

AVIATION OCCURRENCE REPORT

STALL AT LOW ALTITUDE

**EDMONTON FLYING CLUB
BELLANCA 8KCAB DECATHLON C-GWZE
VILLENEUVE, ALBERTA
15 MARCH 1994**

REPORT NUMBER A94W0032



The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

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Synopsis

Following a touch-and-go landing on runway 26, the Bellanca Decathlon entered a climbing right turn to avoid a Cessna 172 on final for runway 16. At an altitude of approximately 200 feet above ground level, the aircraft banked steeply to the right, and pitched nose down. The aircraft was substantially damaged after it struck the ground; however, the two occupants were not injured.

The Board determined that, while attempting a low altitude climbing turn, the pilot did not maintain sufficient airspeed, and the aircraft stalled. There was insufficient altitude available to effect a full stall recovery.

Ce rapport est également disponible en français.

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1.0 *Factual Information*

1.1 *History of the Flight*

At 1600 mountain standard time (MST)¹, the instructor and his student departed in a Bellanca Decathlon from the Edmonton Municipal Airport, Alberta, on a visual flight rules (VFR)² flight to Villeneuve Airport, Alberta. The purpose of the flight was to check-out the private pilot on the aircraft type. After arriving at the Villeneuve Airport, the pilots conducted three or four touch-and-go landings into wind on runway 16. The pilots then decided that crosswind-landing practice on runway 26 would be beneficial. The pilots were told by Villeneuve Tower to plan a left-hand downwind circuit to runway 26. When the pilots were in the circuit for runway 26, they were cleared for a full stop landing on runway 26 by Villeneuve Tower.

Also at the Villeneuve Airport was a Cessna 172, from the same company, cleared for a right-hand downwind circuit to runway 16. (See Appendix A.) While on final to runway 26, the Decathlon pilots were re-cleared for a touch-and-go landing. Following the Decathlon's touch-and-go, the Villeneuve Tower issued an instruction to the Decathlon to sequence behind the Cessna 172 that was on final for runway 16. At this point, the Decathlon instructor spotted the traffic, and, believing there was a risk of collision with the Cessna, assumed control of the aircraft from the student, and commenced a steep climbing turn to the right³.

At an altitude of approximately 200 feet above ground level (agl), the Decathlon banked steeply to the right and pitched nose down. Recovery action was taken by the instructor; however, the left wing tip, followed by the right main landing gear, came into contact with the snow-covered ground. The aircraft skidded for a short distance before coming to rest upright, substantially damaged. The two occupants escaped without injury.

The accident occurred at latitude 53°40'N, longitude 113°51'W, at an elevation of 2,241 feet above sea level (asl)⁴, at 1650 MST, during the hours of daylight.

1 All times are MST (Coordinated Universal Time (UTC) minus 7 hours) unless otherwise stated.

2 See Glossary for all abbreviations and acronyms.

3 For more information see Representative Flight Paths - Appendix A

4 Units are consistent with official manuals, documents, reports, and instructions used by or issued to the crew.

1.2 *Injuries to Persons*

FACTUAL INFORMATION

	Crew	Passengers	Others	Total
Fatal	-	-	-	-
Serious	-	-	-	-
Minor/None	<u>2</u>	<u>-</u>	<u>-</u>	<u>2</u>
Total	2	-	-	2

1.3 *Damage to Aircraft*

The aircraft sustained substantial damage.

1.4 *Other Damage*

Not applicable.

