

MODEL SCALE EXPERIMENTS FOR THE INVESTIGATION OF AIR BLAST LOADING ON STRUCTURES

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A safe and cost-saving design of a particular structure which has to be hardened against the air blast loading of a nuclear explosion requires an accurate and detailed knowledge of the blast loading characteristics.

The interaction of an incident blast with an object is a most complicated process. Usually, a simplified calculation procedure as presented in Glasstone's "Effects of Nuclear Weapons" provides the desired information for general design purposes. If more particular data are needed for design optimization or to get deeper insight into the loading dynamics, large HE-tests at full or slightly reduced scale may be performed. Such experimentally evaluated data, further supported by sophisticated numerical calculations, will certainly provide reliable blast loading characteristics. However, these procedures are extremely expensive and limited to one or a few test configurations.

The aim of the test series described in this paper was to check the feasibility of micro-HE-tests with a scale model of 1:100 and smaller and to estimate the physical relevance of the measured blast loading characteristics. The use of such a small scale would of course reduce experimental costs, but at the time being the interpretation and transposition of the scale model data into full scale remain uncertain. Thus 2 test series have been carried out with aircraft shelter scale models of 1:100 and 1:500.

The design load of the real structure considers the case of an incident blast wave of 1 bar peak overpressure generated by a 20 kT nuclear bomb exploding at 270 m HOB. The corresponding HE-charges are 10 kg TNT for 1:100 and 80 g for the 1:500 scale. The time histories of the blast loading were measured simultaneously at 10 different positions around, at and on the structure for different ground zero locations with and without the presence of reflecting surfaces (terrain modeling) in the vicinity of the model.

Test results are presented and compared with those of the simplified calculations mentioned above.