JOURNAL OF INTEGRAL EQUATIONS
AND APPLICATIONS
Volume 2, Number 2, Spring 1990

ON THE CORRECTNESS OF THE PROBLEM OF INVERTING THE FINITE HILBERT TRANSFORM IN CERTAIN AEROELASTIC MODELS

W.R. MADYCH

ABSTRACT. We indicate methods of ensuring that the problem in the title is correctly posed in the L^p sense whenever the derivative of the circulation function satisfies certain mild conditions.

1. Introduction. In the theory of aeroelastic control systems it is required to solve

$$f(x) = \int_{-1}^{1} \frac{\gamma(y)}{y - x}\, dy \tag{1}$$

for $\gamma(y), -1 < y < 1$, in terms of $f(x), -1 < x < 1$. The function f is assumed to be of the form

$$f(x) = w(x) + g(x), \tag{2}$$

where

$$g(x) = \int_{0}^{\infty} \frac{G(s)}{1 - x + s}\, ds. \tag{3}$$

Here w and G are constant multiples of the so-called downwash function and the derivative of the circulation function respectively.

Formula (1) is often referred to as the finite Hilbert transform of γ, see [**3**]. For more detail concerning this model of aeroelasticity see [**1**] and the references cited there. In particular, $f = f^t$ and $G = \dot{\Gamma}_t$ in the notation of [**1**].

In order to guarantee the correctness of the problem of solving (1) via the methods in [**3**], it is necessary to assume that f is in some $L^p(-1, 1)$

Department of Mathematics, University of Connecticut, Storrs, CT 06268.
Partially supported by a grant from the Air Force Office of Scientific Research, AFOSR-86-0145.