United Arab Emirates

الهيئة العامة للطيران المدني
GENERAL CIVIL AVIATION AUTHORITY

Air Accident Investigation Sector

- Final Report -

AAIS Case AIFN/0010/2013

Runway Excursion

Operator: Fujairah Aviation Academy
Type: Cessna C172R
Registration: A6-HSS
Location: Fujairah International Airport
State of Occurrence: United Arab Emirates
Date of Occurrence: 17 September 2013

Synopsis

On 17 September, 2013, at approximately 10:55 Local Time (LT), a Cessna 172R Aircraft, registration A6-HSS departed from Fujairah International Airport for a cross country flight flown by a student pilot.

After touchdown on Runway (RWY) 11, the Aircraft veered to the left from runway's centerline, exited the runway and continued rolling on the runway's strip. Finally, the Aircraft came to a complete stop on a point of about 359 meters from the initial veer off location.

The student pilot vacated the Aircraft with no injury and the Aircraft suffered no damage as a result of the Incident.

The post-Incident medical tests did not reveal any physical or physiological factors that may adversely affect the pilot's performance.

No mechanical anomalies on the flight controls, steering or brake mechanisms were observed by the student pilot prior to the event.

The Investigation determines that the cause of the runway excursion was the improper handling of Aircraft's directional control during the landing sequence. When the airspeed was decaying during flare, it is most probably that the aileron and rudder inputs were not increased as necessary. After touchdown, slowly required increment of aileron deflection into the wind was not applied.

The contributing factor to the Incident was the lack of situational awareness due to the fixation of the student pilot on the cockpit indications, most probably from a point during the flare lasting for few seconds after touchdown, which prevented him from proper external peripheral to assist in handling the directional control of the Aircraft.

The safety issues raised in this Report include:

(a) Emphasizing when to use external peripheral reference points and/or instruments reference on landing.

(b) Handling the aircraft directional control in the flare and landing roll in crosswind condition.

(c) Recovery of the aircraft into runway track when it starts to veer.

Safety Recommendations concerning the above mentioned issues are addressed to the Operator.

Safety Recommendation addressed to the GCAA is to emphasize on the landing techniques in its flight training organization oversight program on all United Arab Emirates Flight Training Organizations.

United Arab Emirates

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Incident Brief

GCAA AAI Report No.:	AIFN/0010/2013
Operator:	Fujairah Aviation Academy
Aircraft Type and Registration:	Cessna C172R Skyhawk, A6-HSS
MSN	17281521
No. and Type of Engine:	Single, Lycoming IO-360-L2A
No. and Type of Propeller:	Single, McCauley 1C235/LFA7570, Two blades – Fixed Pitch
Date and Time (UTC):	17 September 2013, 0651 UTC
Location:	Runway 11 of Fujairah International Airport
Type of Flight:	Training
Persons Onboard:	1
Injuries:	None

Investigation Objective

This Investigation considers the aspects related to the Aircraft handling during landing.

This Investigation is performed pursuant to the UAE Federal Act No 20 of 1991, promulgating the Civil Aviation Law, Chapter VII, Aircraft Accidents, Article 48. It is in compliance with the UAE Civil Aviation Regulations, Part VI, Chapter 3, in conformity with Annex 13 to the Convention on International Civil Aviation and in adherence to the Air Accidents and Incidents Investigation Manual.

The sole objective of this Investigation is to prevent aircraft accidents and incidents. It is NOT the purpose of this activity to apportion blame or liability.

Investigation Process

The occurrence involved a Cessna 172R Training Aircraft, registration A6-HSS, was notified to the General Civil Aviation Authority (GCAA) through the Duty Investigator (DI) by phone call to the Hotline Number +971 50 641 4667.

After the Onsite/Initial Investigation phase, the occurrence was classified as an “Incident”.

An Investigation Team was formed in line with the ICAO Annex 13 obligations of the United Arab Emirates (UAE) being the State of Occurrence.

The scope of this Investigation is limited to the events leading to the occurrence itself.

