Pressure Distribution and Transmissibility Testing of Field Modified Black Hawk Helicopter Seat Cushions

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ABSTRACT

Static posture during extended sitting can produce discomfort, fatigue, and pain, all of which are distracting. Army helicopter pilots have identified seat cushions as a significant source of seated distraction and improvise field modifications to provide improvement. The U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL is evaluating the static and dynamic characteristics of seat cushion configurations currently used by pilots. Four field modified configurations are being compared to the originally deployed seat cushion. Characteristics are quantified by static pressure distribution and dynamic vertical vibration attenuation using a 5th percentile Hybrid III female pelvis with weighted ballast. Pressure distribution will be collected by an H2 xSensor pressure map system with one 36x36 sensor pad positioned over each cushion. Test configurations will be evaluated on a solid surface perpendicular to gravity. Data will be assessed using established metrics, including Absolute peak pressure, Average pressure, Contact area, Contact force, Seat Pressure Index, Seat Pressure Distribution, Area Pressure Change Rate, and Dispersion Index. Vibration attenuation of each configuration will be assessed in a vertical field similar to that of the Army Black Hawk helicopter. Accelerometers will be secured to the shake platform and the Hybrid III pelvis. Seat cushion transmissibility will be evaluated using three different techniques, including: 1) Accelerometer differences in amplitude and frequency, 2) Pressure Change RMS, and 3) Seat Effective Amplitude Transmissibility. This presentation will detail the findings of this ongoing project. Creativity and ingenuity have generated field modifications that have reduced seat cushion related distraction during longer missions; this study will provide empirical data as to how these field changes provide improvement. Ultimately, understanding satisfactory seat cushion characteristics will guide future design and recommendations.