CRUISE REPORT
ON
RETRIEVAL AND DEPLOYMENT OF
SAIC TSUNAMI BUOY IN BAY OF BENGAL

Name of the cruise   Sagar Kanya  SK - 284
Cruise Period       09th May 2011 to 17th May 2011
Place                Chennai to Chennai
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<th>PAGE NO</th>
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<td>22</td>
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Annexure A : Safety Procedures Followed

Annexure B : Lessons Learnt Report

Annexure C : Report on SAIC Experts training

Annexure D : GOA University Students Report

Annexure E : Buoy Search Operation report
CHAPTER 1
OBJECTIVES OF THE CRUISE

Objectives of the SK-284 cruise:

- Retrieval and Deployment of SAIC Tsunami Buoy in STB01 location and Retrieval of TB 03 Tsunami Buoy

Other Activities:

- Training programmes to GOA University students by NIOT team, SAIC team and Norinco team.
# CHAPTER 2

## CRUISE TEAM

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name</th>
<th>Organization</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mr. P. Murugesh</td>
<td>NIOT, Chennai.</td>
<td>Chief Scientist</td>
</tr>
<tr>
<td>2</td>
<td>Mr. Rajesh Kuppilli</td>
<td>INCOIS, Hyderabad</td>
<td>Dy. Chief Scientist</td>
</tr>
<tr>
<td>3</td>
<td>Mr. P. Kaliyaperumal</td>
<td>NIOT, Chennai.</td>
<td>Project Scientist</td>
</tr>
<tr>
<td>4</td>
<td>Mr. R. Sundar</td>
<td>NIOT, Chennai</td>
<td>Technical Assistant</td>
</tr>
<tr>
<td>5</td>
<td>Mr. D. Gowtham</td>
<td>NIOT, Chennai</td>
<td>Project Technical Assistant</td>
</tr>
<tr>
<td>6</td>
<td>Mr. K. M. Vinod</td>
<td>NIOT, Chennai</td>
<td>Multi-tasking staff</td>
</tr>
<tr>
<td>7</td>
<td>Mr. Emayavaramban</td>
<td>NIOT, Chennai</td>
<td>Deployment Assistant</td>
</tr>
<tr>
<td>8</td>
<td>Mr. D. Sakthivel</td>
<td>NIOT, Chennai</td>
<td>Deployment Assistant</td>
</tr>
<tr>
<td>9</td>
<td>Mr. R. Rajapart</td>
<td>NIOT, Chennai</td>
<td>Deployment Assistant</td>
</tr>
<tr>
<td>10</td>
<td>Mr. A. Yuvaraja</td>
<td>NIOT, Chennai</td>
<td>Deployment Assistant</td>
</tr>
<tr>
<td>11</td>
<td>Mr. James Robert Wrightsman</td>
<td>SAIC, USA.</td>
<td>Electrical Engineer</td>
</tr>
<tr>
<td>12</td>
<td>Mr. Christopher Bruce</td>
<td>SAIC, USA.</td>
<td>Deployment Engineer</td>
</tr>
</tbody>
</table>

Other Participants were from NCAOR, GOA University students, Goa; M/s Norinco Pvt Ltd.
CRUISE ITINERARY

Departure : Chennai - 09th May 2011
Arrival   : Chennai - 17th May 2011
# CHAPTER 3
## CRUISE TRACK

<table>
<thead>
<tr>
<th>Buoy ID</th>
<th>Buoy locations</th>
<th>Depth</th>
<th>No. of Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>STB 1(R&amp;D)</td>
<td>06°15'00&quot;</td>
<td>3793</td>
<td>9</td>
</tr>
<tr>
<td>TB03®</td>
<td>06°46'00&quot;</td>
<td>3035</td>
<td></td>
</tr>
</tbody>
</table>
**CHAPTER 4**

