but the spin will become more vertical and degenerate into a spiral. When the spin transitions into the spiral the airspeed will increase as the nose goes down to near vertical. The side forces on the airplane build very rapidly and recovery must be effected immediately before exceeding the structural limits of the airplane.

The primary cause of an inadvertent spin is one wing exceeding the critical AOA while executing a turn with excessive or insufficient rudder, and, to a lesser extent, aileron. In an uncoordinated manoeuvre, the pitot/static instruments, especially the altimeter and airspeed indicator, are unreliable due to the uneven distribution of air pressure over the fuselage. The pilot may not be aware that the critical angle of attack is about to be exceeded until the stall warning device activates. If a stall recovery is not promptly initiated, the airplane is more likely to enter an inadvertent spin. The spin that occurs from cross-controlling an aircraft in a skidding turn usually results in rotation in the direction of the rudder being applied, regardless of which wing tip is raised. In a slipping turn, where opposite aileron is held against the rudder, the resultant spin

will usually occur in the direction of the applied rudder and opposite the aileron that is being applied.

As a rough estimate, an altitude loss of approximately 500 feet per each 3-second turn can be expected in most small aircraft in which intentional spin is approved. Greater losses can be expected at higher density altitudes.

There is another danger in excessive rudder use during gliding turns. As the airplane skids, the bank will increase. This often alarms the beginning pilot when it occurs close to the ground, and the pilot may respond by applying aileron pressure toward the outside of the turn to stop the bank. At the same time, the rudder forces the nose down and the pilot may apply back-elevator pressure to hold it up. If allowed to progress, this situation may result in a fully developed cross-control condition. A stall in this situation will almost certainly result in a spin.

2. ANALYSIS

2.1. General

The CFI and SP possessed valid CPL and SPL respectively at the time of occurrence. The CFI held valid FIR and was rated on the Cessna 172 aircraft type. The SP was flying the aircraft under supervision from the CFI for a second attempt at first solo flight check-out. There was no evidence that physiological factors or incapacitation affected the performance of the flight crew based on radio transmissions with TWR and as observed by ground witnesses prior to the flight.

The accident aircraft had all the relevant valid certificates to conduct the flight. The aircraft was equipped and maintained in accordance with applicable regulations. Based on available records, no maintenance work had been performed on the aircraft since the last scheduled maintenance in August 2013. Engine hours were within the TBO limitation. Takeoff, climb and right turnout was uneventful during the accident flight based on TWR communications and witness information. Based on information from flight crew who had flown the aircraft recently before the accident, the aircraft was in a good operating condition with no snags experienced or reported since the last check. Based on available information at the time of this report, all essential aircraft systems appeared capable of normal operation prior to the accident.

There was no evidence of pre-existing structural, system or engine failure.

The aircraft was not loaded with any cargo during the accident flight. The loading of the aircraft during the accident flight was considered routine with no anomalies reported. The aircraft was loaded with sufficient fuel for the intended flight. The aircraft was operating within the prescribed CG limits at the time of occurrence.

At the time of accident, winds were reported calm at 5 knots from a direction of 180°. Clouds were broken at 1800 feet AGL. It was considered that there was no significant meteorological condition that could have affected the accident flight.

The sequence of events in this accident was consistent with a loss of control during a low level flight. This analysis will focus on Wreckage and Impact Information, Recorded Information, Aircraft Stall and Spin Characteristics, Flight Crew Qualifications and Training and Organizational Influences.

2.2. Wreckage and Impact Information

The aircraft crashed in an almost vertical, nose-down attitude on a relatively flat terrain. The cockpit area was badly damaged and disrupted as a result of ground impact at a high vertical velocity. The main wreckage was located 5 meters from the initial point of impact which was indicative of very low horizontal velocity. The aircraft did not disintegrate much at impact with the exception of the front section of the fuselage. The furthest piece of debris was

located 17 meters from the initial point of impact. Fuel was spilled over a distance of 10 meters from the resting point of the right wing tip as indicated by evidence of discoloured brown vegetation at the accident site.

The aircraft right wing moved in a clockwise direction from the initial point of impact through an arc of 36°. The left wingtip section remained relatively in the same position of initial impact as the rest of the aircraft moved in a clockwise direction. This difference in alignment of the ground mark of initial impact and the final resting position of the main wreckage was a clear indication that the aircraft was in a spin to the right at the time of impact. This was corroborated by witness statements of those who had observed the spin.

There was significant damage to the rudder, aileron and elevator controls in the cockpit. Flaps were found in the full up position which was consistent with the position at the start of the downwind leg. The elevator was not trimmed and the rudder did not appear jammed. A preliminary check on the continuity and integrity of the flight control systems was done at the site to the extent possible considering the damage. This check did not reveal anything significant to the investigation.

The separation of the propeller assembly was typical of that associated with considerable rotational energy absorption at impact. The propeller assembly was subjected to considerable torque forces during the sudden stoppage at impact resulting in the

separation of the propeller due to the nose down attitude of the airplane. A propeller under power that strikes the ground in a vertical attitude usually comes to a stop in microseconds of impact and the energy gets absorbed into the propeller separating due to the dissipation of the torque loads. It was considered that during the steep attitude impact, the blade that struck the ground first caused the engine to stop suddenly resulting in power related damage to the single blade and none to the other.

