

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

CRUISE PROPOSAL MOD C/94

HIGH-FREQUENCY ACOUSTIC
BOTTOM BACKSCATTER STUDIES

CSIRO
MARINE LABORATORIES

27 SEP 1994

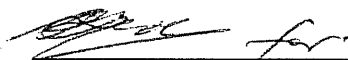
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CSIRO Cruise Number SS C/94

FRV SOUTHERN SURVEYOR, 23 SEPTEMBER - 6 OCTOBER 1994

CRUISE LEADER, M. J. Bell

R & D AUTHORITY:



R. BARRETT

A/Chief, Maritime Operations Division

19 September 1994

POSTAL ADDRESS:

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

1. INTRODUCTION

FRV SOUTHERN SURVEYOR will conduct a research cruise in the Jervis Bay area to gather scientific data on the backscattering of high-frequency acoustic energy from the sea floor. This cruise follows a similar cruise, conducted in SOUTHERN SURVEYOR off Dampier in October 1993. This work is relevant to the performance of mine hunting sonars currently in service with the RAN and systems under consideration for the proposed MHC vessels.

As well as the bottom backscattering (BBS) measurements, ancillary measurements will be made to assist in interpretation and analysis of the measured backscattering. These measurements will include stereo photography, sediment sampling and sound speed profiling of the water column.

Incidental to the backscatter experiments SOUTHERN SURVEYOR will be sound ranged using the Jervis Bay facility.

2. CRUISE PROGRAMME

A. Narrative

SOUTHERN SURVEYOR will berth at Pymont AM on Sunday 25 September. MOD equipment for the cruise will be loaded in SOUTHERN SURVEYOR alongside in Pymont.

DSTO personnel will join SOUTHERN SURVEYOR on Monday 26 to install and set to work scientific equipment for the cruise. Later that day the ship will sail for the experiment area in Jervis Bay.

The deployment platform for the bottom backscattering experiments is a tower approximately 4.3 metres high. This is the same equipment as used previously off Dampier in October 1993. A typical deployment of the tower will entail a period of several hours on the sea floor. It is anticipated that there will be a maximum of two deployments each day. Some deployments will repeatedly measure in the same location, while others will be at other selected locations.

Two localities in the Jervis Bay area have been chosen for the acoustic experiments. These areas lie in the shallow practice mine-field within Jervis Bay and south of Pt. Perpendicular at the northern edge of the deep practice mine field. Backscatter measurements will be conducted in each area. A third area about six miles SE of area B has also been selected. No acoustic experiments are planned for area C however grab samples to determine bottom sediment type will be conducted.

The experiment areas are bounded by the co-ordinates:

AREA A (shallow)	35° 04.40'S, 150° 44.80'E	35° 05.90'S, 150° 46.90'E
	35° 05.25'S, 150° 43.90'E	35° 06.70'S, 150° 46.10'E

AREA B (deep)	35° 06.00'S, 150° 48.00'E	35° 06.00'S, 150° 50.00'E
	35° 08.00'S, 150° 48.00'E	35° 08.00'S, 150° 50.00'E
AREA C	35° 08.35'S, 150° 58.05'E	35° 09.48'S, 151° 00.01'E
	35° 10.95'S, 150° 58.60'E	35° 09.95'S, 150° 56.65'E

Measurements in area A will be restricted to the flat sandy area in the north-western half. Indicated water depth in this region is 24 metres. As the maximum safe depth of deployment of the MOD equipment is 100m, measurements in area B will be confined to the western half so as not to exceed this depth.

B. Schedule

MOD equipment will be loaded in SOUTHERN SURVEYOR alongside at Pymont on Monday 26 September.

Day	Date	Event
	Sun 25 Sep	SOUTHERN SURVEYOR berths at Pymont. Load equipment
01	Mon 26 Sep	Install equipment. SOUTHERN SURVEYOR sails late PM.
02	Tue 27 Sep	SOUTHERN SURVEYOR arrives in Jervis Bay area. Set to work and calibrate bottom backscatter equipment. Commence backscatter measurements on completion.
	Wed 28 Sep	Backscatter measurements
	Thu 29 Sep	Sound ranging
	Fri 30 Sep-Tue 4 Oct	Backscatter measurements
10	Wed 5 Oct	SOUTHERN SURVEYOR berths at Pymont. DSTO equipment unloaded. SOUTHERN SURVEYOR sails for Hobart on completion.

The order of experiments will be determined by consultation with the master SOUTHERN SURVEYOR.

The first acoustic measurements are planned for the shallow field. However, as measurements in the deep field are dependent on weather and sea state, they will take precedence over experiments within Jervis Bay.

The sound ranging is planned for Thursday 29 September. Run plans and schedules are to be advised by RAU.

