

LARGE SCALE UNDERGROUND RESEARCH FACILITY ON SAFETY AND SECURITY – L-SURF

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ABSTRACT

L-surF, implemented as a design study within the 6th Framework Programme of the European Community, is somehow the logical consequence of several earlier and partly still running projects dealing with the improvement of confined spaces' safety and security. Besides numerous technical issues which have to be dealt with in the frame of the L-surF project, there is a broad variety of business related problems, starting with the assessment of possible future core business domains and activities followed by the potential users and clients question and the financial options for the legal entity. All of these arising questions are last but not least in close connection with the necessary decision where to erect such a Large Scale Underground Research Facility. This is up to now an open question and the result remains to be seen.

1. THE IMPORTANCE OF SAFETY & SECURITY – THE EUROPEAN APPROACH

Security and stability rank among the most important aspirations in everybody's life. Mobility of people and reliable transport of goods are key issues in our society. Both economic growth and societal development rely heavily upon safe and secure infrastructure, in which road, rail and metro tunnels and other enclosed spaces of infrastructures are important elements.

To date, the increasing awareness of safety and security caused by severe heavy accidents with partly enormous damage on health and goods and terrorist attacks in underground infrastructures, leads to the necessity of R&D projects that work on safety and security and make an improvement of both existing and projected infrastructure in enclosed spaces possible. This also finds its expression in the description of the 7th framework programme of the EC where safety and security is explicitly addressed as an individual topic for R&D activities or in the fact that a first "European Conference on Security Research" was held in February 2006.

1.1 EC supports the Design of New R&D Infrastructure

The European Community supports actively the design of new RTD infrastructure on a European level with the aim to both structure the European Research Area and to support the design and the construction or further development of research infrastructure which justify not only a national but a European wide support.

Within the frame of the Sixth Framework Programme of the European Community, the L-surF project is run as a Specific Support Action (SSA) under the specific programme “Structuring the European Research Area”, the project in other words responds exactly to the aims of the EC.

1.2 The L-surF project

L-surF, acronym of the project and abbreviation of Large Scale Underground Research Facility on Safety and Security, is a feasibility study. It is carried out through the cooperation of some of Europe’s leading institutions on safety and security, started in March 2005 and will finish after 36 months, say in the spring of 2008. The six partners of the consortium are:

- VSH Hagerbach Test Gallery Ltd., Switzerland (Coordination)
- SP Fire Technology, Swedish National Testing and Research Institute, Sweden
- STUVA, Studiengesellschaft für unterirdische Verkehrsanlagen e.V. , Germany
- TNO, Netherlands Organisation for Applied Scientific Research, The Netherlands
- SINTEF NBL as, Norwegian Fire Research Laboratory, Norway
- INERIS, Institut National de l’environnement industriel et des risques, France

The budget for the feasibility study is approximately 3.3 Mio €.

2. WHY L-SURF

2.1 Various EC programmes

A couple of EC funded RTD programmes on safety in underground infrastructures within the 5th Framework Programme, for example FIT (Fire In Tunnels), DARTS (Durable And Reliable Tunnel Structures), Virtualfires, Uptun (cost-effective, sustainable and innovative upgrading methods for fire safety in existing tunnels), SafeT etc, have been dealing with the improvement of safety in tunnels. The fact that all these programmes have been carried out, shows that the EC identified clearly the need for such efforts on safety and security in enclosed spaces.

The necessity for large scale test and R&D on safety and security in enclosed spaces - and correspondingly for adequate R&D facilities - was identified during these programmes and expressed at the First International Symposium on safe and reliable tunnels, held in Prague in February 2004. The projects of the 5th framework programme also showed a highly fragmented and a mostly unstructured research industry for safety and security in enclosed spaces with many national or even local ‘players’ – a fact which must be addressed if a higher quality level of the R&D work and larger R&D infrastructures are considered being necessary. Also other issues are currently not taken care of sufficiently within the existing industry: Matters like education and training are entirely left to national or regional efforts, there are no harmonized test and R&D procedures available which makes it very difficult to compare R&D work carried out in various sites under various and often quite differing conditions etc.



Figure 1. Preparation for water mist tests at Hagerbach Test Gallery
Source: VSH Ltd.