2.3. Recorded Information

Based on radar data, the last recorded position of the accident aircraft was on the downwind leg of runway 07 at an altitude of 6200 feet AMSL and climbing at 1300 feet per minute. This ROC would have indicated a sudden pitch-up of the aircraft. The sudden pitch-up was, however, not collaborated by witness information. It was considered that the high ROC recorded prior to the occurrence was likely to be inaccurate or as a result of a sudden and inadvertent pitch-up due to inadequate aircraft control or may have resulted from a deliberate yanking of the control column. The heading of 246° was generally consistent with an aircraft on the downwind leg of runway 07. The last aircraft groundspeed recorded was 88 knots. The aircraft disappeared from radar about 30 seconds after transmitting its last communication to TWR.

2.4. Aircraft Stall and Spin Characteristics

The last recorded aircraft groundspeed was 88 knots, which was higher than the TAS, KIAS and KCAS. Based on witness information, the aircraft banked sharply on the right before its nose moved down. This was consistent with a stall condition where one wing drops before the other and the nose yaws in the direction of the low wing. According to AC, an accelerated stall can occur at a higher than normal airspeed due to abrupt or excessive control applications. The stall may lead to an inadvertent spin if one wing exceeds the critical AOA while executing a turn with excessive or insufficient rudder, and, to a lesser extent, aileron. It was considered that the aircraft entered into an accelerated stall during climb which resulted in an inadvertent spin in the right direction. Based on the physical evidence at the accident site and witness information, it was considered that the aircraft entered into a spin that quickly degenerated into a spiral dive before ground impact.

Although intentional spins were approved on the Cessna 172, this was not planned to be performed as an exercise during the first solo check-out flight. Based on radar data, the aircraft was likely to have entered into the right spin at its last recorded altitude of 6200 feet AMSL. At this point, the aircraft was only 690 feet AGL. According to Cessna 172 POH, a minimum altitude loss of 1000 feet should be allowed for a 1-turn spin and recovery, while a 6-turn spin and recovery may require more than 2000 feet. According to eyewitness information, the aircraft had entered a multiple-turn spin which

would have required for than 2000 feet to recover. At such a low altitude, the spin and subsequent spiral on the accident flight was considered irrecoverable.

2.5. Flight Crew Qualifications and Training

2.5.1. Check-out Flight Instructor

At the time of accident, the CFI held appropriate FIR for the flight. He had a total of 129.75 instruction hours as a full instructor, having received his full FIR on 26 July 2013. The FIR was issued with limitations of not to instruct on low-level flying, formation and aerobatic flying, multi-engine, and instrument rating. The CFI was approved to release students on first solo on 26 July 2013, when the existing limitation was removed.

Based on KCAA records, there was no evidence that the CFI was competent and possessed instructional proficiency in stall awareness, spin entry, spin, and spin recovery procedures as required by the regulations. In addition, there was no evidence that the CFI had conducted a review of the SP in accordance with the existing regulatory requirements.

The CFI had not flown with the SP prior to the accident flight. The CFI was only briefed on phone the night before the accident about the flight with the SP which was scheduled for the following morning. It was reported that the RFI had reminded the CFI of the SP's previous incident prior to the accident flight and had been cautioned for high alertness on approach to land. It was, however,

considered unlikely that the CFI had gotten sufficiently familiarized with the SP's weaknesses which were not clearly outlined in the records.

It could not be established based on the records available whether the CFI was qualified and familiar with the spin characteristics of Cessna 172. It was only during PPL GFT, CPL issue flight test and Cessna 172 rating practical test that the CFI was tested on precautions before spinning, recovery from spin, precautions before stalling, stall recovery, steep turns, recognition and recovery from spiral dives. Therefore, it was considered that although the pilot had a valid FIR endorsement, he had not received any training on recovery from stall/spin conditions, typical of a loss of control at low level.

2.5.2. Student Pilot

The last flight conducted by the SP was almost three weeks prior to the accident flight. During this last flight, the RFI had commented that the SP needed to improve on his landings, approach to land and checks. Landings, rollers, look-out, orientation, normal circuits, straight and level and medium turns were rated average. There was no indication that the SP's weaknesses at this point were addressed prior to the accident flight.

According to Skylink, the accident flight was the second attempt by the SP at first solo check-out after failing at the first attempt. However, based the SP's records, it could not be established when

the first attempt at first solo check-out was done and how the SP's weaknesses noted during this flight were addressed prior to the second attempt.

The SP was reported to have shown inconsistencies in the handling of the aircraft during his training. Areas of weakness consistently noted in the SP's records from January to September 2013 included turns, look-out, awareness, landings, rollers, checks, orientation, approaches, and observation of aircraft limits. The SP was also reported to have had an inherent fear in him. These weaknesses were indicative that the SP was not ready for a first solo check-out.

The SP was reported to have expressed concerns about missing flights. He had two flights in September, two in August and none in June and July. There was generally a lack of consistency in SP's flying.

The SP had 15.9 total flying hours at the time of accident. Based on the TP, the SP should have finished 20 hours of flying exercises before first solo. According to Skylink, however, the SP was ready for first solo flight check-out. It was, however, considered that the SP's weaknesses should have been addressed before release for first solo check-out.

