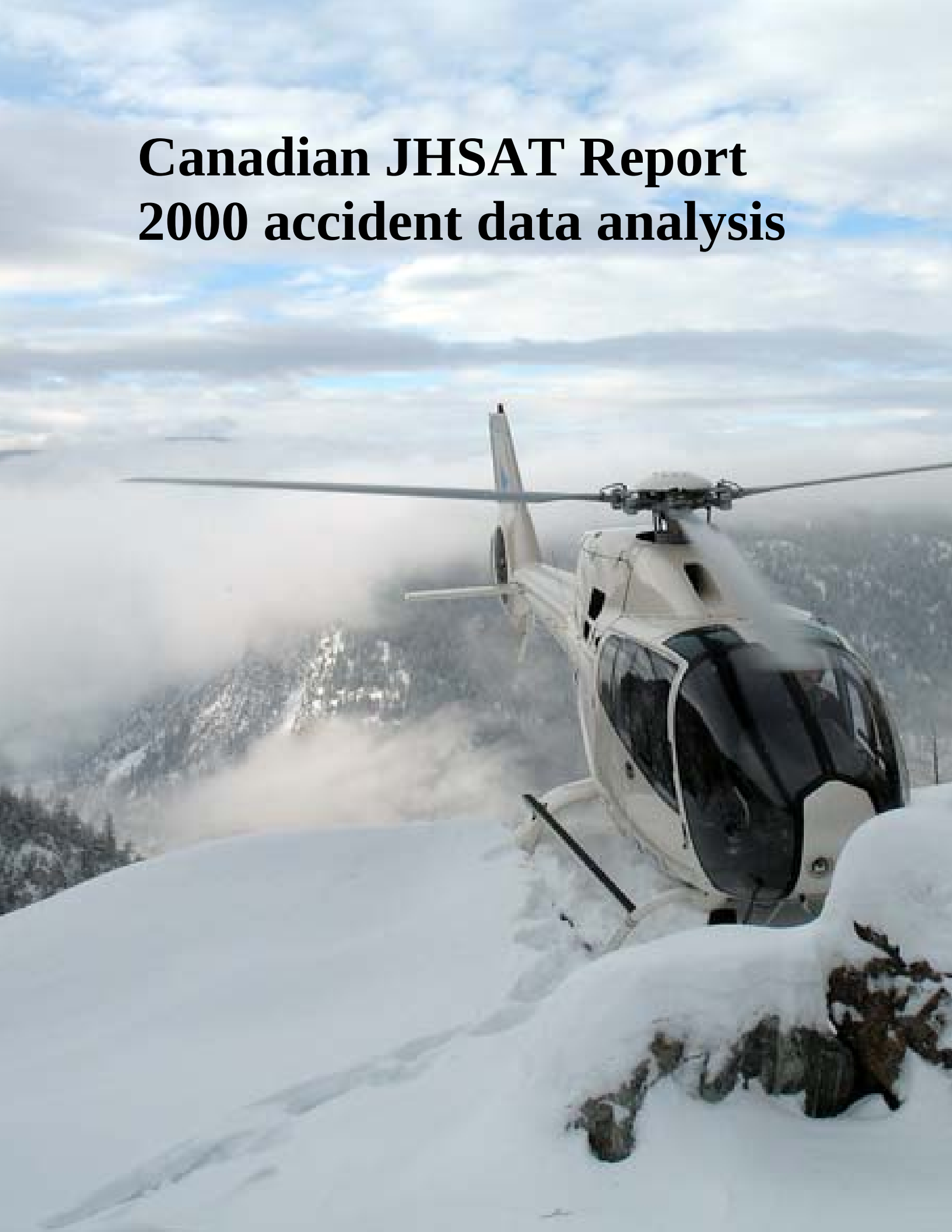
Canadian JHSAT Report
2000 accident data analysis



CANADIAN JOINT HELICOPTER SAFETY ANALYSIS TEAM

YEAR 2000 SUMMARY REPORT & FLIGHT HOUR DATA ANALYSIS

ABSTRACT

This report presents a summary of the analysis of 52 accidents (51 civil and one Canadian Forces) that occurred in the calendar year 2000. Intervention recommendations are provided based on the frequency of intervention categories being cited for each standard problem statement. This approach will allow the Canadian Joint Helicopter Safety Implementation Team (CDNJHSIT) to focus it work on the most significant areas requiring intervention. In addition, flight hour data from years 2000-2008 is also included to allow for the determination of annual accident rates.

Executive summary:

Helicopter operations in Canada are as diverse as its climate and geography which spans over 9.9 million square kilometers (3.8 million square miles) and touches three oceans the Atlantic to the Pacific to the Arctic Ocean. In recent years the increased global demand for commodities has helped incite helicopter activity in Arctic regions, an area by itself larger than Western Europe but with a population of only 100,000 this presents ongoing and unique operational challenges.

Single engine turbine helicopters (FAR 27) account for almost 70% of hours flown in Canada with an accident ratio of 64% while piston helicopters represent only 11% of the fleet, have a disproportionate accident ratio of 25%. The data however shows a continual trend reduction in Piston Helicopter accidents.

Twin turbine have only a slightly better accident rate as their single engine counterpart partly due to the fact that most aircrafts being single or twin engine are used to fly similar missions, it is however noteworthy that there are no HEMS or offshore accidents during this period which can be partly explained by the operational structure and two Pilot operations.

