Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT

A03A0076

LOSS OF CONTROL AND COLLISION WITH TERRAIN

SUPER MARINE AIRCRAFT INCORPORATED
DROMADER PZL-M-18 C-GMVE
BUCHANS, NEWFOUNDLAND AND LABRADOR 25 nm SE
26 JUNE 2003

Canada

Aviation Investigation Report

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Summary

A formation of four PZL-M-18 Dromader spray aircraft were applying product to a block of forest. While turning to intercept the next spray line, the pilot of the number 3 aircraft (C-GMVE, serial number 1Z002-03) transmitted a radio call indicating that the aircraft had an engine problem. The aircraft completed two, increasingly tight, spiral turns to the left and was in a near-vertical attitude when it entered a stand of trees and struck the ground. The aircraft exploded on impact; it was destroyed, and burning fuel ignited a small forest fire. The pilot, the lone occupant, was fatally injured. The accident occurred at dusk at about 2100 Newfoundland daylight time.

Ce rapport est également disponible en français.

Other Factual Information

The aircraft were staged at the Buchans Airstrip and were conducting forestry spray operations for the Government of Newfoundland and Labrador. A normal day of spray operations involves an early morning and/or an evening flight if visibility and wind conditions permit. Low or near to calm winds are most likely during these two periods and are ideal for the application of product. Weather conditions for the flight were clear skies, with unlimited visibility and very light winds. Carburetor icing was not reported by the other aircraft in the formation.

Each aircraft was fully fuelled before take-off on the occurrence flight, and 550 litres of spray product was carried in each aircraft's 2500-litre-capacity hopper. All aircraft were within the weight and balance limitations. The formation was airborne at approximately 2030 NDT[1] and arrived in the application area approximately 10 minutes later. The spray mission then started routinely, with normal radio communications.

While spraying in the block, aircraft are in a loose formation near the tree-tops. Lateral spacing between aircraft is approximately 75 metres, with each aircraft slightly trailing the aircraft preceding. Formation turns are known as "P-turns" and are initiated by the pilot of the lead aircraft. The manoeuvre starts with a climbing turn to 45 degrees right of the sprayed line. At approximately 300 to 400 feet above ground level (agl), the climb is stopped, and the formation manoeuvres in the opposite direction, descends to near tree-top level, and re-enters the spray block. On this flight, the terrain and flight conditions did not require excessively aggressive aircraft manoeuvring during the P-turns.

Partway through the fourth P-turn, the accident pilot made a radio call calmly indicating that his aircraft engine was backfiring. At this time his aircraft was in level flight at approximately 300 to 400 feet agl in a left turn. On hearing the call, the pilots of number two and number four aircraft moved to observe number three.

The M-18 is equipped with a PZL-KALISZ model ASZ-62IR-M18 engine. When a backfire occurs, a spring-loaded valve, located on the top of the engine and downstream of the carburetor, opens to relieve back pressure in the intake system. The operation of the valve is easily visible to the pilot and can also be observed from a distance at the time of a backfire. The pilot of number four aircraft manoeuvred his aircraft to observe the operation of the backfire valve. While manoeuvring, the pilot of number four did not need to reduce power to maintain spacing on number three. The pilot of number four aircraft could see the backfire valve and did not observe it actuate. As the number three aircraft continued to turn to the left, it entered a spiral dive which continued for two turns before the aircraft entered the trees in a near-vertical attitude. The pilot of number two aircraft radioed to warn of the dive, but there was no response. There were no observed flight control movements consistent with that of an attempted recovery, and the spray load was not jettisoned. The accident was non-survivable due to the magnitude of the deceleration forces.

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[1] All times are Newfoundland daylight time (Coordinated Universal Time [UTC] minus two and one-half hours) unless otherwise noted.

The accident pilot held a valid Canadian airline transport pilot licence. According to available records the pilot had accumulated in excess of 7000 hours flight time. He had experience on a variety of aircraft and had some previous spray experience; however, he had only 30 hours on the PZL-M18 Dromader. All of his Dromader time had been accumulated since 14 June 2003. The pilot had flown approximately five hours in the 90 days prior to commencing flights on the Dromader. Post mortem examination did not reveal any pre-existing medical conditions that would have contributed to the occurrence.

The PZL-M18 Dromader is a special-purpose, medium-load carrying capacity, agricultural airplane powered by a 967-horsepower piston radial engine. It is a single-seat, low-wing, cantilever, all-metal airplane with fixed main and tail landing gear. Records indicate that the aircraft was certified and equipped in accordance with existing regulations and procedures. There were no outstanding maintenance issues with the aircraft, and it had been performing normally since the contract began. The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR), nor was either required by regulation.