2.6. Organizational Influences

2.6.1. KCAA

Based on the Practical Test for issuance FIR and CFI's logbook pages presented to KCAA, there was no evidence that, at the time of occurrence, the CFI was competent and possessed instructional proficiency in stall awareness, spin entry, spins, and spin recovery procedures after receiving flight training in those training areas in an aircraft certificated for spins. There was also no clear demonstration of instructional proficiency in stall awareness, spin entry, spins, and spin recovery procedures based on the documents submitted by CFI during application for a FIR. Therefore, the eligibility requirements for FIR were not fully met as per regulation 81(1) of the Civil Aviation (Personnel Licensing) Regulations, 2013. The CFI was, however, issued with a FIR based on recommendations from a flight examiner without ensuring that all eligibility requirements were met.

According to the existing regulations at the time, a FI was to endorse the logbook of a pilot for a flight check-out only if that FI has conducted a review of the pilot in accordance with the requirements of regulation 29 of the Civil Aviation (Personnel Licensing) Regulations, 2013. However, based on the documentation available for investigation and interviews carried out, there was no indication that a review of the SP was conducted prior to the flight. This is despite the fact that the SP had some known weaknesses.

2.6.2. Skylink Flight Services Limited

Skylink as an ATO had been approved by KCAA and its ATO certificate was valid at the time of occurrence. Cessna 172 was among the aircraft types the ATO had been authorized to operate at the time of accident. The CFI had been hired in January 2013 as a flight instructor at Skylink. The ATO also had a maintenance agreement in place with Hawk Aviation Limited which was valid at the time of occurrence.

Skylink had relevant training procedures in place and its TM had been approved by KCAA. It was, however, established that not all relevant training records were being kept by the organization. Training records provided in the course of investigation did not indicate details of regular progress tests and examinations for SPs as per the TM. The SP's weaknesses and incidents were not adequately documented in the records. The SP's initial failed attempt at first solo check-out was not indicated in the records. The 10-hour check ride to determine if the SP had the ability to pursue flying or not as stipulated in the TM appears not to have been conducted based on records provided during the investigation. Based on the records provided by the ATO, there was also no evidence that the CFI had undergone a 6-month proficiency check after recruitment, standardization training and an upgrading training for assistant flight instructors as per the TM. The only training on the record for the CFI was initial FIR Practical Test on 10 December 2012 and another Practical Test for full FIR on 24

July 2013. Based on these, it was considered that training records in the ATO were inadequate and the procedures in the TM were not being effectively implemented.

It was not clear from the TP how PPL ground and flight training were being conducted systematically for a student pilot to progressively qualify for PPL. According to the TP, the SP should have flown for at least 20 hours before first solo if the flight training was being conducted sequentially as per the TP. According to the ATO, the SP was ready for first solo at the time of accident. However, in view of the SP's weaknesses at the time, it was considered that more time should have been allocated to address areas of deficiency prior to the first solo check-out.

At the time of accident, SP was yet to receive training on recovery from stalls, unusual attitudes, medium turns and forced field landing. According to the TP, this training was scheduled after first solo flight. There was a procedure in the TM which indicated that student pilots would receive and log flight training from an authorized flight instructor on, among others, flight at critically low speeds, recognition of and recovery from incipient and full stalls, flights at critically high speeds, recognition of and recovery from spiral dives. However, it was noted that this was not translated into relevant exercises in the TP.

According to the TM, student pilots were to be briefed and debriefed on various exercises including sides-slipping, spinning (how to avoid), steep turns, unusual attitudes, stalling among others. It was

not clear how these briefings and debriefings were being implemented in the TP. Based on the above issues, it was considered that the TP in place at the time of accident was inadequate.

According to the TM, no solo flights were to be authorized in Skylink unless the student had satisfied specified criteria which include flights at various airspeeds from cruise to slow flights, stall entries from various flight attitudes and power combinations with recovery being initiated at the first indication of stall, recovery from full stall, emergency procedures and more. However, the standards to be met by the student pilots for authorization for first solo flights were not specified in the TM and TP.

The first solo check-out procedures in the TM were not clear on which instructor would conduct first solo check-out flights. The TM was also silent on the policy of getting student pilots checked out by a qualified flight instructor, different from the regular instructor. During the accident flight, the CFI should have reviewed the SP's records, results of first solo theory, and get a comprehensive briefing from the RI. It was however, considered that the time available on the morning of 9 October, 2013, was inadequate for the CFI to effectively review the SP's history and records and at the same time prepare for the day's flights. It is probable that the CFI relied on the telephone briefing the previous night from the RFI. The process of handing over a student pilot to the check-out flight instructor was, therefore, considered inadequate as it did not allow

for appropriate oral and records briefing by the regular instructor on a student's performance prior to flight.

The sequence for the conduct of first solo check-out exercises was found to be variable among instructors at the company depending on the circumstances of the flight. However, according to Skylink, it had been previously agreed during a company safety meeting that instructors would not conduct emergency checks or simulations on the first circuit of a first solo check-out. It was, therefore, considered that just immediately prior to the occurrence, the SP would have likely been conducting normal downwind checks which would include a confirmation that the engine is running smoothly, confirmation of circuit altitude of 1000 feet AGL, and configuration of the aircraft for cruise. After attainment of circuit altitude, altitude at downwind leg of the circuit would only change as the aircraft turns for base leg. BWL was on early downwind leg at the time and its altitude should not have increased beyond 1000 feet AGL. At downwind, the SP should have reduced the throttle, ensured that aircraft airspeed is constant, maintained a constant distance from runway 07 and informed TWR that the aircraft is established on downwind leg.