2.2 Large scale problems

If one thing has become apparent from the EU co-financed projects such as mentioned above, it is that accurately assessing the safety level of complex systems such as tunnels on the basis of laboratory test on sub-systems and single elements, even in combination with advanced modelling techniques (CFD, FEA), is hardly possible. This is due to:

- scale effects
- unexpected (adverse or positive) interaction between (mitigating) measures
- limited (read: costly) options to validate models to realistic scale events
- a lack of understanding or even unknown physical phenomena regarding fire development (spread of fire to other vehicles or rolling stock)

As long as there is no correspondingly versatile test and R&D facility available that allows working under realistic conditions these problems can't be addressed properly. However such a facility is only possible to be set up on a European approach.

2.3 Content of the Design Study

In order to answer these questions and to overcome the identified shortcomings a basic analysis of all relevant aspects was needed.

A design – study seemed to be the most appropriate tool to do so.

Aim of the project is to respond to all aspects mentioned and the main objectives of the design study are thus to describe the constructional lay-out of the facility, based – if the concept is feasible - on a entirely new concept for easily creating any contours, shapes and sizes of enclosed spaces needed, but also all other aspects like installations, environmental impacts etc. The concept will allow novel approaches to R&D work, e.g.

- to describe innovative measuring sensors, based on the latest technologies (e.g. nanotechnology) available
- to evaluate the research needs and to outline the R&D - activities
- to develop an integration process for the existing and projected national facilities with their competences and researchers, thus restructuring and improving the relevant EU competence while simultaneously showing ways for using R&D funds more economically
- to show ways and means to raise the necessary funds for the different stages in the setting up of the facility
- to include a business plan for a new legal entity dedicated to the establishing of L-SURF

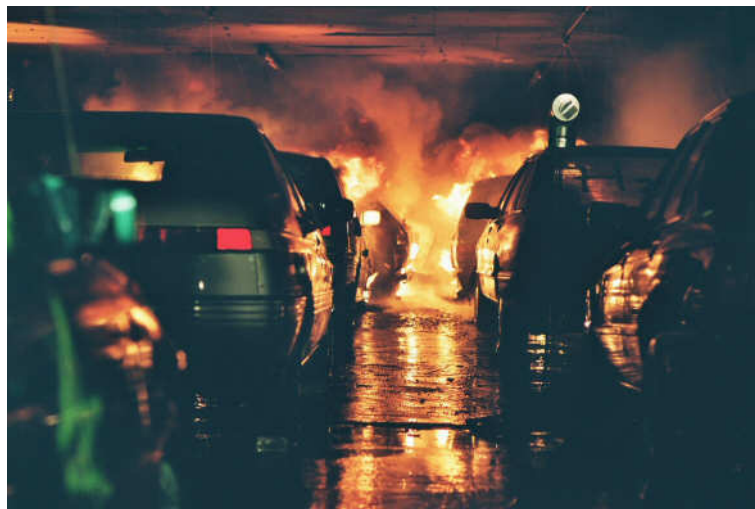


Figure 2. Beginning of water mist test at Hagerbach Test Gallery
Source VSH Ltd.

2.4 The work-packages

To reach this aim all tasks are grouped within six work packages (WP) within the implementation plan and briefly described including responsibilities and objectives to achieve.

Task n°	Descriptive Title	Leading participant	Short description and specific objectives of the task
WP 0	Project Management	VSH	Steering and coordinating the project Implementing the business plan and setting-up of a legal entity for L-surF

Task n°	Descriptive Title	Leading participant	Short description and specific objectives of the task
WP 1	Integration	INERIS	Survey on existing or project development facilities, integrative activities to integrate existing and under development European research facilities and organisations, development of potential L-surF scenarios for integration within the ERA (European Research Area).
WP 2	Research needs	TNO	Identifying and prioritising of scientific and technological research necessities on safety and security in enclosed underground spaces, finding future users and clients of L-surF
WP 3	Lay-out	NBL / SINTEF	Defining of civil-works, auxiliaries, installations of L-surF, evaluation of measures to minimise environmental impact, development of technical specifications for converting the geometry and the lay-out of the L-surF research facility
WP 4	Equipment / Measuring technique	SP	Defining of ultra-modern test methods and the corresponding use of measuring installations, development of technical specifications for innovative 2- and 3-dimensional data acquisition sensors
WP 5	Activities	STUVA	Defining all the activities of L-surF (R&D, training and education, external-services, maintaining and operating) in accordance with the existing national organisations and thus reshaping the European R&D - environment.
WP 6	Funding / Business plan	VSH	Fund raising for the realisation of L-surF, establishing a business plan for L-surF based on public private partnership (PPP) and evaluation of legal forms.

