THE REPUBLIC OF CROATIA

Air, Maritime and Railway Traffic Accident Investigation Agency

Air Traffic Accident Investigation Department

CLASS: 343-08/19-03/04
No: 699-04/3-21-22
Zagreb, 28th June 2021

F I N A L R E P O R T

ON SERIOUS INCIDENT OF THE AIRCRAFT CESSNA 172, REGISTRATION 9A-DMG

21 SEPTEMBER 2019, ON ROUTE LDZL-LDLO NEAR RIJEKA AIRPORT

PUBLICATION OF REPORT AND COPYRIGHT

This report has been made and published by the Air, Maritime and Railway Traffic Accident Investigation Agency (hereinafter: AIA) pursuant to Article 6 section 1 and 2 of the Act on Establishment of the Air, Maritime and Railway Traffic Accident Investigation Agency (Official Gazette no 54/13), Article 7 Section 1 and 2 of the Statute of the Air, Maritime and Railway Traffic Accident Investigation Agency, Article 16 of the Regulation (EU) No 996/2010 of the European Parliament and of the Council on the Investigation and Prevention of Accidents and Incidents in Civil Aviation, provisions of the Air Traffic Act (Official Gazette no 69/09, 84/11, 54/13, 127/13 and 92/14), and pursuant Chapter 6 of the Annex 13 ICAO.

The aim of the investigation relating to safety is in no case determination of guilt or liability.

Investigations are independent and separate from court or administrative proceedings and should not prejudice determination of guilt or liability of individuals.

The final report cannot be used as evidence in court proceedings whose aim is determining civil or criminal liability of individuals.

CONTENT

OCCURENCE INFORMATION

Type of the occurrence:	Serious incident
Date:	21 September 2019
Local time:	12:30
Place:	On route LDZL – LDLO
Type of the aircraft:	Aeroplane
Manufacturer / model:	Cessna/172N
Registration:	9A-DMG
Owner:	Albatros pilotska škola d.o.o
Operator:	Albatros pilotska škola d.o.o
Number of persons on board:	Two
Injuries:	No injuries
Damage to the aircraft:	Minor material damage

INVESTIGATION

The Air, Maritime and Railway Traffic Accident Investigation Agency received information about a serious incident from the Croatian Civil Aviation Agency, and from Albatros pilot school occurrence report. A safety investigation has been opened which determined possible causes of this serious incident.

Upon completion of the investigation in question, AIA issued this Final Report. AIA issued Safety Recommendations to the Belgian Civil Aviation Authority (BCAA), the American Federal Aviation Administration (FAA), the engine manufacturer Lycoming company, and the Belgian general engine overhaul company Loma Air.

SUMMARY

On 21 September 2019 around 13:00 UTC, on the flight of the aircraft in question from Lučko Airport (LDZL) to Mali Lošinj Airport (LDLO), above the village Baška (island of Krk), at an altitude of 5500 ft, the pilot felt a loss of power and considerable vibration of the engine, after which he made an emergency landing at Rijeka Airport. There were no injuries in this serious incident, while damage occurred on the aircraft engine.

1. FACTS AND INFORMATION

1.1. FLIGHT INFORMATION

The training flight in question was being conducted in accordance with the VFR flight rules and in accordance with the submitted flight plan. The take-off airport was Lučko Airport (LDZL), and the planned destination was Mali Lošinj Airport (LDLO). Rijeka Airport (LDRI) was listed as an alternative airport. The route of the flight in question was "*H4-W1-KARLOVAC-TNJ-SENJ-O1*".

At the moment when the aircraft was flying above the village of Baška on the island of Krk, at an altitude of 5500 ft, the crew noticed loss of power. Considering that after applying the procedures stated in the Checklist there was no improvement in the operation of the engine, they decided to land on the closest

airport, i.e. Rijeka Airport. The crew successfully landed the aircraft in question without additional difficulties.

