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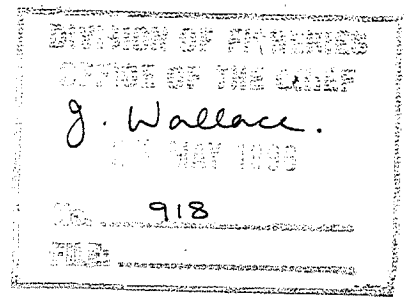
MINUTE



Chief
CSIRO Division of Fisheries
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551/96

CRUISE REPORT, MOD CRUISE F/95, 9 APRIL - 15 APRIL 1996

A copy of the cruise report for MOD cruise F/95 is enclosed for your information.

The cruise was conducted in the Hobart area in the CSIRO vessel FRV SOUTHERN SURVEYOR. During the cruise the towing dynamics of an instrumented V-fin towed body were assessed under a variety of tow speeds and configurations.

M. J. Bell
Cruise Leader
14 May 1996

DEFENCE SCIENCE & TECHNOLOGY ORGANISATION

AERONAUTICAL AND MARITIME RESEARCH LABORATORY

MARITIME OPERATIONS DIVISION

CRUISE REPORT MOD F/95

V-FIN STABILITY and TOWING TRIALS

CSIRO Cruise Number SS 1/96

FRV SOUTHERN SURVEYOR, 9 APRIL-15 APRIL 1996

CRUISE LEADER, M. J. Bell

1. INTRODUCTION

This trial was the first in a program to develop a deep water capability for measurement and survey of acoustic bottom backscatter at mine hunting frequencies in support of the Mine Hunter Coastal (MHC) vessels. The objective of the cruise was to assess the towing characteristics of an instrumented V-fin towed body under a range of tow speeds and configurations in order to define the performance envelope for the operational system. The V-fin will be the sensor platform for the acoustic backscatter measurements.

The cruise was conducted in FRV SOUTHERN SURVEYOR between 11 - 13 April 1996. The trials area extended along the south east coast of Tasmania from Tasman Island to Cape Forestier and approximately 10 miles to sea.

2. NARRATIVE

DSTO personnel joined SOUTHERN SURVEYOR in Hobart on Tuesday 9 April and commenced loading, installation and setting to work of scientific equipment for the cruise. These operations were completed late on Wednesday 10 April. SOUTHERN SURVEYOR sailed early on Thursday 11 April for the trials area which extended north from Tasman Island to Cape Forestier.

Towing trials were commenced on Thursday 11 April and were completed the following day. SOUTHERN SURVEYOR then returned to Hobart.

3. EQUIPMENT

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

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

Bottom depth from the EK500 echo-sounder and GPS data were also recorded by the logging PC.

4. RESULTS

Results were disappointing. Sea and weather conditions were good with swell generally less than 1 metre and slight seas and fine weather however the V-fin did not perform as

expected and showed unacceptably high fluctuations in pitch and roll. V-fin pitch fluctuated in sympathy with the tow point motion as monitored by the tow point vertical acceleration.

Runs were conducted over a range of tow speeds, tow cable out and configurations. At short tether the V-fin pitch varied from approximately 20° up to 30° down in sympathy with the ship heave. As the length of tow cable was increased the pitch and roll stabilised to some extent but were still unacceptably high. At long cable deployments (200m) the roll increased to approximately 18°±2°.

In all configurations the tow cable angle was shallow indicating smaller lift to drag ratio than anticipated. The position of the instrumentation canister was moved forward to increase the static pitch angle and to increase the down force. No significant improvement in V-fin stability was noted so the canister was moved back to the original attachment position.

In an attempt to reduce drag and change the towing characteristics the acoustic transducers were removed and the V-fin redeployed for a further sequence of tests. Some small improvement in stability was noted but the V-fin movement was still excessive.

The system was recovered , the skids removed to further reduce the drag and redeployed. Finally the instrumentation canister was removed and the V-fin flown bare. While no data acquisition was possible in this configuration it was investigated to look at tow cable angle under minimum drag.

Table 1 lists files recorded during the cruise. Figure 1 shows plots of V-fin pitch and tow point vertical acceleration.

THU 11 APRIL

File name ddmmhhmm.dat	**SPEED (kt)**	**CABLE) (m)**	**WATER DEPTH (m)**	**COMMENT**
11040820.dat				test file logged on deck
11041140.dat	2-4	50	220	pitch +35°/-20°, roll ±2°
11041327.dat	4	100	220	pitch 5°/15°
	4	200	300	pitch 10°±3°, roll +4°~+10°
11041402.dat	6	200	>300	pitch 7°±2°
11041418.dat	4	200	280	
Change tow point				
11041528.dat	3	50		
11041543.dat	3.5	100		altitude 180m
11041557.dat	3.2	200	260	
11041612.dat	6	200	270	altitude 172m (intermittent.)
11041639.dat	6	100	216	pitch 9°±4°, roll 18°±2°

Remove acoustic transducers

FRI 12 APRIL

File name	SPEED (kt)	CABLE (m)	WATER DEPTH (m)	COMMENT
12040803.dat	2-4	50	220	
12040818.dat	4	100	254	
12040833.dat	4	200	252	
12040854.dat	4	200	285	A/C 180° (South)
12040928.dat	4	50	400	skids removed
12040946.dat	4	200	365	no altimeter data

Table 1. Data files recorded during V-fin towing experiments.

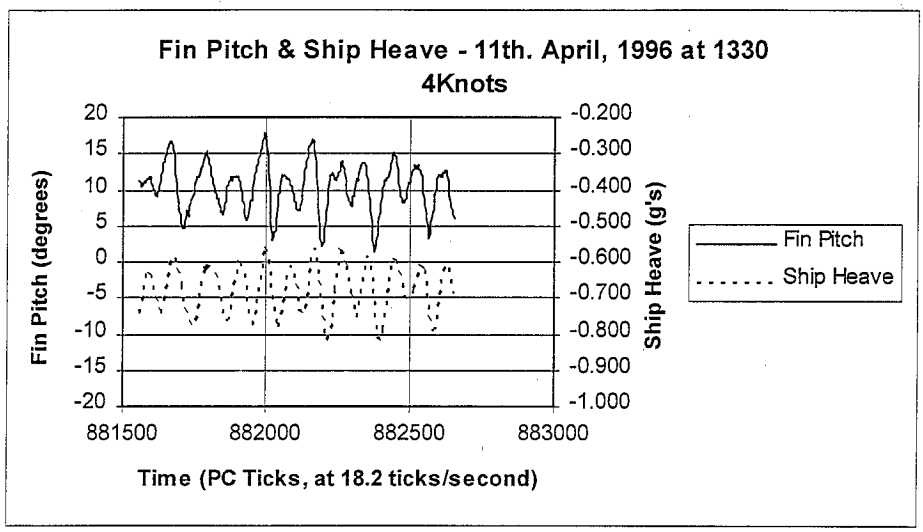

Figure 1. Comparison of V-fin pitch and ship heave.

5. CONCLUSION

In the present configuration the V-fin is not suitable for bottom backscatter measurements. Additional work on tow point decoupling is required to minimise the influence of ship heave on the V-fin dynamics and improve platform stability.

6. DISTRIBUTION

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

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RLOE, Maritime Operations Division
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