1.5 *Personnel Information*

	Pilot-in-Command	Student
Age	30	37
Pilot Licence	CPL	PPL
Medical Expiry Date	01 Sept 94	01 Apr 95
Total Flying Time 1,100 hr	190 hr	
Total on Type	150 hr	15 hr
Total Last 90 Days	134 hr	50 hr
Total on Type Last 90 Days	29 hr	15 hr
Hours on Duty Prior to Occurrence	4.5 hr	1.5 hr
Hours off Duty Prior to Work Period	10 hr	24 hr

1.5.1 *Air Traffic Controller*

Controller Position	Tower Control
Age	45
Licence	Air Traffic Controller

Medical Expiry Date	01 Oct 94
Experience - as a Controller	21 yr
- as an IFR Controller	N/A
- in Present Unit	17 yr
Hours on Duty Prior to Occurrence	4
Hours Off Duty Prior to Work Period	16

1.6 *Aircraft Information*

Particulars	
Manufacturer	Bellanca Aircraft Corp.
Type	8KCAB Decathlon
Year of Manufacture	1975
Serial Number	205-75
Certificate of Airworthiness (Flight Permit)	Valid
Total Airframe Time	1,573.6 hr
Engine Type (number of)	Lycoming AEIO-320-E1B (1)
Propeller/Rotor Type (number of)	Hartzell HC-C2YL-4/C7663-4 (1)
Maximum Allowable Take-off Weight	1,800 lb
Recommended Fuel Type(s)	minimum 80/87
Fuel Type Used	100 LL

1.6.1 *General*

The Decathlon is a two-place tandem, strut-braced, high-wing monoplane. The maximum demonstrated cross-wind velocity is 17 knots.

1.6.2 *Centre of Gravity Calculations*

Based on the information provided by the pilots, it was determined that the weight of the aircraft at the time of the occurrence was about 1,795 pounds, and that the centre of gravity (C of G) was at about 16.48 inches aft of the datum. The C of G limits are 13.5 to 18.5 inches aft of the datum.

1.6.3 *Aircraft Stall Speed*

A wings-level aircraft stall speed of 46 knots calibrated airspeed (CAS) is depicted in Section IV of the *Pilot Operating Handbook*. This speed is based on the engine at idle power, and the aircraft at 1,800 pounds gross weight. At the time of the occurrence the aircraft was close to gross weight. At bank angles of 10, 30, and 45 degrees, the stall speeds would be about 46.4, 49.4, and 54.7 knots (CAS) respectively. These stall speeds would also be affected by the wing load factor and the engine power at the time of the occurrence.

The Decathlon was equipped with a serviceable stall warning horn and a red stall indicator light located on the instrument panel. These warnings are activated by a sensing vane located on the leading edge of the left wing. Stall warning is given at an indicated airspeed (IAS) about 5 to 10 knots above the speed at which an actual stall would occur. The instructor reported that he heard the stall warning horn during the climbing turn.

1.6.4 *Instrument Panel*

The instrument panel is located forward of the front tandem seat. The instructor, who occupied the rear tandem seat, reported that, during the occurrence, his forward vision of the instrument panel was hindered by the student occupying the front seat.

1.6.5 *Aircraft Maintenance*

The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures.

1.7 *Meteorological Information*

1.7.1 *General*

At the time of the occurrence, there was high scattered cloud over the Edmonton region and the visibility was unlimited. The area forecast (FACN1), issued at 1030 MST on 15 March 1994, valid for the Villeneuve area, predicted scattered cloud based at 13,000 feet asl, and topped at 15,000 feet asl. Variable scattered to

broken cloud would prevail during the forecast period.

1.7.2 *Surface Observations*

Weather conditions at the Villeneuve Airport were generally consistent with the Atmospheric Environment Service (AES) forecast and satellite imagery. Witness reports indicate that there were visual meteorological conditions (VMC) with the ceiling and visibility - OK (CAVOK). The surface wind was from 130 to 160 degrees magnetic at 10 to 15 knots, and there were no obstructions to vision.

1.8 *Communications*

1.8.1 *General*

Very high frequency (VHF) radio communications were established between Villeneuve Tower and the pilots of both aircraft on frequency 120.0 megahertz (MHz). A record of the communication was transcribed from the Air Traffic Services (ATS) tape recording.

