No: 3/92 **Ref: EW/G91/09/13** **Category: 1c**

Aircraft Type and Registration:	Rockwell Commander 112 TCA, N4698W
No & Type of Engines:	1 Lycoming TO-360-C1A6D piston engine
Year of Manufacture:	1978
Date & Time (UTC):	20 September 1991 at 1454 hrs
Location:	Near Retford (Gamston) Airport, Nottinghamshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Damage to right outer wing and flap, forward fuselage underside and propeller
Commander's Licence:	Private Pilot's Licence
Commander's Age:	56 years
Commander's Flying Experience:	440 hours (of which 70 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot and examination of aircraft by AAIB.

The aircraft had flown from Framlingham at FL45, the flight time being about one hour, and the pilot had contacted Gamston and had obtained airfield information. Joining downwind the pilot checked his instruments, selected fuel to 'BOTH', fuel pump 'ON' and selected the landing gear 'DOWN'. He recalled later that the ammeter read approximately zero. He checked his position downwind and then realised that no landing gear indication lights were on. The selector was recycled but the lights did not illuminate. The circuit breakers were checked and all were in. The pilot then realised that the radios were not illuminated and it appeared that the aircraft had suffered a total electrical failure.

The pilot extended the downwind leg and orbitted a power station while he rechecked the indications and control selections. He then returned to the airfield and flew past the tower to attract the attention of the controller and make her aware that he had a problem. After his third pass he saw the airfield's fire tender driving out towards the holding point for the active runway. He decided to complete a circuit and to select the emergency gear selector knob to 'DOWN' on the approach. He opened the throttle and initiated a climb but at 150 to 200 feet the engine 'coughed' and cut out. He opened and closed the throttle but there was no response from the engine. He lowered the nose, selected the landing gear

'EMERGENCY DOWN', closed the cowl flaps, selected the mixture to 'IDLE CUT-OFF', the magneto switches to 'OFF' and the master switches to 'OFF'. He banked left to avoid some cables across the approach to a stubble field ahead, levelled and landed wheels up in a field of sugar beet. The pilot was uninjured and evacuated the aircraft without difficulty. When the aircraft was lifted later on slings the two maingear legs deployed and locked down. The noseleg remained stowed because of damage to its doors. When this was later cleared the noseleg fell down and locked. The aircraft was recovered to the airport where it was later examined.

Although the aircraft was being operated from the United Kingdom its registered ownership was in the United States and it was being maintained under FAA regulations. An Annual Inspection had been completed four days before the accident and arising from that inspection the electro-hydraulic powerpack which powers the retractable gear had been replaced with an overhauled unit, a new turbocharger had been fitted and the propeller had been sent back to the United States for a mandatory inspection.

Following the Annual Inspection the pilot became aware that cruise performance was below normal and on the day of the accident he flew from Gamston to Framlingham to allow the engineers to check the engine and propeller operation. The aircraft had been refuelled to the fixed indicators or 'steps' situated inside the tank filler holes three days before when 168 litres (44.4 gall US) had been put into the tanks. The steps signify an amount of 24 gall US in each tank. The aircraft was not then flown until the flight to Framlingham when the tank contents were again checked before flight. On the flight south the pilot recorded a cruising speed of 120 kt at 65% power instead of 135 kt which had been previously obtained. At Framlingham the engineer carried out adjustments to the mixture and the idle setting and checked the calibration of the RPM indicator. A small fuel leak was found at the Gascolator and, because a new seal was not available, the old seal was smeared with petroleum resistant grease as a temporary measure. After between 10 and 15 minutes of ground running the aircraft was cleared for flight. On the return flight the aircraft's performance appeared to have been restored.

The aircraft was examined six days after the accident to identify the cause of the engine failure and electrical failure, the latter considered both in terms of insufficient charge rate or unusually high current drain.

An unrestricted flow of clean fuel was obtained from the Gascolator drain and 180 mls of fuel was recovered from the carburettor bowl but the right tank was found to contain only 8 litres (2.1 gall US) and the left tank 3.5 litres (0.9 gall US). The quoted unusable fuel is one gall US in each tank. The aircraft had been stored in a hangar both before and after the accident and there had been no sign of

fuel leakage from it and there was no sign of fuel spillage at the accident site. Since it had 168 litres (44.4 gall US) of fuel added the aircraft had flown for 2 hours 30 minutes plus 10 to 15 minutes of ground running. Under normal operation at 65% cruise power, with allowances for take-off, climb and descent, 30 gall US might have been consumed during the two flights with, perhaps two or three gall US being consumed during the ground running. Therefore, about 18 gall US could not be accounted for.

The aircraft's battery had been disconnected shortly after the accident and when checked for condition was found to be in a low charge state though not fully discharged. The alternator's electrical connections were secure and its driving belt tension appeared normal. With the aircraft jacked and secured a fully charged battery was fitted and some checks were carried out. When an 'UP' or 'DOWN' selection is made on the gear selector the operation of the powerpack is terminated by a pressure switch in either hydraulic line which switches off power when a designated pressure is reached. Initially, with the cockpit settings as found (Electrical switches 'OFF', gear selector 'DOWN', emergency gear selector 'DOWN' and the noseleg restrained retracted) the pump ran continuously, *ie* the system appeared not to be controlled by the 'DOWN' pressure switch. The current, estimated from the aircraft ammeter at about 50 amps, was higher than that required for normal extension pressure which is limited at 500 psig by the 'DOWN' pressure switch and requires less than 30 amps. These symptoms could be consistent with the the pressure switch having failed and the output pressure being controlled by the hydraulic powerpack's internal 'DOWN' pressure limiting valve. However, when the noseleg was freed the gear operated normally in retraction, extension and emergency extension and the pump pressurised within a few seconds after each operation with less than half deflection (35 amps) on the ammeter. The initial symptoms could not then be reproduced.

The powerpack and the pressure switches for both 'UP' and 'DOWN' systems were removed and sent for bench checking. All operated correctly on test and when the powerpack was dismantled no evidence was found of any contamination or damage. When the powerpack was removed from the aircraft it was found that the vent serving the integral reservoir was closed (its transport position). The powerpack was run on the test rig in this condition but no adverse effects were seen.

The alternator, its regulator and overvoltage relay were removed and tested and all operated correctly.

The aircraft is under repair and any relevant defects which are found while it is being prepared for release to service will be reported.