

الهيئة العامة للطيران المدني  
GENERAL CIVIL AVIATION AUTHORITY



# Air Accident Investigation Sector

Accident

- Final Report -

AAIS Case File AIFN/0014/2014

## Runway Excursion following Hard Landing and Separation of the Right Hand Main Landing Gear

Operator: Fujairah Aviation Academy  
Make and model: Cessna 172S  
Nationality and Registration: The United Arab Emirates, A6-FAA  
Place of occurrence: Fujairah International Airport  
State of Occurrence: The United Arab Emirates  
Date of occurrence: 11 August 2014



## Aircraft Accident Brief

<b>AAIS Case No.:</b>	AIFN/0014/2014
<b>Operator/owner:</b>	Fujairah Aviation Academy
<b>Aircraft Make and Model:</b>	Cessna 172S
<b>Registration Mark:</b>	A6-FAA
<b>MSN:</b>	172S8146
<b>Engines S/N:</b>	L-30656-51E
<b>Date and Time (UTC):</b>	11 August 2014, 11:45
<b>Location:</b>	Fujairah International Airport.
<b>Category:</b>	Training
<b>Persons on-Board:</b>	2
<b>Injuries:</b>	0

## Investigation Objective

This Investigation is performed pursuant to the UAE Federal Act No 20 of 1991, promulgating the *Civil Aviation Law, Chapter VII- Aircraft Accidents, Article 4*. 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 Accident was notified to the General Civil Aviation Authority (GCAA) on 10 August 2014 at about 0745 UTC. The Investigator went to Fujairah International Airport on 11 August 2014. The Investigator coordinated with all authorities on site by initiating the accident investigation process according to prepared and previously exercised plans. The Air Accident Investigation Sector (AAIS) of the GCAA is leading the investigation, as the United Arab Emirates (UAE) is the State of Occurrence.

Note: Unless otherwise mentioned, all times in this Report are Coordinated Universal Time (UTC), (UAE Local Time minus 4).



## Synopsis

On 11 August 2014, at 0845 UTC, Fujairah Aviation Academy flight FUJ004, operated by a Cessna 172S aircraft, registration A6-FAA, was performing a recency and Pilot In Command (PIC) flight. The student pilot had not flown for about 40 days.

The instructor requested the student to perform a short field take-off from runway 11.

The student performed the take-off uneventfully. After take-off, at approximately 300 feet (ft) above ground level (AGL), climbing on the RWY 11 heading, the instructor gave an 'engine failure' exercise to the student.

In the simulation of engine failure, the student lowered the nose and applied 30° flaps. On final approach to the runway, the instructor requested a go-around and the student performed the go-around with full power and selected the flaps to 10°.

While climbing in the go-around, and at approximately 300 ft AGL, the instructor reduced the engine power to idle and gave another engine failure exercise to the student who again lowered the nose, applied 30° flap and aligned with the runway until reaching the flare phase. The instructor and the student felt that the rate of descent was higher than normal, the instructor delayed making a decision whether to go-around or to make a normal landing.

The instructor requested a go-around and both the instructor and the student advanced the throttle to full power.

The Aircraft made an unintentional heavy landing and bounced on its right main landing gear (RH MLG). The instructor then took control and initiated a climb.

After flying two low approaches followed by two go-arounds, the Aircraft touched down on the LH MLG from the third approach.

During the landing roll, the right wing gradually lowered until the wing tip touched the runway and the Aircraft veered to the right. The instructor applied left brake to counteract the veer towards the right hand edge of the runway, but the wing and the horizontal stabilizer had already contacted the runway surface, the Aircraft came to rest about 3 meters off the runway shoulder.

Shortly after the Accident, the AAIS issued SR29/2014 to the GCAA Airworthiness to carry out the following:

- (a) Request the operator to perform detailed inspection, visual and other methods, on similar areas of the Cessna 172 MLGs (both L/H and R/H) spring assembly (PN: 0541198) to determine serviceability.
- (b) This information and required inspection should also be shared with other UAE Operators of C172 Aircraft.

One safety recommendation was addressed to the operator to update the Standardization Manual to include a decision height for a go-around.



