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TITLE

THE FEASIBILITY OF DETERMINING PERCENT PLASTIC STRAIN IN HY80 STRUCTURES USING X-RAY DIFFRACTION PEAK ANALYSIS

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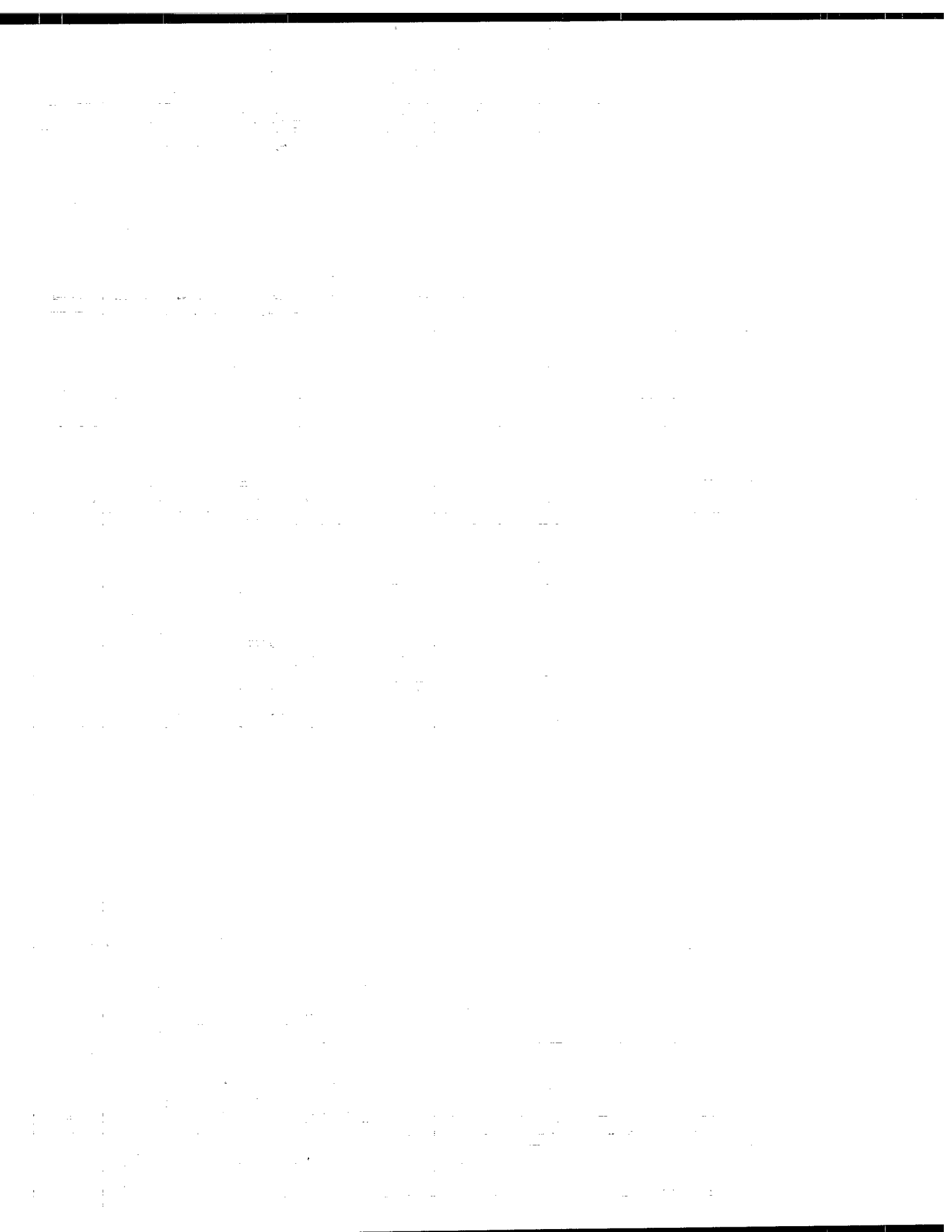
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**The Feasibility of Determining Percent Plastic Strain in
HY80 Structures Using X-Ray Diffraction Peak Analysis**

by

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ABSTRACT

This paper describes the approach and summarises the results of an investigation on the feasibility of employing non-destructive X-ray diffraction techniques to determine percent plastic strain in marine platforms fabricated with HY80. The study began by creating a series of dog bone samples machined from HY80 stock. The sample surfaces were electro-etched with a regular pattern of circles and plastically deformed to various levels. The ellipsometry of the etched circles, now deformed, were analysed using the FAMOSS system to characterise the degree of plastic deformation on each sample.

The samples were then analysed using x-ray diffraction techniques. The integral peak breadth and full width half maximum (FWHM) of several samples were measured and the results correlated to the optical strain data. It was hoped that a calibration of the integral breadths versus the optically determined strains would permit the determination of plasticity in other blind specimens. This was not possible as several different phenomena occur simultaneously when a material undergoes plastic deformation. These various phenomena affect the baseline necessary for a reliable calibration of percent plastic strain.

The necessity of segregating effects on peak broadening due to instrumental optics, domain size and microstrain distributions became apparent. Several different techniques exist to conduct this type of analysis. Various different approaches were used and their respective results compared and correlated with the optical data.