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2006

Annual Report on Flight Safety

Canada

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DIRECTOR COMMENTS

This report provides a synopsis of the activities carried out by the Directorate of Flight Safety and gives an analysis of the FS information collected during 2006. A key factor in managing risk is collecting occurrence data, subjecting it to analysis, and making it available to the chain of command for action. This report gives an overview of that function for the calendar year 2006.

The Canadian Forces Flight Safety program continues to meet its aim of preventing the accidental loss of aviation resources. It is a mature program and has been made more effective through its continued development and its strong linkage to the overall airworthiness program. Its success may be judged by the results – accident rates remain low. Nonetheless, more needs to be done to assure that future losses are avoided to the maximum extent possible.

The theme for the 2006 DFS Briefing Tour, "Back to Basics – Back to the Future," resonated well with the airmen and airwomen in the line units. Canada's Air Force is heading off into a very interesting future, with some exciting new equipment acquisitions on the horizon and with continued demand for challenging operational flying. Everyone is very excited about these developments; yet, at the same time each military occupation is facing shortfalls of experience, due to economic and demographic-driven attrition, at a time when operational tempo continues to be high. In the next few years, as we acquire powerful new aircraft that feature a level of automation and sophistication not seen before in the CF, we will be entrusting their operation, maintenance and support to cohorts of operators, maintainers and supporters who are relatively inexperienced. As always, the air force attracts excellent people to its ranks – the trick will be to ensure they take to heart the core principles of flight safety as they become the supervisors and leaders of tomorrow. Attention to the basic skills and principles of safety will be more important than ever if we are to continue to accomplish our mission at an acceptable level of risk.

This is the second FS Annual Report that has been produced by DFS. Feedback on this document is solicited and would be greatly appreciated. Comments should be forwarded to DFS 3, Jacques Michaud at Michaud.jc@forces.gc.ca

<original signed by>
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Colonel
Director of Flight Safety

EXECUTIVE SUMMARY

This report provides a synopsis of the activities carried out in 2006 by the Airworthiness Investigative Authority and gives an analysis of the FS information collected.

The Air Accident Rate for 2006 was 0.41 per 10,000 flying hours, which is a decrease from the previous year of 0.56, but is within the 10-year average.

The Airworthiness Investigative Authority (AIA) initiated twenty-four investigations on fifteen accidents (Six category 'A' damage, six 'B', and three 'C') and nine incidents (four 'D' and five 'E'). The AIA also participated in one United States Air Force (USAF) led investigation. The number of outstanding preventive measures (PMs) continues to decrease, and with the exception of 2 PMs dating back to 1997, all PMs raised as a result of accidents prior to 2001 have been actioned.

At the 2005 Airworthiness Advisory Board (AAB), it was determined that the CF Cockpit Voice Recorder (CVR) / Flight Data Recorder (FDR) policy was deficient and that this policy was a critical airworthiness requirement. As directed by CAS, a CVR/FDR Working Group developed a revised, practical policy as well as a detailed schedule outlining the way in which this revised policy will be implemented.

Major concerns in types of occurrence by fleet were raised during the Airworthiness Review Board fleet review. Two common themes were identified fleet wide:

- First, there was an increase in the number of occurrences related to survival and safety equipment in several fleets. This analysis reinforced a concern noted in a number of recent Flight Safety Investigation Reports in which Aviation Life Support Equipment (ALSE) was deficient. DFS staff is actively investigating this issue with the OAA and the TAA staffs.

- Second, several fleets suffered from a high number of occurrences where panels/doors were left unsecured for flight. DFS staff has identified a requirement for further research on this issue.

The DFS annual briefing was employed as a major mechanism to promote flight safety. In an effort to increase the awareness of Air Force personnel, *Back to Basics* was the central theme of the annual DFS briefing. This presentation was offered to all Wings, most bases and some establishments providing contracted maintenance services to the Department. Three issues of the Flight Comment magazine and two issues of the flight safety newsletter Debriefing were published.

DFS conducted two contractor site surveys (IMP Group Limited, Halifax and L3 MAS, Mirabel) and participated with 1 Canadian Air Division Flight Safety staff to 8 surveys conducted at 3 Wing, 4 Wing, 8 Wing (including 412 Sqn), 12 Wing (including 443 Sqn), 14 Wing, 15 Wing, plus 430 and 438 Squadrons.

The Flight Safety staff of 1 Canadian Air Division qualified 180 persons as Unit Flight Safety Officers/NCMs and 19 as Wing Flight Safety Officers. A total of three *Good Show* and 18 *For Professionalism* awards were granted in 2006, which is a significant reduction from 2005. The need to nominate deserving personnel for these awards has been emphasized by DFS during the annual briefing tour.

The A-GA 135-001/AA-001 Flight Safety for the Canadian Forces underwent final review in Dec 2006 and was be published in the spring of 2007. The document has been reformatted to become a practical handbook for the creation, conduct, and administration of a comprehensive Flight Safety program across the full spectrum of CF activities. The categorization of accident and incidents has also undergone slight changes as a result of the revision. Hence, the 2006 Annual Report uses the aircraft damage categories in effect during 2006 (A, B, C, D, E). The 2007 Annual report will reflect the updated system.

2006 FLIGHT SAFETY ANNUAL REPORT

References: A. 1016-18, 7 May 2007-07-16 (DMCS 14248)
B. 1016-22 (DSV 3), 21 June 2007 (DMCS 14888)

AIRWORTHINESS PROGRAM

1.1 AIRWORTHINESS INVESTIGATIVE AUTHORITY (AIA) ACTIVITIES

1.1.1 Amendment to Aeronautics Act - Bill C-6

Bill C-6, an Act to amend the Aeronautics Act and to make consequential amendments to other Acts, was read the second time and referred to the Standing Committee on Transport, Infrastructure and Communities where it is still under review. Transport Canada is the lead department on this initiative. The Bill, if passed, will address several Department of National Defence (DND) airworthiness concerns such as granting additional powers for AIA-appointed investigators to deal with civilian companies and the next of kin of personnel killed in CF aircraft accidents, confirming of the privileged status of flight safety information, enhancing the conduct of DND/TSB co-ordinated investigations, and allowing the sub-delegation of airworthiness authorities.

1.1.2 Airworthiness Investigative Manual

The AIA is tasked to issue airworthiness instructions and standards and to assign investigative authority to organizations and individuals. Staffing has started on the production of an AIA Manual (AIM) to formalize the AIA processes. The first version of this document will be produced in late 2007.

1.1.3 Surveys

DFS conducted Flight Safety surveys at two contractor sites (IMP Group Limited, Halifax and L3 MAS, Mirabel) as part of the DFS continuous contractors visit program. 1 Canadian Air Division Flight Safety, augmented with DFS personnel, conducted surveys at 3 Wing, 4 Wing, 8 Wing (including 412 Sqn), 12 Wing (including 443 Sqn), 14 Wing, 15 Wing, plus 430 and 438 Squadrons. Surveys are conducted to measure the effectiveness of the Flight Safety Program, to identify deficiencies that would otherwise have gone undetected, and to make recommendations for enhancements to this program with the intent of contributing to the production of an airworthy product.

1.1.4 CVR/FDR Working Group

A CVR/FDR Working Group was formed to develop a coherent CF Cockpit Voice Recorder (CVR) / Flight Data Recorder (FDR) policy. The Working Group identified aircraft families, developed a standard for each family and developed a new CVR/FDR Policy (reference A). Implementation timing is to be completed by end Sep 07. It consists of a comparison between the current CVR/FDR capabilities of each fleet and the required technical standards detailed in the CVR/FDR policy. This activity will generate an implementation plan that will identify the

activities, and associated timelines that are technically and financially possible to implement by the CVR/FDR policy implementation deadline of 31 Dec 2010.

1.2 INVESTIGATIONS

1.2.1 Investigation Summary

The AIA initiated 24 investigations divided between fifteen accidents (Six category 'A' damage, six 'B', and three 'C') and nine incidents (four 'D' and five 'E'). The AIA also participated in one United States Air Force (USAF) led investigation. Table 1 outlines the investigations initiated during the year followed by a synopsis of each one.

#	DATE	ACCIDENT / INCIDENT	DAMAGE	FATAL / SERIOUS INJURY	AIRCRAFT	EVENT
FLIGHT SAFETY INVESTIGATION REPORTS						
1	02-Feb-06	Accident	Cat A		Sea King	CFIT
2	25-Apr-06	Incident	Cat D		Hercules	Runway Excursion
3	06-May-06	Accident	Cat A		Sperwer	Unsuccessful Recovery
4	19-Jun-06	Accident	Cat A		Schweizer	Lost Control
5	13-Jul-06	Accident	Cat A	3/2	Cormorant	CFIT
6	07-Aug-06	Accident	Cat A	0/1	Schweizer	Glider Off-Field Landing
7	10-Sep-06	Accident	Cat B		Schweizer	Clipped Trees/Hard Landing
ENHANCED SUPPLEMENTARY REPORTS						
8	24-Jan-06	Incident	Cat E		Jet Ranger	Unmanned Helicopter Movement
9	31-Jan-06	Accident	Cat B		Vindicator	UAV Crash
10	08-Feb-06	Accident	Cat C		Griffon	Hard Landing
11	14-Feb-06	Incident	Cat D		Griffon	Truck Backed Into Helicopter
12	11-May-06	Incident	Cat 'E'	0/1	Hercules	Injury - Fall From Ladder

#	DATE	ACCIDENT / INCIDENT	DAMAGE	FATAL / SERIOUS INJURY	AIRCRAFT	EVENT
13	24-May-06	Accident	Cat 'B'		Sperwer	Engine Failure After Launch
14	12-Jun-06	Accident	Cat 'C'		Griffon	FOD in #2 Engine
15	06-Jul-06	Accident	Cat 'B'		Sperwer	Inadvertent Airbags Deployment
16	18-Jul-06	Incident	Cat 'D'		Cessna	Landing Overrun
17	20-Jul-06	Accident	Cat 'A'		Sperwer	AV Burned up after Recovery
18	23-Aug-06	Incident	Cat 'E'		Buffalo	Elevator Rod Unsecured
19	28-Sep-06	Incident	Cat 'D'		Hornet	Planing Link / Main Gear Collapse
20	02-Oct-06	Incident	Cat 'E'		Hornet	Near Miss
21	24-Oct-06	Accident	Cat 'B'		Sperwer	Engine Failure After Launch
22	27-Oct-06	Incident	Cat 'E'		Hornet	Near Miss
23	21-Nov-06	Accident	Cat 'B'		Sperwer	Airbags Deployed on Launch
24	07-Dec-06	Accident	Cat 'C'		Griffon	High Side Engine #2

Table 1 - List of 2006 AIA Initiated Investigations

1.2.2 Investigation Details

1.2.2.1 2 Feb 06, CH12438 Sea King , Accident, Cat 'A' , East of Aalborg, Denmark ,Case ID # 125184

The Sea King helicopter was returning to Her Majesty's Canadian Ship ATHABASKAN after having completed circuit training at Aarhus, Denmark. On completion of one radar-controlled approach to the ATHABASKAN, the crew commenced an overshoot and entered the visual circuit to land. On short final, at approximately 30 meters on the ATHABASKAN's port quarter, the helicopter's rear fuselage and tail rotor contacted the water. The helicopter pitched forward, became airborne again, and began to yaw right. The helicopter then impacted the water in a near level attitude and, while still yawing right, rolled left. Water flooded the helicopter almost immediately as it rolled inverted. All five crewmembers then egressed and were recovered to the ATHABASKAN by Zodiac within approximately 15 minutes. Four crewmembers encountered

difficulties while egressing the inverted helicopter. One crewmember received minor injuries. The aircraft sustained “A” category damage after sinking in 16 meters of water one hour after the accident.