3. ADMINISTRATION

A. Scientific Personnel

MOD - DSTO

Mr. Michael Bell	Cruise leader
Mr. Jim Thompson	Scientist
Mr. John Shaw	Engineer
Mr. Ross Susic	Engineer
Ms. Jane Cleary	Scientist
Mr. Neil Taverner	Electronics & Mechanics
Mr. Bill Martin	Electronics & Mechanics
Dr. Stuart Anstee	Stereo Photography

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: Jervis Bay area
- (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 Pymont. Approximately two days are required to install, test and calibrate the equipment in the ship.
- (iv) Unloading: All DSTO equipment for this cruise will be unloaded in Pymont.

D. Security

All aspects of the cruise are unclassified.

E. Safety

The experimental programme will be suspended if the Master SOUTHERN SURVEYOR considers that it is unsafe to proceed.

F. Command and Control

(i) R & D Authority:

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

(ii) Task:

Mine Hunting Sonar Support, NAV 92/256.

(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 all scientific records generated from the backscatter experiments. i.e. acoustic, SDL, sediment samples, stereo photographs and video records.

4. TECHNICAL PROCEDURES

A. Equipment Required For Cruise

(i) DSTO Equipment:

Tower (with pan & tilt)
Transducers (33 kHz, 100 kHz and 200 kHz)
Underwater cable system
Deck leaders for underwater cables

Acoustic transmission, reception and recording system

- underwater electronics, including housing
- laboratory equipment & electronics to drive underwater electronics
- laboratory equipment & electronics to drive transducers from ship
- receive electronics
- data acquisition system

Stereo photography system

Laptop computer

Desktop computers for system control and logging

SDL portable CTD

Cable floats

Shipek grab

Sample bottles for sediments

(ii) Ship's Equipment:

Laboratory space

- computer Room
- operations Room

Photographic darkroom

Lifting equipment

- aft gantry hoist, including wire
- small towed bodies winch, including wire (for camera deployment)
- hydrographic crane

Echo sounder

GPS

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 and side scan survey. This log forms a valuable part of the scientific record by providing an independent record of events.

C. Procedures For Scientific Measurement Programme

Water depths for deployment of the equipment vary from 25m in the shallow field to approximately 90 metres in the deep field.

The tower is approximately 4.5 m high, with a 1.5 m wide steel base of square shape. It weighs approximately 1300 kg. The structure is lowered to the sea floor for the bottom backscatter measurements. The tower has a pan-and-tilt mechanism to enable the acoustic transducers to ping on the sea floor at a variety of elevations and azimuths, and an on-board electronics module which is powered and controlled from the ship via electrical cable. The acoustic signals and instrument state data are transmitted to the ship via the electrical cable. Measurements are also remotely made of compass heading and of pan and tilt.

The stereo camera frame will be deployed to the sea floor from the starboard side small towed bodies winch. The system is self contained with flash and exposure controlled by an electronic timer installed in one of the water proof camera housings.

A grab will be used to obtain sediment samples at each measurement site.

MOD SDL equipment will be used to measure sound speed profiles (SVP) during the measurement program.

D. Equipment Deployment

The same deployment procedures as have been used previously will be followed.

The tower will sit vertically under the aft gantry. The gantry hoist will lift the tower outboard of the stern via the top lifting point. The tower will then be lowered to the sea floor using the net winch.

Cable deployment is an important aspect of the total deployment. The electrical and strength cables must be held clear of the pan and tilt mechanism at the top of the tower so as not to foul. A protective "top-hat" will be attached to the top of the tower to protect the pan and tilt mechanism. As on previous experiments floats will be attached to the strength cable to suspend it clear of the tower. The strength cable and the electrical cable will be separately led to the ship.

E. Ship Positioning

During the bottom backscatter measurements, the scientific equipment mounted on the tower is connected to the ship by a multi core electrical cable (350m length). This cable is separate to the support cable and provides power and bi-directional communication between laboratory equipment and the instrumentation package. Both cables are connected to the ship throughout the experiment. The ship must remain in close proximity to the underwater structure, due to the limited length of the underwater cables.

Constraining the ship position is essential for the success of the operation. The ship must be anchored fore and aft to maintain position and heading during the deployment.

5. DISTRIBUTION

RAN:

Hydrographer
Director, Hydrographic Office, Sydney
Mine Hunter Coastal, Project Director
Mine Sweeper Project Director
Naval Scientific Adviser

DSTO:

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

CSIRO:

Chief , CSIRO Division of Fisheries
Chief , CSIRO Division of Oceanography
Library, CSIRO Hobart
C. Liron
FRV SOUTHERN SURVEYOR (3 copies)