The top standard problem statements are Pilot Judgements, Data issues, Mission Risks Pilot Situational Awareness and Safety Management. This follows closely the findings from the US and European JHSAT groups, however the mission risk category was higher in Canada.

Top interventions were Training, Safety Management, Design Manufacturing and Information. Although much of the benefit of an integrated SMS system are known worldwide, combined group intellectual capital would help raise safety to the next level. This is why that the Canadian JHSAT committee strongly recommends increased industry participation in the development of industry best practices (IBP) and for companies to use these IBP's to establish strong company Sop's. Pilots are often trained as generalists and would benefit from well established work parameters in

specialty operations such a Heli-logging, EMS, Oil & Gas, Fire Fighting, Seismic to name a few.

In conclusion the lack of adequate and readily available data was evident in this study. Data for accident investigation such as FDR's and or cockpit recorder and easily searchable and pertinent accident investigation reports allowing operators to use reactive indicators when formulating risk assessments. More detailed information is available in this report.

BACKGROUND

At the inaugural international helicopter safety symposium held in Montreal, Quebec in 2006, it was agreed that the qualitative accident rate was high and required improvement. As a result of this, it was agreed that the International Helicopter Safety Team would pursue this issue with the goal of reducing accidents by 80% by 2016. Participants at this symposium included both civilian and military personnel.

The methodology to accomplish this activity was borrowed from a previous FAA initiative that was used for large transport category airplanes. Based on this model an executive group, known as the International Helicopter Safety Team (IHST), was established to oversee this initiative. The IHST asked regional bodies to conduct analysis of their regions, implement recommendations and share results with the executive group. This approach would allow the IHST to prioritize their efforts on common areas of concern.

In order to compare findings the U.S. Joint Helicopter Safety Analysis Team (JHSAT) provided a common methodology to regional bodies. This methodology was later enhanced with the introduction of the Human Factors Evaluation provided by the European Helicopter Safety Analysis Team (EHSAT). Specifics of this methodology and associated details will be provided in a companion document intended for the Canadian Helicopter Safety Implementation Team.

For the Canadian regional body an executive committee was established. This committee was comprised of one member from industry and one from government. The Canadian executive committee established its own JHSAT, comprised of industry and government representatives, to analyze the accident data and provide recommendations.

CANADIAN CONTEXT

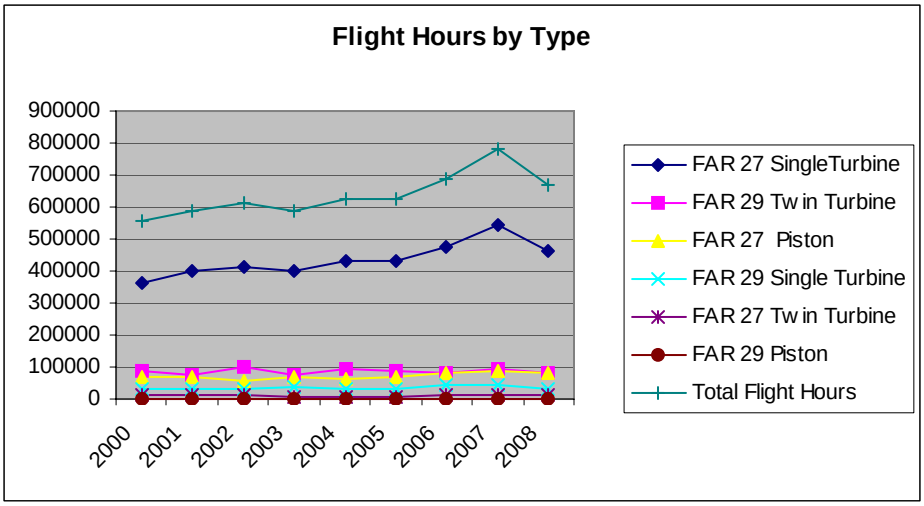
The annual Canadian helicopter fleet is presented based on the Canadian registry data and rotorcraft type.

	2000	2001	2002	2003	2004	2005	2006	2007	2008
FAR 27:Single Turbine	888	990	991	1119	1137	1173	1238	1323	1372
FAR 29:Twin Turbine	129	135	143	170	150	168	181	200	216
FAR 27:Single Piston	310	316	325	407	419	477	532	592	616
FAR 29:Single Turbine	81	76	76	97	94	97	97	101	99
FAR 27:Twin Turbine	38	34	32	38	37	35	43	47	53
FAR 29:Single Piston	3	3	0	0	0	0	0	0	0
Total	1449	1554	1567	1831	1837	1950	2091	2263	2356

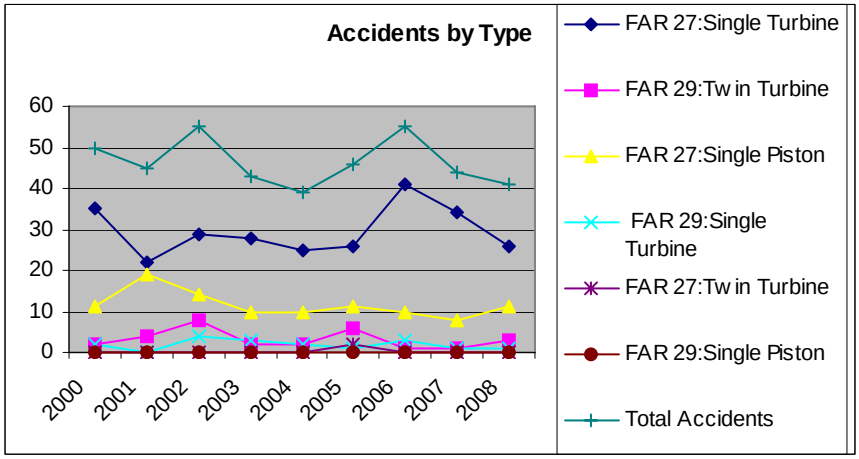
FAR 27: 7000 or less pounds and 9 or fewer passengers, **FAR 29:** Over 7000 pounds or Over 9 passengers.

