

# CANADIAN FORCES FLIGHT SAFETY INVESTIGATION REPORT

## FINAL REPORT

**FILE NUMBER:** 1010-C-GEQF (DFS 2-4-2)  
**DATE OF REPORT:** 7 October 2004

**AIRCRAFT TYPE:** Katana DA-20 C1  
**DATE/TIME:** 25 June 2002 2155Z (1755 local)  
**LOCATION:** St-Lambert de Lévis (Québec City), Québec  
**CATEGORY:** "A" Category Accident

**This report was produced under authority of the Minister of National Defence (MND) pursuant to Section 4.2 of the Aeronautics Act (AA), and in accordance with A-GA-135-001/AA-001, Flight Safety for the Canadian Forces.**

**With the exception of Part 1 – Factual Information, the contents of this report shall be used for no other purpose than accident prevention. This report was released to the public under the authority of the Director of Flight Safety, National Defence Headquarters, pursuant to powers delegated to him by the MND as the Airworthiness Investigative Authority (AIA) of the Canadian Forces.**

## SYNOPSIS

The Katana aircraft and crew were conducting the second flight of the private pilot course in the Air Cadet Flying Scholarship program. The student and Instructor Pilot (IP) were practicing circuit procedures in the local training area when, during a simulated final approach at approximately 400' AGL, the IP took control of the aircraft and executed a missed approach. The IP felt some restriction to the flight controls and noticed that the student was interfering with the control column. The IP repeatedly ordered the student to release his grip on the controls but the student did not. The aircraft contacted the ground, right wing first, and came to rest in a newly seeded cornfield. The student and IP exited the aircraft unassisted and were not injured. They walked to a nearby farmhouse and contacted the flying school by phone.

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## **1. FACTUAL INFORMATION**

### **1.1 History of the Flight**

The student pilot was an Air Cadet taking part in the Air Cadet Flying Scholarship Program. He was on his second instructional flight of the private pilot course at the Quebec City airport. The civilian IP was employed by Pro Aviation, the flying school contracted to provide instruction for the cadet program.

At 1725 local, the student and his IP departed the Quebec City Airport for the local training area. Once in the area, they performed basic flying manoeuvres. This was followed by an IP-demonstrated circuit procedure using a farmer's field as a simulated runway. During the last approach and once established on final for the chosen field, the IP demonstrated and then had the student practice approach-path control.

When the aircraft reached approximately 400' AGL, the IP took control and initiated the missed approach. While establishing the aircraft in the climb, the IP felt pressure on the flight controls such that he did not have complete control of the aircraft. He noticed that the student was pulling the control column back and to the left. While the IP attempted to avoid an aerodynamic stall by lowering the aircraft's nose and increasing airspeed, he repeatedly ordered the student to release the controls. The student did not release the controls and the aircraft, with a nose-high attitude and low airspeed, quickly lost altitude even though it was at full power. At 1755 local, the right wing contacted the ground first in a grass field adjacent to a cornfield. The aircraft then yawed 180° to the right and came to rest upright and facing backwards in the recently planted cornfield (photo 1).

The uninjured student and IP exited the aircraft normally. They walked a short distance to a farmhouse and contacted the flying school by telephone. A helicopter from a company co-located with the flying school brought the school owner and the cadet supervisor to the accident site. Both the owner and supervisor recorded photographic evidence, which was then later provided to the Flight Safety Investigation Team. A civilian doctor at a local hospital attended to the student and took toxicology samples.

### **1.2 Injuries to Personnel**

There were no injuries.

### **1.3 Damage to Aircraft**

The aircraft received "A" Category damage (photo 2). The rear fuselage separated midway between the tail and the cockpit and the right wing was pushed up, damaging the spar and control rods. The nose gear separated and

the engine was forced up, damaging the engine mount. Given the extent of damage and the intricacies of composite material repair, the aircraft was deemed to be uneconomical to repair.

#### **1.4 Collateral Damage**

The accident occurred in a farmer's field. There were no petroleum, oil, or lubricant spills and very little damage to the field. No claims against the Crown were initiated.

