

DEFENCE SCIENCE & TECHNOLOGY ORGANISATION
AERONAUTICAL AND MARITIME RESEARCH LABORATORY
MARITIME OPERATIONS DIVISION

CRUISE PROPOSAL MOD F/95

V-FIN STABILITY and TOWING TRIALS


21 MARCH 96
CLEARANCE, SECURITY

CSIRO Cruise Number SS 1/96

FRV SOUTHERN SURVEYOR, 9 APRIL-15 APRIL 1996

CRUISE LEADER, M. J. Bell

R & D AUTHORITY:



R. CREASER
Chief, Maritime Operations Division
March 1996

POSTAL ADDRESS:

Chief, Maritime Operations Division,
DSTO
Commercial Road
SALISBURY
SOUTH AUSTRALIA 5108

1. INTRODUCTION

The Mine Hunter Coastal (MHC) vessels currently under construction for the RAN to have a capability to hunt mines in water up to 200 m deep using the 2093 variable depth sonar. This trial is the first in a DSTO task to develop a complementary deep water capability for measurement and survey of acoustic bottom backscatter at mine hunting frequencies. The sensor platform for these acoustic measurements will be a V-fin towed body. Information and data gathered during this and subsequent experiments will provide environmental data to facilitate performance evaluation and prediction for the 2093 variable depth minehunting sonar.

In support of this program FRV SOUTHERN SURVEYOR will conduct a cruise in Tasmanian waters to assess towing characteristics of the of the V-fin body under a variety of tow speeds and configurations. These experiments will be the first MOD has conducted with a V-fin towed body and are intended to provide information to define the performance envelope for the operational system.

The trials area extends along the south east coast of Tasmania from Tasman Island to Cape Forestier and approximately 10 miles to sea. The maximum tow depth will not exceed 200 m while the minimum tow depth will be 30 m.

2. CRUISE PROGRAMME

A. Personnel Movements

DSTO personnel will travel to Hobart on Tuesday 9 April and join SOUTHERN SURVEYOR to load, install and set to work scientific equipment for the cruise. Trials participants will be accommodated in SOUTHERN SURVEYOR from 9 April until the end of the cruise on Monday 15 April.

B. Schedule

Day	Date	Event
01	Tue 9 Apr	DSTO personnel travel to Hobart and load equipment. Check interface to SUN SPARCStation.
	Wed 10 Apr	Install equipment and set to work. Conduct alongside system checks and test data acquisition.
03	Thu 11 Apr	SOUTHERN SURVEYOR sails for test area. Commence towing trials.
	Fri 12 Apr	Towing trials.

	Sat 13 Apr	Towing trials. Return to Hobart on completion.
	Sun 14 Apr	Spare day
07	Mon 15 Apr	Unload, return to Sydney.

3. ADMINISTRATION

A. Scientific Personnel

MOD - DSTO

Michael Bell	Cruise leader
Jim Thompson	
Neil Tavener	
Chris Halliday	DSTO Trials Safety Officer
Binh Khuu	

B. Organisation of Scientific Personnel

At the commencement of the cruise the cruise leader will allocate personnel to watches if necessary, and determine responsibilities. During the cruise the cruise leader may change these allocations and responsibilities as necessary for the conduct of the cruise.

C. Co-ordination

- (i) Location: Hobart and east coast Tasmania areas.
- (ii) Responsibility: The Cruise Leader is responsible for the initiation of experiments and location of stations within the overall time available.
- (iii) Preparation: The scientific equipment will be loaded on SOUTHERN SURVEYOR at Hobart. One day is required to install, test and calibrate the equipment in the ship.
- (iv) Unloading: All scientific equipment for this cruise will be unloaded in Hobart on completion of the cruise for return to MOD Sydney.

D. Security

All aspects of the cruise are unclassified.

E. Safety

The master SOUTHERN SURVEYOR is responsible for the safe conduct of the sea trial and may suspend the experiment programme if he considers that it is unsafe to proceed.

Mr. Chris Halliday is the nominated DSTO Trials Safety Officer. DSTO trials operations are to be conducted within the guidelines set out in MOD Work Instruction for Sea Trials.