**DETAILS OF DAY BY DAY ACTIVITIES**

**Dairy of Events:**

<table>
<thead>
<tr>
<th>Date &amp; Day (DD/MM/YYYY)</th>
<th>Time (XX:XX am/pm)</th>
<th>Events Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/05/2011 Sunday</td>
<td>11:30am</td>
<td>All NIOT cruise members were signed on. But SAIC team members were signed on Saturday (07/05/2011, 11.00am.) All Norinco team members were continuing their voyage.</td>
</tr>
<tr>
<td></td>
<td>06:00pm</td>
<td>All the NIOT, INCOIS and NIO materials were loaded with the help of 12 Ton crane available in the ship. The 12 Ton crane became hot after working 1hour. We had to wait for 30 minutes for again to do the work with the crane. INCOIS &amp; SAIC team were assembled all the STB equipment and started.</td>
</tr>
<tr>
<td>09/05/2011 Monday</td>
<td>08:00am</td>
<td>Material loading was finished. Throughout the night, Chief scientist, Mr. Ramesh, NIOT and the four Deployment assistants did not take sleep.</td>
</tr>
<tr>
<td></td>
<td>09:30am</td>
<td>Captain and Chief officer were met and discussed for our operations &amp; cruise track. Captain said that vessel may reach the STB-01 location on 12th May 2011 tentatively.</td>
</tr>
<tr>
<td></td>
<td>10:00am</td>
<td>Chief officer has given safety instructions to all the crew members.</td>
</tr>
<tr>
<td></td>
<td>06:00pm</td>
<td>The vessel was started the voyage. The communication test between the payloads &amp; BPR, Iridium test was done. The random test messages were already sent to INCOIS and the normal mode data was received at 12:35(UTC) and 12:36(UTC) for primary and secondary respectively.</td>
</tr>
<tr>
<td>10/05/2011</td>
<td>08:30am</td>
<td>The wind speed in the current location was 20knots (Sea state 5) and the ship sailing speed was 8.5knots. Since the sea was rough, somebody in the NIOT team and Goa University students suffered sea sickness. Captain had given the wind forecast for the cruise schedule (9 May to 18 May 2011).</td>
</tr>
<tr>
<td>Date</td>
<td>Time</td>
<td>Event Description</td>
</tr>
<tr>
<td>------------</td>
<td>----------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>09/00 am</td>
<td></td>
<td>Chief Scientist had a discussion with captain, regarding the usage of 12 Ton crane for material segregation. Chief officer told that usage of crane in the moment is difficult during the ship sailing. But weather was good after sometimes, we did segregation of material to ease SAIC buoy deployment.</td>
</tr>
<tr>
<td>05:00 pm</td>
<td>06:00pm</td>
<td>SAIC Deployment team explained about the retrieval and deployment of SAIC buoy in the meeting held at conference hall.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>List of Participants:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Captain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Chief officer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. P.Murugesh, Chief scientist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Rajesh, Deputy chief scientist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. James, SAIC team</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Christopher, SAIC team</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7. Emayavaramban, Deployment assistant.</td>
</tr>
<tr>
<td>11/05/2011</td>
<td>09:30am - 12:00pm</td>
<td>Small material boxes were arranged inside the lab.</td>