Notes:

1. Whenever the following words are mentioned in this Report with the first letter Capitalized, it shall mean:
   - (Aircraft) - the aircraft involved in this Incident
   - (Investigation) - the investigation into this Incident
   - (Incident) - this investigated Incident
   - (Report) - this investigation Summary Report
2. Unless otherwise mentioned, all times in this Report are Coordinated Universal Time (UTC), (UAE Local Time minus 4).

Abbreviations

AAIS	UAE GCAA Air Accident Investigation Sector
ALT	Alternator
AMSL	Above Mean Sea Level
ATC	Air Traffic Control
BAT	Battery (Main Battery Electrical Power)
CAR	UAE Civil Aviation Regulation
CAT	Category
CAVOK	Cloud and Visibility OK
C of A	Certificate of Airworthiness
CMR	Certificate of Maintenance Review
CPL	Commercial Pilot License
FTO	Flight Training Organization
GCAA	UAE General Civil Aviation Authority
hrs	hours
ICAO	International Civil Aviation Organization
LDA	Landing Distance Available
Ldg	Landing
LT	Local Time
M	meter(s)
mbar	millibars
METAR	Meteorological Terminal Air Report
MFD	Multi Function Display
MHz	Mega Hertz
MSN	Manufacturer Serial Number
No.	Number
PAPI	Precision Approach Path Indicator
PFD	Primary Flight Display
PPL	Private Pilot License
QNH	barometric pressure adjusted to sea level
Reg	Registration

RWY	Runway
SOP	Standard Operating Procedures
TO	Takeoff
TSN	Time Since New
UAE	United Arab Emirates
UTC	Coordinated Universal Time
VFR	Visual Flight Rule

Table of Contents

1. Factual Information

1.1 History of Flight

On 17 September 2013, at approximately 10:55 local time (LT), a Cessna 172R Aircraft, registration A6-HSS, owned and operated by a locally based flight training organization, departed from Fujairah International Airport (OMFJ[1]) for a cross country flight flown by a student pilot. After touchdown on Runway (RWY) 11, the Aircraft veered to the left from runway's centerline, exited the runway and continued rolling on the runway's strip. The Aircraft came to a complete stop after rolling about 359 meters from the runway centerline departure point. The Incident flight was the last mission flight for the student pilot who was completing the 100 hour solo flight requirement of the Commercial Pilot License (CPL) program course.

The student pilot commenced the Private Pilot License (PPL) course program in January 2012 followed by the CPL course program. He had completed about 192 flight hours when the Incident runway excursion occurred.

On the day of the Incident, the student pilot reported at 07:30 local time for his planned cross country flight. He checked the METAR[2] weather data and submitted the required flight plan. According to the flight plan, the flight also included a touch-and-go on the runway of Al Ain International Airport (OMAL[3]).

During pre-flight briefing, the Flight Instructor informed the student pilot of the predicted maximum wind speed (almost 15 knots) at OMAL. The student pilot was advised to perform the touch-and-go at OMAL only if the wind speed is less than the maximum, otherwise he should overfly OMAL.

After he completed the pre-flight inspection, the student pilot started the takeoff roll on RWY 11 at about 08:50 local time.

When approaching OMAL, the student pilot requested permission from OMAL ATC to perform a touch-and-go. The controller declined the student's request due to busy traffic. Instead, the student pilot was approved to overfly OMAL runway. Accordingly, the Aircraft overflew OMAL runway at 6,500 ft before turning back to Fujairah Airport.

When approaching OMFJ, the student pilot exercised an instrument approach for RWY 29.

The OMFJ ATC instructed the student pilot to land on RWY 11. Consequently, the student pilot reported "breaking to the left" and broke off the approach to RWY 29 by turning the Aircraft to left for landing preparation on RWY 11 while maintaining 1,100 feet.

The ATC requested the student pilot to "report on final for RWY 11". Shortly afterwards, the ATC advised the student pilot "080° /10" wind direction and speed,

[1] OMFJ: 4 letters ICAO code for Fujairah International Airport
[2] Meteorological Terminal Air Report (METAR) - Aerodrome routine meteorological reports
[3] OMAL: 4 letters ICAO code for Al Ain International Airport

and cleared the Aircraft to land on RWY 11 which was followed by the student pilot's read back.