The preliminary investigation has indicated that the helicopter suffered no mechanical problem prior to impact. The investigation will focus on Aerospace Life Support Equipment and human factors. Human factors investigation is focused on human night vision capabilities and organizational issues such as currency and training. The accident is under investigation.

1.2.2.2 25 Apr 06, CC130311 Hercules, Incident, Cat ‘D’, CFS Alert, NU , Case ID # 126426,

The Hercules aircraft was arriving in Alert on a fuel re-supply mission in support of Operation Boxtop. Following a Radar Approach to runway 23 True, the aircraft landed long and the crew experienced difficulty in maintaining runway centreline control. Deceleration efforts were reduced while efforts to regain directional control were attempted. The aircraft departed the end of the runway, coming to rest approximately 80 feet beyond the runway threshold. There were no injuries to any of the 5-crew personnel and the aircraft sustained 'D' category damage.

The Alert runway was covered with hard-packed snow and ice at the time of the incident and the crew was authorized to conduct an overweight landing. The preliminary investigation did not reveal any mechanical problems associated with the aircraft prior to runway departure. The investigation will focus on the Human factors element of flying operations to include crew proficiency and training. The incident is under investigation.

1.2.2.3 6 May 06, CU161009 Sperwer, Accident, Cat ‘A’. Kandahar, Afghanistan, Case ID # 126637

The accident occurred during a day mission conducted in the vicinity of Kandahar Airfield in support of Op ARCHER. During the recovery phase of flight, the parachute failed to deploy. The air vehicle (AV) descended freely, impacted the ground at high speed and exploded. The AV was consumed by post-impact fire and sustained 'A' category damage. There were no injuries. The investigation will focus on areas associated with parachute system design and parachute rigging.

1.2.2.4 19 Jun 06, C-FZIQ Schweizer 2-33, Accident, Cat ‘A’, St-Jean, QC, Case ID # 127373

The accident glider was being escorted by two Air Cadets "wing walkers" holding each wing by the tip and being towed into wind towards its tie-down position. Very heavy rain began to fall accompanied by a sudden increase in wind of up to 40 knots. The glider's wings began to rock and lift. The wing walkers shouted at the vehicle driver in an attempt to draw his attention, but the wind, rain, as well as vehicle noise, negated any communications. The glider then lifted, with both wing walkers initially still holding on to the wings; the right hand walker was lifted to approximately five feet in the air, and the left walker approximately one foot before they let go. The glider rose to approximately 20 to 25 feet in the air, and hovered for a few seconds before the towing rope broke. It climbed an additional 20 to 30 feet with a sharp nose-up attitude, and then became inverted as it traveled backwards. It impacted the ground, nose down,

approximately 200 feet from its initial lift-off point. The accident is under investigation.

1.2.2.5 13 Jul 06, CH149914 Cormorant , Accident, Cat 'A', Chedabucto Bay, NS, Case ID # 127667

The accident involved a Cormorant Search and Rescue helicopter with seven crew members that were authorized to conduct a night training mission from 14 Wing Greenwood, Nova Scotia. The helicopter transited from Greenwood to Port Hawkesbury where the helicopter landed to complete a required tail-rotor inspection. After this brief stop the crew resumed its mission and contacted the fishing vessel *Four Sisters No.1* in preparation for a practice night boat hoist. As the helicopter was approaching the vessel the Aircraft Captain, seated in the jump seat, became concerned with the helicopter's decreasing altitude and directed the flying pilot, who was in the right seat, to go-around. A go-around was initiated but the helicopter contacted the water at 69 knots calibrated air speed while in a nose-low attitude. Upon water impact the forward fuselage area was destroyed and the rear cabin area immediately filled with water. The three pilots in the cockpit and the Search and Rescue Technician (SAR Tech)Team Leader in the cabin were injured, two of them seriously, but survived the crash. The two Flight Engineers and the SAR Tech Team Member died. The surviving crewmembers were immediately rescued by the personnel of the *Four Sisters No.1* and taken to Canso for medical care. The accident is under investigation.

1.2.2.6 7 Aug 06, C-GBJR Schweizer 2-33, Accident, Cat 'A', Mountain View, ON, Case ID # 128031

The accident glider pilot was participating in the summer Air Cadet Glider Pilot course at Mountain View, Ontario. This was the glider pilot's second solo flight of the course, with a briefed release altitude of 1,500 feet. The tow plane pilot had been directed to take the solo pilot to 2,500 feet. During the aero-tow, the glider pilot became concerned when the tow plane climbed through 1,500 feet and was still flying away from the airfield. The glider pilot elected to release from the tow aircraft at 1,600 feet and return to the airport. The glider entered the circuit for a landing on the grass strip 24R. On downwind the glider was seen to be lower and closer to the landing area than normal. As well, the airspeed seemed excessive. The glider turned onto base leg, again at a lower than normal altitude.

On base leg the glider pilot became distracted by an unlatched, but closed, canopy. While attempting to latch the canopy the glider entered a nose low attitude with slight right wing down. The pilot's instructor, who was monitoring the flight from the ground, was concerned that the right wingtip of the glider may contact the ground and cause the glider to cartwheel. The instructor radioed directions for the solo glider pilot to level the wings. The pilot complied and attempted to land straight ahead on an extended base leg.

The glider contacted the ground in a short field, bounced, and impacted a stand of trees while still airborne. The impact caused severe structural damage, including ripping off the outer 10 feet of the left wing. The fuselage came to rest between two smaller trees. The glider received 'A' category damage. The accident is under investigation.

1.2.2.7 10 Sep 06, C-FACY Schweizer 2-33, Accident, Cat 'B', Valcartier, QC, Case ID #128392

The accident glider pilot was participating in the Air Cadet fall familiarization gliding program. The cadet had recently graduated from the summer Air Cadet Gliding Program and was in the process of building up gliding time. Runway 04 is divided into two landing lanes with lane 1 being the left lane (near the trees). The Gliders were landing on lane 1 of runway 04.

On the day of the accident the pilot had already flown three dual trips seven solo trips. The accident occurred on the eighth solo flight of the day. The aero-tow and upper air work of the accident flight were uneventful. On final approach the pilot encountered a left crosswind, which required the application of a sideslip (left wing down with application of right rudder) to maintain the centre-line of the runway. The left crosswind abruptly ceased as the glider descended below the height of the trees that line the left side of the runway. This caused the glider to drift left towards the forested area and lose airspeed. The glider also encountered some downdrafts. The pilot attempted to correct back to the runway centre-line, however, the glider's left wing contacted some trees at 23 feet above ground level. The glider pivoted 90 degrees to the left and fell almost vertically. The pilot suffered serious injuries. The glider sustained 'B' category damage.

The investigation is focussing on the proximity of the trees to the landing area and the localized wind shear phenomenon that is well known by Valcartier pilots. The accident is under investigation.

1.2.2.8 24 Jan 06, C-GAVF Jet Ranger, Incident, Cat 'E', Ranch Point, BC, Case ID # 125174

The contracted civilian helicopter landed at the Ranch Point to carry out a passenger transfer. The pilot exited the aircraft after adding friction to his flight controls. As the pilot was removing cargo from the left rear seats, he noticed the pylon section of the helicopter start to vibrate and bounce. The pilot then moved quickly forward to the right pilots seat and neutralized the controls. The aircraft had moved forward approximately 3 ft and the nose rotated 15 degrees to the right. The awaiting passengers remained at a safe distance away from the aircraft during the occurrence. After assessing the situation, the pilot continued the mission without further incident.

The investigation revealed that the pilot, under perceived time pressure, did not use sufficient friction on the control before exiting the aircraft, which contributed to cyclic displacement when his unsecured briefcase was slipping off the pilot seat.

1.2.2.9 31 Jan 06, CU162031 Vindicator, Accident, Cat 'B', Gagetown, NB, Case ID # 125175

During the first launch of recertification training, the starboard stabilizer separated from the airframe causing instability in flight and resulting in the air vehicle (AV) impacting the ground approximately 150 metres from the launch site. At the same time, it was noted that the port skid block had impacted on two obstructions on the launch rail resulting in the removal of the skid block from the AV. All Vindicator equipment had been received three weeks prior to the

exercise and there was no hands-on training for the three months prior. The last pieces of equipment arrived the day the exercise began with no opportunity to verify that all material was in 100% condition.

1.2.2.10 8 Feb 06, CH146468 Griffon, Accident, Cat 'C', Valcartier, QC, Case ID # 125246

The aircraft entered a snowball condition prior to touch down while conducting a night landing under NVG over an unprepared landing area. The aircraft stopped after sliding forward over a snow and ice embankment. The crew later found that the both the right and left hand chin bubbles were damaged resulting in a 'C' Category damage.

The investigation revealed that the crew was not current and had medical employment limitations, which the Squadron supervisors were not aware of when they authorised the mission. Also, following a last minute change of the pick up zone (PZ), the AMC did not provide the required briefing on the new PZ and the crew did not complete a map reconnaissance of the PZ in accordance with Standard Manoeuvre Manual and Tactical Aviation Doctrine.

1.2.2.11 14 Feb 06, CH146480 Griffon, Incident, Cat 'D', Trenton, ON, Case ID # 125317

On 14 February 2006, two technicians were tasked to take a contractor owned vehicle, from #9 hangar to the East gate, which is near 2 AMU, to escort a delivery vehicle. The contractor vehicle was parked on the north side of #9 hangar, facing west and parallel with the building. Due to activities on the flight line, and the fact that another vehicle was parked directly in front of the contractor owned vehicle, the driver elected to back up his vehicle until he was well clear of #9 hangar and then turned between hangars 8 and 9. The driver, not realizing the presence of a CH146 helicopter between the hangars on parking spot #16, collided his vehicle with the helicopter causing damage that was initially assessed to be "C" Category damage, but later confirmed as "D" Category damage. The investigation revealed the cause of this accident was improper use of safe backing procedures and loss of situational awareness. Also, the driver's field of view was restricted by the presence of a cap on the truck and the fact that the driver did not use his mirrors during the backing procedure.

1.2.2.12 11 May 06, CC130313 Hercules, Incident, Cat 'E', Greenwood, NS, Case ID # 126717

While carrying out a pre-flight inspection on the No.l engine the flight engineer fell from the Little Giant ladder he was using and sustained serious injuries. The investigation found that that the ladder had partially buckled under his weight and had become unstable due to weakening caused by many pre-existing cracks in the rungs of the ladder. The cracks were determined to have been caused over time by aircraft vibration. Inadequate personal inspection and the lack of an effective systematic inspection process allowed the faulty ladder to remain in service.

1.2.2.13 24 May 06, CU161011 Sperwer, Accident, Cat 'B', Kandahar, Afghanistan, Case ID # 126940

Immediately after the air vehicle (AV) departed the launcher, the AV experienced severe degradation in engine RPM. The AV was unable to sustain flight and impacted the ground approx 400 meters from the launcher. Engine fuel starvation occurred when the fuel hose providing fuel to the engine disconnected from its fitting at the fuel pump plate.

