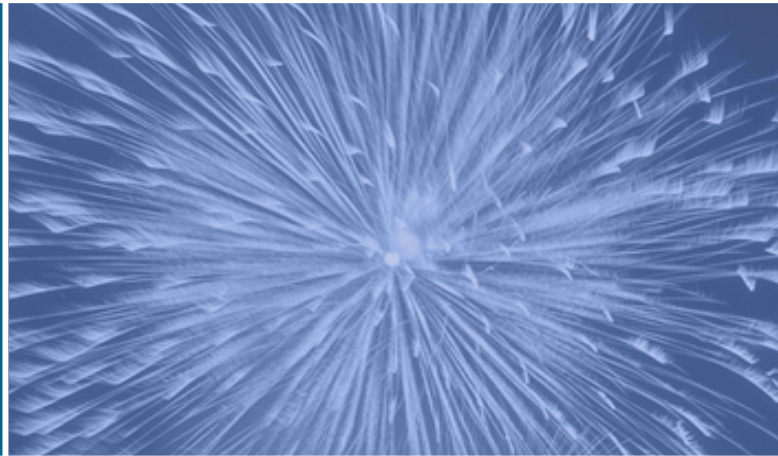




EXPLOSIVES REGULATORY DIVISION

2003

REPORT TO STAKEHOLDERS



Natural Resources
Canada

Ressources naturelles
Canada

Canada



EXPLOSIVES REGULATORY DIVISION

2003 →

REPORT TO STAKEHOLDERS

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Explosives Regulatory Division
Minerals and Metals Sector
Natural Resources Canada
Ottawa, Ontario
K1A 0G1

Telephone: (613) 948-5200
Facsimile: (613) 948-5195
E-mail: canmet-erd@nrcan.gc.ca

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Message From the Chief Inspector of Explosives

At the end of 2002, the Explosives Regulatory Division (ERD) of Natural Resources Canada (NRCan) published its *Report to Stakeholders*, an overview of explosives activities similar to the former Explosives Branch annual reports that ceased publication in the late 1980s. This is the second edition of this report, which we hope will become an annual event.

We will be trying to include information in it that will be of interest to the various communities in the explosives, ammunition and pyrotechnics world and we would appreciate feedback from you, the reader, to tell us what you would like to see in future editions.

The past year has been a busy one for ERD on a number of fronts. We continued our stakeholder consultations on the new security proposals in Bill C-7 (formerly Bill C-17), the *Public Safety Act*; we also published several new draft standards, and the plain-language Regulations project has moved along well, although it has been a heavy consumer of resources.

Bill C-17 passed through the House of Commons and was at Second Reading in the Senate when the change of government in November suspended all legislation in the House. The Bill was reinstated as Bill C-7 in 2004 and, in the meantime, we are completing the consultation process and preparing to implement the new programs. For anyone who has not yet seen or commented on these proposals, they can be found on our web site at www.nrcan.gc.ca/mms/explosif or we would be pleased to send you a hard copy.

Draft standards for display and family fireworks have been published, as well as proposed new guidelines for calculating safety distances at fireworks displays. These are currently being discussed with stakeholder groups. A major effort has been the first draft of a standard for initiating devices. As a result of initial feedback, this

has been split into two documents: a stand-alone authorization section and a compilation of requirements and tests specific to initiating devices. Discussions with industry on this are expected to continue for some time and an ad hoc industry/NRCan working group has been formed for this purpose. Another development in 2003 was the creation of the Bulk Explosives Steering Committee, a joint initiative of the Canadian Explosives Association (CEAEC) and ERD. The Committee's purpose is to ensure that ERD's requirements for bulk facilities remain up-to-date as the use of these products continues to evolve.

We held two focus groups on the plain-language rewrite of the Regulations with the CEAEC and with the Canadian Pyrotechnics Council (CPC); the format was generally liked and we received useful feedback. The first packages of the plain-language Regulations are now available on our web site and we invite you to visit it to participate in the consultation process and provide your comments.

To support ERD's expanded functions and to prepare for anticipated retirements, we have hired four new inspectors and will be adding more. We have also expanded and improved our web site and we are hosting a discussion site for international explosives regulators. This infusion of new blood, combined with a steadily expanding use of the Internet to interact with all stakeholder groups, should enable ERD to provide its services even more effectively in the future.



Christopher Watson, Ph.D.



→ **1. The Year in Review**



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An agreement was reached to keep the U.S.-Canada border open to Canadian commercial road and rail explosives traffic.



1. The Year in Review

1.1 ERD Assists Canadian Drivers to Cope With U.S. Safe Explosives Act

In the summer of 2002, it was brought to ERD's attention by Transport Canada that the upcoming implementation of the *U.S. Homeland Security Act* and provisions to its *Safe Explosives Act* would effectively shut the American border down to Canadian truckers hauling explosive loads into or out of the United States because "non-resident aliens" would no longer be permitted to possess or transport explosives. This issue was going to have a serious impact on explosives users in Canada who rely on the efficient cross-border movement of packaged blasting and oil- and gas-well perforating explosives. This approaching dilemma prompted Transport Canada and ERD to join forces with the Canadian Department of Foreign Affairs and International Trade to find a solution to keep the border open. After several diplomatic notes to the U.S. State Department, an agreement was reached to keep the border open to Canadian commercial road and rail explosives traffic. This was predicated on Canada sending to U.S. authorities a list of commercial truck drivers used by the Canadian explosives industry. The Division acted, and continues to act, as the collection and clearing authority for driver information, which Transport Canada then shares with the U.S. Transportation Security Administration and U.S. Customs. In early 2003, the agreement was further bolstered by passage of U.S. law permitting the commercial transport of explosives between Canada and the United States. For the past year, this system has been operating smoothly for over 500 registered Canadian drivers.

Changes in U.S. law also prevented Canadians engaged in explosives-related activities (mining, construction and demolition) in the United States from possessing and using explosives. To assist these persons, ERD entered into discussions with the U.S. Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) to see what could be done. An agreement was reached that the ATF would accept a Transport Canada Transportation Worker Security Clearance as a prerequisite to their issuing a letter of relief to allow those persons to lawfully possess and use explosives.

By fostering and maintaining good relationships with other government departments in Canada and the United States, ERD continues to support the interests of the Canadian explosives industry.

1.2 Explosives Regulations Project

Some time ago, ERD began a pilot project to make the family fireworks sections of the *Explosives Regulations* more reader friendly. A draft version of the plain-language *Consumer Fireworks Regulations* was constructed and tested with retailers and consumers to see if the Regulations' requirements were clear and easy to understand.

The present *Explosives Regulations* project builds on that venture. The Division is looking at the Regulations as a whole and trying to write modernized regulations that reflect existing regulations, policies and practices in a format that is easier to use and understand. This is being achieved by incorporating novel writing and layout styles such as shorter sentences, informative section headings, side notes, and more effective use of white space.

While all new regulations are required to be published for comment in the *Canada Gazette*, Part I, ERD wants to work with interested stakeholders long before this stage.

In the fall of 2003, two major stakeholder organizations, the CPC and the CEAEC, participated in a two-hour working seminar on the proposed drafts of the new *Explosives Regulations*. The focus groups were led by a facilitator and had two components: a self-administered questionnaire and a group discussion. In all, 37 participants completed the questionnaire (5 in French and 32 in English) while 36 people participated in the group discussions.