1.8.2 *Tower Clearance and Instructions*

The Decathlon was cleared for a downwind left-hand circuit to runway 26. Moments later, the Decathlon was cleared for a full-stop landing on runway 26, and subsequent to this, the clearance was revised to a touch-and-go landing. Following the touch-and-go landing, the tower instructed the Decathlon to move slightly right of the centre line, if able, to pass behind the Cessna on final for runway 16. At the time of the instruction, the Cessna was passing through the runway 26 departure path of the Decathlon.

All clearances and instructions were acknowledged by the Decathlon student pilot.

1.9 *Air Traffic Control (ATC) Manual of Operations (MANOPS)*

With regard to clearances and instructions, the ATC MANOPS states the following:

An ATC clearance or instruction constitutes authority for an aircraft to proceed only in so far as known air traffic is concerned and is based solely on the need to safely expedite and separate traffic.⁵

Pertaining to visual separation of airport traffic in VFR weather conditions, the MANOPS states the following:

Issue position information and traffic information, as necessary, to assist aircraft in establishing visual separation from other aircraft.⁶

Pertaining to the clearances issued to a departing aircraft, the MANOPS states the following:

Separate a departing aircraft from an aircraft using an intersecting runway, or non-intersecting runway if flight paths intersect, by ensuring that the departing aircraft does not begin its take-off roll until one of the following conditions exists:

- A. A preceding departing aircraft has:
1. passed the intersection;
 2. crossed the departure runway; or
 3. turned to avoid any conflict.⁷

All procedures, clearances, and instructions followed by the air traffic controller were in accordance with the ATC MANOPS.

1.10 *Radar Tapes and Witness Reports*

Review of the Edmonton North Terminal Control Unit taped radar tracings and statements from airborne and ground witnesses indicated that the Cessna 172 was through the departure path of runway 26 when the Decathlon commenced its take-off roll. It was also determined from the radar tracings and witness reports that, had the Decathlon continued in a straight-out departure off runway 26, it would likely have passed above and behind the Cessna on final for runway 16.

Witness reports indicate that, when the Decathlon commenced a right climbing turn, the horizontal sequencing distance between the two aircrafts was approximately 1,000 feet.

5 MANOPS Part 1, section 133.1, pp. 1-22

6 MANOPS Part 3, section 351.4, pp. 3-31.

7 MANOPS Part 3, section 352.5, pp. 3-39.

1.11 *Aerodrome Information*

Villeneuve Airport is operated under public licence by Transport Canada. Airport Emergency Response Service (ERS) is not provided. The Villeneuve control zone, categorized as class "D" airspace, extends in a cylindrical shape up to 4,000 feet asl within a three nautical mile (nm) radius of the control tower.

Right-hand circuits are utilized for runways 16 and 26.⁸

1.12 *Wreckage and Impact Information*

Propeller blade damage and twist was consistent with considerable power being produced at the time of impact.

The pilot reported that the accelerometer was re-set just prior to the accident. During the post-accident instrument examination, the accelerometer was indicating approximately 2.8 positive G's (G load factor).

⁸ For more information see Appendix A.

⁹ N.B. Sarter and D.D. Woods, "Situation Awareness: A Critical But Ill-Defined Phenomenon," *The International Journal of Aviation Psychology* 1.1 (1991): 55.

1.13 *Medical Information*

There was no evidence that incapacitation or physiological factors affected the Decathlon student's or instructor's performance.

1.14 *Survival Aspects*

The accident was survivable because the deceleration forces were attenuated by a blanket of snow on the ground and because of the attitude of the aircraft at ground contact. In addition, the pilots used the five-point inertia reel shoulder-harnesses with which the aircraft was equipped, and the cabin area maintained its integrity throughout the accident.

1.15 *Additional Factors*

1.15.1 *Situational Awareness*

Situational awareness is all the knowledge that is accessible and can be integrated into a coherent picture, when required, to assess and cope with a situation.⁹ Typically, breakdowns in situational awareness occur under situations of task saturation, distraction, channelized attention, unrecognized disorientation, or any combination of these.

