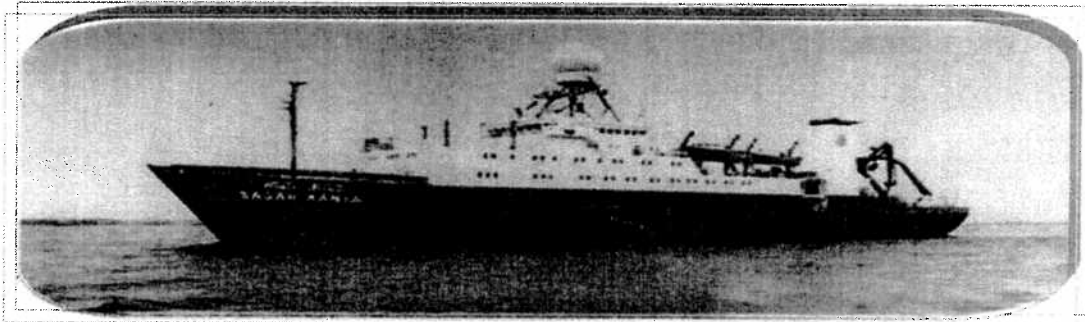


ORV SAGAR KANYA



CRUISE REPORT

SK -222

[Leg 1 - IV]

11 FEB 14 March 2006
(~~15th FEB.~~ '2006 TO ~~28th FEB.~~ '2006)

NATIONAL CENTRE FOR ANTARCTIC & OCEAN RESEARCH

HEADLAND SADA, VASCO-DA-GAMA,

GOA-403804, INDIA

Project : PMN mining – DOD project

“ Development of underwater mining vehicle for long time operation “

Objective : Sand mining at 500m water depth with underwater crawler

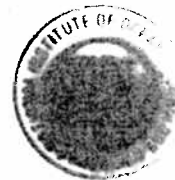
Location : Angria bank off Malvan coast

List of personnel for Crawler trials off Goa (15th to 28th Feb.'06)

Sl. No.	Name of the persons with designation
01	Dr. M.A. Atmanand, Sci-F
02	Mr. M.A. Shajahan, Sci-E
03	Mr. C.R. Deepak, Sci-D
04	Mr. N.R. Ramesh, Sci-C
05	Mr. S. Muthukrishna Babu, Sci-C
06	Mr. B.S. Binu, Sci-C
07	Mr. A. Umapathy, Tech. Asst.
09	Mr. P. Gurusamy, Tech. Asst.
10	Mr. V. Chandran, Tech. Asst.
12	Mr. B. Raja, Tech. Asst.
13	Mr. B.O. Vishwanath, Tech. Asst.
14	Mr. K. Ashok kumar, Skilled Tech.
15	Mr. S. Muruganandham, Skilled Asst.
16	Mr. V.S. Suresh, Skilled Asst.
17	Mr. D. Rajan, Helper-cum-Driver
18	Mr. N. Suresh kumar, Helper-cum-Driver, OSTI
19	Mr. J. Lokesh, NMR, DSM
20	Mr. B.S. Balaji
21	Seamen - 7 nos

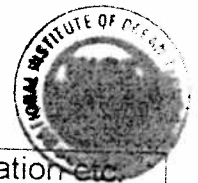
EMBARKATION : 2.02.2006, CHEMNAL.

DIS EMBARKATION : 14.02.2006, CHEMNAL.



Daily log during Mining Dummy trials

Date	Activity
2-2-06 Th.	All items were taken in. Loading commenced. Three trucks were unloaded by late night.
3-2-06 Fri.	Winch, dummy weight and two containers were unloaded. 18 personnel signed in.
4-2-06 Sat.	All interconnection works proceeded. Winch was welded. Container was positioned. Wire rope routing through pulley and float attachment trial was done. Winch was powered up. Hasp was positioned and fixed to deck. Control room powering up commenced. Electronic enclosure testing commenced. Bulk head assembly for enclosure proceeding. National oil rep. arrived. His pass and sailing could not be cleared by SCI. Electrical contractor was explained about all work. But later he said he cannot do the work. Finally decided to go ahead with temporary wiring using aluminium cable.
5-2-06 Sun.	Director visited vessel. Explained about all aspects. Non-availability of DP master for sailing was explained. He told to go ahead with present master. Platform 2 was positioned and fixed to deck. Fixtures for camera, altimeter, pressure transducer, pinger and motion sensor was fixed to dummy. Cardianic joint was received and trial assembled. Latching clamp unlocking problem was rectified by Nat. Oil representative. Electronic enclosure fibre optic bulkhead adapter was re-worked. Control room was powered up.
6-2-06 Mon.	Camera mounting completed. Cabling for APOS repeater completed. Spare of FITA was not as per original. It is to be replaced. Rework on one commenced. Stopper on pulley guard being welded. Clearance for sailing of foreigner not yet obtained. Got cable from ROSUB for crawler trials. Electronics enclosure wiring completed.
7-2-06 Tue.	Cable was routed through LARS pulley. Hose coupling was welded to dummy weight. Hose winch was powered up and tested. Modem in winch developed problem. Arranged to get spare from ROSUB at NIOT. Clearance for foreigner's visit not yet obtained from DG shipping.
8-2-06 Wed.	Hose and buoyancy was routed through pulley. Interconnection between hose and cable for pulley was done. New power supply was fixed for electronics enclosure. Minor re-work to be done on the enclosure end cover. Clearance for foreigner's sailing still not obtained. Director NIOT talked to DG Shipping. MMDA surveyor to inspect vessel and give clearance. Some documents required from ship regarding number of personnel for sailing. Cable delivered to ship for HT transformer wiring later.
9-2-06 Th.	Re-work of enclosure end cover completed. Vacuum tested enclosure for 1 hour. It is okay. Lamp was not okay. Connections to be modified.