1.2. INJURIES

Injuries	Crew	Passengers	Others
fatal	0	0	0
serious	0	0	0
minor / none	2	0	0

1.3. DAMAGE TO THE AIRCRAFT

During the serious incident in question, a minor material damage to the aircraft engine occurred in a form of mechanical damage to the components of the powerplant system - the hydraulic valve lifters.

1.4. OTHER DAMAGE

During the serious incident in question no damages occurred, other than those to the aircraft in question.

1.5. CREW INFORMATION

At the time of the serious incident, a flight instructor and a student were on board the aircraft.

1.5.1. Pilot 1 (Flight instructor and captain of the aircraft)

Male person, Croatian citizen born in 1983. In the serious incident in question the pilot 1 was acting as the flight instructor and the pilot in command of the aircraft. The pilot 1 possesses a valid Commercial pilot licence CPL(A) issued on 8 January 2019 by the Slovenian "Civil Aviation Agency" with the following authorizations: "*MEP, Night, IR / ME, IR / SE, FI (A)*". At the time of the serious incident, the pilot 1 had a total of 305 flight hours on aircraft types C150, C152, C172, PA28, DA20, SR20 and BE76. During the flight, the pilot 1 was sitting in the front right seat.

1.5.2. Pilot 2 (Trainee for PPL - Private Pilot License)

Female person, Croatian citizen born in 2001. In the serious incident in question, the pilot 2 was a student for a PPL license, and until the event in question she was operating the aircraft from the front left seat. At the time of the event in question, she had a total of 34 flight hours, and was in the third stage of training.

1.6. AIRCRAFT CESSNA 172 N SKYHAWK INFORMATION

Type of the aircraft: Aeroplane
Manufacturer / model: Cessna /172N
Aircraft serial number: 17272625

MTOW:	1043 kg
Range:	610 NM
Maximum speed:	163 kts

Cessna 172 N is a high wing aircraft of metal construction. The landing gear in non-retractable type tricycle. The fuselage contains two doors for entry of the pilot and passenger. This model of aircraft has four built-in seats. This aircraft is multi-purpose. Therefore, this aircraft can be used by private users for transport of passengers and baggage, by pilot training centres for training of pilots, as well as for other sports purposes. The aircraft was manufactured in America from 1977 to 1980. Avco Lycoming O-320-H2AD engine of 160 hp was installed in this model of the aircraft. Due to technical difficulties with this type of engine, the aircraft manufacturer began production of model 172 P with a built-in O-320-D2J engine type.

The aircraft in question is registered in the Croatian Register of Civil Aircraft under number 456. The owner of the aircraft is the company “Albatros pilotska škola d.o.o”, which performs training of pilots. At the time of the serious incident, a valid Certificate of Airworthiness and a Certificate of Release to Service (CRS) were issued for the aircraft. The last maintenance work on the aircraft was performed on 28 August 2019 by the Maintenance Organization under number HR.145.045, on a total of 5594.50 flight hours, at which occasion the engine and the propeller were installed after the engine repair.

In July 2019, the aircraft in question was a subject of a safety-related event during which the same engine damage, as in the event in question on cylinder No. 1, occurred on cylinder No. 3.

1.7. METEOROLOGICAL INFORMATION

On 21 September 2019 on the route of the aircraft in question, the meteorological conditions were favourable for flying and were not the cause or contributing factor in the serious incident in question.

1.8. COMMUNICATION

During the flight, the crew communicated with the competent air traffic control via radio without difficulties.

1.9. AIRPORT INFORMATION

Rijeka Airport is registered for public domestic and international air traffic. It is located on the island of Krk in the municipality of Omišalj (Picture 1). The airport operator is the company Zračna luka Rijeka d.o.o. At the airport there is a runway with length of 2946 m, width of 45 m, of direction 09-27, and several taxiways and parking positions. The traffic in 2019 was 200,841 passengers, while 4942 air operations were performed. This turnover was mostly realized during the summer months.

Picture 1 – Rijeka Airport

1.10. ADDITIONAL INFORMATION

1.10.1. Engine O-320-H2AD, SN: L-7452-76T information

By inspection of the technical documentation of the aircraft, it was determined that a four-stroke engine type Lycoming O-320-H2AD, serial number: L-7452-76T, manufactured in 1998, was installed in the aircraft in question.

