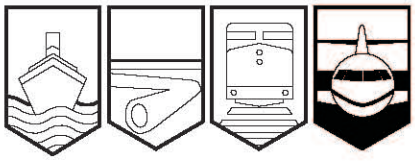
Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada



Transportation Safety Board
Helicopter Related Safety Advisories
and Safety Letters

Canada

Summary of TSB Helicopter Related Safety Advisories 1999-2008

TSB reference	Occ. No.	Narrative
Advisory A08A0007-D1-A1	A08A0007	*Eurocopter AS 350 BA Flight Manual Autorotation Landing Training Procedure* - Nearing the end of the exercise, the fuel flow control lever was advanced to restore power to the engine with a view of executing an overshoot. The engine (a Turbomeca Arriel 1B, serial number 1493) did not spool up as expected. The pilot continued the autorotation contacting the ground at a high rate of descent. Both pilots sustained serious injury; the helicopter was destroyed. The European Aviation Safety Agency may wish to review the autorotation landing training procedure in the AS 350 BA FM with the aim of reducing the risk of inappropriate manipulation of the FFCL during autorotation training.
Advisory A07P0344-D1-A1	A07P0344	*Bell 204B Helicopter Tail Rotor Drive Quill Assembly – Inadequate Overhaul Instructions* On the morning of 6 October 2007, a Bell 204B helicopter was helilogging in the Woodbury Creek Forest Service Road area when the pilot smelled something burning. The burning smell very quickly became stronger and the helicopter began an uncommanded rotation; the rotation increased abruptly. The pilot rolled off the throttle and entered an autorotation from about 200 feet above ground level. The rate of descent increased during the approach and collective had little effect in reducing the descent rate. The helicopter landed hard in the chosen landing area and was substantially damaged. There was no fire. Transport Canada may wish to liaise with the Federal Aviation Administration and Bell Helicopter to ensure the applicable instructions for continued airworthiness for the repair and overhaul of the tail rotor drive quill part number 204-040-207-013 are adequate.
Advisory A07O0314-D1-A1	A07O0314	*Failure of the 41-tooth bevel gear in Turbomeca Arriel Turbo-shaft engines* - (sent 25 Jan 08) On 23 November 2007, an AS350-B3 helicopter, powered by a Turbomeca Arriel 2B engine, was in cruise flight at approximately 2000 feet asl when the engine lost all power. The pilot carried out an autorotation and landed in a farm field. There was no damage to the helicopter, and the pilot and sole passenger were uninjured. The Transportation Safety Board of Canada is concerned about the recent failures of the 41-tooth bevel gear on the Turbomeca Arriel series engines because the cause of the fatigue cracking has not yet been identified, Turbomeca has not developed a feasible method of inspecting the gear in-situ, and there is no system available to warn of an impending 41-tooth bevel gear failure. Failure of the 41-tooth bevel gear will trigger an immediate uncommanded in-

TSB reference	Occ. No.	Narrative
		flight engine shutdown, which can result in substantial damage to the helicopter and death or serious injury to the occupants. Transport Canada may wish to review the action taken thus far by Turbomeca to reduce the probability of failure of the 41-tooth bevel gear.
Advisory A06W0143-D1-A1	A06W0143	*Loose B-nuts on Allison/Rolls-Royce 250 Series Engines' Pneumatic Lines* - On 20 August 2006, the Bell 206L-3 helicopter was conducting oil field operations 40 nautical miles northeast of Lac La Biche, Alberta. During departure from an oil well site, the engine (Allison 250-C30P) lost power. The pilot entered autorotation and the helicopter struck the ground at a high rate of descent, which resulted in substantial damage. The pilot sustained serious injuries. The TSB classified this accident as a Class 5 occurrence. Transport Canada may wish to consider mandating the retrofit of critical B-nuts on pneumatic fuel control tubes on Allison/Rolls-Royce 250 series engines with available positive secondary locking fasteners or devise another means to provide positive secondary locking security on critical B-nuts on these engines, in order to reduce the risk of in-flight loss of engine power.
Advisory A06P0123-D1-A1	A06P0123	*Improper Engagement of Collective Lever Lock in AS350 Helicopters* - On 5 July 2006 at the Grand Prairie airport, Alberta, the pilot of the AS350 B2 was conducting the pre-flight hydraulic test sequence when, during the lateral servo check, the helicopter tilted back sharply and became airborne. The pilot could not push the collective lever down and could not prevent the helicopter from lifting-off to about 15 feet above the ground. The helicopter then turned left, descended tail down, and rolled to the right. The main rotor blades struck the ground and broke off, and the fuselage fell onto its right side. The pilot was not injured but the helicopter was substantially damaged. Transport Canada may wish to pursue this issue of improper engagement of the collective lever lock with the helicopter manufacturer, with the aim of improving the functionality and durability of the collective lever lock, thus reducing the risk of unintentional release.
Advisory A06P0123-D3-A1	A06P0123	*AS 350 Helicopter Pre-Flight Hydraulic Test – Duration of Cyclic Movements* – same occurrence as above. Although the current pre-flight hydraulic accumulator test meets requirements it may not be adequate to identify a failing accumulator in a timely manner. In light of the preceding information, Transport Canada may wish to examine