10-2-06 Fri.	MMDA surveyor came and inspected vessel for accommodation etc. Vacuum tested power supply enclosure. Found okay. Got message that clearance for sailing not obtained. Informed Director. Enclosure and other sub-system mounting commenced.
11-2-06 Sat.	Enclosures mounted on dummy weight. By evening clearance for sailing obtained. Sailed out by 23 hours. Got Thales DGPS from CEE group of NIOT.
12-2-06 Sun.	At location about 50 m depth, tried out DP with first heading control (heading to wind and then wind on beam). Position control with heading to wind and beam wind was done. Each of the four was tried out for 2 hours each. Heading was maintained within about +/- 1 deg. And position within 1m. The position reference was based on GPS and not DGPS as reference from satellite was not available. Thales DGPS could not be commissioned. Hence reference was compared with a DGPS in ship (Magellan). There was problem in active load control coming up, due to which thrusters were not getting enough power. This lead to DP not being effective. Chief engineer is working out to rectify this problem.
13-2-06 Mon.	Held meeting to brief all operations to NIOT and ship staff. Started lowering pinger at shallow depth. Weight could not be held and sea man, Norinco engineer, chief officer and chief scientist got minor injuries. Test can be done only at depth more than 100m. Hence moved to location 13 deg. 03.53 N; 080 deg. 33.65 E and launched pinger. Vessel was put on DP at 23 hours for simulating all operations during mining for a period of 24 hours. Dr. Purnima from NIOT wanted grab samples to be taken at location 13 deg. 10.23 N; 80 deg. 43.30 deg. E.
14-2-06 Tue.	Vessel movement with respect to position as required during crawler trials was done. It was satisfactory. However, problem of active load control coming up was still there. At those times, due to inadequate power for thrusters, vessel moved as much as 10 m and heading was changed as much as 10 deg. This problem is to be resolved at least by the time of actual crawler cruise. DGPS signal was activated till the 21 st of Feb. One more problem is in the setting up of "follow target" mode of DP. This could not be tried out. Attempts were made to reach DP Captain Mishra over Sat. com. But could not get enough information. Lowered one more pinger from boat deck and tried out if follow target is getting activated. But was not successful. It is to be sorted out before the crawler trials. Finally decided to pick up pingers. It had got anchored in the mud.
15-2-06 Wed.	Vessel was moved away with rope slack and pinger was picked up in the early hours. Sailed to site, location : Lat.13 ^o 16' Lon.80 ^o 40'. Found the area to be near submarine exercise area. Hence moved to another location near by : Lat. 13 deg. 18.17, Long. 80 deg. 39.50. Survey was done and area identified about 400 to 500 m depth. Core