On preparation for landing, the Aircraft was configured at flap 20. On short final, the airspeed was 65 knots according to student pilot's statement. Due to the crosswind component, he applied left aileron into the wind simultaneous to the right rudder in order to maintain RWY 11 centerline.

The Aircraft touched down on the runway centerline first on the left main wheel, followed by the right, then lastly the nose wheel. As stated by the student pilot, the speed was between 49 and 55 knots. As he also stated, just before touchdown, the student pilot realized that the Aircraft's attitude was slightly above the horizon and wings level. After touchdown, the student pilot fixated to the Primary Flight Display (PFD) for a while before he turned back to external peripheral. When he turned back to external peripheral, the Aircraft was drifting to the left. The student pilot attempted to recover it to the centerline by applying input on the right rudder. However, the Aircraft did not get the right response and the student pilot noticed that the right wing was about to drop to the right. Then, he released the right rudder pedal to keep the wings level. After he realized that the Aircraft was not able to come back to the centerline, the Aircraft had already departed RWY 11 to the left side runway surrounding natural area.

While the Aircraft was rolling on the natural area, the student pilot informed the tower "shutting down", then he pulled back the fuel mixture handle, verified that the engine was on idle and shut down the engine followed by brakes until the Aircraft came to rest. Starting the moment the Aircraft departed the runway until the time of engine shutdown, the brakes were not applied at all. When the propeller stopped rotating after shutting down the engine, the brakes were applied until the Aircraft stopped. Then, the student pilot switched off the avionics, alternator & battery, ignition and lastly removed the key.

The location where the Aircraft came to rest was at about 326 meters longitudinally and 151 meters laterally from the centerline departure point (See Figure 1 and 2).

Figure 1. Runway Excursion Layout

Figure 2. Intact Aircraft Rest Place

1.2 Injuries to Persons

The student vacated the Aircraft normally with no injury.

1.3 Damage to Aircraft

The Aircraft was intact with no revealed damage resulting from the Incident.

Post-incident damage assessment performed by the Flight Training Organization (FTO) did not reveal any defects, and thereafter the Aircraft was released to service.

1.4 Other Damage

No other damage resulted from the Incident.

1.5 Personnel Information

Student Pilot	:	Male, 23 years old
License & Number	:	UAE Private Pilot License (PPL); 44984
Issue date	:	27 September 2012
Valid until	:	26 September 2020
All classroom training and checking	:	Current at the time of the Incident
Medical certificate	:	GCAA Class 1, valid until 31 December 2013

Flying Experience

Total hours on all aircraft types	:	227.92 hrs
Total dual hours on all aircraft types	:	124.17 hours
Total Solo Hours	:	103.75 hours
Total Hours last 30 days	:	31.33 hours
Total Hours last 24 hours	:	2.33 hours

Previous rest and duty period

Off duty	:	more than 24 hours

1.6 Aircraft Information

The Aircraft was a Cessna 172R delivered from the manufacturer on 24 July 2008.

Cessna 172R Skyhawk is a variant of the basic Cessna 172 aircraft which, the latter, is a four-seats, single-engine, and high-wing aircraft with a tricycle landing gear. The basic Cessna 172 aircraft was first flown in 1955.

Cessna 172R Skyhawk was first introduced in 1996. This variant is powered by a derated Lycoming IO-360-L2A engine producing a maximum of 160 horsepower (120 kW) at 2,400 rpm.

1.6.1 Aircraft General Information

Aircraft Type:	Cessna 172R Skyhawk
Aircraft Manufacturer:	Cessna Aircraft Company
Aircraft MSN:	17281521
Maximum Takeoff/Landing Mass:	2,450 Lbs
Date of first C of A under UAE Registry:	9 September 2009
Date of the last C of A:	15 August 2013
Last C of A expiry date:	31 August 2014
C of A category:	Transport (Passenger)
Time Since New (TSN):	3,980.1 hours
Last Certificate of Maintenance Review (CMR) date:	13 August 2013
Next due CMR	13 December 2013

Engine

Type:	IO–360–L2A
Manufacturer:	Lycoming
Serial Number:	L-32000-51E
TSN :	1,725.55 hours

Propellers

Model:	Fixed pitch, Two blades, McCauley 1C235/LFA7570,
Serial Number:	ACA48537A
TSN:	1,982.45 hours

No malfunctions of the flight controls, steering or brake systems were observed by the student pilot prior to the Incident.

