European Commission

This fiche is part of the wider roadmap for cross-cutting KETs activities

'Cross-cutting KETs' activities bring together and integrate different KETs and reflect the interdisciplinary nature of technological development. They have the potential to lead to unforeseen advances and new markets, and are important contributors to new technological components or products.

The complete roadmap for cross-cutting KETs activities can be downloaded from:

http://ec.europa.eu/growth/industry/key-enabling-technologies/eu-actions/ro-ckets

Potential areas of industrial interest relevant for cross-cutting KETs in the Civil Security domain

This innovation field is part of the wider roadmap for cross-cutting KETs activities developed within the framework of the RO-cKETs study. The roadmap for cross-cutting KETs activities identifies the potential innovation fields of industrial interest relevant for cross-cutting KETs in a broad range of industrial sectors relevant for the European economy.

The roadmap has been developed starting from actual market needs and industrial challenges in a broad range of industrial sectors relevant for the European economy. The roadmapping activity has focused on exploring potential innovation areas in terms of products, processes or services with respect to which the cross-fertilization between KETs can provide an added value, taking into account the main market drivers for each of those innovation areas as well as the societal and economic context in which they locate.

Taking the demand side as a starting point, cross-cutting KETs activities will in general include activities closer to market and applications. The study focused on identifying potential innovation areas of industrial interest implying Technology Readiness Levels of between 4 and 8.

SEC.1.1: Satellite- or drone-based wide area surveillance in air, land and water

Scope:

To develop multi-robot systems and drones for surveillance in air, land and water environments aimed at border security, including land, maritime and country borders or critical infrastructure and perimeter protection.

Demand-side requirements (stemming from Societal Challenges) addressed:

- Contribute to achieving “inclusive, innovative and secure societies”

Demand-side requirements (stemming from market needs) addressed:

- Guarantee border security, considering land, maritime and country borders
- Guarantee security of people including of operators
- Guarantee privacy

Specific technical/industrial challenges (mainly resulting from gaps in technological capacities:

- Increase of the resolution and observation range of on-board observation sensors and sensing systems
- Enhancement of communicative interaction of robotic systems to other systems (including other robotic systems)
- Development of networked robotic architectures
- Development of improved cognitive and self-configuring software architectures
- Improvement of the (dynamic) models of physical, social and ecological environments validate sensor and motion performance
- Enhancement of user interfaces to improved human-machine interaction (two sided)
- Improvement of the robustness of robotic architectures by redundancy in hardware, software and design
- Further miniaturization and integration of actuators, sensors, control systems, energy systems and other physical manipulators
- Improvement of the efficiency of energy systems, including power management and enhanced efficiency of locomotion
- Further development of low weight power sources
- Enhancement of robot control systems, including self-learning, self-calibrating, fault tolerant, etc.
- Improvements in image recognition sensor systems, including environment assessment (objects, human emotions/behaviour, environments, etc.)
- Improvements in integrated sensory systems, including multi-sensors and high quality (bio, neuro, physical, environmental, chemical, motion, positioning, etc.)
- Development and integration of new light-weight, high strength materials
- Development of advanced integrated mechatronic systems
- Development of new concepts for distributed intelligence (e.g. swarms)
- Development of low cost robotic systems (sensors, control, locomotion, skelet, etc.)
- Improved navigation through enhanced mapping and localization (e.g. 3D, cooperative mapping, enhanced GPS or the Galileo system in the future, autonomous)

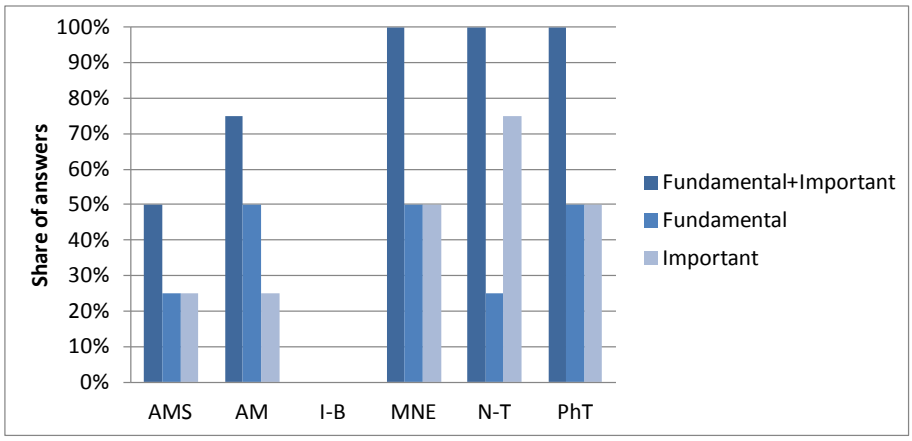
Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the development of advanced wide area surveillance systems based on satellites or drones, building on the increased resolution of on-board sensors and observation systems, the enhancement of the communicative interaction between robotic systems, improved user interfaces, the further miniaturization and integration of actuators, sensors, control and energy systems.