	<p>sampling got delayed as jib boom had problem. By evening it was okay and two core samples were taken. Bearing strength of core as measured using pocket vane tester was about 1.5 tonnes/ sq.m, in one location, adequate for the dummy.</p> <p>Captain was reluctant to launch as he did not have DP certificate. Discussed with Dr. Bhaskara Rao of NCAOR. He promised to look into it. By late evening oral clearance was obtained for Captain. Check list was collected and had pre-launching meeting.</p>
16-2-06 Thurs.	<p>Got information from bridge at 3.50 AM that DP is not holding due to the "active load control" signal in AT. Tried various combinations. BT, AT and propulsion power. It was okay under this condition. In manual mode of DP also, this error was coming up. So the problem could be in thrusters and not DP system. Chief engineer finally reset the max. power to 98% and after that, it seems to be okay. As vessel had drifted, moved to location on BT and AT. All were ready for launching by 6 AM itself. Finally launched at around 1.30 PM. Latching was proper. Slight entanglement between hose and buoyancy was noticed. LARS alarm came up when it was brought near the platform. This problem is attended to by the LARS representative on board the vessel. Due to this, dummy was lifted and put back to deck. As core yesterday was not sufficiently strong as told by Mrs. Vijaya of NIOT, moved to alternate site for coring operation.</p>
17-2-06 Fri.	<p>Launching commenced in the morning. Setting changes with regard to load cell in the LARS was done by Nat. Oil service engineer. It was set properly and the operation started by 12 noon. Location is : 13 deg. 39.484; Long. 080 deg. 32.640 E. Vessel was on DP with DGPS position reference. As the cable ties were getting crushed when passed through the pulley, all the inter connections were done from the folding platform. The platform 2 in the deck was not used. It could be used later for guiding the continuous floats. Interconnections were parting at certain locations. Tying using PP ropes was necessary. This is consuming more time. Propeller wash from Azimuth thrusters (AT) was significant. Pingers were attached at appropriate locations. Finally touch down was at 357m depth at 20.17 hours. Paid out cable and hose and moved vessel also. Vessel was moved towards star board for 45 m and additional cable of about 140 m was paid out. The S-shape profile was obtained. The pinger locations were not exactly at the humps of the S-shape. All operations were smooth. After waiting for stabilisation, picking up started at 21.30 hours. While lifting up from sea bed, load went up to 18 tonnes, mainly due to the sinking of the dummy weight. Up to 100 m was picked up by late night. The LARS was kept at horizontal position and left over night with watch keeping.</p>
18-2-06 Sat.	<p>DW was picked up to deck. Proceeded to coring site. Grab sample was taken.</p>



19-2-06 Sun.	Box core did not close. Hence sample was not properly obtained. There was also problem with deep sea winch. Sailed bak to Chennai port. Personnel getting off at Chennai signed off.
20-2-06 Mon.	Calibration of LARS load cell conducted by Nat Oil Engineer. Loading of Crawler and the related accessories to Vessel started by 5 pm after disconnecting and unloading the dummy weight. The loading has been completed by midnight.
21-2-06 Tue.	Sailing to Goa started at 3am. Crawler system assembly started. Left side Buoyancy structure assembly completed. Deck fixing of HVT and Control room container completed. Cone assembly for launching system commenced and the cardianic x-angle transducer assembly to the same completed. High voltage system cable laying and transformer wiring completed. Video and data telemetry system tested from sub-sea unit to control room. Control room modification for crawler test completed.
22-2-06 Tue.	Calibration of both the cardianic joint angle transducers completed and the LARS cone assembly has been fitted to the Crawler. Hydraulic oil drained out from tank for pressure compensator assembly. Low voltage box mounting completed. Painting of unpainted crawler structures/sub-system completed. Underwater cable wiring started. Mechanical store arrangement is being done. Redundancy in video data telemetry checked and Winch side media converters re-fixed.
23-2-06 Thu	Both the pressure compensators fitted and hydraulic oil filling completed. Energised 3kV and tested the hydraulic functions except drive movements. Hydraulic bypass valve function later found not working from the sensor head, which require opening the sensor head. All other functions from the sensor head successfully tested with temporary wiring with the field instruments. Slurry hose inserted through the pulley. "Fail-to-open" slurry drain valve assembled, functionality checked through hydraulic port and found requires some modification before implementing with the system. Control room console power wiring redone with 6 sq.mm cable. Video handling system control panel embedded in slave system and tested.
24-2-06 Fri	Buoyancies mounted on the right side structure. Removed the sensor head from crawler and problem with the bypass valve operation rectified. Two bulkhead connectors on sensor head, which were weak for connector mating, were replaced. Hot-redundancy provided for bypass valve and slewing operations with electro-mechanical relays. Checked the implementations by running the hydraulics. High voltage box s relocated to the earlier sensor-head position. CCTV-1 relocated to port side and tested. Pressure compensator mounted and connected for Manipulator valve block.
25-2-06 Fri	Structure for side buoyancies attached after required re-work and Buoyancies mounted on the left side (top) structure. Sensor head reassembled after putting new data acquisition card (AI-110) since