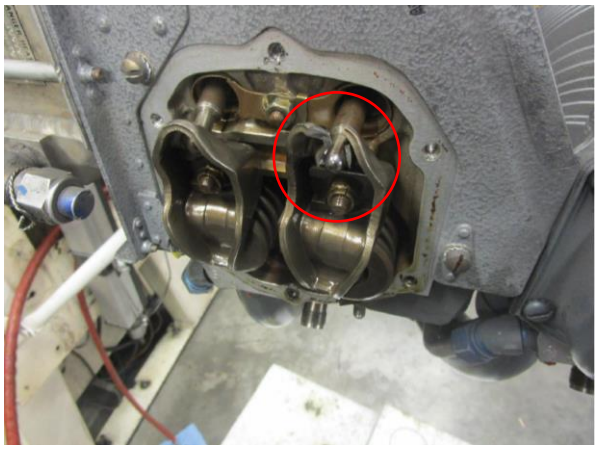
The engine consists of four opposed cylinders with direct power transmission. The engine is air-cooled and has a built-in so-called "Wet crankcase" and carburettor. It develops a power of 160 hp at 2700 rpm.

Malfunctions associated with the hydraulic valve lifter system have been present since the beginning of production of the mentioned engine model until today.

1.10.2. Safety-related event dated 27 July 2019

On 27 July 2019, the aircraft in question was involved in a Safety-related event. During the training flight after taking off from Lučko Airport, at an altitude of 750 ft, and after retracting the flaps, a strong vibration of the engine and a significant loss of power occurred. The pilot of the aircraft successfully landed at the take-off airport. Inspection of the aircraft engine by employees of the aircraft Maintenance Organization, the company Pan Aero Services LLC (HR.145.045) revealed significant damage to cylinder no. 3. Considering that the engine in question was installed in the aircraft after a general overhaul at 288 hours before the said event, the same was removed from the aircraft and sent to the Belgian Engine Maintenance Organization, the company Loma Air (BE.MF.0001) for inspection and analysis, considering that this company performed the said general overhaul of the said engine before that event.

Picture 2 – Bent pushrod of the intake valve lifter



Picture 3 – Poked exhaust rocker arm

By the inspection of the engine at the company Loma Air it was established that the rocker arm of the exhaust valve had been poked and that the pushrod of the intake valve on cylinder no. 3 had been bent (Picture 2 and 3).

The company Loma Air requested an opinion from the engine manufacturer, the company Lycoming. In its conclusion, the engine manufacturer stated the following: "*What happens is, the pushrod pokes through the exhaust rocker arm. Combustion occurs in the cylinder but because the pushrod has gone through the rocker arm the exhaust gasses cannot escape the cylinder. The next stroke would be intake opening, but the intake valve cannot open because of the exhaust gasses still in the combustion chamber causing the intake pushrod to bend ".*

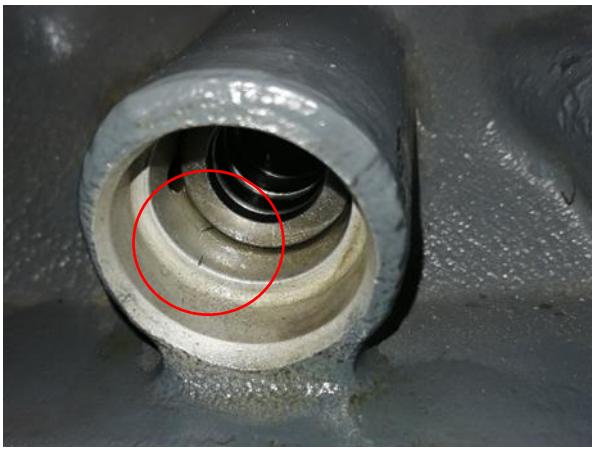
The said conclusion describes the course of events of the damage that occurred without stating the cause. In its report, the company Loma Air also does not state the reasons for the mechanical damage to the engine.

