1 Introduction

Existing parameterizations of heat, moisture, and momentum fluxes in the marine atmospheric boundary layer (MABL) perform poorly under weak wind regimes, especially in regions of inhomogeneity (e.g., Ramage 1984; Mahrt et al. 1996; Sun et al. 1996; Serra et al. 1997; Drennan et al. 1999; Greischar and Stull 1999; Lambert and Durand 1999). These problems are due to a variety of processes including averaging techniques, gravity/capillary wave spacing, surfactants and surface tension, free convection effects, and frequency-dependent differences between wind, waves, and stress. In order to improve our understanding of air-sea interaction in extremely light wind regimes, the Office of Naval Research (ONR) created the Coupled Boundary Layers Air-Sea Transfer (CBLAST) Defense Research Initiative (DRI). The objectives of the CBLAST light-wind initiative are:

- *to measure vertical fluxes of momentum and heat in the lower atmospheric boundary layer and in the ocean surface layer;*

- *to identify the processes that influence these fluxes (e.g., shear, convection, surface wave breaking, Langmuir cells);*

- *to close budgets for heat and momentum;*

- *to test parameterizations of fluxes; and*

- *to obtain other measurements (e.g., horizontal variability of pressure and temperature) sufficient to provide boundary conditions for a large eddy simulation or local application of a regional-scale simulation.*

A research aircraft was used in the CBLAST-Low pilot field study to acquire high-resolution *in situ* atmospheric turbulent fluxes in the MABL and simultaneously document the characteristics of the surface wave field with various remote sensors. The LongEZ (registration N3R) research aircraft has proven to be an especially powerful tool for studying the spatial variability of air-sea interaction (Crawford et al. 1993; Vogel and Crawford 1997, 1999; Crescenti et al. 1999; Mahrt et al. 1999, 2001; Mourad 1999; Sun et al. 1999, 2001; Vogel et al. 1999; Vandemark et al. 1999a, 1999b, 2001; French et al. 2000, Mourad et al. 2000; Vickers et al. 2000, 2001). Data acquired by N3R in CBLAST-Low will support the test and refinement of parameterizations used in air-sea models. In addition, such measurements will provide important boundary conditions to determine boundary layer turbulence and other atmospheric processes controlling the exchange of energy across the air-sea interface.

The CBLAST-Low pilot study was conducted during a three-week period from late July to early August 2001 off the south shore of Martha's Vineyard Island, Massachusetts. Twenty missions (~ 48 flight hours) were flown on days with light winds (< 7 m s^{-1}) under various atmospheric stabilities. This report summarizes the data acquired by N3R in the CBLAST-Low pilot field study.