



Fisheries and Oceans  
Canada  
Coast Guard

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# CANADIAN COAST GUARD RESEARCH AND DEVELOPMENT PROGRAM

**PLAN 2005-2006**

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The Canadian Coast Guard Research and Development Plan lists those research projects planned for fiscal year 2005-2006 by the various branches and regions.

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**CCG R&D Program  
FY 2005-2006  
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## FOREWORD

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Research and Development (R&D) is an essential element in helping the Canadian Coast Guard to achieve its operational mandate. The Coast Guard is dedicated to ensuring the safe and environmentally responsible use of Canada's waters. Research and Development is one way in which the Coast Guard seeks to become more efficient in its day-to-day operations as well as improving the effectiveness and appropriateness of its levels of service.

The Coast Guard R&D Program has been traditionally funded at \$3.5 million dollars. Due to serious financial pressures in the CCG, the 2005-06 budget has been reduced to \$1,063.7M for the R&D Program. No new projects were started. Only ongoing commitments were honoured. The R&D Program Office continues to make a case that, even at a time of constrained funding, a vigorous basic R&D program is indispensable to preserve the effectiveness of CCG services in the years ahead. Additional support from industry and international partners is being pursued.

The CCG R&D plan supports the Coast Guard's strategic plan. R&D performed today provides marine expertise in order to influence international standards and to support Canadian industry for the future. Coast Guard research is dedicated to resolving those technology challenges brought-on by the changing nature of commerce worldwide and the evolution of the marine community.

As part of its commitment to the economy and the achievement of Canada's goals, the Canadian Coast Guard continues to offer a broad-based planning process involving not only its own staff but also its clients. Likewise the Coast Guard will continue to work and consult closely with Canadian industry, universities and colleges seeking partnerships in knowledge wherever practical. Also the R&D program is closely integrated with the work of other government departments and foreign countries.

Any questions or suggestions regarding this publication should be directed to the Manager, Research and Development, (613) 990-3087.

## LOOKING TO THE FUTURE

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This year CCG (Canadian Coast Guard) assumes official status as a Special Operating Agency (SOA). This will allow CCG to focus on providing essential and valuable services to Canada's marine community. It also requires the application of rigorous management procedures and accountability for all program expenditures.

The ultimate goal of SOA status is improved results for Canadians. The role of the CCG R&D program within CCG's new status is the investment in applications that will allow CCG to fulfil its mandate more effectively and affordably in the delivery of critical services to all clients.

The R&D program has a long and valued history in the Canadian Coast Guard (CCG). The program was initiated in 1974 in order to meet new CCG operational demands, using technology as one of the primary tools of change. The decision to put an R&D program in place was recognized as one of the several mechanisms required to keep the organization forward looking and to respond to challenges in service delivery and efficiency. Benefit cost ratios of 10:1 are consistently achieved. The value of this research is undisputed.

CCG research addresses those specific issues brought-on by changing trends in the marine world and international transportation markets; changes in demand for marine services; and to new strategic directions defined by the government. R&D is also directed to a strategic understanding of the broader marine environment, the footprint left by marine activities on our oceans and freshwater resources, and to sustainable transportation objectives. The R&D program assists in meeting new management strategies relating to changes in levels of service and client advice on the marine program. Finally, the CCG research activity also complements the departmental ocean strategies by supporting a shared knowledge base in theme areas of mutual or overlapping interest.

The Coast Guard R&D Program is coordinated through one focal point to assist in the establishment of a master plan, support to the CG business plan and to facilitate the establishment of priorities, project selection criteria, performance measures, reporting and accounting.

At this time, Coast Guard has several priorities. Traditional priorities include safety of life, operational efficiency, and support to the domestic marine industry. The evolution of the CCG's navigation services and the development of a new maritime security role requires for new ways of gathering and analyzing information. The promotion of sustainable transportation, including the promotion of healthy oceans and meeting Kyoto goals requires new approaches to traditional problems. Within the area of energy and emissions, the CG is moving to new strategies for engine health monitoring, fuel conditioning and fuel management.

In summary, R&D sponsored work will focus on the following:

**Marine Highway:**

- development of advanced navigational and ship-related information systems (often satellite-based);
- automatic processing, analysis and automated transmittal of remotely-sensed ice information;
- interactive nature of displays on the bridge of the vessel;
- integration of ship's information with shore-side management functions;
- electronic devices which automatically monitor vessel position and/or services to home-in on persons in the water.

**Sustainable Transportation, Environmental Protection and Safety:**

- continued efforts at marine aids (system) modernization;
- development of improved standards, training and certification procedures for CCG vessels;
- research into new engine maintenance management systems, novel power systems/components, and emission control technologies which offer greater efficiency, reduced emissions and reduced maintenance;
- development of "biological" sewage treatment facilities for ships, to handle black and gray water, with zero tolerance regimes as a target;
- development of new technologies which will reduce clean-up costs and demonstrate due diligence in environmental matters.

