

# Chapter 1

## Preamble

Characteristic of our history as human beings is our development and use of tools and systems which function reliably and are controllable as regards “technical safety”—ranging from simple devices such as hammers and shovels to complex systems such as aircraft and mainframe computers. “technical safety” is to be regarded as an integrated part of the stipulated function (target function). This calls for a holistic way of thinking and a systematic approach over the complete life cycle of products and systems. Here, we must go back to the established structures: “generally accepted rules of technology”, the “state of the art” and the “state of science and technology”. “technical safety” is an inherent quality attribute whose characteristics must be created systematically.

At the present time every technical field, be it civil engineering, transportation systems, chemical engineering, energy technology, aeronautical engineering, plant construction, mechanical or electrical engineering, has its own system of rules for technical safety. Application-specific safety concepts are developed for conception, definition, development and engineering, production and integration. They contain detailed building regulations, operating procedures, operating regulations and maintenance instructions, as well as requirements relating to retrofitting and disposal. Even the supervision of the operation by the operating company itself and the appropriate supervisory authority is prescribed in application-specific rules and standards. This means that there is no safety concept which covers all fields of application, i.e. interdisciplinary validity. Furthermore, new technologies require and have to be provided with additional rules and standards. In the light of this situation and its previous involvement in the creation of the modern standard of technical rules and safety supervision, the Association of German Engineers (Verein Deutscher Ingenieure—VDI) has seen the need to take action.

The beginning of the 1970s saw the emergence of sociopolitical visions which appeared to make a “risk-free” life possible for the population. The common focus of this development was public discussion of large-scale and technologically innovative facilities, whose safety or safety capability above all was presented as questionable. Particularly in the case of technological innovations, there was more

talk about potential risks and—in some cases only ostensibly—undesirable side effects than about the actual benefits to the population or economic and social opportunities. As a result, it was no longer the technical assessment alone which was important in making decisions about the safety of such installations but, increasingly, a political and legal assessment as well. The reports of technical experts consulted also revealed the detrimental situation in modern safety engineering, which provides concepts whose particular form depends on the field of application. Even the standards produced by DIN, the German Institute for Standardization, provide a remarkable number of different definitions for “safety” and “technical safety”.

About thirty years ago, the European Union (EU) commenced its efforts aimed at implementing the free trade of consumer and capital goods. Bound up with this was the question as to how safety could be ensured for the people using the goods. The set of instruments for safety supervision and approval, whose character at this time was mostly nationally oriented, tended to place obstacles in the way of trade rather than prevent them. With its “New Approach” and “Global Approach”, the European Commission, therefore, created a catalogue of measures by which a high degree of independence from national bodies could be achieved on the operative level. The instrument for this was the Declaration of Conformity which, according to the resolution of the European Council, could be issued by either the manufacturer itself or so-called notified bodies. The level of safety itself is laid down here in the European directives and predominantly specified in detail in mandated technical standards. Opinions vary as to the effectiveness of this catalogue of measures. It has clearly already been recognized that both the “New Approach” and the “Global Approach” have considerable weaknesses and are partly a long way behind the effectiveness of the system they replaced. These weaknesses, which at the time of introduction were already known to the experts dealing with safety issues, are diverse and being tackled by the European Commission, and the extent to which these shortcomings can be comprehensively remedied remains to be seen. Over and above the product-related directives, there is the “General Product Safety Directive” 2001/95/EG dated 03.12.2001, which requires all products being put on the market within the European Economic Area to be safe. Precisely how this is to be ensured does, however, call for further regulation.

In both aeronautical engineering and space technology, the New Approach system is still supplemented by mandatory international or European airworthiness certification schemes or final system tests. Similarly, the European Interoperability Directives introduced in the railways sector stipulate that, when the national safety authority grants authorization for putting into service, the new concept system should be supplemented by a final system inspection. The same applies in the process plant sector and, indeed, in other fields as well.

This fragmentation into a large number of “safeties” is increasingly becoming a problem since only a few users are able to look beyond their own area of application to recognize commonalities as a whole. In addition, different interpretations of what is required in technical safety are more and more frequently being settled legally, which in turn can lead to extraneous interference in the technical field.

In 1987, the VDI convened a committee to tackle this problem. This committee of experts agreed in favour of developing a safety concept which could be used on an interdisciplinary basis. In 1999, following a resolution of the Scientific Advisory Board, the VDI “technical safety” Committee was established. The committee was given the task of working out the **hidden commonalities** of the safety concepts in the various specialist technical fields and presenting a standardized practical guide applicable to all technical fields. On 27.09.2013, the draft was intensively discussed in a technical meeting with recognized safety experts from the most varied specialist fields. The results of this discussion have been incorporated in this publication.

It consists of:

- the preamble,
- the development of technical safety,
- the interdisciplinary approach,
- interdisciplinary safety guideline,
- proposal of the VDI ‘Technical Safety’ Committee and
- summery-lessons learned