#### **1.5 Personnel Information**

Personnel information is tabulated in Table 1: Personnel Information. The IP pilot was a civilian employed by the flying school. He held a Transport Canada Class 3 IP rating (equivalent to a military "B" category). He had accumulated approximately 750 hours and had been instructing for 18 months.

The Air Cadet student obtained his glider pilot license the previous summer through the Cadet Gliding Program and was now participating in the Flying Scholarship Program.

**Table 1: Personnel Information**

	<b>IP</b>	<b>Student</b>
Rank	Civilian	Cadet
Currency/Category valid	Yes	Yes
Medical Category valid	Yes	Yes
Total Flying Time (Hrs)	747.8	1.5
Instructional (Hrs)	392.1	N/A
Flying hours on type	227	1.5
Flying hours last 30 days	38	1.5
Duty time last 24 hrs	8	8

#### **1.6 Aircraft Information**

The aircraft was owned and operated by Pro Aviation of St-Foy, Quebec. The aircraft was serviceable prior to the accident and all maintenance and inspections were up to date. The weight and balance was also within limits.

#### **1.7 Meteorological Information**

Actual weather conditions for Quebec City International Airport at the time of the accident were as follows:

CYQB 252200Z 24013KTS 30SM FEW150 BKN220 23.9/9.6 A2997 RMK AC1CI1 SLP150 SKY27

The forecast was:

CYQB 251725Z 251818 24010KT P6SM BKN100 OVC240  
FM0800Z 06006KT P6SM –SHRA OVC040  
FM1200Z 06008KT 5SM –SHRA BR OVC030  
RMK NXT FCST BY 00Z=

### **1.8 Aid to Navigation**

Nil.

### **1.9 Communications**

The aircraft was equipped with a standard panel-mounted aviation VHF radio. This radio was serviceable during the flight and the pilot made all the appropriate radio transmissions. After the accident, the IP used the telephone in a nearby farmhouse to contact the flying school operations desk.

### **1.10 Aerodrome Information**

Nil.

### **1.11 Flight Recorders**

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

### **1.12 Wreckage and Impact Information**

The aircraft's first ground contact was by the right wing in a grass field adjacent to a cornfield. This initial contact damaged the underside of the wingtip and the main spar. It also caused the aircraft to yaw approximately 180° to the right and to land backwards in the cornfield. Although the tail boom broke and separated, the tail section remained attached to the main fuselage by the flight control cables, keeping the wreckage in one piece.

### **1.13 Medical**

The crew were not injured in the accident. They reported to the CFB Valcartier Hospital for toxicology sampling but, since it was closed, they were directed to go to a local civilian hospital. After a lengthy waiting period, the IP elected to return home and the student remained at the civilian hospital to provide the samples. The next business day, a CFB Valcartier Hospital doctor examined the student in order to assess his suitability for further training. Military medical authorities were unsuccessful in obtaining toxicology results from the civilian hospital.

## **1.14 Fire, Explosives Devices, and Munitions**

Nil.

## **1.15 Survival Aspects**

The crew was uninjured in the accident and exited the cockpit in the normal manner.

### **1.15.1 Crash Survivability**

The crash was survivable. The cockpit maintained its survivable volume and was undamaged. The deceleration forces that the crew were subjected to were well within the tolerance level of the human body.

### **1.15.2 Life Support Equipment**

The four-point harness used by the crew effectively restrained them and prevented injury.

### **1.15.3 Emergency Transmitters**

The aircraft was equipped with a standard aviation Emergency Locator Transmitter (ELT). Although the transmitter was armed and serviceable, it did not activate during the accident. The ground impact was similar to a hard or heavy landing and did not result in impact forces severe enough to activate the ELT.

## **1.16 Test and Research Activities**

Nil.

## **1.17 Organisational and Management Information**

All training, administrative, and maintenance files were reviewed and found to be in order.

## **1.18 Additional Information**

Nil.

## **1.19 Useful or Effective Investigation Techniques**

Nil.

## **2. ANALYSIS**

### **2.1 The Aircraft**

The aircraft was fully serviceable prior to the accident. All inspections were up to date and all maintenance records were in order. The flight controls were examined and no evidence was found to indicate that they had malfunctioned during the accident.

