

ACCIDENTS INVESTIGATION BRANCH
Department of Trade and Industry

Report on the accident to
Aeronca C 100 G - AETG
which occurred near High Wycombe,
Buckinghamshire, on 7 April 1969

List of Civil Aircraft Accident Reports issued by AIB in 1971

<i>No.</i>	<i>Short title</i>	<i>Date of publication</i>
1/71	Hawker Siddeley HS 748's G-A TEK and G-A TEH at Portsmouth, August 1967	March 1971
2/71	Aeronca C100 G-A ETG at High Wycombe, April 1969	March 1971

Department of Trade and Industry
Accidents Investigation Branch
Shell Mex House
Strand
London WC2

March 1971

The Rt Hon John Davies MP
Secretary of State for Trade and Industry

Sir,

I have the honour to submit a report by Mr N S Head, an Inspector of Accidents, on the circumstances of the accident to Aeronca C 100, G-AETG, which occurred near High Wycombe, Buckinghamshire, on 7 April 1969.

I have the honour to be,

Sir,

Your obedient servant,

V A M HUNT
Chief Inspector of Accidents

Accidents Investigation Branch

Civil Accident Report No EW/C/311

Aircraft: Aeronca C 100 G-AETG
Engine: One JAP J99
*Registered Owner
and Operator:* MPM Flying Group
Pilot: Mr David F F Poore – Injured
Passenger: Mr David W M Redman-Thomas – Killed
Place of Accident: Lane End Road, High Wycombe
Date and Time: 7 April 1969 at 10.20 hrs.
All times in this report are GMT

Summary

Following a normal take-off and climb to 300 feet, the engine of the aircraft was heard to splutter and then the propeller was seen to be stationary. In the ensuing forced landing, the aircraft struck a tree and then an earth bank, killing the passenger and seriously injuring the pilot. The aircraft was destroyed. The accident was caused by loss of engine power after take-off. The most probable reason for the loss of power was an insufficient supply of fuel to the carburettor.

1. Investigation

1.1 History of the flight

The aircraft was engaged in local private flying from Booker airfield, High Wycombe and the pilot was a member of the group which owned and operated the aircraft. He had met the passenger, Mr Redman-Thomas, at the airfield on the day of the accident and arranged to take him for a flight. According to the pilot's statement, the fuel tank was about half full ie. containing approximately 3 gallons of fuel. The aircraft made what witnesses have described as a slightly flat but otherwise normal take-off at approximately 1010 hrs with Mr Poore at the controls and Mr Redman-Thomas in the right-hand seat.

Soon after take-off, when the aircraft had reached a height of approximately 300 feet and had turned left to join the circuit, the pilot felt and heard the engine start to pop and splutter and the aircraft began to lose height. The pilot's memory of subsequent events is not clear, but witnesses on the ground heard the engine noise cutting in and out and saw the aircraft descending.

The right-hand wing collided with a tree, and immediately afterwards, the aircraft spun round and crashed nose first into an earth bank on the side of Land End Road approximately 1 mile east-north-east of the centre of Wycombe aerodrome. Just before impact, the propeller was seen to be stationary.

The passenger was killed, the pilot received serious injuries and the aircraft was destroyed.

1.2 Injuries to persons

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Others</i>
Fatal	—	1	—
Non-Fatal	1	—	—
None	—	—	—

1.3 Damage to aircraft

The aircraft was destroyed by impact.

1.4 Other damage

None

1.5 Crew information

The pilot, Mr David Poore, aged 27, held a current private pilot's licence. His last medical examination was carried out on 30 September 1968 and he had passed a competency check on 4 January 1969. Although his flying log books have been mislaid, it is understood that he had completed approximately 130 hours' total flying at the time of the accident, of which 16 hours were on the Aeronca. He last flew the aircraft on the morning of 7 April 1969, prior to the accident, when he carried out a test flight of 30 minutes' duration.

