INTRODUCTION

The Naval Ordnance Laboratory, by virtue of its experience and facilities in the fields of propellants and high explosives, is investigating the structural response of reactor vessels to accidental nuclear excursions. As the NOL effort is directed primarily to containing possible excursions within the reactor vessel proper, it has been appropriately titled the NOL Reactor-Vessel Containment Program. From an engineering point of view, the basic parameters of reactor-vessel containment design are material, configuration, constraint, and size. The purpose of the NOL program is to determine, through an investigation of these basic parameters, the optimum containment design of nuclear-reactor vessels for a large range of excursion-energy releases and fluxes.

Considerable experimentation is required to determine the significance of these parameters to the containment problem. One of the primary instrumentation problems in the program is to determine the internal pressure-time history of dynamically loaded model reactor vessels. This is accomplished, in part, through the use of tourmaline piezoelectric gages. Although much is known about these gages, their accuracy is limited by the accuracy of the system in which they are calibrated. This report presents a method of calibration wherein the gages are immersed in an oil-filled compression chamber and subjected to known pressures. Quick release of this pressure is accomplished by breaking a knock-off tube which in turn produces a pressure pulse of known magnitude and duration on the piezoelectric gages. Although this system uses a transient-pressure pulse, it is properly defined to be a static calibration in that there is negligible fluid flow around the gage. On the other hand, a dynamic calibration also uses a transient-pressure

pulse, but the fluid flow may or may not be appreciable, depending upon the calibration medium, e.g., air or water shock tube calibration.

A method is presented by which a safe, workable knock-off tube can be selected that will give a prescribed pressure-release time, and hence, a prescribed static calibration pressure pulse. The method is verified, for the ranges of the test conditions investigated, by a series of 83 experimental tests.