بسم الله الرحمن الرحيم

ACCIDENT INVESTIGATION COORDINATING COMMITTEE

AIRCRAFT SERIOUS INCIDENT REPORT 2019/01

FINAL REPORT

ON THE INVESTIGATION OF THE SERIOUS INCIDENT INVOLVING CESSNA 150M, 8Q-GAC AIRCRAFT, NEAR GAN INTERNATIONAL AIRPORT, MALDIVES

ON 09 AUGUST 2019

INTRODUCTION

Maldives is a signatory to the Convention on International Civil Aviation (Chicago, 1944) which established the principles and arrangements for the safe and orderly development of international air transport. Article 26 of the Convention obligates Signatories to investigate accidents to civil aircraft occurring in their State.

This report is based upon the investigation carried out by the Accident Investigation Coordinating Committee (AICC) in accordance with Annex 13 to the Convention, the Civil Aviation Act 2/2001 and the Civil Aviation Regulations. The sole objective of the investigation of an accident or incident is to prevent accidents and serious incidents and not to apportion blame or liability.

The AICC was assisted by Maldives Civil Aviation Authority (MCAA), Asian Academy of Aeronautics Pvt. Ltd. (AAA), Continental Aerospace Technologies and the Federal Aviation Administration of USA.

All timings in this report are in local time unless otherwise stated. Time difference between local and UTC is +5 hours.

The report is released on 17 March 2021.

Mr. Abdul Razzak Idris
Chairperson
Accident Investigation Coordinating Committee

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LIST OF ABBREVIATION

AAA	Asian Academy of Aeronautics Pvt. Ltd
AICC	Accident Investigation Coordinating Committee
AMO	Approved Maintenance Organisation
ARC	Authorised Release Certificate
ATC	Air Traffic Controller
ATO	Approved Training Organisation
CPL	Commercial Pilot License
DME	Distance Measuring Equipment
FAA	Federal Aviation Administration (USA)
FSDO	Flight Standards District Office
FSTD	Flight Simulation Training Device
GAN	IATA designated 3 letter code for Gan International Airport
lbs.	Pounds
MCAA	Maldives Civil Aviation Authority
MCAR	Maldives Civil Aviation Regulations
MOE	Maintenance Organization Exposition
N/A	Not Applicable
NE	North East
NM	Nautical Mile
PN	Part number
TAT	Total Air time
TSO	Time Since Overhaul
UTC:	Coordinated Universal Time
VHF	Very High Frequency
VRMG	Gan International Airport

SYNOPSIS

On 09th August 2019, Cessna 150M aircraft, registration 8Q-GAC departed Gan International Airport at approximately 15:20 hrs, on a training flight and was operating in the training area declared 'Charlie' in the North – East of Gan, about 6.7 DME. The aircraft was flying the fourth training flight of the day, with two crew onboard, an instructor pilot and a student pilot.

The student pilot was in control and flying under-the-hood at an altitude of 1500 feet.
Approximately 20 minutes into the flight the crew noticed a partial power loss of the engine. The Instructor pilot immediately took over the controls and attempted to correct the situation by adjusting the throttle and the mixture, but there was no improvement in the situation and the aircraft continued to lose altitude.

After having exhausted all their efforts to correct the situation, the Instructor pilot declared an emergency and reported to GAN ATC and requested clearance to make an emergency landing, but at approximately 4 DME from GAN, the aircraft altitude was noted at around 700 / 1000 feet, and the Instructor pilot decided to ditch near the reef of Vilingili island and landed the aircraft safely on water. The crew swam out of the aircraft and remained afloat close to the aircraft which was sinking slowly, and shortly afterwards they were rescued by a boat nearby, and taken to the Shangri-la Resort on Vilingili island.

Both crew members received medical treatment for minor injuries, and when the doctor released them they returned to the base in Gan Island.

The serious incident was notified to the AICC at 16:10 hours on the same day. Investigation began on 10 August 2019 with two Investigators from CAA arriving in Gan and interviewing both crew members and the ATC staff.

1. FACTUAL INFORMATION

Aircraft Owner:	Asian Academy of Aeronautics
Registered owner:	Asian Academy of Aeronautics
Operator:	Asian Academy of Aeronautics (ATO Certificate No: 001, Initial issue 25 July 2010 and last renewed on 01 Jan 2018)
Aircraft Type:	Cessna 150M
Nationality:	Republic of Maldives
Registration:	8Q-GAC
Aircraft Manufacturer:	Cessna Aircraft Corporation
Manufacturer's Serial No.:	15077763
Place of Accident:	Near Gan International Airport Latitude: 0° 40' 25.3'' S (-0.6736830) Longitude: 73° 11' 22.6'' E (73.1896194)
Date and Time:	09 August 2019 at 16:10 hours

1.1. History of the flight

1.1.2. Background

Cessna 150M aircraft, registration 8Q-GAC departed Gan International Airport approximately 15:20 hrs on 9 August 2019, on a training flight and was operating in the training area declared 'Charlie' in the North – East of Gan, about 6.7 DME. Approximately 20 minutes into the flight and at about 1500 feet altitude, while the student pilot was in the controls - and flying under-the-hood, the crew noticed a partial power loss of the engine. The Instructor pilot immediately took over the controls and attempted to correct the situation by adjusting the throttle and the mixture, but there was no improvement in the situation and the aircraft continued to lose altitude. After having exhausted all their efforts to correct the situation, the Instructor pilot declared an emergency and requested

for an emergency landing. The crew approached RWY 28 as instructed by ATC. While trying to return to GAN, the Instructor pilot continuously attempted to correct the situation by applying varying amounts of mixture. The crew reported that at approximately 4 DME from GAN, the aircraft altitude was noticed to be between 1000 to 700 feet. The Instructor pilot determining that the aircraft cannot make it to GAN, decided to ditch and informed ATC, accordingly. While preparing to ditch there was a sudden further loss of power and the crew quickly selected a landing area close to the reef of the Vilingili island, a resort hotel (See Figure 1).