	<p>one of the channels (Card-y) on the existing card was malfunctioning, and mounted in High voltage box location. Old/damaged bulkhead connectors for Low voltage box, Card-Y angle transducer and Density meter were replaced with new ones. LARS buoyancy inserted through pulley and Mechanical Termination and electrical FITA fitted with Crawler.</p>
26-2-06 Sun.	<p>Vessel arrived at Goa port at 9 AM. Sensor head interchange completed. All joining personnel signed on by 5 PM. Truck could not be unloaded to vessel as it was Sunday afternoon. DG shipping clearance awaited. Met Director, NCAOR and explained about programme.</p>
27-2-06 Mon.	<p>Vessel moved out for engine trials at 7 AM in the morning and came back to anchorage. Items from truck were loaded on vessel through boat. Sailed at 6.15 PM. SCI informed captain to sail even though DG shipping clearance was awaited. Will reach site by 8 AM tomorrow. Location on site : 16 deg. 15' and 72 deg. 05'. It is 120 miles from Goa. Only one engine is running due to some problem. Hence, speed is less. Discussed about launching sequence and check list. Camera mounting location was changed so that the latching is visible. Additional deck camera was mounted for viewing crawler water entry. Hose was bonded with rubber and resin for protection at cone.</p>
28-2-06 Tue.	<p>Reached site by 8 AM and survey done. Core also was taken from 3 locations. Bearing strength was adequate (2 to 4 tonnes/sq.m). However, hard stones were found in core samples. Deep sea winch of vessel developed problems as during earlier case and hence first core sampling took lot of time. Area at about 450 m depth identified for crawler launching, based on earlier and present core samples. Check list verification commenced. It went till late night. Pre-launching meeting was held.</p>
1-3-06 Wed.	<p>Launching for air removal commenced at 8 AM. Vessel was on drift mode. Took crawler up to 20m water depth and all operations like manipulator, track belts etc. were checked. Also pumped clear water up to 45 cu.m/h. Brought back crawler to deck and air bleeding was done. One transducer in manipulator was malfunctioning. Checked and rectified same. After running all systems, air bleeding was done again. Moved to location. Launching commenced by 17 hours. Continued launching as per operational document. System was checked in between for track belt running, slurry (clear water) pumping etc.</p>
2-3-06 Thurs.	<p>Continued launching. There was error in depth transducer reading. Buoyancy attachment hence had about 15 to 20 m variation. This was not a major problem. Continued launching up to 150m and completed continuous buoyancy attachment. It went till 5 AM. After checking all parameters, went for rest. Launching again commenced by 10 AM. All parameters were checked at in between depths. In tests after 150m, system was switched on</p>



	<p>with bypass valve closed as the pressure build up was not there if by pass is switched on after pump was switched on. However, this was not a problem.</p> <p>At 17 : 26 hours, crawler touched down at 451 m water depth. Paid out additional 125 m cable and hose. Vessel was moved about 30 m away from crawler towards starboard side. The cable-hose combination took S-shape profile, as verified by the Pinger positions. Pinger positions were, however not at the humps of S-shape exactly. Crawler movement was successfully made manually and automatically. Doppler log was not indicating properly. After moving for some distance, crawler started slipping. Hence it had to be lifted up again.</p> <p>Meanwhile, slurry pumping was attempted. Manipulator and cutter movement was done successfully. Initially slurry was pumped in a rudimentary manner at low flow rate successfully. Flow rate seemed to be less than the set value. Also, noticed traces of oil in the slurry. Causes for this is to be studied. However, it reduced after pumping for some time.</p> <p>As the crawler had slipped, it was lifted to 370m.</p> <p>In summary, all system parameters were functional. Both cameras were working well. System performance study is proceeding.</p>
3-3-06 Fri.	<p>All system parameters were checked and found to be working. System was left in that position as it was 2 AM. System was lowered to a depth of 452 m. However due to weakening of insulation, further tests could not be done. System was lifted up to deck by 9 PM. Crawler was inspected and studied.</p>
4-3-06 Sat.	<p>Crawler inspection continued. Motor to be re-wound. Identified parties for work. It may take 7 to 8 days.</p>
5-3-06 Sun.	<p>It was decided to hand over vessel for ISRO cruise. Hence winding up work commenced. Held post test meeting and briefed about the successful completion of this phase of work. Video and still photo editing continued.</p>
6-3-06 Mon.	<p>Signing off of personnel getting down at Goa. Umbilical was disengaged from crawler and Lars. All dismantled parts was remounted on to crawler.</p>
7-3-06 Tue	<p>Packing of equipments and tools .</p>
8-3-06 Wed	<p>Disconnection of electrical cables from hatch. systems from control console removed and packed separately for transportation.</p>
9-3-06 thr	<p>Vessel left Goa port for return journey to Chennai at 17.30Hrs. Packing of materials continued.</p>
10-3-06 fri	<p>All the deck equipments was properly secured. Packing of materials</p>
11-3-06 sat	<p>Packing of materials</p>
12-3-06	<p>Data recovery from HIPAP</p>



sun	
13-3-06 mon	Packing of all NIOT equipments for unloading from ship and transportation is completed
14-3-06	ETA at Chennai port is scheduled at 12Hrs. Unloading of crawler and its associated sub systems and signing off of NIOT personnel is planned on the same day

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NIOT