# Piper PA-22-150 Caribbean (Modified), G-APTP

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| **AAIB Bulletin No: 5/2003** | **Ref: EW/G2003/03/15** | **Category: 1.3** |
| **Aircraft Type and Registration:** | Piper PA-22-150 Caribbean (Modified), G-APTP | |
| **No & Type of Engines:** | 1 Lycoming O-320-B2B piston engine | |
| **Year of Manufacture:** | 1957 | |
| **Date & Time (UTC):** | 18 March 2003 at 1250 hrs | |
| **Location:** | Roughay Farm, Upham | |
| **Type of Flight:** | Private | |
| **Persons on Board:** | Crew - 1 | Passengers - None |
| **Injuries:** | Crew - None | Passengers - N/A |
| **Nature of Damage:** | Aircraft destroyed | |
| **Commander's Licence:** | Private Pilot's Licence | |
| **Commander's Age:** | 67 years | |
| **Commander's Flying Experience:** | 1,300 hours (of which 200 were on type) | |
| | Last 90 days - 0.50 hours | |
| | Last 28 days - 0.10 hours | |
| **Information Source:** | Aircraft Accident Report Form submitted by the pilot and telephone enquiries by the AAIB. | |

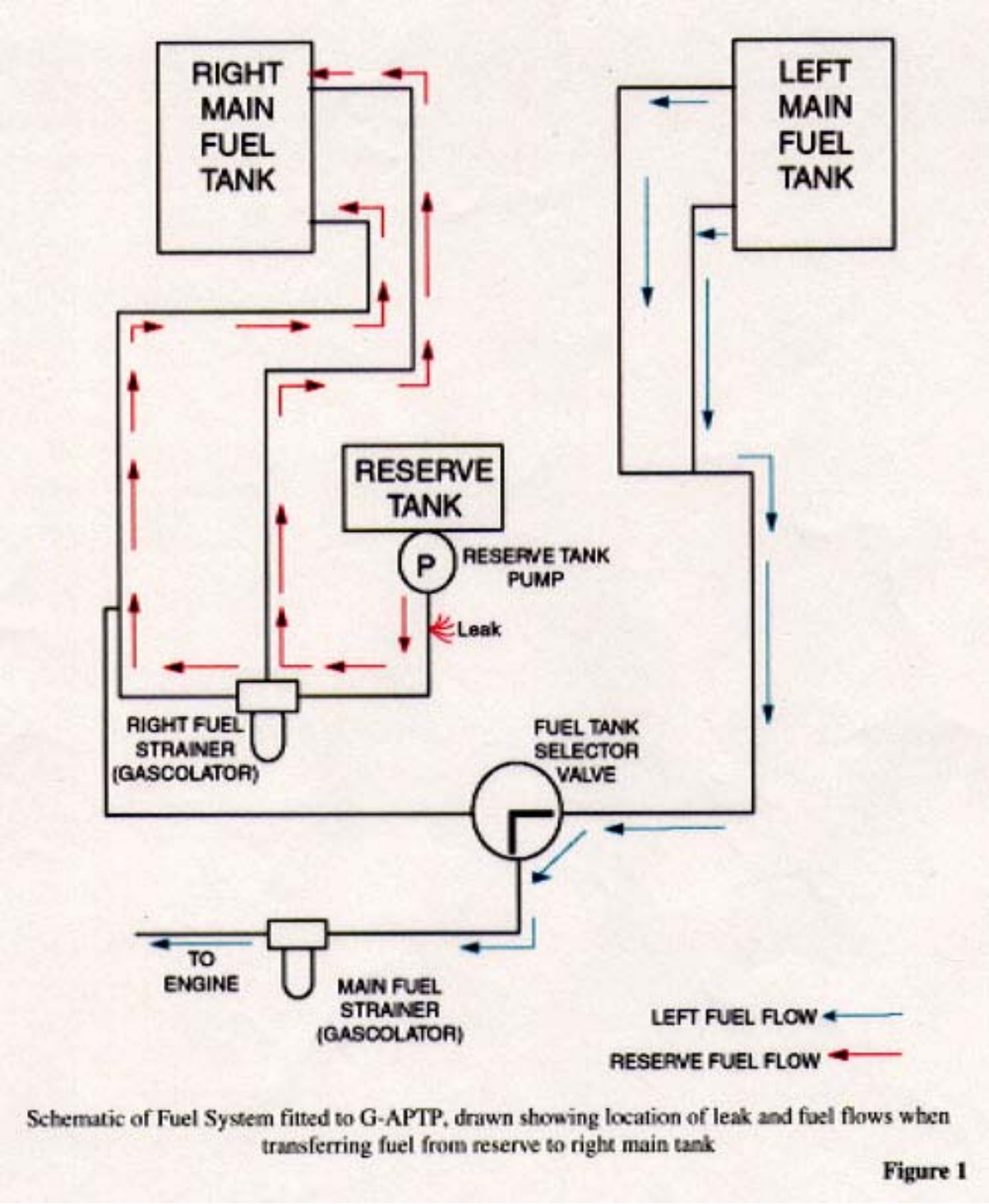
## Synopsis

Whilst carrying out a check of the reserve fuel tank system in flight, a smell of fuel was noticed by the pilot. After landing the smell increased in intensity and fuel was noticed to be leaking from the right side of the fuselage. The leak was traced to a fuel pipe between the reserve fuel tank pump and the right main tank fuel strainer. The pilot managed to staunch the fuel leak using tape but when he returned to the aircraft to drain the right fuel tank the aircraft burst into flames. The cause of the pipe failure, which had been installed for 46 years, could not be ascertained as it was consumed in the fire, but could have been due to internal corrosion.

