

**CANADIAN FORCES
FLIGHT SAFETY INVESTIGATION REPORT**

FINAL REPORT

FILE NUMBER: 1010-C-GGYS
DATE OF REPORT: 21 January 2002

AIRCRAFT TYPE: Bellanca Scout
DATE/TIME: 8 October 2000, 1345 Z
LOCATION: Alexandria Ontario
CATEGORY: B Category Air Accident



SYNOPSIS

The accident aircraft was taking part in the Air Cadet Fall Gliding Familiarisation Program in Alexandria, Ontario. On his ninth landing that morning, the pilot was observed to be slightly "longer" than previously. The conventional landing gear equipped aircraft (tail-dragger) landed slightly farther than usual on the grass runway, requiring more braking force in order to stop at the launch point. The aircraft had almost completed its landing roll when the tail rose past the vertical and the aircraft flipped upside down in the centre of the runway, facing towards the approach end. The pilot sustained no injury but the aircraft's structure was substantially damaged. The Site Commander advised the Trenton Wing Flight Safety Officer who in turn contacted DFS.

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1. FACTUAL INFORMATION

1.1 History of the Flight

One tow aircraft and two gliders from the Quinte Gliding Centre (Mountainview) were deployed to the Alexandria municipal airport for the Thanksgiving long weekend. They were providing local Air Cadet squadrons glider familiarisation flights as mandated by the Air Cadet Gliding Program. The experienced pilot of the accident aircraft took off at approximately 0815 on the Sunday morning and carried out nine successful glider tows. On landing from his ninth tow, the pilot was observed to be slightly "longer" than previously. The aircraft landed slightly farther than normal and required heavier braking in order to stop at the launch point. The conventional landing gear equipped aircraft (tail-dragger) was almost at the end of its landing roll and travelling at no more than a brisk walking pace when the tail was observed to rise then return to the ground and rise again. The tail then kept on rising causing the idling propeller to strike the ground and the engine to stop. The aircraft slid on the lower engine cowling for a short distance until the propeller nose cone caught the ground and the aircraft stood vertically on its nose. After a brief pause in the vertical attitude, the tail of the aircraft continued forward until the aircraft was completely inverted. The aircraft came to rest, inverted and facing toward the approach end of the runway, at a point approximately fifty feet beyond its normal holding position (see photo 1).

1.2 Injuries to Personnel

	Crew
Fatalities	0
Injuries	0

The pilot suffered no injury during the accident or his egress from the cockpit. He was transported in an ambulance to the Alexandria hospital for examination and was soon released. While at the hospital, he submitted to toxicological sampling.

1.3 Damage to Aircraft

The aircraft received "B" Category damage. The propeller was slightly bent at the tips. The engine experienced a sudden stoppage and, as per the manufacturer's recommendation, was sent to an overhaul facility. The top of the vertical stabiliser contacted the ground and suffered considerable skin and structural damage (see photo 3). The weight of the inverted aircraft on the wing caused some buckling of the wing structure at the wing roots and damage to the flap mechanism (see photo 4). The lower part of the engine cowling was cracked at the lower right corner of the air filter holder and a large piece of "Gelcoat" was delaminated on the left front. The windshield, right window and skylight were cracked (see photo 5). The wing struts were also slightly bowed and one of the

attachment points was splayed (see photo 6). The diagonal tube crossing the skylight was bent downwards.

The aircraft was returned to its upright position by a local crane operator who has experience with this operation. He used a boom crane to elevate the aircraft and a tow truck to rotate the nose of the aircraft forward (see photo 2). This operation was successful and did not cause any further damage to the aircraft.

1.4 Collateral Damage

The aircraft came to rest inverted in the middle of the grass runway. The propeller made some very faint indentations in the ground as the engine was only operating at idle power. There was only one relatively larger (approx. two square feet) ground scar resembling "sod cutting" made by the propeller when the aircraft was in the vertical position. The exact location of the accident was very hard to identify on the following day as the ground scars were rapidly disappearing. Immediately following the accident, there was a slight odour of fuel thought to be caused by the carburettor bowl emptying into the engine. Some fuel escaped through the fuel tank vents as the aircraft was suspended vertically by the crane during the recovery operation. The quantity of fuel discharged on the grass was difficult to determine and was estimated by the witnesses as approx. three to four litres. The Trenton Wing Flight Safety Officer was notified of the spill and advised the Trenton Environment Officer who investigated the matter. The spill was small and did not necessitate any intervention. A claim against the Crown is not anticipated.