The passenger, Mr David Redman-Thomas, aged 25, was the holder of a student pilot's licence issued in February 1969.

1.6 Aircraft information

1.6.1 *General*

Aeronca C 100, G-AETG, was constructed by the Aeronautical Corporation of Great Britain Ltd. in 1937, and first flew on 22 February of that year. In 1938 the aircraft had been issued with a certificate of airworthiness.

In 1957, when the subject engine was installed, a replacement fuel cock was fitted and a flow check was carried out. A flow of 12 gallons per hour at the carburettor was recorded with the cock fully open. The aircraft was little used, and spent long periods in storage, before being badly damaged in a flying accident in 1959. Following its purchase by the MPM group in 1964 it was completely rebuilt and the engine was overhauled. The last recorded fuel flow check carried out on the aircraft was in 1966 when, according to the work sheets, a flow of 14 gallons per hour was measured. The engine had a maximum fuel demand of 2.4 gallons per hour at full throttle.

After it was purchased by the MPM group, the work done on the aircraft, including maintenance and certification, was carried out by Mr R W Mills, the group secretary, with the occasional assistance of members of the group. After being re-built, the aircraft was operated on a permit to fly issued by the Board of Trade on the recommendation of the Air Registration Board. A measure of airworthiness safety control is achieved by limiting the conditions under which such aircraft may be flown. The current permit, issued on 10 April 1968, was valid at the time of the accident.

1.6.2 *Recent defects*

On 1 April 1969, a member of the group had to cancel a cross-country flight he had planned in the Aeronca, because of difficulty in starting the engine. The member concerned formed the impression that there was an obstruction or an air-lock in the fuel system, as the carburettor could only be flooded by raising the tail of the aircraft. The incident was reported to Mr Mills who, after checking the fuel and ignition systems, carried out a test flight, during which no faults were found. The cross-country flight was successfully completed on 4 April 1969.

On 5 April 1969, Mr Poore experienced engine trouble during a local flight with a passenger. According to his statement, the engine would not perform satisfactorily with the nose of the aircraft raised but was much improved when the nose was lowered. However, subsequent engine running and a test flight at Booker aerodrome was satisfactory and no defects were found.

The last entry in the engine log book reads as follows:

“50 hr. check carried out, plugs removed and cleaned; gaps .025”, tappets .005”, points .012”, mag. timing checked – Carb stripped and jets cleaned, petrol filter removed and cleaned. Oil not changed. Air filter cleaned. Ground run 2,350 rpm, 25/25 mag. drop. Aircraft flown 2/4/1969. Power loss reported 5/4/69, plug points and tappets checked, air filter and petrol filter checked. Ground run, no loss of power. Test flown 6/4/69 for 30 mins. No loss of power in any phase of flight or mag. drop experienced. Second test flight by D. Poore on 7/4/69 reported satisfactory”.

1.6.3 *Fuel cock*

The fuel cock fitted to the aircraft consists of a drilled tapered plug rotating in a matching body. As the plug is rotated, it progressively opens and closes off the supply of fuel alternately every 90° of movement. The original design of this type of cock provides for the addition of a spring to retain the plug on its seating and stops to limit its rotary movement to 90°. These stops would enable the cock to be positively positioned in the ‘open’ or ‘shut’ settings. In the subject aircraft, neither the retaining spring nor the stops had been incorporated and the cock could be rotated through 360° in either direction (see Appendix Fig. 1). The cock was operated by means of an attached ‘T’ handle, the arms of which lined up with self adhesive labels stuck to the instrument panel indicating the fuel ‘ON’ and ‘OFF’ positions. (Fig 3) the labels were correctly positioned and the cock was fully open at the fuel ‘ON’ indication which corresponded approximately to a ‘5 minutes to 5 o’clock’ position of the fuel cock handle and ‘OFF’ at ‘10 past 8’. However, the secretary of the group had instructed members that the fuel cock was not to be turned off or adjusted between or during flights but was to be kept at the ‘5 past 7’ setting (Fig. 3). It has not been possible to establish why it was kept in this position instead of the correctly marked ‘ON’ setting of ‘5 minutes to 5’. During his checks of the fuel system, following the reported engine trouble on 5 April, the secretary had closed the cock slightly to an estimated ‘10 past 8’ position. He found that the engine would cut out when the throttle was opened with the fuel cock in this position but it operated satisfactorily when he had returned the cock to ‘5 past 7’.