Table 1. Work packages of the L-surF project

2.5 Short report of the actual state of the project

An important fact of the study is certainly the chosen bottom-up approach. From our current point of view it was a good decision because it allows to carefully working out the relevant issues.

According to the schedule of our project analyses of knowledge domains and available or lacking expertise were carried out and led accordingly to the call for '1st expression of interest', the results of which are currently evaluated. The call however is still open and the invitation remains to visit the website at www.l-surf.eu where the questionnaire for the first expression of interest can be found in the download area to be completed and to be sent back. The gained information will serve as base for the integration criteria which will be defined in or-

der to reach a constellation of participants in the future entity that is powerful and economically successful.

Simultaneously to these activities in the first work-package also in the other work-packages we are progressing according to the schedule. In work package two an increasing number of potential clients and users of the future infrastructure are interviewed in order to better understand and evaluate the needs and expectations of the market. The standardized questionnaires and leaflets used as base for these activities can also be found on the website.

Another important work package is dealing with research-, training- and experimental-activities that will be possibly carried out in the new facility and first internally available documents have been prepared.

In the work-packages dealing with scientific research within the L-surF project the development of new types of sensors has made considerable progress while first mathematical modeling of the Convertible Contour and Size Scheme (CCSS) have just started. From a pure scientific point of view it looks promising but the challenge to put these results into the reality of the construction industry still remains.

For most of the work-packages where we look for external input we have prepared questionnaires which can be downloaded from the website www.l-surf.eu and the invitation is still kept to download them, fill them out and send them back.

So far the status of the chosen bottom up approach to the implementation of our project.

However, the actual state calls for corresponding top-down activities. Safety and security have to stay main requests within the European Community's 7th Framework Programme. The European Strategy Forum on Research Infrastructure (ESFRI) for example has the role to support a coherent approach to policy-making on research infrastructures in Europe, and to act as an incubator for international negotiations about concrete initiatives. In particular, ESFRI is preparing a European Roadmap for new research infrastructures of pan-European interest. Positive results of the feasibility study assumed it will be crucial for the future L-surF facility to find entrance into this roadmap. This entrance is directly related to corresponding political support from EC nations and / or regions within the EC. To reach the according awareness of EC national institutions and bodies measures have been started to develop the dialogue between the L-surF consortium and interested nations and regions.

3. THE L-SURF LEGAL ENTITY

Within the Design Study for L-SURF all relevant aspects for such a facility will be elaborated to a level that the facility could be established at least as a legal entity with the necessary structures and activities and that preliminary concepts and plans for the physical construction are laid out.

3.1 Possibilities

The legal form will first of all highly depend on what kind of organisations, public administrations and private companies will participate and in which way in the establishment of the legal entity and secondly on the business plan developed within the frame of the design study. For working out the legal form of the coming legal entity for the L-surF legal advice will be necessary and accordingly subcontracted. As a result the proposal for a legal form of the L-surF that finds approval of the consortium will be put into reality.

3.2 Site of the new legal entity

The choice of the site for the erection of the large scale research facility may also be a criterion in addition to the above mentioned criteria for the legal form, but moreover it will either open or eliminate possibilities for testing and training in connection with fire and smoke as far as environmental impact is concerned, which is a problem not to be sneezed. The analyses of both financial and economical aspects will probably strongest influence the decision where to establish L-surF.

4. CONCLUSION

Safety and Security are among the most urgent challenges of the European Community in the coming years. The EC answers to these challenges with its strategic initiative on safety and security, also in underground and enclosed spaces. The L-surF concept which is both about safety but also about security, because there are similarities in the effect and the need for large scale R&D, testing, training and education is certainly one part of these answers.