



Case study

Blast injury and the Thoracic Rig

THE CHALLENGE

To support the understanding of injury from extreme events such as car crashes or explosions, it has often been necessary to use animals as a surrogate for the human in trials.

Recognising the ethical, legal and financial implications of this practice, the MoD embarked on a programme to develop mechanical test rigs and computer models to simulate the human exposed to blast threats, and reduce the need for animal tests.

However, the human body is complex and developing test equipment to accurately replicate the human response is a challenging area requiring extensive research.

OUR SOLUTION

Frazer-Nash has supported the MoD's research programme into understanding injury and protection of service personnel for many years.

Addressing this particular issue, we supported the initial design and subsequent development of a new mechanical surrogate, called the Thoracic Rig. The rig was required to realistically represent the response of a pig thorax to explosions, and thereby reduce the need to use live animals in tests.

We used computer models to assist in development of the rig. These models were used for virtual prototyping of both the rig geometries and material properties. Once the design was finalised a definitive model of the rig was developed (*see right*) and validated against the physical rig. The rig and its model were also successfully validated against historic data from previous animal trials

The computer models we developed were also able to represent the internal organs and thereby estimate the actual injuries sustained from explosions. This was correlated with the response of the rig, to develop an injury criterion which can be used in the mechanical rig trials. In addition, stresses and pressures generated within the body were examined and correlated with observed injuries, thereby validating the rig and injury criterion as a tool that can be used to evaluate injury.

BENEFITS

An extract from a paper co-authored by DSTL and Frazer-Nash sites: *"The rig has been used in complex realistic military scenarios to assess vulnerability of personnel to blast lung injury - AFV's, field defences, buildings etc. The rig notably enhances MOD's capabilities to assess the threat to personnel from severe explosions and to develop protective measures. It is a unique tool."*

Client

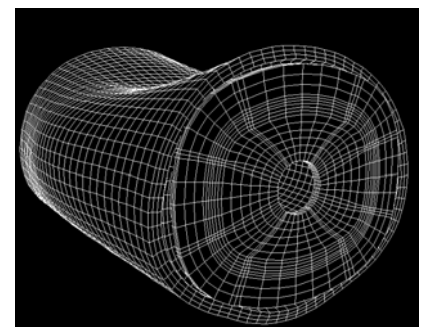
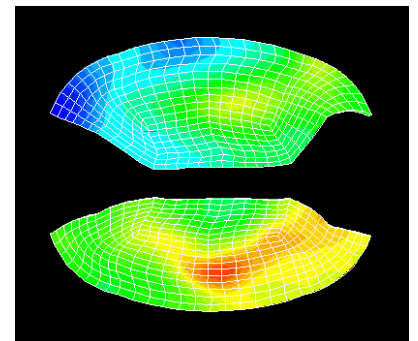
Defence Science and Technology Laboratory (DSTL)

Business need

To assess injury to personnel and the benefits of protection systems without recourse to animal surrogates.

Why Frazer-Nash?

Frazer-Nash has many years experience of modelling injury to personnel and the design of specialist test rigs



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