</tr>
<tr>
<td>12/05/2011</td>
<td>03:45pm</td>
<td>Ch. scientist has discussed with deployment assistant regarding the &quot;Onboard safety procedures&quot; which was developed in NIOT at 3.45pm. Each and every buoy components were secured safely.</td>
</tr>
<tr>
<td></td>
<td>04:00pm - 06:00pm</td>
<td>To Move heavy materials 12 Ton was needed. Chief officer told that ship has to be stopped to use 12 Ton crane. So ship was stopped during the time. All pre-deployment work has done for SAIC buoy. Norinco prepared the deep sea winch for the deployment of SAIC buoy. They routed the wire rope through the A-frame.</td>
</tr>
<tr>
<td>13/05/2011</td>
<td>04:00am</td>
<td>The vessel has reached near the buoy location's watch circle at 4:00AM and we found the surface buoy of STB-01 at 06°15.246'N, 88°48.805'E.</td>
</tr>
<tr>
<td>Time</td>
<td>Event Description</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>05:00am to 09:30am</td>
<td>We started operation at 5:00AM and successfully retrieved old buoy &amp; deployed the new buoy with the same mooring at 06°15.020'N, 88°48.345'E (which is 630m from the centre of the watch circle). We got the confirmation of deployment message received at Tsunami warning centre from Mr. Ajay, INCOIS over phone.</td>
<td></td>
</tr>
<tr>
<td>03:45pm</td>
<td>Reached the TB03 location for tsunami buoy searching operation.</td>
<td></td>
</tr>
<tr>
<td>03:45pm-06:30pm</td>
<td>By using the last transmission position and anchor drop position, we searched the buoy. The buoy was not found in that location. we made 5nm radius search which has anchor drop position as centre for that buoy. Then ship was started the sailing towards Chennai.</td>
<td></td>
</tr>
<tr>
<td>14/05/2011 Saturday 10.30am-11am</td>
<td>Session-1: Norinco team explained about the lab equipments. <strong>Venue:</strong> All labs</td>
<td></td>
</tr>
<tr>
<td>11am to 12:30pm</td>
<td>NIOT team explained Data, Tsunami and OMNI buoys, buoy components and moorings to Goa University students. <strong>Venue:</strong> Ship Main deck</td>
<td></td>
</tr>
<tr>
<td>03:00pm-03:30pm</td>
<td>Sessio-2: SAIC team explained SAIC tsunami buoys and moorings to Goa University students. Mr. James and Mr. Rajesh, INCOIS gave the presentation as well explanation. <strong>Venue:</strong> Conference Hall and ship main deck.</td>
<td></td>
</tr>
<tr>
<td>03:30pm-04:00pm</td>
<td>NIOT team presentation- regarding location of buoys etc. Mr. Sundar gave the presentation to Goa University students. <strong>Venue:</strong> Conference Hall</td>
<td></td>
</tr>
<tr>
<td>04:00pm to 05:00pm</td>
<td>SAIC team explained SAIC tsunami buoys and moorings to NIOT team members. Mr. James gave the presentation. <strong>Venue:</strong> Conference Hall</td>
<td></td>
</tr>
<tr>
<td>15/05/2011 Sunday 09:00am</td>
<td>Chief scientist discussed with Norinco team regarding the CTD operation for the understanding of Goa university students. Then it was decided that the operation will be done on the next day in shallow water region.</td>
<td></td>
</tr>
<tr>
<td>10:00am</td>
<td>Chief scientist discussed with Captain regarding the CTD operation for the understanding of Goa university students. Captain told that ETA will be on 17/05/2011 forenoon.</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER 5
SAIC TSUNAMI BUOY RETRIEVAL AND DEPLOYMENT