1.7 **Meteorological information**

The weather, which was good, had no bearing on the accident. The surface temperature was +11°C.

1.8 Aids to navigation

Not applicable

1.9 Communications

Not applicable

1.10 Aerodrome and ground facilities

Witnesses of the accident alerted the police, ambulance, and the Buckinghamshire Fire Brigade who arrived at the scene within 20 minutes of the occurrence. No other facilities were involved.

1.11 Flight recorder

No flight recorder was installed.

1.12 Wreckage

The aircraft had struck a tree with its right wing tip at a height of approximately 45 feet above the ground. It had then spun around, finally coming to rest on its right side with its nose into an earth bank approximately 100 feet beyond the first point of impact.

Several tubular members and struts had been cut by a saw, and the fuel tank and supply pipe had been cut and removed during the rescue of the occupants. Although both wings had been badly damaged by impact and subsequent rescue operations, the tail section had suffered little damage in the accident. There was a pointer impact mark on the airspeed indicator at 65 mph but most of the instruments had been crushed or torn from the panel by impact and any indications must be considered unreliable. Both magneto switches were in the 'ON' position.

No evidence was found of any airframe or flying control defect or malfunction that could have been contributory.

On removal of the fuel cock from the tank at the scene, on the day of the accident, it was noted that it was almost fully closed. When the cock and its associated operating handle were 'offered up' into the positions they appeared to have been in at impact it was noted that the partially open position corresponded to the '5 past 7' position of the cock handle.

After inspection at the scene of the accident, the wreckage was removed to a hangar for further examination.

The propeller was found to have fractured in straight rearward bending, indicating that it was not rotating at impact. Accordingly, the engine and its associated items were stripped and examined for evidence of failure or malfunction that could have been contributory.

The general appearance of the sparking plugs, piston crowns and valves indicated that the engine had been operating with a weak mixture, although this had not caused any damage to the operating parts. There was no evidence of pre-crash mechanical failure and the engine was adequately lubricated. Rig testing of plugs and magnetos did not reveal any electrical defect or malfunction to which engine failure or power loss could be attributed. The throttle control was noted to be slack and the

gland friction nut could not be tightened. It was possible for the throttle to vibrate to the closed position if not held during flight. The carburettor, filter and fuel lines were stripped and found to be clean and the jets unobstructed. The fuel tank had been split in the impact and had subsequently been cut free and washed out with water by the firemen during the rescue operations. However, the fuel contamination of the pilot's clothing that had occurred and the small quantity of fuel remaining in the pipe lines indicate that fuel was available. No filter was found in the tank.

Dismantling of the fuel cock revealed witness marks on the tapered plug and the bore of the body of the cock which indicated that the cock had been set for a considerable period of time in an intermediate position (Fig 2). The marks corresponded to a '5 past 7' setting of the fuel cock handle. When examined after the accident the fuel cock was found stiff to operate and it is considered unlikely that it could have been moved inadvertently.

Operating and flow tests were carried out on the aircraft fuel system and are the subject of a detailed analysis later in the report (see section 1.15).

1.13 Fire

There was no fire.

1.14 Survival aspects

The pathologist's report of the nature of the fatal injuries suffered by the passenger indicates that, had he been wearing full restraint harness, he might have survived the accident.

1.15 Tests and research

The fuel cock was installed in a simple test rig, using the aircraft fuel system components as far as possible and with a head of fuel approximately the same as that existing at the time of the accident. The object of the test was to ascertain the rate of gravity flow obtainable at the carburettor inlet in the full-flow and restricted-flow settings.