1.15.2 *Illusions Created by Drift*

In flight at normal operating altitudes, the movement of the airplane relative to the ground appears to be comparatively slow even when the airspeed is quite high. However, when the aeroplane is flown closer to the ground, movement in relation to the ground becomes more apparent, and in strong winds optical illusions are

created. When flying upwind, the reduction in ground speed is noticeable; when flying downwind, the increased ground speed is also noticeable--so much so that there

may be a temptation to reduce airspeed, which, if carried to extremes, could lead to stalling.¹⁰

¹⁰ *Transport Canada Flight Training Manual*, p. 99.

2.0 *Analysis*

2.1 *Introduction*

Since the controller followed the procedures as outlined in MANOPS, with no abnormalities, the analysis will address the instructor's reaction to the instruction issued by the controller.

2.2 *Traffic Detection*

The excellent weather conditions, light traffic at the airport, and aircraft positions as reported on VHF radio were favourable for easy situational awareness and early traffic detection. The Decathlon instructor reported that he did not spot the Cessna traffic until the initial climb following the touch-and-go landing on runway 26. The instructor and student did not anticipate nor did they allow for early visualization of the Cessna traffic.

2.3 *Pilot Actions*

The instructor took control of the Decathlon from the student because he perceived there was a risk of collision with the Cessna 172. Although the control tower instructed the pilot to move slightly right of the centre line, the instructor took evasive action by performing a steep climbing turn to the right. The radar tracings and witness reports indicated that, had the Decathlon continued in a straight-out departure off runway 26 or even moved slightly to the right of the centre line, it would likely have passed above and behind the Cessna on final for runway 16.

The instructor reported directing his attention outside of the aircraft because his view of the instrument panel was hindered. His outside forward field of vision would have been restricted because of his rear-seat position and the climb

angle of the Decathlon. The instructor did not maintain sufficient airspeed during the manoeuvre.

A decrease in airspeed, coupled with the increase in stall speed of the aircraft during the climbing turn, resulted in an inadvertent stall at low altitude. The pilot was able to conduct a partial stall recovery; however, there was insufficient altitude available to effect a full recovery.

3.0 *Conclusions*

3.1 *Findings*

1. The instructor and student were certified and qualified in accordance with existing regulations.
2. The aircraft was certified and equipped in accordance with existing regulations.
3. The aircraft weight and C of G were within prescribed limits.
4. The instructor took control of the aircraft during the initial climb, following the touch-and-go landing on runway 26.
5. The instructor did not maintain sufficient airspeed during a climbing turn, and the aircraft stalled at low altitude.
6. A partial stall recovery was carried out before the aircraft struck the ground.
7. The instructor and student did not anticipate nor did they allow for early visualization of the Cessna traffic.
8. The controller followed procedures as outlined in the ATC MANOPS.