To this aim, the combination of KETs experts’ opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this Innovation Field, and desk research activities, have allowed identifying a rather strong interaction of KETs with

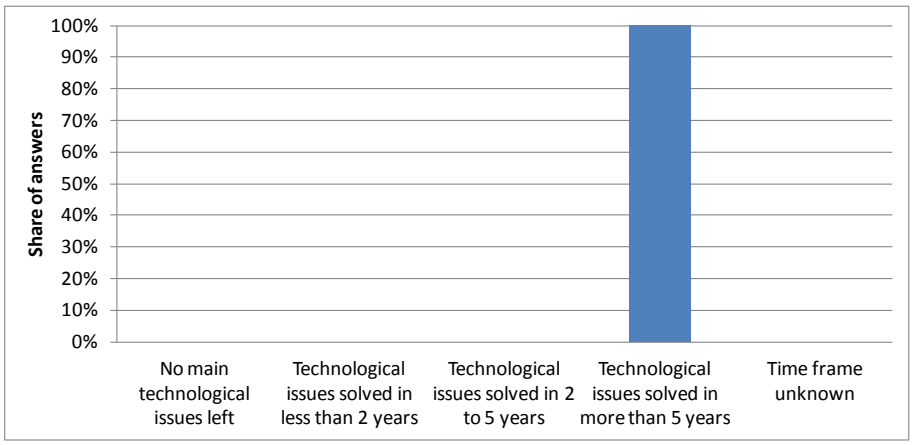
respect to this Innovation Field, with either fundamental or important contribution mainly by the following KETs:

- Micro- and Nano-Electronics (MNE)
- Photonics (PhT)
- Advanced Materials (AM)
- Nanotechnologies (N-T)
- Advanced Manufacturing Systems (AMS)



Timing for implementation:

According to the majority of KETs experts' opinions (whose result is depicted in the below bar chart), desk research, and in line with the KETs-related patenting activity in this field, it is considered that the main technological issues holding back the achievement of cross-cutting KETs based products related to this Innovation Field could be solved in a time frame of more than 5 years:



Hence, depending on the specific technical and/or industrial challenges holding back the achievement of cross-cutting KETs based products related to this Innovation Field, the provision of support in the medium term should be taken into consideration within this framework.

Additional information according to results of assessment:

➢ ***Impact assessment:***

- At least 16 out of the 28 EU Member States already own drones for military (combat and reconnaissance) or non-military (surveillance and detection) purposes. The design, development and production of more than 400 different unmanned aerial vehicle systems is now reportedly spread across at least 21 EU countries. The European Commission has long subsidised research, development and international cooperation among drone manufacturers. The European Defence Agency is moreover sponsoring pan-European research and development for both military and civilian drones. The European Space Agency is funding and undertaking research into the satellites and communications infrastructure

used to fly drones. Frontex, the EU's border agency, is keen to deploy surveillance drones along and beyond the EU's borders to hunt for migrants and refugees (Source: B. Hayes, C.S. Jones, E. Töpfer, Eurodrones Inc.). This application, which has already been developed for defence sector, is clearly dual use and may be extended to the civilian segment.

- There are a number of critical technology areas in the development of UAVs in both the military and civilian sphere, including sense and avoid (S&A), secure datalinks, payloads and systems integration expertise, and the exploration of novel aerodynamic and propulsion solutions. These technologies are considered very challenging and are likely to be the ones which will provide more competitive advantages to whoever is interested in innovating them (Source: ENTR/2007/065, Study Analysing the Current Activities in the Field of UAV, 2007).

➢ ***Results of patents scenario analysis:***

- 10 exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field
- No significant patent-related indicators can be reported in this field