1.5 Personnel Information

The pilot is a retired Canadian Forces pilot with more than thirteen thousand hours, two thousand of which was on conventional landing gear equipped (Tail-dragger) aircraft.

Rank	Major (CIC)
Age	58
Total Flying Time	13188.5 Hrs
"Tail-dragger" time	Approx. 2000 Hrs
Scout	91.8 Hrs
Last 90 days	21.5
Day of occurrence	1.7

1.6 Aircraft Information

The aircraft was serviceable prior to the accident. All maintenance and inspections were up to date. The weight and balance were within limits. An entry was made in the journey log, 172 hours before the accident, noting that the

left brake was "grabby". The brake pads and callipers were cleaned and the aircraft was returned to service. 42 hours prior to the accident, another entry was made for a grabby left brake. The brake linings were changed and the brakes bled before returning the aircraft to service. No other abnormalities with the braking system were noted up to the accident.

1.7 Meteorological Information

There are no METARS or forecasts issued for the Alexandria airport. Weather for this site is obtained by combining the reports from surrounding stations with the area forecast. Area forecasts and actual conditions for surrounding airports are listed below:

Weather observed at Alexandria by the Staff of the Quinte Gliding Centre:

Clouds broken at approx. 2000 ft, winds from the north at less than five knots, visibility unrestricted.

Weather report for Ottawa, 45 miles to the west:

TAF CYOW 080838Z 080906 32008KT P6SM SCT020 TEMPO 0914 BKN020
FM 1400Z 31012KT P6SM BKN040 TEMPO 1424 5SM -SHRASN BR BKN020
FM0000Z 30006KT P6SM SCT040
RMK NXT FCST BY 20Z

TAF CYOW 081131Z 081212 31008KT P6SM SCT020 TEMPO 1214 BKN020
FM1400Z 31012KT P6SM BKN040 TEMPO 1424 5SM -SHRASN BR BKN020
FM0200Z 30006KT P6SM SCT040
RMK NXT FCST BY 15Z

CYOW 081300Z 31012KT 25SM SCT030 BKN080 2.7/-0.5 A3012 RMK
SC3AC2 SLP203 SKY66

CYOW 081400Z 29012KT 25SM BKN023 3.4/-0.7 A3013 RMK SC6 SLP207
SKY88

Weather report for Montreal/Dorval, 38 miles to the east:

TAF CYUL 080834Z 080906 32005KT P6SM -RA SCT015 OVC030 TEMPO
0916 BKN020 OVC030
FM 1600Z 29008KT P6SM BKN030 TEMPO 1623 P6SM -SHRA
RMK NXT FCST BY 12Z

TAF CYUL 081131Z 081212 29006KT P6SM SCT030 BKN050 BKN090
TEMPO 1218 6SM -SHRA BECMG 1618 27010KT
FM 0000Z 27010KT P6SM BKN050 TEMPO 0012 SCT050 BECMG 0406
30006KT
RMK NXT FCST BY 15Z

CYUL 081300Z 29006KT 15SM FEW030 BKN060 4.2/1.4 A3005 RMK
SC1AC6 SLP178 SKY89

CYUL 081400Z 28006KT 15SM FEW030 BKN060 5.1/1.6 A3007 RMK
SC2SC5 SLP182 SKY89

Weather report for Massena, 23 miles to the south:

TAF KMSS 081141Z 081212 30010KT P6SM SCT015 OVC025 TEMPO
1224 6SM -SHRA OVC015
FM 0000Z VRB03KT P6SM OVC020 PROB30 0006 6SM -SHRASN BR
OVC015
FM0600 VRB03KT P6SM OVC020 PROB30 0612 5SM -SHSN BR OVC015

KMSS 081319Z AUTO 27006KT 10SM BKN014 BKN030 OVC050 3/2
A3011 RMK AO2

KMSS 081353Z AUTO 27009KT 10SM BKN016 OVC022 3.3/1.1 A3012
RMK AO2 SLP202

Except for the lack of any headwind and for the presence of water on the runway, weather was not a factor in this accident.

1.8 Aid to Navigation

Not applicable

1.9 Communications

The aircraft and both gliders are equipped with VHF radios, which were serviceable at the time of the accident. Once the aircraft came to a complete stop the Launch Control Officer (LCO) instructed the pilot of the airborne glider to land short in order to avoid the accident aircraft.