1.10.3. The inspection of the engine at Rijeka Airport after the event in question

AIA investigators inspected the aircraft and the engine at Rijeka Airport. By the inspection of the aircraft and the engine, it was established that the push rod of the exhaust valve poked the exhaust rocker arm on cylinder no. 1 (Picture 4). On the surface of the canal where the hydraulic lifter of the intake valve is located on the cylinder no. 1, surface damage in the form of scratches was visible, and it was not possible to remove this lifter from the pertaining canal (Picture 5).

Also, a crack in the snap ring was also found, which prevents the spring, the socket and the plunger from falling out of the canal of the hydraulic lifter of the intake valve on cylinder no. 1 (Picture 6 - marked with a circle). Surface damage in the form of a scratch was also visible on the safety ring (Picture 6 - marked with a red arrow).

Picture 4 – Damaged exhaust rocker arm



Picture 5 – Surface damage of the canal of the hydraulic lifter

Picture 6 – Cracked safety ring

1.10.4. Inspection of the subject engine at the manufacturer, the Lycoming company

On 10 December 2019, the engine manufacturer inspected the engine in question in the presence of FAA inspectors. On 6 October 2020, the manufacturer submitted the analysis of the inspection of the engine in question. From the submitted analysis of the inspection of the engine in question, it was not possible to conclude in which order the detected mechanical damages occurred.

The submitted analysis included the following conclusions. In addition to the previously mentioned damages, measuring revealed the increased wear of material on the hydraulic valve lifters and the camshaft lobes. The said wear of the material could have contributed to the significant engine vibrations and the loss of power.

It was also concluded that the exhaust rocker arm fractured in fatigue. Beach marks are present on all fracture surfaces. The rocker was likely initially split by the pushrod, resulting in a fracture roughly parallel to the side walls of the rocker before the fracture running roughly perpendicular to the sidewall took place. The fracture surfaces running roughly perpendicular have an extremely coarse texture and widely spaced beach marks, indicating high stress, low cycle fatigue. The fracture surfaces running roughly parallel to the side walls of the rocker possess finer beach marks and are relatively flat, indicating a relatively lower stress, higher cycle fatigue. All beach marks visible on fracture surfaces appear to propagate out of the socket region of the rocker arm; the socket region is too marred by

secondary damage for a clear origin to be identified. This may also suggest an initial overload event in service initiated the crack.

Burrs are present ringing the convex side of the oil hole on both rocker arms. The burr of the fractured exhaust rocker arm was measured as approximately 0.016" high using the Keyence Digital Microscope. These burrs are ragged and thin enough to likely be through hardened during the case hardening process for the rest of the part. The burrs surrounding the oil holes on both rocker arms examined in the investigation presumably underwent vibrator deburring and remained attached. The engineering drawing for the part specifies "burrs resulting from manufacturing processes are permissible providing they are securely attached and do not interfere with function of the part". While the oil hole burrs do not contact any surface during use of the rocker arms, it may function as a stress concentrator, encouraging crack initiation and propagation.

1.10.5. Management of continuing airworthiness of aircraft and engine maintenance

Management of continuing airworthiness of aircrafts implies the availability of all aircraft data and data on its components, especially after maintenance work has been performed. Otherwise, the Continuing Airworthiness Management Organization cannot guarantee aircraft airworthiness. At the time of the event in question, a Croatian company, Air Panonia d.o.o., oversaw the continuing airworthiness of the aircraft in question.

The procedure described in Section 5.4.3 of the Maintenance Organization Manual does not define the deadline within which the specified documentation will be submitted to the owner. Regulation (EU) 1321/2014, Section M.A.305, prescribes that the entry of records in the documents related to the continuing airworthiness after maintenance shall be made as soon as possible, but not later than 30 days.

By reviewing the available technical documentation, it was determined that the engine in question was installed on the aircraft in question on 24 May 2019 by the Croatian Aircraft Maintenance Organization, the company Pan Aero Services LLC (HR.145.045). During further operation of the aircraft until the event in question, scheduled maintenance work was performed on the aircraft by the said company, as shown in Table 1.