A boat serving a group of scuba divers was nearby the selected landing area. In preparation for ditching, the crew unlatched both the crew doors and the seatbelts and successfully ditched the aircraft in the sea.
The crew evacuated the aircraft and remained afloat close to the aircraft – which was sinking slowly, and shortly afterwards they were picked up by the boat nearby.

Both crew members received out-patient treatment for minor injuries in the medical facility on the resort. The crew were released and later returned to the base in Gan island.

The aircraft sank to the bottom of the lagoon and was salvaged later and brought back to the Operator's base in GAN. It was then washed with fresh water to clear the effects of salt water before disassembly. The engine was removed and later shipped for testing and examination at Continental Aerospace Technologies engine facility in Mobile, Alabama, USA. The engine was inspected and tested under the oversight of FAA - Birmingham FSDO in Alabama.

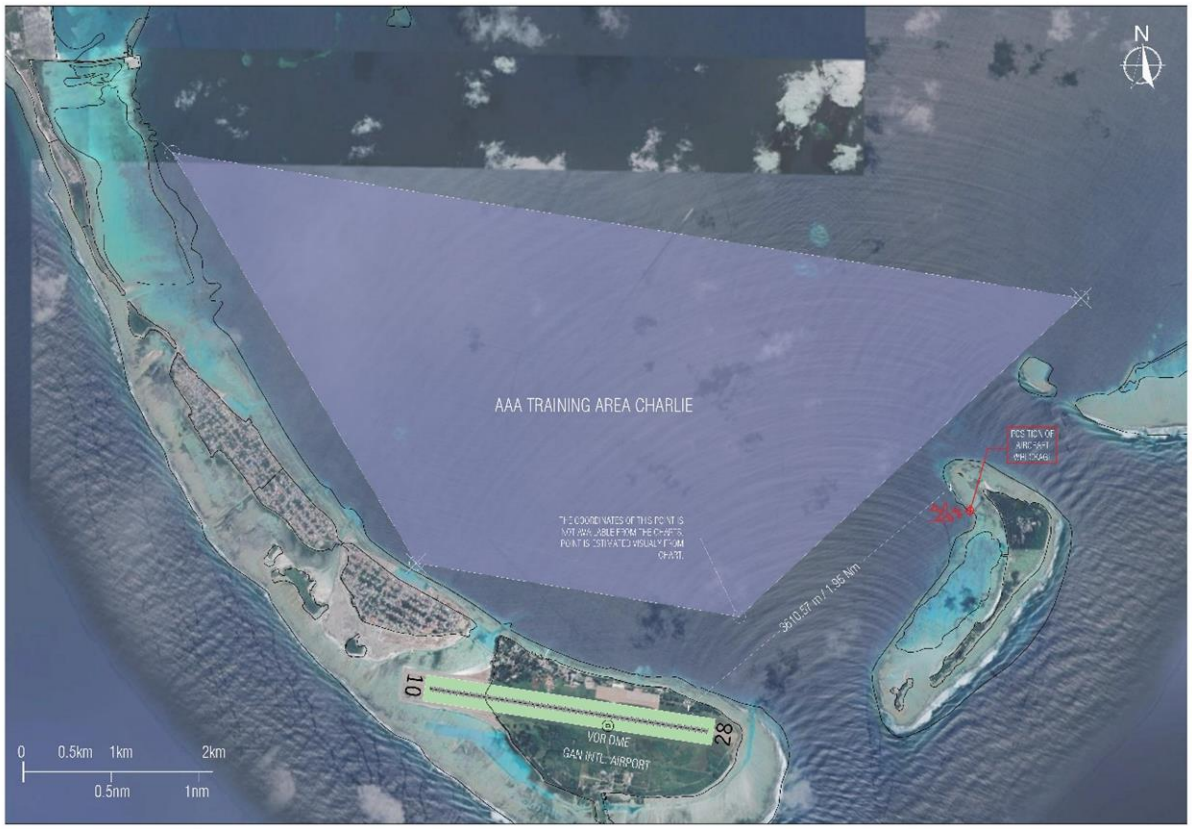


Figure 1: Map showing GAN Airport and location of ditching

The first and second flight of the day on this aircraft was flown by the same instructor with a different student pilot, and the third flight was flown by another Instructor. A total of 1 hour 54 minutes was flown with a total of 8 landings made in the previous three flights. The affected flight was the fourth flight of the day conducted on the aircraft.

According to the Mass and balance sheet the aircraft was re-filled with 8.5 gallons of fuel prior to the incident flight; a total 22.5 gallons of fuel was on board at departure. Take-off mass of the aircraft was 1,509 lbs. when the aircraft departed for the intended training flight.

The crew carried out the pre-flight and walk-around checks prior to the flight. No abnormalities were recorded or reported by the crew.

1.1.2 Aircraft

The single engine Cessna Aircraft Model 150M, Manufacturer's Serial Number 15077763 was built in 1976 and as of incident date it had accrued a TAT of 11,821.45 hours and 10,632 landings.

1.1.3 Flight crew

The flight crew consisted of an Instructor pilot and a student pilot conducting a training flight.

1.2. Injuries of persons

Injuries	Flight Crew	Cabin Crew	Passengers	Total affected in the aircraft	Others
Fatal	0	0	0	0	0
Serious	0	0	0	0	0
Minor	2	0	0	2	0
Nil	0	0	0	0	0
Total	2	0	0	2	0

1.3. Damage to aircraft

Whether the aircraft sustained damages or not during ditching cannot be determined. From underwater pictures taken after the aircraft sank to the bottom, it was seen that a lot of dents were on the belly of the aircraft.

Further, the following damages to the aircraft were found after it was salvaged;

- Aileron and flap substantially damaged
- Right elevator substantially damaged
- Engine and propeller damaged
- Minor damage to RH wheels and brakes

Figure 2: RH wing / flaps

Figure 3: RH wheel assembly

1.4. Other damage

There was no damage to property, persons or objects.

