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KETRON INC ARLINGTON VA
FINAL REPORT ON CONTRACT N00014-77-C-0400, SWDG-ASW.(U)
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FINAL REPORT UNDER
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SWDG-ASW

KFR-197-78

30 November 1978

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

| REPORT DOCUMENTATION PAGE | | READ INSTRUCTIONS BEFORE COMPLETING FORM |
|---|---|--|
| 1. REPORT NUMBER KFR 197-78 | 2. GOVT ACCESSION NO. | 3. RECIPIENT'S CATALOG NUMBER <i>Letter</i> |
| 4. TITLE (and Subtitle) Final Report SECRET on Contract N00014-77-C-0400, SWDG-ASW. (KFR 197-78) | | 5. TYPE OF REPORT & PERIOD COVERED FINAL REPORT. 15 May 1977-30 Sep 78 |
| 7. AUTHOR Dr. Edward Parberry | 14. PERFORMING ORG. REPORT NUMBER KFR-197-78 | 8. CONTRACT OR GRANT NUMBER(s) 15. N00014-77-C-0400 |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS Ketron, Inc. 1400 Wilson Blvd. Arlington, VA 22209 | | 10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS NR 128-054 |
| 11. CONTROLLING OFFICE NAME AND ADDRESS Office of Naval Research 800 North Quincy St. Arlington, VA 22217 | | 12. REPORT DATE 11. 30 November 1978 |
| 14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) Commander, Surface Warfare Development Group Naval Amphibious Base, Little Creek, Norfolk, VA 23521 | | 13. NUMBER OF PAGES 3 |
| 16. DISTRIBUTION STATEMENT (of this Report) <i>12 Sp.</i> Approved for public release; distribution unlimited | | 15. SECURITY CLASS. (of this report) UNCLAS |
| 17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) Same | | 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE |
| 18. SUPPLEMENTARY NOTES Technical work done under this contract has been, or will be, published separately, as noted below, by COMSURFWARDEVGRU. | | |
| 19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Antisubmarine warfare (Surface) Target Motion Analysis | | |
| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This letter report is a brief description of the activities of the principal analyst toward fulfillment of the contract's tasking. No technical details are covered, other than the following bibliography of technical documents prepared for COMSURFWARDEVGRU. | | |

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

- (Secret) COMSURFWARDEVGRU Report, 07 June 1978, "National Week XXIII Surface ASW Report (U)".
- (Secret) COMSURFWARDEVGRU Report, Draft, "Report of Destroyer Squadron Ten Deployment to U.S. Sixth Fleet, July - Dec 1977 (ASW Aspects) (U)".
- (Secret) COMNAVSURFLANT LESSONS LEARNED, proposed, "Target Motion Analysis in ASW, Error Control in DEKE Ranging (U)".
- (Secret) COMSURFWARDEVGRU TACMEMO, proposed, "Shipboard Procedures for Calculator Aided DEKE Ranging (U)".

Additional products prepared for COMSURFWARDEVGRU include:

- (Memorandum to LCDR Huffman) "Non-parametric Statistical Procedure for Comparison of Cumulative Probability of Detection Models with Exercise Results," June, 1977.
- Computer program to implement above procedure.
- "Analysis Plan for TRANSITEX" July, 1977.
- Computer simulation program for parametric evaluation of two-legged TMA techniques.
- Several specialized graphical display programs for the HP-9830 calculator and plotter.
- Briefing for VADM Read: "Target Motion Analysis in ASW and OTHT" June, 1978.
- Briefing for COMSUBDEVRON TWELVE: "Errors in DEKE Ranging August, 1978.

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FINAL REPORT

This constitutes the Final Report on SWDG-ASW Contract No. N00014-77-C-0400. Technical portions of the work accomplished have been prepared for publication by COMSURFWARDEVGRU in tactical documents and exercise reports as detailed below.

The original contract provided for one man-year of analytical support to Surface Warfare Development Group for analysis of ASW exercises conducted during the 1977 deployment of Destroyer Squadron Ten to U.S. Sixth Fleet. This support was provided by Ketron analyst Dr. Edward Parberry. In response to the additional tasking to have Dr. Parberry ^{was to} investigate the utility of several target motion analysis techniques in surface ASW, the contract was amended to provide support for an additional four man-months. The contract's amended effective dates were 16 May 1977 to 20 September 1978.

During the initial months of the contract, Dr. Parberry assisted the ASW Project Officer in preparing exercise and analysis plans related to COMNAVSURFLANT TAC D&E objectives for the deployment. He also developed a non-parametric statistical procedure to evaluate the performance of a cumulative-detection-probability prediction model (PATSEA) intended for use in evaluating towed array screen designs. In late July (21 July to 13 August), Dr. Parberry directly supported the initial ASW exercises of the deployment (ASW WEEK I and SHAREM 23) as a data collector on CONSOLE and then on MCCLOY.

Three exercises were selected for detailed ASW analysis: NATWK XXIII, AUTUMN SURPRISE, and ASW WEEK II. The months late arrival of raw and reconstructed data for the NATWK XXIII exercise left the command far behind its anticipated analysis schedule. Consequently, the only individual exercise analysis report to be published was that on NATWK XXIII. Dr. Parberry was the leader of the analysis team preparing this report.

Upon his return from the Mediterranean, LCDR Millard directed the analysis for the final report on the squadron's deployment. Dr. Parberry prepared a major portion of this report.

Considerable interest and controversy developed during the Post Deployment Conference on the viability of single-ship target motion analysis techniques for towed array ships. Dr. Parberry began to investigate this question upon completion of the final deployment report.

Dr. Parberry's target motion analysis work was focussed on DEKE ranging and Ekelund ranging, these being at once the most mathematically tractable techniques of concern and the most promising. Conclusions drawn from this analysis may be briefly summarized as follows:

- Ekelund ranging and the related graphical technique, strip plotting, are not suitable for use with towed array contacts due to the poor bearing resolution of these sensors;

- DEKE ranging has great potential as a towed array technique out to the maximum direct path range of the sensor.

The potential claimed for DEKE ranging is largely based on the time-correction formulae developed by Dr. Parberry and on the techniques arising from this analysis to control both inherent error and measurement error. These are reported in a LESSONS LEARNED, and implemented for shipboard use in a TACMEMO as listed below.

Publications prepared for COMSURFWARDEVGRU to which Dr. Parberry was a primary contributor or sole contributor are:

- (Secret) COMSURFWARDEVGRU Report, 07 June 1978, "National Week XXIII Surface ASW Report (U)".

- (Secret) COMSURFWARDEVGRU Report, Draft, "Report of Destroyer Squadron Ten Deployment to U.S. Sixth Fleet, July - Dec 1977 (ASW Aspects) (U)".

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