No.	Date	Type of works	Hours of engine service
1.	24.05.2019	Installation of the engine after general overhaul + additional works on the aircraft	00:00
2.	25.05.2019	Engine oil and filter replacement	03:40
3.	05.06.2019 - 22.07.2019	Scheduled maintenance of the aircraft and the engine at intervals of 50, 100, 200 hours of service	45:54 – 288:30
27.07.2019 Safety-related event (Hours of engine service 288:30)			
4.	28.08.2019	Installation of the engine in question after the repair	288:30
5.	28.08.2019 – 21.09.2019	Scheduled maintenance of the aircraft and the engine at intervals of 50, 100, hours of service	288:30 – 384:10

21.09.2019 Event in question (Hours of engine service 384:10)

Table 1 – Maintenance work on the aircraft in question

1.10.6. Engine lubricating oil

Considering that the lubricating oil has a significant role in the engine operation, the type of engine oil used during aircraft operation was identified. By reviewing the available documentation, and in accordance with the statement of the owner, it was established that the engine lubricating oil manufactured by Aeroshell 100 with the additive of the company Lycoming LW-16702 was used during engine break in period. During further operation of the engine, Aero Total DM 15W50 engine lubricating oil was used.

It was also established that the importer of the said oil for Croatia, also the supplier of oil to the owner in question, has the correct documentation for establishing the product traceability.

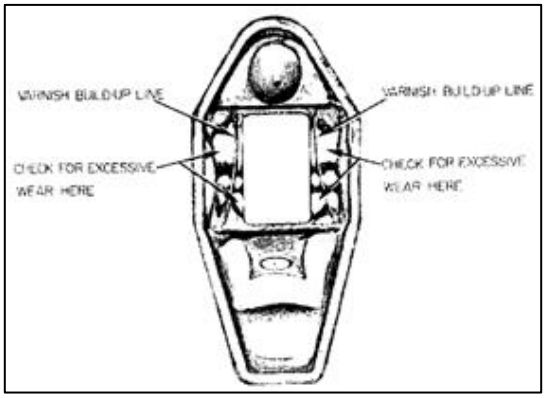
The said oil is approved by the engine manufacturer, and already contains the manufacturer's oil additive LW-16702, which is necessary for proper engine operation.

1.10.7. Maintenance instructions issued by the engine manufacturer

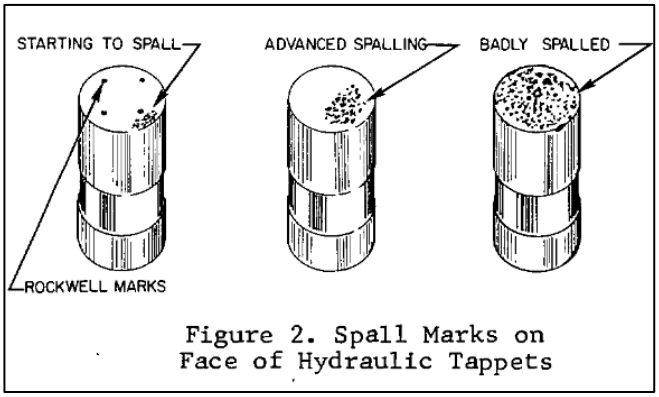
During the period from 1977 until today, the engine manufacturer, the company Lycoming, has issued, in addition to standard maintenance manuals, several documents related to hydraulic valve lifter system components maintenance instructions.

Service Bulletin No. 424, Replacement of hydraulic lifters (tappets) due to excessive wear of the material

At the beginning of 1978, the manufacturer issued Service Bulletin No. 424 due to wear of the material on the hydraulic lifter surface. It was described how the new lifters improve the lubrication of the camshaft lobes surface and allow longer life of components (Pictures 7 and 8).



