

Image Cover Sheet

CLASSIFICATION

SYSTEM NUMBER

510324

UNCLASSIFIED



TITLE

INTRODUCTION TO THE A.P.H.I.U.S. DEVELOPMENT PROJECT

System Number:

Patron Number:

Requester:

Notes: Paper #19 contained in Parent Sysnum #510305

DSIS Use only:

Deliver to: DK



A.P.H.I.U.S.

by G.R. Labbé, J.R. Matthews, D.R. Hay and J. Hélie

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K1A 0K2

***** ABSTRACT *****

Under the direction of DSE and the field supervision of DREA/DL, Tektrend International Inc. was awarded a contract for the development of a project entitled APHIUS which stand for Automated Pressure Hull Intelligent Ultrasonic System.

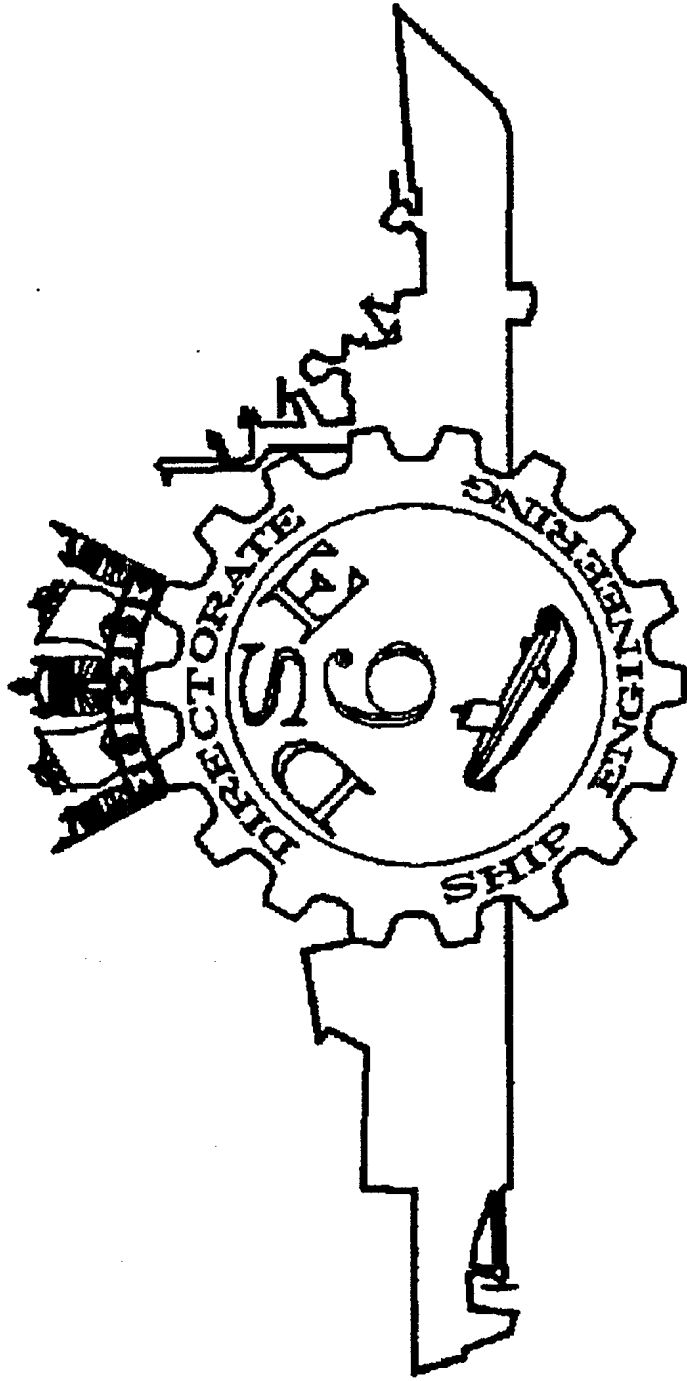
APHIUS is an ultrasonic inspection system whose hardware configuration and software capabilities are uniquely designed for submarine pressure hull inspection. However, future expansion will allow to meet a wide range of Canadian Forces naval vessel inspection requirements.

Inspection of submarine pressure hulls is a very complex and detailed task. If condemnation limits are to be based on the most serious defect type that the field inspector reports, the tasks of discrimination and the burden of the proof are dependent upon the inspectors' abilities. APHIUS provides assistance to the inspector by automating the interpretation process and providing advanced display capabilities. Handling of the information generated by the inspection for management decision-making is also addressed.