Annually, CG will plan and prioritize R&D projects based on the above key thrust areas to give CG the information it needs to make prudent and strategic investments to provide effective and efficient public services.

# **PROGRAM DELIVERY**

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This Research and Development plan reflects those activities undertaken within the CCG, in direct support of CCG's service lines: Navigation Services, Safety and Environmental Response Systems, Fleet Management, and Integrated Technical Services.

The R&D program is coordinated at Headquarters (HQ) Ottawa and delivered at HQ branches or in the regions. A brief overview of the groups involved in the delivery of the R&D program follows.

**Navigation Services** provides, operates and maintains a system of aids to navigation, provides waterways development and maintenance, and ensures protection of the public right to navigation and protection of the environment. Also part of Navigation Services is Icebreaking operations which include activities such as icebreaking escort, channel maintenance, flood control, harbour breakouts, ice routing and information services for marine traffic navigating through or around ice-covered waters, and for the general public. The R&D activities focus on investigating and evaluating promising new technologies that can modernize and improve service delivery without compromising marine safety or service to the public.

**Safety and Environmental Response Systems** conducts R&D in the following major program areas: marine search and rescue, environmental response, and marine communication and traffic services. The R&D activities provide knowledge, technologies and tools to improve efficiencies and reduce expenditures.

**Fleet Management** provides leadership in the development, implementation and execution of a national Fleet management framework, to remain effective and operationally ready to deliver core marine services to Canadians and support to departmental programs. Within available resources, Fleet additionally provides additional sea and air support to other government departments (OGD).

**Integrated Technical Services** provides project planning and management services for the delivery of technical solutions and/or service delivery needs identified by Marine program R&D managers.

**R&D office** has the responsibility to establish goals, objectives, priorities, and accountability measures for the program that support CCG's Business Plan. It is also the program's focal point for resource/business management services, special projects and planning and co-ordination of the program.

**Risk Management** is responsible for the development of a marine services Risk Management Program. Its R&D focus pertains to the development of a comprehensive marine activity and risk model to address CG planning issues as well as to serve as an important component of coastal mapping.

# CG R&D PROJECT DIRECTORY

## Long Life Synthetic Mooring

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In 1992, the Canadian Coast Guard (CCG) began the 5-year buoy project the purpose of which was to reduce the costs and increase the efficiency of the Aids to Navigation Program. The major over-riding goal of the 5-year buoy project was to develop and implement a total buoy equipment system, which can operate on station, without servicing or maintenance, for a period of up to five years. This goal has almost been achieved by using high strength mooring chain, high performance coatings, solar power systems, and rugged lights. However the best which has been accomplished for moorings is a three-year life. Consequently, many buoys today stay on station for six years with their mooring changed at three years.

In order to achieve a reliable 5-year mooring for the difficult sites, work continued in the evaluation of alternative mooring systems. In 1994, CCG began a program of field testing a new synthetic mooring system on the East Coast. In 2001/02, an extensive R&D project was conducted to review the reliability, safety and the cost effectiveness of synthetic moorings. Unfortunately, these studies raised more questions than answers. The aim of this project is to develop comprehensive performance specifications outlining the minimum requirements a synthetic mooring system must meet to satisfy all CCG requirements before undertaking any further testing. The CG requirements include design, handling and safety concerns.

Synthetic moorings can save money and ship time for the CG. They are also environmentally friendly as they cause less sea bottom disturbance compared to chain moorings.

**Contact:** Reiner Silberhorn, Ottawa, (613) 998-1411  
**CG Branch:** Marine Aids  
**Funding:** CCG R&D Program TEC \$50,000 CY \$50,000  
**Schedule:** Fiscal Year 2005/06 – Fiscal Year 2007/08  
**Project Number:** FKAD6



## Lighted Plastic Buoy Development

This project is part of the Marine Aids Modernization Project to develop a buoy system that operates without servicing or maintenance, for a period up to five years. It is investigating the use of plastics as potential replacement material for the steel predominantly used in buoy construction.

Phase 1 analyzed questionnaires completed by stakeholders (industry, Regions and HQ CCG Staff) regarding operational and technical requirements for small, medium, and large plastic buoys. The next phase is to validate these requirements and develop a set of performance specifications specific to CCG's operational requirements. Subsequent phases involve the development of testing specifications and procedures to help determine whether the buoys are in full compliance with the CCG performance specifications; and the testing and evaluation of commercially available large lighted plastic buoys.

Large lighted plastic buoys could bring significant savings to the CCG by eliminating the need for sandblasting and painting and servicing by large buoy tenders.