Picture 7 – Rocker arm



Picture 8 – Hydraulic lifter (tappet)

Mandatory Service Bulletin no 446, The use of LW-16702 oil additive

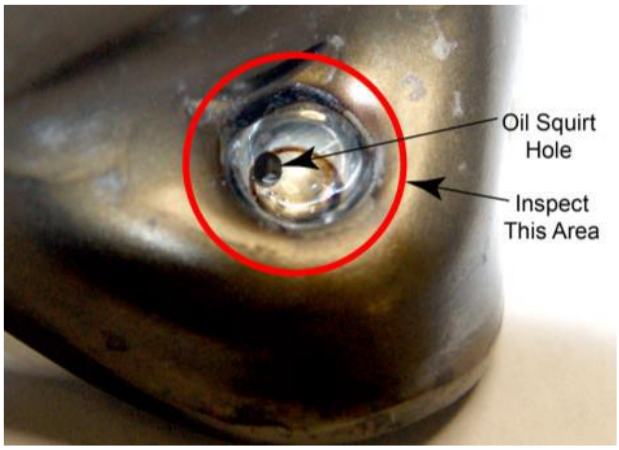
On 18 July 2008, the manufacturer issued a Mandatory Service Bulletin describing the importance of using LW-16702 oil additives, which by its application reduces the wear of engine components when there is insufficient residual oil between the rubbing components (i.e., when the engine starts).

Mandatory Service Bulletin No. 619, Hardness check for rocker arm, PN: LW-15014

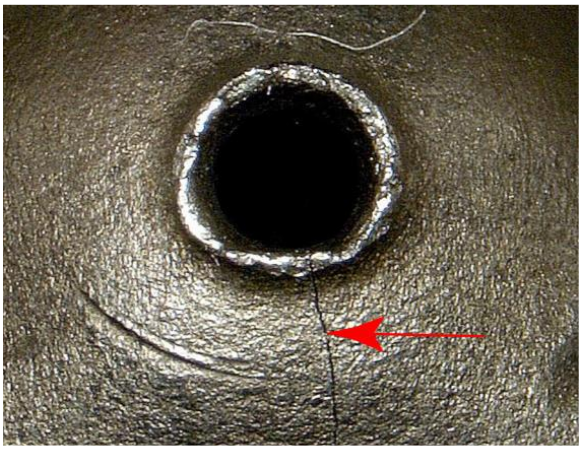
On 9 April 2015, the engine manufacturer issued a Mandatory Service Bulletin No. 619. The bulletin was issued after a reported case of one excessively worn rocker arm, which caused rough operation of the engine. The material analysis of the rocker arm showed that the rocker arm had not been case hardened, as required, during manufacturing. As a corrective measure, the manufacturer stated that a hardness check is to be completed by a simple mechanical procedure at the next scheduled 50 hours maintenance event.

Mandatory Service Bulletin No. 639, Inspection of rocker arm, PN: LW-15014

On 17 January 2020, the engine manufacturer issued a Mandatory Service Bulletin No. 639. In the said bulletin, the manufacturer describes possible rough engine operation caused by cracks on the pushrod socket side of the rocker arm, around the oil squirt hole, as well as how to check the correctness of the socket during the next regular oil change and every 50-hours of engine service.



Picture 9 – Pushrod socket side of the rocker arm


Picture 10 – Crack on the socket

Service Instruction No. 1014, Lubricating Oil Recommendations

On 22 May 1995, the manufacturer issued a Service Instruction No. 1014 relating to the application of lubrication oils on all manufacturer's opposed cylinders aircraft engines. The said instructions describe the types of engine oil and additives that can be used after a general engine overhaul and during its operation.

1.10.8. Airworthiness Directives (USA Federal Aviation Administration)

During the period from 1977 until today, the FAA has issued several Airworthiness Directives for the engine typeO-320-H2AD, some of which relate to the operation of hydraulic valve lifters system components.

FAA AD 77-20-07, Replacement of hydraulic lifters due to excessive wear

On 31 August 1978, the FAA issued Airworthiness Directive No. AD-77-20-07. The said directive describes the procedure of inspection of the rocker arm and other components of the hydraulic valve lifter system, referring to the existing Service Bulletin of the engine manufacturer No. 424.