2.6.3. Change in experience requirements for PPL

KCAA reviewed the minimum flight time requirement for an applicant for PPL with an aeroplane category rating and for a single engine class rating from 55 hours to 40 hours. This change has put a lot of pressure on flight instructors and ATO's as they strive not to

exceed the 40 hours requirement without compromising on the quality of flight training. The reduction in the minimum hours for PPL also implies that first solo check-outs are now conducted sooner than before the change in this regulation in order to allow for the 10 hours of solo flight.

The reduction in the minimum flight time requirement for PPL has particularly affected ATO's operating from busy aerodromes like Wilson Airport. The busy air traffic and ground congestion in such locations indicates that training aircraft operating in these environments are likely to conduct less number of circuits per unit time in comparison to those operating in less busy aerodromes.

To remain competitive, ATO's are striving as much as possible not to exceed the minimum of 40 hours for PPL. ATO's whose PPL students consistently exceed 40 hours may not be financially attractive in the long run for prospective students.

It was therefore considered that the current system in place in line with the challenges of the operating environment in busy and congested aerodromes was likely to compromise on the quality of flight training received by students. Students may be pushed through the process without necessarily being competent enough by ATOs keen on being on top of the competition. In addition, ATO's are likely to exert pressure on instructors to release students on first solo sooner in order to meet the target of 40 hours for PPL.

3. CONCLUSIONS

3.1. Findings

1. The flight crew members held valid licenses and relevant ratings issued in accordance with existing regulations;

2. There was no evidence that physiological factors or incapacitation may have affected the performance of the flight crew;

3. The maintenance records indicated that the aircraft was equipped and maintained in accordance with existing regulations and approved procedures;

4. All essential aircraft systems appeared capable of normal operation prior to the accident;

5. The aircraft had all the relevant and essential valid certificates to conduct the flight;

6. The aircraft was operating within the prescribed CG limits at the time of occurrence;

7. There was no significant meteorological condition that could have affected the accident flight;

8. The aircraft crashed in an almost vertical nose-down attitude on a relatively flat terrain with very low horizontal velocity;

9. The aircraft was in a spin to the right at the time of impact;

10. The aircraft engine was producing considerable power at the time of impact.

11. The aircraft wing leading edges impacted the ground almost simultaneously;

12. The aircraft was on the initial downwind leg of runway 07 and it had been configured for cruise as required;

13. The aircraft entered into an accelerated stall during climb which resulted in an inadvertent spin in the right direction that quickly degenerated into a spiral dive before ground impact;

14. The aircraft entered into a spin and spiral dive at too low an altitude for any recovery attempt to be successful;

15. The CFI had limited instructional experience at the time of occurrence and was not authorized to instruct on low-level flying, formation and aerobatic flying, multi-engine and instrument rating;

16. Although the CFI had valid FIR endorsement, he had not received any documented training on recovery from stall/spin conditions, typical of a loss of control at low level;

17. There was no clear demonstration of the CFI's competency and instructional proficiency in stall awareness, spin entry, spins, and spin recovery procedures after receiving

flight training in those training areas in an aircraft certificated for spins;

18. The CFI was probably not sufficiently familiarized with the SP's weaknesses and could not have conducted a thorough review of the SP in the limited time available in the morning prior to the accident flight;

19. There was a lack of consistency in the SP's flying record, with indications of missing flights for extended durations;

20. The SP had demonstrated a lack of consistency in aircraft handling and had some known flying weaknesses;

21. The SP was not ready for first solo check-out, especially with known weaknesses which were yet to be addressed;

22. The CFI was issued with a full FIR without meeting all the eligibility requirements as per the existing regulations;

23. Skylink held a valid ATO certificate and had been authorized by KCAA to operate the Cessna 172 aircraft type;

24. Training records for student pilots and instructors in the ATO were inadequate and the procedures in the TM were not being effectively implemented;

25. The SP's weaknesses and previous incidents were not adequately documented in the records;

26. The 10-hour check-ride to determine the SP's ability to pursue flying or not as per the TM appears not to have been conducted;

27. The CFI had not undergone a 6-month proficiency check, standardization training and an upgrading training for assistant flight instructors as per the TM;

28. It was not clear from the TP how PPL ground and flight training were being conducted systematically for a student pilot to progressively qualify for PPL;

29. The procedure in the TM for student pilots to receive and log flight training from authorized flight instructors on, among others, flight at critically low speeds, recognition of and recovery from incipient and full stalls, flights at critically high speeds, recognition and recovery from spiral dives, was not translated into relevant exercises in the TP;

30. It was not clear how briefings and debriefings stipulated in the TM on various exercises including side-slipping, spins (how to avoid), steep turns, unusual attitudes, and stalling were being implemented in the TP;

31. The PPL TP in place at Skylink at the time of occurrence was inadequate;

32. The criteria for solo flights authorization in Skylink was stipulated in the TM but standards to be met by student pilots for first solo flight authorization were not specified;

33. The first solo check-out procedures in the TM were inadequate as they did not indicate the kind of instructor who would conduct first solo check-out flights and were silent on the policy of getting student pilots checked out by different flight instructors;

34. The process of handing over a student pilot to the check-out flight instructor was found inadequate as it did not allow for appropriate oral and records briefing by the regular instructor to the check-out instructor on the student's history and performance prior to the flight;

35. During the first circuit on the downwind leg, no emergency checks or simulations were expected to be tested by the CFI except for normal downwind checks;

36. After attainment of the circuit altitude at the downwind leg, no sudden change in altitude was expected except when the aircraft turns for the base leg;

37. There is a lot of pressure on instructors and ATOs to ensure that students accomplish PPL flight training within 40 hours to enhance competitiveness;

38. The quality of flight training, especially in the busy and congested Wilson Airport, has likely been affected by the reduction of the minimum flight time for PPL;

39. The sequence of events in this accident was consistent with a loss of control during a low level flight. The reason for the loss of control had not been determined as at the time of this report.