**Contact:** Reiner Silberhorn, (613) 998-1411

**CG Branch:** Marine Aids

**Funding:** CCG R&D Program TEC \$195,000 CY \$50,000

**Schedule:** Fiscal Year 2001/02 – Fiscal Year 2005/06

**Project Number:** FKAB6

## Development of Response Strategies for Orimulsion

The objective of this project is to review and test new recovery technologies for Orimulsion™.

Orimulsion™ is currently being shipped to the Dalhousie Generating Station in New Brunswick and can be quite difficult to cleanup once spilled. It is a heavy bitumen that has a higher viscosity than Bunker C, sinks in freshwater and floats, semi-emerged in salt water. Due to the unusual behaviour of this product, response agencies are struggling to find ways of recovering Orimulsion and are just beginning to understand its impacts on the marine environment.

Any R&D work conducted on recovering Orimulsion will also benefit responders in dealing with other heavy oils, such as Bunker C. Recent incidences, such as the Erika incident off the coast of France in 1999, demonstrates this point.

This project began in 2001/02 when the International Orimulsion Working Group was formalized. Together they developed a five-year research plan to evaluate new and existing oil spill recovery methods and techniques to assist in the advancement of recovering Orimulsion. The plan consists of five subject areas: shoreline recovery, mechanical recovery, biological studies, chemical/physical studies and detection/tracking.

Current funding pressures have made it necessary to defer some of the planned activities for this research work. The main priority for 2005-2006 is to further enhance the existing GT series pumps/skimers to bring this equipment to reach its fullest potential through new technologies.

Specifically, this year will study the brush attachment technology which would significantly reduce water intake while skimming thus ensuring an adequate supply of oil reaches the pump while pumping bitumen or other very viscous fuel oils. This study will explore the various brush attachments, their bristle size, arrangement, and material as it relates to very viscous bitumen and heavy fuel oils.

The benefits to Coast Guard are associated with an increased capability to respond effectively to a spill and thereby reduce environmental impacts as well as response costs.

<b>Contact:</b>	Ron Mackay, Maritimes Region, (902) 368-0204			
<b>CG Branch:</b>	Rescue, Safety and Environmental Response			
<b>Funding:</b>	CCG R&D Program	TEC	\$1,255,000	CY \$75,000
	Environment Canada		\$ 555,000	
	Bitor Corp.		\$ 120,000	
	N.B. Power		\$ 27,500	
	USCG		\$ 235,000	

**Schedule:** Fiscal Year 2001/02 – Fiscal Year 2007/08

**Project Number:** FKCA6

## Evaluation of Arctic Diesel Fuel & Marine Diesel Oil Blends (with and without Lubricity Additives)

The wide range of quality in marine fuels represents a real limit on the ability of ship operators, such as the Coast Guard, to maximize the use of their vessels. Proper fuel quality, which includes lubricity factors, is essential to the long life and health of the fuel injection pump plungers and other components in marine diesel engines. Wear rates are critical to effective engine management and, even, safety.

In many locations, the fuel quality is either unknown or suspect in terms of its ability to meet marine engine requirements. For example, diesel fuels transported into Canada's north are refined to have low pour and cloud point temperatures. The additional refining that has to be carried out to lower the pour/cloud point temperatures leads to a fuel that typically will have a lower viscosity. This additional refining also removes polar compounds from the fuel thus reducing the sulphur content and its lubricating qualities. As a result, additives are used to compensate. But even so, there can be questions as to the whether the fuels will fall within the engine specifications for all applications.

If marine operators could more easily determine the lubricity properties of available diesel fuels, and the wear rates, they could adopt alternative fuel conditioning and fuel management strategies. Likewise, if fuel lubricity levels can be established, off-spec fuels might be tolerated for short time periods or additives could be introduced, by the operator, to bring wear rates within desired ranges. For the Coast Guard, this could imply substantial savings in annual fuel expenditures and ship maintenance.

The lubricity project, which is contracted to Advanced Engine Technology Ltd. (AET), served to develop a test apparatus and associated test method to test fuel for its lubricity levels. This is the "Ball on Three Disks" (BOTD) system. In addition to determining diesel fuel lubricity quality, the project team has also developed the capability to assess the adequacy of various lubricity additives to bring the diesel fuel up to acceptable standards, as would be required for CCG engine types. The improved instrumentation and test method can determine the lubricity level of diesel fuels with and without lubricity additives.

The new Ball on Three Disk (BOTD) lubricity test equipment is manufactured by Falex Corporation and the test protocol will shortly be presented to the American Society of Testing and Materials (ASTM). This test method will be validated in an upcoming round-robin test program, which is presently being organized to fulfil requirements of this standards-making organization. ASTM standards are often adopted by other standards making organizations such as the International Standards Organization (ISO). This usually leads to international acceptance of the standard as an ASTM/ISO numbered test method.

