

## **BN2A Mk III-1 Trislander, G-AZLJ**

<b>AAIB Bulletin No:</b>	<b>11/98</b>	<b>Ref:</b>	<b>EW/G98/06/40</b>	<b>Category:</b>	<b>1.2</b>
<b>Aircraft Type and Registration:</b>	BN2A Mk III-1 Trislander, G-AZLJ				
<b>No &amp; Type of Engines:</b>	3 Lycoming O-540-E4C5 piston engines				
<b>Year of Manufacture:</b>	1972				
<b>Date &amp; Time (UTC):</b>	21 June 1998 at 0440 hrs				
<b>Location:</b>	15 nm north-west of Wallasey, Merseyside				
<b>Type of Flight:</b>	Public Transport (Cargo)				
<b>Persons on Board:</b>	Crew - 1 - Passengers - None				
<b>Injuries:</b>	Crew - None - Passengers - N/A				
<b>Nature of Damage:</b>	Severe internal damage to right engine and crankcase rupture				
<b>Commander's Licence:</b>	Commercial Pilot's Licence with Instrument Rating				
<b>Commander's Age:</b>	35 years				
<b>Commander's Flying Experience:</b>	976 hours (of which 60 were on type) Last 90 days - 63 hours Last 28 days - 33 hours				
<b>Information Source:</b>	Aircraft Accident Report Form submitted by the pilot and metallurgical examination of engine by the AAIB				

### **History of the flight**

The aircraft was operating a freight service between Liverpool and the Isle of Man. The pre-departure engine checks were satisfactory and, after a normal take off and climb, the aircraft was established in the cruise at Flight Level 60, with normal oil pressure and temperature indications observed for all three engines. However, some 20 minutes after departure and when approximately 15 nm from Wallasey VOR, the aircraft suddenly shuddered and yawed to the right as the right engine speed reduced to 2,000 RPM. Realising that the right engine had developed a severe problem, the pilot decided to shut it down. However, before he could feather the right propeller

there was a loud 'thud' and the propeller came to a complete stop. He later estimated that the time between the loss of power and the propeller coming to a complete stop was some 2 to 4 seconds. The pilot had not noticed the right engine oil pressure indication immediately prior to the engine failure, although after the failure he observed that the oil pressure gauge indicated zero, with the oil and cylinder head temperatures still within their normal operating ranges. Despite selecting maximum power on the remaining two engines, the aircraft gradually lost height at about 100 to 200 feet per minute. The pilot later attributed this to the fact that the aircraft was close to its maximum all up weight and the right propeller was not feathered. He informed Manchester ATC of his problem and requested a heading to the nearest airfield. A successful landing was subsequently made at Blackpool where later inspection of the right engine revealed a large rupture in the crankcase. The engine was subsequently removed and dispatched to the AAIB for examination.

## **Engine examination**

Initial examination confirmed the presence of a large hole in the top of the crankcase in the region of the No 6 connecting rod big end. The engine was taken to an approved overhaul organisation where a strip examination was carried out. This revealed extensive internal damage within the engine which had occurred as a result of the No 6 connecting rod big end cap having detached from the connecting rod. Fragments of the big end cap, together with parts of the two attachment bolts and one associated nut were recovered. The strip examination also revealed that the No 4 exhaust valve rocker arm had fractured in the area of the bush oil holes, and the No 4 inlet valve push rod had failed in bending at a point approximately halfway along its length. The failed components were subjected to a detailed metallurgical examination which concluded that the primary failure had been associated with the loss of one retaining nut from one of the No 6 connecting rod big end cap attachment bolts. This had allowed the big end cap to detach from one side of the connecting rod, causing the second retaining bolt to fail as a result of overload bending. There was no evidence to indicate why the nut had unscrewed from the big end cap attachment bolt. The failure of the No 4 exhaust valve rocker arm and the inlet valve push rod were secondary to the No 6 connecting rod big end cap failure and had occurred as a result of metallic debris, generated by the latter, having become trapped in the valve operating mechanism. This had effectively increased the stroke of the push rods and induced the associated failures due to overloading.

## **Engine history**

The engine had been manufactured in 1966 and after accumulating 2,038 hours had undergone its first overhaul to 'zero hours' in the USA in 1987. It was then fitted to Trislander G-OREG in March 1987 and by August of that year had accumulated 11 hours. That aircraft was out of service between August 1987 and May 1992, during which period no engine hours were logged. By March 1994 the engine had accumulated 226 hours and the aircraft was taken to Greece with a view to putting it onto the Greek aircraft register. However this was not accomplished and the aircraft returned to the United Kingdom in 1996, by which time the engine had accumulated a total of 261

hours. In late 1996 the aircraft was re-registered in the United Kingdom as G-AZLJ. At the time of the incident the engine had achieved a total of 717 hours since overhaul.