TSB reference	Occ. No.	Narrative
		and review this hydraulic test procedure with the aim of reducing the risk of unintentional helicopter movement on the ground.
Advisory A06P0123-D2-A1	A06P0123	*AS350 Helicopter Hydraulic Accumulator Test - Rotor RPM Requirement*– same occurrence as above. Lower rotor speed produces lower aerodynamic forces, which are insufficient for flight. Conducting the accumulator test at lower rotor speed reduces the risk of unintentional and violent helicopter movement on the ground in the event of an uncommanded servo response to accumulator exhaustion coincident with a disengaged collective lever lock. Transport Canada may wish to examine and review the requirement to conduct the hydraulic test procedure at 100% rotor RPM.
Advisory A060024-1	A05W0205	*Engine Combustion Chamber Inspection* – (sent 29 Jun 06) On 28 September 2005 a Bell 205A-1 was performing heli-slinging operations 21 nm south east of Tumbler Ridge, BC. While in a hover, with a seismic drill on a long line, a loud bang was heard and engine (Lycoming T5317A, serial number LE07284X) power was lost. The helicopter descended and impacted the trees, injuring the pilot and substantially damaging the helicopter. Transport Canada and the manufacturer may wish to consider a periodic non-destructive inspection (such as ultrasonic) to detect the onset of cracking before penetration to the external surface occurs. There has been no loss of life to date, but the potential, as shown in this occurrence, should be considered.
Advisory A050015-1	A05P0103	*Hazardous fixture in cabin of Messerschmitt-Bolkow-Blohm BO 105 helicopter* - On 07 May 2005, a Messerschmitt-Bolkow-Blohm (MBB) BO 105 helicopter was being used to carry out external load (sling) operations near Bella Bella, BC. While en route over the ocean, at a height of about of 200 feet and at a airspeed of about 60 knots, the load appeared to go above and behind the tail-rotor. The long line was then observed to be hanging from the back of the helicopter. The helicopter slowed, then began to descend in a spin. The aircraft crashed onto the ocean surface and sunk immediately in 26 metres of water. The pilot was able to exit the sinking helicopter, but ended up face-down in the water. He was wearing a life jacket, but it had not been inflated. The pilot was rescued within three minutes and was revived, but was seriously injured because of his near-drowning. Given the risk to persons seated in the front seat who are not wearing protective head gear, Transport Canada may wish to modify the fixtures that hold the life rafts in the MBB BO 105 helicopters to remove the hazard; or, limit use of the front seats to persons wearing protective head gear. Transport Canada may also wish to check whether other

TSB reference	Occ. No.	Narrative
		aircraft have been modified and have similar hazards. ASSESSMENT While TC's stated intentions were satisfactory, staff checked the operations TC are carrying out on behalf of the CCG in the Pacific region and found the BO 105 helicopters are operating, as they were at the time of the accident, with no modifications to the fixtures, no padding was added to them, and the passengers in the front seats are not wearing helmets and are not required to. Given this information, the response is rated as Unsatisfactory. NEXT TSB ACTION Staff will follow-up with TC ASD to encourage that their proposed action be expedited.
Advisory A050010-1	A05P0038	*Dual Engine Power Loss - Power Turbine Governor Rigging* - On 24 February 2005 near Blue River, B.C., a Bell 212 HP Helicopter was conducting heli-skiing operations. At about 150 feet above ground level, and about 30 knots airspeed, the pilot increased the collective pitch and simultaneously pushed forward on the rpm beep switch to increase the engines' rpm. The engines did not respond, the low rotor rpm warning sounded and the rotor rpm decreased. As the sink rate could not be arrested, the helicopter landed hard and yawed right about 90° but remained upright, sustaining substantial damage. Because power turbine governors are essential engine controls which can cause critical power losses when they malfunction, Pratt & Whitney Canada, in cooperation with Honeywell, may wish to review the effects of having to rig the PT6 power turbine governor control arms in the 75° range.
Advisory A050009-1	A05P0038	*Dual Engine Power Loss - Power Turbine Governor Malfunctions* – same narrative as above. Transport Canada, in cooperation with Honeywell, Pratt & Whitney Canada and Rolls-Royce, may wish to review the TBOs approved for these governors.
Advisory A060031-1	A05F0025	*Provision of Unique Warning Horn for Low Rotor Speed in AS 350 Helicopters* - On 6 February 2005, the pilot of a Eurocopter AS 350 B2 helicopter with a 120-foot longline attached, entered a stable, out-of-ground-effect hover. As the pilot gradually descended, and at a height of about 10 feet above the ground, he experienced significant binding in the flight controls. During 15 seconds of random, uncontrolled hover flight, the helicopter turned and climbed to about 20 feet, whereupon the pilot retarded the throttle lever. The main rotor rpm decayed rapidly and the low-rotor warning horn

TSB reference	Occ. No.	Narrative
		sounded. The helicopter descended quickly and struck the ground causing substantial damage to the skids, the tail boom, and the main rotor head. The pilot was not injured. Transport Canada may wish to pursue this issue with the helicopter manufacturer, with the aim of providing pilots with unique aural warnings for both the low rotor rpm situation and the less time-critical hydraulic system low-pressure event.
Advisory A050017-1	A05F0025	*Fitment of Protective Cover to the Hydraulic Test Switch of AS 350 Helicopters* – same narrative as above Transport Canada may wish to assess the benefits of issuing an airworthiness directive mandating the fitment of SB 67.00.32 for Canadian-registered AS 350 helicopters, with the aim of providing a further defense barrier against inadvertent activation of the hydraulic test switch in flight.
Advisory A060023-1	A05A0155	*Safety Management – Transport Canada Aircraft Services Directorate* – (02 Jun 06) On 07 December 2005 a MBB-BO105 helicopter was operating near Marystown, NL, in support of Coast Guard operations. The helicopter was observed flying along the shoreline, at low altitude, in snow, and in darkening conditions. The helicopter struck the water about 1000 feet from shore and sank to the bottom of Mortier Bay. The pilot and passenger escaped from the helicopter; however, the pilot died of hypothermia and the passenger drowned. ASD may wish to re-evaluate all levels of its organization with a view to becoming more pro-active in identifying risks and deficiencies, and more responsive in communicating and mitigating already identified risks associated with their operations.
Advisory A060012-1	A05A0155	*Requirements for Immersion suit use in CCG Helicopter Operations* – narrative the same as above ASD may wish to revise its mandatory OM requirements for immersion suit use to include the more relevant risk factors related to their helicopters' performance characteristics and operating environment. RESPONSE to A060012-1 On 02 May 2006 TC ASD responded to the Aviation Safety Advisory. TC ASD related that a safety oriented CCG Helicopter Operations Safety Working Group (HOSWG) has been struck to consider all aspects of the circumstances surrounding this accident. The ASD letter points out that ASD already exceeds the regulatory standards for equipment