1.5. Personnel Information

1.5.1. Instructor Pilot

Age:	33 yrs
License:	CPL-A (valid till 06 November 2023)
Aircraft Ratings:	SEP (Land), SE/IR, FI
Last proficiency check:	25 April 2019
Last instrument rating renewal:	25 April 2019
Last line check:	SEP valid until 31 January 2020
	SE/IR expired on 30 April 2019
	FI valid until 11 February 2020
Last medical:	Class I – valid till 8 August 2020

Flying experience

Total all types:	1536 hours
On Type:	1457.8 hrs
Last 90 days:	166.4 hrs
Last 28 days:	56.5 hrs
Last 24 hours:	1.8 hrs

1.5.2. Student Pilot

Age:	23 yrs
License:	N/A
Aircraft Ratings:	N/A
Last proficiency check:	N/A
Last instrument rating renewal:	N/A
Last line check:	N/A
Last medical:	Class I – Issued 31 January 2018

Flying experience

Total:	126.7 hrs
Last 90 days:	12.4 hrs
Last 28 days:	8.5 hrs
Last 24 hrs:	0 hrs

1.5.3. Cabin crew

None

1.6. Aircraft information

1.6.1. General information

Cessna Model 150M aircraft is a single engine piston aircraft with fixed landing gear. The aircraft seats up to 2 pilots or 1 pilot and 1 passenger.

1.6.2. Airframe

Manufacturer:	Cessna Aircraft Company (one of the 3 distinct brands now owned and manufactured by Textron Aviation)
Registration:	8Q-GAC
Manufacturer's Serial Number (MSN):	15077763
Year of construction:	1976
Total Air Time at time of accident:	11,821.45 hours
Certificate of Airworthiness:	Issued by MCAA on 14 March 2011
Airworthiness Review Certificate:	Initial issued on 14 March 2011. Last ARC issued on 21 Jan 2019 valid until 20 Jan 2020
Last periodic inspection:	100 hourly - carried out on 28 July 2019
Last inspection carried out at TAT:	11,777.09 hrs

1.6.3. Engines and propellers

Aircraft is installed with one Continental O-200-A engine which is a naturally aspirated, air-cooled, horizontally-opposed four-cylinder engine driving a two-bladed fixed pitch all-metal McCauley propeller.

Engine	
Manufacturer:	Continental
Year of manufacture:	May 1967
Model:	Continental O-200-A
Serial number:	66800-7-A
Last overhaul:	14 May 2019
Date Installed on 8Q-GAC:	3 July 2019
TSO at installation:	0.00 hrs
TSN:	Unknown

The manufacturer records reflect that the build date of the engine as 09 May 1967, and the engine was initially shipped as an O-470-LI engine.

Propeller	
Manufacturer:	McCauley (now owned by Textron Aviation)
Year of manufacture:	Unknown
Model:	McCauley 1A102/OCM69-48
Serial number:	G17068

1.6.4. Cabin Layout and Configuration

The aircraft is fitted with a total of two seats installed side by side with an area behind the seats for storage. The aircraft has two large doors used for entry as exits.

1.6.5. Recent maintenance

The last scheduled Maintenance Check (100 hourly check) was completed on 28 July 2019 at TAT 11,777.09 hrs. The following scheduled Maintenance Checks were completed earlier:

Date	Check	Complied with at TAT
28 July 2019	100 hour check	11,777.09 hrs
15 July 2019	25 hour check	11,752.39 hrs
03 July 2019	50 hour check	11,728.42 hrs

During the 50-hour check on 03 July 2019, the aircraft had an engine change at TAT 11,728 hours. The installed engine, Continental O-200-A, Serial Number 66800-7-A was overhauled at the operator's facility and had 00 hours TSO at the time of installation.

1.6.6. Flight Controls

The flight controls consist of conventional, manually actuated primary flight controls operated through cables, pulleys, and mechanical linkages.

1.6.7. Fuel

According to the Mass & Balance completed by the Instructor Pilot, the aircraft was loaded with 22.5 gallons (108 lbs.) of fuel when it departed on the intended training flight.

Aviation gasoline AVGAS 100LL, stored by the company was used for all the aircraft in the operator's fleet. The fuel is supplied by the main fuel supplier in GAN airport and is delivered in 200 litre steel drums, as imported. The operator confirms that the barrels received are sealed and were delivered as imported, and no refilling takes place at the Supplier's facility.

The Operator provided a copy of the Quality certificate No. 52365-2/WF/FO/19 dated 13 May 2019, issued for batch no. 19/IN/144. The certificate was issued to Warter Fuels S.A. by J.S. Hamilton Poland Sp z.o.o. The certificate confirms the product Aviation Gasoline AVGAS 100LL meets WT 09/OBR PR/PD/48 ed VII and ASTM D 910, DEF-STAN 91-90 Issue 4. There was no documentation available to confirm that the fuel used for the affected flight was from this batch and not from a previous batch. Fuel from the same stock was used on all other aircraft refuelled on the day of the incident and there were no issues reported. Hence, the possibility of any fuel contamination is ruled out.

1.6.8. Accessories

None

1.6.9. Defects

Aircraft had no open defects as per the recorded information on the aircraft log books or technical log sheets.

1.6.10. Aircraft load

Load Limitations:

Maximum Take-Off Weight	1,919.32 lbs.
Empty Weight:	1,148.00 lbs.
Arm	32.3 inches
Moment:	58
CG Index:	32.58

The aircraft departed with a take-off mass of 1,509 lbs.

1.6.11. Load sheet

The Instructor pilot prepares the Mass & Balance sheet and leaves a copy on the ground prior to departure. The Mass and Balance sheet was retained on ground prior to this flight. Load sheet number 5183/06 prepared for the flight shows a calculated weight of 1509.1 lbs. CG was found to be within limits. Details on the load sheet is provided in the Appendices, under section 5.3.1 of this report.

1.7. Meteorological information

The following weather data was provided by ATC at Gan International Airport.

