

# **AFA72 Occurrence Investigation**

## **Executive Summary**

On July 9<sup>th</sup>, 2018, APEX flight academy, flight AFA72, a DA-40NG trainer aircraft, registration number B-88123, took off at 1622 Taipei local time from Taitung Airport to Kaohsiung International Airport for a training flight with one instructor pilot and 2 student pilots on board. The flight crew declared an emergency of engine failure to the traffic controller at 1705, then ditched on the sea about 12 nautical miles southwest of Kaohsiung International Airport. All of the three on board crew were rescued and sent to medication, the occurrence aircraft sank into the sea.

Pursuant to the Transportation Occurrence Investigation Act of Republic of China (ROC) and refer to the Annex 13 of the Convention on International Civil Aviation, the Taiwan Transportation Safety Board (TTSB), an independent aviation occurrence investigation agency, is responsible for conducting the investigation. The investigation team included members from Ministry for Transport, Innovation and Technology (Bundesministerium für Verkehr, Innovation und Technologie/BMVIT) of Austria, Diamond Aircraft Industrie, Austro Engine GmbH, Apex flight academy and Taiwan Civil Aeronautical Administration (CAA). The draft investigation report was completed in May 2019. In accordance with the procedures, it was reviewed at ASC's 80<sup>th</sup> Council Meeting on June 25<sup>th</sup>, 2019 and distributed to the occurrence related organizations and authorities for comments. The final investigation report has been reviewed and been approved by TTSB's 5<sup>th</sup> Council Meeting on November 1<sup>th</sup>, 2019, and is published on November 18<sup>th</sup>, 2019.

There are a total of 8 findings from the Final Report, and 5 transportation safety recommendations issued to the related organizations as follows.

### **Findings related to the probable causes**

1. The No.4 piston crown of the occurrence engine encountered a massive oil loss from the hole which caused by the abnormal thermal stress of non-optimal fuel injection, which all attributed to the deterioration of the injector interior cavitation, and eventually led the power loss and engine flame out. (1.16.2, 2.1.1)

### **Findings related to the risks**

1. In accordance with the manufacturer engine manual, the occurrence engine has to be overhauled within the usage of 1,800 flight hours or 12 calendar days, before that, there was no maintenance action required on injector section. As per the examination reports from the manufacturer, the risk of engine failure is raised due to the fuel injection could deteriorate after 900 flight-hour usage. (1.6.3, 1.16.2, 2.1.2)

### **Others**

1. Despite the reachability of relevant ditching procedures in the appendix 11 of Apex flight operation manual, but lack of the reference of the water/ground emergency procedure is possibly influencing decision and action making during the flight crew encounter emergency. (1.6.2, 1.16.2, 2.2.1)
2. The battery status check of life vest was not included in the Apex maintenance item. The brightness of the life vest locating light was possibly insufficient or being inactive before 2-year expiration

prescribed in the manual. (1.15.3, 2.2.2)

3. The emergency actions applied and decision made by the flight crew during ditching were complied with the relevant operation procedure. (1.15.4, 2.3)
4. Not only the fleet of Apex is not equipped Automatic Dependent Surveillance-Broadcast (ADS-B) OUT system, also some locations of the ADS-B IN system set by the CAA are influenced by the local geographic setting, therefore the coverages of aircraft flight path would be lost in low altitude area of the Taiwan east rift valley. (1.18.4, 2.4)
5. The flight crew of this occurrence is qualified and both are compliance with the current civil aviation regulations, there is no evidence indicating the performance of the crew had been influenced by any medication or alcohol during flight. There were no abnormal finding related to weight and balance of the occurrence aircraft. (1.5, 2.2)
6. There was no abnormal item or event recorded in accordance with one week daily /pre/post-flight check records, one-month maintenance log book and aircraft and engine periodic check records before occurrence. The airworthiness directive status of occurrence aircraft is normal. (1.6.2)

## **Recommendations**

In lights of Austro Engine manufacturer issued a mandatory service bulletin No. MSB-E4-025 on 1<sup>st</sup> October, 2018 and EASA issued an airworthiness directive No: 2019-0041 on 25<sup>th</sup> February, 2019. Otherwise, the Taiwan CAA approved the items of maintenance program mentioned in the subject MSB and issued an airworthiness directive No. CAA-2019-02-017 on 27<sup>th</sup> February, 2019 in Taiwan. The

TTSB believes those proactive safety actions with regards to the maintenance improvement of fuel injectors taken by Apex, Austro Engine and corresponding authorities appropriately address the safety issue related to fuel injectors deterioration problem when the usage is over 900 flight hours. Furthermore, the Taiwan CAA reviewed the Apex flight academy safety training revisions of ditching on open water and the relevant enhancements. Given that, there is no recommendation for the above mentioned issues. The TTSB proposes following safety recommendations for other identified safety issues.

#### **To Apex flight academy**

1. Draw up checklists or relevant approaches to ensure the battery power of life vest is qualified and be ready for use at any time. (TTSB-ASR-19-11-001)
2. Contact the aircraft manufacturer to propose the ADS-B OUT system upgrading modification, enhancing the integrity of the aircraft tracking information for the operating fleets. (TTSB-ASR-19-11-002)

#### **To Taiwan Civil Aeronautics Administration, Ministry of Transportation and Communications**

1. Review the checklists or relevant approaches for ensuring the battery power of life vest is qualified and be ready for use at any time which the Apex flight academy developed. (TTSB-ASR-19-11-003)
2. Review the Apex flight academy and other related operator to upgrade the ADS-B OUT system upgrading modification, enhancing the integrity of the aircraft tracking information for the operating fleets. (TTSB-ASR-19-11-004)
3. Evaluate the feasibility of adding transponder bases which the coverage

is influenced by local geographic setting to enhance the dynamic monitoring on low altitude operating aircrafts. (TTSB-ASR-19-11-005)

### **Safety Actions Accomplished**

#### **Austro Engine**

1. Austro Engine manufacturer issued a mandatory service bulletin No. MSB-E4-025 on 1<sup>st</sup> October, 2018.

#### **European Union Aviation Safety Agency**

1. EASA issued an airworthiness directive No: 2019-0041 on 25<sup>th</sup> February, 2019.

#### **Apex flight academy**

1. The Apex flight academy revised the maintenance program per the MSB-E4-025 which Austro Engine manufacturer issued and the revision has been approved by the CAA.
2. The Apex flight academy proposed a safety training address and enhancements for ditching on open water to CAA on 12<sup>th</sup> July, 2018.

#### **Civil Aeronautics Administration, Ministry of Transportation and Communications**

1. The CAA approved the items of maintenance program mentioned in the MSB and issued an airworthiness directive No. CAA-2019-02-017 on 27<sup>th</sup> February, 2019.
2. The CAA reviewed and approved the Apex flight academy a safety training addresses and the enhancements for ditching on open water.