1.2.2.14 12 Jun 06, CH146489 Griffon, Accident, Cat 'C', Goose Bay, NL, Case ID # 127287

On 12 Jun 06, a 444 Combat Support Sqn crew from 5 Wing Goose Bay was scheduled to fly a local familiarization/unit check out flight. Engine #2 was started first when the FE noticed a loud grinding sound coming from the engine. Shut down hand signal was given by the FE and acknowledged by the pilots. The engine was shut down very early in the start sequence as the engine just started to rotate. Aircraft was quarantined and initial FS inspection revealed FOD in the plenum chamber directly under the compressor inlet. The investigation revealed that a technician, in an effort to quickly complete a repair, signed out and carried in his pocket extra consumables, in a plastic bag, which inadvertently were dropped. The investigation also revealed that maintenance supervisors, which were regularly employed as line technician observed the practice of carrying spare parts in plastic bags but did not ensure that technicians accounted for all consumables upon completion of maintenance activities. Contributing to the occurrence was the lack of adequate platforms for scheduled maintenance which was conducive to improper maintenance practices, such as carrying consumable parts in the pocket while conducting on-aircraft maintenance and not accounting for them after completion of maintenance tasks.

1.2.2.15 6 Jul 06, CU161002 Sperwer, Accident, Cat 'B', Kandahar, Afghanistan, Case ID # 17672

The accident occurred during a night UAV mission conducted at the Kandahar Airfield (KAF) in support of Op ARCHER. Immediately following launch, the air vehicle's (AV) airbags deployed rendering the AV incapable of sustained flight. The AV impacted the ground approximately 300 metres from the launcher.

The launch followed a successful pre-flight inspection ('C' Check) in which all Ground Control Station (GCS) monitored performance parameters indicated normal. Eyewitness accounts, along with GCS tape replay, indicated that after launch the AV's high-pressure air bottle had a rapid decrease in pressure, followed by airbag deployment.

1.2.2.16 18 Jul 06, C-GFYW Cessna 172G, Incident, Cat 'D', Courtenay, BC, Case ID # 127731

The aircraft was being flown by an air cadet on the Air Cadet Power Flying Scholarship program. He had completed a number of successful circuits with his instructor prior to this occurrence on his first solo flight. On the second landing, which was intended to be a stop, the aircraft departed the overrun area of runway 31, off runway heading, and impacted a perimeter fence separating the runway from a public walkway and a river approximately 40 feet beyond.

The pilot egressed uninjured with the assistance of Air Cadets and supervisory staff.

1.2.2.17 20 Jul 06, CU161012 Sperwer, Accident, Cat 'A', Kandahar, Afghanistan, Case ID # 127770

Due to abnormal fuel pressure indications, the AV was re-directed back to the Kandahar airfield. Within three minutes, the AV could no longer maintain altitude and the engine failed. The AV was routed towards an open area and an emergency recovery was initiated. After recovery, reports were received from Coalition Forces that the AV was burning. It was assessed thereafter that the AV was in an unrecoverable state and the tactical situation did not allow for a detailed crash investigation. The remains of the AV were blown-in-place by Coalition Forces.

1.2.2.18 23 Aug 06, CC115462 Buffalo, Incident, Cat 'E', Comox, BC, Case ID # 128157

While carrying out troubleshooting for an airframe vibration snag, a tech found the elevator control rod screwed into the eye-end but not secured by locking bolt through both the rod and eye-end. Only a few threads of the eye-end connected the push pull rod to the elevator. Separation of the eye-end from the push-pull rod will result in loss of elevator control and would quite likely have led to the loss of the aircraft.

The investigation revealed that technicians at the third line contractor facility were being trained to install elevators with procedures that differ from those in the approved technical orders. The investigation also revealed two other concerns, namely physical configuration discrepancies for the elevator push-pull rod and a lack of detail in the contractor Maintenance Process Manual as to eligibility criteria, minimum training and qualifications required for technicians to perform maintenance rectifications.

1.2.2.19 28 Sep 06, CF188931 Hornet, Incident, Cat 'D', Cold Lake, AB, Case ID # 128687

One second after landing, the aircraft was reported to have lurched to the left followed by a loud "bang" and then the landing gear unsafe / planing link audio tone was heard. Subsequently, there was a loud rattling accompanied by the aircraft shaking and the left wing settling towards the runway as the left main landing gear collapsed. Aircraft came to rest on runway centreline approximately 7000 feet from initial touchdown. Crew shut down and evacuated aircraft WFI and with no injuries. The investigation revealed that the approach resulted in a hard landing with a final sink rate of approximately 1200 fpm and a landing G between 2.4 and 3.0 with significant left drift and the left wing low. This resulted in an enormous strain imparted on the left landing gear. The investigation also revealed that the left and right MLG were out of rig in a number of key areas that are known to contribute to MLG collapse and/or planing mechanism failure.

1.2.2.20 2 Oct 06, CF188932/935 Hornet, Incident, Cat 'E', Cold Lake, AB, Case ID # 128754

While conducting 2v2 ACT manoeuvring the pilot of the #2 aircraft in the formation misinterpreted an "out right" call by the lead aircraft. #2 commenced a left hand turn resulting in

closure between the two aircraft and a close pass of approximately 300'. The mission was terminated and all aircraft RTB'd WFI. The investigation revealed that the wingman initiated a turn towards lead while having lost visual contact. A contributor to this occurrence was the poor performance of the modernized CF18 radios, which created a situation of broken and misinterpreted radio calls. This deficiency has been known for a long time but has still not been addressed.

1.2.2.21 24 Oct 06, CU161007 Sperwer, Accident, Cat 'B', Kandahar, Afghanistan, Case ID # 129090

The accident occurred during a night UAV mission conducted at the Kandahar Airfield (KAF) in support of Op ARCHER. The launch followed a successful pre-flight inspection (C Check) in which all Ground Control Station (GCS) monitored performance parameters indicated normal. Forty-two seconds after launch, the air vehicle (AV) lost power and crash-landed 1.7 kilometres from the launcher.

1.2.2.22 27 Oct 06, CF188744/747 Hornet Incident, Cat 'E', China Lake, CA, Case ID # 129067

Two CF-18 aircraft merged over the target during an aircraft attack at 1000'AGL. Distance of the miss was assessed airborne to be approximately 200 feet.

1.2.2.23 21 Nov 06, CU161001 Sperwer, Accident, Cat 'B', Kandahar, Afghanistan, Case ID # 129742

The accident occurred during an UAV mission in support of Op ATHENA. Immediately following launch, the UAV's airbags deployed, rendering it incapable of sustained flight. The UAV impacted the ground approximately 250 metres from the launcher.

1.2.2.24 7 Dec 06, CH146422 Griffon, Accident, Cat 'C', Goose Bay, NL, Case ID # 129628

Following an overnight survival exercise, a High Side Governor Failure (uncontrollable) was experienced during the Force Trim Check. Cold Weather start procedure was not carried out since Engine Idle was below 61+/-1%. (OAT -8 degrees C) Right side pilot was unable to shut down the engine and Rotor over sped. Aircraft recovery and Flight safety investigation in progress.

1.2.3 Joint Investigations

The AIA participated in one United States Airforce (USAF) led investigation during 2006. The accident involved a USAF C-21 aircraft with two pilots – a Canadian exchange officer and an American pilot. The aircraft crashed at Decatur, Illinois during a training flight and was destroyed. The Canadian pilot received serious injuries.

1.2.4 Investigation Reports Status

Table 2 outlines the status of ongoing investigations up to 31 Dec 2006.

DATE	AIRCRAFT	DESCRIPTION	ACTIVITIES
14 May 04	CT155202	Moose Jaw, SK - bird strike on touch and go.	Final FSIR being prepared
19 Jun 04	CF188761	Yellowknife, NT - pilot ejected after experiencing control problems on landing.	Final FSIR completed
10 Dec 04	CT114064 CT114173	Mossbank, SK - Snowbird 8 & 9 collided mid-air	Final FSIR being prepared
16 Aug 05	CF188745	Bagotville, QC - Aircraft departed controlled flight. Pilot ejected from flat spin.	Final FSIR completed
24 Aug 05	CT144120	Thunder Bay, ON – Snowbird crash, pilot ejected.	Final FSIR being prepared
02 Feb 06	CH12438	Denmark – Ditching (30NM EST of Denmark Coast)	Draft for comment being prepared
08 Feb 06	CH146468	Valcartier, QC - Hard Landing	Enhanced SR being prepared
25 Apr 06	CC130311	Alert, NU – Runway Overrun	Final FSIR being prepared
28 Apr 06	CU161009	Operational, KAF	Final FSIR being prepared
19 Jun 06	C-FZIQ	St Jean – glider was upset by wind gust while being towed	Draft for comment being prepared
13 Jul 06	CH149914	East Coast – Cormorant crashed while conducting night training	Draft for comment being prepared
20 Jul 06	CU161012	Afghanistan – engine failure during mission	Enhanced SR being prepared
07 Aug 06	C-GBJR	Mountainview On – Crash landing in field adjacent to Landing strip	Draft for comment being prepared
10 Sep 06	C-FACY	Valcartier QC – Crash landing fol contact with trees along landing strip	Enhanced SR being prepared
28 Sep 06	CF188931	Cold Lake AB – Planning link failure and gear collapse on landing	Enhanced SR completed
24 Oct 06	CU161007	Afghanistan – UAV failed to climb after launch	Enhanced SR being prepared
27 Oct 06	CF188744/ CF188747	China Lake - Near Miss	Enhanced SR being prepared

DATE	AIRCRAFT	DESCRIPTION	ACTIVITIES
21 Nov 06	CU161001	Afghanistan – Airbag premature deployment	Enhanced SR being prepared
07 Dec 06	CH146422	Goose Bay – Main rotor overspeed on start up.	Enhanced SR being prepared

Table 2 - Investigation Report Status

FLIGHT SAFETY ACTIVITIES

1.3 PROMOTION

The DFS annual briefing was again employed as a major mechanism to promote flight safety. In an effort to increase the awareness of Air Force personnel, *Back to Basics* was the central theme of the annual DFS briefing. This presentation was offered to all Wings, most bases and some establishments providing contracted maintenance services to the Department. The briefing was also presented to the European liaison officers at CDLS(L), the NATO AWACS Base personnel in Geilencherchen, Germany and the Royal Navy Flight Safety Centre staff in Yeovolton, England. Three issues of the Flight Comment magazine and 2 issues of the flight safety newsletter Debriefing were published.

1.4 AWARDS

A total of 26 Flight Safety award submissions for individuals or groups were forwarded to DFS. These submissions represented the actions of 29 different individuals resulting in the granting of three Good Show and 18 For Professionalism awards. Six individuals were recommended for Squadron or Wing level awards.

1.5 TRAINING

For training of personnel, 1 Canadian Air Division Flight Safety staff conducted 6 Basic Flight Safety Courses qualifying 180 students as Unit Flight Safety Officers/NCMs. This included 8 DND contractor staff, 15 Air Air Cadets, 7 Foreign Military and 6 Land Force personnel. The Air Division conducted one Advanced Flight Safety Course of 19 students, which included 1 DND contractor and 2 Foreign Military. The Division Flight Safety Officer also presented Flight Safety related briefings to the Flying Supervisor's Course, and the Commanding Officer's Course.

1.6 PUBLICATION NEW EDITION A-GA-135A-GA-135-001

The A-GA-135-001/AA-001 (Part 1 - Flight Safety for the Canadian Forces) underwent final review in Dec 2006. This document standardizes the risk analysis process with the OAA and TAA processes. The document has been reformatted to become a practical handbook for the creation, conduct, and administration of a comprehensive Flight Safety program across the full spectrum of CF activities. The amended document was published on 20 March 2007.