TSB reference	Occ. No.	Narrative
		and training. The information raised in the Aviation Safety Advisory will be chaired at the first meeting of the working group, scheduled for 18 May 2006. ASSESSMENT While TC's stated intentions seem satisfactory, TC ASD has been aware of this particular deficiency in its CCG helicopter operations since 2001 and has not taken action to correct the deficiency. TC ASD inaction was also noted in the staff assessment of response to a previous Safety Advisory A050015-1 (attached). There is also a noted tendency to refer to the regulations as the standard which must be met. This has occurred both in the response to this Aviation Safety Advisory, and in briefings and meetings attended by the IIC. Meeting the regulations does not ensure the protection that the CCG crews and passengers require. This accident has proven this. The formation of a multi agency safety oriented working group is promising, but given previous ASD inaction on this particular matter, the response must be rated as "Satisfactory Intent" until positive change has been achieved. NEXT TSB ACTION Staff will review the results of the HOSWG to assess any action which may occur.
Advisory A060019-1	A05A0155	*Post¬ Accident Survivability – Direct to Airframe Helmet Cord Connections* - narrative the same as above (sent 09 May 06) TC may wish to advise the aviation community that these connection types may impede egress, and that an intermediate cord can help to mitigate this hazard.
Advisory A060021-1	A05A0155	*Liferaft Mounting Bracket Failure* - narrative the same as above (sent 09 May 06) ASD may also wish to consider steps to prevent the mounting bracket and liferaft from jamming against the passenger seat belt mounting bolts should a failure occur.
Advisory A060020-1	A05A0155	*Survival Equipment Installations – Coast Guard Helicopter Operations* - narrative the same as above (sent 09 May 06) While TC pursues these regulatory changes, TC Aircraft Services may wish to consider the adequacy of its equipment installations with a view to improving occupant survivability in a capsized helicopter event.

TSB reference	Occ. No.	Narrative
Advisory A040019-1	A03P0247	*Established Maintenance Procedures Not Followed* - On 17 August 2003, a Bell 204B helicopter was involved in forest fire suppression at Bonaparte Lake, British Columbia. Shortly after take-off, with an empty water bucket on a 100-foot long-line a high-pitch, oscillating sound was heard by observers on the ground. The flight path and behaviour of the aircraft appeared normal as it went out of view over the trees. Immediately thereafter, the sound of the main rotor blades "whopping" was heard, followed by the sounds of impact with the trees. The helicopter impacted the ground about 0.5 kilometres southeast of the staging site. A post impact fire ensued. The pilot (sole occupant) was fatally injured. Transport Canada may find it prudent to liaise with Cappsco and all known T53-11B operators who have had work done by this facility during the applicable period to implement methods of mitigating this risk.
Advisory - A030018-1	A03P0136	*Undetected Sulfidation in Rolls-Royce 250 C20 engine* - On 06 June 2003, near Lillooet, B.C., a Bell 206B helicopter, with one pilot and two forestry workers on board, was hovering about 150 feet above ground over a forestry cut block. They were scanning for hot spots in the cut block when black smoke engulfed the cabin. The pilot turned the helicopter right, reduced power and descended in an attempt to reach a road. As he applied collective in a high flare, the pilot sensed a deterioration of power by way of diminishing rotor rpm. The helicopter landed hard, nose down, and short of the road. There was no post impact fire. The pilot and the front seat passenger were trapped in the wreckage for a short time before the back seat passenger helped extricate them. The pilot suffered a back injury and both passengers suffered minor injuries. The helicopter was substantially damaged. RESPONSE On 05 February 2004 TC responded to the safety advisory letter. They referred to both this advisory letter and the draft investigation report (A03P0136) and failed to acknowledge the link between sulfidation and the failure of the blade in the turbine. While the response does acknowledge that sulfidation exists, TC suggests that there are visual inspections which can be performed to determine whether turbine blades are showing evidence of contamination with sulphur build-up, and that such inspections can be conducted in conjunction with visual compressor blade inspections. TC's response also refers to the manufacturer's recommended procedures for engine performance recovery. They are suggesting compressor washes. TC however deems that in the absence of data substantiating the need for scheduled washing of compressor (and turbine) blades, the introduction of scheduled tasks for doing washes is unnecessary. Instead they deem it to be more logical to rely in part on a scheduled visual inspections (usually performed by borescope) to provide evidence of sulfidation. They also deemed it appropriate, in the absence of a link between

TSB reference	Occ. No.	Narrative
		sulfidation and the blade failure, to continue to rely on visual inspections and performance runs as the means for limiting the effects of turbine blade sulfidation." On 15 April 2004, following discussions between TSB staff and TC concerning the TC response, the DOI received a letter from TC. The letter indicated that TC had reconsidered the issue of sulfidation, and would recommend to Rolls Royce that they include an inspection for sulfidation on turbine blades in the 250 series engines. TC also stated that they would track the manufacturer's actions relating to the recommendation. ASSESSMENT The most recent response from TC indicates that they have accepted the existence of the safety deficiency and have proposed actions that, if implemented in full, should substantially reduce the deficiency. Therefore this latest response is assessed as Satisfactory Intent. NEXT TSB ACTION Staff will monitor the actions taken by TC to reduce the risk of sulfidation in Rolls Royce 250 C20 engines. The status of the file will remain active.
Advisory A030019	A03O0012	*Hydraulic Drive Belt Failure* - On 21 January 2003, a Eurocopter Aerospatiale AS 350 B-2 helicopter with the pilot and three conservation officers was conducting a moose survey near Mekatina, Ontario. During the conduct of the survey, the aircraft experienced a hydraulic failure. While manoeuvring, the helicopter enter a steep left turn and pitch down as it approached rising terrain. The helicopter crashed and came to rest in an inverted position. All four occupants were fatally injured. Transport Canada may also wish to communicate with the original equipment manufacturer (OEM) and require that they review their product integrity. RESPONSE On 30 December 2003, TC responded to the safety advisory letter A030019. They indicated that they are currently conducting a Continuing Airworthiness review of service difficulties related to the hydraulic and flight control systems of the occurrence type helicopter with the Civil Aviation authority (Direction Generale de l'Aviation Civile (DGAC)) in

