WELCOME AND INTRODUCTION

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ABSTRACT

The tragic tunnel fires of the past years have lead to discussions of experts in Europe and around the world. In many European countries they have caused a complete revision of the national safety guidelines for road and rail tunnels. The European Commission has developed directives concerning the minimum safety equipment of road tunnels as well as of railway tunnels. This action is supplemented by intensive domestic and international research activities. The Second International Symposium on Safe & Reliable Tunnels gives special focus on the objectives and important findings of this most recent research programme. The two projects UPTUN and SafeT being just in their final stage form together with COSUF – the ITA Committee on Operational Safety of Underground Facilities the main topic. The Committee is joining 8 research and network projects launched within the 5th and 6th Research Programme of the EU. It is aiming at a world-wide exchange of views, ideas and experience in the field of safety and security regarding traffic tunnels and other underground facilities.

1. INTRODUCTION

Fires in transport tunnels can cause catastrophic disasters. The accidents in the Mont Blanc Tunnel (March 24, 1999), in the Tauern Tunnel (May 29, 1999), in the Gotthard Tunnel (October 24, 2001; Fig. 1), in the subway system in Daegu/South Korea (February 18, 2003; Fig. 2), in the Baregg Tunnel (April 14, 2004) and recently in the Fréjus Tunnel (June 4, 2005; Fig. 3) have made this more than clear. The detailed analysis of the cause and progression of these fires have yielded new insights that had not been expected or calculated to this extent before. The only comparable experience before has been the fire in the Nihonzaka Tunnel in Japan of 1979, which involved a total of 189 vehicles.

One insight pertains to the extremely rapid development of truck fires with an enormous rise in temperature of up to 1000 degrees Celsius and above. Experience has also shown that large amounts of fire gases are released within a short time, starting in a very early phase of the fire development.

The fire in the Mont Blanc Tunnel also showed that heated gases are capable of setting other vehicles on fire even at distances of 200 meter and more with no vehicle in between. The third and especially frightening aspect is the behaviour of the tunnel users. Too many of them did not recognize the danger they were exposed to.

Figure 1. Burning lorries in the Gotthard Tunnel (Switzerland) on 24.10.2001

Figure 2. Arson attack in the subway of Daegu/South Korea on 18.2.2003

Figure 3. Fire accident in the Fréjus Tunnel (France) on 4.6.2005

When they finally realized what was happening, it was frequently too late for a successful escape. In the context of subway fires, the example of Daegu also showed how crucial the impact of railcar engineering and equipment, operational organization and safety training of train conductors and station managers can be. Severe shortcomings in these criteria were a crucial factor in the tragic outcome with 196 fatalities.

2. SAFETY RELATED EUROPEAN RESEARCH

In consequence of the devastating fire accidents the European Commission issued directives regarding the minimum fire prevention equipment of road and rail tunnels [1, 2]. In addition, a number of important research projects were initiated. These are seven multinational projects that have already been awarded and funded in conjunction with the fifth and one project with the sixth Research Framework Programme of the EU [3]. They are more or less linked with each other as well as with national projects like a puzzle.

- **DARTS** (**D**urable **A**nd **R**eliable **T**unnel **S**tructures) started in March 2001 and ended in early 2004. The initiative included eight European partners and was structured into six technical work packages. It was primarily dedicated to the problem of exceeded cost during the construction of underground transport facilities. Furthermore, the quality and lifetime of tunnels as the most cost-intensive component of the entire traffic infrastructure was to be improved. For more information see www.dartsproject.net.

- **FIT** (**F**ire **I**n **T**unnels) was established in March 2001 and limited to four years. This "thematic network" included 33 partners from twelve European countries. The project was to gather information from all over Europe and around the world about existing research results and general experiences with fire prevention and mitigation in transport tunnel facilities. For further details visit: www.etnfit.net.

- **UPTUN** (Cost-effective, sustainable and innovative **UP**grading methods for fire safety in existing **TUN**nels) is a RTD project, running from 2002 – 2006. UPTUN is being performed by 42 partners from 18 European countries. UPTUN comprises research work of approx. 950 man months. Detailed information on UPTUN and its partners can be found at www.uptun.net.

