SERIOUS INCIDENT TO APEX AIRCRAFT CAP 10B, LN-KAP, AT KJELLER AIRFIELD 8 JANUARY 2010 - PRELIMINARY REPORT

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10/23 - 09

All times given in this report is local time (UTC + 1), if not otherwise stated.

Aircraft information:

- Type and reg.:	Apex Aircraft CAP 10B, LN-KAP
- Year of manufacturing:	1981
- Engine:	Textron Lycoming AEIO-360-B2F
Date and time:	Friday 8 January 2010 at 1150 hrs
Location:	6 nm SSE of Kjeller airfield (ENKJ)
Type of occurrence:	Serious incident
Type of flight:	Private
Injuries to persons:	None
Damage to aircraft:	Engine seizure
Other damage:	None
Information sources:	AIBN initial investigation

History of the flight

In a time frame of 2 weeks prior to date of incident, LN-KAP had been flown twice (23 Dec 2009 and 1 Jan 2010). Temperatures at the airfield these dates were -8 °C and -10 °C. It is documented that no negative g-manoeuvres was flown during these two flights. When not in use, LN-KAP was parked in a cold hangar with an electric engine block heater connected. In addition a blanket was laid over the engine cowling. Purpose of the mission 8 January, was recurrent aerobatics training with 2 pilots on board. Weather conditions at time of incident was CAVOK with QNH 1029 hPa. Temperature was -28 °C on the ground and -10 °C at 5 000 ft.

After completing pre-flight checks, the engine started normally. Before take-off, the pilots ran the engine at low power setting until oil temperature indication reached the green arc (60 °C). The oil temperature remained at the lower end of the green arc during the entire flight. The flight was uneventful until the aerobatics training started in the training area approximately 20 nm SSE of Kjeller airfield. The crew completed two loops and one 4-point roll. Shortly after completing the roll, it was noted that the “low oil pressure warning light” was on. In addition the engine oil pressure gage indicated zero pressure.

The crew immediately set course for Kjeller airfield maintaining an indicated airspeed of 185 km/h at 4 700 ft. The engine seized approximately 5 minutes later when the aircraft was about 6 nm away from the field. The crew was able to glide the plane to Kjeller where a safe landing was performed. Shortly after landing at Kjeller, the AIBN was contacted and informed about the incident.

The investigation was initiated in the unheated hangar and it was found that the hose from the T-fitting down to the Christen 802 valve was totally filled with solid ice (indicated blue on the figure below). Furthermore, it was found that the balls in the Christen 802 valve were blocked by ice.

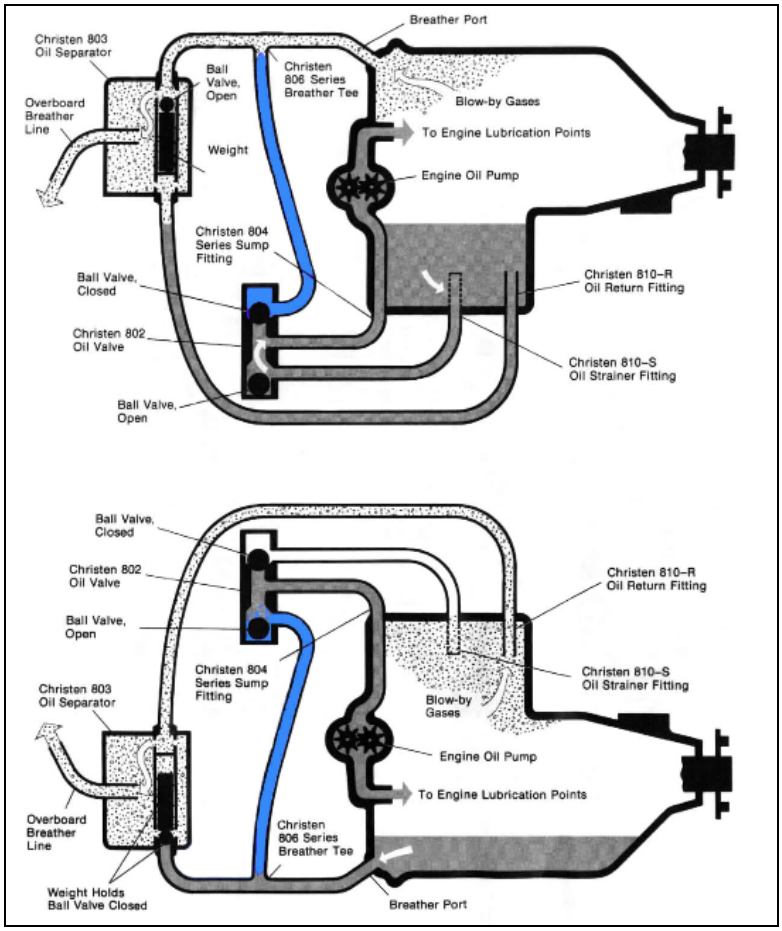

Figure 1: Christen 801 inverted oil system schematic. Blue colour indicates ice/water. (Engine inverted on lower figure)

Figure 2: Ice and oil drained from the Christen 802 valve

The valve and the hose was brought inside a warm hangar and heated up slowly. Oil and ice came out of the ports of the valve and the balls became gradually released (see figure 2). Figure 3 and 4 show the amount of ice that was trapped inside the hose.

Figure 3: Ice removal from hose

Figure 4: Ice amount from hose

It is likely that the following caused the loss of oil pressure. The mentioned 4-point roll was the first time in nearly two flight hours where manoeuvres involving negative g were flown. During these two hours a lot of humidity from the crank case ventilation probably condensated at the inner walls of the hose leading from the crank case to the oil separator. This drained down from the t-fitting into the “blue hose”, filling it up with water. As no negative g-manoeuvres had been flown last two flight hours, the water was not flushed out of the hose. It is likely that all components at the fire wall had temperatures below freezing level during the night prior to the flight 8 January. Further it is likely that the area between the engine baffle plates and the fire wall stayed below freezing temperature during the entire flight. Engine oil at about 60 °C is likely to have been the only heat source in that area. This would heat the lower portion of the Christen 802 valve and the two associated hoses. When the airplane became inverted it is likely that ice and probably water from the “blue hose” entered the Christen 802 valve. This blocked the oil from entering the oil pump and the oil pressure dropped. When the airplane completed the roll, the bottom ball (during normal flight) was probably kept on its seat by suction produced by the turning oil pump. It is also a possibility that the balls were jammed by ice.

The AFM contains no limitation regarding minimum operation temperature or any warnings regarding the inverted oil system and cold weather operations.

Regardless of type of airplane, it is likely that all inverted oil systems of this type might be affected by sub zero temperatures in a similar way.

This investigation is ongoing. AIBN will publish a full report when the investigation has been completed. This is preliminary information, subject to change, and may contain errors. Updated preliminary information or safety recommendations will be issued at any stage of the investigation if deemed necessary for air safety.

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