FAA AD 80-04-03, Usage of oil additive LW-16702

On 25 April 1988, the FAA issued Airworthiness Directive No. AD-80-04-03. The said directive describes procedures for the use of lubricating oil additives and the replacement of hydraulic valve lifters to prevent bending of pushrods. The bulletin also describes the procedures related to the presence of metal contaminants caused by the wear of the components of the hydraulic valve lifter system. The described procedures refer to the Service Bulletins of the engine manufacturer SB No.435 and No. 446, and to the Service Instruction No. 1406B.

FAA AD 80-14-07, Exhaust valve spring seats

On 7 July 1980, the FAA issued Airworthiness Directive No. AD-80-14-07. The said directive describes possible mechanical damages related to exhaust valve spring seats marked by no LW-16475, and handling instructions.

1.10.9. Engine Overhaul Organization, the company Loma Air

The company Loma Air (authorization number BE.MF.0001), is a Belgian organization, approved by the Belgian aviation authorities, for maintenance works on aircraft components, namely, engines, air conditioners, pressure pipes, alternators, generators, starters, carburettors and magnetos with headquarters in the municipality of Heist-op-den-Berg near the city of Brussels. At the time of the performance of works on the engine in question, the organization had a valid engine maintenance approval certificate in accordance with Commission Regulation (EU) 1321/2014, Annex I, Part-M, Subpart F. Details of the level of the allowed works are defined in the Maintenance Organization Manual (MOM).), Part E.2., and it corresponded to the works performed on the engine in question.

Loma air is a family company founded in 1979 in Belgium, which over the years became one of the largest organizations for the general overhaul of the above-mentioned components in Europe. The company is also a distributor for components for an American company, engine manufacturer, Lycoming. The company employs up to ten people on the maintenance of components, and several people in administration.

Company culture related to reporting of Safety-related events

Part D, Chapter 7, of the Engine Maintenance Organization Manual, describes the procedures related to the reporting of safety-related events, and they are in accordance with the standards specified in Regulations (EU) 376/2014, and 1321/2014.

During the safety investigation, it was established that the European repository of Occurrence reports events contains two events reported by the company Loma Air, namely the event in question in 2019, and one event in 2020. Reviewing the repository did not reveal any event reported by the company Loma Air prior to the event in question.

It was also determined that on 31 July 2019 during the scheduled engine maintenance on the aircraft Cessna 150 in the Croatian register, and owned by the Croatian flying school, a rupture of the engine case was noticed. Considering the severity of the discovered failure, the engine was sent to the Maintenance Organization, the company Loma Air, for further identification of the level of damage. The said event has not been reported by the Engine Maintenance Organization, in accordance with the procedure specified in the Maintenance Organization Manual, Chapter 7, Part D, and in accordance with the obligations prescribed by the applicable EU regulations.

On one occasion during their scheduled audit, the Belgian Civil Aviation Authority warned the Engine Maintenance Organization about the reduced number of the occurrence reports in regard to the volume of works performed by the company in question.

1.10.10. The manufacturer of the engine in question, the company Lycoming

Lycoming is an American company which manufactures internal combustion aircraft engines. For many years, the company has been one of the world's most significant factors in manufacture of reciprocating engines. In addition to the production of new engines, Lycoming also performs general overhauls of used engines.

In accordance with the applicable regulations, the said company should have implemented a system for processing reports of Safety-related events received from industry, directly from the owners and users of their products or the company's authorized service and sales centres. During the Safety investigation in question, the company Lycoming did not respond to questions related to the implementation of regulations related to reporting of safety-related events.

2. ANALYSIS

Analysis of technical serviceability of the engine

The analysis of the technical serviceability of the engine revealed several mechanical damages that could have caused the rough engine operation and the loss of power. Material wear of the camshaft lobes and hydraulic valve lifters was identified, which could have led to irregularities in the engine strokes. Such condition could have also caused increased stress on the hydraulic valve lifter system which could have eventually led to damage of the rocker arm.

