AD-A207 659 RESEARCH IN NONLINEAR WATER WAVES(U) CALIFORNIA INST OF 1/1
TECH PASADENA DEPT OF APPLIED MATHEMATICS P G SAFFMAN
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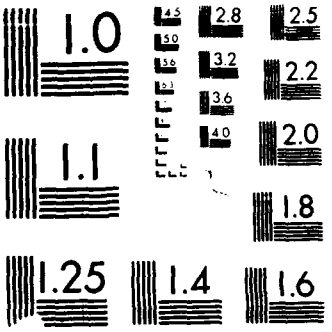
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March 31, 1989

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Dear Mike

Research in Nonlinear Water Waves
Navy Grant No. N00014-89-J-1164

Quarterly letter progress report Jan 1, 1989 - Mar 31, 1989

The major effort during the quarter has been work with Dr. F. A. Milinazzo on the calculation of wind drift effects on the properties of finite amplitude capillary gravity waves. We have successfully extended our code to the case when the wave is not too steep and the wind drift layer is thin compared with the height of the wave. Results have been obtained showing the effect of the wind drift layer on the properties of finite amplitude waves of permanent form. These are currently being validated and we intend to complete the analysis of these results during the next quarter. In particular, we intend to compare with the theory of Banner & Phillips which models the wind drift layer by a quasi-one-dimensional sheet. Further, we are investigating the construction of a boundary integral type code which will enable us to calculate the effect of the wind drift layer on steep waves, but first work shows that this is a highly non-trivial task.

A remarkable result that we have discovered concerns the stability of the waves when there is a wind drift layer. It appears that infinitesimal waves may be spontaneously unstable in the presence of a thin wind drift layer of sufficient strength. Our first results indicate that capillary gravity waves in a narrow band of around 2 cm wavelength are unstable for a wind drift layer corresponding to a wind speed of around 15 knots. According to our present understanding, this appears to be a complete new mechanism for the generation

of waves by wind, since it is independent of the air motion once the wind drift layer is set up by viscous or turbulent stresses. Investigation of this instability is continuing, and the work on the Hamiltonian formulation is being delayed while we follow up this phenomenon.

With best wishes

Yours sincerely

P.G. Saffman

cc: ONR Pasadena
cc: Director, Naval Research Laboratory
cc: Defense Technical Information Center

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