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

Paul St. Onge¹, V. Carol Chancey¹, B. Joseph McEntire¹, Frederick Brozoski¹,
Vickie Mando¹, Mary Rudisill¹

¹Auburn University

ABSTRACT

Static posture during extended sitting can produce discomfort, fatigue, and pain, all of which are
disturbing. 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.