3.2. Probable Cause

The probable cause of the accident was loss of control at low altitude resulting in an inadvertent spin and subsequent spiral dive which was unrecoverable. Contributory factors included: insufficient recovery altitude; limited instructional experience; inadequate system of release of student pilots for first solo check-out.

4. SAFETY RECOMMENDATIONS

1. KCAA in its oversight role should ensure that ATO's maintain an effective system of maintaining training records for student pilots and instructors. Such system should facilitate detailed documentation of students' performance, weaknesses and progress reports throughout the training period. The system should also ensure documentation of all the relevant training that instructors are required to undergo in the ATO;

2. Skylink should review its system of student authorization for first solo in the TM to ensure that students achieve adequate experience, confidence and competence prior to release for first solo check-out. The system should ensure that check-out flight instructors are well versed with student weaknesses and historical performance for appropriate assessment during first solo check-out flights;

3. Skylink should review its first solo check-out procedures in the TM to achieve the following: a thorough review of all students ready for first solo check-out to ensure that check-out flight instructors get sufficiently familiar with the students through an evaluation of students' training records, oral briefing from the regular instructor and an interview of the students prior to flight; clarity as to which instructors would conduct first solo check-out flights; consistency in first solo check-out instructors for individual students; address the

policy of getting student pilots checked-out by instructors different from the regular instructors;

4. Skylink should develop standards for authorization of students for first solo check-out flights. Such standards should ensure that students attain a certain minimum level of competency and consistency in aircraft handling prior to release for first solo check-out flights;

5. Skylink should ensure that all its procedures in the TM are effectively implemented. The ATO should implement all the necessary trainings for flight instructors including proficiency checks, standardization training, and upgrading training for assistant flight instructors as per TM. An effective internal quality audit mechanism should be established by the ATO to enhance compliance with procedures;

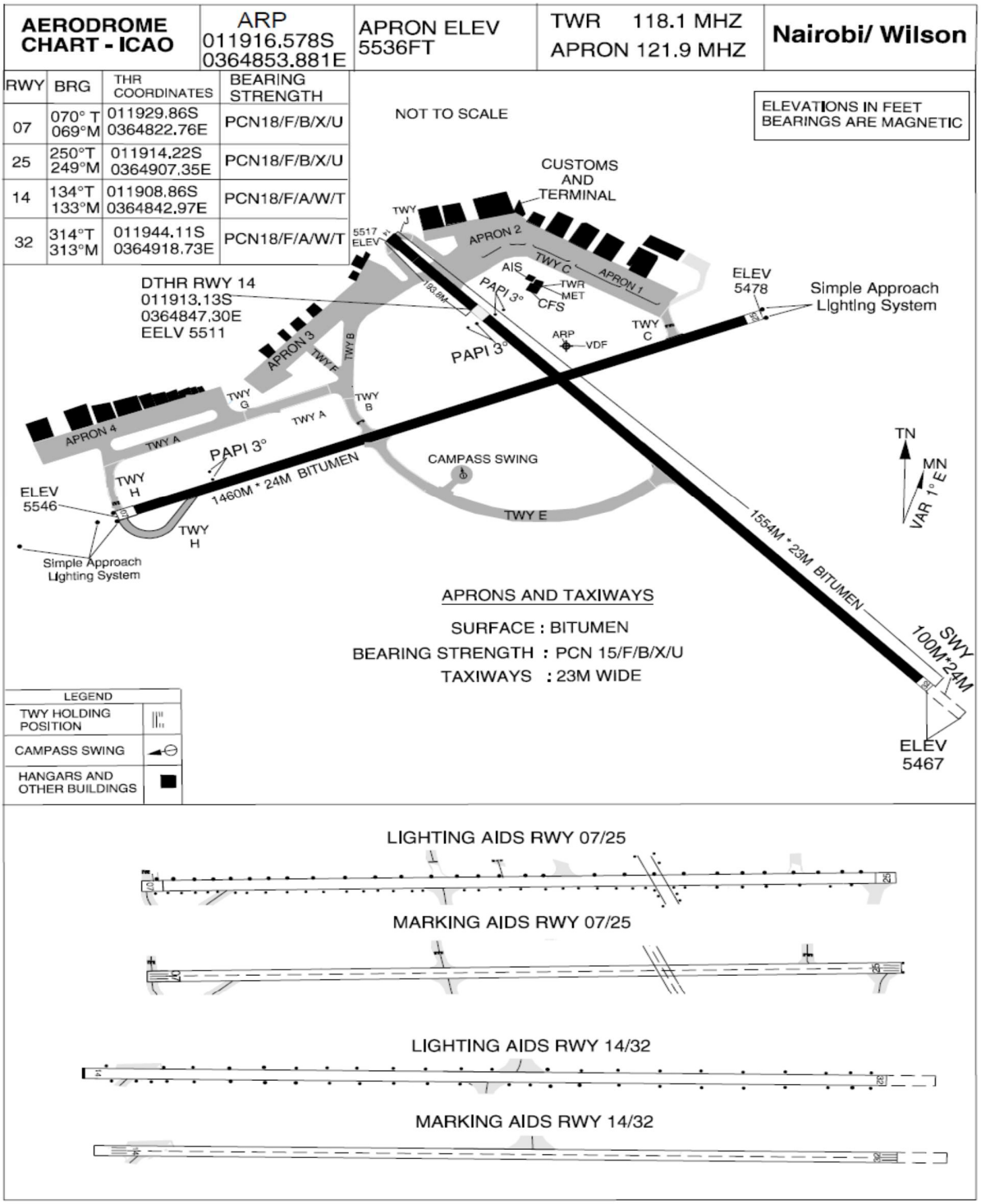
6. Skylink should review its PPL TP to achieve systematic conduct of both PPL ground and PPL flight training. The TP should project sequence in which training exercises will be conducted to progressively qualify for PPL.