Four alternative flow rates were measured. In position (a) the cock was fully open. In position (b) the cock was aligned as closely as possible with its actual setting in the aircraft as indicated by the witness marks. In positions (c) and (d) the cock had been positioned 5° respectively either side of the setting in (b) in order to allow for any slight error in alignment with the witness marks, which might have occurred during re-assembly.

The results of the tests are tabulated below:

<i>Position of fuel cock</i>	<i>Rate of flow in gallons per hour</i>
(a) Fully open	12.8
(b) Aligned with witness mark	0.88
(c) 5° Further open than (b)	2.25
(d) 5° Further closed than (b)	Nil

Notes – the maximum demand of this engine at 2,400 RPM (full throttle) was 2.4 gallons per hour. It is good airworthiness practice, however, that the fuel flow rate to the engine should not be less than 150 per cent of the fuel consumption at maximum power.

2. Analysis and Conclusions

2.1 Analysis

The evidence of eye-witnesses near the scene of the accident indicates that after take-off, when the aircraft had reached a height of about 300 feet, the engine was heard to splutter and just before impact with the ground, the propeller had stopped rotating.

The examination of the aircraft and the engine revealed no evidence of pre-crash failure, but the fuel cock, which was not fitted with positive 'ON/OFF' stops, was found near to the 'OFF' position. With the cock at this position, (described in the report as the '5 past 7' position), it provided only a very narrow elliptical-shaped opening for the fuel supply and the tests referred to in paragraph 1.15 of this report established that the fuel flow was so restricted that sustained operation at full throttle could eventually reduce the fuel level in the carburettor until the engine suffered a weak mixture 'cut'. In this accident, once the engine had stopped, there was insufficient height in which to get it re-started.

Evidence obtained during the investigation shows that instructions had been given by the group secretary that the fuel cock was not to be moved from the '5 past 7' position and this position was accepted by the group pilots as being the correct 'open' position. It has not been possible to determine why this position was selected instead of the correctly-marked 'ON' position at '5 minutes to 5'. At the correct position, the fuel flow was more than adequate to supply the engine at full power. From the test carried out by the group secretary on the day before the accident, the accuracy of the adjacent '10 past 8', ('OFF') position was established. After the test he returned the cock to '5 past 7' although it is difficult to see how an accurate resetting to the original position could have been achieved. In accordance with the secretary's instructions, the fuel cock was not touched by the pilot on the subject flight.

Bearing in mind the number of successful flights the aircraft had made, some of which had included the carriage of a passenger, consideration has been given to the possibility of other causal factors being associated with the accident flight. A number were considered, including the inadvertent operation of the ignition switches to 'OFF' and the inadvertent closure of the throttle because of an ineffective friction damper. The evidence indicated that these possibilities were unlikely, but factors which proved relevant were those concerned with a reduction in fuel flow resulting from a lower head of fuel or from dirt or foreign matter entering the system.

On the accident flight, the fuel tank was only half full and, therefore, the rate of flow could have been less than it was on other occasions when the tank was full for take-off.

Although no dirt or foreign matter was found in the fuel tank, any remaining could have been washed out by the firemen when they flushed the tank with water at the accident site. No filter was found in the tank. Consequently, if any dirt was present, it could have reached the fuel cock and any small amount in such a restricted opening would have significantly reduced the rate of flow. This possibility cannot be discounted.

Consideration has also been given to the possibility of effecting a successful forced landing, following the engine failure. The nature of the terrain and the proximity of the town of High Wycombe and its environs precluded the chances of this being achieved on the accident flight.

2.2 Conclusions

(a) Findings

- (i) The documentation of the aircraft was in order.
- (ii) The pilot was properly licensed.
- (iii) There was no pre-crash failure of the aircraft.
- (iv) During the climb after take-off, the engine lost power.
- (v) The aircraft was being operated with its fuel cock in the nearly fully-closed position which restricted the flow of fuel to the carburettor.
- (vi) The terrain over which the aircraft was flying when the engine lost power was unsuitable for a forced landing.