Hours flown are from the Annual Airworthiness Information Report, which is a regulated reporting requirement in Canada.

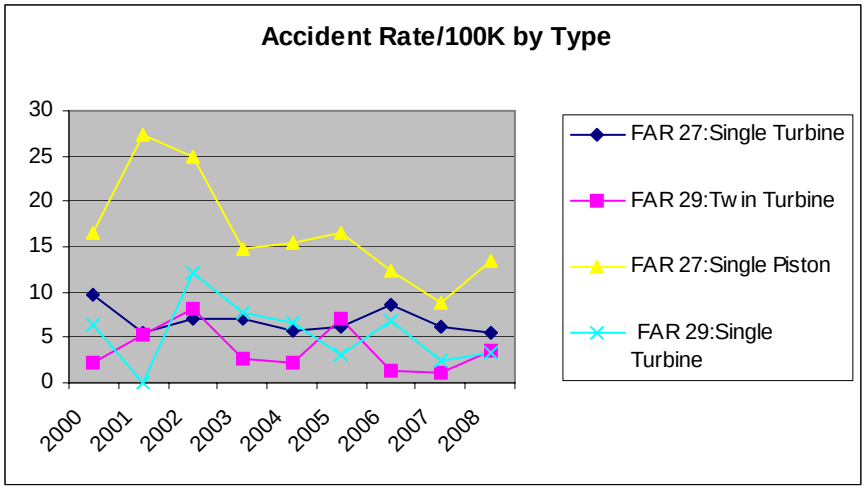
This graph illustrates that the majority of the flight hours are accumulated on FAR 27: Single Turbine rotorcraft.



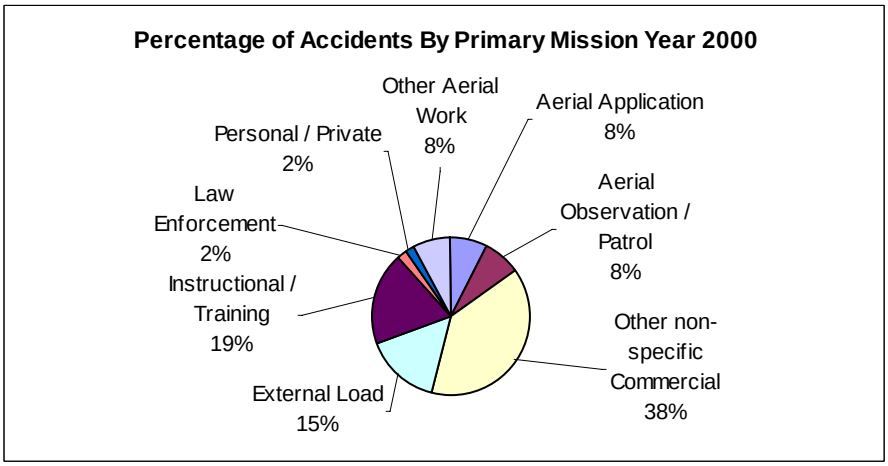
This graph illustrates that a large portion of the accidents occur on FAR 27 Single Turbine rotorcraft.



This graph indicates the disproportional accident rate for FAR 27: Single Piston rotorcraft.



This graphic indicates 98% of the accident in year 2000 occurred in Commercial Operations.