1.10 Aerodrome Information

The Alexandria Airport is uncontrolled. The single grass runway (11-25) is 2050 feet long and 100 feet wide. Runway 25 was active at the time of the accident. This runway is considered short for gliding operations but is well within the Short Take Off and Landing (STOL) capabilities of the Scout aircraft. The runway was reported to be wet with dew on the morning of the accident. Witnesses stated that a grass runway will dry unevenly and that it took approximately one and a half hour for the runway to dry completely on that day.

The airport is located in a heavily farmed area providing numerous emergency landing fields for both the tow aircraft and the gliders. There is a low power line approximately 1500 feet from the threshold of runway 25 requiring the tow aircraft to fly a slightly higher approach than normal in order to avoid snagging

the tow cable. There is also a higher power line (steel towers) running in a shallow valley approximately 3000 ft from the departure end of the runway.

1.11 Flight Recorders

The aircraft is neither equipped nor required to be equipped with any type of flight recording device.

1.12 Wreckage and Impact Information

The aircraft remained intact during the accident.

1.13 Medical

Toxicology samples were taken at the Alexandria hospital following the accident. The results were negative.

1.14 Fire, Explosives Devices, and Munitions

There was no post-crash fire.

1.15 Survival Aspects

According to the GPH-205, the Alexandria airport does not have Crash and Fire Response (CFR) capability. However, one of the witnesses used his cellular telephone and called 911. The local ambulance, fire brigade and RCMP were at the scene within six minutes of the accident.

1.15.1 Crash Survivability

The accident was survivable. The aircraft had lost most of its energy during the after landing roll and the "somersault" was relatively gentle.

1.15.2 Life Support Equipment

The five-point harness used by the pilot effectively restrained him and prevented injury.

1.15.3 Emergency Transmitters

The aircraft was equipped with an emergency transmitter. Deceleration forces were insufficient to activate it, and it was found to be serviceable at the time of the accident.

1.16 Test and Research Activities

Nil

1.17 Organisational and Management Information

The Quinte Gliding Centre is headquartered at the Mountainview airport near Trenton. Personnel and equipment from the centre routinely deploy to surrounding airports in order to provide familiarisation flying to local Air Cadet squadrons.

1.17.1 Site Organisation

Each site is under the supervision of a Site Commander who is assisted by a deputy. The flying activities are co-ordinated by the LCO. Accident response co-ordination is the responsibility of the Emergency Response Officer (ERO). Both the LCO and the ERO are easily identifiable on the site by their respective red reflective vests. The positions of LCO and ERO are rotated among the qualified staff throughout the day in order to limit fatigue. Other staff on the site include a log keeper, tow pilots and glider pilots. The supervision of the familiarisation cadets is the responsibility of the accompanying staff from the local squadron but all staff members of the Gliding Centre are expected to watch over the young cadets. These familiarisation cadets are usually asked to assist the staff with the ground movements of gliders but always under the supervision of one of the Gliding Centre staff member.

1.17.2 Unit Training

In order to become an Air Cadet tow pilot on the Bellanca Scout, one must first hold a valid Transport Canada private pilot licence and have one hundred hours of pilot in command time. The selected candidate must then undergo the Air Cadet tow pilot conversion course on the Scout aircraft. In order to maintain the qualification, a pilot must comply with the recency requirements of the Canadian Air Regulations (CARS) and must fly every sixty days. The pilot of the accident aircraft had last flown in September and his next scheduled tow pilot duty weekend, in November, would have put him over the sixty day limit. He therefore flew on that Sunday in order to stay well within the sixty-day currency requirement.

2. ANALYSIS

2.1 The aircraft

The aircraft was examined and all systems were serviceable before the accident. The pilot indicated that the previous brake problem mentioned in the aircraft logbook did not reoccur. All aircraft documentation was up to date and all inspections had been carried out.

2.2 The pilot

2.2.1 Experience

The pilot is a retired military pilot with vast experience on numerous types of aircraft. He also has much experience on conventional landing gear equipped aircraft, namely on the Chipmunk, Harvard and DC-3. Although the pilot has experience with tail draggers, most of it is in the distant past, at the beginning of his military career. His recent experience on the Scout aircraft is only 91.8 hours.