### **2.2 The Weather**

The 2200Z METAR indicated ideal VFR flying conditions.

### **2.3 The Briefing**

The student was properly briefed before the flight and, since he had graduated from the Cadet Gliding Course the previous summer, he was familiar with the procedure for exchanging control between IP and student.

### **2.4 The Student's Actions**

It is common practice for a student to hold the controls lightly or follow through on the controls when the IP is in control. This practice allows the student to follow the physical control inputs while at the same time keeping an outside visual picture. Following through on the controls is important for training student muscle and nerve responses to correct control inputs. Furthermore, the student becomes familiar with the movements required to perform a manoeuvre without losing situational awareness.

Students who follow through on the controls must always be aware of the IP's inputs and keep a light touch, so as not to impede movement of the controls. This technique has limitations. During potentially stressful situations, it is possible for students to tense their muscles. This could then result in placing the aircraft in an unsafe situation. This in turn could increase students' stress levels and cause them to further tighten their grip, possibly without being conscious of it, and exacerbate an already dangerous situation.

In this case, it is highly probable that the student relinquished control of the aircraft to the IP but left his hands on the controls in order to follow through. As the aircraft approached the ground, the student's stress level increased and he unknowingly tensed-up and applied pressure to the control column. There was no evidence that the student was seized by panic. However, one does not necessarily need to panic in order to hold the controls too tightly.

## **2.5 Instructor Pilot's Actions**

The IP recognized that there was an aircraft control problem after he took control from the student and applied full power: the control column was being pulled back and to the left as the airspeed decreased. The IP attempted to keep the wings level and to push the control column forward to increase the airspeed. He told the student several times to release the controls but the student did not respond. The limited control movement available was insufficient to control the aircraft as it descended towards the ground under full power, at a very low airspeed (close to the stall), and in a nose-high attitude.

The Katana has a side-by-side seat configuration with both pilots in very close proximity, such that the IP has a clear view of the student's controls. In this case the side-by-side seat configuration might also have allowed the IP to physically reinforce his verbal commands by knocking the student, thus causing him to release the controls. In discussion with IPs on other side-by-side seat configuration aircraft, it was mentioned that this is a technique that many would have used in this situation. It is most likely that the IP was quite surprised by the situation and concentrated all his attention on maintaining aircraft control. Subsequently, he did not consider attempting to physically remove the student's hands from the controls.

## **2.6 Discrepancy in Testimony**

The student was not conscious of gripping the controls and impeding the movement of the column; he was unconscious of preventing the IP from performing the overshoot. Because the student was not conscious of holding the controls, he recalled finding it strange that the IP told him to let go of the controls.

The IP clearly remembers that the student had his hands on the control column. When he told the student to let go of the controls, there was no response from the student. This may have occurred if the student did not hear him, did not understand him, or if he was highly stressed and was physically not able to respond.

Although the student does not remember holding on to the controls during the overshoot, the lack of any mechanical failures to cause the stiff controls suggests that the student may have inadvertently been gripping the controls.

Therefore, discrepancy between the IP and student testimonies exists and requires further examination. During the witness interview process, it is common for certain discrepancies to surface about an event. However, rarely does this occur on such a major issue, especially since the interviews were conducted within a short time after the accident occurred thus minimizing witness contamination. Possible explanations for this discrepancy therefore include:



- a. The student had his hands on the control column without being aware of it. The student is a licensed glider pilot and therefore it is likely that he was familiar with the technique of following along on the controls. Because he was familiar with the routine of following through on controls during his previous training, it may be possible that the student was following along on the controls without actually being aware of it, as he had done many times before. However, when the IP called for the student to relinquish control, it should have become apparent to the student that he had his hands on the controls;
- b. The student froze on the controls and does not remember holding them. Related to the previous paragraph, and as mentioned above, the student could have been under duress, which caused him to freeze on the controls. This duress may have increased the more stressful the situation became;
- c. The IP and student were both afraid of the repercussions of admitting to an error committed by either one or both of them. Even though it was stated during the interview process that this is a flight safety investigation, there may have been reluctance on the part of either the IP or student to identify what actually occurred;
- d. The IP or student genuinely incorrectly recalled the actual sequence of events. This is common after a traumatic incident. It is possible that either the student or the IP, severely affected by the crash, did not clearly recollect the events of the accident. It is also possible that perceived guilt about an action or inaction has altered either the IP's or student's recollection of the events. As a result, they may have blocked less than favourable recollections; and
- e. The IP did not clearly see the student's hands and controls. Given the proximity of the student and IP in the cockpit, and the side-by-side seating, it is unlikely that the IP had an obstructed view of the student's hands and controls.

