

**DATA SUMMARY**

**LOCATION**

Date and time	<b>Thursday, 10 May 2007; 12:35 local time</b>
Site	<b>Añora (Cordoba)</b>

**AIRCRAFT**

Registration	<b>EC-CUU</b>
Type and model	<b>PIPER PA-36</b>
Operator	<b>Trabajos Aéreos Espejo</b>

**Engines**

Type and model	<b>LYCOMING IO-720-D1CD</b>
Number	<b>1</b>

**CREW**

Pilot in command

Age	<b>40 years</b>
Licence	<b>Commercial aircraft pilot</b>
Total flight hours	<b>2,000 h</b>
Flight hours on the type	<b>400 h</b>

**INJURIES**

	Fatal	Serious	Minor/None
Crew			<b>1</b>
Passengers			
Third persons			

**DAMAGE**

Aircraft	<b>Significant</b>
Third parties	<b>Damage to some trees</b>

**FLIGHT DATA**

Operation	<b>Aerial work – Commercial – Agricultural</b>
Phase of flight	<b>Maneuvering – Low-altitude flight</b>

**REPORT**

Date of approval	<b>26 September 2007</b>
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## 1. FACTUAL INFORMATION

### 1.1. History of the flight

The aircraft was performing fumigation work over some oak trees. It was the third flight of the day, the first having lasted some 90 minutes, and the second about 60. Fifty-five minutes into the third flight, as the aircraft was climbing out of a spraying run, it experienced a loss of power. When noticed by the pilot, he engaged the electric fuel pump, which helped the engine recover but only momentarily, and the power quickly dropped again. The pilot disengaged the pump and prepared for an emergency landing.

The landing took place in a wooded area and the aircraft suffered extensive damage to the frame and wings during the landing run. The main gear and tail wheel detached, and the right wing fuel tank broke when the right landing gear leg was lodged in the ground.

The pilot and sole occupant of the aircraft escaped uninjured and was able to exit the aircraft under his own power without any further incident.

The fuel tanks had been topped off before each flight, and according to available documentation, the aircraft had been maintained as required by its official maintenance program.

### 1.2. Tests and research

#### 1.2.1. *Field investigation of the engine*

As inspection was performed at the scene of the accident which revealed that the left fuel tank was approximately half full. The right tank had broken off and was empty. There were obvious signs that a significant amount of fuel had spilled on the ground.

The power plant components (power and mixture levers, regulator, magnetos, ignition harness, spark plugs, air filter, etc.) were generally in good condition except for the mechanical fuel pump, which was completely seized, with its axle shaft broken.

The propeller showed signs that the engine was turning when it impacted the ground but with negligible power.

#### 1.2.2. *Workshop inspection of the mechanical fuel pump*

The pump, P/N RG9080J6A and S/N D-263, was manufactured by ROMEC DIVISION.

A disassembly of the pump revealed that the rotor was broken in four places. There was also a crack on the rear cover of the pressure vessel. The remaining pump components showed no outward signs of damage aside from dents and scratches.

Two foreign objects some 5 millimeters in size were found inside the pump. One was a piece from a manufactured plastic component with a carbon-like appearance, and the other was metallic and seemed to be a small section of flattened tube.

It was concluded that the foreign metallic object found inside the pump had wedged itself between the rotor and stator, which resulted in the pump seizing.

The fuel system inlet to the mechanical pump, specifically the auxiliary electric pump and the fuel filter, was inspected in an attempt to discover the origin of the foreign objects found inside the mechanical pump.

### 1.2.3. *Workshop inspection of the electric pump and fuel filter*

The pump, P/N 2B6-36 and S/N 4AK2, was manufactured by PARKER AIRBORNE DIV.

The pump inspection revealed that the four impeller blades had seized in their housing grooves. One of them had broken down the middle, and all showed abnormal wear near the suction port.

The carbon-like object found in the mechanical pump was the missing half of the impeller blade from the electric pump.

Also missing from the electric pump was the positioning pin from the rear cover of the pressure vessel. This cover serves two purposes within the pump: to ensure the watertightness of the rotating components, and to function as a regulating valve for the pump. The pin keeps the cover from rotating as the blades brush against it and maintains it properly positioned.

The metallic debris found in the mechanical pump was from the electric pump's missing positioning pin.

The inspection of the fuel filter showed nothing out of the ordinary as all its components were in good condition. The filter is before the electric pump, so there are no obstacles to keep objects leaving the electric pump from reaching the mechanical pump.

No record of similar failures was found in the course of the investigation.

#### 1.2.4. *Procedures and checklists*

The operator uses the procedures and checklists contained in the aircraft's Flight Manual.

The normal procedure states that the electric pump is to be connected for takeoff, approach and landing.

The emergency procedure for an IN-FLIGHT LOSS OF POWER states that if the power loss takes place at low altitude, the first step is to prepare for an emergency landing. It then refers the pilot to the procedure on DEAD-STICK LANDING, which states, among other things, that the electric pump must be disengaged. If the altitude is high enough, the IN-FLIGHT LOSS OF POWER procedure specifies a series of steps, one of which is to engage the electric fuel pump to try to regain engine power.

## 2. ANALYSIS

The positioning pin on the rear cover of the electric pump's pressure vessel broke loose for unknown reasons (vibrations, temperature, loss of the elasticity which keeps it in place). The damage to the pin was caused by the mechanical pump.

This loose component caused the breakage of one blade and the abnormal wear of the other three blades in the electric pump. Eventually, both the pin and the blade section were swept by the fuel to the mechanical pump.

The mechanical pump seized when the pin became wedged between the mechanical pump's rotor and stator, which led to the damage observed in the pump.

The engine power dropped when the mechanical pump seized, and the poor condition of the blades on the electric pump prevented the engine from regaining power once engaged by the pilot. There may also have been a slight delay in turning on the electric pump, which caused (along with the condition of the blades) the engine knocks noted by the pilot.

The pilot carried out the emergency procedure for an in-flight loss of power and engaged the electric pump in an effort to regain engine power. According to the manual, this procedure is applicable when flying at sufficient altitude, which was not the case here, as frequently happens during spraying operations. The correct action would have been to prepare for an emergency landing immediately, though it is understandable, given the wooded terrain and the difficulties it presented for landing, that the pilot would try to stay airborne.

### **3. CONCLUSIONS**

The most likely cause of the accident was the detachment of a positioning pin in the electric pump, which was then swept by the fuel to the mechanical pump, which seized when the pin became wedged between the stator and the rotor.

The failure of the mechanical fuel pump led to a drop in engine power which persisted even after the electric pump was engaged, due to the poor condition of the latter and to the short amount of time available to evaluate the effectiveness of this action given the aircraft's low altitude at the time of the event.