The maximum crosswind component for this aircraft type is 15 knots.

1.6.2 Aircraft Maintenance

The last 100-Hours maintenance inspection was carried out on 4 September 2013 and the Aircraft was released to service on 5 September 2013. Based on the Aircraft technical logs, there was only one defect observed since the last 100 Hours inspection. The defect was relevant to the Bus 2 avionic fan which may cause the MFD not to be switched on. Rectification was carried out by replacing the avionic switch with a new one.

Examination of the maintenance records did not reveal evidence of any pre-existing Aircraft structural or mechanical anomalies that could have contributed to the Incident.

1.7 Meteorological Information

The weather report at Al Ain International Airport for 17 September at 07:00 UTC, which was the approximate time of the Incident, showed the following information:

Wind	: 080 degrees / 10 knots
Cloud and Visibility	: CAVOK, 7,000 meters
Temperature	: 35 degrees centigrade
Dew point	: 27 degrees centigrade
QNH	: 1004 mbar
Forecast	: No significant change

1.8 Communications

All communications performed between the Aircraft and Fujairah Approach, on 129.4 MHz, and with Fujairah Tower, on 124.6 MHz, were satisfactory.

1.9 Aerodrome Information

Fujairah International Airport is located approximately 1 km southwest of Fujairah City, UAE.

The Airport is equipped with single RWY 11/29.

RWY 11 has an ICAO simple inset approach lighting system, a Landing Distance Available (LDA) of 3,049 m, is 45 m wide, and has a threshold elevation

and highest elevation of touchdown zone of 153 ft Above Mean Sea Level (AMSL). The runway surface is made of asphalt and concrete.

RWY 11 is equipped with displaced threshold green lights, visual approach light (PAPI, on left side of the runway with a 3° and a distance of 546 m from displaced threshold), runway edge lights, and runway end lights.

Runway 29 has an ICAO CAT 1 precision approach lighting system with distance coded wing bars each 300 meters.

The runway was in dry condition during the Incidence.

1.10 Medical and Pathological Information

Medical examination of the student was performed after the Incident and no evidence was found of physical or physiological factors which could have adversely affected his performance.

1.11 Survival Aspects

The Airport Emergency Plan was activated immediately and the Fujairah Airport Airfield Rescue and Fire Fighting units responded.

1.12 Organizational and Management Information

According to the Training Organization Certificate No U.A.E 04/2004, the Operator is a GCAA approved training organization for conducting ground and flying training courses. The approved training course is for Fixed Wing training.

The Operator's fleet consists of seven Cessna 172, three Diamond DA40, and two Diamond DA42 aircraft.

1.13 Additional Information

1.13.1 FTO Training Manual

The following is the crosswind approach and landing procedure as published in the FTO training manual.

Task B. Cross wind circuit, approach & landing:

Description: *A crosswind approach and landing involves techniques utilized when the wind is blowing across rather than parallel to the runway direction, therefore, all pilots should be prepared to cope with these situations.*

Procedure:

- *Utilize the same procedures used for a normal approach.*
- *On final, lower the upwind wing as necessary to control lateral drift over the extended runway centreline.*
- *Use opposite rudder to align the longitudinal axis of the airplane with the extended runway centreline.*
- *Maintain and adjust the control deflections as necessary to track the extended centreline.*
- *As the airspeed slows during the round out and flare, control deflections must be increased as necessary to obtain the desired effect.*
- *After touchdown, slowly increase aileron deflection into the crosswind to assist in directional control.*

Standards:

Beside the standards for normal approach & landing, the student should be able to:

- *Consider the wind conditions, landing surface, obstructions, and select a suitable touchdown point.*
- *Maintain crosswind correction and directional control throughout the approach and landing sequence.*

Common errors:

Beside the common errors for normal approach & landing, some other errors are:

- *Touchdown with the aircraft drifting sideways as a result of not applying enough "wing low" into the crosswind.*
- *Touchdown in a crab as a result of allowing a wing to rise on round out or in the flare.*
- *Poor directional control after touchdown because of, allowing a wing to rise after touchdown, allowing touch while in crab, over controlling with rudder.*

Note to instructors:

Beside the points for normal approach and landing:

- *Make sure the student consider the wind conditions, landing surface, obstructions, and selected a suitable touchdown point.*
- *Make sure the student maintain crosswind correction and directional control throughout the approach and landing sequence.*

2. Analysis

2.1 Crosswind Landing

The landing was performed on RWY 11 with 10 knots wind speed and 080° wind direction. The analysis of this wind velocity will give a landing crosswind component of 5 knots which was below the maximum permissible 15 knots crosswind as given in the SOP.

