AIRPLANE CRASH AND EXTERNAL EXPLOSIONS — DESIGN STANDARDS IN THE FEDERAL REPUBLIC OF GERMANY

M. BORK, G. PHILIP

Kerntechnischer Ausschuß (KTA)-Geschäftsstelle bei der GRS, Glockengasse 2, D-5000 Köln 1, Germany

Summary

To ensure that all nuclear power plants in the Federal Republic of Germany have the same level of safety on a continuous basis, the Nuclear Safety Standards Commission (KTA) initiated work on the following nuclear safety standards:

Protection of NPP against Airplane Crash and External Explosions

KTA 2202: Basic Principles and Load-Assumptions

KTA 2203: Design of Structural Components (for given Load-Assumptions).

This paper will limit itself to the consideration of those aspects, where significant progress could be made recently.

In addition to the load-time function, which envelope aircraft impacts, the specific load-parameters for local penetrations (mass, impact velocity and effective diameter) have been derived on the basis of risk and probability analyses; these parameters are then used together with the penetration formulae to obtain the effects of the impact of airplanes and their debris on concrete walls and soils. Although the effects of structural debris can only be made on a qualitative basis, the load-assumptions resulting from a fuel fire can be clearly defined for the free field in terms of fuel mass, maximum duration of fire and maximum flame temperature.

For the site-independent design against pressure waves from a deflagration, the load-time functions are defined 1) for the incident wave and 2) for the reflected pressure loading as a function of the shape of the structure. For the site-dependent design against pressure loads which are higher than those resulting from deflagration (e.g. detonation) either the safety distances or the load-time function, which is dependent on the actual distances, are defined.

The requirements for the detailed design of the structural components include the analytical methods, acceptable simplifications in modelling and the permissible stresses. One of the interesting aspects is the consideration of the overall stability; here reference is made to the nuclear safety standard KTA 2201, Part 3: "Design of NPP against seismic events;Design of structural components" (see also paper K 2/7).