CANADIAN FORCES
FLIGHT SAFETY INVESTIGATION REPORT (FSIR)

FINAL REPORT

FILE NUMBER:	1010-N261 WL (DFS 2-3-2)
DATE OF REPORT:	1 April 2005
AIRCRAFT TYPE:	A4N Skyhawk
OCCURRENCE DATE/TIME:	161830Z June 2004
LOCATION:	Bagotville, Québec
CATEGORY:	"D" Category Incident

SYNOPSIS

The incident aircraft was number 2 of a two plane A4N SKYHAWK formation which was providing Interim Contracted Air Training Services (ICATS) to the CF 18 fleet at 3 Wing. The formation completed the tasked mission and was recovering to a left hand overhead break for landing on runway 29 (Rwy 29) at Bagotville. The pilot in number 2 was distracted by a radio communication problem in the break and failed to lower the gear. He landed gear up and crossed the arrestor cable slicing the external fuel tanks in half. The aircraft continued down the centerline of the runway on the ruptured tanks. No fire developed, and the aircraft came to a stop with approximately 6000' of runway remaining. The pilot shut down, egressed from the aircraft and waited for the emergency vehicles to arrive. Emergency response vehicles were on scene quickly and the site was secured.

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1. FACTUAL INFORMATION

General

The incident aircraft was number 2 of a two plane A4N SKYHAWK formation which was providing ICATS to the CF 18 fleet at 3 Wing, Bagotville. The incident aircraft was flown by a contractor pilot from the United States of America (USA). There were numerous aircraft inbound to the Bagotville airport for landing at the time of the incident.

1.1 History of the Flight

After a successful rejoin to the Bagotville circuit, the two-ship formation was cleared for, and executed, a left hand overhead break for Rwy 29. Tower cleared them to land and called for gear down confirmation. A response was heard from lead but nothing from the second A4. Tower called the aircraft again, to confirm the gear.

On board the occurrence aircraft the pilot was in the middle of his landing check and had heard the first radio call but responded on the wrong radio (VHF inter-plane). The pilot changed to the correct radio (UHF tower) and although he quickly glanced down at the gear indicator (indicating gear up), he responded to Tower that his landing gear was “down and locked”. The aircraft continued to the runway in a gear up condition and the aircraft touched down, stayed on centerline and decelerated in that configuration. The external tanks below the aircraft were sliced in half by the arrestor cable rigged at the approach end of Rwy 29. The aircraft continued on the centre-line as the pilot used rudder to maintain directional control down to 60 knots. Amateur video taken by a Bagotville Squadron member showed sparks but no fire. The aircraft came to a stop on the runway approximately 8 feet off centerline and near the 6000 feet-to-go marker. The pilot advised Tower he was shutting down. He then shut down, secured the cockpit, exited the aircraft, and waited for emergency crews to arrive.

The ground controller observed the aircraft in the flare with the gear still up and initiated a 1-bell emergency response. The emergency response was quick and complete.

1.2 The Injuries to Personnel

The pilot was not injured in the incident. He was taken to the Base Hospital and examined by the duty Flight Surgeon.

1.3 Damage to Aircraft

The aircraft suffered ‘‘D’’ category damage. Damage was limited to the external fuel tanks, left hand wing flap, nose panels, and some damage to a jamming pod which the aircraft was carrying. The external fuel tanks were sliced open when the aircraft skidded over the arrestor cable.

1.4 Collateral Damage

The incident occurred on the airfield. The ruptured external fuel tanks were empty at the time and no other fluids were spilled. The arrestor cable was damaged and required replacement.

1.5 Personnel Information

	Pilot
Rank	Civilian
Currency/Category valid	Yes
Medical Category valid	Yes
Total flying time	15000 hrs
Flying hours on type	5000
Flying hours last 30 days	25
Duty time last 24hrs	5.4

1.6 Aircraft Information

The aircraft was serviceable prior to the accident. All maintenance and inspections were up-to-date.

1.7 Meteorological Information

The accident occurred at 1830Z and the actual conditions at Bagotville Airport were VFR. The METAR was:

31009KT 20 SM SCT050 BKN210 22/11 A2997 RMK SC1AC1CI2 SLP150 SKY56

1.8 Aid to Navigation

Not applicable.

1.9 Communications

All communication equipment in both the tower and the aircraft were working properly.

1.10 Aerodrome Information

Not applicable.

1.11 Flight Recorders

This A4N was not equipped with any onboard voice or flight data recording devices.