NIOT team had participated in the SAIC Tsunami buoy Retrieval and deployment activities at STB1 location.

Ship reached the STB01 Location on 13th May 2010, 4.00 AM. Search operation was done by NIOT and SAIC team. We found the SAIC buoy at the location of 06° 15.246’N, 88° 48.805’E.
After that the buoy was hooked by SAIC personnel.

Two deployment assistants were approached the buoy by using Geminicraft, and tied the buoy in the rope. Then the buoy was brought into the centre of the watch circle, which is at the location of 06°14’ 994” N, 88°48’325” E, to have low tension on the mooring. Deep sea winch rope was guided on the A-frame pulley and the buoy was lifted in the Aft side of the ship. The initial 3.5 m long chain of the mooring was firmly hooked with the ships deck by using chains as shown in figures.

Fig 5.1 preparation of Deck chain
The connection between the surface buoy and mooring was removed and the surface buoy is replaced by new one. The new Surface buoy was connected with the mooring by using Bow Shackle.

Hence, the Bathymetric survey was done during the earlier deployment at the same location, it is not performed in the present course of action. The BPR also not retrieved in the present deployment.

Then by using the A frame, the surface buoy was lowered on the sea surface and the buoy is released by using Buoy release unit. After the deployment of the buoy, communication between the buoy and the BPR unit was confirmed by INCOIS and SAIC officials, then ship was started to move towards TB-03 Location for retrieval operation.
Photos taken during retrieval and deployment:

Fig. 5.3 Retrieval of SAIC buoy

Fig. 5.4 Deployment of SAIC buoy
CHAPTER 6

RETRIEVAL OF TB03 TSUNAMI BUOY

The ship reached the TB03 location on 3.45 pm hrs, the search operation was performed by NIOT officials by using binocular and ship Radar. Then a round about the Anchor deployment location was taken by considering 5 nm as radius. We are not able to find the surface buoy during the operation.

After that BPR searching operation was started, and it is also not found at the deployed location.

Then a decision was taken by Chief scientist and Chief Officer, to return to Chennai.
CHAPTER 7

TRAINING PROGRAMMES TO STUDENTS

The training was given to the Marine science post graduate students from Goa University, during retrieval and deployment of SAIC tsunami buoy system operation. As per Dr.R.Venkatesan, Group Head, OOS,NIOT and Mr.MM.Subramaniam, NCAOR instructions, the training was given. The list of students and training topics covered given below.

Venue : ORV Sagar Kanya  Date : 09th May 2011 to 17th May 2011

LIST OF TRAINERS:

1. Mr.P.Murugesh, Scientist – B, NIOT(Chief scientist, SK - 284)
2. Mr.R.Sundar, Technical Assistant, NIOT
3. Mr.P.Kaliyaperumal, Project Scientist, NIOT
4. Mr.D.Gowthaman, Project Technical Assistant, NIOT
5. Mr.M.Vinod kumar, Multi-tasking staff, NIOT
6. Mr.V.Sarthchandran, Norinco private limited
7. Mr.James Robert Wrightsman, SAIC

LIST OF PARTICIPANTS:

1. Mr.G.Sarvesh, NCAOR
2. Mr.A.Bibin, NCOAR
3. Ms.Botelho Daphne Veneta, Goa University
4. Ms.Chaneker Sonal Prakah, Goa university
5. Ms.Dhiman Kalpana, Goa university
6. Ms.Gosavi Mamata Manohar, Goa university
7. Ms.Lotlikar Nikita Pradip, Goa university
8. Ms.Mangeshkar Nikita Gokuldas, Goa university
9. Ms.R.Nayak Bagyashri, Goa university
10. Ms.Rodrigues Flovina, Goa university
11. Ms.Smita Namdeo Naik, Goa university
12. Ms.Tambat Deepika Prakash, Goa university
13. Mr.Joglekar Mandar, Goa university

INTRODUCTION OF BUOY SYSTEMS:

Mr.P.Murugesh, Scientist has explained about the mechanical part of the buoy system. He explained about the materials used for fabrication, different mechanical parts and their functional description and significance.

Topics covered:

1. Buoy hull
2. Central cylinder
3. Mast assembly
4. Keel frame, keel weight
5. Anti rotation fin
6. Vandalism
7. Maintenance of the buoy system

Introduction of buoy systems:

Mr.R.Sundar, Technical assistant has explained about Tsunami Buoy and BPR system. Also he presented about Ocean Observation System activities and the OOS video presentation demonstrated.

Topics covered:

1. Tsunami Buoy and BPR System
2. Data reception and data management
3. Data analysis and Data quality
Introduction of mooring design:
Mr.P.Kaliyaperumal, Project Scientist has explained about the mooring design for our different buoy systems and the BPR mooring.

Topics covered.
1. Mooring design for Omni Buoy System
2. Mooring design for Tsunami Buoy System
3. BPR mooring

Introduction of sensors
Mr.D.Gowthaman, Project Technical assistant has explained about the different buoy configurations, electronics used in the buoy systems and the shore station configuration.