No particular safety hazards during the conduct of the cruise are anticipated however personnel should be aware of additional hazard during deployment and recovery of the V-fin

F. Command and Control

(i) R & D Authority:

Chief, Maritime Operations Division,
Aeronautical and Maritime Research Laboratory,
Defence Science and Technology Organization.

(ii) Task:

Minehunting Sonar Support, NAV. 95/290

(iii) Co-ordinator:

Mr. M. J. Bell,
Maritime Operations Division,
DSTO Sydney,
P.O. Box 44, Pyrmont 2009
Phone (02) 692 1422, Fax (02) 660 0019
DNATS 8-27 1422, Telex 127142
Located at: Wharf 17, Jones Bay Road, Pyrmont

G. Stores Requirements (FRV SOUTHERN SURVEYOR)

Nil for scientific work.

H. Tenure of Data

DSTO will retain scientific records generated from the towing experiments.

4. TECHNICAL PROCEDURES

A. Equipment Required For Cruise

(i) DSTO Equipment:

V-FIN towed body, sensors and instrumentation canister
Towing cable
Towpoint motion monitoring unit
Data acquisition computers

(ii) Ship's Equipment:

Laboratory space

- computer room
- operations room

Lifting equipment

- aft gantry hoist
- large towed bodies winch
- hydrographic crane

Echo sounder

GPS

SUN SPARCStation

Equipment and Instrumentation

The wing span of the V-fin is approximately 2 metres and the length is similar. A stabilising fin extends the height to approximately 1 m. Weight is estimated at approximately 400 kg.

The V-fin is fitted with pitch and roll sensors to measure platform attitude and stability and an altimeter to monitor height above the sea floor. Data from these instruments will be telemetered to a logging computer in the operations room to monitor body motion and flight dynamics.

A ship motion sensing package comprising accelerometers and inclinometers will be fitted to the ship close to the tow point. Data from this equipment will be logged in parallel with the V-fin sensor data to determine the degree of coupling between tow point motion and the V-fin dynamics.

Bottom depth from the EK500 echo-sounder in the operations room and GPS data will also be logged via the CSIRO SPARCStation and passed to the logging PC.

B. CSIRO and Ship Support

The CSIRO bridge log should be maintained by the watch keeping officer. Information is to be recorded hourly. Separate lines are required for the start and finish of scientific stations. This log forms a valuable part of the scientific record by providing an independent record of events.

C. Procedures For Scientific Measurement Programme

The aim of the trial is to test the towing dynamics and characteristics of the V-fin body under various combinations of towing speed, cable length and towed body trim. Configurations to be tested will be selected from the parameters listed in table 1.

Ship speed (kts)	2	4	6
Cable out (m)	30	100	200
Trim angle	5°	8°	
Acoustic transducer depression angle	12°	90°	

Table 1. Possible range of towing geometries.

The V-fin cannot be controlled in flight as it has no active control surfaces. The tow depth is determined by the cable out and must be adjusted by paying out or hauling in the tow cable. It is essential therefore that the water depth be always greater than the length of tow cable out. During initial runs or when entering a new area where the bottom topography is uncertain the **maximum towing depth is to be water depth less 50 m.**

Water depth (m)	Maximum cable out (m)
80	30
150	100
250	200

Table 2. Water depth and cable out

D. Equipment Deployment

Approximately 500m of faired tow cable will be wound on to the towed bodies winch and connected to the slip rings terminals. DSTO will provide a deck cable to connect the winch to the logging equipment in the operations room.

CSIRO will supply a sheave to be fitted to the aft gantry. The V-fin will be deployed from this sheave via the tow cable which will be marked to indicate cable out.

During initial runs or when entering a new area where the bottom topography is uncertain the **maximum towing depth is to be 50 m less than the water depth.**

5. DISTRIBUTION

RAN:

Hydrographer
Mine Hunter Coastal, Project Director
DGFD (SEA) Attn. Cmdr Rankin
Naval Scientific Adviser

DSTO:

Chief, Maritime Operations Division
RLOE, Maritime Operations Division
DSTO Cruise Participants
DSTO Sydney Library
AMRL Melbourne Library
DSTO Sydney Registry, File 490-1-16

CSIRO: Division of Fisheries

Chief
Library
C. Liron
FRV SOUTHERN SURVEYOR (3 copies)