TSB reference	Occ. No.	Narrative
		France. TC also indicated that the helicopter manufacturer is presently offering an improved (re-designed) belt and pulley system as an optional product improvement to mitigate premature failures of the existing belt. This option is not mandatory and is being evaluated during the aforementioned review to determine if mandatory replacement is warranted to improve reliability. On 22 April 2004, TC issued an Airworthiness Directive (#CF-2004-10) effective 4 June 2004 which states in part "By 30 September 2004, unless already incorporated, install Poly-V Hydraulic Pump Drive Belt in accordance with Eurocopter Service Bulletin 63.00.08, dated 27 May 2002, or later approved revisions." ASSESSMENT The issuance of the Airworthiness Directive now makes it mandatory for all operators to install the new Poly-V Hydraulic Pump Drive Belt and as a result the response is now assessed as fully satisfactory.
Advisory A020030-1	A02P0096	*Emergency Locator Transmitter Mounting Location* - On 20 May 2002 a Bell 206L4 helicopter took off from Kelowna, on a VFR flight to Rocky Mountain House, with an intermediate refuelling stop at Golden. When the helicopter did not arrive in Rocky Mountain House later that evening, company personnel alerted the Rescue Coordination Centre in Victoria and a search was begun. The helicopter wreckage was located three days later about one nautical mile southeast of Three Valley Lake. The accident probably occurred at 1749 PDT in daylight and poor weather conditions. The pilot was fatally injured and the helicopter was destroyed. Transport Canada may wish to review the regulations and standards regarding ELT mounting locations and how they are interpreted and applied.
Advisory A020007-1	A01P0282	*Loss of drive - Eurocopter Lama, Input Freewheel Unit* - On 08 November 2001, a Eurocopter Lama was involved in heli-logging operations near Cranbrook, British Columbia. The helicopter was starting to lift a log when the pilot experienced some difficulty with the lift. He released the load, the rotor rpm decayed, and the helicopter quickly descended to the ground. The helicopter was destroyed by impact forces and the pilot, who was the sole occupant, was fatally injured.

TSB reference	Occ. No.	Narrative
		Transport Canada may wish to take action to ensure that the Eurocopter Lama is operated, inspected, and overhauled in a manner that takes into account the adverse effects of repetitive heavy-lift operations on the IFWU. RESPONSE On 31 May 2002, TC responded to the safety advisory. The response letter requested further information on a number of technical questions before appropriate action could be considered and taken. In the meantime, they indicated that they will continue to work with the manufacturer and operator to determine if any future modifications, or mandatory corrective action is required. If warranted, they will make a formal request to the French DGAC to address safety concerns. The Department will also consider issuance of a Service Difficulty Advisory upon review of the requested information. Transport Canada also indicated they will publish an article on the subject of "Freewheeling" in the Vortex newsletter. An additional article on "Helicopter Cycle Times" will follow this article. It is expected that both articles will be published by the end of 2002. The TSB will be provided copies once available. Transport Canada also noted that, on February 13, 2002 Eurocopter issued a Telex Information Letter SA 315 Version B, in response to the TSB accident investigation A01P0282. This letter reminds operators of the existing maintenance procedures for correct freewheel operation by inspecting the Input Freewheel Unit (IFWU) at 800 operating hours. ASSESSMENT TC's request for substantiating information suggest that TC is not thoroughly convinced regarding the probability of recurrence of an IFWU malfunction in heli-logging operations at this time. Notwithstanding, actions being considered by Transport Canada would mitigate some of the risks. Therefore, the response is assessed as Satisfactory Intent. NEXT TSB ACTION The staff will provide TC with the requested information and will continue to monitor corrective actions taken and consider the need for further safety action. The file will remain in an active status.
Advisory A010028-1	A01P0065	*Power Loss - Fuel Pump Drive Coupling Failure* - On 15 March 2001, a Bell 212 helicopter was returning to camp in the area of Stewart Lake, British Columbia with an empty net and a suspended longline. Approximately two miles from the camp, the number two engine (P&W PT6T-3B) flamed out . The pilot secured the engine, declared an emergency, and flew back to camp on one engine. After releasing the external load the pilot successfully carried out a single engine landing.

TSB reference	Occ. No.	Narrative
		Transport Canada may wish to review the inspection criteria for the fuel pump drive coupling, and the manufacturer (P&WC) may wish to reexamine the engine fuel pump drive system.
Advisory A010049-1	A01P0003	*Risk when operating a helicopter at a high rate of climb, in the event of a total power loss* - On 15 January 2001, a Sikorsky S-61N helicopter was climbing at approximately 2500 feet per minute with about 85 per cent torque from each engine to pick up logs on the side of a hill, in Porteau Cove, British Columbia. The helicopter was facing a hill about 200 feet away when the two pilots heard a loud bang and the rotor rpm (revolutions per minute) started to decay. The pilot flying turned the helicopter away from the hill, but the helicopter descended into the trees and came to rest, nose down and left side-down, on the steep hillside. The pilots suffered serious but non-life-threatening injuries. Transport Canada may wish to consider cautioning pilots on the risk of operating in these flight regimes. ASSESSMENT TC acknowledges the safety deficiency identified in the safety advisory. They plan to have an article in the Vortex Newsletter early in 2003, to inform readers about how autorotation rpm is affected by weight, density altitude, speed and adjustment, including a discussion on rate of climb and height-velocity (H-V) charts. This action will publish critical information in a news letter to all existing pilots, and staff agree it will be a good measure, but it does not incorporate initial or recurrent training. New pilots may miss the distribution of this knowledge and TC has no way of knowing, by audit, if pilots involved in commercial air operations have been educated in this area. Because the proposed measure will not effectively impact all helicopter pilots, the response is assessed as Satisfactory-in-Part. STAFF COMMENT With regard to the two statements within the advisory TC had some difficulty with; staff agree that explanations are not always practical for flight manuals, however explanations should be made at some point in pilot training; and the intent was to point out where consideration for poor autorotation characteristics has been made in flight manuals. Other existing examples may have been better, like the blue line on the Bell 206 airspeed indicator, or the single engine VNE on the Bell 222UT.