At the end of 2003, three parts of the new Regulations and a questionnaire were posted for comment on ERD's web site. The questionnaire received approximately 180 responses. As 2004 progresses, the Division intends to post additional draft versions of the new Regulations along with a full report on the focus group meetings and the questionnaire results.

For more information on the *Explosives Regulations* project, visit ERD's web site at www.nrca.gc.ca/mms/explosif.

1.3 Improved Web Site

ERD has improved its web site (www.nrca.gc.ca/mms/explosif) and navigational system to provide easier access to information on its educational programs and licensing forms. The upgraded site offers a cleaner, more organized presentation that allows users to click on "key-word" buttons that direct them in accordance with their interests.

Users will find that the educational pages have been sub-divided into three major components (fees, certification and scheduling) and that the licensing forms have been reformatted so that they can be completed either electronically or by hand. A new on-line form for the reporting of accidents and incidents is also being introduced.

In addition to these improvements, the "What's New" page is constantly being updated to assist visitors in obtaining the latest information.

To ensure that ERD's web site is working for you, the Division welcomes your comments and suggestions. Please send them to the attention of:

Explosives Regulatory Division
CANMET Mineral Technology Branch
Minerals and Metals Sector
Natural Resources Canada
1431 Merivale Road
Ottawa, Ontario K1A 0G1

Facsimile: (613) 948-5195
E-mail: canmet-erd@nrca.gc.ca

or submit the information on-line at:

www.nrca.gc.ca/mms/explosif

25 years ago ... The explosives industry and the Explosives Regulations went metric. On November 25, 1977, the conversion of explosives quantities into metric units became law (e.g., 4000 lb became 2000 kg).



A redesign of the walk-in magazine door will ensure a higher degree of security.



Roman candles

1.4 Magazine Standards

ERD, in conjunction with the Royal Canadian Mounted Police (RCMP), has developed and adopted a redesign of the walk-in magazine door. This new standard makes the new laminated door, along with new high-security locking hardware, mandatory.

As of May 31, 2001, the new door concept was to be adopted on all new walk-in magazines while a phase-in implementation period has been established for existing magazines.

A graduated implementation period has also been created for the locking hardware in that licensees have three to five years (depending on existing hardware) from May 31, 2001, to upgrade their locking systems to the newer, higher-security standards.

In addition, as of May 31, 2003, it was expected that all licensees will provide an Implementation Plan to ERD that outlines a time line for achieving these new requirements. This implementation plan is mandatory, but is not intended to be final; rather, it is to serve as a guide for both parties to illustrate that progress/commitment is being made toward the necessary changes to improve the security of explosives.

1.5 Development of Other Standards

Within the *Explosives Regulations* is listed a series of tests that can be used to determine the acceptability of explosives for authorization. These tests are generic without acceptance criteria, which in the past left the approval process to the discretion of the explosives inspector.

For years, however, inspectors came from industry, often with a depth of knowledge and experience in the various types of explosives and thus were able to properly judge acceptability. In addition, most products were made in Canada by large companies with technical expertise. ERD could inspect the manufacturers, question their quality control and quality assurance practices, and determine whether good products were being made. The Regulations gave some guidance as to what testing

might be required but, generally speaking, there was a certain confidence that only a product of good quality would be submitted for authorization.

Times have changed.

In today's global economy, many explosive products are imported from overseas and the Division cannot inspect their manufacturers. Unfortunately, the quality of products from some sources is not consistent and can even pose a danger to the user; therefore, these products are not acceptable for use in Canada.

Furthermore, the Canadian (and also the global) explosives industry has greatly downsized and the pool of experienced personnel from which government can draw is disappearing. Inspectors are now hired with little background in explosives and most will not have worked in the industry.

These changes dictate that clear standards with definite acceptance criteria are required in support of the authorization process.

Some stakeholders have expressed concern that this would be an unnecessary additional burden. The Division's view is different. Clear standards help the industry to know what is acceptable and help to maintain a minimum level of quality. This in turn ensures that cheap but poor-quality products do not come into the country — a practice that forces companies to lower their own standards, possibly resulting in dangerous situations (e.g., detonators made with paper).

ERD has prepared standards for family and display fireworks and is working on one for initiating devices (i.e., detonators). Other standards to come include blasting explosives, ammunition, propellants, model rocketry, and theatrical pyrotechnics.

These standards will be developed with the participation of industry (including the CEAEC, the CPC and the Institute of Makers of Explosives) and the Canadian Explosives Research Laboratory (CERL), and will provide the basis for acceptable explosives in the future.

1.6 New Global Classification for Fireworks

In Enschede, Holland, in May 2000, a fire and explosion in a fireworks storage area resulted in 21 deaths and more than 800 injuries. The tragedy was partly due to the mis-classification and mis-labelling of the fireworks involved. While Canada authorizes and classifies all fireworks used in the country (whether imported or domestically produced), some countries have neither the legislation nor the facilities to do this. A default classification scheme, conservative in nature, would be a benefit to such states while permitting manufacturers to seek a less conservative classification by means of product testing.

As a result of this accident, a working group was formed, under the auspices of the UN Committee for the Transportation of Dangerous Goods, to develop a default classification scheme for all fireworks. A number of countries, including Canada, are represented in the working group, with the Dutch taking the lead. Many points were quickly settled, including the classification of all report shells and all shells over 200 mm in diameter as 1.1G. Unfortunately, serious disagreements arose over the classification of some smaller fireworks. Following numerous classification tests, a conservative scheme was proposed, including the classification of small roman candles as 1.3G. Small roman candles are usually classified as 1.4G,

Improving Safety

An international working group was formed to develop a default classification scheme for all fireworks.



Focus on emulsion classification and safety



United Nations
(Photo Source: UN/DPI by Eskinder Debebe)

Applications for Explosives

Unusual

Oxygen Producer

In the event of an aviation emergency, the ability to be able to produce oxygen is critical. But what actually happens when you “tug gently” on that infamous oxygen mask? Simple manual activation (i.e., the tugging action) initiates a thermo-chemical decomposition of sodium chlorate and iron, which burns at 482°C to produce rust, sodium chloride (table salt) and oxygen gas.



even though they rarely meet the criteria for 1.4G – no flaming projections further than 15 metres.¹ Many countries objected to this cautious classification, stating that small roman candles do not present the same hazards as a 1.3G classification would suggest. Another point of disagreement was whether articles should be classified according to their dimensions (easier for customs officers to check) or according to the quantity of pyrotechnic material they contain (perhaps a better criterion but more difficult to determine).

At the July 2003 UN Committee meeting, the disagreements were so serious that it appeared the whole project might fail but, at the December meeting, a spirit of compromise enabled much progress to be made and the list will likely be completed at the July 2004 meeting. This new UN classification is not expected to have much impact on the current Canadian situation as Canada is a country that has always classified conservatively. It is important to remember, however, that this is a default classification and that a more favourable classification may be obtained by additional testing and appropriate packaging.