METAR VRMG 091100Z 18010KT 9999 - FEW018TCU BKN260 31.0/25.7 Q1009.3 NOSIG=

Meteorological information provided by ATC at Gan International Airport at 1100z on 9 August 2019 shows:

Wind:	180^{o} 10 knots
Sky condition:	Few clouds @ 1800 ft with towering cumulus
	Broken clouds @ 2600 ft
Temperature:	31.0; dew point 25.7
Pressure:	1009.3 hPa

No significant change expected

1.8. Aids to navigation

The trainee pilot was being trained on IFR flying at the time of the serious incident.

Following are the radio navigation and landing aids available at Gan.

Type of aid.CAT of ILS/MLS (for VOR/ILS/MLS, give VAR)	ID	Frequency	Hours of Operation	State of transmitting antenna coordinates	Elevation of DME transmitting antenna	Remarks
VOR / DME (4° W, 2020)	GAN	113.4 MHz CH 81x	H 24	004139.37S 0730919.77E	10M	Nil

1.9. Communications

The aircraft was equipped with one VHF radio set which was serviceable at the time of departure and all throughout the flight. There were no reports of any defects in the communication equipment.

1.10. Aerodrome information

GAN airport has a 3600 meter asphalt runway with fire category CAT 7 and is open for day and night operations.

Reference 004136S, 0730920E

1.11. Flight recorders

Not installed

1.12. Wreckage and impact information

1.12.1. Accident site visit

MCAA investigators visited accident site and observed the salvage operation. The ditching location is just outside the western reef of the Vilingili island in Addu Atoll, and the aircraft had come to rest in approximately 8m depth, the geographical location of which is 0° 40' 25.3'' S; 73° 11' 22.6'' E.

1.12.2. Salvage operations

The aircraft was lying upright on the seabed, at about 8.7m depth. The wreckage was recovered to shore by a team of salvage personnel, 5 days after the accident. It was lifted using an excavator positioned on a landing craft. The wreckage was placed on the same landing craft as the excavator, and transported to Operators facility on Gan island.

1.13. Medical and pathological Information

Both crew members initially received first aid medical treatment at the resort Clinic, and later at Hithadhoo Regional Hospital. The student pilot confirmed having undergone a radiographic imaging examination to diagnose conditions or injuries of the nose and a minor fracture observed and treated.

1.14. Fire

None

1.15. Survival aspects

Instructor and trainee pilot evacuated themselves immediately after the ditching and a nearby boat rescued them.

The student pilot stated that the cabin door on the port side was found jammed after the ditching, and could not be operated from inside the cabin, and therefore the instructor pilot evacuated through the door on the starboard side.

The only survival equipment on board were life jackets, and according to the student pilot, the life jackets were neither worn nor inflated, prior to or even after the ditching. It was evident, through student pilot's interview that no safety briefings were carried out in accordance with MCAR Air Operations, NCO.SPEC.125 Safety Briefing.

1.16. Tests and researches

Engine was examined to find the cause for power loss.

1.17. Organizational and management information

Asian Academy of Aeronautics Pvt. Ltd. (AAA) is a MCAA approved training organization holding Approved Training Organisation (ATO) Certificate No 001. AAA provide pilot training courses including use of Flight Simulation Training Device (FSTD) to student pilots. The AAA fleet consists of 13 aircraft (including the affected aircraft) comprising of Cessna 150, 152, 172 and Piper PA34.

The Organisation holds Continuing Airworthiness Management Organisation Approval MV.MG.004 for managing the maintenance, and MCAR M, Subpart F, approval MV.MF.001 for carrying out maintenance on the company owned aircraft fleet.
Under the Approval schedule of the Maintenance Organization Approval (MV.MF.001), the Organisation is authorized to carry out overhaul of Continental O-200 series piston engines.

1.18. Additional information:

None

1.19. Useful of effective investigation techniques:

None

2. ANALYSIS

The serious incident occurred due to loss of engine power whilst on a training sortie. The crew tried to recover engine power by taking corrective actions. However, these actions did not regain engine power and as a result the aircraft was ditched.

The aircraft wreckage was salvaged from the sea bed and brought back to Operator's base in GAN airport. Substantial secondary damages were caused during the salvage operation.

The engine was removed as part of the investigation and sent to the manufacturer for further investigation. The results of the investigation reads;

"The intake valve on the #4 cylinder separated from the valve springs/guide and punctured the intake port after the stem was bent almost 90 degrees. One half of the two-piece valve key for the #4 cylinder's intake valve was fractured. The intake rocker also displayed rub damage consistent with contact interference with the valve keys or the valve spring keepers. It was not clear if the rocker damage was an initiating or resultant event."

Figure 4: Affected intake valve springs and valve keys

On cylinder #4, the cylinder stem of the intake valve was protruding from the right side of the cylinder in the intake port area. One of the two intake valve keys was fractured. There

were wear masks and deformation damage noted on the outside of the valve keys. The valve keeper displayed markings consistent with rocker contact. The intake valve was displaced from the seat and the stem was bent almost 90 degrees. "

The report also stated that no pre-event anomalies were observed on the induction system, left magneto, right magneto, ignition harness, spark plugs, carburetor, oil pick up tube and screen, cylinder #1, cylinder #2, cylinder #3, crank case, #1 main bearings, #2 main bearings, #3 &4 main bearings, #1 connecting rod, #3 connecting rod, #2 connecting rod, #4 connecting rod, cam shaft, starter, Alt/gen#1 and vacuum pump.

Review of the records confirmed that the affected engine had been removed on 17 July 2018, from another aircraft operated by the same company for overhaul at TSO 1,794.44 hours, the overhaul (Hard Time) interval being 1800 hours.

The engine overhaul records indicate that the engine was overhauled in AAA maintenance facility in Gan.

Documents were available for review. According to the Authorised Release Certificate (ARC) (CAA Form 1 F1.AAA295, dated 14 May 2019) issued after completing the overhaul of the engine states that the #4 cylinder was replaced with an overhauled unit of part number SAC10203F and serial number B-03273.