## Abbreviations and Definitions

<b>AAIS</b>	The Air Accident Investigation Sector
<b>AD</b>	Airworthiness Directive
<b>AGL</b>	Above Ground Level
<b>ARFF</b>	Airfield Rescue and Fire Fighting
<b>ATPL</b>	Air Transport Pilot License
<b>ATO</b>	Approved Training Organization
<b>CoA</b>	Certificate of Airworthiness
<b>CoR</b>	Certificate of Registration
<b>CPL</b>	Commercial Pilot License
<b>CRM</b>	Crew Resource Management Review
<b>CVR</b>	Cockpit Voice Recorder
<b>CSN</b>	Cycles Since New
<b>FDR</b>	Flight Data Recorder
<b>ft</b>	Feet (distance unit)
<b>GCAA</b>	General Civil Aviation Authority of the United Arab Emirates
<b>Investigation</b>	The investigation into this Accident
<b>IP</b>	Instructor Pilot
<b>M</b>	Meter(s)
<b>ME</b>	Multi Engine
<b>No.</b>	Number
<b>PPC</b>	Pilot Proficiency Check
<b>PPL</b>	Private Pilot License
<b>RH MLG</b>	Right Hand Main Landing Gear
<b>SB</b>	Service Bulletin
<b>SE</b>	Single Engine
<b>SOP</b>	Standard Operating Procedure
<b>SP</b>	Student Pilot
<b>TSLO</b>	Time Since Last Overhaul
<b>TSN</b>	Time Since New-flight hours
<b>UAE</b>	The United Arab Emirates
<b>UTC</b>	Coordinated Universal Time
<b>VFR</b>	Visual Flight Rules



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# 1. Factual Information

## 1.1 History of Flight

On 11 August 2014, at 0845 UTC, Fujairah Aviation Academy flight FUJ004, operated by a Cessna 172S aircraft, registration A6-FAA, was performing a recency and Pilot in Command (PIC) flight. The student pilot had not flown for about 40 days. On the day of the accident, before engine start, he was seated in the left hand seat and was responsible for radio communication with ATC. After engine start, the instructor took over communications with ATC and the student taxied the aircraft and lined up on the runway.

The instructor requested the student to perform a short field take-off from runway 11.

The student performed the take-off uneventfully. After takeoff, at approximately 300 feet (ft) above ground level (AGL), climbing on the runway 11 heading, the instructor gave an 'engine failure' exercise to the student which involved reducing the engine power to idle according to the "Standardization Manual", which states to *simulate by reducing power to idle*.

In the simulation of engine failure, the student lowered the nose and applied 30° flaps. On final approach to the runway, the instructor requested a go-around and the student performed the go-around with full power and selected the flaps to 10°.

While climbing in the go-around, and at approximately 300 ft AGL, the instructor reduced the engine power to idle and gave another engine failure exercise to the student who again lowered the nose, applied 30° flap and aligned with the runway until reaching the flare phase. The instructor and the student felt that the rate of descent was higher than normal, the instructor delayed making a decision whether to go-around or to make normal landing.

In the final approach stage the instructor requested a go-around, and both the instructor and the student advanced the throttle to full power.

The Aircraft made an unintentional heavy landing and bounced on its right main landing gear (RH MLG). The instructor then took control and initiated a climb.

After the go-around, ATC informed the instructor that something had separated from the Aircraft. The instructor confirmed that the RH MLG had detached. The Aircraft remained climbing on the runway heading.

While the Aircraft was climbing, following the ATC message, the instructor declared an emergency and prepared for an emergency landing.

The tower cleared the Aircraft to land. As a preparation for landing, the instructor flew an orbit and requested that the Airfield Rescue and Fire Fighting (ARFF) standby on the right hand side of the runway, as the instructor thought the Aircraft would drift to the right after touch down.

After flying two low approaches followed by two go-arounds, the Aircraft touched down on the LH MLG from the third approach.

During the landing roll, the right wing gradually lowered until the wing tip touched the runway and the Aircraft veered to the right. The instructor applied left brake to counteract the veer towards the right hand edge of the runway, but the wing and the horizontal stabilizer had already contacted the runway surface.

After 30 meters veering to the right on the runway, the Aircraft came to rest about 3 meters off the runway shoulder (figure 1).

Both pilots evacuated the aircraft without injury and were transported to the hospital.



Figure 2. Accident Aircraft final position

## 1.2 Injuries to Persons

Table 1 shows the injuries, there were no injuries.

Table 1. Injuries to persons						
Injuries	Flight Crew	Cabin Crew	Other Crew Onboard	Passengers	Total Onboard	Others
Fatal	0	0	0	0	0	0
Serious	0	0	0	0	0	0
Minor	0	0	0	0	0	0
None	2	0	0	0	0	0
<b>TOTAL</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

## 1.3 Damage to Aircraft

The RH MLG separated from the Aircraft due to the heavy landing. During the landing sequence the Aircraft sustained damage to the lower right hand side of the fuselage in the area where the undercarriage had separated. There was also damage to the right wing tip and bending of the right hand horizontal stabilizer upper and lower surfaces.

The right wing and right hand horizontal stabilizer control surfaces were slightly deformed due to contacting the runway. The fuel tanks and habitable living space in the cockpit remained intact.

## 1.4 Other Damage

There was no other damage to property or the environment.