TSB reference	Occ. No.	Narrative
		NEXT TSB ACTION TSB staff is investigating at least two other helicopter accidents where information gathered to date indicate low rotor rpm and loss of control. The TSB pacific region manager will contact the editor of the Vortex news letter to offer insight to these accident investigations and the TSB's concerns. He also plans to attend the next Helicopter Association Canada meeting to brief helicopter operators on our findings. Staff will monitor helicopter accidents where successful emergency landings are compromised by a loss of control as a result of operating in flight regimes where no caution is expressed in the flight manual. If this type of accident continues, staff will consider further safety action.
Advisory A020028	A01P0003	*Risk of misalignment during buildup of Sikorsky S61 main transmission* – narrative the same as above. (sent 03 Oct 02) Transport Canada and Sikorsky Aircraft Corporation may wish to consider reviewing the manual governing the overhaul procedures for the main-rotor transmissions in Sikorsky S61 helicopters with a view to incorporate multiple measurements and maximum differential between measurements from the datum fixture and the No. 4 bearing inner race. Additionally, Transport Canada and Sikorsky Aircraft Corporation may wish to consider incorporating a gear pattern check at transmission buildup.
Advisory A000047-1	A00W0105	*Installation of Unapproved Parts* - On 01 June 2000, a Bell 206B helicopter was on approach for landing at an airstrip at Helmet, British Columbia. The helicopter lost engine power and descended rapidly in a nose low attitude and a right bank turn. The helicopter struck a metal fence near the runway threshold, burst into flames and was destroyed by fire. The pilot was fatally injured. A screw failure in the Honeywell DP-N2 fuel control unit (FCU), part number 2524644-29, caused severe fuel leakage. This fuel leakage reduced engine performance and presented a fire hazard. TC may wish to consider communicating with the FAA to alert them to this serious safety concern and request that appropriate action be taken.
Advisory A010013	A00P0158	*Power Loss - Defective Power Turbine Governor Spring* - On 18 August 2000, the pilot of a Bell 206B helicopter was forced to jettison a slung load and enter autorotation after the Rolls Royce Allison 250 C20 engine decelerated to idle in flight. The pilot suffered only minor injury in the occurrence; however, the helicopter was substantially damaged during the landing. Transport Canada may wish to take steps to both inform operators of the likelihood of faulty governor springs, and to ensure that these springs are removed from service.

TSB reference	Occ. No.	Narrative
Advisory A010029	A00P0010	*Aircraft Fuel System Contamination by Internal Components of the Refuelling Filter* - On 20 January 2000, a Eurocopter SA315B (Lama) helicopter was in cruise flight near Goldbridge, British Columbia when it experienced a partial loss of engine power resulting in a rotor RPM decay. The pilot attempted a forced landing on the lake shore of Downton lake but, as he flared the helicopter the tail-boom contacted the ground and separated from the aft fuselage section. The helicopter rolled end over end before coming to rest. A passenger, sitting in the left forward seat, suffered a punctured lung, the pilot and a second passenger escaped with minor injury. There was no fire. Transport Canada may wish to review the effectiveness of procedures that are in place to ensure that fuel suppliers, aircraft operators, pilots, and refuelling personnel are fully aware of: a. the operational limitations of refuelling gear filters, b. the increased risk of filter failure when they are used in the presence of anti-icing additives, or at flow rates that are beyond their design standards; and c. the risk that a failed fuel filter may extrude internal components through the filter to enter the aircraft systems as a contaminant.
Advisory A010009	A00A0076	*Survival Equipment for Over Water Flights* - On 10 May 2000, a Canadian Coast Guard Bell 212 helicopter crashed into the water while re-supplying a lighthouse on Cabot Island, Newfoundland. The Transport Canada pilot received fatal injuries during impact. Transport Canada may wish to consider revising the criteria for survival equipment carriage and use on over water flights. ASSESSMENT Transport Canada concedes that it is technically correct that it may be possible to double the distances and times flown offshore without appropriate survival equipment; however they do not make specific mention that more appropriate criteria will be established. It seems that TC has accepted that there is a deficiency and is willing to study the issue; however a solid commitment to change has not been established. Therefore, the response is assessed as Satisfactory In Part. STAFF COMMENT

