Top notch technology for landwards sciences at the CSIR

Piet Ramaloko (left) and Jimmy Hannan with the hybrid dummy after conducting a test at Paardefontein test range

The CSIR's landward sciences team, with the assistance of the South African National Defence Force (SANDF) through Armscor, has established a high-end rapid event test measurement and evaluation capability to support blast and protection research.

The capture of the morphology of blast and ballistic events and their interaction with structures and targets is a fundamental aspect of research into protection systems used by both mounted and dismounted soldiers against blast and ballistic threats.

These events occur within nanoseconds and microseconds for detonics and blast, and within milliseconds for structural response.

Principal researcher David Reinecke says that to measure this morphology, researchers need specialised equipment, personnel and facilities. "This combination of capabilities and equipment that has been established within this area is unique in the Southern Hemisphere."

The CSIR now prides itself in housing modern day world-class capabilities such as a digital Flash X Ray system, an Ultra High Speed Rotating Imaging camera - a first of its kind in the Southern Hemisphere as well as medium and low speed cameras (1 000 to 250 000 fps) and a high-speed data acquisition unit, including systems that are robust and can be placed in structures that are subject to blast and impact loading.

In addition, says Reinecke, special measurement transducers such as shock accelerometers and blast pressure probes required for this research are in place. He says that the landwards sciences group has also acquired non-contact high-speed laser displacement sensors used for measuring and verifying structural response to blast and impact loading. "Also being procured to assist in this research is a velocity interferometer system for any reflector (VISAR), also a first of its kind in South Africa," he says. "This unique combination of equipment and facilities is to secure the best detonics, blast, structural response and human response measurement equipment so that it can be used to research the effects of blast and impact loading on humans and enable the development of world-class protection systems and the ability to validate such systems for the SANDF."

This group is also upgrading its Hybrid III crash test dummies and is procuring a Euro Side Impact Device test dummy with the required sensors and data acquisition systems to complement the current two Hybrid III test dummies the group already uses extensively for research. "What makes this capability building project unique is the combination of specialised test measurement and evaluation equipment combined with unique test facilities as well as the capability to design, develop, manufacture, assemble and validate explosive surrogates and experimental explosive threats and then also the ability to execute explosive tests at our laboratory at Paardefontein," he says. "There are only a very few facilities such as ours in the world."

"Locally, this positions us to support the defence force with world-class facilities in research for force protection and to support acquisition projects from a position of knowledge," Reinecke adds. "Furthermore, it also enables us to support local industries that are successfully competing internationally, by providing independent test and validation capability, in particular impartial vehicle landmine protection validation

testing." He adds that landwards sciences' facilities are "up there with the best" and enables the CSIR to provide outstanding test, measurement and evaluation internationally and also helps the organisation to participate collaboratively with other international research organisations.

In addition, he says, "We are able to develop and train young scientists, engineers and technicians in an environment with leading-edge challenges and opportunities. "We are able to expose these young scientists at a young age to the international research arena, developing a sound base from which they can develop their careers," he says. Also, this project has not been done independently of other local research institutes, experts and industry. "Their inputs have been actively sought to ensure that the equipment and capability that is established here can be applied as a national asset and through the involvement of local experts this project has enabled the CSIR to transfer its landward sciences expertise to young and upcoming scientists and engineers," he concluded.