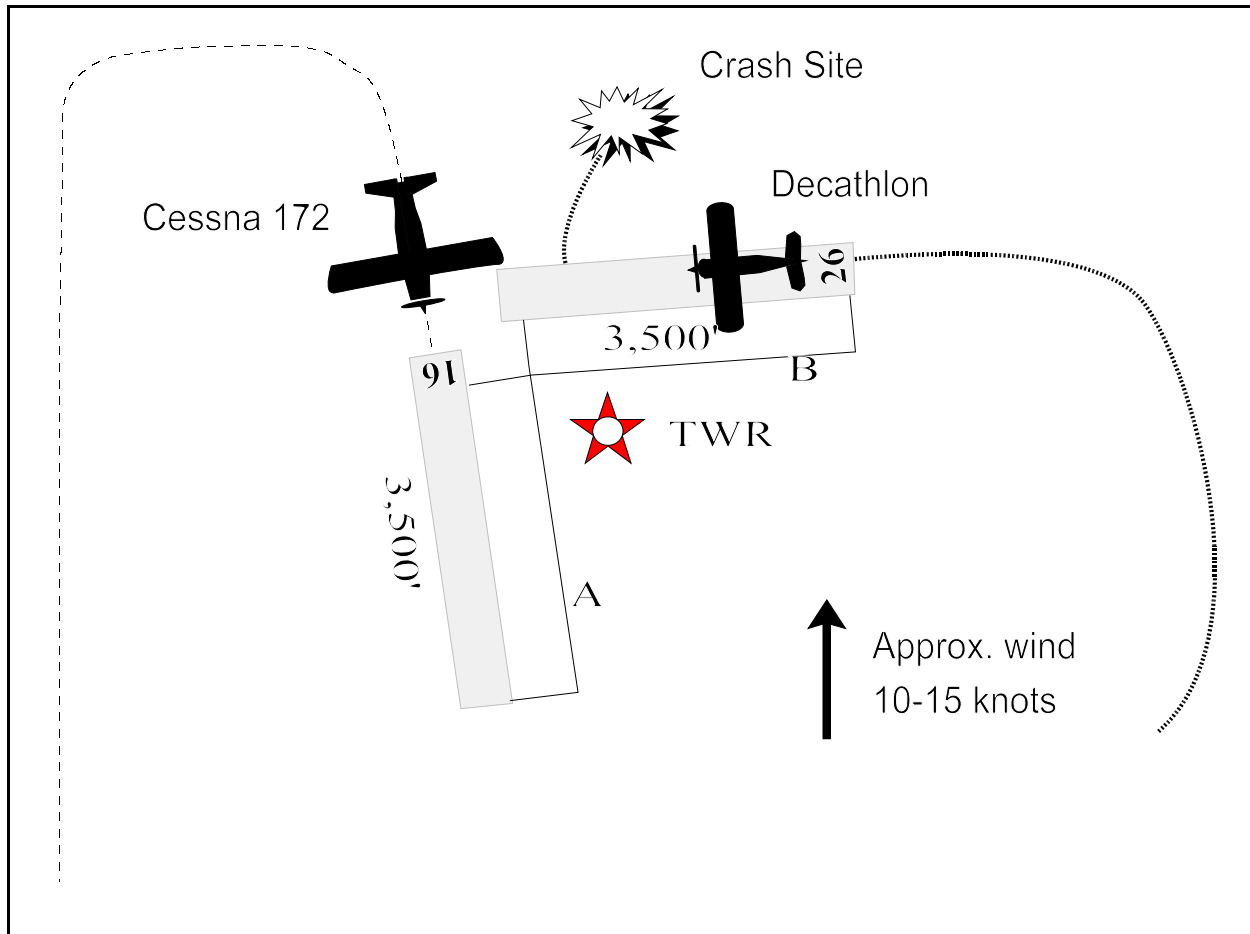
3.2 *Causes*

While attempting a low altitude climbing turn, the pilot did not maintain sufficient airspeed, and the aircraft stalled. There was insufficient altitude available to effect a full stall recovery.

4.0 *Safety Action*

The Board has no aviation safety recommendations to issue at this time.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson, John W. Stants, and members Gerald E. Bennett, Zita Brunet, the Hon. Wilfred R. DuPont and Hugh MacNeil, authorized the release of this report on 24 November 1994.

Appendix A - Representative Flight Paths

Appendix B - Glossary

AES	Atmospheric Environment Service
agl	above ground level
asl	above sea level
ATC	air traffic control
ATS	Air Traffic Services
CAS	calibrated airspeed
C of G	centre of gravity
CAVOK	ceiling and visibility - OK
CPL	commercial pilot license
ERS	Emergency Rescue Service
FACN1	area forecast
G	G load factor
hr	hour(s)
IAS	indicated airspeed
lb	pound(s)
LL	low lead
MANOPS	Air Traffic Control Manual of Operations
MHz	megahertz
mph	miles per hour
MST	mountain standard time
N	North
nm	nautical miles
PPL	private pilot license
TSB	Transportation Safety Board of Canada
TWR	air traffic control tower
UTC	Coordinated Universal Time
VFR	visual flight rules
VHF	very high frequency
VMC	visual meteorological conditions
yr	year(s)
W	West
°	degree(s)
'	minute(s)