1.12 Wreckage and Impact Information

The aircraft, except for external tanks, retained its integrity throughout the landing slide (photo 1). Debris from the external tanks was scattered around the area just past the arrestor cable (photo 4). The bottom half of the left external tank remained engaged in the cable.

1.13 Medical

Not applicable

1.14 Fire, Explosives Devices, and Munitions

The pilot inserted all seat and canopy pins before exiting the aircraft. Maintenance personnel secured all explosive charges as soon the emergency response personnel deemed the site safe. There was no post accident fire.

1.15 Survival Aspects

The fuselage around the cockpit was not deformed and the cockpit volume remained unchanged. After the aircraft came to a stop, the pilot ground egressed from the aircraft and inspected the aircraft while waiting for emergency personnel.

1.16 Test and Research Activities

Not applicable.

1.17 Organisational and Management Information

An audit indicated that training, administrative and maintenance files were in order.

2. ANALYSIS

2.1 Aircraft Radios

The aircraft has three radios consisting of 2 UHF radios and 1 VHF radio. Both UHF radios, an AN/ARC-151/9 and an AN/ARC-51A are located on the right console (photo 2). The single VHF radio is part of the Garmin 530 Navigation package and is located on the front instrument panel. The NAT 301/A Audio Control Panel controls radio selection. This panel is capable of monitoring and communicating on five transmitters and monitoring six additional frequencies and is located on the upper right console of the A4N.

The small rotary radio selector switch located underneath the pilot's right arm was in the VHF position (inter-plane) instead of the UHF (Tower) position when the aircraft entered the break. The pilot responded on the wrong radio and quickly realized it. Correction of the switch position required the pilot to switch control hands, move the switch and respond to Tower's second call. This interrupted the pilot's landing checks, and he did not lower the landing gear.

After resolving the radio problem, the pilot continued with his checks. He believed the gear was down and he could complete the final turn to a successful landing. In fact the gear handle was in the up position and he did not perform his normal backup check that the gear was down and locked on final. As he was landing he realized the site picture was wrong and transmitted to Tower that he was landing gear up.

2.2 Landing Gear

The aircraft uses a tricycle landing gear system. The landing gear is retracted and extended by utility hydraulic system pressure during normal operation. The main gear retracts up and forward and the wheels rotate to fit flush in the wheel wells in the wings. The nose gear also retracts up and forward. The landing gear handle is located forward of the left cockpit rail and controls normal operation of the landing gear system. The handle has two positions ''UP'' and ''DOWN'' and is mechanically linked to the landing gear control valve. The position of the wheels is shown on a combination wheel and flap position indicator located on the lower left hand console (photo 3).

A "WHEELS" flasher type caution light is installed in the left hand annunciator lights panel on the lower instrument. With the wing flap handle in any position other than the UP detent and the landing gear up or unsafe, retarding the throttle below approximately 92% engine's revolutions per minute (rpm) causes the WHEELS caution to flash. There is no aural warning system for the landing gear system.

2.3 Cockpit Layout

The A4N is a small aircraft with a small cockpit and is an older design. With some integrated modern technology, the instrumentation for flying and fighting is placed in prime areas while other items like the landing gear handle, gear down and locked indicators, and radio transmit selector are placed where they can fit in. The gear handle and indicators are small and located down low on the left hand side of the instrument panel. The radio rotary selector switch is small and located on the NAT 301/A Audio Control Panel on the console underneath the pilot's right arm beside the canopy jettison handle. The steady red light in the gear handle is dim in daylight and the flashing "WHEELS" annunciator can be blocked from view by the flight control stick.

The investigation found that the landing gear handle, the landing gear position indicators and radio control panel were not easily visible in the cockpit.

2.4 Human Factors

The re-selection from inter-plane VHF to Tower UHF radio during a critical phase of the overhead break lead the pilot to overlook the lowering of the landing gear. This created a false impression that the gear was down-and-locked. The annoyance of re-selecting the radio remained a distraction for a short period of time - long enough to impair the ability of the pilot to function normally. The pilot commented he always did a double-check on final for the gear, yet, this time he did not.

3. CONCLUSIONS

3.1 Findings

3.1.1 The aircraft was serviceable at the time of the incident, and all inspections were up-to-date and complete.

3.1.2 The pilot was distracted by a radio switchology problem during the overhead break and interrupted his landing check sequence.