(b) Cause

The accident was caused by a loss of engine power after take-off. The most probable reason for the loss of power was an insufficient supply of fuel to the carburettor.

3. Compliance with Regulations

In conducting this investigation, the provisions of Regulation 7(5) of the Civil Aviation (Investigation of Accidents) Regulation, 1951, have been complied with.

On 30 June 1970 a letter was sent to Mr R W Mills, the Secretary of the MPM Flying Group, offering him, the opportunity of exercising the rights conferred by the Regulation and informing him of the facilities available for that purpose. There was subsequent correspondence with solicitors acting for Mr Mills, but despite two reminders, they have made no representations under the Regulation on behalf of their client.

N S HEAD
Inspector of Accidents

Accidents Investigation Branch
Department of Trade and Industry
March 1971

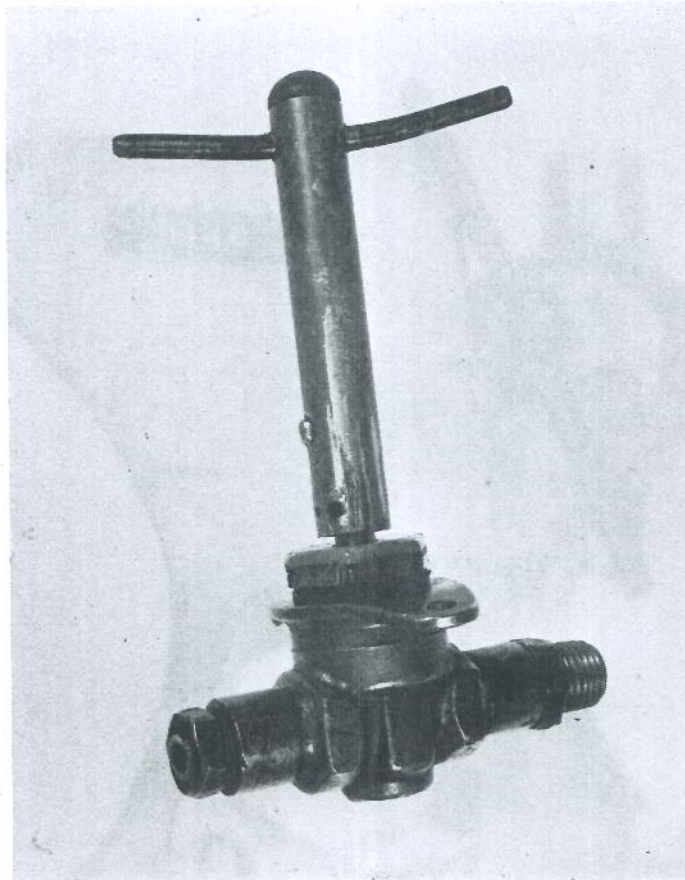


FIG.1 SHOWING FUEL COCK AND HANDLE ASSEMBLY WITH NO STOPS

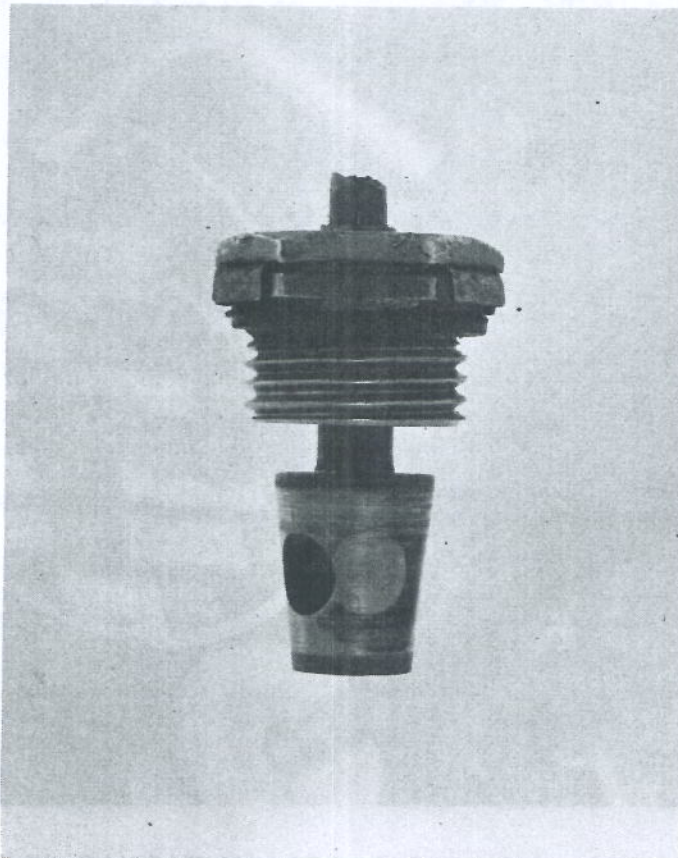


FIG.2 SHOWING WITNESS MARK ON PLUG OF FUEL COCK
CORRESPONDING WITH HANDLE IN "5 PAST 7" POSITION

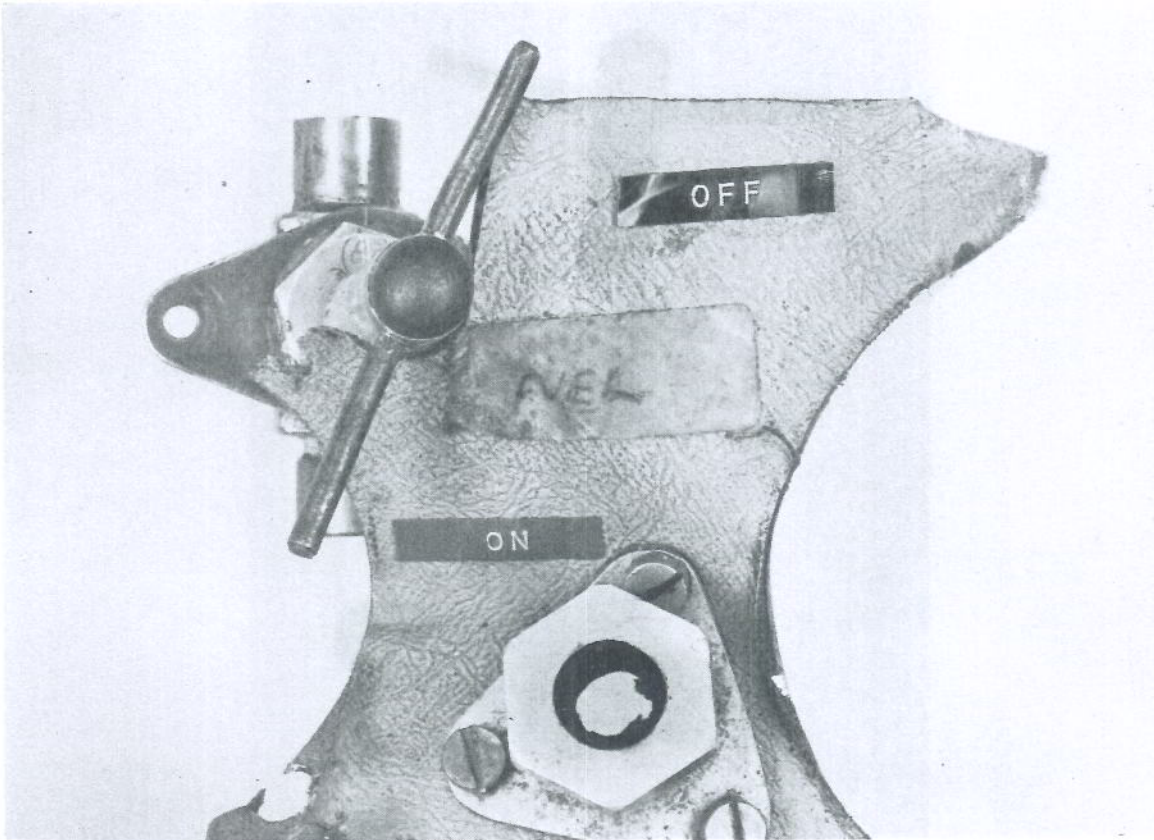


FIG.3 FUEL COCK WITH HANDLE IN "5 PAST 7" POSITION (G-A E T G)

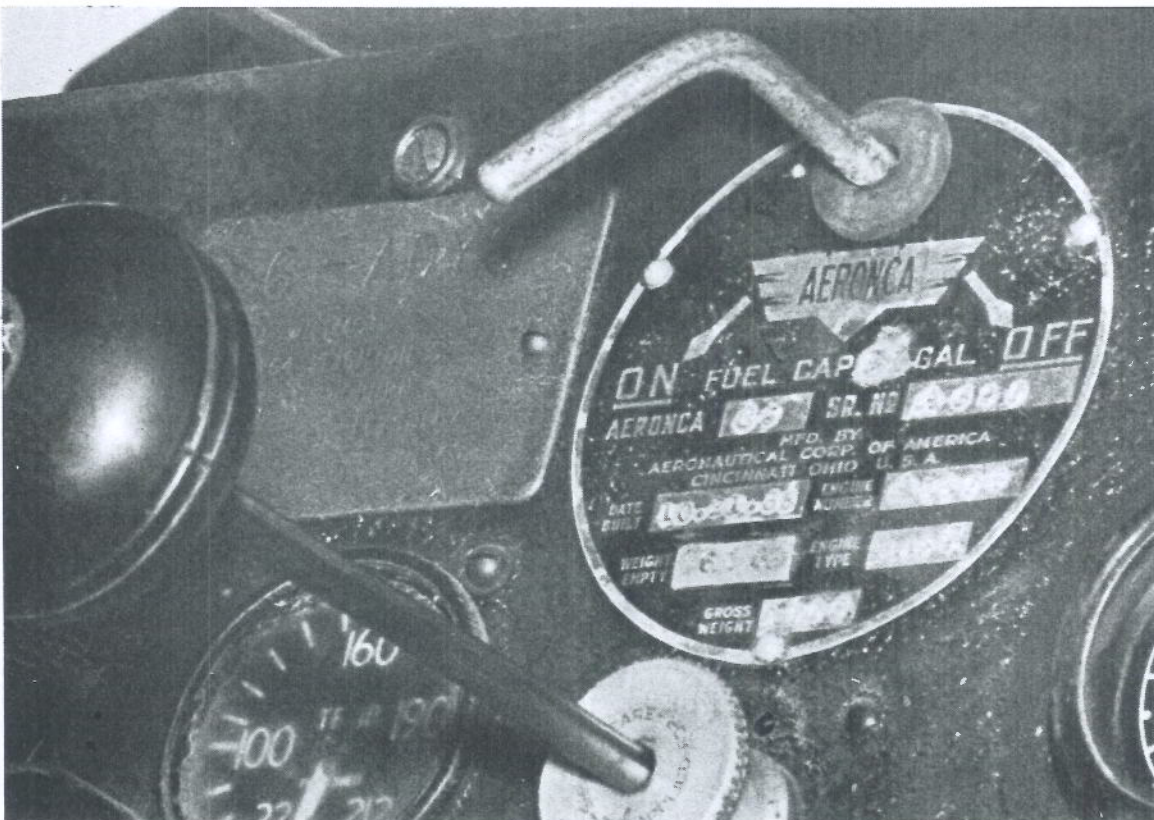


FIG.4 NORMAL AERONCA FUEL COCK HANDLE AND INDICATIONS