To date, laboratory work has also been validated in a series of full-scale diesel engine tests, using a VASA 32 engine belonging to the Nunavut Power Corporation in Iqaluit, Nunavut. These tests have been identified as critical to the acceptance of wear measurements derived from the test apparatus.

As part of this final stage of the project, the team will again test the lubricity additive(s) in this stationary generator set, this time using ceramic coated parts and some new additive packages. As well, the High Frequency Reciprocating (HFRR) test rig has been added for comparative purposes. This step of testing in a full size medium speed diesel engine is proposed so that any potential longer term engine problem during testing would not jeopardize a CCG heavy icebreaker during a major mission. This final phase will continue to (early) 2005-06.

Subsequent to this test, the industry members of the project will conduct a round-robin test of the additives to validate the results. The results of the round robin will serve as the basis for a submission to the American Standard Testing and Materials (ASTM) organization, mentioned above, to create a new fuel test procedure and fuel standard.

This project will benefit all of CCG's diesel engine application areas through reduced maintenance costs and improved lubricity additive formulation. This project also demonstrates CCG responsible behaviour in the North to help protect an environmentally sensitive area. The project will provide a world-wide standard and associated test equipment.

Although not part of the current proposal, the work on lubricity clearly indicates new directions for marine operators in fuel conditioning and fuel management strategies. Additional (future) work will be proposed in these areas, specifically to respond to changing (regulated) fuel qualities and sources of fuel stock (Tar Sands). This work will also serve to meet Kyoto commitments and to improve operational efficiency.

**Contact:** Al Dacosta, Headquarters Ottawa (613) 998-1776

**CG Branch:** Integrated Technical Support

**Funding:** CCG R&D Program TEC \$1,400,000 CY \$60,000  
 Numerous Industry Partners & GNWT \$3,000,000  
 Numerous Companies \$ in-kind support

**Schedule:** Fiscal Year 2002/2003 – Fiscal Year 2005/2006

**Project Number:** HCAA6

## Squat Study for the Purpose of Re-Evaluating Underkeel Clearance Specifications

The loading capacity and safety of ships travelling the St. Lawrence are directly related to three factors: (1) the maintained (dredged) depth of the channel with respect to the chart datum; (2) the water level with respect to the chart datum; and (3) the various dynamic factors and phenomena that are included in the underkeel clearance calculation (squat, roll, pitch, etc). Squat, which is defined as the measurement of the sinking of the ship when in movement, is one of the components of underkeel clearance (UKC). This squat, which varies mainly according to the speed, width, and static draft of the ship and the depth of the water, is estimated by means of a theoretical formula that has never been validated under real operational conditions and whose accuracy can vary from one ship to another. This formula constitutes the basis for the UKC specifications that have been in force on the St. Lawrence waterways between Montreal and Quebec City since 1992. These UKC specifications, which were implemented for reasons of safety and environmental protection, are managed and enforced by Marine Communications and Traffic Services (MCTS) of the Canadian Coast Guard (CCG).

Climate changes predicted for the short and medium terms suggest that in future, the water level of the river could dip below the average more often than it has in the past 40 years. At a time when dredging is the subject of many environmental concerns, a better knowledge of the phenomenon of ship squat, with a view to optimizing the water column available for navigation, could offer a promising alternative to dredging, should the maintained depth of the waterway need to be increased to ensure the competitiveness of ports along the St. Lawrence.

The purpose of this project is to study the squat phenomenon of ships, using GPS-OTF (Global Positioning System – On-the-Fly) technology for the purpose of re-evaluating the underkeel clearance standard in force on the St. Lawrence.

Phase I (2001-2002; 2002-2003) consisted of a feasibility study that reviewed literature and recent squat studies conducted around the world, analyzed available technologies, and identified the resources required to conduct the study as well as the development of a work plan. An initial squat measurement survey was made in December 2002. Analyses of the data gathered revealed some problems associated with the quality of data measured by the GPS-OTF technology.

Phase 2 (2003-2004) comprised of a study to improve the reliability and performance of the GPS-OTF technology in response of the results and technical problems encountered in phase 1.

During 2004-2005 (phase 3), the new approach was used to process and validate the quality of the data obtained during the measurement survey conducted in December 2002.

Phase 4 (2005-2006) will be devoted to conducting the measurement exercise, processing the data and determining the squat of ships based on the various parameters that influence these phenomena. The results obtained will be analysed in light of the current underkeel clearance (UKC) specifications for the St. Lawrence River. If necessary, requirements for additional measures will be defined so as to revise the UKC specifications currently in force.