The ARC (CAA Form 1 F1.AAA281, dated 22 July 2018), issued for the cylinder, indicates that the intake valve (part number SA641792) was replaced and a spring valve test was conducted. It was entered in the log books that the overhaul was carried out in accordance with the engine overhaul manual part number X30010.

During examination of the engine at Continental Engine Overhaul Facility, it was observed that fractured valve keys (keepers) resulted in separation of an intake valve that punctured the intake port on number 4 cylinder. The part numbers for the Lock, valve spring seat (valve keepers) were not listed on the Work Order and there was no confirmation that those were replaced at the time of the overhaul.

The "Maintenance Manual, Standard Practice, For Spark Ignited Engines" publication M-0, Change 5, dated January 2018, published by the Continental Aerospace Technologies, covers Mandatory Overhaul Replacement Parts in Table C-1 in section C-2.4, which states that the Valve Keepers (intake / exhaust) require "Mandatory Replacement at Engine Overhaul". This was the latest revision of the Maintenance manual Standard Practice that was current at the time of the overhaul. However, the Organisation had access to an outdated version of the manual which was Change 4, issued, and dated July 2017. According to the maintenance staff who worked in the overhaul shop it was noted that in all the previous engine overhauls the valve keys were replaced only if they were worn or otherwise not acceptable to be installed.

The examination report confirmed that the rocker showed some rubbing damage consistent with damage caused from rubbing on the valve spring assembly and / or valve keys. Whether this was an initiating event or an after effect of the fractured keys, cannot be established during the examination.

According to AAA, the overhaul was carried out in accordance with manual # X30010, an FAA approved document issued in January 1984 and revised on 31 August 2011.

Review of the Company records from the Bonded Stores confirm that a stock of 50 pieces of the 'Locker, valve spring seat' p/n: 21361 was available since 2016.

Figure 4: 'Locker, valve spring seat' p/n: 21361

As per the engine overhaul report A2269 / F1.AAA.295 completed on 14 May 2019, under Assembly and Sub-assemblies chapter 75-50-00 (Fig 75-50-01A/B/C and D) the cylinder assembly overhaul was completed in accordance with the Overhaul Manual references 11-16/11-22/14-8/15-13/ 16.8/16.9. The Operator uses an overhaul form, – FORM-OH-003 for Continental O-200 series engines, which is defined in the MOE, to record tasks. However, AAA could not produce a duly completed Form relevant to this particular engine. Instead, Form OH-001 was used which is the form to be used for Lycoming O-320 series engines.

The engine had accrued a total of 93:03 hours since overhaul when the incident occurred on 9 August 2019. There were no recorded defects on the Technical Log pages since 03 July 2019 until the accident flight.

2.1 Organization's Scope of Maintenance

The scope of works as stated in company MOE section 1.9 states:

a) "Under the MCAR-M Subpart F approval the company is approved to:

1. Maintain any aircraft and/or component for which it is approved at the locations specified in the approval certificate and this manual, and;
2. Maintain any aircraft and/or component for which it is approved at any locations subject to such maintenance being only necessary to rectify a defect, and;
3. Arrange for specialised services to be carried out by an appropriately qualified organisation and under the control of this organisation in accordance with procedures described in its Maintenance Organisation Manual.
4. Issue Certificates of Release to Service on completion of maintenance."

b) Under engine maintenance rating, B2, Continental O-200 series engine models, maintenance level is stated as:

"All maintenance specified in the Maintenance Manual including cylinder assembly/disassembly and engine overhaul limited to disassembly, clean, inspect and reassembly in accordance with the current approved manufacturer instructions."

c) Under the sub-section on Engine overhaul works and description of jobs it is stated:

"AAA Approved Maintenance organisation carries out engine overhaul works on engines installed on AAA fleet only. All the overhaul work is done in accordance with the following procedure.

Disassembly, clean , inspect and reassembly in accordance with the current manufacturer instructions described on overhaul manuals approved by FAA (all the engines on AAA fleet have TCs issued by FAA) and engine manufacturer specified in each type of engine, using the correspondent form of each engine."

3. CONCLUSIONS

3.1. Findings

3.1.1. General

1. The aircraft could not maintain its altitude due to engine failure;

2. The aircraft had sufficient fuel on board;

3. Examination of the engine by the OEM confirmed that its number 4 cylinder sustained damage due to:
   a. The valve spring/guide separating from the intake valve on #4 cylinder and puncturing the intake port;
   b. One half of the two-piece valve key of the #4 cylinder's intake valve being fractured;
   c. The intake rocker also displaying rubbing damage consistent with contact interference with an initiating or resultant event;

4. The part numbers of the valve keepers were not listed on the Work Order as one of the parts replaced during the overhaul of the engine. As confirmed by AAA the valve keeper was not replaced at the time of the overhaul as required by "Maintenance Manual, Standard Practice, For Spark Ignited Engines";

5. The "Maintenance Manual, Standard Practice, For Spark Ignited Engines" publication M-0, Change 5, dated January 2018, published by the Continental Aerospace Technologies, covers Mandatory Overhaul Replacement Parts in Table C-1 in section C-2.4, which states that the Valve Keepers (intake / exhaust) require "Mandatory

Replacement at Engine Overhaul". The Organization did not have access to the latest revision of the manual.

3.1.2. Safety Briefings for Over Water Flying

It was evident, through student pilot's interview that no safety briefings were carried out in accordance with MCAR Air Operations, NCO.SPEC.125 Safety Briefing.

3.1.3. Causes

The aircraft could not maintain altitude to reach GAN airport due engine power loss resulting from mechanical failure of number 4 cylinder assembly.

4. SAFETY RECOMMENDATIONS

1. The operator to establish procedures to:
    a. Ensure that all maintenance, repair and overhaul of the engines / airframes / components are carried out as per the prescribed procedures in the Technical Publications plus the policies and procedures prescribed in the Manuals approved by MCAA;
    b. Ensure updated manuals are made available at all times for maintenance and overhaul operations personnel;
    c. Ensure all the tasks carried out plus specific references are recorded in the Work Orders/Task Cards, as required by MCARs;
    d. Ensure safety briefings are carried out in accordance with MCAR Air Operations NCO.SPEC.125 before each flight.

