DESCRIPTION OF THE OCCURRENCE

The aircraft, on its third flight of the day, was dispatched for a day/VFR flight from Winnipeg to Oxford House, Manitoba. The pilot obtained takeoff clearance for runway 13 (130^{o}M) from the tower and approval for a "left turn out". The takeoff was made with partial flap extended and the ground roll was longer than usual for the aircraft type. At about 150 feet above the runway with the wheels retracted, one engine lost power. The aircraft then entered a right turn and the wheels were extended. The bank of the turn became very steep and the aircraft lost height. The other engine then lost power whereupon the wings were levelled and full landing flap was extended. A few seconds later the aircraft struck trees in a residential area while almost stalled, then struck the ground heavily nose first. Fire broke out on impact.

Findings

- The left engine lost power for an undetermined reason.
- The pilot did not follow the recommended emergency procedures after the power loss.
- The right engine lost power because the pilot turned the right fuel selector valve to the "off" position.
- The company had not ensured that the pilot was adequately trained in emergency procedures.

Assigned Cause

The pilot did not follow the correct emergency procedure following a loss of power from one engine after takeoff.

"This accident was investigated to determine the cause (s) in order to provide guidance toward the prevention of a recurrence. The content of this report is confined to cause-related circumstances and is published for accident prevention purposes only."

SCOPE OF THE INVESTIGATION

1. Operational Aspects

The aircraft gross weight and load distribution were within the authorized limits. The takeoff from runway 13 normally calls for a right turn after takeoff. The pilot asked the tower for a left turn out, presumably because that would be closer to his intended direction of flight to Oxford House, and this request was approved. When the radar operators later saw the aircraft start a right turn they watched it closely.

The takeoff was made with the wing flaps partially down. It is unusual and unnecessary to use flaps for takeoff in this type aircraft, especially on a long (9000 ft.) runway. The use of flaps on takeoff on this aircraft shortens the takeoff run but degrades the single engine performance.

Witnesses reported that the aircraft took a longer than usual takeoff roll. The existing air temperature ($82^{o}F$), being above standard would increase the roll required by some 30% and at the same time decrease the climb performance by 24%. (Aircraft performance figures are reduced to standard atmosphere conditions of 29·92 inches of mercury, and $59^{o}F$ temperature at sea level.)

The pilot raised the wheels immediately after takeoff, as is customary. When shortly thereafter one engine lost power he was faced with the need to make quick decisions and to take immediate action.

Pilots train for this type of emergency and the recommended initial procedures for the Beechcraft 18 are standardized: continue straight ahead, increase power, raise the wheels and flaps, reduce drag by feathering the propeller of the failing engine. The aircraft should have been capable of continuing flight if the correct procedures had been followed.

Following the loss of power from one engine, the pilot commenced a right turn and lowered the wheels - and did not feather the propeller of the affected engine, but allowed it to windmill, thus creating extra drag and making continued flight impossible. It is apparent that the pilot did not follow the recommended emergency procedures.

Consideration of witness observations and technical evidence established that it was the left engine that first lost power. The reason for that power loss was not determined.

The angle of bank in the turn after the loss of power from the left engine increased to such a degree (witnesses said 90^{o}) that it could hardly have been intentional on the part of the pilot but must be attributed to the beginning of a loss of control; the aircraft would not be controllable very long with one engine out, its propeller windmilling, part flaps and the wheels down.

The subsequent loss of power from the right engine is attributed to an action of the pilot. The right fuel selector lever was in the "off" position; technical analysis of the wreckage confirmed that the fuel valve was closed and that this selection had occurred prior to the impact. Turning off the right fuel selector would result in the loss of power from that engine after 12.8 seconds (see Flight Test). This means that the "off" selection was made after the takeoff and about 17 seconds before the final impact. Medical evidence (lactate tests) indicated that the pilot experienced greatly increased stress

about 5 seconds prior to the crash).

Once the right engine stopped the situation was irretrievable and the pilot apparently levelled the wings, selected full flap and awaited the final impact, keeping the aircraft airborne as long as he could, possibly hoping to reach the golf course which was a few hundred feet past the point of impact.

The foregoing attributes a number of incorrect actions to the pilot, all indicative of inadequate training in emergency procedures. The pilot had recently obtained instrument flight training (see crew information). This IFR training however does not include all emergency procedures and was not on the same type aircraft. Upon hiring a pilot, it devolves upon the operator to ensure that the pilot is adequately trained and to provide extra training as necessary.

2. TESTS AND TECHNICAL ANALYSIS

WRECKAGE ANALYSIS

The aircraft struck trees between two houses, in an almost stalled condition with the wings nearly level. The right wing outboard of the engine nacelle was torn off at this time and the fuselage, otherwise intact, then dove steeply to the ground slightly "right wing down". An intense fuel-fed fire broke out on impact; this destroyed the upper portion of the cockpit and cabin as well as part of the aft fuselage, the left wing, most of the center section and the left empennage. (Nearby houses and other property were also severely damaged by the fire). The left engine and nacelle area was considerably damaged by fire and the right engine and nacelle was slightly damaged.

