

## **RAMSIS Defense / Anthropometric Data for Ergonomic Applications Benefits for Developing Defense Vehicles**

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### **Abstract**

In the late 80's of the last century the German automotive industry initiated the project 3D Softdummy. The objective was a 3D anthropometrical correct digital human model for the ergonomic car design in the upcoming 3D CAD systems. Extensive measurements of the human body and behavior were taken at the Universities of Munich and Berlin and the final human model system was developed by Human Solutions. At the end the realistic 3D Digital Human Modeling (DHM) tool RAMSIS (Realistic Anthropometrical Mathematical System for Interior Simulation) was introduced at vehicle manufacturers and today has become the leading de-facto standard software for product ergonomics in vehicle interiors.

While at the beginning of the RAMSIS development the anthropometric measurements were taken manually, nowadays 3D body scanners have automated this process. Several surveys as SizeGermany, Sizetaly and actually SizeNorthAmerica were and are performed together with the automotive and fashion industry to acquire correct and up-to-date size information of the human body using 3D body scanner technology.

In addition to the automotive industry, manufacturers of trucks and commercial vehicles use RAMSIS to design the interior of vehicles and optimize the ergonomic product development, too. Moreover, the ingress and egress of vehicles is crucial for the ergonomic design of vehicles. Digital human modeling for the development of defense vehicles requires more than the representation of vehicle occupants, also the representation of body equipment and simulation of the impact of such equipment on the person is important.

In cooperation with the German Bundeswehr, Human Solutions has developed the module RAMSIS Defense. Soldiers were measured with and without body equipment / clothing in a 3D body scanner. From these data the relative location of equipment and cloth configurations on the body was derived. Finally, realistic 3D models of soldiers with body equipment and cloths were developed. To realistically simulate occupants in defense vehicles (land or air based), equipment must become an integral part of the extended human model. Simply attaching CAD-geometry to one manikin's element is not sufficient. Equipment size needs to be scalable with respect to anthropometry, impact on joint mobility needs to be considered with respect to material stiffness. Those aspects must be integrated in posture prediction algorithms to generate objective, reliable and reproducible results to help design engineers making better products that are safe, comfortable and appropriate for the occupants.

With the module RAMSIS Defense, engineers of vehicles for armies, police, fire brigades and even of motor bikes can carry out ergonomic examinations with and without equipment and check their effects on the product development.