7. Skylink should review its PPL TP to ensure that the requirement for student pilots to log flight training from authorized flight instructors on, among others, flights at critically low speeds, recognition of and recovery from incipient and full stalls, flights at critically high speeds, recognition and recovery from spiral dives is translated into relevant exercises

in the TP. The PPL TP should also include briefings and debriefings on various exercises including side-slipping, spins (how to avoid), steep turns, unusual attitudes, and stalling.

APPENDICES

Wilson Airport Aerodrome Chart



KENYA CIVIL AVIATION AUTHORITY

AIRAC AMDT NO.9

Radar Data for 5Y-BWL on 09/10/2013

TIME	DME(From HKNW), nautical miles	Bearing (From HKNW)	ROC (Ft/Min)	Altitude (Ft)	GS (Knots)	Heading	Coordinates
09:15:52	1.2	121°	-	5800	72	170°	01°20'12"S, 036°49'37"E
09:16:15	1.1	144°	-	5900	105	251°	01°20'29"S, 036°49'16"E
09:16:43	1.2	182°	+1300	6200	088	245°	01°20'49"S, 036°48'31"E
09:17:06	1.5	200°	+1300	-	088	246°	01°21'00"S, 036°48'06"E
09:17:08	Aircraft disappears from radar				088	246°	01°21'03"S, 036°48'06"E

Final Resting Point: 01°20'44"S, 36°48'26"E

KEY:

ROC – Rate of Climb

DME – Distance Measuring Equipment

GS – Ground Speed

ATC Transcript

TRANSCRIPT ON 5Y-BWL ON THE 09TH OF OCT. 2013 (GROUND FREQ. 121.9MHZ)

TIME	TX	RX	INTELLIGENCE
05:54:30	5Y-BWL	TWR	GOODMORNING WILSON GROUND, FIVE YANKEE BRAVO WHISKY LIMA
05:54:35	TWR	5Y-BWL	BRAVO WHISKY LIMA
05;54;38	5Y-BWL	TWR	BRAVO WHISKY LIMA REQUESTING START UP THREE ZERO MINUTES IN THE CIRCUIT, TWO SOULS ON BOARD, THREE HOURS ENDURANCE
05:54:45	TWR	5Y-BWL	BRAVO WHISKY LIMA START UP APPROVED, QNH ONE ZERO TWO THREE
05:54:50	5Y-BWL	TWR	REQUESTING QNH IN MILLIBARS
05:54:53	TWR	5Y-BWL	ONE ZERO TWO THREE IN MILLIBARS
05:54:55	5Y-BWL	TWR	ONE ZERO TWO THREE, BRAVO WHISKY LIMA
06:01:23	5Y-BWL	TWR	WILSON GROUND FIVE YANKEE BRAVO WHISKY LIMA IS READY FOR TAXI
06:01:30	TWR	5Y-BWL	TAXI HOLDING POINT ONE FOUR, QNH THREE ZERO TWO ONE
06:01:33	5Y-BWL	TWR	CLEARED TO TAXI, BRAVO WHISKY LIMA
06:01:37	TWR	5Y-BWL	ON BOARD AND ENDURANCE, DURATION IN THE CIRCUIT?
06:01:39	5Y-BWL	TWR	FIVE HOURS ENDURANCE, TWO SOULS ON BOARD
06:01:44	TWR	5Y-BWL	WHISKY LIMA NOTHING COPIED, SAY ALL OVER AGAIN
06:01:56	5Y-BWL	TWR	WHISKY LIMA TWO SOULS ON BOARD, FIVE HOURS ENDURANCE, THREE ZERO MINITES IN THE CIRCUIT
06:02:00	TWR	5Y-BWL	OK COPIED
06:05:43	5Y-BWL	TWR	WILSON GROUND BRAVO WHISKY LIMA REQUESTING FREQUENCY CHANGE
06:05:48	TWR	5Y-BWL	BRAVO WHISKY LIMA ONE ONE EIGHT ONE
06:05:50	5Y-BWL	TWR	ONE ONE EIGHT ONE.
06:07:14	5Y-BWL	TWR	WILSON TOWER FIVE YANKEE BRAVO WHISKY LIMA READY FOR DEPARTURE
06:07:18	TWR	5Y-BWL	FIVE YANKEE BRAVO WHISKY LIMA NUMBER THREE FOR DEPARTURE
06:07:21	5Y-BWL	TWR	NUMBER THREE FOR DEPARTURE, BRAVO WHISKY LIMA
06:12:05	5Y-BWL	TWR	FIVE YANKEE BRAVO WHISKEY LIMA IS READY TO LINE UP ONE FOUR
06:12:08	TWR	5YBWL	FIVE YANKEE BRAVO WHISKEY LIMA LINE UP ONE FOUR
06:12:12	5YBWL	TWR	LINING UP RUNWAY ONE FOUR BRAVO WHISKEY LIMA
0614:04	TWR	5YBWL	FIVE YANKEE BRAVO WHISKEY LIMA WINDS ARE CALM CLEARED FOR TAKE OFF ONE FOUR RIGHT TURN OUT
0614:08	5YBWL	TWR	CLEARED FOR TAKE OFF BRAVO WHISKEY LIMA
0615:48	5YBWL	TWR	FIVE YANKEE BRAVO WHISKEY LIMA IS RIGHT DOWNWIND RUNWAY ZEROSEVEN FOR TOUCH AND GO
0615:51	TWR	5YBWL	FIVE YANKEE BRAVO WHISKEY LIMA FINAL NEXT NUMBER TWO
0615:57	5YBWL	TWR	NUMBER TWO BRAVO WHISKEY LIMA
0616:33	5YBWL	TWR	WHISKEY LIMA.....
0616:38	TWR	5YBWL	SAY AGAIN
0616:48	TWR	5YBWL	FIVE YANKEE BRAVO WHISKEY LIMA SAY AGAIN
0616:58	TWR	5YBWL	FIVE YANKEE BRAVO WHISKEY LIMA
0617:05	TWR	5YBWL	FIVE YANKEE BRAVO WHISKEY LIMA
061715	TWR	5YBWL	FIVE YANKEE BRAVO WHISKEY LIMA
0617:16	5YKWM	TWR	WE CONFIRM SHE HAS JUST CALLED MAY DAY
0617:18	TWR	5YKWM	SAY AGAIN
0617:22	5YKWM	TWR	WHISKEY LIMA WAS CALLING MAY DAY, WHAT IS HER LOCATION?
0618:50	5YKWM	TWR	TOWER KILO WHISKEY MIKE
0618:52	TWR	5YKWM	KILO WHISKEY MIKE GO AHEAD
0618:55	5YKWM	TWR	WHAT IS THE LOCATION OF KILO WHISKEY LIMA, WE CAN CHET IT FOR YOU