2.2.2 Technique

The pilot landed slightly longer than on his previous approaches and applied more brake pressure in order to stop at “the cone”. This cone is placed along the edge of the runway to indicate where the tow aircraft is to hold while the glider is being hooked-up.

The grass runway was wet with dew at the start of the flying day and dried unevenly as the day progressed. Wet grass is quite slippery and pilots landing on it can easily, and sometimes unknowingly, lock the wheels when too much brake pressure is applied. In this case, the propeller wind and engine exhaust from the aircraft holding at the cone on the previous launches probably accelerated the drying process of the grass in the vicinity of the cone and created “dry patches” at the holding point. On his last landing the pilot used more braking and most likely locked-up the wheels on the wet grass. The pilot realized that he was not able to stop the aircraft at the cone and released the cable in order to facilitate taxiing back to the launch point. Immediately after the pilot released the cable, the aircraft transitioned from wet to dry grass. This caused a sudden increase in traction on the locked wheels and caused the tail to rise. It is believed that the aircraft passed through a smaller dry grass patch immediately prior to entering the much larger dry patch at the holding point. This smaller dry patch most likely caused the first tail rise observed by witnesses. Before the pilot could react to the first tail rise and release the brakes, the aircraft was over the second patch and pitching forward. The combination of no headwind, low speed and low engine RPM provided no airflow over the elevator and did not allow the pilot to keep the tail on the ground, even with full aft stick.

2.2.3 Medical

The pilot suffered no injury in the accident. He was well rested and nutrition was not a factor.

2.3 Training

This pilot has a vast experience on many types of aircraft with conventional and tricycle landing gear. He knew the risks associated with landing on wet grass and was still caught off-guard. Since the majority of our tow pilots are not as experienced and a substantial number of airfields where the Cadets operate have grass runways, more emphasis and training on grass runways should be given during conversion courses and recurrent training flights. More emphasis on these grass runways (especially wet grass) should be included in the soft field landings section of the Air Cadet Gliding Program Tow Aircraft – Scout /L-19 – Manual of Flying Training.

3. CONCLUSIONS

3.1 Findings

3.1.1 The aircraft was serviceable before the accident.

3.1.2 The pilot was properly licensed and current.

3.1.3 The runway was wet with dew at the start of flying operations and dried unevenly as the day progressed.

3.1.4 The section on soft field landings in the Air Cadet Gliding Program Tow Aircraft – Scout /L-19 – Manual of Flying Training does not cover wet grass landings.

3.1.5 There were no medical factors in this accident.

3.2 Causes and Contributing Factors

3.2.1 Causes

This accident was caused by an excessive application of brakes on a wet grass runway causing wheel lock-up. When the aircraft reached an area of dry grass, the sudden increase in traction caused the tail of the aircraft to rise uncontrolled and the aircraft tipped forward and came to rest upside-down.

3.2.2 Contributing Factors

The combination of low groundspeed, lack of headwind and low engine RPM reduced the airflow over the elevator and prevented the pilot from being able to keep the tail on the ground with the control stick in the full aft position.

4. SAFETY MEASURES

4.1 Safety Measures Taken

4.1.1 The pilot involved has since flown again in the scout in order to regain his confidence and skill with the aircraft.

4.2 Further Safety Measures Required

It is further recommended that:

4.2.1 All Regional Flying Orders be amended to require that, in addition to the Daily Airfield Operational/ Safety Check and Briefing, when operating on a wet grass field, the Launch Control Officer (LCO) regularly keep the tow pilots informed of the condition of the runway particularly when it is starting to dry-up.

4.2.2 The National Cadet Air Operations Officer include a section on wet grass runway landings in the Air Cadet Gliding Program Tow Aircraft – Scout/L-19 - Manual of Flying Training as well as in the Scout and the L-19 Flying manuals. This section should also recommend that it is a good practice for pilots to have a quick glance at the wheels when landing on wet grass to ensure that the amount of brake pressure used is not causing the wheels to lock-up.

4.2.3 The Regional Cadet Air Operations Officers consider including as much training as possible on grass runways during the tow Pilot Conversion Course.

5. DFS comments

In this accident, a very experienced pilot was caught off-guard. If this could happen to him, it could happen to anyone, so more awareness of the phenomenon causing the accident (variable braking effectiveness on drying grass runways) is critical to avoiding a repeat. Accidents exactly like this one have undoubtedly happened many times since people started taking to the air in flying machines, and unless something is changed, they will eventually happen again. The measures recommended at para 4.2, and any other measures that the Air Cadet community can envisage following the publication of this report are thus fully supported, and should be implemented without delay.