Topics covered.
1. Data acquisition and processing system
2. Sensors at a glance
3. Inmarsat transceiver
4. Typical shore station

Introduction of buoy assembling
Mr.K.M.Vinod kumar, Multi tasking staff has explained about the step by step procedure of buoy assembling.

Topics covered.
1. Buoy assembling
2. Buoy deployment

Introduction of CTD sensors
Mr.V.C.Sarat chandran from Norinco pvt ltd has explained about the CTD sensors and its operation. During the CTD sensor operation water samples are collected at different depths at 10m, 25m, 50m, 75m, and 100m. Graph is attached with this document and the data backup was taken.

Topics covered.
1. Multi beam survey
2. CTD sensors and its operation
3. Echo sounder
4. Ship maintenance

**Introduction of SAIC Tsunami system**

Mr. James Robert Wrightsman from SAIC has explained about the SAIC tsunami buoy system.

**Topics covered.**

1. Deployment procedure of BPR
2. Data acquisition and processing system of SAIC buoy

**SNAPSHOTS**

![Image](image_url)

*Fig.1 Introduction of buoy systems*
Fig. 2 Introduction of Tsunami warning systems and BPR

Fig. 3 Introduction of data acquisition system and sensors
Fig. 5 Introduction of SAIC Tsunami buoy system

Fig. 6 Lowering of CTD sensor up to 100m depth
Fig. 7 Introduction of CTD sensor and its operation

Fig. 8 CTD data
GOOD MORNING SIR,

All the NIOT, INCOIS and NIO materials are loaded from Sunday after noon with the help of 12 Ton crane available in the ship and it is finished on Monday morning upto 8 AM because of crane became hot after working 1 hour. We have to wait for 30 minutes for again to do the work with the crane.

All the crew members (29) are sign on Sunday and the vessel started sailing on Monday evening at 6PM towards STB-01 location. Yesterday we met the captain and Chief officer discussed for our operations & cruise track. He said vessel may reach the STB-01 location on 12th May 2011 tentatively because sea is very rough at this time and he given the wind forecast for the cruise schedule (9 May to 18 May 2011). Now the windspeed in the current location is 20 Knots and the ship sailing speed is 8.5 knots. Chief officer has given safety instructions to all the crew members.

INCOIS & SAIC team were assembled all the STB equipment on yesterday and started the communication test between the payloads & BPR, Iridium test also done in the evening after the vessel started to sailing. The random test messages are already sent to INCOIS and the normal mode data will receive at 12:35(UTC) and 12:36(UTC) for primary and secondary respectively. I request Mr. Ajay, INCOIS to please confirm whether the data is receiving at INCOIS or not.

Thanks & regards,
Chief Scientist.

GOOD MORNING SIR,

We are sailing towards the STB-01 location. Since sea is in rough condition and the ship is sailing opposite to the wind direction, the ship reach the location at midnight of 12th May 2011 tentatively.

Today we segregate the material for the deployment of STB-01 location. We moved the materials for the easy operation of retrieval and deployment of SAIC buoy.
STB-03 testing is still going on and the tested data is sending continuously to Tsunami Warning centre. We got the confirmation of received data at tsunami warning centre from Mr. Ajay, INCOIS. I request Mr. Ajay to send the last received data of STB-01, SAIC team wants to check the buoy location, BPR and battery parameters of STB-01. It is required to know the buoy and BPR status of STB-01.

Thanks & regards,
Chief Scientist.