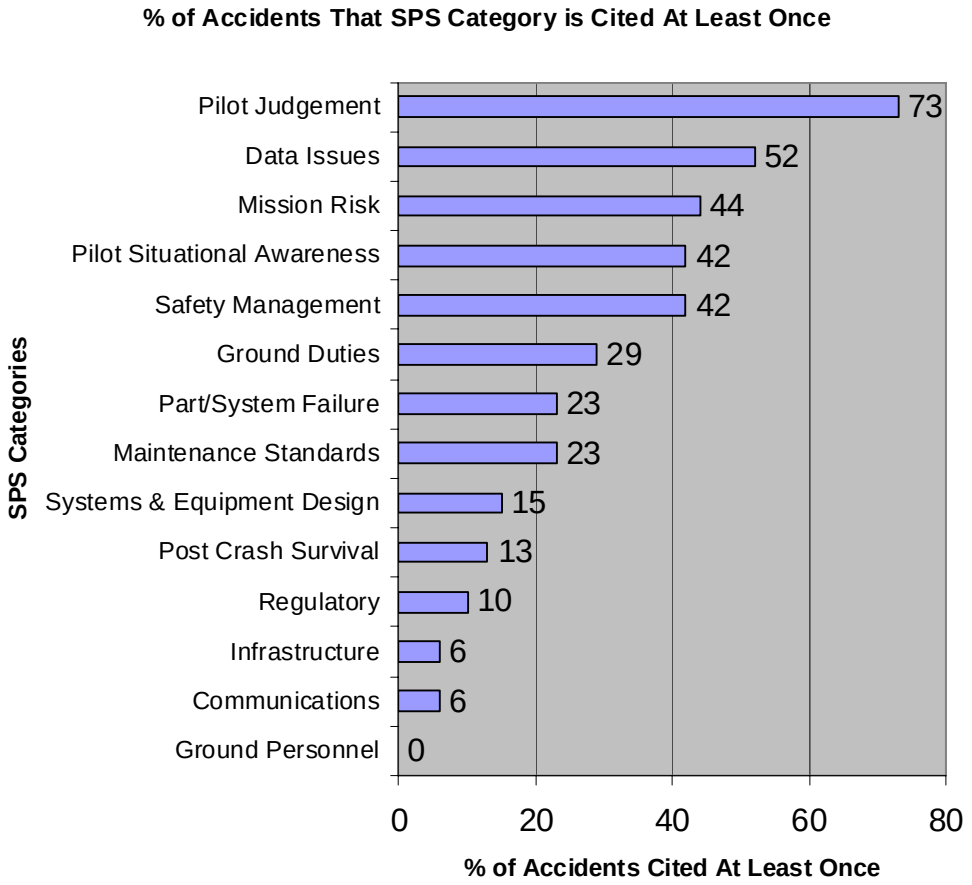
This table indicates that FAR 27 Single Turbine represents the majority of the fleet and the accidents seem proportional to its size. Whereas, the FAR 27 Single Piston represents 11.3% of the flight hours flown but disproportionally 24.9% of the accidents.

	% Of Aircraft Registered	% Of Fleet Hours Flown	% Of Fleet Accidents
FAR 27 Single Turbine	60.5	68.3	63.6
FAR 29 Twin Turbine	8.8	13.4	6.9
FAR 27 Piston	23.6	11.3	24.9
FAR 29 Single Turbine	4.8	5.5	4.1
FAR 27 Twin Turbine	2.1	1.6	0.5
FAR 29 Piston	0.0	0.0	0.0

Data from 2000 to 2008

ANALYSIS RESULTS: PROBLEMS IDENTIFIED

Standard Problem Statements (SPS) are used in the analysis tool to categorize problems identified on review of the accident data.



Pilot Judgment and Action (SPS 500000 Series)

Problem categories relating to Pilot Judgment and Action were cited 107 times in 38 (73%) of the accidents.

The following mission types were affected: Non Specified Commercial Operations (46), Instruction/training (23), Aerial Observation (9), Other Aerial Work (8), External Load (7), Law Enforcement (6), Aerial Application (3), and Private (2).

Number of Times Cited	Problem Statement Description
23	Pilot Flight Profile unsafe in various conditions and aspects; altitude, airspeed, unsuitable terrain, approach, takeoff, rotor RPM

16	Landing Procedures; normal landings and in emergency and training auto rotations
15	Disregarded cues
13	Pilot Decision Making
11	Procedure Implementation
5	Failed to follow procedures
5	Diverted attention / distraction
5	Perceptual judgment errors
4	Pilot misjudged own limitations / capabilities

Data Issues (SPS 1100000 Series)

Problem categories relating to Data Issues were cited 42 times in 27 (52%) of the accidents.

The following mission types were affected: Non-Specified Commercial Operations (12), Instructional/training (11), External Load (9), Aerial Observation (5), Aerial Application (3), Law Enforcement (1), and Other Aerial Works (1).

Number of Times Cited	Problem Statement Description
42	Inadequate information in the report. This is further divided into the following two subcategories: 1) A lack of information available to the investigators. 2) Inadequate information capture particularly in the class 5 (one page data gathering summary) investigation reports limiting our ability to provide complete analysis of the factors involved in the occurrences.

Mission Risks (SPS 900000 Series)

Problem categories relating to Mission Risks were cited 37 times in 23 (44%) of the accidents.

The following mission types were affected: Non Specified Commercial Operations (15), External Load (7), Instructional/training (5), Aerial Observation (4), Aerial Application (4), Law Enforcement (1), and Other Aerial Works (1).

Number of Times Cited	Problem Statement Description
20	**Terrain/Obstacles** • Operation involves flying near hazards, obstacles, wires • Operation involves selection of remote landing sites • Lack of job site recon

Number of Times Cited	Problem Statement Description
	• Mountain operations • Operation involves flight over unsuitable emergency landing terrain
17	**Pilot Intensive** • Operation requirements place pressure on crew to fly • Operation requires low/slow flight • Operation involved flying in inclement weather conditions • Operation requires extended flight in HV avoid area • Operation involved flying in weather conditions conducive to icing

Pilot/Crew Situational Awareness (SPS 700000 Series)

Problem categories relating to Pilot/Crew Situational Awareness were cited 54 times in 23 (44%) of the accidents.

The following mission types were affected: Non Specified Commercial Operations (28), Aerial Observation (8), Aerial Application (7), Instructional/training (4), External Load (3), Other Aerial Works (2), Law Enforcement (1), and Private (1).