2. MCAA to ensure compliance monitoring and quality assurance of the Maintenance Organization (AAA) is strengthened.

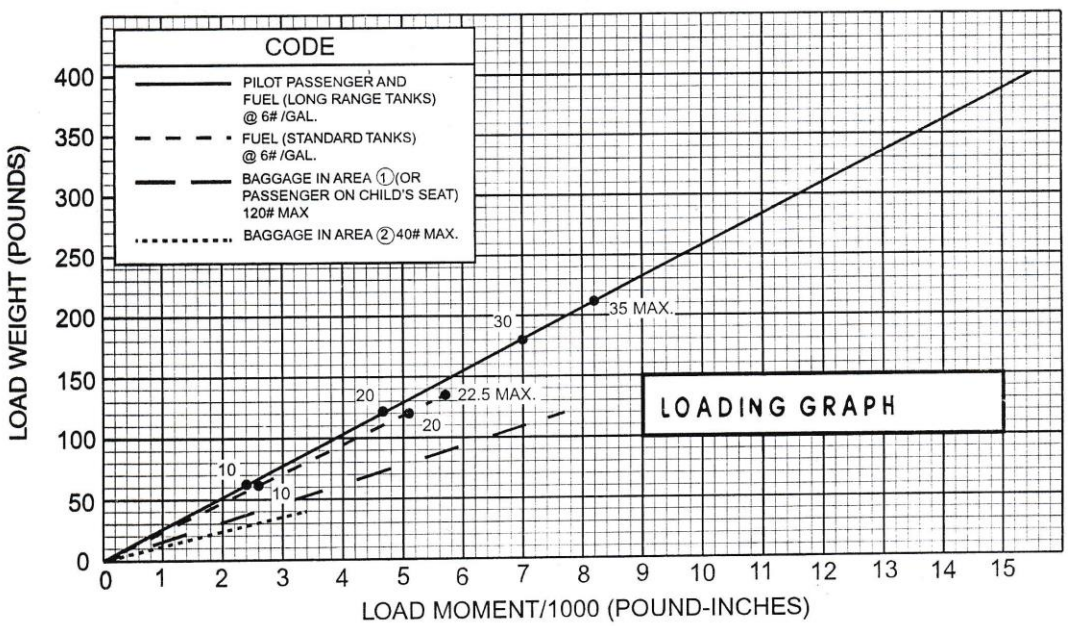
5 APPENDICES

5.1 Flight plan and Load Sheet

DATE	09/08/19
SERIAL NO.	5183/06
A/C REG.	8Q GAC
STUDENT	
INSTRUCTOR	

C150
Mass & Balance Sheet
Flight Operations
Asian Academy of Aeronautics

SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE		YOUR AIRPLANE	
	Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	Moment (lb.-ins. /1000)
1. Basic Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel and full oil)	1125	36.6	1148	36.9
2. Usable Fuel (At 6 Lbs./Gal) Standard Tanks (22.5 Gal. Maximum)	135	5.7	108	4.5
Long Range Tanks (35 Gal. Maximum)				
Reduced Fuel (As limited by maximum weight)				
3. Pilot and Passenger (Station 33 to 41)	340	13.3	253	9.8
4. Baggage - Area 1 (Or passenger on child's seat) (Station 50 to 76, 120 Lbs. Max.)				
5. Baggage - Area 2 (Station 76 to 94, 40 Lbs. Max.)				
6. TOTAL WEIGHT AND MOMENT	1600	55.6	1509	51.2
7. Locate this point (1600 at 55.6) on the Center of Gravity Moment Envelope and since this point falls within the envelope, the loading is acceptable.			1401	46.7



NOTES: Line representing adjustable seats shows the pilot or passenger center of gravity on adjustable seats positioned for an average occupant. Refer to Loading Arrangements Diagram for forward and aft limits of occupant. e.g. range.

5.2 Technical investigation reports

The engine examination report from Continental Aerospace Technologies following engine examination was used to compile this report.

5.3 Pertinent pages from manual and logbooks

Technical log Sheet for affected flight

A/C Type	A/c Reg.No	AIRCRAFT TECHNICAL LOG SHEET	DATE	Tech Log Serial No.
CESSNA 150	8Q-GAC	Asian Academy of Aeronautics (Pvt) Ltd. Gan International Airport, Republic of Maldives	09/08/19	2029

I certify that I have inspected this Aircraft in accordance with approved Daily Inspection Schedule — CAM Signature — Lic No 3111

Pre Flight linspection carried out (Signature of Pilots) — Victor C

S #	FROM	TO	FLIGHT TIME T/O	FLIGHT TIME LAND	FLIGHT TIME TOTAL	FUEL (Gal) UP LIFT	FUEL (Gal) TOTAL	OIL (qts) UP LIFT	OIL (qts) TOTAL	CAPTAIN'S NAME	LIC NO	SIGN	LDGS	HOBBS TIME
1	VRMG	VRMG	0918	1002	0044		22		5.0	CHARLS	936		3/L	25.1-26.0=0.9
2	VRMG	VRMG	1050	1134	0044					CHARLS	936		4/L	26.0-26.9=0.9
3	VRMG	VRMG	1418	1444	0026	8.5	22.5			VICTOR	1189	Victor C	1/L	26.9-27.5=0.6
4	VRMG	-	1530							CHARLS	936			27.5
5														
6														
7														
8														
9														
10														
11														
12														
		TOTAL												

TOTAL AIRCRAFT TIME & LEGS STATE		
	Total Time	T/L
BRING FWD	11819.21	
THIS PAGE		
CARRY FWD		

CERTIFICATE OF RELEASE TO SERVICE		
SERIAL NUMBER	AC012/19	
TOTAL A/C TIME		
ISSUED TIME		DATE

CERTIFICATE OFMAINTENACE REVIEW	
LAST SCHEDULE CHECK SERVICE	
Description	100H
Done at	11777.09
NEXT SCHEDULE CHECK SERVICE	
Description	50H
Due at	11827.09
Remaining	7.48