TSB reference	Occ. No.	Narrative
		TSB staff will monitor Transport Canada's action concerning this issue.
Advisory A0100006-1	A00A0076	*Helicopter Personnel Restraint Systems* – same narrative as above Transport Canada may wish to consider investigating and requiring other means of personnel restraint for use during these operations. ASSESSMENT TC seems to have missed the intent of the letter. They point to the same regulation that we say has not been adequately applied, and place the responsibility on "industry" to comply with the regulation. Industry, in this instance is TC, so their argument is somewhat circular. Despite TC's assertion that the approved shoulder harnesses are safe, they do not allow the pilot to "perform all of the pilot's necessary functions" as stated in the letter. Further consideration of this issue is required by TC. Therefore, the response is assessed as Unsatisfactory. STAFF COMMENT As per the Boards minutes, TSB staff will include the TC response in the draft version of the report and allow them another opportunity to respond. TSB staff will monitor the response and consider the need for further safety action.
Advisory A000009-2	A99F0082	*Bell 212 Total Electrical Power Losses* - On 03 December 1999, a Maldivian Air-taxi Bell 212 departed Rangali heliport in the Maldives for Male. About two minutes after take-off, witnesses saw the helicopter returning to the Rangali heliport in a descent. It then descended rapidly and disappeared into the ocean. All 10 persons on board perished in the accident, including two Canadian pilots and three Canadian passengers. Transport Canada, in conjunction with the United States Federal Aviation Administration, Bell Helicopter Textron, and Pratt & Whitney Canada, may wish to consider the phenomenon of a total electrical failure coincident with a latent fuel delivery problem and its impact on the continuing airworthiness of the Bell 212 model helicopter. A similar Safety Advisory has been forwarded to the United States NTSB for its consideration.

Summary of TSB Helicopter Related Safety Information Letters 1999-2008

TSB reference	Occ. No.	Narrative
A000048-1	A00A0076	*Carriage of Underwater Locating Devices* - On 10 May 2000, a Bell 212 helicopter crashed while re-supplying a lighthouse on Cabot Island, Newfoundland. There were no witnesses to the crash; however, workers on Cabot Island reported spotting wreckage floating not far offshore of the island. The pilot was fatally injured. Since this accident, Transport Canada Aircraft Services has responded outstandingly and has begun to install underwater beacons on all helicopters which operate in support of the Coast Guard, regardless of passenger seating capacity.
A010031-1	A01W0142	*Generator Failure Warning Light - Bell 206* - On 14 June 2001, a Bell 206B helicopter with a pilot and two passengers on board was returning to an exploration camp. Approximately two miles from the camp, just north of Fort St. John, British Columbia. The pilot observed a rotor low rpm warning horn and light, coincident with gauge indications of 108 percent rotor rpm. He reduced the rotor rpm to about 102 percent and initiated the approach for a precautionary landing on an available field. During the descent, the boost pump warning light illuminated, and the pilot initiated a full autorotational landing onto another field. Prior to the landing, the engine out horn activated. The helicopter touched down with forward speed and rolled onto the right side. The engine was still operating after the helicopter came to rest, and the pilot performed a shut down. One of the two passengers sustained minor injuries and the helicopter sustained substantial damage. Bell Helicopter Textron Service Instruction 206A-52 provides information on how to install a generator fail warning light on Bell 206A helicopters. Owners and operators can use a modified version of this Service Instruction, along with local aviation authority approval, to install the warning system in Bell 206B helicopters.
A010051	A01W0255	*Supplemental Type Approval Number SH78-1 (McDonnell Douglas 369HS)* - On 5 October 2001, a McDonnell Douglas 369 HS helicopter was on a VFR flight from a hunting camp on the South Nahanni River, NWT to Fort Simpson, NWT. As the helicopter neared the landing pad at Fort Simpson and at an altitude of 100 to 200 feet above ground, the engine flamed out. The pilot entered autorotation and attempted to forced land on a secondary road. The helicopter struck trees prior to reaching the road and descended rapidly to the ground. The pilot sustained fatal injuries, the passenger sustained serious injuries, and the helicopter was substantially damaged. (Fuel exhaustion)

TSB reference	Occ. No.	Narrative
		Although STA SH78-1 contains clear installation instructions, a deviation from these instructions, such as excluding the alternate vent on applicable helicopters, could result in partial collapse of the fuel cells, erroneous fuel quantity indications and engine flame out due to fuel starvation or exhaustion. It is also evident that discrepancies such as a damaged or missing fuel vent fairings could induce similar risks. ASSESSMENT The response provided by Transport Canada to Aviation Safety Information Letter A010051 was satisfactory intent. Transport Canada will be advising the aviation community via an article in an upcoming Maintainer newsletter. The article will reflect the dangers in deviating from instructions of a supplemental type approval.
A020029	A01W0297	*Awareness - Aviation Fuel Additives* - On 18 December 2001, an EC120B helicopter lost engine power during a training flight near Yellowknife Airport, Northwest Territories. The pilot entered an autorotation and, in the ensuing hard landing, the helicopter was substantially damaged. The pilot sustained minor injuries. Although flight and maintenance crews have information available to them regarding availability of pre-mixed icing inhibitor in dispensed Jet A and JetA1 fuels, there is evidence that there probably are wide misconceptions and misunderstandings on the subject. By operating certain aircraft without the additive there is a risk of engine power loss which could result in property loss and injury. ASSESSMENT Transport Canada's response indicating a plan to publish an article in the fall, 2003 issue of the Aviation Safety Letter will raise awareness to the issue of fuel system icing inhibitors in aviation fuels. The response has been assessed as demonstrating Satisfactory Intent to rectify the safety deficiency, and ASIS has been updated to reflect this fact. The file will be kept open until completion of publication and distribution of relevant safety information to the aviation community.
A010034	Confidential reporting system	*Helicopter Operating Restrictions - Abbotsford, British Columbia* - The correspondent was concerned that helicopters arriving and departing the Abbotsford airport were habitually not complying with the helicopter procedures directives in the 'PRO' portion of the Abbotsford entry of the CFS, Section B. As a result, the flights "regularly cross the city centre instead of following the helicopter route designated". The correspondent felt that "If those craft were to be confined to the designated helicopter routes it would substantially reduce the hazards to city residents that are now

