SERIOUS INCIDENT

Aircraft Type and Registration:	Diamond DA42, N648KM	
No & Type of Engines:	2 Thietlert TAE 125-02-99 piston engine	
Year of Manufacture:	2007	
Date & Time (UTC):	27 November 2018 at 1450 hrs	
Location:	En route from Retford Gamston Airport to Weston Airport, Dublin, Ireland	
Type of Flight:	Private	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	None reported	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	54 years	
Commander's Flying Experience:	386 hours (of which 103 were on type) Last 90 days - 64 hours Last 28 days - 6 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

While in the cruise at FL100 the left engine fire warning illuminated. A PAN was declared and a diversion to Liverpool initiated with the assistance of Scottish and Liverpool ATC. During the descent, control of the aircraft was lost while in IMC. The aircraft descended rapidly, and control was recovered as the aircraft reached VMC at approximately 800 ft agl. At this juncture, and at the suggestion of Liverpool ATC, the aircraft diverted to the nearby RAF Woodvale where it landed safely.

History of the flight

The aircraft was on an IFR flight from Gamston to Weston, near Dublin. The planned cruising level was FL100 and icing was forecast. The aircraft is equipped with a fluid anti icing system and is cleared for flight into known icing conditions. The pilot stated he replenished the fluid level prior to departure and that pitot heat was on during the climb. The pilot had been cleared to route direct from DESIG to BAGSO. Approximately 39 nm east of BAGSO the left engine fire warning illuminated. The pilot disengaged the autopilot, retarded the left engine control to idle and began to monitor for smoke or flames. The co-pilot contacted Scottish ATC, informed them of the fire warning and declared a PAN. The crew requested a descent and vectors to land at the nearest airfield.

Scottish ATC suggested a diversion to Liverpool Airport and cleared a descent to 5,000 ft. Scottish ATC asked the crew to Squawk 7700 and then handed the aircraft over to

Liverpool ATC. Liverpool ATC offered vectors for an instrument approach to Runway 09 and cleared the aircraft for further descent. Liverpool ATC also asked the crew about their ability to maintain heading and altitude, concerned at manoeuvring that had not been directed by ATC.

The fire warning persisted during the descent until below 5,000 ft when it cleared briefly before reappearing. Apart from the warning, however, there were no signs of fire. At approximately 3,000 ft the pilot stated that he engaged the autopilot, though he confirmed he had become aware subsequently that autopilot use was not permitted for asymmetric flight. The pilot said he then felt a sudden jolt in the aircraft and the autopilot disengaged. Simultaneously, the slip ball moved rapidly to full scale deflection left and the aircraft pitched sharply nose down.

The aircraft descended rapidly. The pilot stated that he applied full left rudder, neutralised the control column and retarded the good engine to idle thrust. Then he gradually pulled back on the control column. The aircraft reached VMC just southeast of Crosby at approximately 800 ft agl and was recovered to level flight.

Liverpool ATC, concerned at the sudden descent, asked if the aircraft was in VMC and the pilot could see the coast. The crew confirmed that they could. Liverpool ATC then suggested a diversion to RAF Woodvale, as it was closer than Liverpool Airport, or a continued diversion to Liverpool by following the Mersey River. The crew accepted the first option and were passed the Woodvale weather and the tower frequency by Liverpool ATC.

The in-use runway at Woodvale was Runway 08. Woodvale ATC had been informed of the diversion by Liverpool ATC and so were alerted to the arrival of the aircraft. The crew called Woodvale Tower shortly before arrival, when the aircraft was on final approach to Runway 03. The weather was poor and, given the circumstances, Woodvale cleared the aircraft to land on Runway 03, although it was out of use due to a degraded surface. The aircraft landed safely and taxied to the apron under its own power.

It was not established why the fire warning was triggered.

Personnel

The pilot had an FAA PPL with an Instrument Rating. His logbook indicated that he had completed the necessary recency training to operate in IMC and that he had completed the requisite biennial check flight.

Human factors

The pilot was in an unfamiliar, high stress and high workload environment. With asymmetric thrust, the handling of the aircraft is much more challenging than normal and effective control of attitude is more difficult. In asymmetric flight any power changes induce yaw and roll effects which must be corrected to control the flight path. In IMC these additional factors increase the risk of spatial disorientation.

Analysis

Following the fire warning the pilot was in asymmetric flight, with the left engine at idle power. With the fire warning emergency, the unplanned diversion in IMC and the higher than usual workload there were many and significant pressures on the pilot's capacity to operate effectively. The autopilot was disengaged after the fire warning occurred, so the descent was being manually flown. Given the high workload and the difficulties in controlling the aircraft the pilot decided to re-engage the autopilot at approximately 3,000 ft. The autopilot has no yaw channel and therefore is unable to control the effects of asymmetry. Shortly after the autopilot was engaged the pilot reported feeling a sudden jolt and the autopilot disengage. The aircraft then went out of control. It is likely that the autopilot exceeded its operating parameters as a result of the asymmetric condition. With the slip ball deflected left, the aircraft was yawing rapidly right. The secondary effect of the yaw would induce a right roll and it is probable the aircraft entered a spiral dive condition. The pilot took appropriate corrective action and the aircraft was recovered to level flight, albeit at low altitude.

The diversion to Woodvale was flown at low altitude and in poor weather, though VMC. The pilot called Woodvale only shortly before his arrival and was positioned on final approach for Runway 03. While this runway was closed by NOTAM, ATC assessed the surface to be safe and, in the circumstances, allowed the aircraft to land on it.

Conclusion

Control of the aircraft was lost during high stress, high workload flight following an engine fire warning. It is probable that the pilot, operating in very challenging circumstances during the descent, became spatially disorientated. His use of the autopilot in an attempt to manage workload, in fact exacerbated the situation. The pilot was able to recover before terrain impact as the aircraft entered VMC at low altitude.