No.	DEFECT (State if Nil)	Rectification
1	-NIL-	
2	-NIL-	
3	-NIL-	
4	PARTIAL POWER - A/C DISLIKED	
5		
6		
7		
8		
9		
10		
11		
DIFERRED LIST		-NIL-

NOTE

A new sheet must be started for each days flying as well as defect has been recorded and rectified

Distribution of Tech Log Sheet	
White	Stay in Log Book
Pink	Maintenance
Green	Flight Operation

Certifies that the work specified except as otherwise specified was carried out in accordance with MCAR-M and in respect to that work Aircraft in considered ready for Release to service	CRS CAM Signature	CAM Lic. No.	Dual Signature	Licence Number	DATE

5.4 ATO Certificate copy

بسم الله الرحمن الرحيم

MALDIVES CIVIL AVIATION AUTHORITY
REPUBLIC OF MALDIVES

ATO No: 001

APPROVED TRAINING ORGANISATION CERTIFICATE

Pursuant to Civil Aviation Regulation MCAR – AIRCREW, and subject to the conditions specified below, the Maldives Civil Aviation Authority hereby certifies,

ASIAN ACADEMY OF AERONAUTICS (PVT) LTD
AAA Hanger
Gan International Airport,
Addu Atoll
Republic of Maldives
Telephone: (960) 6898829 (960) 759 9149
Fax: (960) 689 8829
E-mail: info@aaa-fta.com, ceo.ht@aaa-fta.com

as a Part-ORA certified training organisation with the privilege to provide Part-FCL training courses, including the use of FSTDs, as listed in the attached training course approval.

CONDITIONS

This certificate is limited to the privileges and the scope of providing the training courses, including the use of FSTDs, as listed in the attached course approval.

This certificate is valid whilst the approved organisation remains in compliance with Part-ORA, Part-FCL and other applicable regulations.

Subject to compliance with the foregoing conditions, this certificate will remain valid to the expiry unless the certificate has been surrendered, superseded, limited, suspended or revoked.

Date of initial issue: 25th July 2010
Date of renewal: 1st January 2018

MALDIVES CIVIL AVIATION AUTHORITY · MALDIVES

Hussain Jaleel
CHIEF EXECUTIVE

5.5 AMO approval

بسم الله الرحمن الرحيم

MALDIVES CIVIL AVIATION AUTHORITY
REPUBLIC OF MALDIVES

Reference:
MV.MF.001

MAINTENANCE ORGANISATION APPROVAL CERTIFICATE

Pursuant to Civil Aviation Regulations for the time being in force and subject to the conditions specified below, the Civil Aviation Authority hereby certifies:

ASIAN ACADEMY OF AERONAUTICS PVT LTD
AAA HANGER AND OFFICE FACILITIES
GAN INTERNATIONAL AIRPORT
ADDU CITY
REPUBLIC OF MALDIVES

as a maintenance organisation in compliance with MCAR-M Section A Subpart F, approved to maintain the products, parts and appliances listed in the attached approval schedule and issue related certificates of release to service using the above references.

CONDITIONS

1. This approval in limited to that specified in the scope of approval section of the approved maintenance organisation manual as referred to in Section A of MCAR-M Subpart F, and
2. This approval requires compliance with the procedures with the procedures specified in the approved maintenance organisation manual, and
3. This approval is valid whilst the approved maintenance organisation remains in compliance with MCAR-M.
4. Subject to compliance with the foregoing conditions, this approval shall remain valid for an unlimited duration unless the approval has previously been surrendered, superseded, suspended or revoked.

Revision Number: 04
Date of this Revision: 03 October 2016
Date of Original Issue: 09 August 2012

Signed:
For the Civil Aviation Authority

CAA Form 3-MF, Issue 02, 1 November 2014

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MAINTENANCE ORGANISATION APPROVAL SCHEDULE

Reference: **MV.MF.001**

Organisation: **ASIAN ACADEMY OF AERONAUTICS PVT LTD**

CLASS	RATING		LIMITATION
AIRCRAFT	A2	Aeroplanes	Cessna 150 Series
			Cessna 172 Series
			Piper PA-34 Series
ENGINES	B2	Piston	Lycoming O-235 Series
			Lycoming O-320 Series
			Lycoming O-360 Series
			Rolls-Royce Continental O-240 Series
			Continental O-200 Series
			Teledyne Continental TSIO-360 Series
			Teledyne Continental LTSIO-360 Series
COMPONENTS OTHER THAN COMPLETE ENGINES OR APUs	C4	Doors — Hatches	All maintenance specified in the Scope of Work in the Company MOE
	C5	Electrical Power	
	C8	Flight Controls	
	C12	Hydraulic	
	C14	Landing Gear	
	C16	Propellers	
	C20	Structural	

This approval is limited to the products, parts and appliances and to the activities specified in the scope of work section of the approved maintenance organisation manual.

Maintenance Organisation Exposition Reference: MV.MOE.MF.001 at latest amendment

Revision Number: 04
Date of this Revision: 03 October 2016
Date of Original Issue: 09 August 2012

Signed:
For the Civil Aviation Authority

CAA Form 3-MF, Issue 02, 1 November 2014

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5.6 Photographs

The photos below show the aircraft underwater, after salvage and some photos of the components captured from the engine examination report.