Number of Times Cited	Problem Statement Description
41	**External Environmental Awareness** • Aircraft position and hazards • Altitude, Aircraft state, lack of knowledge of aircraft's aerodynamic state (envelope) • Pilot unaware aircraft restrained by the ground or ground obstruction. • Failed to recognize cues to terminate current course of action or manoeuvre. • Low flight near wires
13	**Visibility/Weather** • Reduced Visibility - Darkness, fog, rain, snow, and smoke. • White out, brown out • Sun/glare • Local and enroute weather

Safety Culture (SPS 200000 Series)

Problem categories relating to Safety Culture were cited 68 times in 22 (42%) of the accidents.

The following mission types were affected: Non Specified Commercial Operations (9), Instruction/training (6), External Load (3), Other Aerial Work (2), and Aerial Application (2).

Number of Times Cited	Problem Statement Description
18	**Management** • Management policies/oversight inadequate Management disregard of known safety risk / Lack of local supervision of remote ops • Crew - mission assignment • Risk Management inadequate / Helicopter inadequately equipped for mission / Crew - mission assignment • Customer/company pressure
12	**Flight Procedure Training** • Emergency training inadequate, Inadequate post Vortex ring state ("settling with power") or loss of tail rotor effectiveness avoidance, recognition and recovery training • Inadequate systems failure training • Autorotation Training Inadequate • Special operations training inadequate
11	**Inadequate Pilot Experience** • Pilot inexperienced • Pilot lacking experience in operations or make/model • Student Pilot Inadequate pilot knowledge
5	**Safety Program**
5	**Equipment**
5	**Pilot** • PIC self induced pressure
4	**Scheduling /Dispatch** Lack of monitoring of flight ops data
4	**Training Program Management**,

	• Inadequate flightcrew training due to cultural/economic • Instructor preparation and planning
2	**Ground/Pax Training** • Ground/LZ personnel
1	**Transition Training** Transition to aircraft make/model

Ground Duties SPS Category (SPS 100000 Series)

Problem categories relating to Ground Duties were cited 29 times in 15 (29%) of the accidents.

The following mission types were affected: Non Specified Commercial Operations (19), External Load (6), Aerial Application (3), and Private (1).

Number of Times Cited	Problem Statement Description
20	**Mission Planning** • Mission Requirements / contingencies planning inadequate • Inadequate consideration of Weather / wind • Incorrect fuel planning / calculation • Inadequate consideration of aircraft performance • Inadequate consideration of aircraft / operating limits
9	**Aircraft Preflight** • Aircraft preflight process inadequate • Performance of Aircraft Preflight inadequate • Diverted attention, distraction

Part/System Failure (SPS Category 800000)

Problem categories relating to Part/System Failure were cited 18 times in 12 (23%) of the accidents.

The following mission types were affected: Non Specified Commercial Operations (5), Instruction/training (3), External Load (2), Aerial Observation (1), and Other Aerial Work (1).

Number of Times Cited	Problem Statement Description
11	**Aircraft** • Airframe component failure

	• Main Rotor Drive System Component Failure • Main Rotor Blade Failure • Transmission System component Failure • Components used did not conform to type design • Landing Gear/Skids • Fuel Quantity System
5	**Powerplant** • Engine Component Failure
2	**Mission Specific Equipment** • Mission Specific Equipment

Maintenance (SPS 300000 Series)

Problem categories relating to Maintenance were cited 35 times in 12 (23%) of the accidents.

The following mission types were affected: Non Specified Commercial Operations (6), Instruction/training (2), Other Aerial Work (2), and External Load (2).

Number of Times Cited	Problem Statement Description
16	**Performance of Maintenance Duties** • Maintenance did not detect impending Failure • Failure to perform proper maintenance procedure Failure of personnel to coordinate • Maintenance Induced • Maintainer interrupted • Loss/degradation of TR drive system due to inadequate maintenance
14	**Maintenance Procedures/Management** • Failure of QA or supervisory oversight • Aircraft released in non-airworthy condition • Inadequate documentation of aircraft records • Mechanic insufficient training/experience • Pre Functional Check flight maintenance settings lead to hazardous conditions
3	**Quality of Parts** • Unapproved parts • Tracking/cert military/surplus parts • Fuel Contamination

2	**Aircraft Design** • Lack of equipment to detect impending part failure

Aircraft Design (SPS 1400000 Series)

Problem categories relating to Systems and Equipment- Aircraft Design were cited 16 times in 8 (15%) of the accidents.

The following mission types were affected: External Load (6), Non Specified Commercial Operations (4), and Instruction/training (3).

Number of Times Cited	Problem Statement Description
9	**Aircraft Design** • Aircraft Design - Other • Lack of warning of incipient flight critical failures • Lack of annunciation/caution/warning of critical condition • Safety assessments did not adequately identify system failure consequences
6	**Manufacturing** • Manufacturing QA failed to identify fault
1	**RFM** • Inadequate or missing procedures

Post Crash Survival (SPS 1000000 Series)

Problem categories relating to Data Issues were cited 18 times in 7 (13%) of the accidents.

The following mission types were affected: Non Specified Commercial Operations (11), Instruction/training (1), Other Aerial Work (1), External Load (4), and Aerial Application (1).

Number of Times Cited	Problem Statement Description
9	**Safety Equipment** • Safety equipment not installed, Pax/crew survival gear not used
5	**Crashworthiness** • Vehicle sank and/or capsized • Post-crash fire

4	**Delayed Rescue** • ELT inoperative/damaged by impact • No flight following – slow to locate site • Inadequate communications between survivor(s) and rescue

Regulatory (SPS 1300000 Series)

Problem categories relating to Data Issues were cited 8 times in 5 (10%) of the accidents.