TSB reference	Occ. No.	Narrative
		everyday occurrences". This information has not been verified by the TSB, it is based solely on the information provided to by the correspondent. The foregoing is provided for whatever follow-up action you may deem appropriate. RESPONSE On 13 September 2001, Transport Canada responded to the Safety Information Letter. They indicated that only certain operating restrictions indicated in the CFS are subject to enforcement action and those restrictions are indicated by the use of the term 'Rstd to...'. The operating procedures applicable to Abbotsford did not contain this statement and are therefore advisory only and are not enforceable. The TC response did not address the issue raised by the correspondent that the flights regularly disregard the procedures. ASSESSMENT The TC response adhered to the strictly legal interpretation of the CARs and did not address the perceived safety deficiency raised by the correspondent that the overflights of the city pose a safety risk. The response is assessed as Satisfactory-in-Part. The information will be entered in ASIS and the DI will become inactive.
A020020-1	A02W0064	*Alternator Inspection Requirements* - On 8 April 2002, a Robinson R22 Beta,was on a round robin flight from Manning, Alberta, to several local natural gas well sites to document instrument readings, and return. At approximately 15:25 an ELT signal was received from the area, 20 nm West of Manning. The aircraft was found 90 minutes later. It had struck the ground on the perimeter of one of the well sites. The pilot was fatally injured and the helicopter was substantially damaged. It was determined that the alternator had failed and was not producing any power to the electrical system before the accident. It is possible that the alternator failure may have distracted the pilot from a low rotor speed situation; however, this could not be determined. Although the risk of hazardous flight immediately after an alternator failure is low, flights of longer duration may have more severe consequences, and component failures can have an undetermined human factors effect on flight crews. The undefended risks of having no required inspections may be a factor in future accidents.
A060016-1	A05A0155	*DUKANE Underwater Locator Beacon Signal Failure in Cold Water* – (sent 05 Apr 06) At about 1630 local time on 07 December 2005, CCG 352, an MBB-BO105 helicopter registered to Transport Canada (TC) Aircraft Services Directorate

TSB reference	Occ. No.	Narrative
		(ASD) was operating near Marystown, NL, when it struck the water and sank to the bottom of Mortier Bay. The passenger and pilot did not survive the accident. All of ASD's ULBs have now been replaced by the manufacturer, and the originals have been tested. To determine the extent of the delamination problem Dukane is also cold testing beacons in a range of serial numbers centered about the incident beacon (S/N DT1218). Once the manufacturer has determined the cause of the metal delamination, and the potential scope of the failure, a further course of action will be considered.
A050013-1	A05P0103	*Helicopter sling load ingested by tail-rotor* - On 07 May 2005, a Messerschmitt-Bolkow-Blohm (MBB) BO 105 helicopter was being used to carry out external load (sling) operations near Bella Bella, BC. While en route over the ocean, at a height of about of 200 feet and at a airspeed of about 60 knots, the load appeared to go above and behind the tail-rotor. The long line was then observed to be hanging from the back of the helicopter. The helicopter slowed, then began to descend in a spin. The aircraft crashed onto the ocean surface and sunk immediately in 26 metres of water. The pilot was able to exit the sinking helicopter, but ended up face-down in the water. He was wearing a life jacket, but it had not been inflated. The pilot was rescued within three minutes and was revived, but was seriously injured because of his near-drowning. As demonstrated by the accident to C-GCHX, the use of unsafe slinging equipment flown in an unsafe manner continues, even within Transport Canada. ASSESSMENT Although TC's response indicates that the ultimate responsibility to ensure safe slinging operations remains with operators, the response notes that further action by TC is required to remind operators of the risks involved with slinging operations. The planned video on external load operations and the forthcoming Aviation Safety Letter article on the subject are indications that TC accepts that further action is required in order to mitigate those risks. The response is therefore rated as Fully Satisfactory. NEXT TSB ACTION Monitor rotor/sling strike occurrences to determine the effectiveness of the new/proposed safety information produced by TC. The response and TSB's assessment will be entered in ASIS and the DI will become inactive.

TSB reference	Occ. No.	Narrative
A050014-1	A05P0103	*Vertical Reference Helicopter sling operations without pilot upper body restraints* – narrative same as above. Transport Canada's response to the advisory letter was that it was the responsibility of the industry to comply with the regulations, and if warranted to apply for an approval of a configuration to meet its operational needs. As demonstrated by facts uncovered during this investigation of the accident involving C-GCHX, the practice of operating without the use of upper body restraint equipment continues, even within Transport Canada. ASSESSMENT In its response, TC states that it is the operators' responsibility to request the approbation of supplemental aircraft equipment such as restraint systems, if an operator finds the standard equipment unsuitable or deficient. Nevertheless, TC has accepted that the present risk is high enough that a decision has been made to form a committee whose objective will be to develop a more adequate upper body restraint system for operators. The response is therefore rated as Fully Satisfactory. NEXT TSB ACTION Monitor TC's progress in developing a new restraint system and the production of the Safety Education and Promotion products on VREL operations. The response and TSB's assessment will be entered in ASIS and the DI will become inactive.
A060026-1	A05Q0119	*Inadequate identification of fuel barrels* - On 16 July 2005, the Bell 205 A-1 helicopter with two pilots on board, was engaged in forest fire suppression operations at Solitude Lake Québec, about 25 nautical miles north west of Port-Cartier, Québec. At approximately 1220 eastern daylight time (EDT), the helicopter hover taxied from a fuel cache site on the southern end of the lake, slinging an empty water bucket on a 100-foot longline. While hovering, the pilot felt a vibration, heard a bang, and the engine lost power. The aircraft quickly lost altitude, pitched nose down and to the right, then struck the water. The two pilots were able to exit the aircraft before it sank and were rescued by nearby fire-fighters. The pilot-in-command was seriously injured, and the other pilot sustained minor injuries. The aircraft was substantially damaged. The use of fuel barrels for remote aircraft operations is widespread throughout Canada. It is of utmost importance to ensure that the product not only be identifiable by name but that it also be distinguishable from another petrol product