**IN MESSAGE:**

Date: 11th may 2011

e-mail to: Sagar Kanya - MASTER <master@sagarkanya.amosconnect.com>; venkat@niot.res.in <venkat@niot.res.in>; NCAOR SUBBU MM <mmsubbu@ncaor.org>; Srinivas Kumar T srinivas@incois.gov.in

CC: ssamc@niot.res.in <ssamc@niot.res.in>; NIOT Sundar <sundar@niot.res.in>; arul@niot.res.in <arul@niot.res.in>; tsunami <tsunami@incois.gov.in>; Rajesh <rajesh@incois.gov.in>

Dear Chief Scientist, SK-284, Nice to see your progress, Present STB-01 is located at 0615.0318 N, 08849.0640 E. I have enclosed below STB01 dataset which received today at 6:27

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Temperature</th>
<th>Humidity</th>
<th>Pressure</th>
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<td>D$1</td>
<td>1</td>
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<td>19:15:00</td>
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<td>20:15:00</td>
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<td>08849.0640</td>
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<td>D$2</td>
<td>1</td>
</tr>
</tbody>
</table>

With regards
Ajay
INCOIS

From: snehal@ncaor.org

To: master@sagarkanya.amosconnect.com master@sagarkanya.amosconnect.com

CC: mm subramaniam mmsubbu@ncaor.org
Dear Sir,

Kindly send the list of equipment if there are any equipments to be offloaded from ORV Sagar Kanya.

Regards

Snehal
Sagar Kanya Cell
NCAOR

OUT MESSAGE: Date: 12th may 2011

e-mail to: venkat@niot.res.in;srinivas@incois.gov.in;mmsubbu@ncaor.org; 
CC:ssamc@niot.res.in;sundar@niot.res.in;arul@niot.res.in;ajay@incois.gov.in;tsunami@incois.gov.in;rajesh@incois.gov.in;

Good morning Sir,

Yesterday we had a meeting at 05:00pm in Conference hall. James and Christopher explained the deployment and retrieval procedures.

Participants of the meeting:
1. Captain
2. Chief Officer
3. P.Murugesh,Chief Scientist
4. Rajesh, Deputy Chief Scientist
5. Emayavaramban, Deployment Assistant.

The meet has ended at 06:00pm.

The chief officer told that we will reach the location at 3am to 4am tomorrow. The operation will start at 7am. We are prepared for the operation and ready for that.

Kind attn: Dr.R.Venkatesan
As you told the buoy vandalism posters were given to Captain and he was given it to chief officer to paste in Notice Board. Here Kaliyaperumal and sundar are suffered from seasickness. We are taking care of them.

Note:

Kind Attn: Mr.Arun,

please send BPR retrieval procedure document to retrieve the TB03 BPR.

Kind Attn: SSAMC team,
Please send the BPR position and buoy anchor position from the cruise report.

TB03 Deployment position:
Anchor position
last transmission position
IN MESSAGE:  

Date: 12th may 2011

From: ssamc
To: master@sagarkanya.amosconnect.com

Sundar Sir,

Mr Arul Muthiah Want to talk with u Sir, so please make a call to us.

Regards,

S.S Team.  
NIOT chennai.

From: SSAMC
To: Sagar Kanya - MASTER <master@sagarkanya.amosconnect.com>; venkat@niot.res.in <venkat@niot.res.in>; NCAOR SUBBU MM <mmsubbu@ncaor.org>; INCOIS SRINIVAS KUMAR srinivas@incois.gov.in

CC: ajay incois <ajay@incois.gov.in>; NIOT Sundar <sundar@niot.res.in>; arul@niot.res.in <arul@niot.res.in>; INCOIS-TSUNAMI <tsunami@incois.gov.in>; INCOIS RAJESH rajesh@incois.gov.in

Dear FT,

TB03 Deployment position : 06deg39.800’ N 89deg48.613’ E

Anchor position : 06deg39.800’ N 89deg48.613’ E

last transmission position : 06deg 39min 25sec N 89deg 50min 03sec E

BPR position : 06deg40.1135’N 89deg48.8091’E

Depth : 3000 m

Deployment date : 09/02/2009 15:00 IST

Stopped Date : 21/04/2009 - 22 GMT (22/04/2009 03 :30 AM hrs IST)
Dear Chief Scientist, SK-284,