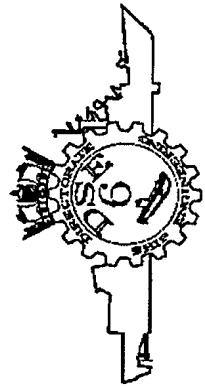
The benefits of automating the inspection of submarine pressure hulls is twofold; It will permit the revision of materials condemnation criteria of the pressure hull material based on defect identification, thereby raising the levels of the detectability, productivity, and reliability of the inspection and providing a consistent information system. The information system addresses the documentation aspect of maintaining the inspection result, presentation, interpretation, decision-making, and archiving of the data collected.

APHIUS addresses these issues by incorporating advanced inspection capabilities including state-of-the-art hardware and software, artificial intelligence methods to assist the operator during testing, and in post-test analysis to achieve the quality, productivity and reliability gains.

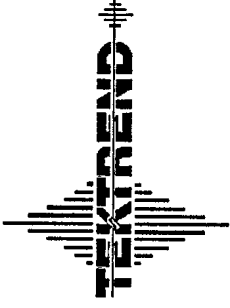
The system embodiment in terms of physical size and interface requirements specific to submarine will be described. Software capabilities specific to pressure hull steel and weldments will be presented.



Metallic Materials



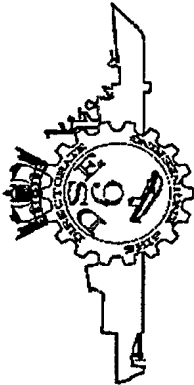
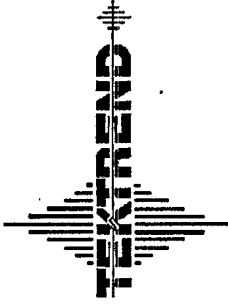
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APHIUS

AUTOMATED PRESSURE HULL INTELLIGENT ULTRASONIC SYSTEM

April 1993



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CONTENT

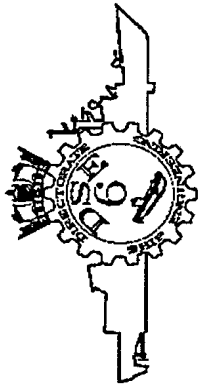
PART 1 -----> INTRODUCTION

PART 2 -----> HISTORY

PART 3 -----> DEVELOPMENT PROJECT

PART 4 -----> CONCLUSION

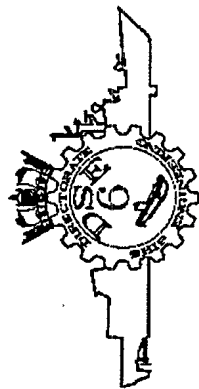




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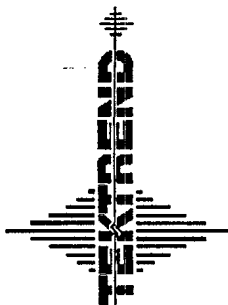
REQUIREMENT

TO REDUCE THE AMOUNT OF REWORK ON
SUBMARINE PRESSURE HULL WELDS DURING
REPAIR AND/OR NEW CONSTRUCTION
BY DEVELOPING AN IMPROVED
ULTRASONIC INSPECTION SYSTEM.

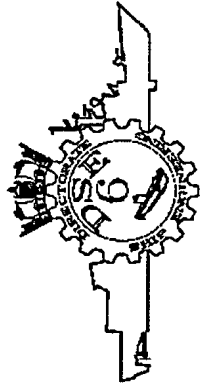


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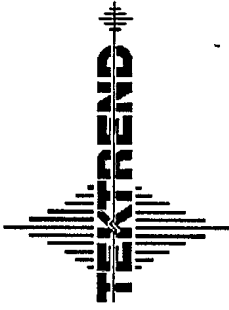
AIM



TO DEVELOP AN ADVANCED MODEL OF AN INDUSTRIAL QUALITY COMPUTER-AIDED ULTRASONIC INSPECTION SYSTEM, INCLUDING SOFTWARE AND HARDWARE FOR INSPECTION MAPPING, DEFECT CLASSIFICATION THROUGH ARTIFICIAL INTELLIGENCE, COMPLETE DATA RECORDING AND REPRODUCTION WITH EMPHASIS ON GRAPHICAL USER INTERFACES.



