# Load Effects Assessment Program (LEAP): a Systematic Multinational Approach to Understand and Address Soldier Physical Burden

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Physical overload remains a reality for the modern warfighter. New technologies, shifting demands of modern asymmetric warfare, and the desire to protect soldiers from emerging threats are contributing to ever-increasing soldiers loads that, even in combat, are nearing if not surpassing body weight.

Much research has focused on the effect of carried or worn loads on soldier physiology and biomechanics. However, there remains a significant knowledge gap relating to the effect of soldier load on performance of combat-related tasks, vulnerability to enemy action, or mission outcome. Particularly poorly understood are the trade-offs between protection, performance and ultimate survivability.

Understanding load effects on battlefield performance and outcome will be critical for effective combat mission planning (i.e., distribution of load across a section or squad or protective posture to be adopted). Similarly, knowledge of the relative contributions of load parameters (weight, bulk, stiffness) to performance degradation or survivability will be important for the design, specification and acquisition of the next generation of soldier system ensemble that aims to minimize burden and casualties.

In order to objectively measure the impact of loads on soldier operational task performance, the Marine Corps Load Effects Assessment Program (MC LEAP) was developed in 2009, in consultation with subject matter experts experienced in combat mobility requirements. MC LEAP comprises a timed series of obstacles combined with several separate accessory task performance stations. Initial testing and validation of the LEAP concept sparked interest in the international defence community. In March 2011, Defence R&D Canada procured a LEAP system of their own (CAN-LEAP), and in November 2013, the Australian Department of Defense followed suit (AUS-LEAP). Over the past 4 years, five different experimentation campaigns have been successfully completed using the LEAP, in both indoor and outdoor settings, to assess the impact of operationally-relevant soldier ensembles or equipment on soldier performance. The LEAP course has also been used as a part of several soldier equipment user evaluation trials (including body armour, modular load carriage, CBRN respirators and soldier-borne computing systems).

Currently, there is a collaborative research project, under the auspices of The Technical Cooperation Program (TTCP) to exploit the outcomes of a further-refined and standardized LEAP. The project aims to model the contributions of soldier ensemble load parameters (weight, bulk, stiffness) to operational task performance, vulnerability and mission outcome in order to develop commander's guidance on the employment of protective equipment, distribution of squad/section loads, and to inform the future design, specification and acquisition of soldier clothing and equipment.

This presentation will be the first of several international LEAP presentations that will describe the rationale and plans for a coordinated international effort, under TTCP, to: 1) standardize the measurement of operationally-relevant soldier task performance; 2) collect soldier performance data across a wide range of load, user and environmental parameters; 3) model the contributions of load parameters and other factors to soldier performance; 4) assess the impact of performance decrements on soldier survivability and small unit outcome; and 5) develop decision tools that unit leaders and acquisition stakeholders can use in future to mitigate the negative effects of soldier burden.

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