M18 pilots report that the aircraft's attitude must constantly be monitored as it is sensitive in elevator trim as fuel and product is being consumed. If a pilot does not maintain visual reference to the outside horizon, the aircraft attitude has a tendency to change quickly.

During the last moments of descent, several trees, up to 11 inches in diameter, were cut repeatedly by the rotating propellor. All four propeller blades were damaged by ground contact. Two of the blades had dug into the ground and had compound twists, consistent with the engine developing power. The aircraft flight controls and systems were examined to the degree possible, and no indication of a malfunction was found. The power plant controls were accounted for and continuity was confirmed. The engine was transported to the Transportation Safety Board regional wreckage examination facility where it was disassembled and examined. All internal components of the engine were found to be in good condition. All components attached to the accessory section were heavily fire damaged. Other than confirming security of attachment, the serviceability of these components prior to impact could not be ascertained.

The *Aircraft Flight Manual* (AFM), section 3.5 - Other Emergency Procedures, subsection (b) states the following:

> Rough running engine or loss of Power.
>
> Immediately after observing any symptoms of engine power loss (pressure drops in oil or fuel installations) the procedure to be followed is:
>
> 1) Engine shut off fuel valve - CHECK setting;
>
> 2) Low fuel pressure - ACTUATE the emergency hand (or electrical if installed) fuel pump to obtain proper pressure;
>
> 3) Carburetor heat - ON;
>
> 4) Magneto switch - "BOTH".

The engine shut off valve, the hand fuel pump, and the magneto switch are all located on the lower right console and require the pilot to look down to the right to confirm the settings. To activate these items, the pilot would be required to take his right hand off the control stick and fly with his left hand. The carburetor heat control is located on the engine control quadrant on the left side of the cockpit and is activated by the left hand. To complete the emergency check in sequence the pilot would have to switch control from his right to his left hand, and then back to his right hand to activate the carburetor heat, then back to his left hand to check the magneto switch, then back to his right hand to resume normal flying.

The aircraft flight manual does not contain specific instructions for engine roughness or engine failure during low-level spray operations. However, it does contain engine failure procedures for both take-off and after take-off. The limiting factor contained in both of these procedures is related to altitude, specifically 330 feet agl or less. If the aircraft is below 330 feet agl, the AFM indicates a return to the airfield is not possible and landing straight ahead with small deviations from aircraft heading for the purpose of avoiding obstacles are permitted. There are no other procedures indicated.

Analysis

The aircraft was within weight and balance limits, had sufficient fuel to conduct the flight, and weather was not a contributing factor.

Although the occurrence pilot reported that the engine was backfiring, the pilot of number four aircraft did not observe actuation of the backfire valve. As well, the pilot of the number four aircraft was able to maintain spacing with the number three aircraft without having to reduce power, which suggests that the engine of number three aircraft was producing sufficient power to maintain flying speed. The softwood trees cut by the rotating propellor and propeller damage at impact also indicate that the engine was producing power. The cause of the engine problem could not be determined during wreckage examination; however, a decrease in power, or even a complete power loss, should not have resulted in loss of control of the aircraft.

It is not possible to determine the pilot's exact actions after making the radio call, however, it is likely he would have attempted to resolve the problem. The most appropriate action(s), according to the AFM, is to complete the emergency procedures for a rough running engine. Accomplishing the items in sequence requires the pilot to divert attention away from his outside references and into the cockpit. Also, the check requires the pilot to change hands on the control stick to reach the items on the right side of the cockpit. During the switching of hands on the control stick, inadvertent control inputs may be introduced. These inadvertent control movements may go undetected if the pilot's attention is focussed inside the aircraft. As there was no observed attempt at a recovery, it is possible that the pilot's attention was focussed inside the aircraft while he was troubleshooting his engine difficulty, and he did not detect the developing spiral dive until a recovery was not possible in the altitude remaining.

When operating aircraft at very low altitudes the most appropriate immediate action may be to initiate a climb to a safer altitude prior to starting involved checklist procedures. Only the most critical checklist items should be actioned while in a low-level environment.

Finding as to Causes and Contributing Factors

1. For undetermined reasons, the pilot lost control of the aircraft; it entered a spiral dive and struck the ground.

Finding as to Risk

1. The AFM emergency procedures section provides guidance when an engine problem occurs during take-off, after take-off, and in flight; however, it does not provide guidance for emergencies which occur at the very low altitudes required during aerial application.

Other Finding

1. Neither the nature nor the cause of the reported engine problem could be determined.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 23 June 2004.

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