Optimizing the UKC offers several benefits. It will help CCG ensure safe shipping, preserve the coastal regions and oceans and produce potential fuel savings for the marine industry. The findings of the study could also lead the CCG to revise downward the squat factor in the application of the UKC standard, the marine industry could increase load capacity of its ships without further deepening the navigation channel. This would help maintain or improve the competitiveness of Canadian ports along the St. Lawrence.

**Contact:** Pierre Rouleau, Eng. Québec Region (418) 648-7493

**CG Branch :** Navigation Services

**Funding:** CCG R&D Program TEC \$783,300 CY \$270,000  
 Thales Navigation \$400,000

**Schedule:** Fiscal Year 2001/2002 – Fiscal Year 2006/2007

**Project Number:** GMJF3

## Erosion-Sedimentation Model of the St. Lawrence River

The purpose of this project is to develop a modelling package comprising a numerical erosion/sedimentation model and a graphic interface. This model could be used to

gain a better understanding of erosion, transport and sedimentation processes in the St. Lawrence under various hydrological and hydraulic conditions; and

- evaluate the potential impacts of navigation and of waterway maintenance on the environment (shore erosion and deposition of dredged sediments).

The potential impact of maritime navigation and the maintenance of the St. Lawrence Waterway have been the subject of numerous comments and concerns, following Environment Canada's publication of a background paper on the condition of the St. Lawrence in 1996, and the submission of an impact study during the course of a project to deepen the waterway. These events lead to the creation of a navigation co-operation committee which brings together representatives of government, the maritime industry and the community who have a mandate to find means of limiting the impact of navigation on the environment. The main concerns raised by the committee are bank erosion, the destruction of fauna habitats and dredging-related impacts. In conjunction with the committee's work, the purpose of this project is to develop a software which is capable of modeling the influence of navigation and maintenance of the waterway on bank erosion of the St. Lawrence between Cornwall and Cap Gribane at the end of the North Traverse. The knowledge gained from these projects will enable various departments to be better informed to respond to concerns expressed by interest groups and the general public.

In addition, the numerical model will be used in the International Joint Commission (IJC) study to review the criteria for Lake Ontario-St. Lawrence River water-level regulation. It will be used to simulate erosional processes in the fluvial portion of the St. Lawrence.

The numerical erosion/sedimentation model, in development over the last several years in partnership with National Research Council's Canadian Hydraulics Centre (CHC), Environment Canada and the Science Directorate of Fisheries and Oceans Canada, is designed to provide CCG with a tool for the analysis and understanding of the phenomena of erosion, sedimentation and lapping (ship-generated waves) in the St. Lawrence.

For 2005-2006, the research team will use the model to analyse erosion and sediment transport processes based on various hydrological and hydraulic scenarios and evaluate the potential environmental impacts of navigation and waterway maintenance in terms of erosion and sedimentation.



The numerical model will be of benefit to the CCG in that CCG will be better informed to manage dredged sediments, assess environmental impacts of navigation and maintenance of the waterway and respond to concerns raised by interest groups and the general public regarding certain CCG activities or development projects.

**Contact :** Pierre Rouleau, P. Eng., Québec Region (418) 648-7493  
**CG Branch :** Navigation Services  
**Funding:** CCG R&D Program TEC \$642,300 CY \$43,700  
**Schedule :** Fiscal Year 2001/2002 – Fiscal Year 2005/2006  
**Project Number :** FMCC3

## Lighted Spar Buoy

Every year, the Quebec Region faces pressure from the marine industry to leave the lighted buoys in place as long as possible in the fall and to put them back as soon as possible in the spring. Furthermore, the requirement to go to the same place twice a year to change the spar buoy for the lighted one (and the reverse) involves considerable CCG resources.

During the first four years of this project, ten CCG spar buoys (0.7m & 1.0m) were converted into lighted buoys and have been moored in various sectors to cover the whole range of existing river conditions. To date, the field trials have provided excellent information on the spar buoys' performance, level of service, and structural resistance as well as user feedback about this type of navigational aid.

A concurrent study is investigating why spar buoys become unstable when currents reach a certain speed and on the modifications they require to achieve satisfactory performance in terms of stability, angle of heel, and trim. The findings from this study will be available shortly.

Based on the current findings, the project objectives were modified and the project is now focused on providing the necessary technical information to install 0.7m and 1m luminous spar buoys that can provide reliable and efficient service 9 months of the year, remain in the water year round, and stay in place up to two years without replacement or maintenance.

For 2005/06, a conceptual model of the lighted spar buoy will be developed and two prototypes (one of 0.7 m, the other of 1 m) will be tested over a two-year period (2006-2008). The prototypes will be modified spar buoy models currently in use by the CG. Other tasks will include the development of a heeling model for the buoys and conduct a hydrodynamic characterization of the St. Lawrence River between Montreal and Beauharnois, including Lac Saint-Louis. A final report of the technical findings and operational impacts will be published at the end of the test period.

