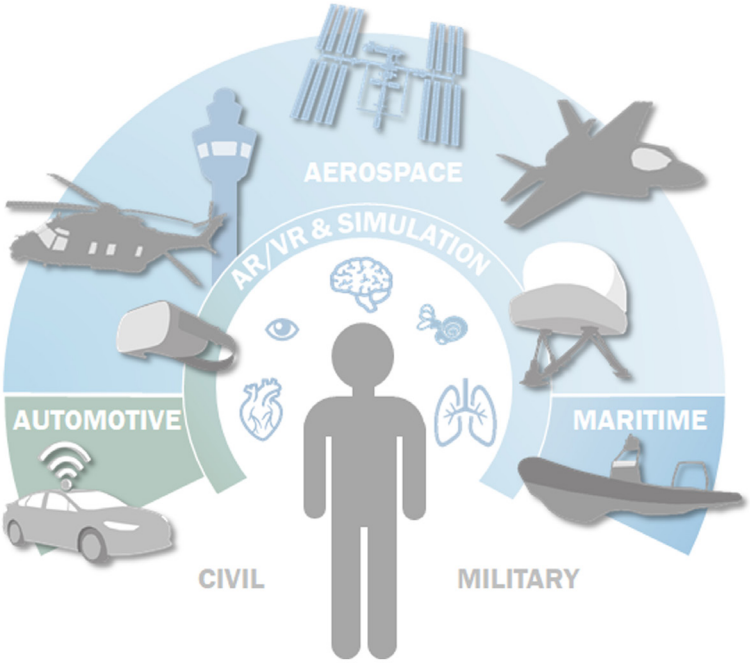
ADVANCING HUMAN PERFORMANCE IN ENVIRONMENTS THAT ARE ADVERSE AND DEMANDING (AHEAD)

HUMAN PERFORMANCE, SAFETY, HEALTH AND WELLBEING IN HIGH-DEMANDING ENVIRONMENTS



TNO innovation for life

The mission of the TNO team AHEAD is Advancing Human performance in Environments that are Adverse and Demanding. Our focus is on human performance, safety, health and wellbeing in high-demanding environments. We do this through multi-disciplinary research and consultancy, improving operation oriented simulation and training.

EXPERTISE

Team AHEAD is a multi-disciplinary group from different departments within TNO, with experts in the area of human physiology, simulation and modelling, Augmented and Virtual Reality, psychophysics, monitoring and sensing, gaze tracking, didactics, engineering and Good Clinical Practice.

We have been combining these disciplines for many years to help improve human performance in high-demanding and adverse environments, which impose high physical, cognitive or emotional stress, such as moving platforms (e.g. ships, aircraft), high workload situations, and unexpected events.

Team AHEAD provides advice, guidelines, products and interventions through applied research, having a nationally and internationally leading position. Our focus is on the aerospace, automotive, and maritime domains, both civil and military.

RESEARCH TOPICS

The applied research projects of team AHEAD cover a variety of human factors aspects, such as spatial disorientation, motion sickness, fatigue, startle and surprise, and hypoxia.

These aspects are being imposed by stressors such as physical and visual motion, g-loads, vibrations, workload and air quality (e.g. low oxygen conditions). Furthermore, our applied research covers topics on training and selection, such as training effectiveness, competencies, retention and skill decay, emergency training, and personnel attrition.

EXAMPLE PROJECTS

Team AHEAD is involved in the following example projects, and many more.

Modelling human motion and orientation perception

The TNO's mathematical motion perception model consists of transfer functions representing the dynamics of the human vestibular and visual systems. With the model, the perceived motion and attitude, as well as motion sickness can be predicted.

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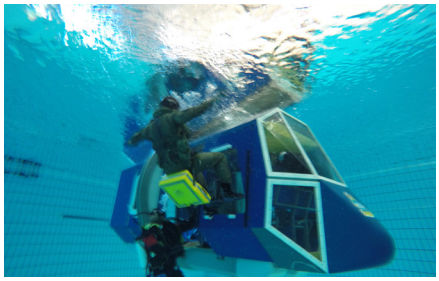
Simulation of UPset Recovery in Aviation (SUPRA)
In this project an enhanced aerodynamic aircraft model has been developed, together with new motion cueing solutions including g-forces. These capabilities enable airline pilots to recognize and manage unusual attitudes and stall events in a moving-base flight simulator.
eric.groen@tno.nl

Helicopter Underwater Egress Training (HUET)
The HUET training effectiveness is investigated to improve HUET emergency training in terms of frequency, personalized training, e-learning, and practical support.
esther.oprins@tno.nl



Measuring pilots' visual behavior
The pilots' instrument scanning (crosschecking) and flight performance are investigated in relation to spatial disorientation, unexpected events, hypoxia, workload, etc.
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Augmenting Military Performance through Resilience Enhancement (AMPERE)
Cognitive stress is induced with a virtual reality environment. The stress level is measured, classified and feedback is provided for learning and training purposes.
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Shocks and vibrations aboard FRISC
In this project, human body accelerations are measured aboard Fast Raiding Interception and Special Forces Crafts. Based on the results, recommendations and norms are developed to minimize the risk of physical complaints and injuries.
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Spatial Disorientation Investigation Tool (SDiT)
Based on the TNO motion-perception model, a tool is being developed to detect and recognize spatial disorientation illusions. The tool visualizes in-flight motion and attitude perception to support analysis of aircraft motions for the potential of inducing spatial disorientation in pilots.
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Startle and surprise in aviation
In this project, simulator-based training interventions are being developed for airline pilots to cope with startle and surprise.
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Hypoxia in a moving-base flight simulator
This project is targeted to improve the operational realism of a hypoxia training environment. Applied research is performed on the effects of hypoxia in relation to flight tasks in a moving-base flight simulator.
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Motion sickness in self-driving cars
In this project, the ride control of self-driving cars is being optimized for comfort to minimize the built-up of motion sickness.
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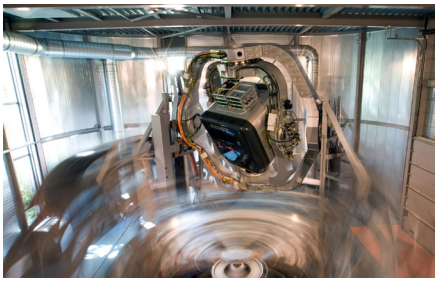

FACILITIES

Team AHEAD has access to a state-of-the-art laboratory, featuring a wide range of facilities, such as the DESDEMONA centrifuge-based simulator, the RNLAF Advanced Spatial Disorientation simulator, the TNO driving simulator, the LIMOSINE linear motion simulator, a 3D rotating chair, climate chamber, the RNLAF hypobaric chamber, human centrifuge and Helicopter Underwater Egress Trainer (HUET), learning technology and gaming laboratory, and several HMD based virtual environments.

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