Figure 6: Aircraft on the seabed

Figure 7: Aircraft on the sea bed

Figure 8: Disassembled engine

Figure 9: Bent Intake valve stem

Figure 10: Intake valve stem protruding from the cylinder

Figure11: Protruding engine intake valve stem

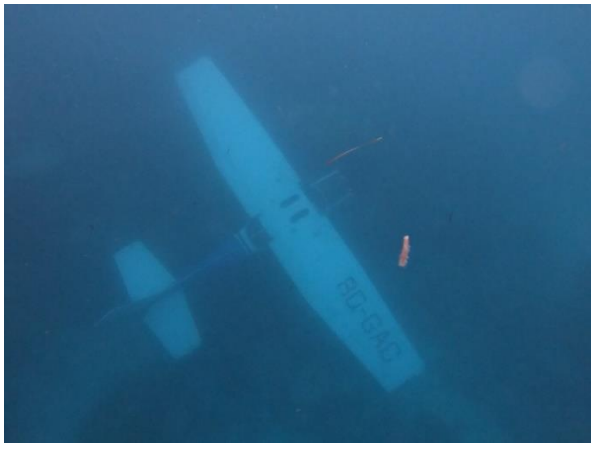

Figure 12: Aircraft on the seabed

Figure 13: Unopened life jacket observed on cabin floor after the salvage

5.7 Authorised Release Certificate:

5.7.1 MCAA Form 1 – issued by AAA (MV.MF.001) following overhaul of cylinder s/n B-03273 p/n: SAC10203F.

1. Approved Competent Authority / Country Maldives Civil Aviation Authority, Maldives	2. AUTHORISED RELEASE CERTIFICATE CAA Form 1	3. Form Tracking Number F1.AAA.281
4. Approved Organisation Name and Address Asian Academy of Aeronautics Gan International Airport Telephone: +960 7599150 Facsimile: +960 6898829		5. Work Order/ Contract/ Invoice: AZ255

6. Item	7. Description	8. Part No	9. Qty.	10. Serial No.	11. Status/Work
1	CYLINDER	SAC10203F	1	B-03273	Overhauled

12. Remarks
REPLACED INTAKE VALVE PART# SA641792 AND EXHAUST VALVE GUIDE PART# SA10205-1, PERFORMED HOMMING AND SPRING VALVE TEST, OVERHAULED IAW MANUAL # X30010

"Certifies that, unless otherwise specified in this block, the work identified in block 11 and described in this block was accomplished in accordance to the requirements of Section A, Subpart F of MCAR-M and in respect to that work the item is considered ready for release to service. THIS IS NOT A RELEASE UNDER MCAR-145."

13a. Certifies that the items identified above were manufactured in conformity to: ☐ Approved design data and are in condition for safe operation ☐ Non-approve design data specified in block 12		14a. ☐ MCAR-145.50 Release to Sercive ☑ Other regulation specified in block 12 Certifies that unless otherwise specified in block 12, the work identified in block 11 and described in block 12, was accomplished in accordance with MCAR-145 and in respect to that work the items are considered ready for release to service.	
13b. Authorised Signature	13c. Approval/ Authorisation Number	14b. Authorised Signature	14c. Certificate/ Approval Ref. No MV.MF.001
13d. Name	13e. Date (dd/mm/yyyy)	14d. Name	14e. Date (dd/mm/yyyy) 22/07/2018

USER/INSTALLER RESPONSIBILITIES
This certificate does not automatically constitute authority to install the item(s).
Where the user/installer performs work in accordance with regulations of an airworthiness authority different than the airworthiness authority specified in block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts items from the airworthiness authority specified in block 1.
Statements in blocks 13a and 14a do not constitute installation certification. In all cases aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be flown.

CAA Form 1
Issue 02, November 2014

5.7.2 MCAA Form 1 – issued by AAA (MV.MF.001) following overhaul of O-200 –A engine s/n 66800-7-A

1. Approved Competent Authority / Country Maldives Civil Aviation Authority, Maldives	2. AUTHORISED RELEASE CERTIFICATE CAA Form 1			3. Form Tracking Number F1.AAA295
4. Approved Organisation Name and Address Asian Academy of Aeronautics Gan International Airport Telephone: +960 7599150 Facsimile: +960 6898829				5. Work Order/ Contract/ Invoice: AZ269
6. Item	7. Description	8. Part No	9. Qty.	10. Serial No.	11. Status/Work
1	ENGINE	CONTINENTAL O200-A	1	66800-7-A	Overhauled
12. Remarks COMPONENTS INSTALLEDS: CRANKSHAFT PART# 653012 SER#N10BA125 /CAMSHAFT PART# 626608 SER#189941 /CYL #1 PART#SAC10203F SER# B-03718 /CYL#2 PART#SAC10203F SER# B-03754/CYL#3 PART# SAC10203K SER# B-4710 /CYL#4 PART#SAC10203F SER#B-03273 /CARBURETTOR PART#10-4894-1 SER# BE-24-22526/ MAGNETOS PART# 4301 LH SER# 06070597 RH SER# 11011005/ STARTER PART# C12ST2/S SER# H-S060746/DRY PUMP PART# 215CC SER# 174730 / ALTERNATOR PART# DOFF10300FR SER# H-L06077.				
"Certifies that, unless otherwise specified in this block, the work identified in block 11 and described in this block was accomplished in accordance to the requirements of Section A, Subpart F of MCAR-M and in respect to that work the item is considered ready for release to service. THIS IS NOT A RELEASE UNDER MCAR-145."				
13a. Certifies that the items identified above were manufactured in conformity to: ☐ Approved design data and are in condition for safe operation ☐ Non-approve design data specified in block 12			14a. ☐ MCAR-145.50 Release to Sercive ☑ Other regulation specified in block 12 Certifies that unless otherwise specified in block 12, the work identified in block 11 and described in block 12, was accomplished in accordance with MCAR-145 and in respect to that work the items are considered ready for release to service.	
13b. Authorised Signature	13c. Approval/ Authorisation Number		14b. Authorised Signature	14c. Certificate/ Approval Ref. No MV.MF.001
13d. Name	13e. Date (dd/mm/yyyy)		14d. Name	14e. Date (dd/mm/yyyy) 14-05-19
USER/INSTALLER RESPONSIBILITIES This certificate does not automatically constitute authority to install the item(s). Where the user/installer performs work in accordance with regulations of an airworthiness authority different than the airworthiness authority specified in block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts items from the airworthiness authority specified in block 1. Statements in blocks 13a and 14a do not constitute installation certification. In all cases aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be flown.				

CAA Form 1
Issue 02, November 2014