The development of a lighted spar buoy will enable CCG to provide lighted service for 9 months of the year and move closer to the levels of service that users would like to see during the winter, particularly at night. The new buoy would also substantially reduce CG costs in the service and maintenance of these buoys.

**Contact:** Sylvie Pelletier, Québec Region (418) 648-7450  
**CG Branch:** Navigation Services  
**Funding:** CCG R&D Program TEC \$872,000 CY \$115,000  
**Schedule:** Fiscal Year 2000/2001 – Fiscal Year 2005/2006  
**Project Number:** FJNF3

## Large Scale Sewage Treatment Plan

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This project has been cancelled for FY 2005/2006.

**Contact:** Jacques Mondy, Québec Region (418) 648-3208  
**Project Number:** FQAT3

## **NEW SEARCH AND RESCUE INITIATIVES FUND (NIF)**

The New Search and Rescue Initiatives Fund (NIF) is a unique undertaking by federal and participating provincial, municipal and private Search and Rescue (SAR) organizations. The objective is the saving of lives by enhancing SAR prevention and the provision of SAR services. NIF is not specifically oriented to R&D projects but, rather, was established by the federal government to provide funding to new initiatives which enhance the effectiveness of SAR by all participants, especially those outside government.

NIF is managed by the National Search and Rescue Secretariat (NSS) reporting to the Lead Minister for Search and Rescue (the Minister of National Defence).

Within CCG, it is managed as a separate program within the Safety and Environmental Response Directorate (SERS). For the CCG R&D Program, NIF funded research projects are reported when a research project is sponsored by CCG.

Below lists the ongoing projects to be funded by NIF for FY 2005/2006. New proposals were not yet approved at the time of this publication and will therefore, be included in the year-end annual report.

To obtain more information about these projects, please contact Janice Brasier at (613) 991-6123, CCG NIF Coordinator.

### **Project List Summary**

<b>PROJECT NUMBER</b>	<b>PROJECT TITLE</b>	<b>2005/06 Approved ('\$'s)</b>
2003023	Personal Emergency Locator Device	169,514
2003022	Location-Based Risk Analysis of Recreational Boating Activity	221,100
2003026	Cruise Ship Activity and Risk Analysis for Improved SAR Response Planning	122,100
2003	Remote Sensing Shoreline	416,143
2003032	Coherent UHF Radar for Small Target (Liferaft) Detection: Phase 2	38,960
FVHV6	Radio Channel Noise Reduction	82,000
FVHP6	Investigation of Leeway and Drift for Ovatek Life Rafts	344,658

<b>PROJECT NUMBER</b>	<b>PROJECT TITLE</b>	<b>2005/06 Approved ('\$'s)</b>
FVHQ6	CCGA-P Marine Simulator Program	160,364
FVHU6	Life Raft Operational Performance Evaluation of Technology, Human Factors and Training Elements	588,748
	<b>NIF – Total Approved</b>	<b>2,143,587</b>

## Personal Emergency Location Device

Now in its final year of a three-year plan, current activities include putting together a test package to evaluate methods of improving signal detectability and investigating alternatives in antenna design. A final report will be delivered by the end of FY 2005/06.

Contact : **Janice Brasier, (613) 991-6123**  
 CG Branch : **Search and Rescue**  
 Funding: **NIF Fund**                      **TEC**    **\$595,684** **CY**    **\$169,514**  
 Schedule : **Fiscal Year 2003/2004 – Fiscal Year 2005/2006**  
 Project Number : **2003028**

## Location-Based Risk Analysis of Recreational Boating Activity

Recreational boating accidents account for many of the SAR incidents annually. The Canadian Coast Guard (CCG) has identified a need to know more about the patterns of recreational boating in Canada (frequency, duration, location, type of activity, etc.) to aid with targeting prevention programmes, and assist with SAR planning. Although several studies have investigated factors associated with recreational boating (demographics, PFD use, alcohol consumption, etc.), two main factors that would help decision-making are missing: spatial & temporal distribution of boating activities; and incident rate by level of exposure and type of activity. This project will address these issues through data collection and analysis, and GIS (geographic information system) and risk modelling. This will complement existing studies on recreational boaters' behaviour (bottom-up analysis) by linking it with this top-down approach based on incident rates.

All results will be published, and the rights to any software developed in the course of this project will rest with the principal investigator.