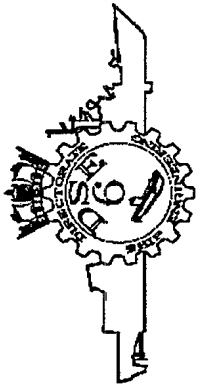
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SCOPE

TO DEVELOP AN INTELLIGENT ULTRASONIC SYSTEM FOR INSPECTION OF SUBMARINE PRESSURE HULLS INCLUDING PARENT PLATES AND WELDMENTS.

GENERATE NEW CRITERIA WHICH WILL PERMIT OVERHAULING THE OUDATED CONDEMNATION CRITERIA AND ELIMINATE WASTEFUL DEFECT REMOVAL.



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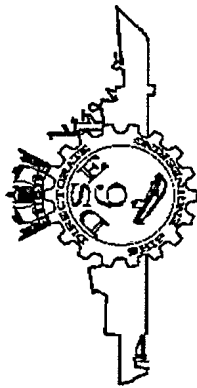
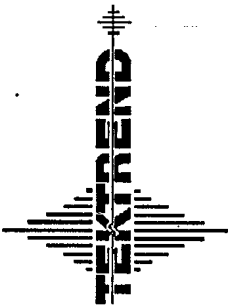


SCOPE (Cont'd)

IMPROVE PERFORMANCE OF THE ORIGINAL SYSTEM FOR FIELD APPLICATION

INCORPORATE FEATURES TO FACILITATE FIELD APPLICATION INCLUDING THE USER INTERFACE, DISPLAY AND REPORTS FORMATS, LOCATION TRANSDUCER ATTACHMENT, SCANNING MODE, PORTABILITY AND TRANSPORTABILITY.





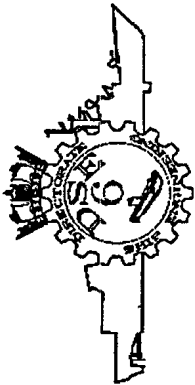
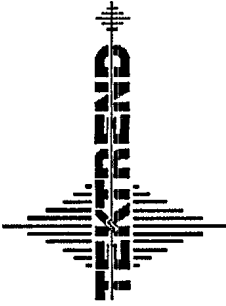
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SCOPE (Cont'd)

PROVIDE A SIMPLE MEANS FOR
TRANSDUCER CHARACTERIZATION IN THE FIELD.

PROVIDE EXTENDABILITY TO MEET NEEDS AND
EVOLUTION OF CURRENT TECHNOLOGY.

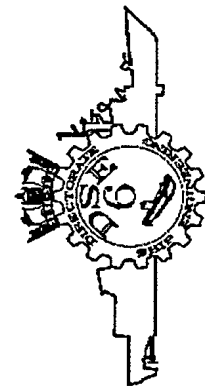
RETAIN MAINTAINABILITY THROUGHOUT THE
ORIGINAL MODULAR SYSTEM DESIGN.



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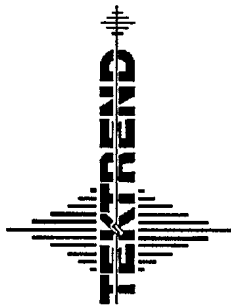
SCOPE (Cont'd)

PREPARE USERS MANUALS AND TRAINING MATERIALS.



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MATRIX



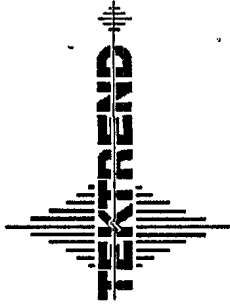
SCIENTIFIC AUTHORITY ----->

Mr. G.R. Labbé
DSE 6

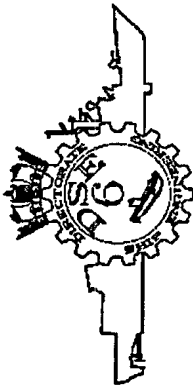
TECHNICAL AUTHORITY ----->

Dr. J.R. Matthews
DREA/DL

Mr. J.F. Boucher
DSE 6

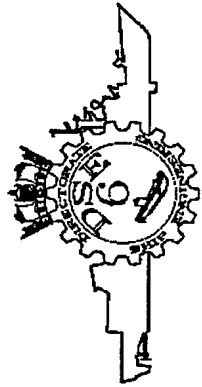


MATRIX (Cont'd)



Metallic Materials

PROJECT DIRECTOR	----->	Dr. J.L. Kennedy DRDM 8
PROCUREMENT MANAGER	----->	Mr. B.T. Forster DSS/SPO
PROCUREMENT OFFICER	----->	Mr. Y. Lafèche DPSupM 2



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CONTRACTOR



TEKTREND INTERNATIONAL Inc.

