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A COMPARISON OF LOCOMOTION IMPACT FORCES: ONE-G VS. ZERO-G. Smith, R.A., *G. Klute, J.B. McCaulley, *A. Jones, *M. Greenisen (SPON: B. Squires). McDonnell Douglas Space Systems Co., and *NASA Johnson Space Center, Houston, TX 77058.

The purpose of this study was to investigate the effectiveness of musculoskeletal loading using various treadmill mounting conditions during zero gravity parabolic flights on NASA's KC-135 aircraft. Treadmill operation in microgravity introduces high levels of impact vibration that can disrupt gravity sensitive crystal growth experiments. To attenuate transmitted forces into the spacecraft structure, passive vibration isolation systems have been proposed using a large counterpoise mass in conjunction with a soft suspension. There is some concern, however, on the effectiveness of musculoskeletal loading using such an arrangement. Utilizing a load cell instrumented treadmill, foot-ground reaction forces (Fz) and body restraint loads were measured under conditions of hard attachment to the aircraft, free-floating, and 1-g laboratory environments. Two different treadmill forces were investigated under tethered, free-float conditions. Results indicate that during 0-g parabolic flights, a properly arranged body restraint harness can reproduce 1-g impact forces utilizing a firmly mounted treadmill. Under free-float conditions, a peak Fz force reduction was indicated for treadmill masses of 245 kg and 200 kg with peak force reduction being more pronounced in the 200 kg case.