Contact : **Janice Brasier, (613) 991-6123**  
 CG Branch : **Search and Rescue**  
 Funding: **NIF Fund**                      **TEC**    **\$674,300** **CY**    **\$221,100**  
 Schedule : **Fiscal Year 2003/2004 – Fiscal Year 2005/2006**  
 Project Number : **2003022**

## Cruise Ship Activity and Risk Analysis for Improved SAR Response Planning

The Canadian Coast Guard has noted a number of changes and trends in the cruise ship industry across Canada. In fact, there have been serious occurrences that might have resulted in a significant loss of lives in North America in recent years. The number of cruise ships arriving in Canada and the number of people on board are growing at a very high rate, and this exposure is compounded by their forays into increasingly remote locations. The purpose of this project is to clearly identify trends in cruise ship activity levels and locations in Canada to produce a risk analysis. Knowledge of the risk levels by location and other factors would assist with better SAR resource allocation, contingency planning, and prevention or mitigation measures.

Contact : **Janice Brasier, (613) 991-6123**  
 CG Branch : **Search and Rescue**  
 Funding: **NIF Fund**                      **TEC**    **\$371,800** **CY**    **\$122,100**  
 Schedule : **Fiscal Year 2003/2004 – Fiscal Year 2005/2006**  
 Project Number : **2003026**

## Remote Sensing Shoreline for Northern Labrador

Canadian charts have a serious lack of up-to-date coastal information on the Labrador Coast, especially from Nain, north to the Button Islands. Many rocks and islands are not identified and many others are not properly positioned; major features such as fiords do not have good shorelines. This situation is hazardous to mariners and those who are called to assist in an emergency. The Canadian Hydrographic Service (CHS) is responsible for charting Canadian waters, but priorities dictate that this area will receive little attention in the foreseeable future. This proposal will allow CHS to provide information to improve SAR capability and reduce the risk to mariners and the environment.

A shoreline database consisting of provisional paper charts will be created using Remote Sensing technology in the Northern Labrador area. These products will be available for use in Search and Rescue activities. Mariners will be able to use the products to enhance navigational safety and therefore prevent incidents necessitating SAR. These provisional paper charts will allow accurate positioning using GPS, radar or pilotage techniques. Advances in Satellite Remote Sensing technology allow the collection of shoreline data in remote areas that traditionally were inaccessible.

All results will be published, and the rights to any software developed in the course of this project will rest with the principal investigator.

Contact : **Janice Brasier, (613) 991-6123**  
 CG Branch : **Search and Rescue**  
 Funding: **NIF Fund      TEC      \$1,073,879      CY      \$416,143**  
 Schedule : **Fiscal Year 2003/2004 – Fiscal Year 2006/2007**  
 Project Number : **2003xxx**

## **Coherent UHF Radar for Life Raft Detection - Phase II**

The safety of life at sea and the efficiency of marine search and rescue (SAR) operations could be substantially enhanced by increasing the ability of radars to detect small targets, particularly in higher sea states (< 5m). Numerous discussions with personnel involved in marine SAR have confirmed that improving the capability of radar systems to detect small targets such as life rafts and other craft would be a notable asset. Similar conclusions on technological limitations have been drawn by those involved in coastal surveillance for regulations enforcement and narcotics interdiction.

The project proposed here addresses this need by improving on the inherent limitation of existing marine radar systems to detect targets with a radar cross section on the order of 1 m<sup>2</sup> or less. Such targets include life rafts, lifeboats, various other small vessels, and small ice pieces (bergy bits and growlers). This limitation is particularly severe in high sea states where the return from these targets is further "buried" in ocean clutter.

Improvements in this area will allow search and rescue operations to be conducted more efficiently by potentially reducing the time required to locate life raft and distressed personnel in the water during heavy seas. This will provide the ancillary benefit of reducing the total SAR incident time (which averaged over 16 hours in 2001), thus providing costs savings on available resources.

Contact : **Janice Brasier, (613) 991-6123**  
 CG Branch : **Search and Rescue**  
 Funding: **NIF Fund      TEC      \$151,899      CY \$38,960**  
 Schedule : **Fiscal Year 2003/2004 – Fiscal Year 2005/2006**  
 Project Number : **2003032**



## Radio Channel Noise Reduction

It is proposed to develop and test a near real-time voice enhancement system that can be operated as a call-check system to aid in the interpretation of voice data over noisy MF, HF and VHF communication channels. The Canadian Coast Guard has noted that in previous SAR incidents communication with persons in distress has been hampered by radio channel noise.

In the first phase of this project an algorithm for voice enhancement will be developed and tested on examples from previous recordings of SAR communications. The algorithm will be implemented on a dedicated hardware system, and provide interpretation of radio transmissions over noisy channels. Prototypes of this system will be provided to the five MCTS centres on the island of Newfoundland for evaluation by MCTS Officers over the course of the second year of the project. Feedback from the MCTS Officers will be considered for improvements during the evaluation phase of the project. A summary of the trials will be included in the final report due at the end of fiscal year 2005-2006.