## History of Flight

The intention of the flight had been to check the systems on the aircraft prior to a scheduled Star Annual inspection at Old Sarum. Prior to the flight, the pilot fuelled the aircraft with 40 litres of fuel in each of the right and left main fuel tanks and 10 litres in the reserve tank and, for the flight, the pilot selected fuel from the left main tank. There were no problems experienced with the aircraft during the taxi, takeoff and initial climb and, during this climb, the pilot attempted a test of fuel transfer from the reserve to the right main tank by pulling the reserve fuel knob. A couple of minutes later he became aware of a distinct smell of fuel in the cockpit and he immediately switched off the reserve fuel to stop the transfer. As the closest landing area was his home airstrip of Roughay Farm, he elected to return there and landed uneventfully.

## Fuel system description, Figure 1




Schematic of Fuel System fitted to G-APTP, drawn showing location of leak and fuel flows when transferring fuel from reserve to right main tank

**Figure 1**

G-APTP was fitted with an optional reserve fuel tank, which was installed at manufacture in 1957. This tank has a capacity of 8 US Gallons (37 Litres) and is situated under the rear seat in this model of aircraft. When the reserve fuel knob in the cockpit is pulled, an electrical fuel pump under the right hand seat pumps fuel from the reserve tank to the right main tank fuel strainer. This pressurised fuel then flows through the right main tank supply lines to replenish the right fuel tank; this process must be carried out with the fuel selector set for the engine to draw fuel from the left tank.

## Aircraft examination

As the aircraft stopped on the runway, the smell of fuel became stronger and so the pilot shut down the aircraft and climbed out. On exiting the aircraft he noticed that fuel was dripping from the rear of the fuselage on the right hand side. He returned to the cockpit to find the carpet on the right side floor was soaked with fuel and in order to investigate, he removed the forward right seat. This revealed a leak from a rigid fuel pipe that ran from the reserve tank pump to the right main tank fuel strainer. The leak was described by the pilot as a small fan like spray jetting forward with some localised weeping of fuel and, as he had some tape in his flight bag, he used this to try to stop the leak. Having staunched the fuel leak, the pilot left the aircraft to retrieve some fuel draining equipment from his car, parked at the end of the runway, his intention being to drain the fuel from the right main tank. However, as he was preparing the equipment beside the aircraft, it spontaneously burst into flames. The fire appeared to start at the front of the cockpit and spread very quickly. The pilot was able to escape from the area without any injury and called the Fire Services. There was no fire fighting capability at the airstrip, except for portable fire extinguishers in the aircraft and at a local hangar. By the time the Fire Service arrived some 10 to 15 minutes later, the fire had already consumed most of the aircraft. The Fire Service assessment of the cause of the fire was fuel vapours becoming ignited by hot spots from the engine. There was very little surface wind reported at the time of the accident.

Unfortunately, as the leaking pipe was consumed by the fire, it was not possible to ascertain the exact cause of the pipe failure. This had been a rigid fuel line made of aluminium alloy and was located in an area that was locally free from aircraft structure or electrical cabling, making chafing or arcing unlikely as a cause of the failure. The pilot stated that, prior to the leak, there had been no signs of corrosion or pitting on the outside wall of the pipe. The pipe was the original factory fit and had not been replaced in the 46 year history of the aircraft. The last disturbance of the pipe was determined by the pilot to have been in 1993 when major maintenance was carried out.

It was reported that the reserve tank system was rarely, if ever, used and was only tested during the annual inspections and visually inspected during other scheduled maintenance. In normal operation, fuel is supplied from the right and left main tanks to the selector valve by gravity, with no additional pumps. This means that the subject pipe normally contains fuel whenever the right fuel tank also contains fuel, but only at a relatively low pressure. Unless the reserve tank fuel is used on a regular basis, the fuel in the subject pipe would be relatively stagnant and therefore the pipe could be at risk of long term water contamination, and hence be at risk from long term internal corrosion. It is most probable that, when the reserve fuel tank pump was operated, it pressurised the fuel in the pipe to a pressure sufficiently high to cause a breech in the pipe wall. This weakness could have resulted from the effects of such corrosion.

In retrospect, the pilot stated that he considered that it was somewhat foolish to take the steps he did to staunch the leak, and drain fuel from the right main tank, albeit this was intuitive at the time.