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NAVAL OCEAN SYSTEMS CENTER
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MEMORANDUM

From: Al Gordon, Code 5211

To: Paul Heckman, Code 5211

Subj: Considerations concerning an active electromagnetic pipeline following system

- Ref:
- (a) University of New Hampshire, Sonatrack I, The Design and Development of a Pipeline Survey Vehicle, by B. Haley 1976-1977.
 - (b) Innovatum, Inc. ltr dated 8 November 1976 from Paul A. Cloutier to Mr. Donald M. Rosencrantz.
 - (c) Geometrics, Applications Manual for Portable Magnetometers, by S. Breiner, 1973.
 - (d) Proceedings, 1978 Offshore Technology Conference, "Inspection of Buried Pipelines by Submersibles - Pipe Tracking and Pipe Logging Instrumentation," by Y. Durand and Alain Stankoff, pp. 207-216.
 - (e) NUC memo 6512/137-75 dated 22 August 1975 "Feasibility Investigation of using some form of metal detector as a sensor in a free-swimming, underwater object inspection vehicle," by M. Wolff
 - (f) Handbook of Electromagnetic Propagation in Conducting Media, by Martin B. Kraichman, U.S. Government Printing Office, 1970.
 - (g) Galejs, J., "Admittance of Insulated Loop Antennas in a Dissipative Medium," IEEE Trans. Antennas Propagation, Vol AP-3, March 1965, pp. 229-235.
 - (h) Ramo, Whinney, and Van Duzer, Fields and Waves in Communications Electronics, Wiley, New York, 1967, p. 295
 - (i) Eshbach, Handbook of Engineering Fundamentals, 3rd Edition, Wiley, 1975, p. 1443
 - (j) Arnold Engineering Co., Tape Wound Cores, Publication TC-101B, Marengo, Illinois, 1972.
 - (k) American Institute of Physics, American Institute of Physics Handbook, Third Edition, McGraw-Hill, 1972, p. 5-247.
 - (l) Naval Undersea Center TP 294, Undersea Detection of Various Signals, "Static Electric and Magnetic Fields," by A. Gordon, July 1972, p. 17

1.0 INTRODUCTION

One of the missions which appears attractive for the NOSC free swimmer is pipeline inspection. With an ever-greater number of pipes distributing oil and gas from offshore wells, there is a need to insure that these pipes are not leaking and show no signs of imminent failure. A typical scenario would be the launch of the free swimmer some distance from the pipeline with the free swimmer programmed to cross the pipeline at some preset altitude. Aboard the free swimmer will be some sort of pipeline detection system, the subject of this memorandum, which will alert the onboard microprocessor that the pipeline has been crossed. The vehicle's control logic will then take over piloting and