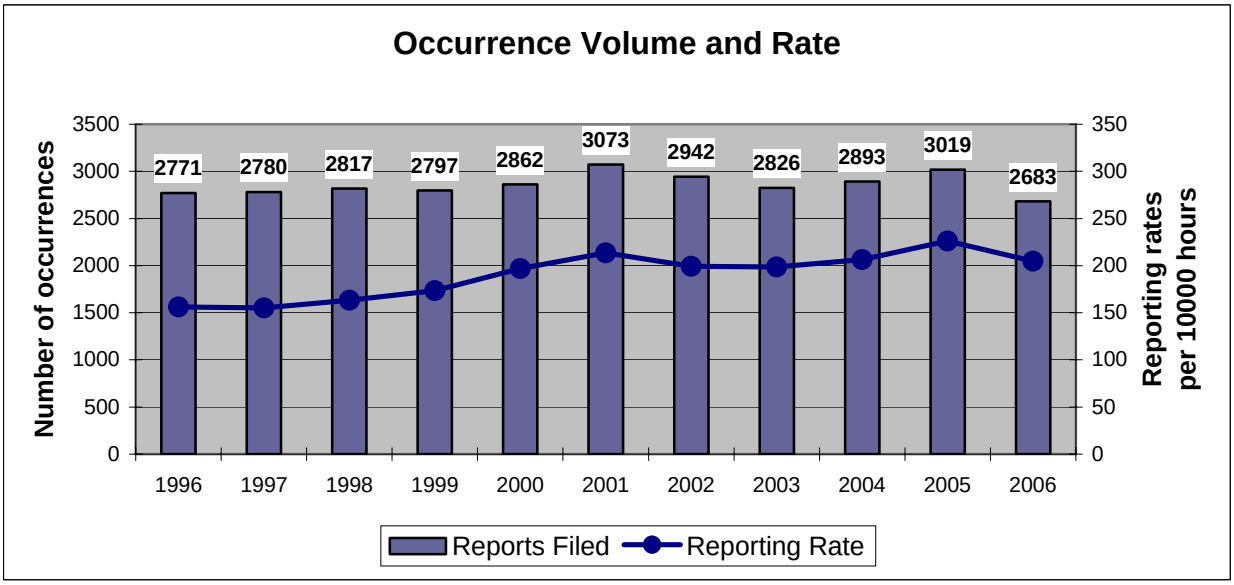
1.7 FLIGHT SAFETY OCCURRENCE MANAGEMENT SYSTEM WORKING GROUP

The Flight Safety Occurrence Management System (FSOMS) Working Group (held in Ottawa in late March 2007) recommended a list of short and long-term initiatives aimed at improving the functionality and usability of the application. FSOMS 3.0.3 was released on 7 March 2007. The application should effect earlier identification of negative trends in order to propose pro-active counter measures to the identified problem areas, and improve the tracking of the implementation of the Preventive Measures more closely from all sources.

STATISTICS AND TREND ANALYSIS

1.8 REPORTING LEVEL

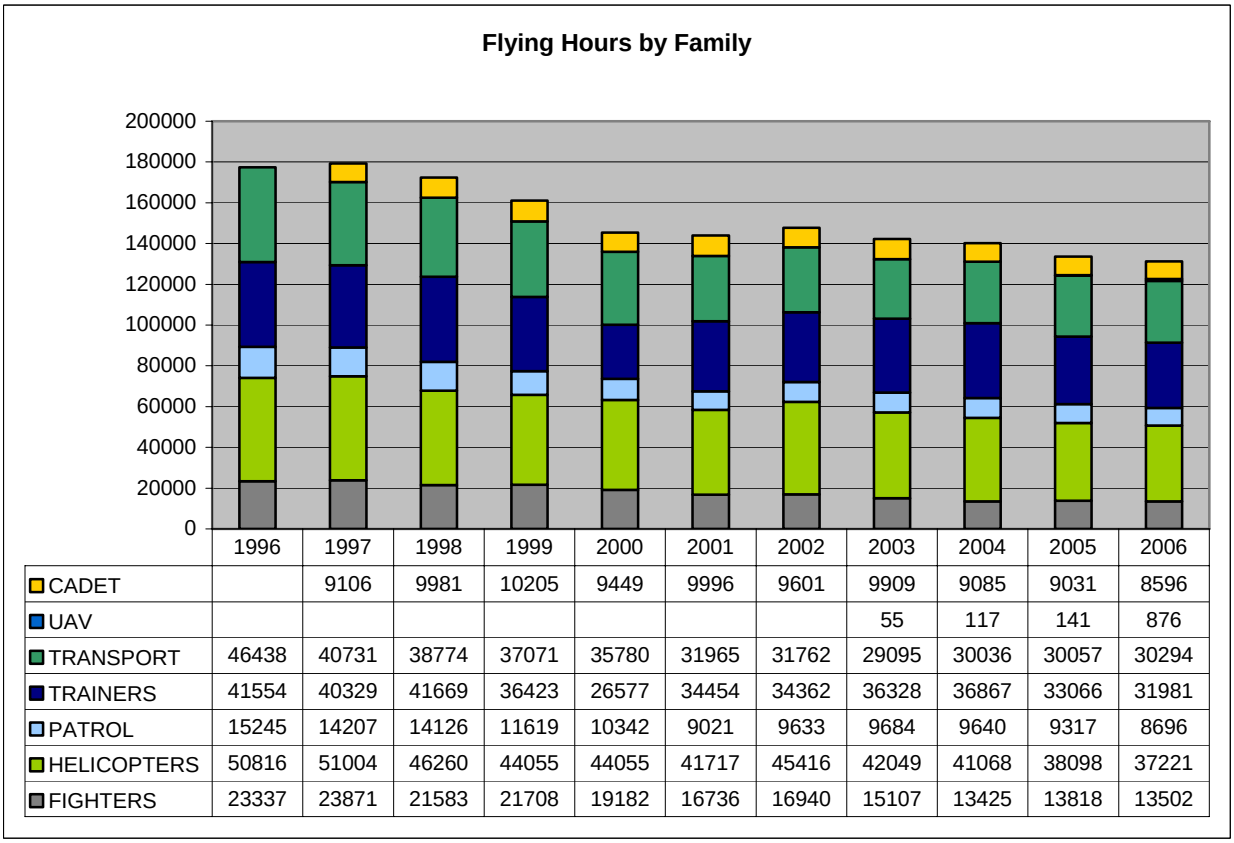
The number of occurrences reported per 10,000 hours was comparable to the last 6 years average with approximately 60% of them taking place in the air and 40% on the ground.



Graph 1 - Volume and Rates by Year - 1996 to 2006

1.9 FLYING HOURS BY FAMILY

CF flying hours (exclusive of UAVs and Air Cadets) have been steadily decreasing over the last ten years. With the exception of Transport and Fighters, all families experienced the lowest flying hours ever in 2006.

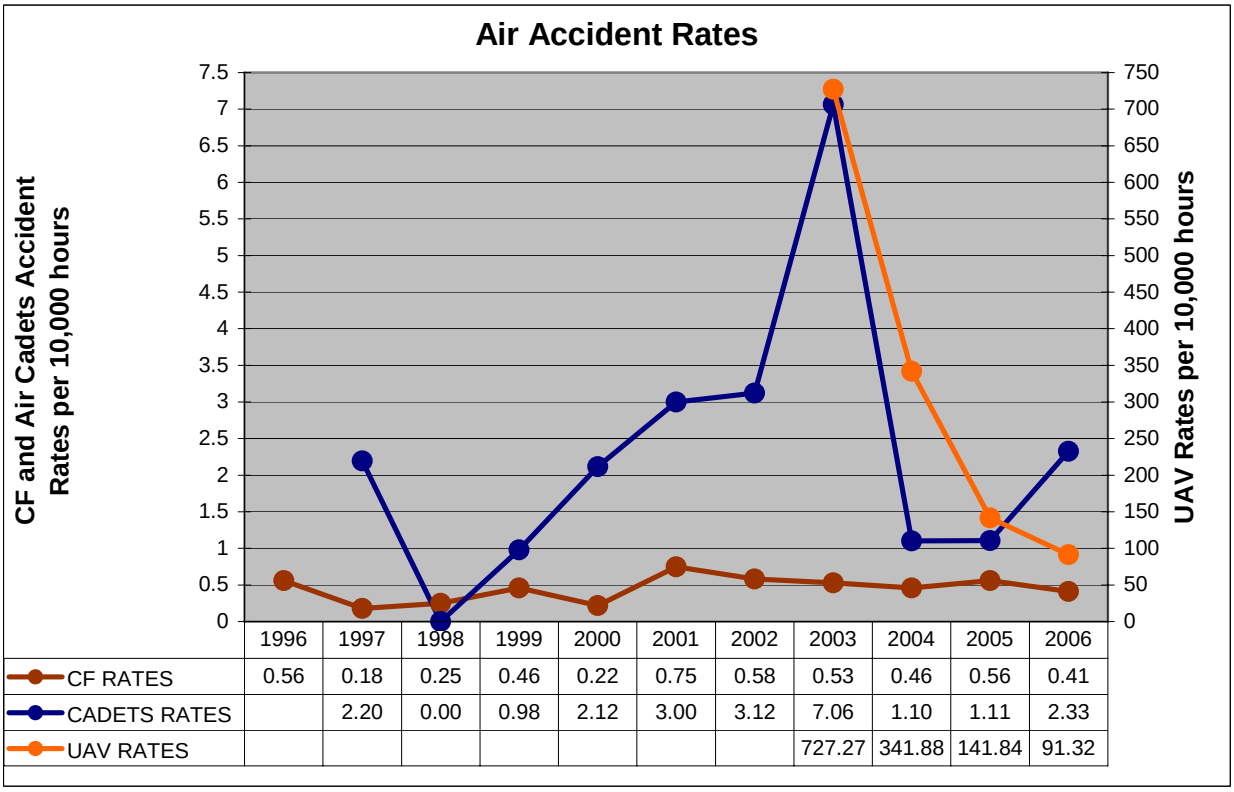


	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CADET		9106	9981	10205	9449	9996	9601	9909	9085	9031	8596
UAV								55	117	141	876
TRANSPORT	46438	40731	38774	37071	35780	31965	31762	29095	30036	30057	30294
TRAINERS	41554	40329	41669	36423	26577	34454	34362	36328	36867	33066	31981
PATROL	15245	14207	14126	11619	10342	9021	9633	9684	9640	9317	8696
HELICOPTERS	50816	51004	46260	44055	44055	41717	45416	42049	41068	38098	37221
FIGHTERS	23337	23871	21583	21708	19182	16736	16940	15107	13425	13818	13502

Graph 2 - Flying Hours

1.10 AIR ACCIDENT RATE

The CF air accident rate for 2006 (excluding UAVs and Air Cadets) was 0.41 per 10,000 flying hours, which is a 25% decrease from the previous year of 0.56 but is within the 10-year average. All the 5 accidents occurred on helicopters. Beside the Cormorant and Sea King Cat 'A' accidents, there were three Cat 'C' accidents involving the Griffon, two of them related to engine losses which by the new accident and incident definitions (effective as of 2007) of the A-GA-135 would be categorized as incidents. The accident rate for UAVs still continues to decline (down to 91.3) as UAV operations mature and airworthiness issues are better understood. The Air Cadets accident rate went up to 2.33 but is within the historical norms for Air Cadet flying. As Air Cadet flying, particularly glider operations, involves a very large number of flights of very short duration, an elevated rate in comparison to other fleets is not unexpected.



