The **French-German Research Institute of Saint-Louis (ISL)** situated in the border triangle of Germany, France and Switzerland is an internationally renowned research institute belonging to a global industrial and economic network.
The spectrum of our core activities comprises a variety of topics: aerodynamics, energetic and advanced materials, lasers and electromagnetic technologies, protection, security and situational awareness. Our activities are related to both basic and applied research.

ISL is offering a **PhD Position**

Research field: Protection technologies, security, situational awareness

Vulnerability of the head/neck segment under high strain rate loads – Experimental & numerical modeling

Context: Soldier protection/blast waves

Military and homeland security forces as well as civilians are increasingly faced with blast waves and different kind of projectile impacts. Energies deposited to the human body is responsible of injuries if timescale is too short and biomechanical properties of biological tissues are exceeded. Upper body and mainly head is particularly aimed with life threatening consequences.

APC objective

Blast loading on human body is a matter of concern for the APC group as well as for FR/GE MoD. Similarly to the ongoing studies on thoracic experimental/numerical approaches of the blast loading, we propose to investigate the vulnerability of the head/neck segment under high strain rate loads in order to get a more general view of the intricated mechanisms of injury and develop a common approach for injury risk criteria and protective methods.

Targeted candidate

The background of the PhD candidate is physics with some knowledge in biomechanics. An added value would be to use numerical tools (LS-DYNA or equivalent) during his Master.

Time-sharing scheduled: 50 % ISL (experimental part) / 50% University Strasbourg if chosen (numerical part).

Main tasks assigned and outcomes

- State of the art on the topic pointing out both experimental and numerical issues on the topic (6 months)
- Use of existing experimental means: instrumented head form and simulant media exposed to blast and blunt impacts
- Emphazize on the key factors making sense on injury level such as kinetic parameters of the skull (linear and angular acceleration), intracranial pressure, transient systemic pressures, loading on the neck etc. (1.5 years)
- In parallel, an existing numerical model of the head (UNISTRA model) could be used at UNISTRA
- Results are intended to fit and improve existing numerical models of the head injuries to the high strain rate loads represented by projectile hits and blast from explosion (1 year).

At the end, that help us providing new insights for improving protective solutions such as combat helmet for instance.

French-German Research Institute of Saint-Louis (ISL)

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