Given the above possibilities and the clarity of the IP's statement, it is believed that the second scenario was most likely to have occurred. Therefore, it is concluded that the student unknowingly left his hands on the control column and, as the situation became more serious, the student froze on the controls and did not respond to direction for him to release them.

### **3. CONCLUSIONS**

#### **3.1 Findings**

3.1.1 The aircraft was serviceable prior to the accident.

3.1.2 The weather did not affect flight operations.

3.1.3 The IP and student were current, qualified, and medically fit for their respective duties.

3.1.4 Although the student does not recall, his hands remained on the control column during the IP's overshoot attempt.

3.1.5 The IP repeatedly told the student to release the controls but did not use any physical means to reinforce his commands.

3.1.6 The aircraft contacted the ground in an uncontrolled manner with full power applied, at a low airspeed, and with a nose-high attitude.

#### **3.2 Causes and Contributing Factors**

##### **3.2.1 Causes**

3.2.1.1 It is most probable that the student unknowingly gripped the control column and interfered with the IP's inputs during a critical phase of the flight.

##### **3.2.2 Contributing Factors**

3.2.2.1 After the student relinquished control, he unknowingly left his hands on the control column and, as the aircraft approached the ground, his stress level increased, causing him to tense-up on the controls and pull back on the control column against the IP's inputs.

3.2.2.2 The IP was surprised by his inability to control the aircraft and, in the ensuing high stress situation, did not consider physically removing the student's hands from the control column.

## **4. SAFETY MEASURES**

### **4.1 Safety Measures Taken**

The cadet's ability to resume training was assessed by a military doctor at CFB Valcartier. The Regional Cadet Air Operations Officer, in consultation with the on-site Cadet Supervisor on site and the school owner, decided to retain the cadet on the course. He resumed training with a different IP and successfully completed the course. Prior to his recommencement of training, the student was briefed and made fully aware of his responsibilities for the changing of aircraft control.

### **4.2 Further Safety Measures Required**

This accident should be used during IP training within the Air Cadet Gliding and Flying programs to illustrate the relatively rare situation when a student, in a high stress situation, freezes on the controls and impedes the IP's ability to control the aircraft. IPs should be reminded that, in some extreme cases, verbal commands may not be sufficient to get a student to relinquish aircraft control. An IP may have to use physical means against his student in order to regain aircraft control.

### **4.3 Other Flight Safety Concerns**

Nil.

### **4.4 DFS Remarks**

This mission, which was to be a straight-forward training flight, ended with an accident that destroyed an aircraft and had the potential to seriously injure both the IP and the student. In this case, the IP was caught by surprise by the reaction of his student during a critical phase of flight. Unfortunately, it appears that the actions of the student prevented the IP from maintaining aircraft control and from avoiding impact with the ground.

So what can be learned from this accident? This is not the first time that a student, or even an experienced crewmember has done something totally unexpected and surprised the other occupants of the aircraft. It is easy to say that you should always expect the unexpected but no one can foresee all eventualities. The only thing that you can do is to learn as much as you can from the mistakes of others and prepare yourself accordingly. How would you have dealt with this situation or with a similar situation such as an incapacitated crewmember interfering with the controls? How about the situation where you have a communications system failure and there is some uncertainty as to who has control of the aircraft? These are excellent topics for discussion during crew debriefs, daily emergency briefings or in casual discussions around the Sqn. You can learn a tremendous amount from working through these scenarios with

the other members of your crew or unit. More importantly, you have the time to develop your basic game plan should the situation ever arise in the air where time is critical.

AD Hunter  
Colonel  
Director of Flight Safety

**Annex A: Photographs**



**Photo 1: Accident Site**



**Photo 2: Final Resting Place**