- **Safe Tunnel** (**Safe**ty in Road **Tunnel**s) began in September 2001 and was designed for a project term of three years. The project involved nine partners. The main focus was to reduce the extent and number of fire accidents in road tunnels. The web address of this project is: www.crfproject-eu.org.

- **SIRTAKI (S**afety **I**mprovement in **R**oad& Rail **T**unnels using **A**dvanced Information Technologies and **K**nowledge **I**ntensive Decision Support Models) was initiated in September 2001 for a term of three years. The initiative was shared by twelve European partners. The main focus of the project was to reform operative concepts with regard to safety and emergency management. Further details are available at: www.sirtakiproject.com.

- **Virtual Fires** (**Virtual** Real Time Emergency Simulator) was started 2001 for a duration of three years with eight partners from five European countries. The objective was to develop a suitable and practical simulator to train firefighters in confining and fighting fires in tunnels. A computer model is used to create virtual simulations of fires in tunnel situations. For more information visit: www.virtualfires.org.

- **Safe-T** (**Safe**ty in **T**unnels) represents another thematic network with a three-year term that was started in the fall of 2003. The primary objective is to harmonize the European requirements regarding tunnel safety.

Experiences gathered at the national level are to be compiled and assessed in such regulations.Given the background of the negative experience with the former operative concept of the Mont Blanc Tunnel, special emphasis will be on cross-border operative concepts. The experience of regional authorities, firefighters and emergency rescue services are of special importance for this project. Further details are available from the website at: www.safetunnel.net.

- **L-SURF** (Design study for a **L**arge **S**cale **U**nderground **R**esearch **F**acility on Safety and Security) as a research project on safety and security in enclosed underground spaces is of outstanding importance as most recent incidents (tunnel fires, terror attacks in metros etc) have shown. However currently the competence related to safety and security in Europe is largely unstructured, fragmented and mostly national oriented. Especially missing is a large scale research facility. For more details see www.L-Surf.org.

3. STEP INTO FUTURE

These eight projects mentioned before came to the conclusion that their joint capacity and the momentum gained by the intensive research work conducted during the last couple of years present a great chance for an ongoing future research work and global exchange of knowledge. They therefore looked for a worldwide well reputed international umbrella organisation which could offer a basis for coming activities to develop a better safety level for all kinds of underground facilities. ITA – the International Tunnelling Association – with its 53 member nations worldwide was ready to play that role in close cooperation with PIARC – the World Road Association. Finally the eight projects came to an agreement with ITA and established the ITA **C**ommittee on **O**perational **S**afety of **U**nderground **F**acilities (COSUF; Fig. 4). This committee was installed in May 2005 at the occasion of the ITA World Tunnel Congress 2005 in Istanbul, Turkey. Although starting from the 8 European projects listed above COSUF is open for all institutions, companies, consultancies, governmental organisations etc. world-wide which are active and interested in the field of safety and security regarding underground facilities.

Figure 4. Logo of COSUF

4. OUTLOOK

The tremendous research efforts of the European Commission described here to improve the safety in traffic tunnels are an essential prerequisite for the highly needed all-European harmonization in this field. Here COSUF forms a platform to continue the activities even after finalising the research projects and in the same time presents a forum for a world-wide exchange of views, ideas and experience in the field of safety and security regarding underground facilities. This appears especially important as tunnels are an indispensable part of the trans-European traffic network.

Given this background, the research activities are delivering a crucial contribution to guarantee the mobility of persons and goods, which represents a high political priority.

This conference here in Lausanne – the Second Symposium on Safe & Reliable Tunnels – offers an excellent opportunity to join forces and to start with work in the direction of a safer and securer world.

5. REFERENCES

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2. Directive 2004/49/EC of the European Parliament and of the Council, 29. April 2004 on safety on the Community's railways and amending Council Directive 95/18/EC on the licensing of railway undertakings and Directive 2001/14/EC on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certification (Railway Safety Directive). In: Official Journal of the European Union L 164/44 pp; published 30.4.2004

3. Haack, A. (May 2005): European Research and Development on Safety in Road Tunnels; 3rd International Congress – Traffic and Safety in Road Tunnels – HBV-Verkehrsconsult, Hamburg, 18.-20. May 2005 in Hamburg