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SECURITY AND THE ENGINEERING PROFESSION IN CANADA

The tragic events of September 11, 2001 are indelibly imprinted in our minds and memories; we will never forget the images of death and destruction which we witnessed on TV that day and in the immediate aftermath. Security of people and places has since become a major priority in the national agendas of many nations. Following a brief outline of U.S. and Canadian initiatives, this issues paper addresses the responsibility and potential roles of Canadian engineers in assisting to protect society against terrorism.

US INITIATIVES

On September 20, 2001, the Presidents of the US National Academies (which include the National Academy of Engineering) wrote to President Bush expressing their readiness to take on active role in the "war against terrorism". The focus of the initiatives proposed in that letter was much on the security front, i.e. "facilitating a more concerted and better coordinated involvement of the US scientific and technology community in assessing threats, developing counter measures, and designing responses to terrorist incidents." A committee of the US National Academies then prepared a framework for the application of science and technology for combating terrorism; their report entitled "Making the Nation Safer: The Role of Science and Technology in Countering Terrorism" was published in June 2002. In addition to setting the context, this report provides technical recommendations in nine areas: nuclear and radiological threats, human and agricultural health systems, toxic chemicals and explosive materials, information technology, energy systems, transportation systems, cities and fixed infrastructure, the response of people to terrorism, and complex and interdependent systems. The full report, including an executive summary can be read and/or downloaded as a PDF file on this website: *www.nap.edu/catalog/10415.html*

CANADIAN INITIATIVES

The Royal Society of Canada convened a symposium on Research and Security on May 9 and 10, 2002; participants included representatives of the US National Academies, Canadian academics and government officials and several members of the Canadian Academy of Engineering. The purpose of this symposium was to examine key issues related to security arising from the events of September 11, and to consider future opportunities and challenges for research on those issues. Information on research topics proposed at this symposium, ranging from technological through societal and cultural, and including education and training, can be found on the Royal Society website *www.rsc.ca/english /research/html*

The federal government's response has been to establish a multidepartmental CBRN Research and Technology Initiative (CRTI) to strengthen Canada's preparedness for, prevention of and response to a CBRN (chemical, biological, radiological and nuclear) attack by fostering new investments in research and technology. CRTI is responsible for coordinating a five-year $170 million fund which is intended to generate knowledge and technology, and support their application as well as harnessing existing capabilities. Further information on CRTI and the projects it is funding can be found on the CRTI website *www.crti.drdc-rddc.gc.ca/home_e.html*

ENGINEERING RESPONSIBILITY

The CCPE defines the "practice of professional engineering" as

> *any act of planning, designing, composing, evaluating, advising, reporting, directing or supervising, or managing any of the foregoing that requires the application of engineering principles, and that* ***concerns the safeguarding of life, health, property, economic interests, the public welfare or the environment***

From this definition, it is very clear that the application of engineering principles in safeguarding life, health, property, economic interests and the public welfare are very much a responsibility of the practice of professional engineering. It is appropriate for the engineering community to contribute its expertise and know-how to that effort, both nationally and internationally.

ROLES AND OPPORTUNITIES

The engineering community can contribute significantly to the development and assessment of alternatives for

dealing with a variety of Canadian security-related concerns, taking into account both technical and economic dimensions. A few of these are described briefly below; these are intended to stimulate discussion rather than representing the most important topics.

One key area of endeavour is the vulnerability of our urban infrastructure to terrorism. Just as it is not economically feasible to prevent the collapse of buildings located at the epicentre of a major earthquake, it is probably not economically feasible to construct buildings which would not collapse under any conceivable act of terrorism. However, improvement of some characteristics, e.g. vulnerability to fire, can significantly reduce the risk of loss of life. Another important infrastructural dimension is the protection of the supply of potable drinking water in our cities and towns; the recent Walkerton catastrophe has demonstrated the vulnerability of such systems and the tragic consequences of contaminated drinking water.

Systems for the supply of energy, communication and information are also vulnerable to terrorism. A glimpse of the serious consequences of breakdowns in such systems arises from our experience during the winter ice storm in eastern Ontario and Quebec several years ago.

Another important area of vulnerability is agriculture and the food-chain. The protection of our food supply is essential both for the ongoing viability of our people but, for Canada in particular, it has major economic significance for many regions of the country.

Knowledge and experience gained from dealing with and preventing natural and technological disasters, including emergency preparedness and response measures, can and should be used to reduce both the vulnerability of and risk to the public arising from acts of terrorism. For example, those working in earthquake lifeline engineering (which include electrical transmission lines, pipelines, and transportation systems) have developed design approaches and technologies which significantly reduce the vulnerability of such systems.

PREVENTIVE MEASURES

Preventive measures include the elimination of those environmental characteristics which foster discontent and which may lead, directly or indirectly, to resorting to terrorism; these characteristics comprise primarily poverty and disease. The professional engineering community in Canada has an opportunity, and arguably a responsibility, to participate in the reduction of poverty internationally through application of our scientific and technological expertise in key thrusts such as developing clean drinking water, the lack of which is a major contributor to disease and ill health. Other important thrusts include: affordable housing, affordable sources of energy, improvements in agriculture (including storage and transportation of food supplies) and urban/rural infrastructure development.

WHAT CAN CAE DO?

The Canadian Academy of Engineering can contribute to security concerns at several levels. In its relationship to the government of Canada, in concert with the other Canadian Academies, it can foster broadly based policy initiatives which recognize the role of science and technology in developing approaches and solutions. For example, it can assist in the development of appropriate engineering research through its work with NSERC and with the engineering and science communities at Canadian universities. The Academy can encourage both private sector and public sector engineering organizations in their own national and international activities.

WHAT CAN OUR MEMBERS DO?

Through their corporations and their contacts, Fellows of the Academy can influence the development, planning and execution of projects which will reduce the vulnerability of various systems. We can ensure that technological, economic and societal dimensions are included and given appropriate weights in such projects. In particular, it is necessary that the basic concepts leading to the reduction of vulnerability be included in the initial planning of such projects.

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Editor: **Arthur Heidebrecht**
(905) 628-8726
heidebr@mcmaster.ca

Executive Director: **Philip Cockshutt**
180 Elgin Street, Suite 1100
Ottawa ON K2P 2K3
(613) 235-9056
acadeng@ccpe.ca