## 1.5 Personnel Information

### 1.5.1 Instructor Pilot

The 24-year, male instructor pilot (IP) joined Fujairah Aviation Academy on 22/04/2013. He held a Commercial Pilot Licence (CPL) issued by the GCAA on 16/11/2011. He also held Multi-engine (M/E) land, Single engine (S/E) land, Instrument and Flight Instructor FI((A) Airplane) ratings. The instructor's total flight hours were 793:10.



The IP performed his Pilot Proficiency Check / Pilot Proficiency Instrument (PPC/IPC) with a GCAA flight examiner and obtained a satisfactory result on 16/12/2013.

The instructor held a valid aviation medical certificate GCAA, class 1.

## 1.5.2 Student Pilot

The 27 year old Student Pilot (SP), held a Private Pilot License (PPL) issued by the GCAA. He held a single engine land rating and had a total of 100:50 flight hours. The SP held a GCAA aviation medical class 1.

## 1.6 Aircraft Information

### 1.6.1 General Information

Table 2 illustrates general information on the aircraft.

Table 2. Aircraft data	
Manufacturer:	Cessna Aircraft Company
Model:	Cessna 172S
MSN:	172S8146
First Flight	17 March 2000
Nationality and registration mark:	UAE, A6-FAA
Name of the owner:	Fujairah Aviation Authority
Name of the operator:	Fujairah Aviation Authority
Certificate of Airworthiness (C of A)	
Number: 172S8146/Issue date: 14 October 2013/Valid to: 25 May 2015	
Certificate of Registration (C of R)	
Number: 14/99/ Issue date: 28 September 2006	
Date of delivery	23 October 1999
Total hours since new (TSN)	9132.35
Total cycles since new (CSN)	20149
Last inspection and date:	Phase 2 on 26 06 2014

### 1.6.2 Engine Data

General information about the engines.

Table 3. Engine data	
Engine Make and Model:	LYCOMING- Fuel Injected
Manufacture:	Cessna Textron Company
Propeller Type:	1A170E/JHA7660

## 1.7 Weight and Balance

The weight and balance was not a contributing factor to this Accident.

## 1.8 Meteorological Information

The prevailing meteorological conditions were not a factor in this Accident.



## 1.9 Aids to Navigation

None of the ground-based navigation aids, on-board navigation aids, and aerodrome visual ground aids or their serviceability was a factor in this Accident.

## 1.10 Communications

None of the on-board communications aids were a factor in this Accident.

## 1.11 Aerodrome Information

Aerodrome Information as per GCAA AIP relevant at the time of the Accident.

**Table 4. Aerodrome information**

Aerodrome ICAO Code	OMFJ
Airport Name	Fujairah International Airport
Airport Class	III
Airport Service	AFIS
Type of Traffic Permitted	IFR/VFR

The Fujairah International Airport is certified under the UAE *Civil Aviation Regulations (CAR) Part IX- Aerodromes*. Fujairah airport has one terminal and one runway and is rated as ARFF category 03.

## 1.12 Flight Recorders

The aircraft was not equipped with flight recorders.

Flight Recorders are not required for this category of air transport operation by the UAE *Civil Aviation Regulations*.

## 1.13 Wreckage and Impact Information

The Aircraft was intact, except that the RH MLG had detached from the Aircraft and was recovered on the Runway. The RH MLG was quarantined for testing.

## 1.14 Medical and Pathological Information

The crew were required to undergo a drug and alcohol test following a serious incident or accident. The Pilot and the student Pilot completed the required drug and alcohol test. There were no drug and alcohol findings.

## 1.15 Fire

There was no sign of fire.

## 1.16 Survival Aspects

The IP and the SP were transported to the hospital in the city. The medical report showed that they suffered no injuries.

## 1.17 Tests and Research

The RH MLG strut was sent to a metallurgical laboratory for independent examination to determine the fracture cause.



### **1.18 Organizational and Management Information**

Fujairah Aviation Academy is established in 1986. The Academy is approved by the GCAA and operates 13 aircrafts.

The flight consists of Cessna172, Diamond/D40/D42 and Robinson R44 Aircrafts.

Fujairah Aviation Academy manages air safety through the use of a Safety Management System (SMS).

### **1.19 Additional Information**

The Aircraft maintenance history recorded in the tech-log showed that all airworthiness directives and service bulletins were completed. A review of the global Cessna 172 accident data for similar failures did not detect any failure trends of the MLG assembly.

### **1.20 Useful or Effective Investigation Techniques**

Standard investigation techniques were used.



## 2. Analysis

### 2.1 Maintenance Record Verification

The investigation reviewed the maintenance history of the Aircraft and no anomalies or non-compliances were found that could have contributed to the onset of the RH MLG material failure.