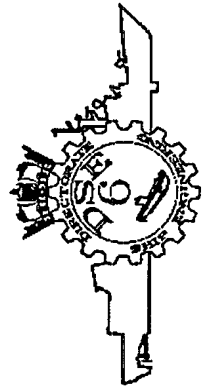
2755 Pitfield

St-Laurent

Montréal, Québec

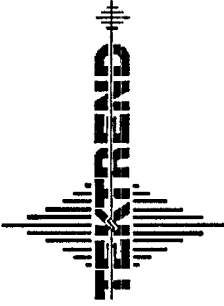
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(514) 333-7371



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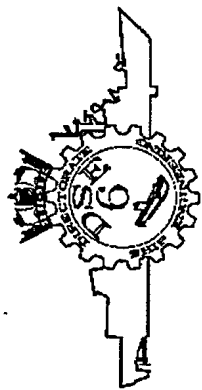
PHASING



PHASE

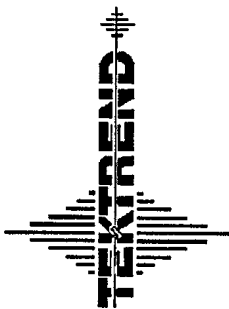
ITEM

- | | |
|-----|-----------------------------------|
| I | DESIGN MAIN CONSOLE |
| II | DESIGN TRANSDUCER LOCATION SYSTEM |
| III | ASSEMBLE MAIN CONSOLE |
| IV | ASSEMBLE LOCATION SYSTEM |
| V | USER INTERFACE DEVELOPMENT |
| VI | DEVELOP AND IMPLEMENT REPORTING |



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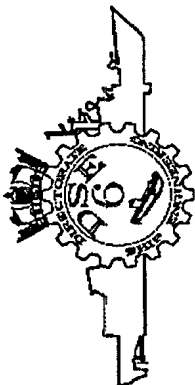
PHASING (Cont'd)



PHASE

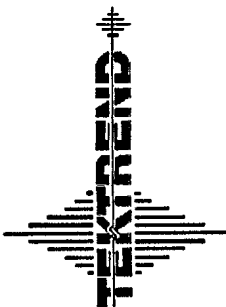
ITEM

- | | |
|------|---|
| VII | IMPLEMENTATION OF CODE-BASED
ACCEPTANCE CRITERIA |
| VIII | MANUALS AND TRAINING MATERIALS |
| IX | SERVICE AND UPGRADE PROGRAM |
| X | TRAINING |

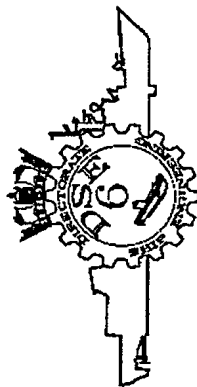
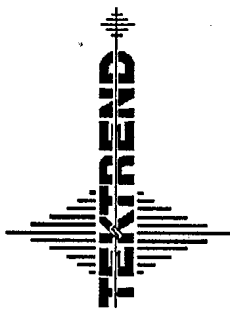


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MILESTONES



<u>ITEM</u>	<u>ESTIMATED DATES</u>
MAIN CONSOLE	Mar 93
LOCATION SYSTEM	Mar 93
USER INTERFACE	Aug 92
INTEGRATED HARDWARE AND SOFTWARE SYSTEM	Dec 92

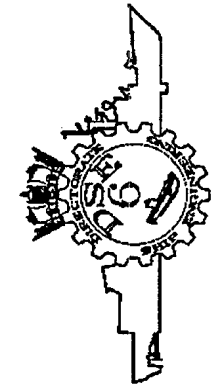


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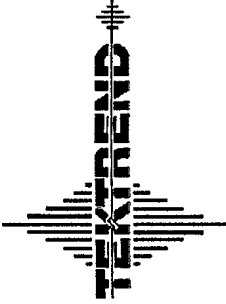
MILESTONES

(Cont'd)

<u>ITEM</u>	<u>ESTIMATED DATES</u>
REPORTING SOFTWARE	Apr 93
KNOWLEDGE-BASED SYSTEM	Apr 93
MANUALS AND TRAINING MATERIALS	Jun 93
FINAL REPORT	Dec 93



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COST

DATA AS PER MAR 93 FORECAST

TOTAL (\$000) ----- > \$609

FY	91/92	92/93	93/94	94/95
BY	75	275	220	39