TSB reference	Occ. No.	Narrative
		in a more predominant manner. The quality control of the petrol product provided to an aircraft operator at an airport should also be assured when operating at an aerodrome. ASSESSMENT In its response, TC states that it is the operators' responsibility to ensure the aircraft is fuelled with the appropriate petrol product. TSB agrees that the operator is ultimately responsible to ensure that the aircraft is properly fuelled. However, so as to ensure an additional layer of defence, the TSB would like TC to consider that although federal standards apply to the colour of container, pump and/or label, these standards cannot be enforced. In order to ensure a level of quality control and safety throughout the industry, aviation petrol products should be distinguishable from one another no matter if the aircraft is being operated from a conventional airport or an aerodrome. Inadequate identification of a product can lead to improper fuelling. TC published the Aviation Safety Information Letter A060026-1 in TC's Aviation Safety Letter, Issue 4/2006. This publication is distributed worldwide to over 90,000 readers and therefore the TSB feels that the aviation audience will have been adequately informed on the subject of inadequate petrol product identification. The response is therefore rated as Fully Satisfactory.
A05Q0119-D2-L1	A05Q0119	*Inadequate identification of parts* – narrative same as above The CAGE code 81996 found inscribed on the three unauthorized parts described above refers to material being manufactured for the US Army Aviation and Missile. For this occurrence engine, the correct CAGE code for these parts should have been 91547. The tags do not include the CAGE code nor is it required by regulation. In the absence of this critical information, the certificate of airworthiness was issued without the benefit of complete and adequate documentation. The installation of unauthorized parts did not play a role in this occurrence.
A0500023-1	A05W0140	*Lycoming T53-13B Compressor Blade Failure in Bell 204B* - On 08 July 2005, a Bell 204B, registration was en route from the Chip Lake Tower to Red Earth Creek, Alberta, with a pilot and three Alberta Forestry employees on board, when the engine (Avco Lycoming T53 13B) lost power. The helicopter was autorotated onto a muskeg bog and the aircraft sank to its belly after touchdown. The four occupants were uninjured and the helicopter sustained minor damage. The risk of compressor blade failure in turbine powered helicopters, such as what occurred in this incident, will be reduced by taking whatever design, maintenance and operational precautions are necessary to ensure that the airflow through the engine is free of all possible solid contamination in all conditions.

TSB reference	Occ. No.	Narrative
A06C0131-D1-L1	A06C0131	*Pre-crack/Fatigue Crack of the Tail Rotor Gearbox Bellcrank Support Horn* - The McDonnell Douglas 369E was transporting two line cutters from base camp to a position a few miles west of Davy Lake, SK. About 4 miles west the pilot executed a descending 180 degree turn over a small lake. During the turn, a high rate of descent developed, and the helicopter struck the water, overturned and submerged about 100 feet from the shore. All occupants were able to evacuate. One passenger was unable to reach shore and drowned. Analysis of the fracture by the engineering lab revealed a pre-crack/fatigue crack extending across approximately 75% of the entire cross section of the bell crank support horn. Photographic evidence (see Appendix A) revealed that the bell crank support horn was still in place after the wreckage was first put down on shore, indicating that the fractured horn did not contribute to the accident. Failure of the remaining intact structure of the horn was the result of bending overload following the drop during transport.
A060041	A06W0104	*Passenger and Equipment Weights in Helicopter Fire-Fighting Operations* - On 03 July 2006, a Bell 206B helicopter was departing the Nose Mountain, Alberta fire tower landing area with a pilot and three firefighters on board. During the take-off, the helicopter entered a flight condition known as unanticipated right yaw, and the pilot was unable to prevent the helicopter from turning. The helicopter rotated through 180 degrees and crashed onto an escarpment, resulting in one fatality and one serious injury. While it is recognized that the pilot-in-command has the ultimate responsibility to ensure a helicopter is properly loaded prior to flight, a process to provide pilots with accurate firefighter crew and gear weights will help to ensure that helicopters involved in ASRD-FPD fire-fighting activities are flown within prescribed weight and balance limits.
A06W0182-D1-L1	A06W0182	*Failure of Third Stage Compressor Blades in Allison/Rolls-Royce C20R Turbo-shaft Engines* - On 05 October 2006, the Bell 206L, was on approach to a remote landing site when the engine (Allison 250-C20R, serial number CAE-295218) flamed out. A hard landing ensued, and the helicopter was substantially damaged when the main rotor severed the tail boom. One passenger sustained a minor injury. The pilot and three other passengers were uninjured. The Transportation Safety Board of Canada is concerned about the recent high failure rate of 3rd stage compressor blades on Allison/Rolls-Royce 250 series C20R engines, due to fatigue cracking, with no determination as to why the fatigue cracking is occurring. Failure of third stage compressor blades will trigger an in-flight loss of engine power, which can result in substantial damage to the helicopter and death or serious injury to the occupants.

TSB reference	Occ. No.	Narrative
A07P0241-D1-L1	A07P0241	*Fuel Manifold Failures - General Electric CT58 Engines* – (sent 07 Aug 07) On 5 July 2007, the Sikorsky S-61 helicopter, was heli-logging at Pemberton Meadows, BC. As a load of logs was being lifted off the hill, the flight crew noticed a burning smell and decided to drop the logs and fly to the service landing. As the logs were being released, the crew noticed that the No. 1 engine (General Electric CT58-140-1, serial number 280140MA) was running hot and was unable to produce full power. Moments later, smoke was noted coming from the No. 1 engine and the No. 1 fire light illuminated. The Engine Fire Emergency Procedure was followed and the No. 1 engine was shut down. Both fire bottles were discharged before the fire light went out. The helicopter was flown single-engine to the service landing and landed without further event. When GE last reviewed the fuel manifold failures in 2002, there had been 82 reported failures over about 35 years in both civil and military applications. This occurrence and anecdotal information reveals that old-type fuel manifolds (P/N 5018T64G02, etc.) are still in use, and fail from time to time. Such failures increase the risk of injuries to persons and of damage to property and the environment.