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CF RATES	0.56	0.18	0.25	0.46	0.22	0.75	0.58	0.53	0.46	0.56	0.41
CADETS RATES		2.20	0.00	0.98	2.12	3.00	3.12	7.06	1.10	1.11	2.33
UAV RATES								727.27	341.88	141.84	91.32

Graph 3 - Accident Rates by Year - 1996 to 2006

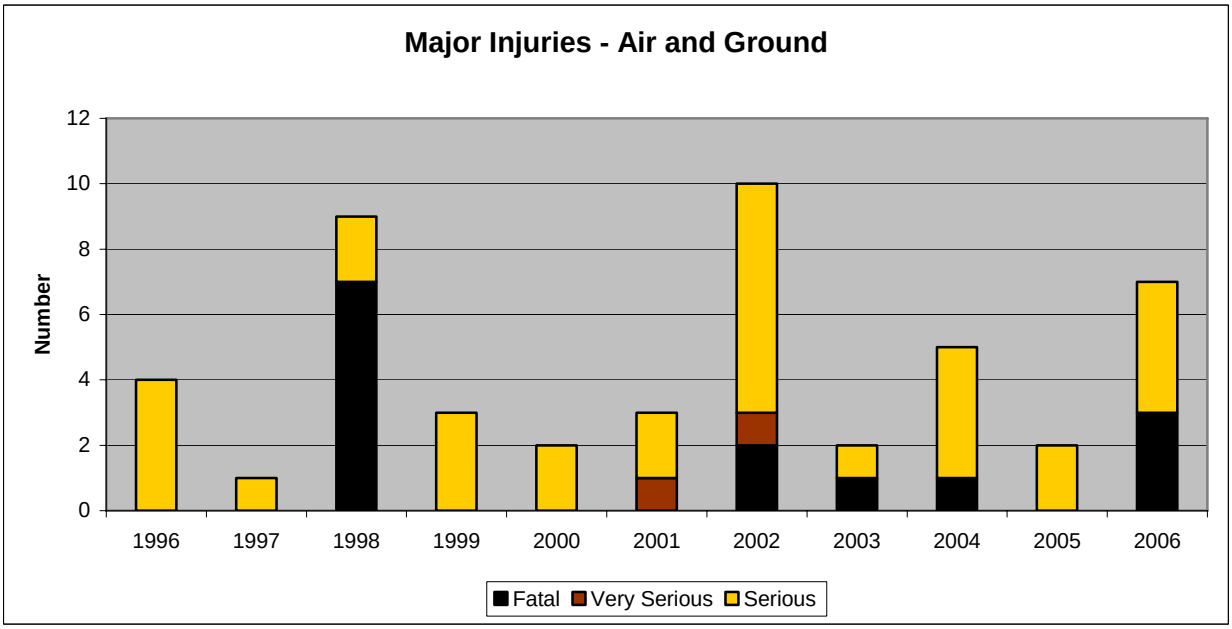
1.11 AIRCRAFT DESTROYED/WRITTEN-OFF

The number of aircraft destroyed in 2006 was six: four CF aircraft (one CH124 Sea King, one CH149 Cormorant and two Sperwer UAVs.), and two Air Cadet Schweizer gliders.

1.12 FATALITIES AND INJURIES

1.12.1 Major Injuries

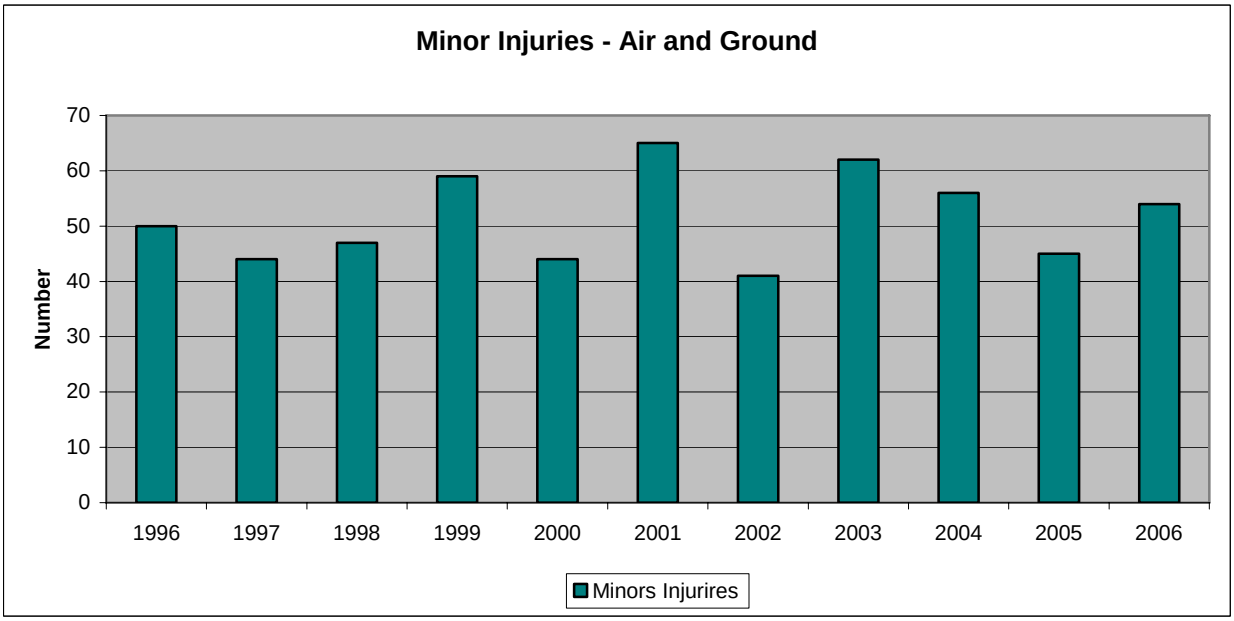
There were three fatal and two serious injuries during the CH149 Cormorant crash and two other serious injuries (one Air Cadet during a Schweizer glider off-field landing and one crewmember falling of a defective ladder while working on a Hercules aircraft).



Graph 4 - Fatalities and Serious Injuries

1.12.2 Minor Injuries

A total of 54 of minor injuries took place in 2006. These injuries were predominantly experienced by ground/support personnel.



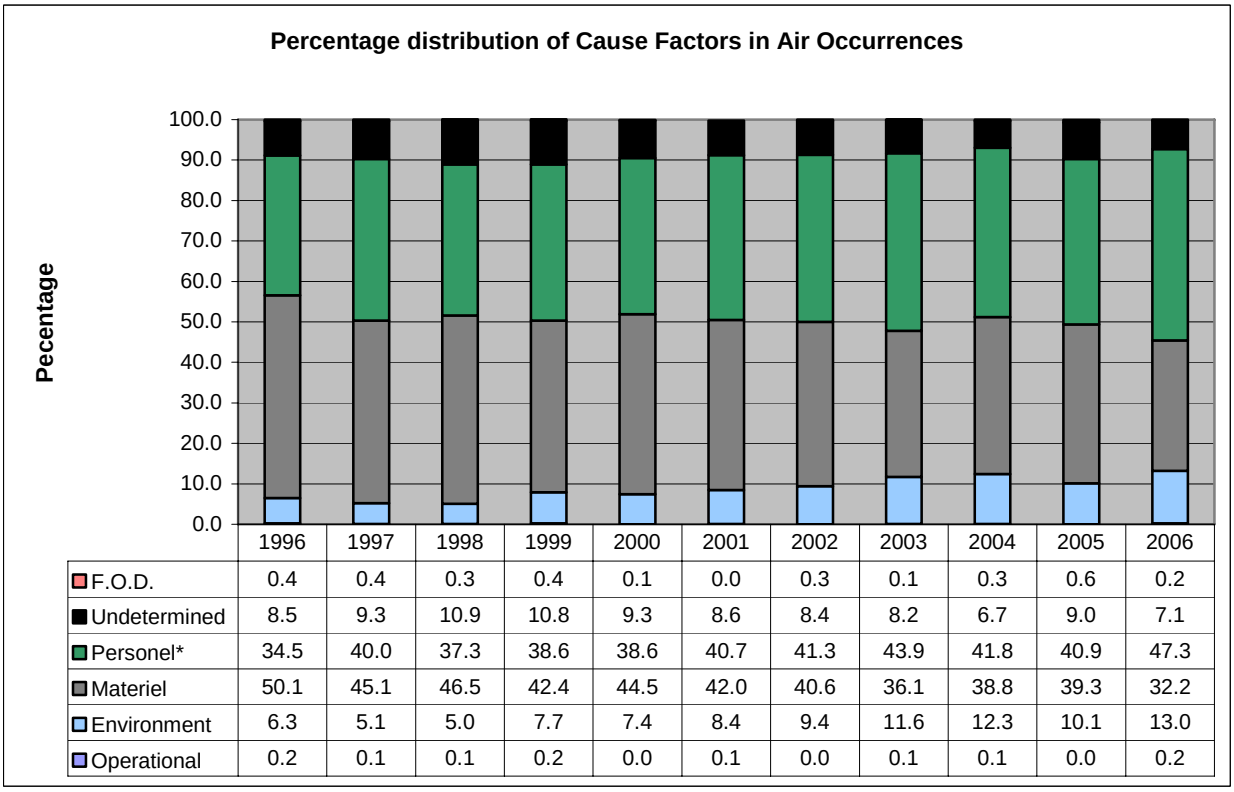
Graph 5 - Minor Injuries

1.13 CAUSE FACTORS ANALYSIS

Some 2,683 occurrences were reported in the Flight Safety Occurrence Management System which is down from the mean value of 2,900 per year.

1.13.1 Air Occurrences

In 2006, Personnel cause factors increased to 47.3% while Material cause factors has decreased, as compared to previous years (32.2%).

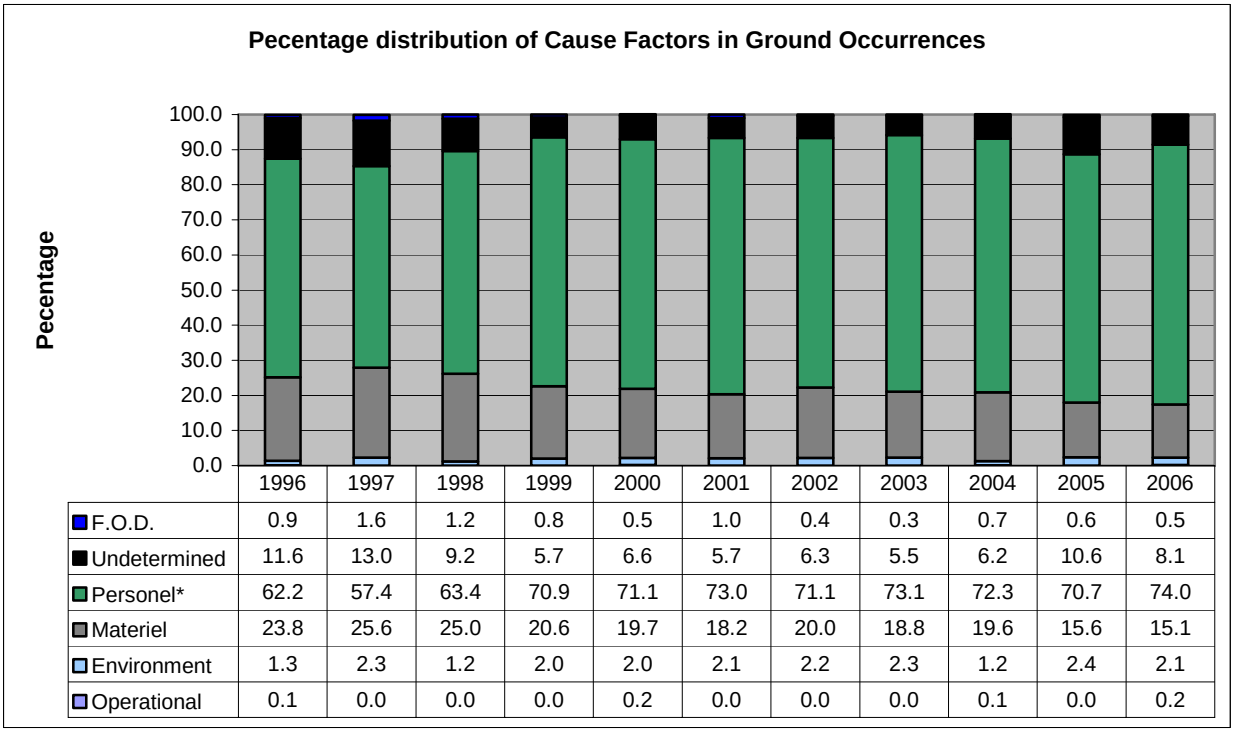


	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
F.O.D.	0.4	0.4	0.3	0.4	0.1	0.0	0.3	0.1	0.3	0.6	0.2
Undetermined	8.5	9.3	10.9	10.8	9.3	8.6	8.4	8.2	6.7	9.0	7.1
Personel*	34.5	40.0	37.3	38.6	38.6	40.7	41.3	43.9	41.8	40.9	47.3
Materiel	50.1	45.1	46.5	42.4	44.5	42.0	40.6	36.1	38.8	39.3	32.2
Environment	6.3	5.1	5.0	7.7	7.4	8.4	9.4	11.6	12.3	10.1	13.0
Operational	0.2	0.1	0.1	0.2	0.0	0.1	0.0	0.1	0.1	0.0	0.2