On short final, as stated by the student, he applied left aileron into the wind and opposite (right) rudder input in order to maintain the runway centerline to correct the drift from the crosswind. The airspeed was about 65 knots with flaps 20. The Investigation believes that the student pilot applied side-slipping technique for landing the Aircraft.

At touchdown, the left main wheel touched the ground first followed by the right and lastly the nose-wheel. The wings were level. The Aircraft touched down on the runway centerline which indicate that the side-slipping technique was applied correctly until, most probably, the touchdown, which was a proper implementation as depicted in the FTO's Training Manual.

2.2 Aircraft Control

The student fixated his attention to the PFD, most probably, from the time of starting the flare and lasting for few seconds after touchdown.

The student pilot's concentration was on watching the cockpit indicators instead of attaining a suitable external peripheral while leveling off the wings. The inputs on the aileron and rudder controls may have been reduced or totally released for this purpose, which may have caused the Aircraft to veer to the left.

When the student pilot regained external peripheral, he realized that the Aircraft was drifting to the left. Consequently, he tried to re-align the Aircraft to runway's centerline by applying right rudder. However, instead of bringing the Aircraft back to the runway track, the right wing was about to drop to the right, which indicates that the airspeed was still effective at touchdown and for few seconds later. The insufficient aileron input to counteract the crosswind caused the into-wind (left) wing start lifting. Then, in order to stop the rate of into-wind wing lift, the right rudder input was released. The Investigation believes that during that phase, the weathervane effect[4] had, most probably, added more to the Aircraft veering to the left towards the heading of the wind direction. The Aircraft had already departed the runway after releasing the right rudder input.

Normally, the standard side-slipping landing technique aims to maintain the wing low until the touchdown and throughout the landing roll. After the touchdown, more aileron input into the wind is required when the airspeed reduces to prevent the into-wind wing from lifting and to counteract the weathervane effect. In a highly

[4] Crosswind creates a yaw moment tending to turn the nose of the aircraft into the wind.

dynamic situation as in the landing phase, when the pilot does not handle the aircraft properly, the pilot will have very short time to assess and then control the aircraft attitude and flight path which in, most cases, will cause the aircraft to veer off the runway.

The Investigation believes that the directional control after touchdown was exercised improperly. When the airspeed was decaying during the flare, the aileron and rudder inputs were, most probably, not adequately increased. After touchdown, the required slow increments of aileron deflection into the wind were not applied as should have been according to the FTO's training manual.

The Investigation believes that the student pilot had misperceived the crosswind component and this, together with inadequate training and experience in handling the aircraft's directional control on the ground in crosswind situations, contributed to the Incident.

The situation was exacerbated when the required external visual reference was not used to assist in controlling the Aircraft. The student pilot diverted his attention to inside the cockpit. He, most likely, initiated this in the flare in order to bring the wings level. The lack of situational awareness[5] through external peripheral added more adverse effect during this critical flight phase.

There was no evidence to the Investigation that the student had any kind of fatigue, physical or psychological effect that could have contributed to the Incident.

There was no evidence observed that the condition of the runway could have contributed to the Incident.

There were no abnormalities of the flight controls, steering or brake systems prior to the Incidents.

[5] A failure to recognize all the consequences of an action, or lack of foresight

3. Conclusions

3.1 General

From the evidence available, the following findings, causes and contributing factors were made with respect to this Incident. These shall not be read as apportioning blame or liability to any particular organisation or individual.