Skylink's Sample First Solo Check-out Form

SAMPLE 1ST SOLO FLYING EXAM.

1ST SOLO CHECK OUT FORM

1. CCT Pattern on RNW 07
2. CCT Pattern on RNW 14
3. RNW 07 CCT
   - I) Normal
   - II) Flapless
   - III) High Approach Recovery
   - IV) Low Approach Recovery
   - V) Low Approach Recovery
   - VI) Balloon recovery
4. RNW 14 CCT
   - I) Normal
   - II) EFATO
   - III) Overshoot/Mist-approach/Go round
5. Extend to monastery
6. Radios
7. Checks
   - I) Pre-flight
   - II) Start and After start
   - III) Power checks
   - IV) Pre-take off
   - V) Down and checks
8. Grounds control of Aircraft
   - I) Taxing
   - II) Stopping after landing
   - III) Parking
9. Emergencies
   - I) Cabin fire on ground
   - II) High speed landing
   - III) Off runaway emergency

I..... is satisfied with the above exercise done by.....

Type of A/C.....
Reg of A/C.....

Date.....
Signature.....

***The form to be ..... On the Flight Record Book of students**
***then given to the CFI prior to solo check out**

Skylink's Sample First Solo Theory Exam

SAMPLE SOLO EXAM (1ST SOLO). -THEORY

FIST SOLO EXAM

AIR LAW

1. What are the privileges of an SPL?

2. What are the least amount of hours to go SOLO? /WHY DOES ONE GO SOLO WITH A HIGHER NUMBER OF HOURS AT WILSON AIRPORT?

3. Define the airspace of Nairobi:

    A. area 1 airspace.

    B. area 2 airspace.

    C. area 3 airspace.

4. Do you require a radio license to go solo?

5. What class of medical do you need?

6. What is the minimum flight you can fly in a:

    a. Game park

    b. A densely populated area.

    c. Uncontrolled airspace.

    d. Sea (water masses)

7. Colours of the three main navigation lights and their location on the aircraft.

8. Right of way:

    a. Ground

    b. Air.

THEORY OF FLIGHT

Emergency procedure

1. What are the checks of an engine failure?
2. What the checks of an engine failure are after takeoff?
3. What are the checks of an engine fire?

CHECKS

4. What are the checks on a circuit pattern far runway 07 at Nairobi Wilson Airport?
5. What are the checks on "leaning the mixture?"
6. What are the take off checks?
7. What are the landing checks?

METEOROLOGY

1. What is
   a. QNE?
   b. QNH?
   c. QFE?
2. Visibility
   a. VFR
   b. IFR
   c. Special VFR
3. What is the CAVOK?

HUMAN PERFORMANCE

1. What does the MNEMONIC -"I M SAFE" mean?
2. If I have
   a. Headache, can I fly"
   b. A common cold can I fly?
   c. Cancer (and does not affect my flying) can I fly.
   d. HIV can I fly?
3. How Many hours can I sleep for?
4. How many hours should I wait for to fly after a drink?
5. If quite stressed, can I fly?
6. How do you know you're stressed?
7. What medicine won`t allow me to fly?
8. If I have food poisoning can I fly?