To explain the RH MLG fracture mechanics, detailed testing of the undercarriage was performed.

No airworthiness directives or service bulletins had been implemented on the undercarriage during the last three months.

### 2.2 Fracture Analysis Report

The MLG was removed and sent to an independent forensic laboratory for detailed metallurgical analysis to determine cause of the fracture.

The conclusions of this analysis were:

- (a) The fracture surfaces of the RH MLG Assembly exhibited evidence of a typical brittle fracture.
- (b) Location of the failure, multiple cracking, flat fracture, absence of material thinning and chevron patterns on fracture surfaces confirms that the part was subjected to excessive stresses due to instantaneous load.
- (c) No Fatigue striations were observed on the fracture surface.

### 2.3 Flight Operations Review

A review of the *Standardization Manual* and the *Operations Manual- Part A*, for practice engine failures indicated that a decision height point was missing for mismanaged or unstabilized approaches.

A Crew Resource Management review (CRM) of the workload, task distribution and instructor decision making for unstabilized approaches, indicated that a full review of the SM is desirable.

### 2.4 Human Factors

There was no evidence of any psycho-active material that could have affected the performance of the Flight Instructor or the Student Pilot.

The Student Pilot was instructed to carry out a practice engine failure at 300ft AGL with engine idle power. After the instructions were given by the Instructor Pilot the Student Pilot carried out the exercise correctly according to the Standardization Manual SM. Before the Aircraft touched down the Instructor requested the student to fly a go-around.

At 300ft AGL the IP requested a second engine failure exercise and the SP performed the actions as on the first engine failure exercise.

The IP delayed deciding whether to ask the student to carry out a go-around, or to proceed with the landing, and the SP became confused as to the intentions of the IP.

The IP instructed the SP to fly a go-around late in the final approach stage. Both the instructor and the student advanced the throttle to full power. Shortly after this the RH MLG touched the Runway and separated from the Aircraft structure.



Both Pilots felt that the sink rate was higher than normal and the Instructor Pilot and the Student Pilot simultaneously applied engine power. This action did not lessen the sink rate significantly prior to the aircraft contacting the runway.

The reason for high sink rate could not be determined.



## 3. Conclusions

### 3.1 General

From the evidence available, the following findings, causes and contributing factors were made with respect to this Accident. 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 Accident. The findings are significant steps in this Accident sequence but they are not always causal or indicate deficiencies.
- **Causes-** are actions, omissions, events, conditions, or a combination thereof, which led to this Accident.
- **Contributing factors-** are actions, omissions, events, conditions, or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the accident or incident occurring, or mitigated the severity of the consequences of the accident or incident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil or criminal liability.

### 3.2 Findings

- 3.2.1 The IP was licensed and qualified for the flight in accordance with the existing requirements of the Civil Aviation Regulations of United Arab Emirates.
- 3.2.2 The SP was qualified for the flight in accordance with the existing requirements of the Civil Aviation Regulations of United Arab Emirates.
- 3.2.3 The Aircraft was airworthy, certified, equipped, and maintained in accordance with the existing requirements of the Civil Aviation Regulations of the UAE.
- 3.2.4 No AD's or SB's had been implemented on the undercarriage during the last three months.
- 3.2.5 The SM does not contain a decision height for mismanaged approaches.
- 3.2.6 The impact force of the heavy landing caused the RH MLG strut to fail and to separate from the aircraft.
- 3.2.7 No pre-existing faults were evident in the MLG structure as determined by testing conducted by a metallurgical laboratory.

### 3.3 Causes

The Air Accident Investigation Sector determines that the causes of the Accident were:

- 3.3.1 Mismanagement of the high rate of descent which resulted from the second engine failure exercise.
- 3.3.2 High impact force applied to the RH MLG which caused the failure of the RH MLG due to the heavy landing.
- 3.3.3 Lack of engine failure practice decision height in the SM for unstabilized approaches.



## 4. Safety Recommendations

### 4.1 General

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

#### 4.1.1 Prompt Safety Recommendation:

Shortly after the Accident AAIS issued SR 29/2014, requested GCAA- Airworthiness to carry out the following:

- (a) Request the operator to perform detailed inspection, visual and other methods, on similar areas of the Cessna 172 MLGs (both L/H and R/H) spring assembly (PN: 0541198) to determine serviceability.
- (b) This information and required inspection should also be shared with other UAE Operators of C172 Aircraft.

#### 4.1.2 Fujairah Aviation Academy:

It is recommended that Fujairah Aviation Academy

#### **SR16/2016**

Update the *Standardization Manual* to include a decision height for a go-around.

This Report is issued by:  
**The Air Accident Investigation Sector**  
**General Civil Aviation Authority**  
**The United Arab Emirates**