Specialist examinations of the wreckage were conducted at the accident site and at facilities in Winnipeg and Ottawa. A summary of the technical findings follows:

1. The landing flaps were fully extended at impact.
2. The flap position indicator was indicating down.
3. Both propellers were in fine pitch.
4. The left propeller was very nearly stopped at final tree impact.
5. The right propeller was windmilling at about 1600 RPM at tree trunk impact.
6. The left engine fuel selector was in the center (main tank) position.
7. The right engine fuel selector was in the "off" position.
8. The fuel cross-feed valve was closed.
9. The landing gear switch was in the down position.
10. The landing gear was down at impact.
11. The trim controls were near neutral.
12. The throttles, mixtures and pitch controls were all forward (calling for full power.)
13. All magneto switches were on.
14. The left engine was well lubricated and had been in satisfactory mechanical condition. No mechanical reason could be found for the malfunction of this engine. The spark plugs were in good order but the rest of the ignition system and the fuel system was too badly damaged for assessment.
15. The right engine was also well lubricated and had been in satisfactory mechanical condition (see also Fluid Analysis).
16. Carburettor throttle and mixture control settings of both engines were consistent with the positions of the cockpit controls.

FLUIDS

Oil samples were obtained from the engines and small fluid samples were obtained from the fuel system remnants. A gasoline sample was also obtained from the refuelling tender. All samples were sent to The National Research Council Fuels and Lubricants Laboratory for analysis. Studies confirmed that the oil was 100 grade aviation oil and the refuelling tender sample was the correct aviation gasoline. No fuel other than aviation gasoline was detected in the samples removed from the fuel system. (NRC report No. MPT-7258, dated 12 September 1972 refers.)

AIR TEST

An air test was carried out in a similar aircraft with the following results:

(a) Time for power failure when fuel turned off:

- at 36" manifold pressure and 2300 RPM (takeoff power) 12.8 seconds ± 1 sec.
- at 30" manifold pressure and 2000 RPM (climb power) 18.8 seconds ± 1 sec.

(b) Flaps extension time:

0° to full	5.1 seconds
15° to full	2.8 seconds

(c) Minimum propeller windmilling speed "1250 RPM". This was observed at 85 knots I.A.S. with the fuel shut-off. The throttle was opened and closed with no noticeable change in R.P.M. The propeller R.P.M. was stable with no indication of stopping.

3. Crew Information

The pilot and sole crew member was Wilbur Scott Coughlin, 47 years of age. He commenced flying in 1964, first flew multi-engine aircraft in February 1970, and flew 7 different types of light multi-engine aircraft. Most of his experience was as a flight instructor on light aircraft.

He first flew a Beechcraft 18 on January 10, 1972, and he received 16 hours training as a first officer with a commercial operator in Manitoba. Details of the training are not available, but examination of the pilot's log book indicates that it was on-the-job training. On January 22, 1972, he was checked out as pilot-in-command on the Beechcraft 18 by that operator.

He obtained an Airline Transport Pilot Licence on May 12, 1972, after taking instrument flight training at his own expense.

Total flying time	4256.3 hours
Total time on Beechcraft 18	273.8 hours
Time last 90 days	92.0 hours
Time last 3 days	4.5 hours

The pilot had been hired by Ilford-Riverton Airways only a few days before the accident, following a 1.2 hour check flight carried out by another pilot employed by the company. He received no further training before being assigned as a pilot-in-command.

The medical investigation concluded that the pilot had no predisposing problems which could cause incapacitation in the air. The tissue carbon monoxide level was less than 10% and the blood alcohol was zero. The lactate levels indicate a period of severe stress of not much greater than five seconds. (This time corresponds to the period from the loss of power from the right engine.)

4. Aircraft Information

The aircraft, CF-IRY, was a Beechcraft D18S, serial #A-259, manufactured in 1946. It was a "Conrad" conversion with an authorized gross weight of 9,800 pounds. The minimum crew was one pilot and there were seats for eight passengers.

The aircraft was fitted with Pratt and Whitney R985AN14B engines and Hartzell three bladed full feathering propellers.

5. Meteorological Information

High scattered cloud, visibility 15 miles, temperature 82°F, dewpoint 42°F, wind 140°M at 9 mph.

6. Aids to Navigation

Not involved in the accident.

7. Communication

Communications between the aircraft and Winnipeg Air Traffic Control (tower) were normal. These were recorded and information from this source is incorporated in this report.

8. Witnesses

The aircraft was observed by eyewitnesses for the entire flight except for the first part of the takeoff roll. The reports of the witnesses, many of whom were aviation-oriented, were consistent. Observations were both visual and aural and the attention of the witnesses was drawn to the aircraft by its unusual behavior, or unusual sounds.

A number of persons reported that the left propeller was stopped or rotating slowly during the latter part of the flight. The investigators were satisfied that the left engine was not producing power and that the propeller was rotating very slowly at impact, but have been unable to discover mechanical reasons for this (See "Tests and Technical Analysis").

In addition to the eyewitnesses many other persons who might have knowledge pertinent to the accident were interviewed.

Witness information is incorporated in this report.

9. Aerodrome and Ground Facilities

Not directly involved.

10. Flight Recorder

The aircraft was not equipped with recorders.

11. Wreckage

See No. 2 - "Tests and Technical Analysis"

12. Fire

There was no fire prior to impact.

13. Survival Aspects

Destruction was instantaneous and catastrophic.