1.7 Ammonium Nitrate Emulsions (ANEs)

Ammonium nitrate emulsions (ANEs, UN No. 3375), as defined by the UN classification scheme, are materials that are “intermediate for blasting explosives.” They are essentially emulsions, suspensions or gels that are intended for use as blasting explosives after further modification (normally sensitization by means of gas bubbles or glass microspheres). They are not classified as explosives (Class 1) by UN Test Series 2, and they must pass UN Test Series 8 to be classified as ANEs in the oxidizer class (Class 5.1). To be accepted as an ANE, a material must not only pass Test Series 8, but must also meet a definition that limits the type and quantity of ingredients it may contain.

A Spanish-based explosives company has now developed a series of suspensions that pass Test Series 8 but that do not meet the required definition since they contain limited quantities of amine nitrates or metal perchlorates. The Spanish delegate to the UN Transportation of Dangerous Goods Committee has proposed that the definition be amended to allow these suspensions to be included in the ANE group, a proposal that has caused considerable debate. Some delegates feel that any formulation that contains sensitizers or energetic materials should not be allowed into the ANE group on principle. Others argue that if the formulations behave like ANEs, they should be classified accordingly. The question has been posed, “If these materials are not explosives according to Test Series 2, and not ANEs according to the definition, how then should we classify them?” One possibility is to place them into Class 5.1, but with a different UN number. This solution presents its own problems because we are presently trying to rationalize the UN list and remove overlapping, redundant and often confusing numbers.

Opinions are still divided in this area. There is a growing feeling that Test Series 8 needs to be improved. CERL is continuing to assess the minimum burning pressure test as a possible Series 8 test. Until the issue is resolved, Canada believes it must

¹ Although Canada presently classifies small roman candles meeting the 7.2.1 criteria as 1.4G, this may change if the current trend of developing candles with higher projection heights continues. While these candles meet the restrictions of both net explosive quantity and dimension, the projection heights are much higher (sometimes as high as 50 metres) than the 20 or so metres expected from family roman candles. One can argue whether a fiery projection of 20 m is much more hazardous than one of 15 m, which is the present criterion. This argument cannot be used for 50-m heights. Another choice would be to limit family roman candles to a maximum height of 20 m.

Bill C-7 has successfully passed through the House of Commons.



continue to classify all such products as explosives, requiring all the provisions of the *Explosives Act* and the *Transportation of Dangerous Goods Act* to be met.

1.8 Amendments to the Explosives Act – Bill C-7 Update

In the *2002 Report to Stakeholders*, a detailed description of the proposed changes to the *Explosives Act* was given. While the proposed explosives amendments were, for the better part, non-contentious, the proposal to introduce controls to prevent the illicit trafficking in inexplusive components of ammunition such as bullets and cartridge cases drew sharp criticism. The Government listened and all such provisions were removed from the Bill at clause-by-clause review during Special Legislative Committee study following Second Reading. The Bill then successfully passed through the House of Commons and was referred to the Senate where it was scheduled for committee study when Parliament was prorogued. Prorogement kills all legislation on the order paper; however, when Parliament resumed, the House voted favourably to have Bill C-17 reinstated on February 10, 2004. This Bill was renumbered as C-7 and was at the Senate for study at the time of writing.

Bill C-7

- To control the acquisition and possession of explosives by requiring a background security check before persons can buy and/or handle explosives (a similar system has operated successfully in Quebec for 30 years);
- To introduce export and in-transit permit requirements to complement the current import-permit regime (this amendment will also assist in Canada's eventual ratification of the Organization of American States Inter-American Convention Against the Illicit Manufacturing of and Trafficking in Firearms, Ammunition, Explosives and Other Related Materials [OAS Convention], which Canada signed in November 1997); and
- To track, through a simple, non-obtrusive reporting system, the consumer sale of explosives precursors such as ammonium nitrate.



2. About the Explosives Regulatory Division



United Nations
(Photo Source: UN/DPI by Eskinder Debebe)

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2. About the Explosives Regulatory Division

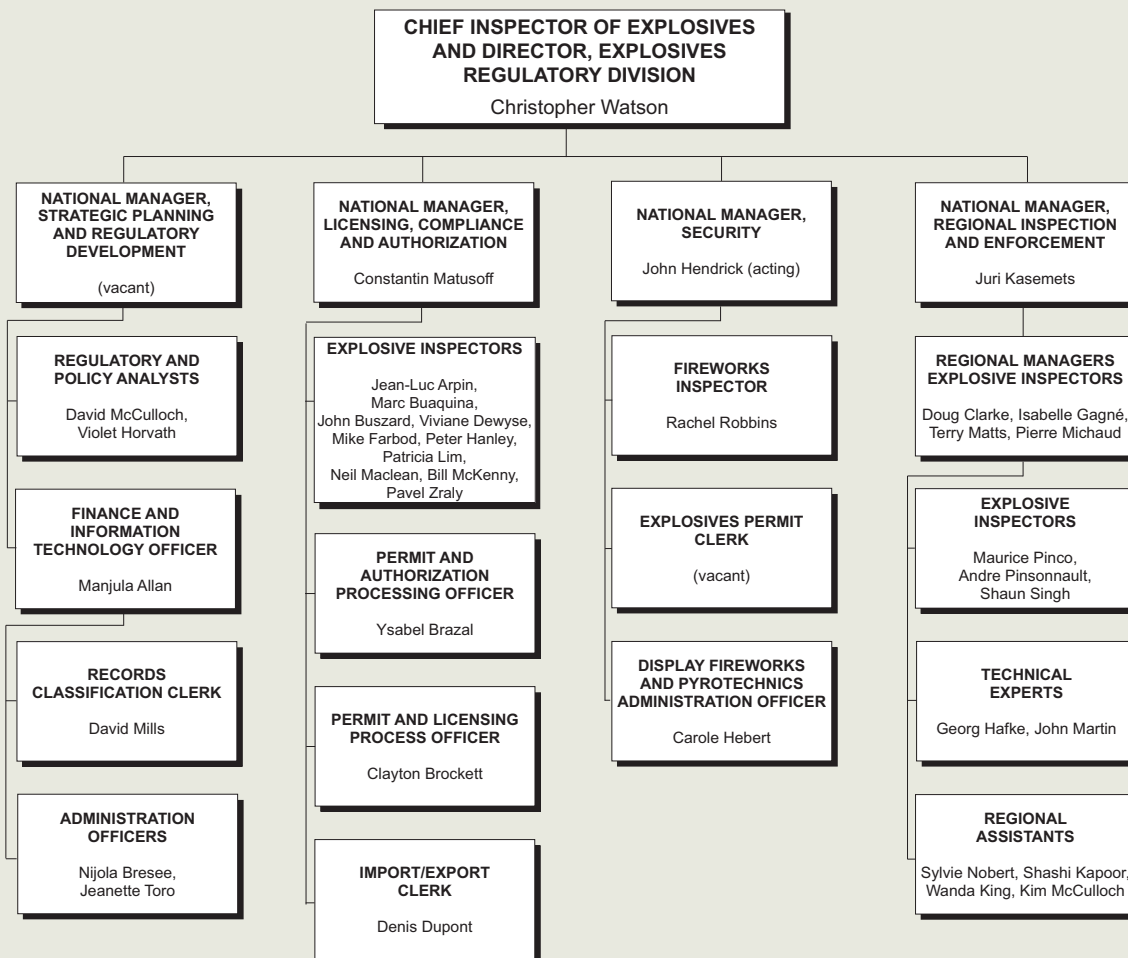
2.1 Who We Are and What We Do

The Explosives Regulatory Division (ERD) is part of the CANMET Mineral Technology Branch within the Minerals and Metals Sector of Natural Resources Canada. The Division's headquarters is located in Ottawa with regional offices in Vancouver, Calgary, Ottawa, Saint-Hyacinthe (Quebec) and Halifax.

