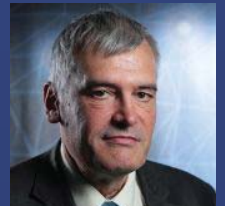




## Research Program 2 Communication

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**Information and communications technologies develop rapidly, and their development cycles are correspondingly short. There is therefore a risk of technologies becoming obsolete within a foreseeable period. This risk needs to be countered by employing new solutions which balance technology against cost. In order to develop the necessary technological and scientific expertise, technology monitoring studies, research projects, and field and laboratory trials are carried out and demonstrators are built. A multi-lateral collaborative network is available for this purpose.**

Communications has a key role both in network-enabled command and control and in civilian-military cooperation. Reliable, high-performance systems for mobile communications networks that permit timely command and control even under adverse conditions are required.

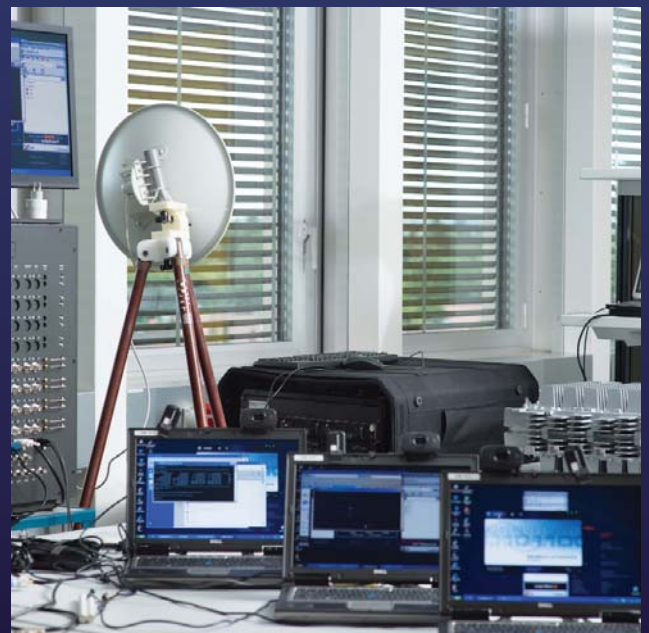
The skills required to assess the technologies employed in future military systems will be developed as part of this research program. The task is to support strategic, operational and tactical decision-making in a degraded information environment and to validate conceptual approaches for future armaments programs.

The rapid advances in civilian mobile communications technologies generate a constant need to examine how they can be integrated into a military environment.

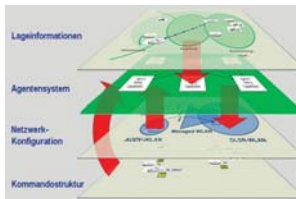
Since no individual technology will represent a comprehensive solution even in the future, heterogeneous communications tools with a modular architecture are also being considered. Intelligent, self-organizing systems are of major importance if a large number of nodes (sensors, decision-making bodies, and effectors) are to be quickly and effectively interlinked. This requires the development of intelligent network management systems (incl. routing procedures) so that resources can be employed

efficiently.

The growth in the need to transmit data and information between mobile systems demands a more efficient use of the limited communications resources available within the electromagnetic sphere. Software-defined and cognitive radios optimize wave forms and frequency allocation in line with the mission and electromagnetic environment. New antenna technologies such as smart antennae will enhance performance and spectral efficiency while reducing detectability. Swarms of mini aerial vehicles or HAPs (High Altitude Platforms) are possible alternatives to satellite communications.



# Areas of expertise



## Integrated mobile communications networks

The development in communications networks is being investigated by integrating the relevant technologies in a modular fashion. Approaches directed towards continuously and intelligently optimizing resource allocations will be examined in accordance with the operational requirements and based on the current resource situation.



## Efficient use of the electromagnetic sphere

In addition to optimizing spectral efficiency, smart antennae can also lead to a lower detectability and reduced energy requirements. The cognitive radio approach allows the available frequency bands to be allocated more intelligently, flexibly and economically.



## The military relevance of modern civilian communications technologies

The rapid pace of technical development and the resulting short life cycles of civilian telecommunications systems mean that military applications have to constantly adopt new designs and technical systems. The options for developing military communications networks are examined by continuously incorporating the relevant new civilian technologies.

# Technology demonstrators



## RECOMS: Software Defined Radio

The RECOMS platform developed by the Engineering School in Yverdon combines a Field Programmable Gate Array (FPGA) and a Linux computer as well as a software development environment designed to examine wave forms and new methods for software defined and cognitive radios in real-life environments.



## SMAVNET: Swarm of micro-Aerial Vehicles

An autonomous swarm of micro-aerial vehicles is being used to investigate broadband communications networks between aerial platforms and/or units deployed on the ground.

# Networks

The requisite professional skills build on a broad network of partners from business, universities (including universities of applied science) and other research units in Switzerland and abroad. To ensure that these skills are properly developed, there is close contact and an ongoing exchange of information with users and with planning, procurement and testing units within the DDPS.

## State partners / federal government

- Defence
- GS DDPS
- FOCP
- armasuisse - Procurement
- NATO/PfP research organization

## Universities, universities of applied sciences/industry

- EPFL, Lausanne
- ETHZ, Zurich
- IDIAP, Martigny
- University of Bern
- HEIG-VD (Yverdon Engineering School)
- Fribourg Engineering School
- Rayzon Technologies AG, Ittigen
- BeOne AG, Cham