The following mission types were affected: Non Specified Commercial Operations (3), Other Aerial Work (1), and External Load (1).

Number of Times Cited	Problem Statement Description
2	**Accident Prevention** • Insufficient analysis of previous incidents and lack of available incident information to the operators due to lack of oversight on the part of the regulator(s)
2	**Safety System** Failed to disseminate pertinent flight safety information
4	**Oversight** • Inadequate application of government/industry standards

Infrastructure (SPS 400000 Series)

Problem categories relating to Infrastructure Issues were cited 4 times in 3 (6%) of the accidents.

The following mission types were affected: Non Specified Commercial Operations (3), and External Load (1).

Number of Times Cited	Problem Statement Description
2	**Oversight / Regulation** • Inadequate oversight / regulations
2	**Equipment** • Weather information inadequate or not available for departure, enroute, and/or destination • Inadequate ground support equipment or oversight

Communications (SPS 600000 Series)

Problem categories relating to Communications Issues were cited 5 times in 3 (6%) of the accidents.

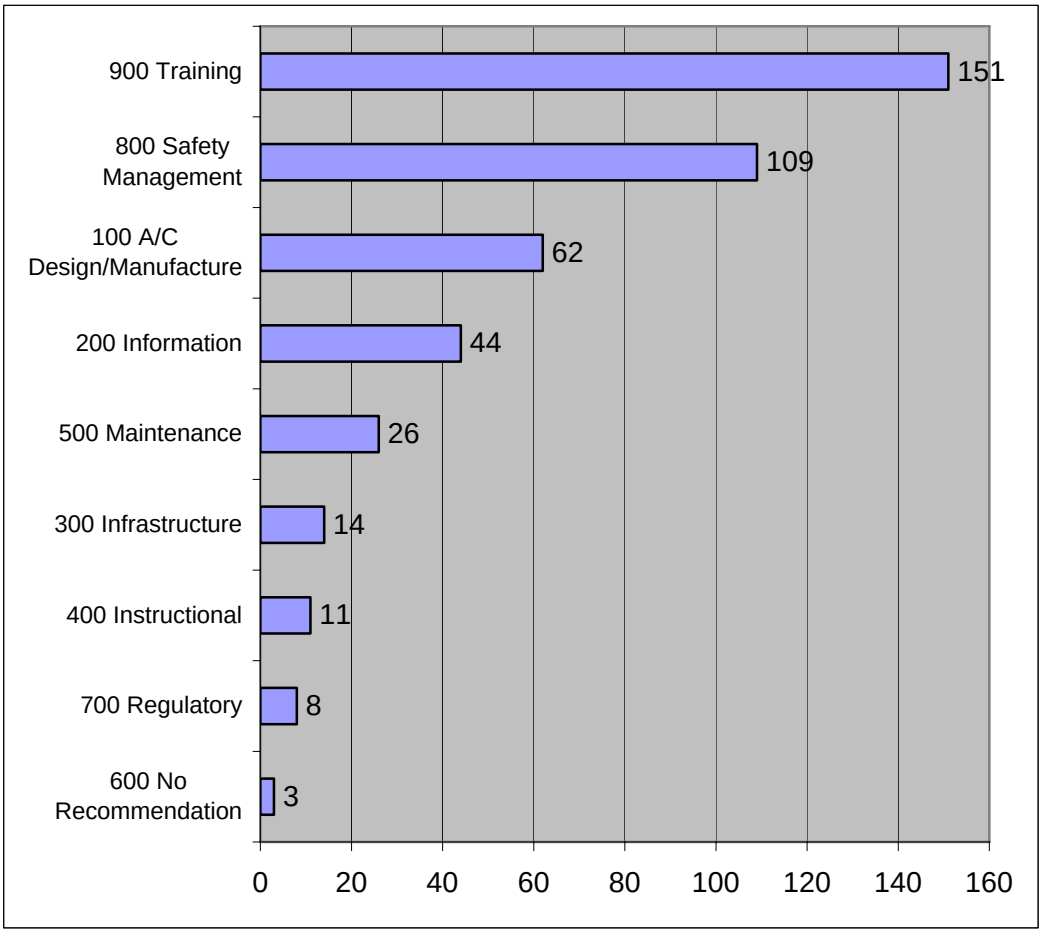
The following mission types were affected: Non Specified Commercial Operations (1), Aerial Observation and Patrol (1), and External Load (1).

Number of Times Cited	Problem Statement Description
3	**Inadequate Procedures** • Inadequate flight following protocols and operational controls • Inadequate coordination with tactical operations control
2	**Controlling Agencies** • Coordination with ground/LZ personnel in regards to communications and safety education

ANALYSIS RESULTS: INTERVENTIONS IDENTIFIED

Interventions, which may have prevented the accidents, are identified and categorized.

This table illustrates the number of interventions identified for each intervention category.



This table indicates the number of Intervention by category cited for each Standard Problem Statement.