ERD is responsible for administering Canada's *Explosives Act* and Regulations. With 26 inspectors and 10 support staff, ERD provides services and support to all facets of the explosives industry, including manufacturers, importers, distributors and users of blasting explosives, pyrotechnics (special effects), fireworks (family and display), ammunition, propellant powders, and toy pistol caps, as well as other safety-oriented types of explosives (e.g., safety flares, air-bag inflators). ERD's principal priority is the safety of the public and of all workers involved in the explosives industry throughout Canada.

2.2 ERD Structure

While the principal aim of the *Explosives Act* has been public and worker health and safety, following the tragic events of September 11, 2001, a new emphasis on enhanced security has become reality. To respond to emerging workload and program delivery requirements, as well as anticipated retirements, ERD has hired four new inspectors and will be hiring more (both inspectors and support staff) in the future. An overview of ERD's structure is provided below.





2.3 Our Participation in National and International Activities

ERD is known worldwide for having excellent regulatory practices. To ensure that ERD responds proactively to new trends, information and technology, the Division is involved in a number of initiatives. With the launching of its Canadian-based Internet discussion board (G.E.R.M.), ERD is involved in secure communications with international regulators and explosives laboratories regarding new regulatory practices and emerging technologies and trends. These discussions will help ensure that new policy development, program design/delivery and publications remain current and relevant.

ERD is also involved in meetings and ongoing dialogue with key U.S. regulators, such as the U.S. Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), as well as with other national and international organizations, including Transport Canada and the United Nations, to ensure that new programs strike a proper balance between safety and security and social and economic interests.

In addition, ERD employees have attended a number of conferences and courses on new technology and safety concerns, such as the 7th International Fireworks Symposium and the 30th International Pyrotechnic Seminar/Euro Pyro 2003. They also attended a working meeting on the Transportation of Dangerous Goods given by Transport Canada and a working meeting of the United Nations Economic and Social Council's Committee of Experts on the Transport of Dangerous Goods. Participation at these meetings and courses will enable the Division to continue to provide professional and up-to-date technical advice to both the public and its stakeholders.



Shaun Singh, Marc Buaquina and Terry Matts (second from right) attending The Chemistry of Explosives and Pyrotechnics Course at Washington College



→ **3. Product Authorization and Our Partnership With CERL**



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ERD and CERL have a crucial partnership ... product trials are made possible by CERL.



Phil Lightfoot, Manager of the Canadian Explosives Research Laboratory, and Christopher Watson, Chief Inspector of Explosives

3. Product Authorization and Our Partnership With CERL

3.1 Product Authorization and Classification

Any explosive that is to be imported into Canada, or manufactured, transported, possessed or used in Canada, must be authorized (the most up-to-date list is available on ERD's web site) or be covered by a permit, certificate or special authority issued by ERD for special tests or product trials.

A testing protocol has been established for authorization and classification of Class 1 materials (explosives), which helps to establish the UN classification. After reviewing submitted specifications for a product, this testing protocol may be initiated if further quality assurances are required or if the product is new in the field. Testing is used to determine the safety of the product and conformity with the manufacturer's specifications. These tests also establish the criteria for storage, transportation (which is done on behalf of the Transportation of Dangerous Goods Directorate), and general use of the product.

ERD works in partnership with CERL, which, in addition to many other activities, provides the technical support for testing of explosives submitted for authorization. In 2003, a total of 5485 new products were classified and authorized for use in Canada (Table 1).

Figure 1 shows the change in the total number of products authorized from 1998 to 2003. The dramatic increase in the number of authorized products in 2001 is due to the reclassification, and subsequent authorization, of fireworks. Previous to 2001, fireworks were classified only according to size, while the new classification scheme includes not only the size, but also the type and colour of the effect. In 2003, a second spike is also observed. This increase in newly authorized products reflects the reclassification of perforating charges from a generic scheme to one based on specific part numbers. Reclassification schemes were incorporated to better reflect the unique types of explosives being authorized for use in Canada.

50 years ago ... The Explosives Division constructed new testing facilities for the Explosives Laboratory (now the Canadian Explosives Research Laboratory). The site was located near the Ottawa airport. In 1967, the Explosives Laboratory moved to where it currently resides at Bells Corners in Ottawa.

3.2 A Word From CERL

CERL works alongside ERD as part of the Mineral Technology Branch of Natural Resources Canada. With a staff of 25 scientists and support personnel based in Ottawa, CERL is the only Canadian government laboratory working in the area of commercial explosives.

CERL's test facilities are unique in Canada and are equal to those of any non-military government explosives laboratory in the world. Ongoing maintenance and improvement at these facilities are done for the benefit of industry and the public. In 2003, for example, one of two original outdoor blast chambers was replaced after 20 years of service, and major renovations of the main laboratory space were also completed. CERL strives to provide high-quality service to all of its clients and, in 2003, certification as a testing laboratory under the ISO/IEC standard 17025 was renewed after a detailed audit.

CERL's primary mandate is to support the implementation of Canada's *Explosives Act*. As part of this effort, CERL tests products on behalf of ERD, assists with accident investigations, and carries out safety-related research and development to provide a sound scientific basis for new regulations and policies. In addition to work in support of ERD, CERL very actively assists the energetic materials industry through contract research work, particularly in the area of explosives safety. Over the last few years, CERL has been increasingly involved in explosives security work from the marking and identification of explosives to helping develop standards for protecting windows against blast effects.

A brief description of CERL's major program areas follows. More detailed information can be found on its web site at www.nrcan.gc.ca/mms/cerl.



New outdoor blasting tank;
X-ray fluorescence (XRF) spectrometer

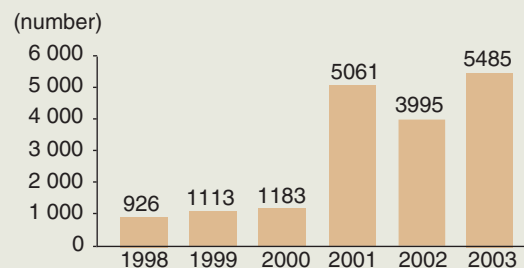
Table 1
Product Authorization Data for 2003, Including
Number of Applications and Approvals

Product Authorization	Applications	Product Test Requests	Approved
Blasting explosives and accessories	193	25	134
Oil and gas well charges	44	4	142
Propellant, percussion caps, ammunition	105	2	84
Fireworks and pyrotechnic articles	1 178	87	5 125
Total	1 520	118	5 485

Source: Natural Resources Canada.

Note: Many applications contain more than one product; therefore, the number of approved products is greater than the number of applications.

Figure 1
Total Number of Authorizations,
1998-2003



Source: Natural Resources Canada.

**Table 2
Distribution of Products Tested
by CERL, 2003**

Products	No.
Blasting explosives and accessories	43
Ammunition and propellants	17
Fireworks and pyrotechnics	124
Perforating products	15
Miscellaneous	106
Paper studies	15
Total	320

Source: Natural Resources Canada.