To serve the objective of this Investigation, the following sections are included in the “Conclusions” heading:

- **Findings-** are statements of all significant conditions, events or circumstances in this Incident. The findings are significant steps in this Incident sequence but they are not always causal or indicate deficiencies.
- **Causes-** are actions, omissions, events, conditions, or a combination thereof, which led to this Incident.
- **Contributing factors-** are actions, omissions, events, conditions, or a combination thereof, which, directly contributed to this Incident and if eliminated or avoided, would have reduced the probability of this Incident occurring or mitigated the severity of its consequences.

3.2 Findings

3.2.1 The Aircraft was airworthy and properly certified.

3.2.2 The Aircraft had a valid Certificate of Airworthiness and had been maintained in compliance with the regulations.

3.2.3 The maintenance records indicated that the Aircraft was equipped and maintained in accordance with the applicable regulations and approved procedures.

3.2.4 At the time of the Incident, the student pilot was in a CPL program and had accumulated about 192 flight hours.

3.2.5 The flight was a VFR flight in normal meteorological conditions.

3.2.6 A crosswind component of 5 knots was experienced during the occurrence which was below the maximum published crosswind component limitation for this aircraft.

3.2.7 The student pilot applied side-slipping technique to land the Aircraft.

3.2.8 The Aircraft touched down on the runway centreline.

3.2.9 The student pilot was fixated to the PFD after the touchdown, most likely, he initiated this in the flare in order to bring the wings level.

3.2.10 The student pilot was not able to handle the Aircraft's directional control after the touchdown. The required aileron input into the wind and rudder controls were not applied which may have caused the Aircraft to veer to the left.

3.2.11 The weathervane effect may have caused the Aircraft to veer more to the left towards the heading of the wind direction.

3.2.12 The Aircraft departed the runway on the left side.

3.2.13 There was no damage to the Aircraft resulting from the Incident.

3.2.14 There was no other damage caused by the Incident.

3.2.15 The student pilot vacated the Aircraft normally with no injury.

3.2.16 There were no mechanical anomalies on the flight controls, steering and brake mechanisms prior to the Incident.

3.2.17 Examination of the maintenance records did not reveal any evidence of any other pre-existing Aircraft structural or mechanical anomalies that would have contributed to the Incident.

3.2.18 The post-incident damage assessment did not reveal any defects to the Aircraft.

3.2.19 There was no evidence that the student had any kind of fatigue, physical or psychological effect that could have contributed to the Incident.

3.2.20 There was no evidence observed that the condition of runway could have a factor in the Incident.

3.3 Cause

The Air Accident Investigation Sector determines that the cause of the runway excursion was the improper handling of the Aircraft directional control during the landing sequence. As the airspeed was reducing during the flare, the aileron and rudder inputs were, most probably, not increased as necessary. After touchdown, slowly required increment of aileron deflection into the wind was not applied.

3.4 Contributing Factor

Contributing factor to the Incident was the lack of situational awareness due to the fixation of the student pilot on the cockpit indications, most probably from a point during the flare lasting for few seconds after touchdown, which prevented him from proper external peripheral to assist in handling the directional control of the Aircraft.

4. Safety Recommendations

4.1 General

The safety recommendations are proposed according to paragraph 6.8 of *Annex 13 to the Convention on International Civil Aviation*[6], and are based on the conclusions listed in heading 3 of this Report. The GCAA expects that the safety issues identified by the Investigation are addressed by the receiving States and Organizations.

4.2 Safety Recommendations

The Air Accident Investigation Sector recommends that:

SR 05/2014

The Fujairah Aviation Academy to improve its training in:

(a) emphasizing when to use external peripheral reference points and/or instruments reference on landing.

(b) handling the aircraft directional control in the flare and landing roll in crosswind condition.

(c) recovery of the aircraft into runway track when it starts to veer.

SR 06/2014

The General Civil Aviation Authority of the United Arab Emirates to:

emphasize on the landing techniques in its flight training organization oversight program on all United Arab Emirates Flight Training Organizations.

[6] Paragraph 6.8 of *Annex 13 to the Convention on International Civil Aviation* states: 'At any stage of the investigation of an accident or incident, the accident or incident investigation authority of the State conducting the investigation shall recommend in a dated transmittal correspondence to the appropriate authorities, including those in other States, any preventive action that it considers necessary to be taken promptly to enhance aviation safety'.