Contact : **Janice Brasier, (613) 991-6123**  
CG Branch : **Search and Rescue**  
Funding: **NIF Fund                      TEC      \$169,313    CY      \$82,000**  
Schedule : **Fiscal Year 2004/2005 – Fiscal Year 2005/2006**  
Project Number : **FVHV6**

## Investigating Leeway and Drift in Ovateck Liferrafts

This submission seeks NIF funding support to carry out a leeway investigation of a relatively new type of SAR object (specifically, the Ovatek 4- and 7-person rigid life rafts (<http://www.ovatek.com/>) for which leeway speed and angle information is currently not available in the National Search and Rescue Manual (DFO, 1998) and the Canadian Search and Rescue Planning (CANSARP) program. Ovatek life rafts; which have SOLAS, CCG, and USCG approval; are becoming a popular alternative to inflatable life rafts on board fishing vessels in Atlantic Canada and the West Coast of North America.

Since 1995, Ovatek has sold more than six hundred 4-person units and 7-person units. In spring 2003, a SAR operation (Incident L2003-0034 Quebec Region) was conducted for a 7-person Ovatek life raft in the Quebec Region of the Gulf of St. Lawrence without benefit of leeway information for use in CANSARP. The liferaft belonged to the MV "Caboteur" that sank on April 4, 2003 at 1215 EST. Fortunately, in this case a vessel, the MV "Marie-Eve 2" was standing close by when the MV "Caboteur" sank and the 6-man crew of the MV "Caboteur" was recovered from the life raft within an hour with no injuries or deaths. The life raft along with an EPIRB from the MV "Caboteur" was not recovered until 2 days later on April 6, 2003.

The incident report prepared by the Operations Centre of the Marine Rescue Sub Centre Quebec states in its report that the position of the search objects was very different than the positions calculated by CANSARP. Further it states that upon examination of the incident it is evident that the fibreglass survival capsule (Ovatek Life Raft) did not have the same rhythm of drift as a conventional life raft. If it had not been for the close proximity of the MV "Marie-Eve 2" the outcome of this sinking may have been quite different.

The proposed project seeks to address the concerns raised by this incident by conducting field experiments to establish a relationship between the observed wind velocity and the measured Ovatek life raft leeway velocity for inclusion in CANSARP. The proposed approach will follow the general methodology successfully used in previous work by the proponents (e.g., Fitzgerald et al., 1994).

Contact : **Janice Brasier, (613) 991-6123**  
 CG Branch : **Search and Rescue**  
 Funding: **NIF Fund**                      **TEC**      **\$616,968**    **CY: \$344,658**  
 Schedule : **Fiscal Year 2004/2005 – Fiscal Year 2005/2006**  
 Project Number : **FVHP6**

## CCGA-P Marine Simulator Program

The Canadian Coast Guard Auxiliary Pacific Region (CCGA-P) would like to develop and implement a new volunteer search and rescue (SAR) training program that employs emerging technology to improve the safety, efficiency, and cost-effectiveness of the existing SAR training program and the effectiveness of current marine SAR operations throughout Canada.

The technology that would be utilized in this program would also be used to educate the public in the fields of SAR prevention and boating safety.

All of the information gathered through the simulation project would be compiled and made available to other interested marine SAR organizations, and the CCGA-P will be available to assist these groups when necessary.

Contact : **Janice Brasier, (613) 991-6123**  
CG Branch : **Search and Rescue**  
Funding: **NIF Fund                      TEC      \$346,879    CY \$160,364**  
Schedule : **Fiscal Year 2004/2005 – Fiscal Year 2006/2007**  
Project Number : **FVHQ6**

## Liferaft Performance During Evacuation, Rescue & Recovery

Liferafts are commonly used worldwide as primary or secondary means of evacuation from merchant ships, passenger vessels, fishing boats, and offshore petroleum installations. In many cases, liferafts are required by regulation or law whose explicit aim is to provide for the safety of life at sea.

Despite being almost universally prescribed for and carried by ships and offshore platforms, the actual performance that can realistically be expected of liferafts and the people who have to use them in practice is largely unknown. The absence of quantitative knowledge about liferaft performance – especially in different weather conditions – weakens rational decision-making processes governing a host of associated search and rescue operations and planning.

The proposed project will address this need by assessing liferaft operational performance in terms of technical capabilities in a range of weather conditions. The influence of external factors and mitigating measures on performance will also be evaluated. This includes the role of human factors and training. The outcome of the project will be practical knowledge that can promote survival and support operational decision-making, with the ultimate goal being to improve the safety of personnel who work on or travel by sea.

Contact :	<b>Janice Brasier, (613) 991-6123</b>		
CG Branch :	<b>Search and Rescue</b>		
Funding:	<b>NIF Fund</b>	<b>TEC</b>	<b>\$989,097 CY \$588,748</b>
Schedule :	<b>Fiscal Year 2004/2005 – Fiscal Year 2006/2007</b>		
Project Number :	<b>FVHU6</b>		