Photos from top to bottom: 1 and 2 – Assembly of a large slip ring for testing; 3 – Simultaneous TG-DTA with gas analysis by mass spectrometry and Fourier transform infrared spectrometry

3.2.1 Explosives Certification

CERL aims to provide timely and cost-effective certification services. The laboratory's explosives certification work allows products to be authorized by the Chief Inspector of Explosives and is one of the most important functions for CERL. In 2003, a total of 320 products were tested (Table 2). In addition to work for product authorization, CERL also regularly tests products that are not designed to be explosives on behalf of clients.

CERL provides the full range of testing specified in the UN Recommendations for the Transport of Dangerous Goods and can also test to other national and international standards where needed.

3.2.2 Hazardous Locations

CERL has one of the largest indoor facilities for testing equipment to be used in hazardous locations such as explosive gas atmospheres or underground coal mines. Testing is carried out to many national and international standards and the results are accepted by many overseas certification agencies. In 2003, a total of 20 products were tested from a 1-kg electrical transmitter to a large slip-ring assembly (designed to provide electric power to moored oil tankers) weighing 20 tonnes and measuring 8 metres in length.

3.2.3 Explosives Safety Science and Technology

In addition to its explosives certification work, CERL is very active in the broader area of explosives safety. Much of this work is done in support of ERD's policy decisions and to provide sound science on which to base new regulations. There is also a strong effort to look at the properties of new and unusual energetic materials. Some examples from 2003 include:

- Researching fireworks safety – looking into how close fireworks shells need to be for the explosion from one firework to propagate to another;
- Measuring minimum burning pressures of commercial explosives;
- Determining the properties of new aluminum nanopowders for use in novel energetic mixtures;
- Identifying the hazardous properties of ammonium nitrate when mixed with other chemicals; and
- Measuring the thermal properties of CL-20, a high-performance explosive.

3.2.4 Explosives Security Science and Technology

Although CERL has been involved in the security aspects of commercial explosives for many years, its efforts in this diverse area have recently increased. Some examples from 2003 include:

- Determining the pull-out strength of window anchors when subjected to blast loads;
- Working with other government departments to establish standards for window protection against blasts;
- Testing several bomb-containment vessels for industrial clients;
- Developing a database of commercial explosives to assist security agencies; and
- Investigating the feasibility of marking detonating cord and sheet explosives for easier detection at airports.



4. Statistics



Thermofuse

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Providing services to manufacturers and distributors of various explosive products ...



Natural Resources Canada
Explosives Regulatory Division

Ressources naturelles Canada
Division de la réglementation des explosifs

Guidelines for the Pumping of Water-Based Explosives



www.nrccan.gc.ca/mms/explosif

Reprint of
November 30, 1998,
edition

Canada

4. Statistics

4.1 Licensing

ERD provides licensing services to manufacturers, importers, distributors and users of explosives within Canada. These licences, certificates and permits cover a variety of operations from the construction and operation of explosive factory sites to the general public importing family fireworks for various celebrations. Applications for these different categories are submitted using the guidelines and forms developed for each application type. These forms and guidelines are available in interactive PDF format from the Division's web site (www.nrccan.gc.ca/mms/explosif) or by contacting one of its regional offices.

4.1.1 New Requirements

Although the nature of explosives manufactured in and imported into Canada is controlled through the authorization process, manufacturing licences and importation permits, the volumes are not known. With the passing of Bill C-7, however, it will be mandatory for all companies to report to ERD their annual production of explosives. In addition, the Division is collecting and reporting data on the importation, and eventually the exportation, of explosives.

These data will aid in trend monitoring (what industries are doing and where they are going) and will highlight where actions must be taken to ensure that the Division evolves according to the needs of the industry and the safety requirements of the public. Take, for example, the continuing shift to using bulk explosives over packaged ones. In response to this change, ERD introduced new licence categories for explosives factories and has revised the *Guidelines for the Pumping of Water-Based Explosives* (now available for purchase). There has also been rapid growth in the importation of fireworks. To effectively manage this rising demand for prompt product authorization and subsequent importation permits, ERD has hired two full-time inspectors, and is in the process of hiring more, who will be specifically assigned to the authorization of new explosives. The Division is also in the final stages of developing a new database. Initial use of the database will be to streamline the internal authorization process and eventual use will incorporate the electronic submission and issuance of importation permits.

4.1.2 Importation

With the exception of the explosives listed in Table 3 and those under the direct control of the military, an Importation Permit is required for the importation into Canada of any explosive. In addition to this permit, other criteria must be met before an explosive can be imported into Canada, including a citation of the specified explosive in the *List of Authorized Explosives* and compliance with all other licensing and/or certification requirements. Special permits can be issued for testing and field trials.

The class and quantity of explosives imported into Canada from the world in 2003 and, for comparison purposes, 2002 are shown in Table 4, while the importation of explosives from different countries displayed as a percentage is shown in Table 5 (see page 18). The import statistics were classified and published according to the Harmonized Commodity Description and Coding System (Harmonized System or H.S.) employed by Statistics Canada. The weights are based on estimates produced by Statistics Canada from factors applied to the value of goods; these weights should be used with caution. In addition, in-transit data (i.e., goods originating in a foreign country but exiting through a Canadian port) are not included in this trade data.



Table 3
Explosives For Personal Use and Not For Sale That May Be Imported Into Canada Without an Explosives Importation Permit

Explosive Type	Quantity
Safety cartridges	5 000
Percussion caps (primers) for safety cartridges	5 000
Empty primed cartridge cases	5 000
Gunpowder (black powder) in canisters of 500 g or less and smokeless powder in canisters of 4000 g or less	8 kg
Model rocket engines	6
Pyrotechnic distress signals and lifesaving devices	Any quantity necessary for the safe operation of the aircraft, train, vessel or vehicle in which they are transported, or for the safety of the occupants

Source: Natural Resources Canada.

Table 4
Canadian Imports of Explosives From Around the World, 2002 and 2003

	2002 (kg)	2003 (kg)
Propellant Powders	147 851	188 917
Propellant powders	92 375	155 950
Black powder (gunpowder)	55 476	32 967
Prepared Explosives	14 418 976	14 315 800
Prepared explosives, other than propellant powders	9 622 839	9 106 924
Prepared explosives, in cartridges, sticks or form, for blasting	2 107 050	2 441 401
Explosives, based on nitroglycerin, in cartridges, sticks or form, for blasting	2 689 087	2 767 475
Fireworks, Signalling Flares	1 536 961	1 774 992
Fireworks	1 118 983 *	1 463 640 *
Rain rockets, fog signals and other pyrotechnic articles	69 274	101 382
Signalling flares	348 704	209 970
	(\$ millions)	(\$ millions)
Safety Fuses, Detonating Cord	37	46
Detonating caps	15	14
Igniters and electric detonators	17	25
Safety fuses and detonating cord	4	6
Percussion caps	1	1

Source: Statistics Canada.

* 713 225 kg and 1 083 760 kg were imported from China alone in 2002 and 2003, respectively.