RADIO TELEPHONY

1. What are the privileges of a restricted radio license?
2. What are the privileges of a general radio license?
3. What are the procedures of a radio failure?
4. Give the various frequencies
   a. Emergency frequency
   b. Nairobi Wilson airport frequency
   c. Local area frequency
   d. Transponder codes

   What do the above codes mean?
   i. 7500
   ii. 7600
   iii. 7700
   iv. 7000
   v. 2077

5. Radio phraseology.
   a. What does a" go around mean"?
   b. What is the difference between "a go around "and "an overshoot"?
   c. What is an orbit? How should it be done in a circuit?
   d. What does expedite mean?
   e. Write the whole alphabet in the phonetic alphabet
   f. When does one have priority in the circuit? How many a/c are supposed to be in the circuits? (During the day and at night?)
   g. What does 'cleared to land' mean and what are your rights?
   h. How is "continue approach" different from "cleared to land"?
   i. Could the term 'Short finals' be correct radio phraseology? If it is, what does it mean?
   j. What is the difference between, 'long final and final' AT WILSON AIRPORT?
6. What is the different between "may day and pan pan, what is the radio phraseology between the two?

Criteria for First Solo Authorization

3.4.1 AUTHORIZATION FOR SOLO FLIGHTS

SKYLINK FLIGHT SERVICES Co. LTD shall ensure that no solo flights shall be authorized unless the student has satisfied the following criteria:

- Proper flight preparation procedures, including pre-flight planning and preparation, engine operation, and aircraft systems;
- Taxiing or surface operation, including run-ups;
- Take-offs and landings, including normal and cross wind;
- Straight and level flight, and turns in both directions;
- Climbs and climbing turns;
- Airport traffic patterns;
- Radio telephony, airport entry and departure procedures;
- Collision avoidance, wind shear avoidance, and wake turbulence avoidance;
- Descents, with and without turns, using high and low drag configurations;
- Flight at various airspeeds from cruise to slow flight;
- Stall entries from various flight attitudes and power combinations with recovery initiated at the first indication of a stall, and recovery from a full stall;
- Emergency procedures and equipment malfunctions;
- Ground reference manoeuvres;
- Approaches to a landing area with simulated engine malfunctions;
- Slips to a landing; and
- Go-arounds.

2.5 TRAINING PROGRAMME

2.5.1 GROUND SCHOOL TRAINING PROGRAMME FOR PRIVATE PILOT LICENSE

SUBJECT	DURATION OF INSTRUCTION	INSTRUCTOR
Navigation	25 Hours	Assigned instructor
Flight Planning	20 Hours	Assigned instructor
Plotting	20 Hours	Assigned instructor
Meteorology	35 Hours	Assigned instructor
Aviation law, flight rules and procedures	30 Hours	Assigned instructor
Theory of flight, aircraft performance and operation.	30 Hours	Assigned instructor
Human performance and limitation	25 Hours	Assigned instructor
Radio telephony	35 Hours	Assigned instructor

TOTAL 220 Hours

Skylink PPL Flight TP

2.5.2 FLIGHT TRAINING PROGRAMME FOR PRIVATE PILOT LICENSE

EQUIPMENT	EXERCISE	DURATION OF INSTRUCTION	INSTRUCTOR
Aircraft	Air experience / controlling aircraft by external visual reference points / effects of controls	3 Hours	Assigned instructor
Aircraft	Pre-flight inspection	2 Hours	Assigned instructor
Aircraft	Aerodrome and traffic pattern operations and procedures	5 Hours	Assigned instructor
Synthetic trainer	Polishing up student on handling aircraft and its parameters	5 Hours	Assigned instructor
Aircraft	Preparing student for first solo in the aerodrome traffic circuit	5 Hours	Assigned instructor
Aircraft	Recovery from stalls, unusual attitudes, medium turns, steep turns and forced-field landing	4 Hours	Assigned instructor
Synthetic trainer	Polishing up student on handling above maneuvers	2 Hours	Assigned instructor
Aircraft	Cross-country flying - VFR	9 Hours	Assigned instructor
Aircraft	Emergency operations – simulated aeroplane equipment malfunctions	4 Hours	Assigned instructor
Aircraft	Preparing student for PPL – GFT	6 Hours	Assigned instructor
	TOTAL	**45 Hours**	

Aerial Accident Photographs

Figure 6: Wreckage as seen from the right hand side of the aircraft

Figure 7: Front aerial photograph of the wreckage taken in the direction of debris flow

Figure 8: Aerial photograph of the wreckage taken from the left hand side of the aircraft

Figure 9: Aerial photograph of the wreckage taken from the rear

Ground Accident Photographs

Figure 10: Main wreckage

Figure 11: Aircraft front section taken in the direction of debris flow

Figure 12: Ground mark of initial point of impact and main wreckage

Figure 13: Right wing tip and main wreckage

Figure 14: Right wing and tail section as seen from the right side of the aircraft

Figure 15: Tail section and right wing

Figure 16: Right cabin door and main wreckage as seen from the rear section of the aircraft

Figure 17: Main wreckage as seen from the left side of the aircraft showing the engine

Figure 18: Main wreckage as seen from the left side of the aircraft

Figure 19: Main wreckage indicating impact damage on the cabin and wing leading edges

Figure 20: Main wreckage and separated propeller assembly

Figure 11: Separated propeller assembly

Figure 22: Propeller blade close-up indicating damage

Figure 23: Damage to cabin and the front section of the aircraft

Figure 24: Close-up of damage to the front section of the aircraft