Graph 6 - Percentage Distribution of Cause Factors in Air Occurrences

1.13.2 Ground Occurrences

As in previous years, the overwhelming majority of cause factors in ground occurrences are attributable to personnel (74%).



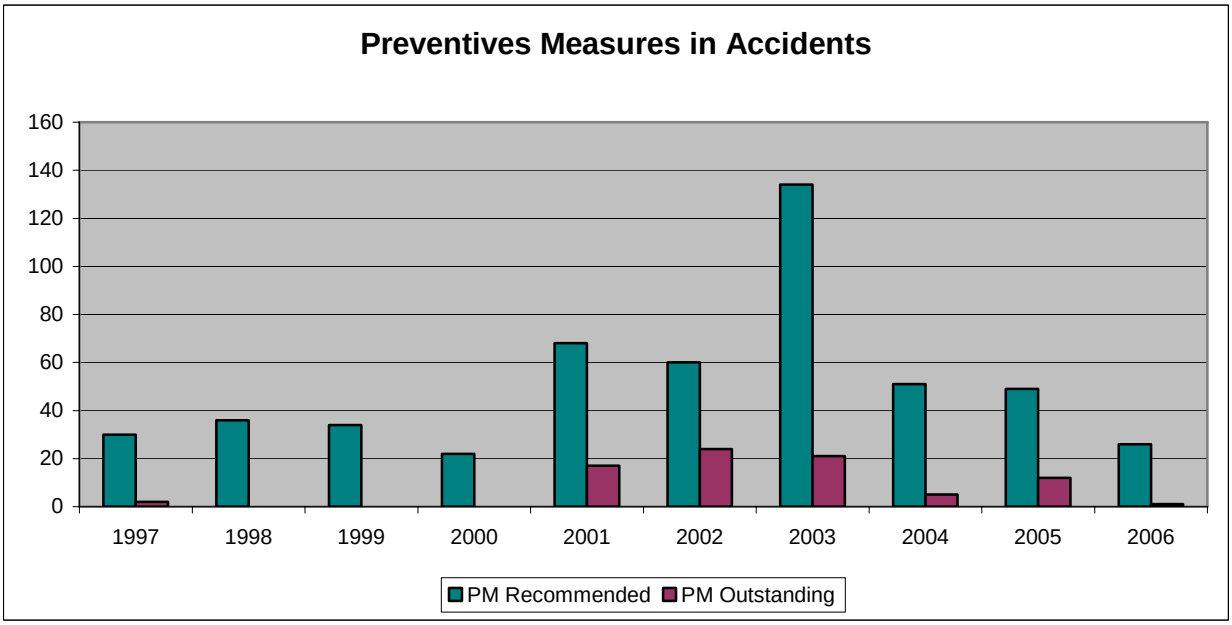
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
F.O.D.	0.9	1.6	1.2	0.8	0.5	1.0	0.4	0.3	0.7	0.6	0.5
Undetermined	11.6	13.0	9.2	5.7	6.6	5.7	6.3	5.5	6.2	10.6	8.1
Personel*	62.2	57.4	63.4	70.9	71.1	73.0	71.1	73.1	72.3	70.7	74.0
Materiel	23.8	25.6	25.0	20.6	19.7	18.2	20.0	18.8	19.6	15.6	15.1
Environment	1.3	2.3	1.2	2.0	2.0	2.1	2.2	2.3	1.2	2.4	2.1
Operational	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.2

Graph 7 - Percentage Distribution of Cause Factors in Ground Occurrences

1.14 PREVENTIVE MEASURES

1.14.1 Preventive Measures in Accidents

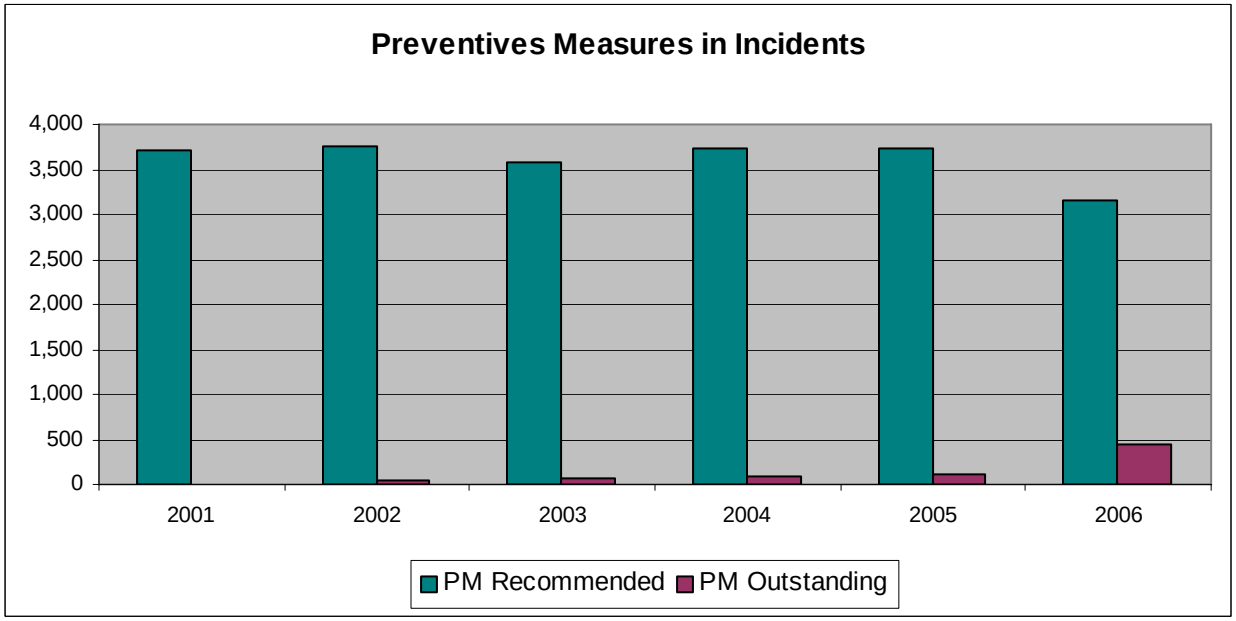
With the exception of 2 PMs in 1997, all PMs up to 2000 have been actioned. Overall, the number of outstanding PMs continues to decrease.



Graph 8 - Preventive Measures in Accidents

1.14.2 Preventive Measures in Incidents

Despite the high number of PMs for incidents, the majority are actioned in a timely fashion. The charts indicate that PMs are often actioned within a year, and typically no longer than 5 years.



Graph 9 - Preventive Measures in Incidents

DEFINITIONS

1.15 AIRCRAFT FAMILIES AND CLASSIFICATION CODE

The following outline the family classification and aircraft type in the CF.

FAMILY	CODE	DESCRIPTION
Fighters	CF188	CF18 Hornet
Helicopters	CH124A	Sea King
	CH139	Jet Ranger Bell 206B
	CH146	Griffon
	CH149	Cormorant
Patrol	CP140	Aurora
Trainers	CT102	Astra
	CT114	Tutor
	CT145	King Air
	CT146	Outlaw
	CT155	Hawk
	CT156	Harvard II
Transport	CC115	Buffalo
	CC130	Hercules
	CC138	Twin Otter
	CC142	Dash-8
	CC144	Challenger
	CC150	Polaris (Airbus 310)
UAV	CU161	Sperwer
	CU162	Vindicator
	CU163	Alatair
	CU167	Silver Fox
	CU168	Skylark

Table 3 - Aircraft Families

1.16 TERMINOLOGY

The following terms are condensed extracts from A-GA-135-001/AA-001 Flight Safety for the Canadian Forces as per the version current in 2006 (2 December 2002). The 2007 Annual Report

will reflect the terminology of the latest version of the A-GA-135 (20 March 2007). Essentially, an air accident or air incident occurs between the time the aircraft is started with the intent for flight and the time it is shut down; at any other time the event would be either a ground accident or incident.

1.16.1 Occurrence

The non-specific term occurrence refers to an air or ground flight safety event. An occurrence can be defined as either an accident or an incident dependent upon the assigned category.

1.16.2 Damage Category

Damage to an aircraft is said to have occurred when the aircraft, or any portion thereof, is lost or requires repairs or replacement as a result of unusual forces. eg. Collision, impact, explosion, fire, rupture, overstress, upset, wilful damage, sabotage, or vandalism. This does not include faults that progressively develop as a result of normal flight stresses, eg., repeated applications of loads at or below the design operating limits of the aircraft which in long term result in fatigue failure. Such failures which may be beyond unit resources to repair, or may require replacement of major components, may be classified as progressive wear if the equipment has not been misused or subjected to unusual forces as indicated above. Accordingly, such failures will not be classed as damage but normal wear resulting from prolonged service use. Additional damage which may result from such failures must, however, be classified appropriately. The routine type of system or component unserviceability is not considered to be damage, and need not to be reported unless the originator feels that it has accident potential. The categories of aircraft occurrences reflect the degree of damage as follow:

- ‘A’ Category: The aircraft is destroyed, declared missing or damage beyond economic repair.
- ‘B’ Category: The aircraft has sustained damage to major components beyond normal second-level maintenance capability and would normally required to be shipped to a 3rd line repair faculty. The overall structure damage is assessed as within economical repair.
- ‘C’ Category: The aircraft must be flown to a contractor or depot-level facilities for repairs; repairs are carried out by a mobile repair party; or a major component has to be replaced
- ‘D’ Category: Damage to any component that can be repaired within field-level resources.
- ‘E’ Category: No aircraft damage, but accident potential exists.

1.16.3 Accident

An event in which the aircraft or person is missing, where there is an A, B or C category aircraft damage, or a person received fatal or serious injury. An accident involving more than one

aircraft, is counted as one accident.

1.16.4 Incident

An event where there is a category ‘’D’’ damage or a person received a minor injury; or E category where there is a risk of injury or accident potential, but no aircraft damage. An incident involving more than one aircraft is counted as one incident.