Display fireworks connector; fireworks mortars manufacturing warehouse

**Table 5
Importation of Explosives**

Country	Percentage
United States	44
Germany	17
Mexico	12
China	9
Brazil	5
Spain	5
United Kingdom	2
Belgium	1
Italy	1
France	1

Source: Statistics Canada.

4.2 Inspections and Compliance

To ensure compliance with the safety and security provisions of the *Explosives Act* and its Regulations, inspections are carried out throughout Canada by our inspectors and by those appointed as Deputy Inspectors of Explosives (RCMP, Ontario Provincial Police, Sûreté du Québec).

When enforcing the *Explosives Act*, all inspectors follow a policy of Education Where Possible — Prosecution When Necessary. In most instances, unsafe conditions or other deficiencies found during an inspection are voluntarily corrected by the offender simply on request. In some cases, however, the inspector must issue a formal stop work order or, in extreme situations, seize the explosives and prosecute.

4.2.1 How Are We Doing?

As expected, trend monitoring has shown that as the number of inspections increases, the rate of compliance also increases. Thus, ERD has continued to maintain a strong presence in the field, which in turn has resulted in greater safety in the explosives industry (see Table 6 and *Accidents and Incidents* on page 20). Compared with 2002, the number of inspections in 2003 was roughly the same (1226 vs. 1222), while the number of licences increased by over 300 (2044 vs. 2356).

**Table 6
Number of Federal Licences Issued and
Number of Inspections Completed In 2003**

Category	Licences	Inspections (no.)
Factory Licence, Total	100	107
Mobile Process Unit Authorization	174	39
Mfr. Cert, Satellite Site	34	3
Mfr. Cert., ANFO Mech.	15	6
Mfr. Cert., ANFO Non-Mech.	10	–
Mfr. Cert., Re-loading	11	3
Explosives Vendor Magazine	144	112
Explosives User, Regular	511	379
Explosives User, Zone	1 037	190
Explosives User, Special	57	32
Explosives User, Other	37	6
Propellant Magazine	74	37
Fireworks Vendor	138	59
Fireworks User	14	160
Unlicensed Premises	n.a.	74
Port Survey	n.a.	13
Trucks (Without Permits)	n.a.	2
Total	2 356	1 222

Source: Natural Resources Canada.

– Nil; n.a. Not applicable.



*Prevention
is key to
public safety.*

4.2.2 How Are You Doing?

As ERD expands its information-gathering network to include such things as the type of infraction seen during an inspection (minor, major, critical), a more complete picture of the relationship between compliance rates and safety and security of explosives will become available. It is envisioned that stakeholders will use this information as a guide to help ensure their own compliance (see blank Magazine Inspection Report at the end of this report for examples of minor, major and critical).

Critical criteria are those that have the potential of being a hazard to worker or public safety. This does not necessarily mean imminent danger. It can refer to situations such as placing a magazine too close to a dwelling; as long as nothing happens there is no problem but, if something does go wrong, the public is placed at risk. If there is imminent danger, the operation must stop and the situation must be corrected. The critical criteria were developed from the *Explosives Regulations* and standards.

A major criterion is any mandatory requirement in the Regulations or standards, but that would not, in the opinion of the inspector, have the potential of being a hazard or danger to worker or public safety.

Minor criteria might not constitute good industrial practice but do not endanger public or worker safety and are not mandatory requirements in the Regulations. In this procedure, there are only a few minor criteria. The inspector may add as he/she sees fit minor observations for individual cases. These should be noted under comments.

Applications for Explosives

Unusual

Meat Tenderizer

Explosions to tenderize different types of meat? Ludicrous you say? Well, research shows that small amounts of conventional explosives in an aqueous environment can be used to tenderize your rubberiest rump roast into something as succulent as filet mignon. Eat beef — it's a blast!



Roman candles

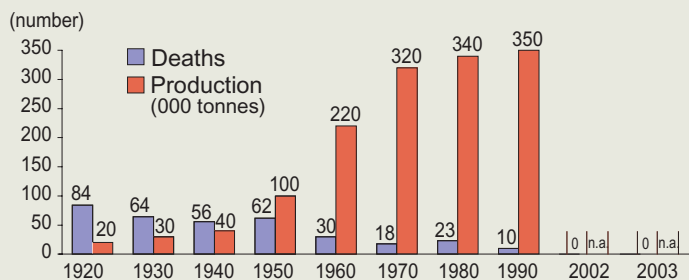


4.3 Accidents and Incidents

The high rate of accidents in the explosives industry in the early 1900s, many of them involving fatalities to innocent bystanders, emphasized the need for control over explosives. Since promulgation of the *Explosives Act* in 1921, the production and importation of explosives have increased dramatically while the number of accidents has fallen from alarmingly high to encouragingly low numbers (Figure 2). (An accident is defined as an incident in which injury or death occurs; unusual occurrences or those causing only property damage are regarded as incidents.)

This improvement in safety is due in part to the cooperative approach between government and stakeholders. The introduction of safer, less-sensitive products has reduced the number of accidental explosions, while new regulations and guidelines have minimized the risk of injury to persons or damage to property (for example, the Canada-wide training and graduated certification programs for display fireworks supervisors and pyrotechnicians, which have allowed these rapidly expanding industries to develop with a minimal number of accidents and/or incidents).

Figure 2
Number of Deaths Compared With Production/Importation of Explosives



Source: Natural Resources Canada.
n.a. Not available.

Unfortunately,
most accidents
occur due to
human error.

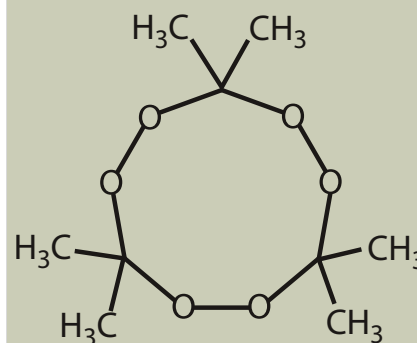


4.3.1 Serious Accidents

During 2003, there were thirteen injuries in nine separate instances involving explosives. Of these, two were classified as serious; fortunately, none were fatal. In almost all cases, the cause was human error. Two of the accidents are highlighted below.

Homemade Explosive – Two teenagers were injured, one with severe damage to his hand, including the loss of all fingers, when the homemade explosive (triacetone triperoxide, TATP) they were fabricating unexpectedly exploded. These individuals had been preparing batches of this type of explosive for some time. Interestingly, the same type of explosive was used to set off an explosive in a Montréal high school (no major injuries or damage to the school, other than destruction of a garbage can, were reported).

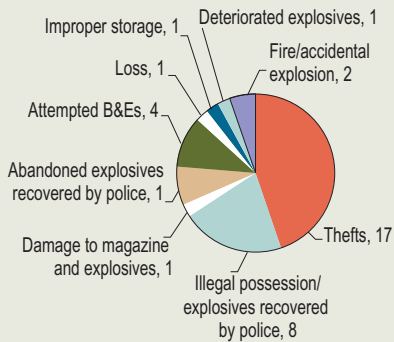
Critical Injury – A man suffered the loss of two fingers when the detonator he was looking at accidentally detonated in his hand.



