Definition of training program contents – Task analysis

A comprehensive task analysis of emergency response drives was conducted in order to define goals and contents of the training program. These analyses were based on diverse sources, including:

- a bibliographical survey on current research of driver training and analysis of existing teaching material,
- boards of experts (police driving instructors and experienced officers were asked to participate in the designing of the scenarios and to impart their specific knowledge),
- an analysis of accident records and relevant laws and court decisions as well as
- traffic observations and observations of driver behaviour during emergency vehicle driving.

The resulting findings were used to derive and define detailed training contents and learning goals.

Training design and didactics

Following the results of the task analysis, training contents were assigned and adapted to different didactic methods. The training combines individual and group exercises in different instructional settings and their respective training contents complement one another. Four basic types of instruction were selected:

- **Simulator-based training:** driving scenarios aim at critical situations and driving strategies while driving with lights and sirens.
- **Computer-based training:** is used to deliver basic knowledge on traffic situations and driving behaviours during emergency response drives as well as important information on legal issues.
- **Group exercises:** target the driver and the co-driver of the patrol car as a team to improve their cooperation and communication skills.
- **Exercises in real traffic:** address the interaction of tactical, vehicle- and traffic-related aspects of emergency driving.

Evaluation

Starting with the implementation of the training, a comprehensive process-evaluation was conducted aiming to optimize the driving simulator training and its integration into the whole curriculum.

An overall evaluation was conducted with regard to acceptance, learning results and simulator sickness. The trainees’ acceptance of the training program is high, and indications for the training’s effectiveness in terms of performance improvements have been found. Evaluation results also showed that simulator technology can be successfully integrated into a comprehensive driver training curriculum.
Simulator training

The driving simulator manufactured by RDE GmbH consists of a motion system with six degrees of freedom and provides a visual range of 210x40 degrees and three rear views. Fixed onto the motion platform is an original BMW patrol car cabin. The simulation offers three independent fixed databases (rural, urban, motorway). The behaviour of autonomous traffic can be overruled for selected vehicles in order to create critical scenarios such as violations of right of way or traffic jams.

The specific scenario contents were derived from the task analysis and implemented as driving scenarios. The superior learning objectives target safe driving strategies focusing on hazard perception and interactions with other road users. Exemplary scenario contents include:

- negotiating intersections with different right of way regulations,
- clearing traffic, creating alternative paths in dense traffic or traffic jams,
- proper use of irregular lanes and
- proper use of warning devices.

The simulator-based training session always starts with familiarization rides in order to allow the trainee to become comfortable with the simulator. Several emergency training rides follow. The focus is on urban settings emphasizing the negotiation of intersections and junctions, as these are particular locations responsible for a large percentage of major accidents.

Instruction and feedback

Emergency training rides are supervised and guided by an instructor being located in a control room who continuously observes the trainee's driving behaviour. Instructor and trainee are linked through radio communication. The instructor also adopts the role of the emergency control room.

The "co-driver" is as well actively taking part in the training - also sitting in the control room and using radio communication. His task is to maintain radio communication, to support the driver in performing the driving task and to evaluate his partner's performance. A joint analysis of both trainees' errors serves as a basis for an intense debriefing of each simulator session. By this means both trainees receive detailed feedback on their proficiency level.

The driving simulator integrated into a training program

Training contents like mastering of complex traffic situations – especially under emergency conditions - cannot be practiced in real traffic due to the risk of endangering others. Instead such contents are mostly taught in theoretical terms, rather than through practice. The development of simulation technology now offers the possibility to train such skills in realistic traffic scenes in a safe environment. For that reason, emergency driving simulation complements rather than replaces other training methods within a comprehensive training program. Vehicle-related aspects (e.g. the safe handling of the vehicle in critical dynamic situations) have to remain part of an intense practical driver training with focus on manoeuvring skills in real vehicles.