1.16.5 Rate

The number of occurrences per ten thousand flying hours. For example, four accidents in 30,000 flying hours would result in a 1.33 rate.

1.16.6 Cause Factors

Any event, condition or circumstances, the presences or absence of which, within reason, increased the likelihood of the occurrence. Cause assessments constitute the basis for the creation and application of preventives measures. Listed below are the definitions for the six cause factors that are assigned to aviation occurrences in the Canadian Forces.

- Personnel: Acts of omission or commission by those responsible in any way for the aircraft operations, which cause an accident or incident. Personnel factors include the individual e.g. pilot, technician, manager, or supervisor.

- Materiel: Materiel failures include failure of aircraft components and any facility related to flight, which has a bearing on the accident or incident. An example of a related facility materiel failure would be a situation where the aircraft is on a final PAR approach and the controller’s equipment fails.

- Environment: Included in this category are such hazards as birds and weather which exists in the aircraft operation environment. This factor is assigned only if all reasonable precautions have been taken and applied to a condition that is beyond human control within the present state of the art.

- Operational: This cause factor is used when an accident or incident occurs as a result of a specific search and rescue flight or during commitments related to the preservation of national security as defined by the B-GA-100. When this cause factor is assigned it must be recommended by the Commander 1 Canadian Air Division and approved by the Chief of the Air Staff.

- Unidentified FOD: This cause factor is used when aircraft damage results from a foreign object that cannot be identified or the source determined.

- Undetermined: This cause factor is applied to occurrences when the evidence available is insufficient to permit a reasonable determination of the cause; however, probable causes are normally assigned so that preventive measures can be implemented.

1.16.7 Human Factors Analysis and Classification System (HFACS)

HFACS is a general human error framework used as a tool for investigating and analyzing the human causes of aviation occurrences.

1.16.8 Preventives Measures

A preventative measure (PM) is any step that can be taken to decrease the likelihood of an aircraft occurrence. When practical, one or more PMs should be applied to each cause factor assigned to an occurrence.

STATISTICAL DETAILS

1.17 FLYING HOURS BY AIRCRAFT TYPE

AIRCRAFT TYPE	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
TOTAL	170142	162411	150876	135936	133893	138113	132317	131155	124497	122544
CC115	2480	2424	2492	2967	2304	2115	2439	1839	2526	2065
CC130	23412	22036	21556	20360	17656	17067	14833	16422	15248	16236
CC142	3930	4183	3499	2735	2259	2300	2328	2446	2660	2760
CC144	3598	3213	2821	2881	2963	3157	2812	2979	2815	2706
CC150	4026	3923	4154	4079	4328	5267	4760	4516	4847	4903
CF188	23871	21519	21536	19052	16620	16872	15089	13425	13818	13502
CH124A	10211	9291	9068	9002	9108	10027	8236	8480	6855	6917
CH139	7547	5877	5602	6121	6527	6666	6070	6371	5024	4613
CH146	24119	25238	23319	22627	20477	21487	21211	21185	21633	21147
CH149	0	0	0	0	239	3196	4906	4568	4586	4563
CP140	14207	14126	11619	10342	9021	9633	9684	9640	9317	8696
CT102	0	0	0	0	0	0	0	0	0	2118
CT111	3163	3747	4730	3879	4073	3230	2994	4163	3079	0
CT114	23093	25330	22983	12503	3408	3781	3894	3903	3738	4101
CT145	5091	4300	4108	4274	3708	3951	4771	5079	3271	2141
CT146	0	0	0	0	0	0	0	0	38	93
CT155	0	0	0	592	5128	7342	8383	8446	9137	8806
CT156	0	0	0	2213	13016	14474	15838	14942	13728	14722
RETIRED FLEET	21394	17205	13391	12310	13059	7550	4015	2634	2036	1581

Table 4 - Flying Hours by Aircraft Type

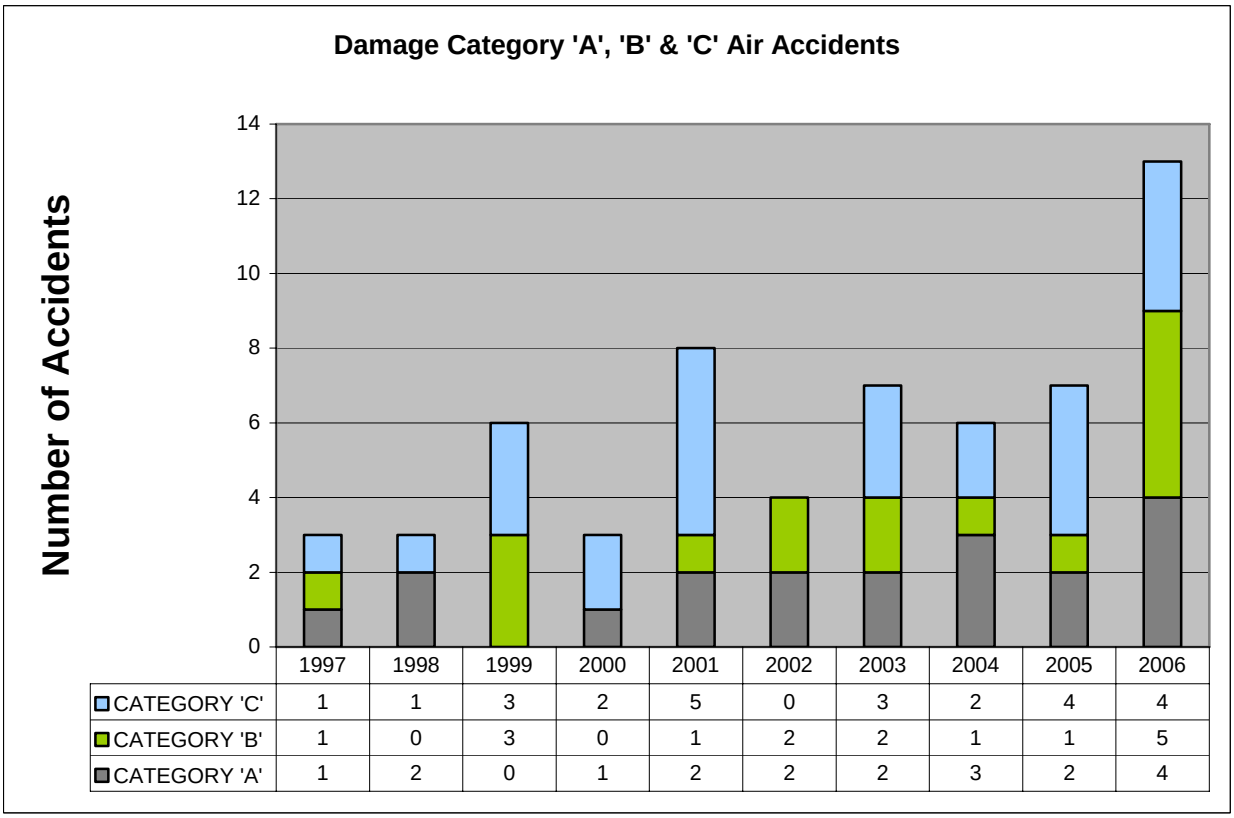
1.18 AIRCRAFT WRITE-OFF 10 YEAR SUMMARY

CASE ID	DATE	AC	TAIL #	LOCATION	DESCRIPTION
28522	25 September 1997	CT114	048	Moose Jaw Area, SK	Birdstrike
79005	02 October 1998	CH113	305	Marsoui, QC	In-flight break-up
28743	10 December 1998	CT114	156	Moose Jaw Training Area	Mid Air
100494	23 June 2000	CH124A	422	At sea	Ditching
104593	21 June 2001	CT114	006	London, ON	Mid Air
106002	10 October 2001	CH139	320	Edmonton, AB	Auto-rotation training
108852	02 July 2002	CH139	308	Southport, MB	Auto-rotation training
109081	18 July 2002	CH146	420	40NM West of Goose Bay, NL	Tail-Rotor Failure
111359	27 February 2003	CH124A	401	At Sea	Crash on take off
112191	26 May 2003	CF188	732	Cold Lake, AB	Crash
116524	14 May 2004	CT155	202	Moose Jaw, SK	Birdstrike
119527	10 December 2004	CT114	173	Moose Jaw Area, SK	Mid-Air
119527	10 December 2004	CT114	064	Moose Jaw Area, SK	Mid-Air
122639	16 August 2005	CF188	745	Bagotville, QC	Crash
122771	24 August 2005	CT114	120	Thunder bay, ON	Loss of thrust
125184	2 Feb 2006	CH124	438	30 NM East of Denmark	CFIT
127667	13 July 2006	CH149	914	Canso, NS	CFIT