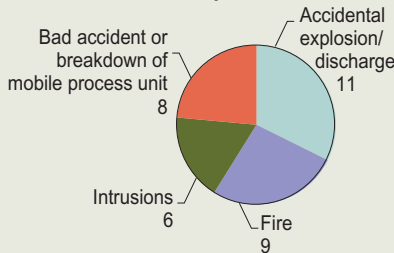
Structure of triacetone triperoxide (TATP)

83 years ago ... Following a high rate of accidents and incidents in the explosives industry in the early 1900s, one of which shattered the windows in Parliament, the first Explosives Act was drafted and introduced in the House of Commons in 1911 and assented to in 1914. Proclamation was deferred because of the war until 1920 when the Explosives Division came into being and was vested with the responsibility of administering and enforcing the Explosives Act.

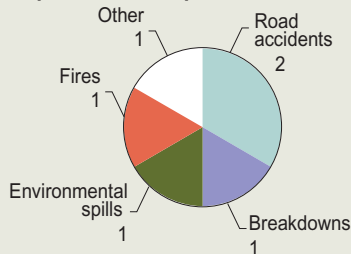
**Figure 3
Incidents Related to
Explosives Security**



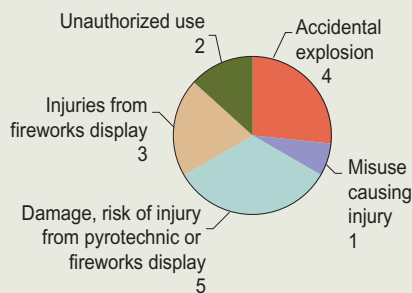
**Figure 4
Incidents Occurring During the
Manufacture of Explosives**



**Figure 5
Incidents Occurring During the
Transportation of Explosives**



**Figure 6
Accidents and Incidents Occurring
During the Use of Fireworks or
Pyrotechnic Devices**



Source: Natural Resources Canada.

4.3.2 Canadian Accidents and Incidents

In addition to data on serious accidents, ERD collects information on accidents and incidents involving explosives in the areas of security, transportation, manufacturing, and fireworks/pyrotechnics (Figures 3-7). It is important to note, however, that while the Division makes every attempt to obtain data on accidents and incidents, not every incident is reported and therefore the information may not come to the attention of ERD. Furthermore, no statistics on the personal use of fireworks are available at this time.

In 2003, seventeen reports of theft were received (Figure 3), a dramatic increase when compared with the six cases reported in 2002. There were also four attempted break-and-enters in 2003. In all cases, the magazines were not constructed in accordance with the 2001 *Storage Standards for Industrial Explosives*; however, all have been subsequently upgraded to these new requirements. In addition, only three recoveries directly related to these thefts were reported, which unfortunately leaves a considerable quantity of explosives unrecovered.

During 2003, there were thirty-four accidents or incidents involving the manufacture of explosives that resulted in three minor injuries (Figure 4). Although this number seems high, and is higher than the twenty cases reported in 2002, many of the incidents were classified as minor and are probably the result of diligent accident-reporting rather than unsafe manufacturing practices.

A summary of the six incidents in transportation by road is given in Figure 5. For each incident (breakdowns, road accidents and environmental spills), the proper authorities were contacted and the proper procedures were followed. Section 64 of the *Explosives Regulations* requires that operators or drivers of a vehicle report to the Chief Inspector of Explosives any accident, fire, damage to the vehicle, or any other occurrence that causes a significant delay in the delivery of explosives. This is to ensure that procedures following the incident do not compromise the safety of the workers or the public and to check that possible trends highlighting underlying problems do not persist.

In 2003, the number of accidents and incidents in Canada associated with the use of display fireworks and pyrotechnics was also encouragingly low and very similar to those reported in the previous year: 4 accidents and 11 incidents in 2003 compared with 6 accidents and 8 incidents in 2002 (Figure 6). Of the reported accidents, 75% occurred on or around Canada Day.

**Table 7
Total Number of Certification Courses and Attendees for 2003***

Course	Sessions		Attendees	
			(no.)	
Pyrotechnic special effects	29	(22)	971	(771)
Display fireworks	34	(25)	1 037	(711)
Total	63	(47)	2 008	(1 482)

Source: Natural Resources Canada.

* For comparison, numbers from 2002 are given in parentheses.

The tragic pyrotechnic accident in a nightclub in West Warwick, Rhode Island, was, however, a horrific reminder of what can go wrong. In Canada, the pre-emptive response to this accident by members of the public services who are responsible for the authorization and support of fireworks displays, such as fire prevention officers and firefighters, was readily apparent. Attendance numbers for the display fireworks and pyrotechnician certification courses increased dramatically (Table 7) with many attendees participating in the courses for a second time.

A breakdown of accidents and incidents reported to ERD by province and territory is shown in Figure 7. Quebec and Ontario, with two-thirds of Canada's population and seven-eighths of the manufacturing factories, not surprisingly reported the highest number of accidents and incidents.

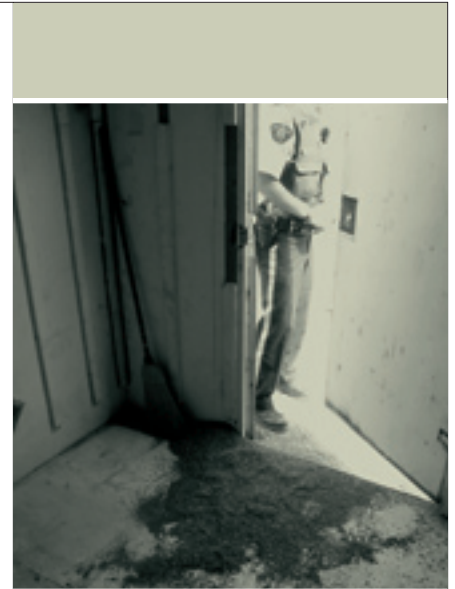
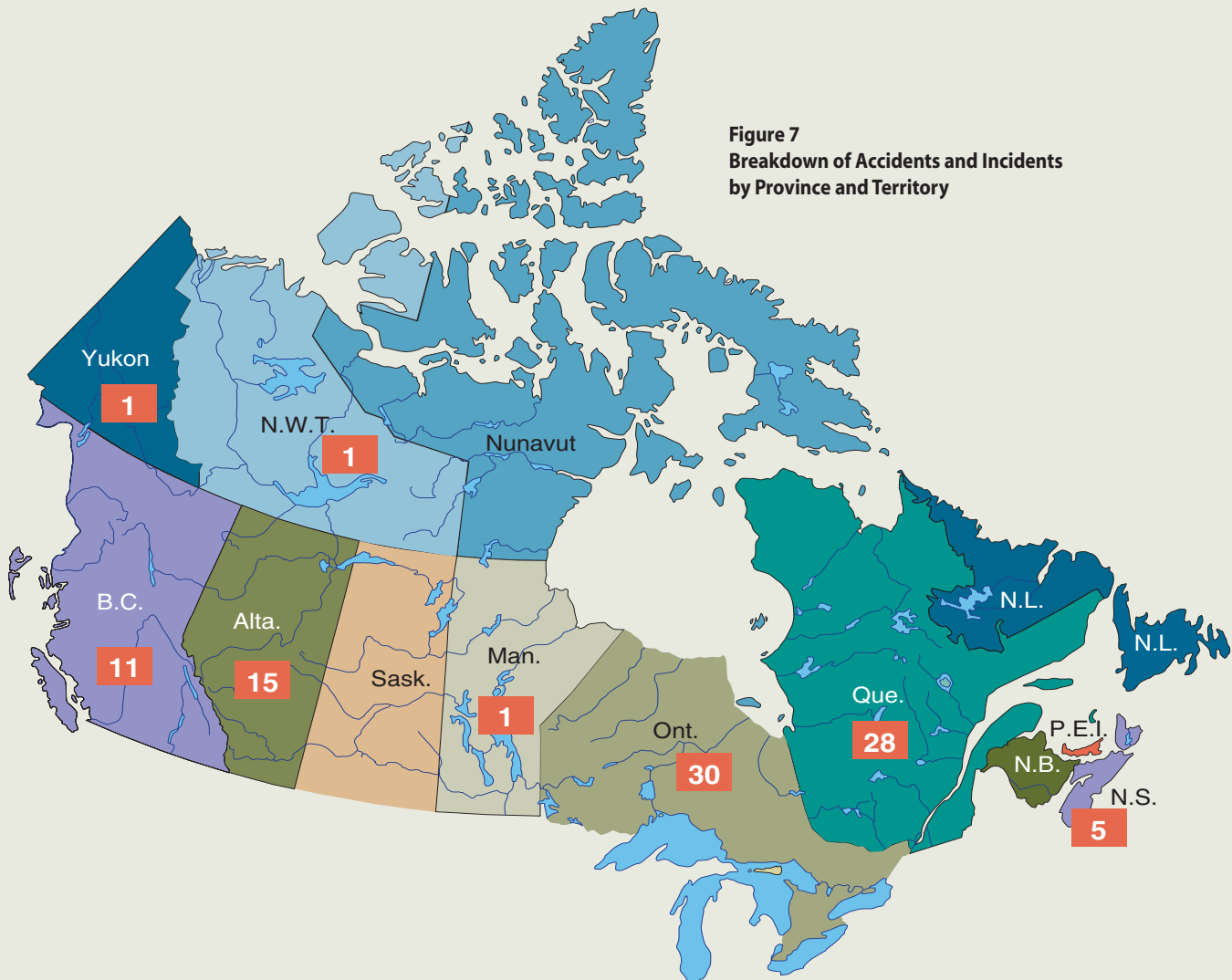


