International Journal of Impact Engineering 92 (2016) 26–31

Impact loading response of the MiL-Lx leg fitted with combat boots

T. Pandelani [a,*], T.J. Sono [a], J.D. Reinecke [a], G.N. Nurick [b]

[a] *CSIR Defence, Peace, Safety and Security, PO Box 395, Pretoria, 0001*
[b] *University of Cape Town, BISRU*

Abstract

Anti-Vehicular Landmine or under-belly Improvised Explosive Device (IED) or even a side-attack IED are found to be one of the major threats for military vehicles and their occupants. The lower extremities of the occupants are very prone to the injuries more especially during underbelly detonation due to the spatial proximity to the rapid deforming floors. Lower limb surrogate legs, such as the Hybrid III (HIII) or Military Lower Extremity (MiL-Lx) are used to quantify the loading on the lower extremity when subjected to the impulsive loading caused by such an explosive event. Military boots could be used by the occupants to mitigate the blast loading impact on the lower extremities. This work presents the response of the MiL-Lx leg fitted with two different combat boots (Meindl and Lowa) and exposed to typical blast loading conditions. The purpose of the work was to evaluate the potential load mitigation effects of the boots using the MiL-Lx leg. The blast loading conditions were simulated using the modified lower limb impactor at several loading velocities spanning 2.7-10.2 m/s. The MiL-Lx leg was instrumented with triaxial load cells located at the upper and lower tibia. The results show that both combat boots attenuate the peak force only at the lower tibia while showing slight increase of the peak force at the upper tibia. Within the lower loading severities, the Meindl boot shows a better peak force attenuation than the Lowa boot at the upper tibia. Both boots show a delay in time to peak force at both upper and lower tibia. The Meindl boot shows a longer delay in time to peak force than the Lowa boot. Both boots show an increase in impulse determined at the upper and lower tibia and across the loading severities. The increase in impulse is attributed to the presence of the boot materials and the thicker boot showed a higher increase.