Table 5 - Aircraft Write Off 10-year Summary

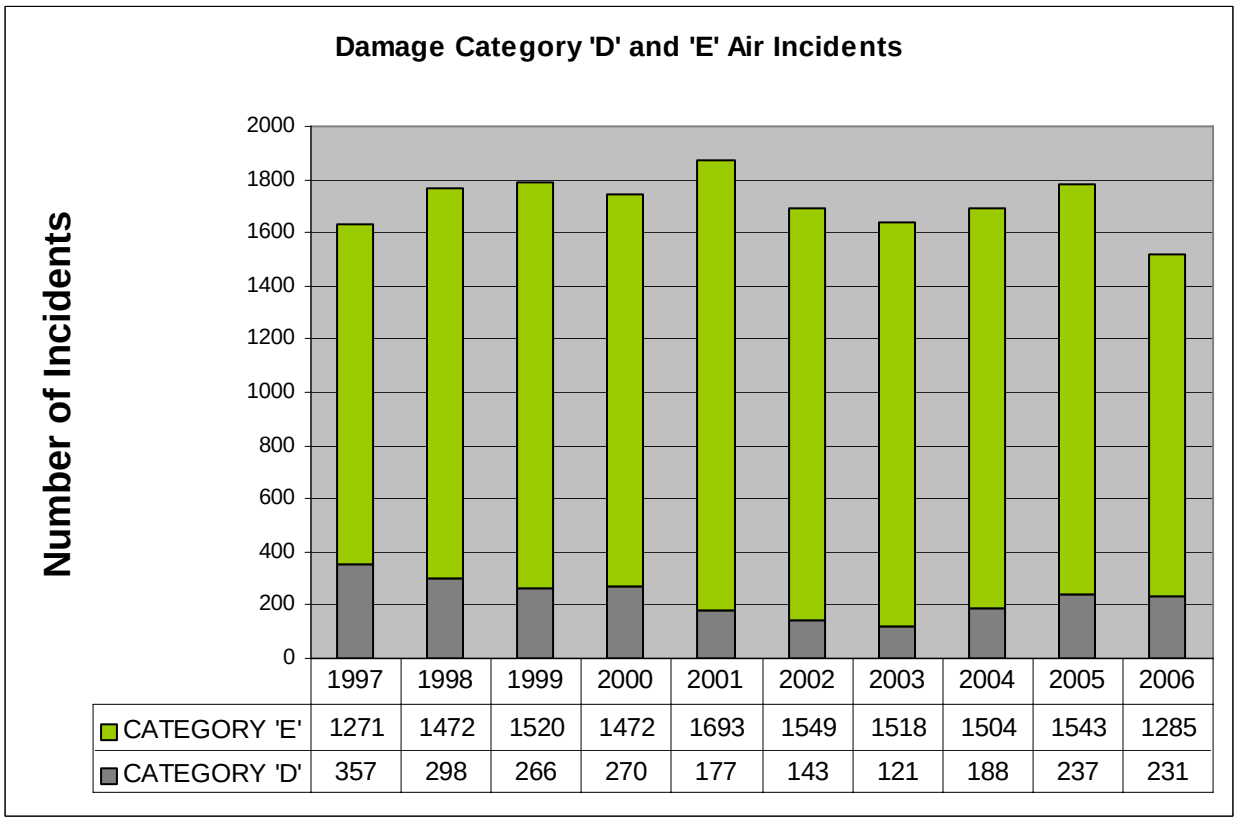
1.19 DAMAGE

1.19.1 Damage Category ‘A’, ‘B’ and ‘C’ Air Accidents



Graph 10 - Damage Category 'A', 'B' and 'C' Air Accidents

1.19.2 Damage Category ‘D’ and ‘E’ Air Incidents



Graph 11 - Damage Category 'D' and 'E' Air Incidents

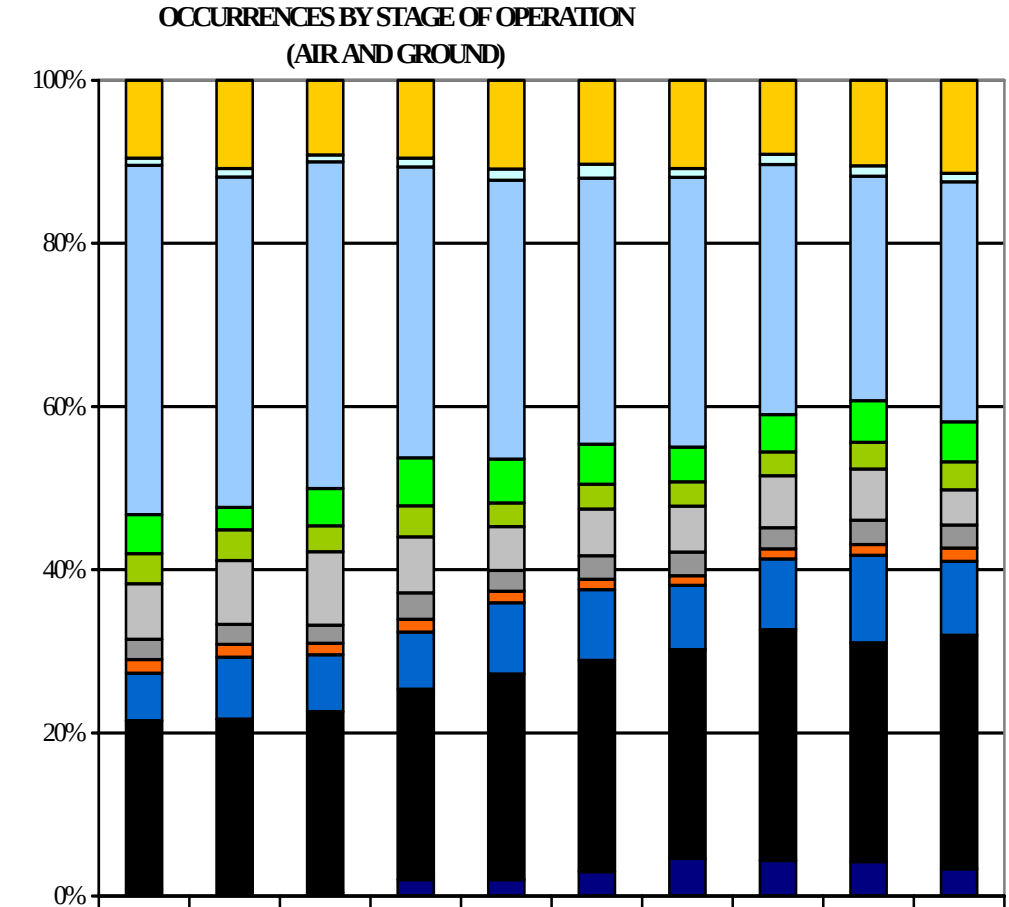
1.19.3 Damage Category ‘A’ to ‘E’ Ground Occurrences

DAMAGE CATEGORY	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CATEGORY ‘A’	0	0	0	0	0	0	0	0	0	0
CATEGORY ‘B’	0	0	0	0	0	0	1	0	0	0
CATEGORY ‘C’	0	1	1	0	0	0	0	2	1	0
CATEGORY ‘D’	334	327	252	242	191	181	152	280	324	283
CATEGORY ‘E’	699	630	659	707	879	917	888	794	804	717

Table 6 - Damage Category 'A' to 'E' Ground Occurrences

1.20 10-YEAR ANALYSIS OF CAUSE FACTORS

1.20.1 Occurrences by Stage of Operation



	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Landing	244	283	245	256	318	285	289	248	303	284
Go Around	22	27	23	28	40	48	28	35	37	25
In-Flight	1092	1060	1074	955	1000	903	882	840	794	733
Take-Off	122	72	123	157	157	136	113	125	148	122
Taxi	93	99	85	103	85	84	80	80	94	85
Ground Running	174	204	241	183	157	160	150	174	181	108
Load/Unload / Weapon Handling	64	65	60	86	75	79	77	72	87	70
Towing	42	41	38	42	41	36	31	33	38	40
Parked	149	198	186	188	256	240	210	237	309	226
Maintenance	548	568	595	625	737	718	683	775	776	713
Not Reported	0	0	12	54	59	83	123	120	121	83

Graph 12 - Occurrences by Stage of Operation - Air and Ground (Air Cadets, NON CF and UAV's excluded)

1.21 HFACS CAUSE FACTORS

1.21.1 Air Occurrences HFACS Cause Factors Breakdown

HFACS CAUSE FACTORS		2005	2006	CHANGE	%
TOTAL ACTIVES FACTORS		**1145**	**1111**	**-34**	**-3%**
Errors	Attention Memory	438	429	-9	-3%
	Decision Errors	185	183	-2	-2%
	Technique Based Errors	371	322	-49	-13%
	Knowledge of Information	72	90	18	20%
	Perceptual Errors	34	30	-4	-12%
Rule and regulation	Routine	13	18	5	38%
	Exceptional	32	39	7	18%
TOTAL LATENT FACTORS		**980**	**1029**	**49**	**5%**
Conditions of Personnel	Mental State	550	575	25	5%
	Physiological States	7	9	2	29%
	Physical Mental Limitation	16	21	5	31%
Working Conditions	Equipment	17	24	7	41%
	Workspace	16	21	5	31%
	Environment	27	33	6	22%
Practices of Personnel	Resource Management	76	88	12	16%
	Personal Readiness	9	3	-6	-67%
	Qualification	5	6	1	20%
	Training	40	50	10	25%
Supervision	Rules and Regulation	7	5	-2	-29%
	Planned Activities	24	19	-5	-21%
	Problem Correction	15	14	-1	-7%
	Level of Supervision	84	86	2	2%
Organisational Influences	Resource Management	34	16	-18	-53%
	Organisational Climate	6	14	8	133%
	Organisational Process	47	45	-2	-4%

Table 7 - Air Occurrences HFACS Cause Factors Breakdown

1.21.2 Ground Occurrences HFACS Cause Factors Break-down

HFACS CAUSE FACTORS		2005	2006	CHANGE	%
TOTAL ACTIVES FACTORS		**1177**	**1077**	**-100**	**-8%**
Errors	Attention Memory	563	513	-50	-9%
	Decision Errors	145	123	-22	-15%
	Technique Based Errors	231	185	-46	-20%
	Knowledge of Information	121	129	8	7%
	Perceptual Errors	17	15	-2	-12%
Rule and regulation	Routine	35	39	4	11%
	Exceptional	65	73	8	9%
TOTAL LATENT FACTORS		**1001**	**1018**	**17**	**2%**
Conditions of Personnel	Mental State	427	406	-21	-5%
	Physiological States	5	3	-2	-40%
	Physical Mental Limitation	9	5	-4	-44%
Working Conditions	Equipment	38	41	3	8%
	Workspace	17	38	21	124%
	Environment	11	21	10	91%
Practices of Personnel	Resource Management	63	99	36	57%
	Personal Readiness	3	0	-3	-100%
	Qualification	9	12	3	33%
	Training	34	45	11	32%
Supervision	Rules and Regulation	22	17	-5	-23%
	Planned Activities	29	31	2	7%
	Problem Correction	26	26	0	0%
	Level of Supervision	172	148	-24	-14%
Organisational Influences	Resource Management	61	43	-18	-30%
	Organisational Climate	24	18	-6	-25%
	Organisational Process	51	65	14	27%

Table 8 - Ground Occurrences HFACS Cause Factors Breakdown

1.22 SYSTEM DESCRIPTOR BY FLEET

Two common themes were identified fleet wide:

- First, there was an increase in the number of occurrences related to survival and safety equipment in several fleets. This analysis reinforced a concern noted in a number of

recent Flight Safety Investigation Reports in which Aviation Life Support Equipment (ALSE) was deficient. DFS staff is actively investigating this issue with the OAA and the TAA staffs.

- Second, several fleets suffered from a high number of occurrences where panels/doors were left unsecured for flight. DFS staff has identified a requirement for further research on this issue.

Table 9 below shows the main trends detected for each aircraft in the CF.

AIRCRAFT TYPE	TREND DETECTED	10-YEAR MEDIAN RATE	2006 RATE	CHANGE FROM 10-YEAR MEDIAN RATE	% CHANGE
CC115 Buffalo	Flight Instruments	2.5	19.4	+16.9	683.8
	Undercarriage (Landing Gear)	20.6	48.4	+27.8	135.1
	Weapons Systems	15.7	63.0	+47.3	302.2
CC130 Hercules	Hydraulics	4.6	7.4	+2.8	59.6
	Survival and Safety Equipment	8.4	13.6	+5.1	60.5
CC142 Dash 8	Fuselage/Wings/Empennage	6.2	10.9	+4.7	76.3
CF188 Hornet	Electronic Warfare Equipment	2.3	5.9	+3.7	161.1
	Elevators and Stabilator	2.5	4.4	+1.9	75.0
CH146 Griffon	Fuselage/Wings/Empennage	7.2	10.9	+3.7	52.0
	Hydraulics	2.4	3.8	+1.4	59.7
	Survival and Safety Equipment	3.4	5.2	+1.8	53.4
CH149 Cormorant	Survival and Safety Equipment	9.1	15.3	+6.2	67.7
CP140 Aurora	Electrical Systems	17.3	32.2	+14.9	86.3
	Electronic Warfare Equipment	4.2	6.9	+2.7	65.6
	Engine	6.3	10.3	+4.1	64.5
	Flaps	4.7	10.3	+5.7	120.3
	Fuel System	5.1	11.5	+6.4	127.6
	Pneumatics	11.3	19.5	+8.3	73.7
CC138	Electrical Systems	6.6	25.3	+18.7	282.8

AIRCRAFT TYPE	TREND DETECTED	10-YEAR MEDIAN RATE	2006 RATE	CHANGE FROM 10-YEAR MEDIAN RATE	% CHANGE
Twin Otter					
CT114 Tutor	Fuselage/ Wing / Empennage note 2	10.8	36.6	+25.8	240.0
	Undercarriage (Landing Gear)	8.5	24.4	+15.9	187.1
CT155 Hawk	Controls	1.8	6.8	+5.0	279.9
	Elevators and Stabilator	0.3	3.4	+3.2	1229.7
	Flaps (Mainly Aircrew Handling) note 3	7.4	14.8	+7.3	98.7

Table 9 - System Descriptor by Fleet

Notes

1. Cormorant data analysis since years 2002
2. Tutor data analysis since 2001 (mainly Snowbird ops)
3. Hawk data analysis since 2000