Standard Problem Statements

Interventions	Standard Problem Statement VS Interventions	Plt Judgment	Safety Culture	Pilot Sit Awareness	Data Issues	Mission Risk	Maintenance	Grnd Duties	Parts/ Syst Failure	Post Crash Survival	A/C Design	Regulatory	Communication	Infrastructure	Ground Personnel	Total Interventions
	Training	72	19	31		15		8	1	1			1		3	151
	Safety Management	27	31	5	1	13	3	18	1	6		1	2		1	109
	A/C Design & Manufacture	3	4	13		6	5		10	6	15					62
	Information	1	1		37					1		2		2		44
	Maintenance					1	24				1					26
	Infrastructure		2	3				1	1	3			2	2		14
	Instructional		10			1										11
	Regulatory	1	1						2			4				8
	No Recommendation			1				1	1							3
	Total Standard Problem Statements	104	68	53	38	36	32	28	16	17	16	7	5	4	4	

Summary of Most Frequently Occurring Interventions

Top 5 intervention categories by order of importance

Listed under each of these are the most frequently identified problem statements per intervention.

1) Training (151)
   - Pilot Judgment (72), Pilot situational Awareness (31), Safety Culture (19), Mission Risk (15)

2) Safety Management (109)
   - Safety Culture (31), Pilot Judgment (27), Ground Duties (18), Mission Risk (13)

3) Aircraft Design/Manufactures (62)
   - Aircraft Design (15), Pilot Situational Awareness (13), Part/System Failure (10)

4) Information (44)
   - Data issues (37)

5) Maintenance (26)
   - Maintenance (24)

ANALYSIS RESULTS: RECOMMENDATIONS

The complete list of recommendations is located in the Supporting Data & Analysis Document.

1) Training

- Pilot mission planning
- Preflight risk assessment
- In-Flight risk assessment to adapt for unexpected mission changes.
- Use of training devices (e.g., decision making)
- Training area selection
- Improve auto-rotational proficiency for trainers.
- Formal training for qualification of company training pilots.
- Pilot recognition of critical cues and recovery (LTE, Inadvertent IMC, dynamic rollover, VRS)
- Increase pilot aircraft type specific knowledge
- Pilot Decision Making and Crew Resource Management
- Task priority management (i.e., when multi-tasking)
- Threat and error management
- Plan and monitor aircraft performance to minimize risk exposure (e.g., HOGE, H-V, and WAT charts)
- Competency based training program for specific operations

- Obstacle proximity awareness
- Customer training on operational limitations.
- Safety Management program training

2) <u>Safety Management</u>

- Industry Association to develop best practices specific to operational activities. (Heli-logging, EMS, Oil & Gas, Fire Fighting, etc.)
- Ensure a company safety management system that will –
  - Establish a company risk management process.
  - Involve clients in risk management process
  - Establish duty day limitations based on operational intensity for Aircrew, Aircraft Maintenance Engineers and Ground Crew.
  - Establish operational oversight protocols for remote operations
  - Establish company SOP's based on industry best practices, for all areas of operational activities to encompass:
    - Specific limitations (e.g., Weather, duty, obstacle clearance)
    - Unprepared landing zone standards.
    - Identifying the role of management, flight, ground crews, and clients
    - Provide pilots with tools to assess and predict aircraft performance.
    - Provide pilots with tools to assess specific operational risk.
    - Required safety equipment and clothing to be worn for flight conditions (e.g., helmets, safety glasses, boots, fire retardant flight suits.
  - Require and allow management to monitor pilot performance and provide feedback to pilots when performance is deviating from the expected standard.
  - Establish management of change process.
  - Empower pilots to make the appropriate decisions with management support.
  - Provide tools to assess the conditions at the work site where appropriate. For example AWOS and live video feed.

3) <u>Aircraft Design & Manufacture</u>

- Effective design performance monitoring to identify in-service difficulties with trend monitoring through the use of Service Difficulty Reporting system.
- Operators and industry associations to promote development and installation of systems for all helicopters to warn of impending failures. (e.g., HUMS, simpler vibration monitoring for airframe dynamic and engine components.
- Industry committee to be established to address a strategy to require new derivative designs and legacy production aircraft to incorporate safety enhancements specified in later design standards.
- Industry associations to encourage design and installation of equipment to improve pilot situational awareness
  - Devices to indicate to pilot that control limitations are being approached, either through aural or visual cues
  - Tail rotor guard or proximity detection warning device
- Introduce automatic recording means to record operating usage data to be used to determine the life of components and associated maintenance..

4) Information

- Industry and operators promote the use of:
  - Flight recording devices appropriate to the design and operation of the aircraft.
  - In-flight monitoring systems.
- Transportation Safety Board should:
  - Develop procedures, policies and tools to enable the timely collection and recording of all available relevant data for all Canadian accidents. (i.e., similar to Transport Canada's web-based reporting of Service Difficulty Reports)
  - Make accident data readily accessible and searchable to all operators in support of their safety management risk assessment process.
  - Promote the development of an international database to share accident information.

5) Maintenance

- Develop standard operating procedures for maintenance on the following topics:
  - Oversight of mechanics in training
  - The conduct of maintenance
    - Develop and introduce use of "Stage/Task Cards" as a SOP.
  - Release of aircraft for flight after maintenance.
    - Briefing of Pilots after maintenance has occurred.
    - Completion of paperwork.
  - Oversight of maintenance
    - At remote locations
    - Fatigue management plan for personnel
  - Introduction of annual compliance monitoring and recurrent training
    - Establish industry best practices.
  - Care and use of equipment particularly from third parties.
    - Refueling equipment
    - Maintenance tools
  - To ensure proper quality of fuel at all sources.

