The Canadian Armed Forces (CAF) has undertaken a project to upgrade its respiratory protection capability within the next three years. The Joint General Service Respirator (GSR) Project will see the CAF acquire almost 80,000 new respirators to replace the C4 mask and C7A filter, in service with the Canadian military since the early 1990s.

‘The C4 is still a good protective mask, but there is newer technology on the market that will allow us to better protect our soldiers, while at the same time making it less stressful to wear this protective kit,’ said Lieutenant (Navy) Jason Pickering, the project’s director. ‘Over the years international standards for respiratory protection have changed, as have the potential threats. So, it was clear to us that we have to look at these newer technologies to meet the future needs of our forces.’

The aim of the Joint GSR project is to acquire new respirators that incorporate the latest technologies and human-factor considerations to meet increased respiratory protection levels, while significantly reducing the overall physiological and psychological burden on the users. The equipment will include the respirator system, spare parts, test equipment, training, documentation and accessories, as required.

The new respirator will be used by all environments of the Canadian military, both domestically and internationally. As Lieutenant Pickering points out, personnel must survive in a toxic environment while retaining the freedom of movement to accomplish their missions. This requirement applies to conventional warfare situations, peace support, counter-terrorism operations and support to civilian authorities.

‘The cornerstone of effective chemical, biological, and radiological defence is a good respirator,’ said Lieutenant Colonel Alain Rollin, the CAF’s Director of CBRN Defence and Operational Support. ‘Without that, none of the other CBRN defence capabilities really matter. The respirator is essential to force protection in the modern threat environment.’

In seeking out a replacement for the C4 mask and C7A canister, the CAF is looking specifically to improve the overall vision quality of the mask, the communications capability of users, and the ability to drink fluids while wearing the mask, as well as to reduce the breathing resistance inherent in the current system. Human-factor considerations are important for troops who may be required to wear respiratory protection for several hours. While hazard avoidance is the preferred protection against chemical, biological or radiological threats, mission success may well depend upon the ability of forces to remain on the battlefield despite the contamination.

While the Canadian requirements for the new military respirator have yet to be finalized, indications are that there will be a consideration on the following:

– Improved protection against toxic industrial materials and biological hazards, as stipulated by the latest Nato standards for protection against chemical, biological and radiological threats.

– The lowest possible breathing resistance to minimize user fatigue and both physiological and psychological stress.

– A wide field of vision unimpaired by glare, fogging or field-of-view obstructions. Also, the mask should allow for the use of corrective lenses without impeding effectiveness.

– Good voice transmission and good hearing capability for the user. The new mask should allow the user’s voice to be transmitted clearly and effortlessly to eliminate the need to speak very loudly when communicating.

– The capability for the user to drink hot or cold liquids in adequate amounts and at an adequate flow rate to ensure good hydration with minimal effort.

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and protective seal for 95 per cent of Canadian military personnel while ensuring comfort for users who may have to wear the mask for extended periods of time.

- Compatibility with other CAF protective and combat equipment without compromising its effectiveness. Since 1992, the CAF has introduced new weapons, clothing, communications systems, optics and vehicles, which have resulted in some minor interface problems between the C4 mask and the new equipment.

‘We have done a lot of work with industry to evaluate technical requirements. This feedback has helped us develop a realistic and robust set of requirements that industry can meet,’ said Lieutenant (N) Pickering. ‘We hope to have a request for proposals out to industry by mid-2014, and a contract awarded early in 2015. We expect to have full operational capability by 2016.’

The CAF originally acquired the C4 mask from Airboss in 1992, with replenishments beginning in 2001 and again in 2008. The C7A filter is manufactured by 3M and was first fielded for the Canadian military as the C7 filter in 1992. Subsequent refinements resulted in the introduction of the C7A in 2003. Production components for the manufacture of both the masks and the filters are owned by the government of Canada and licensed to Airboss and 3M under agreements that were last renewed in 2006 and 2011, respectively.

The C4 mask is still widely used in Canada, and is currently in service with the Royal Canadian Mounted Police, Canada’s national police force, as well as with provincial and municipal first responders (as the PC4 version). This underscores the C4’s long-term shelf life and durability. When it entered service in 1992, the C4 had a predicted shelf life of 10 years. Subsequent testing by Canadian military engineers has demonstrated a shelf life extending out to 29 years.

The C4 mask and C7A canister were designed for Cold War scenarios to protect against the inhalation of worst-case battlefield concentrations of chemical or biological agents, or radiation-emitting particulates suspended in air. Although these threats remain important, there are new concerns with toxic industrial chemicals and other materials, as well as biological warfare agents that could contaminate a theatre of operations as a result of either a deliberate or accidental release.

The introduction of the C7A canister in 2003 was the first step towards providing greater protection against these new threats, but came at the cost of increased breathing resistance.

‘We looked at several options when considering how best to upgrade our respiratory protection capabilities,’ said Lieutenant (N) Pickering. ‘We considered simply making improvements to the existing respirator and canister, or undertaking the design and development of a completely new system. But, in the end, we decided to acquire either a military or a commercial off-the-shelf system that would address all deficiencies and would provide CAF personnel with modern CBRN protection at less cost, in less time and with less risk when compared with other options.’

More than a decade ago, the Canadian Armed Forces undertook a comprehensive program to modernize its chemical, biological, radiological and nuclear (CBRN) defence capabilities. Under the umbrella of the CBRN Defence Omnibus Program, the CAF has embarked upon, and in some cases completed, projects that are replacing ageing and obsolete equipment.

In 2010, the CAF introduced a new Vital Point Biological Sentry system that offers point detection for a wide range of biological warfare threats. More recently, the CAF fielded new personal, handheld and fixed-site chemical detectors, as well as new 50- and 100-person transportable collective protection shelters, some of which are configured for use as a mobile field hospital.

Still in the works, along with the Joint GSR project, are initiatives to update the CAF’s CBRN decontamination, reconnaissance, sensor integration and decision support capabilities, as well a project that is looking at stand-off detection capabilities for chemical agents and hazards.

The projects are directed by the CAF’s Directorate of CBRN Defence and Operational Support, a specialized unit that provides strategic advice on CBRN defence to all levels of command in the Canadian military, oversees capability development for CBRN defence and operational support, liaises with civilian CBRN defence partners at the federal, provincial and municipal levels, and ensures CBRN defence interoperability with Canada’s NATO and other allied defence partners.

As a result of the Directorate’s work, the Canadian Armed Forces recently promulgated its Chemical, Biological, Radiological and Nuclear Defence Operating Concept that provides a framework for Canadian military commanders to establish an effective CBRN defence capability and capacity to meet its defence commitments. As the Operating Concept points out, CBRN defence is a fundamental consideration for all military operations, missions or tasks in which a CBRN threat may be present or may develop.

‘We have had unconditional support within the Canadian Armed Forces for our CBRN defence capability development program,’ said Lieutenant Colonel Alain Rollin. ‘Our commanders at all levels understand well that providing the right CBRN protective equipment to our soldiers is essential to mission success. And recent world events have more than highlighted the continued need for effective CBRN defence capability.’

The mandate and missions of the Canadian Armed Forces are set out by the Canadian government in the Canada First defence strategy. That strategy directs the CAF to provide the government of Canada with a joint force that defends the nation, delivers strategic effect and projects leadership abroad. The CAP must, therefore, continue to be capable of executing operations both domestically and internationally in an increasingly complex security environment where the risk of asymmetric warfare and unconventional weapons remains high.