R.E.K. Harder
Colonel
Director of flight Safety

Annex A: Photographs



Photo 1: Final Resting Place



Photo 2: Aircraft in sling



Photo 3: Tail damage

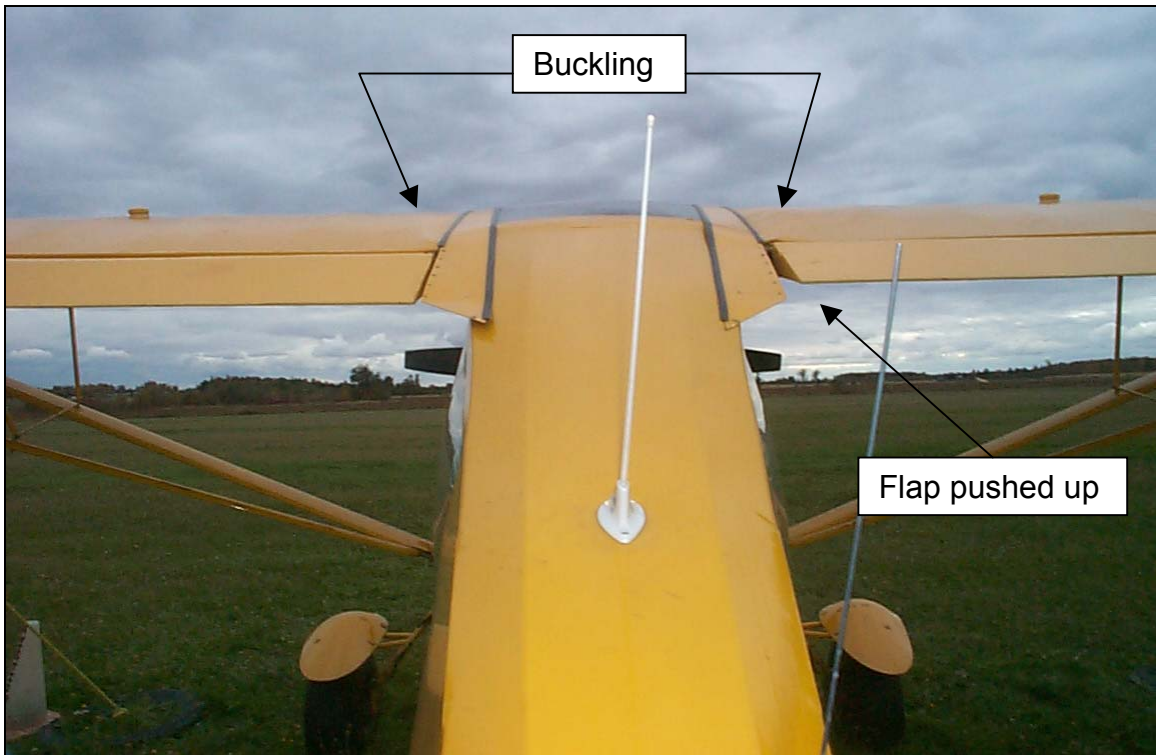