FLIGHT HOUR DATA COLLECTION REVIEW

The International Helicopter Safety Symposium established a goal to reduce accidents by 80% by 2016. In order to trend the accident data the intent is to use flight hour data on accidents per 100,000 Flight Hour bases.

Fortunately, in Canada there exists a requirement for all registered aircraft except ultra-lights to submit flight hour data on an annual basis.

The Annual Airworthiness Information Report (Form 24-0059) states:

> *Pursuant to Canadian Aviation Regulations (CARs), Part V, Subpart 1 and Chapter 501 of the Airworthiness Manual, the owner of a Canadian aircraft, other than an ultra-light aeroplane shall submit to the Minister no later than the due date an Annual Airworthiness Information Report.*

Review of Flight Hour Data and Analysis

A review was conducted regarding data collection and the assumptions used in its analysis to determine the annual helicopter flight hour estimate as determined by Transport Canada. The following concerns where identified:

1) The number of AAIR forms sent to owners of registered aircraft does not equate to the number of forms received. This may be due to changes in the aircraft registry or non-compliance to the regulation to report the data.

2) Since 2003, the Flight Hours estimates provided by Transport Canada Strategic Information do not utilize the AAIR data since the estimates are due prior to the receipt of the AAIR data and there are concerns with the accuracy of reporting due to missing data in addition to conflicts with other dominate indicators based on Growth & Movement Data. The current methodology is inherently prone to inaccuracies.

Recommendations:

1. *The Helicopter Industry to promote collection of flight hour data in support of this safety initiative and Transport Canada to improve compliance with CAR Part V, Subpart 1 specifically Chapter 501.1 Annual Airworthiness Information Report of the Airworthiness Manual to ensure reporting of flight hours. In addition, conduct audits to ensure accuracy of the reported data. This activity to include the aircraft registry data.*
2. *The Helicopter Industry to support Transport Canada's development of a statistical model to be utilized by Transport Canada to improve accuracy of Flight Hour estimates required annually at the end of the calendar year.*

Use of Flight Hour Data in this Report

In review of the AAIR data against the Departmental Flight Hour estimate it was determined that with adjustments for missing data that the AAIR data would be utilized since the data is received from Industry and assumed accurate. Determined missing data based on the number of aircraft registered in that year verses the number of AAIR reports returned. The data was adjusted based on the assumption that 1) ½ of the missing rotorcraft did not fly (sold, damaged, inactive) and 2) the other ½ was assumed to have flown the average flight time for that model.

HUMAN FACTORS ANALYSIS (HFACS)

HFACS information provided by EHST was introduced into the list of SPS however, its late introduction did not allow for collection of sufficient data to conduct an appropriate analysis. Follow on accident reviews will include this analysis.

TEAM MEMBERS

Last	First	**Company**
Seguin[1]	Sylvain	Canadian Helicopters Limited
Taylor[2]	Bill	Transport Canada Engineering
MacDonald	Brian	Transportation Safety Board
LCol Laplante	Jacques	Director Flight Safety DND/CF
Michaud	Jacques	Director Flight Safety DND/CF
Major Leblanc	Martin	Director Flight Safety DND/CF
Capt. Ashton	Kathy	Director Flight Safety DND/CF
Major Régnier	Jeep	Director Flight Safety DND/CF
Suttle	Jack	Bell Helicopter
Louden	Grant	Skyline Helicopters
Gallagher	Rob	Skyline Helicopters
Tommasini	Dave	Four Season Aviation
Bonaud	Guy	Turbomeca
Krebs	Gary	Eurocopter
Jupp	Bill	Transport Canada Flight Test

1 – Industry Co-Chair CDNJHSAT
2 – Government Co-Chair CDNJHSAT

NEXT STEPS

Data will be reviewed for other years to identify any additional interventions. With the availability of flight hour data information a metric is available for the implementation team to judge the effectiveness of the interventions implemented.

CONCLUDING REMARKS

A number of the recommendations made in this report support the fundamentals of Safety Management Systems, which is currently being implemented in Canada by regulation. Metrics are available to measure the effectiveness of this initiative.

With International co-operation it is believe that cost effective methodologies and tools will be developed to address the problems identified relating to training needs, company safety systems identifying and addressing risk, crew situational awareness, equipment health monitoring and data collection.

ACKNOWLEDGEMENTS

The Canadian JHSAT team would like to acknowledge the support provided by the USJHSAT and the leadership they have provided. In addition, we thank the European Team for sharing their approach to human factors data collection.

REFERENCES

Transport Safety Board of Canada accident data.
Transport Canada Aircraft Registry data.
Transport Canada Annual Airworthiness Information Report Data.
USJHSAT analysis methodology and tools.
CDN JHSAT Supporting Data & Analysis Document

ACRONYMS

CDN	Canada
EHSAT	European Helicopter Safety Analysis Team
FAR	US Federal Code of Regulations
FAR 27	Design Requirements for Normal Category Helicopters that are 7000 pounds or less and 9 or fewer passengers.
FAR 29	Design Requirements for Transport Category helicopters that are over 7000 pounds or over 9 passengers.
IHSS	International Helicopter Safety Symposium
IHST	International Helicopter Safety Team
JHSAT	Joint Helicopter Safety Analysis Team
JHSIT	Joint Helicopter Safety Implementation Team
LZ	Landing/Loading Zone
OPS	Operations
PIC	Pilot in Command
SOP	Standard Operating Procedures
SPS	Standard Problem Statements


Canadian