Figure 7
Breakdown of Accidents and Incidents
by Province and Territory



Source: Natural Resources Canada.



4.3.3 RCMP Bomb Incidents

Although incidents pertaining to bombing fall under the *Criminal Code of Canada*, ERD has always maintained an active interest in this aspect of the illegal use of explosives. This interest is fostered by the Division's concern over the security of explosives that, when stolen, abandoned or carelessly lost, often end up in the hands of criminals. The data in Table 8 are extracted from the *Bomb Incident Summary 2003*, published by the Canadian Bomb Data Centre (CBDC), an agency of the RCMP. Also presented are statistics regarding hoax devices and the recovery of explosives and improvised explosive devices. This summary provides an overview of bombings and related incidents in Canada in 2003. It is not an exhaustive report and not all incidents have been reported to the CBDC.

Table 8
Bomb Incident Summary, 2003

	Bombings	Attempted	Recov. IED	Hoax	Accidental	Injuries	Theft	Recov. Exp.	Total
Alberta	2	–	3	2	–	–	–	6	13
British Columbia	39	5	943	12	1	1	4	14	1 019
Manitoba	–	–	–	–	–	–	1	–	1
New Brunswick	–	–	–	3	–	–	–	36	39
Newfoundland and Labrador	–	–	–	–	–	–	–	–	–
Northwest Territories	–	–	–	–	–	–	–	–	–
Nova Scotia	1	–	1	4	–	–	–	48	54
Nunavut	–	–	–	–	–	–	–	–	–
Ontario	8	4	5	4	–	1	1	13	36
Prince Edward Island	1	–	–	–	–	–	–	4	5
Quebec	6	2	7	5	2	26	1	20	69
Saskatchewan	8	–	–	–	–	–	–	–	8
Yukon	–	–	–	1	–	–	–	–	1
Total	65	11	959	31	3	28	7	141	1 245

Source: Canadian Bomb Data Centre.
– Nil.



→ 5. Additional Information



5.1 ERD Contact List	26
5.2 CERL Contact List	26



5. Additional Information

5.1 ERD Contact List

Explosives Regulatory Division

Headquarters

CANMET Mineral Technology Branch
Minerals and Metals Sector
Natural Resources Canada
1431 Merivale Road
Ottawa, Ontario K1A 0G1
Tel.: (613) 948-5200
Fax: (613) 948-5195
E-mail: canmet-erd@nrcan.gc.ca

Pacific Region

(British Columbia and Yukon)

605 Robson Street, Suite 101
Vancouver, British Columbia V6B 5J3
Tel.: (604) 666-0366
Fax: (604) 666-0399

Western Region

(Alberta, Manitoba, Saskatchewan, N.W.T.)

755 Lake Bonavista Drive S.E., Unit 214
Calgary, Alberta T2J 0N3
Tel.: (403) 292-4766
Fax: (403) 292-4689

Ontario Region

1431 Merivale Road
Ottawa, Ontario K1A 0G1
Tel.: (613) 948-5202
Fax: (613) 948-5195

Quebec Region

(Quebec, Nunavut, Labrador – immediate area around Labrador City and Wabush)

P.O. Box 100
2050 Girouard West
Saint-Hyacinthe, Quebec J2S 7B2
Tel.: (450) 773-3431
Fax: (450) 773-6226

Atlantic Region (Newfoundland and Labrador, Nova Scotia, New Brunswick, P.E.I.)

1505 Barrington Street, Suite 1505 North
Halifax, Nova Scotia B3J 3K5
Tel.: (902) 426-3599
Fax: (902) 426-7332

5.2 CERL Contact List

Canadian Explosives Research Laboratory

CANMET Mineral Technology Branch
Minerals and Metals Sector
Natural Resources Canada
555 Booth Street
Ottawa, Ontario K1A 0G1
Tel.: (613) 947-7534
Fax: (613) 995-1230

EXPLOSIVES REGULATORY DIVISION MAGAZINE INSPECTION REPORT

07-06-2004

Inspection Date	Licence No.	File No.
Location		
Name of the Company		Name and Title of Escort
Magazine Number	M-1	M-2
Type of Magazine	M-3	M-4
Magazine Tag Number	M-5	M-6
Warning Signs	M-7	M-8
Condition of Grounds		
Security		
Construction vs. Standards		
Condition of Structure		
Electrical and Heating Safety		
Licence Availability and Accuracy		
Special Instructions Posted		
Stock Condition (incl. packaging)		
Housekeeping		
Ownership and Identification		
Inventory and Records		
Compliance with Licence Limits		
Q/D and Location Issues		
Other (as applicable, see below)		
Peculiarities of the Site or Special Conditions Imposed by the Inspector		
Comments (attach additional pages if necessary)		
Inspector of Explosives	Print Name	Signature

ACTION

Written notification that corrections have been completed is to be forwarded no later than	Send to	Rating

Date		

ACKNOWLEDGEMENT (see reverse side of form for legal requirements)

The undersigned acknowledges receipt of this order comprising _____ pages		
Print Name	Signature	Date