3.1.3 The pilot did not place the gear handle in the ‘’DOWN’’ position and confirm the gear was down.

3.1.4 The pilot did not complete a landing check.

3.1.5 The aircraft landed gear up.

3.2 Causes

The pilot was distracted by a communication problem that occurred during the overhead break

3.3 Contributing Factor

3.3.1 The pilot did not ensure that a complete landing check was carried out.

3.3.2 The Gear Not-Down warning system can easily be missed within the cockpit.

3.3.3 The Gear Not-Down warning system has no audible warning

4. SAFETY MEASURES

4.1 Safety Measures Taken

Nil.

4.2 Further Safety Measures Required

Nil.

4.3 Other Safety Concerns

Nil.

4.4 DFS Remarks

In this case, a pilot with 15,000 hours fell prey to a small error creating a distraction that resulted in a gear-up landing. In a 2003 accident that was strikingly similar, a pilot with 200 hours total flying time landed gear up in a CT-155 Hawk when he was also distracted in the circuit. Both of these accidents are referred to in the DFS annual briefing and it is emphasized that experience is not a defence against making an error such as this.

Air Force Human Factors training has made progress in teaching our personnel to recognize and control the hazards associated with distraction. Accordingly, DFS initiated a dialogue with the Human Performance in Military Aviation (HPMA) Flight at Central Flying School to continue to focus training in this area. In consultation with the Divisional Flight Safety Officer, DFS is looking into the possibility of developing a process whereby pertinent information would be shared with HPMA Flight to provide periodic updates to their training package with recent occurrences.

A.D. Hunter
Colonel
Director of Flight Safety

Annex A: Photographs

Photo 1: Tank and pod damage

Photo 2: Right Console

Photo 3: Landing Gear & Annunciator Panel

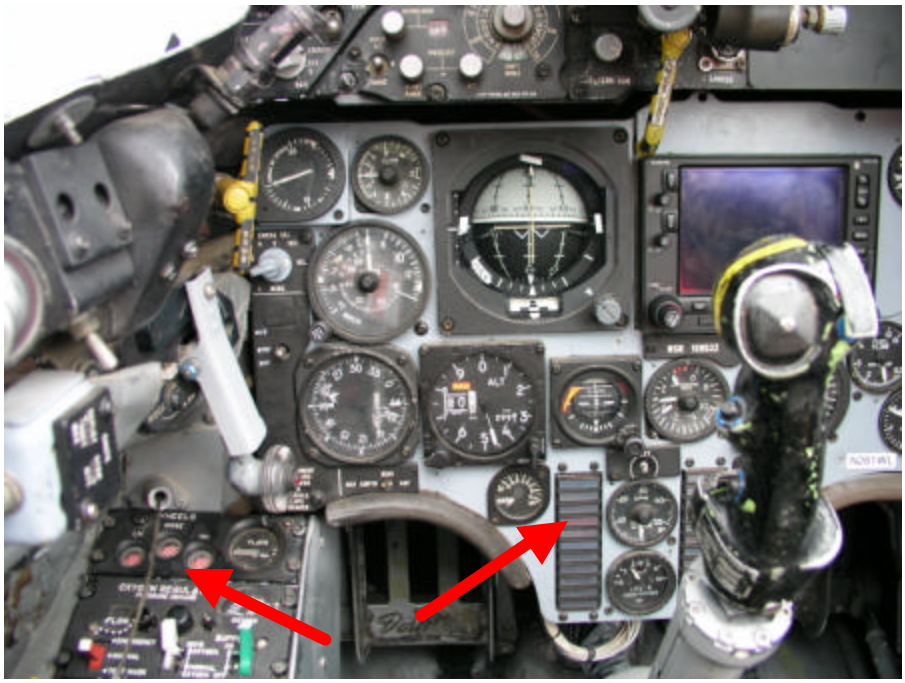

Photo 4: Left External Tank

Annex B: List Of Abbreviations

AA:	Aeronautics Act
AGL:	Above Ground Level
AIA:	Airworthiness Investigative Authority
ASL:	Above Sea Level
ATC:	Air Traffic Control
BKN:	Broken
CAVOK:	Ceiling and Visibility OK
CF:	Canadian Forces
DFS:	Director of Flight Safety
DME:	Distance Measuring Equipment
FSIR:	Flight Safety Investigation Report
IAS:	Indicated Airspeed
ICATS:	Interim Contracted Air Training Service
METAR:	Meteorological Aviation Report
MND:	Minister of National Defence
MSL:	Mean Sea Level
R/T:	Radio Transmission
RMK:	Remark
RPM:	Revolutions per minute
RWY:	Runway
SCT:	Scattered
UHF:	Ultra High Frequency
USA:	United States of America
VFR:	Visual Flight Rules
VHF:	Very High Frequency