By the analysis of mechanical damages on the rocker arm it was established that there were two types of cracks. The parallel crack was the result of low stress and large number of cycles. The vertical crack was caused by high stress and small number of cycles. In the mentioned analysis of the technical accuracy of the engine, the manufacturer did not state the order in which mechanical damages occured.

Analysis of Safety-related events reporting system

The procedures for reporting safety-related events described in Part D, Chapter 7, of the Engine Maintenance Organization Manual, the company Loma Air, are in accordance with the regulations currently in force. By reviewing the European Central Database of Safety-Related Events (ECCAIRS) it was established that the company Loma Air had not reported any Safety-related events prior to the event in question. During their regular supervision, the Belgian Civil Aviation Authority warned the

Engine Maintenance Organization about the reduced number of safety-related events reports in regards to the volume of works performed by the company in question.

During the Safety investigation in question, the company Lycoming did not respond to questions related to the implementation of regulations related to reporting of safety-related events.

3. CONCLUSION

3.1. FINDINGS

- During the training flight of the aircraft in question on the route, above the village of Baška (island of Krk), a rough engine operation and a loss of power occurred.
- After losing the engine power, the crew landed at Rijeka Airport (island of Krk).
- The inspection of the engine revealed mechanical damages on the hydraulic valve lifter system of the cylinder no. 1.
- The aircraft in question participated in a safety-related event prior to the event in question during which the same damage occurred on cylinder no. 3.
- At the time of the event in question, a valid airworthiness documentation was issued for the aircraft.
- During the event in question, the pilot 1 (Flight Instructor) possessed a valid pilot's license.
- During the safety investigation, a discrepancy was identified between the safety-related events reported by the Belgian Maintenance Organization in relation to the volume of works performed by the company.
- After the first safety-related event dated 27 July 2019, the cause of the mechanical failure was not identified, nor was the necessary analysis of the event performed by the Engine Maintenance Organization and the engine manufacturer, nor was that event reported in accordance with the applicable regulations.
- During the safety investigation in question, the company Lycoming did not respond to questions related to the implementation of regulations related to reporting of safety-related events.
- The inspection of the engine revealed several mechanical damages that caused or could have caused rough engine operation and loss of power. The said inspection did not determine the order in which mechanical damages occurred.

3.2. CAUSE

Immediate cause

Considering all the facts established by the safety investigation in question, it can be concluded with certainty that the rough engine operation occurred due to mechanical damage to the rocker arm. The said damage could have occurred due to the presence of unevenness created during the manufacturing process around the oil squirt hole in the spring seat of the pushrod. Material wear of the hydraulic lifter and the camshaft lobe was also identified, which could have contributed to rough engine operation and loss of power.

4. SAFETY RECOMMENDATIONS

The safety recommendation in no case constitutes a legal presumption of guilt or responsibility for the accident, serious incident or incident.

Considering the findings from this safety investigation, upon the completion of the investigation AIA issued the following safety recommendations:

Recommendation to the maintenance organization, the company Loma Air:

AIN04-SR-06/2020

The maintenance organization should establish a plan to raise the culture of reporting of safety-related events to a level appropriate to the volume of works the company performs.

Recommendation to the Belgian Civil Aviation Authority (BCAA):

AIN04-SR-07/2020

The Belgian Civil Aviation Authority should, during their supervision of the Maintenance Organization, the company Loma Air, support the procedures described in Safety Recommendation AIN04-SR-06/2020.

Recommendation to the engine manufacturer, the company Lycoming:

AIN04-SR-08/2020

The company Lycoming should perform analysis of the existing process of manufacturing rocker arms in order to safely eliminate the possibility of creation of the identified unevenness around the oil squirt hole.

Recommendation to the American Federal Aviation Administration (FAA):

AIN04-SR-09/2020

The FAA should conduct a review of compliance of engine manufacturer company procedures, the Lycoming company, with current regulations related to reporting of safety-related events.

Investigator in charge
Dejan Ćurik