Photo 4: Wing root damage



Photo 5: Nose damage

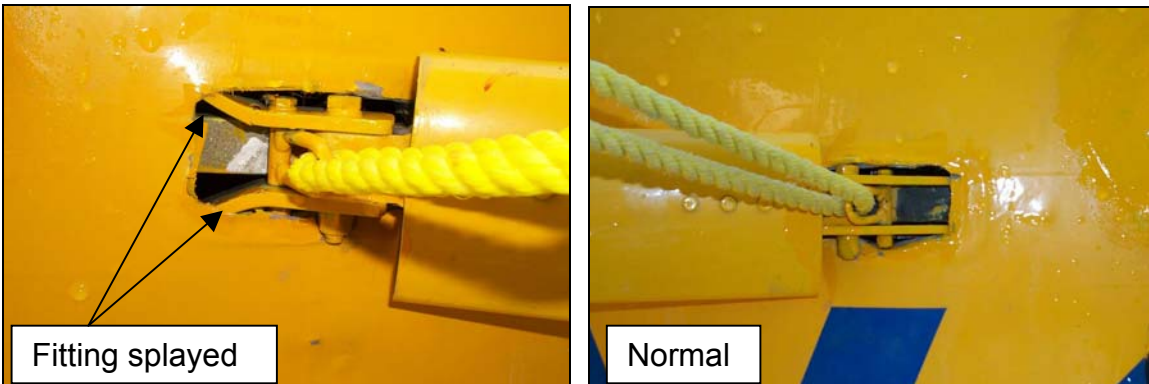
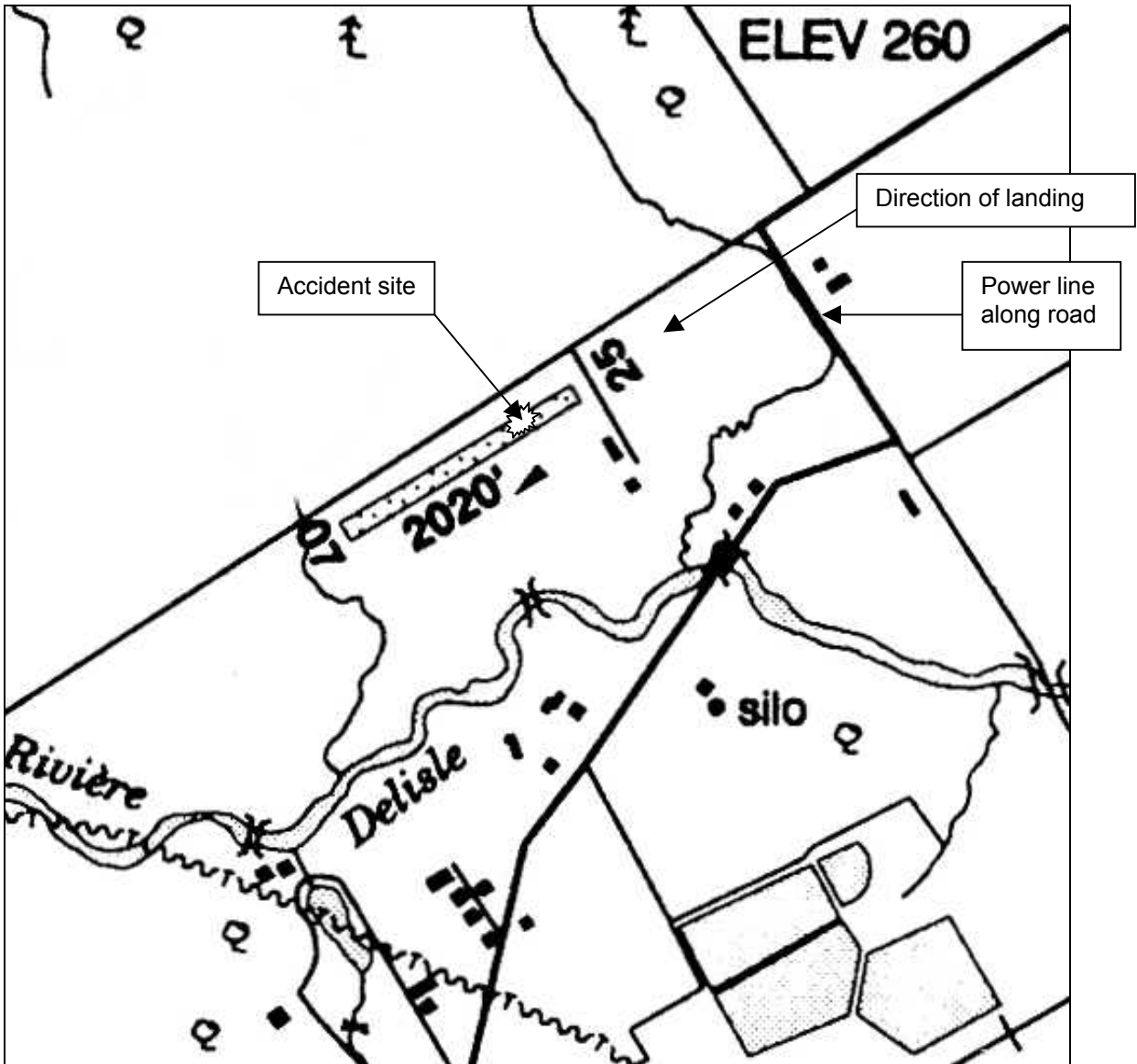


Photo 6: Wing strut damage

Annex B: Maps and Charts



Alexandria Site map