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CLASSIFICATION	SYSTEM NUMBER
UNCLASSIFIED	507202

TITLE

AN AUTOMATED WINCH CONTROL SYSTEM TO PROVIDE SEA BOTTOM FOLLOWING FOR SIDE SCAN SONAR SURVEYS. EXECUTIVE SUMMARY ONLY

System Number:

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TECHNICAL MEMORANDUM 97/234
March 1997

EXECUTIVE SUMMARY ONLY

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Head / Electromagnetic Section

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DREA TM 97/234

An Automated Winch Control System to Provide Sea Bottom Following for Side Scan Sonar Surveys

by

David Hopkin

Executive Summary

INTRODUCTION Sea trials of side scan sonar systems have demonstrated a very strong requirement for an automated system to ensure the towed sonar maintains a constant altitude over the sea bottom. This report describes the development of an automated winch control system that achieves this objective. A review of early bottom following techniques is provided, followed by details of the servo-controlled winch and the computer based sea bottom following controller developed by EDRD. Trials results, conclusions, and recommendations for further improvements are presented.

PRINCIPAL RESULTS A very flexible computer based sea bottom following controller was developed. Sea trial results show that the controller can maintain a towed sonar at an altitude of 15.0 m with a steady state error of less than 0.05 m and a standard deviation of 0.24 m or less at towing speeds of 1.5-2.0 m/s. The graphical interface clearly displays the towfish altitude for the operator, and provides a simple graphical slider to change the command altitude. However, trials also indicated that there are certain types of bottom terrain where it is very difficult to maintain a constant altitude using only the towfish altimeter for feedback control. Further enhancements are needed for these very quickly changing sea bottom contours.

SIGNIFICANCE OF RESULTS The development of an automated bottom following system has been successfully used on several EDRD towed sonar trials, and has proven to be invaluable in maintaining the sonar at a constant altitude over the sea bottom. The development of this system is also key to the successful development of the currently planned Canadian Remote Mine Hunting System (CRMS). As the tow vehicle will be remotely piloted, a robust automated system is essential. However, since the tow vehicle will be traveling at speeds of up to 5 m/s, using only the towfish altitude as the control feedback will not be adequate, and further enhancements will be required.

FUTURE PLANS In order to deal with rapidly changing bottom contours and higher towing speeds, the current bottom following controller needs to be modified to use advance knowledge of the sea bottom contour ahead of the towed sonar. This advance knowledge would then be used to calculate an achievable towfish trajectory to ensure that the towfish can maintain the desired altitude and that the required rate of altitude change never exceeds the maximum winch speed.

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SECURITY CLASSIFICATION OF FORM
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(Security classification of title, body of abstract and indexing annotation must be entered when the overall document is classified)

1. ORIGINATOR (The name and address of the organization preparing the document. Organizations for whom the document was prepared, e.g. Establishment sponsoring a contractor's report, or tasking agency, are entered in section 8.)

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An Automated Winch Control System to Provide Sea Bottom Following for Side Scan Sonar Surveys

4. AUTHORS (Last name, first name, middle initial. If military, show rank, e.g. Doe, Maj. John E.)

HOPKIN, A. David

5. DATE OF PUBLICATION (Month and year of publication of document.)

March 1997

6a. NO. OF PAGES (Total containing information. Include Annexes, Appendices, etc.)

29

6b. NO. OF REFS. (Total cited in document.)

8

6. DESCRIPTIVE NOTES (The category of the document, e.g. technical report, technical note or memorandum. If appropriate, enter the type of report, e.g. interim, progress, summary, annual or final. Give the inclusive dates when a specific reporting period is covered.)

Technical Memorandum

8. SPONSORING ACTIVITY (The name of the department project office or laboratory sponsoring the reseach and development. include the address.)

Defence Research Establishment Atlantic
P.O. Box 1012, Dartmouth, N.S. B2Y 3Z7

9a. PROJECT OR GRANT NUMBER (If appropriate, the applicable research and development project or grant number under which the document was written. Please specify whether project or grant.)

1DA12

9b. CONTRACT NUMBER (If appropriate, the applicable number under which the document was written.)

10a. ORIGINATOR'S DOCUMENT NUMBER (The official document number by which the document is identified by the originating activity. This number mrst be unique to this document.)

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Towed sonars, Automatic control, Winch contol, Towed systems

#507202