Present STB-01 is located at 0615.498 N, 08848.967 E. I'm enclosing today (6:27 UTC) received STB01 dataset below:

 displeasing-----------------------------------------------

D$1I 05/11/2011 18:15:00 1454143 3793235 3793246 3793258 3793274 1* 3B
D$1I 05/11/2011 19:15:00 1454143 3793284 3793298 3793308 3793318 1* 3C
D$1I 05/11/2011 20:15:00 1454143 3793326 3793331 3793332 3793336 1* 38
D$1I 05/11/2011 21:15:00 1454143 3793337 3793333 3793327 3793322 1* 3A
D$1I 05/11/2011 22:15:00 1454143 3793318 3793311 3793307 3793304 1* 32
D$1I 05/11/2011 23:15:00 1454143 3793297 3793290 3793284 3793276 1* 33
D$0 05/12/2011 01:13:10 0615.4981 N 08848.9671 E 041* 5D

D$1I 05/12/2011 00:15:00 1454143 3793267 3793259 3793251 3793247 1* 31
D$1I 05/12/2011 01:15:00 1454143 3793241 3793236 3793234 3793234 1* 3A
D$1I 05/12/2011 02:15:00 1454143 3793232 3793233 3793235 3793240 1* 3A
D$1I 05/12/2011 03:15:00 1454143 3793248 3793255 3793260 3793271 1* 34
D$1I 05/12/2011 04:15:00 1454143 3793274 3793284 3793294 3793305 1* 39
D$1I 05/12/2011 05:15:00 1454143 3793314 3793329 3793338 3793350 1* 3E
D$MI
BATT 05/12/2011 01:19:00 24:00:00
15.57 10.08 44.67
 displeasing-----------------------------------------------

With regards
Ajay
Dear Chief Scientist, SK-284,

Please give details of any materials (except personal belongings) need to be unloaded from the first leg of the cruise. If anything to be unloaded, send the list of materials with prescribed format. Please confirm from the SAIC engineers about the materials, otherwise we will unload all the material after completion of second leg of the cruise in June-2011.

With regards

Ajay

INCOIS

From: Srinivas Kumar T
To: Sagar Kanya - MASTER
CC: tsunami@incois.gov.in; ajay@incois.gov.in; rajesh@incois.gov.in

Thank you for the update Rajesh. All the best for a successful operations.

regards,

Srinivas

OUT MESSAGE: Date: 13th may 2011

Email to: venkat@niot.res.in; srinivas@incois.gov.in; mmsubbu@ncaor.org;

CC: ssamc@niot.res.in; sundar@niot.res.in; arul@niot.res.in; ajay@incois.gov.in; tsunami@incois.gov.in; rajesh@incois.gov.in;

Good morning Sir,

Report on 12/05/2011:

To Move heavy materials 12 Ton was needed. Chief officer told that ship has to be stopped to use 12Ton crane. So ship was stopped 04:00pm to 06:00pm. All pre-deployment work has done for SAIC buoy. Norinco prepared the deep sea winch for the deployment of SAIC buoy. They routed the wire rope through the A-frame.
Report on 13/05/2011:

Today the vessel has reached near the buoy location's watch circle at 4:00AM and we found the surface buoy of STB-01 at 06 15.246N, 88 48.805E, which is very near to the vessel. We started operation at 5:00AM and successfully retrieved old buoy & deployed the new buoy with the same mooring at 06 15.020N, 88 48.345E (which is 630m from the centre of the watch circle). We got the confirmation of deployment message received at Tsunami warning centre from Mr. Ajay, INCOIS over phone.

I very thankful to all the crew members, Captain, Chief Officer and their team for supporting the successful operation and also thankful to all members providing the support to successful operation. Now the ship is sailing towards TB03 location for the retrieval of tsunami buoy. We will reach the location at 4:00pm.

Kind attn: Dr.R.Venkatesan

Ch.scientist has discussed with deployment assistant regarding the "OnBoard safety procedures" which is developed in NIOT at 3.45pm. Each and every buoy components are secured safely. We have arranged a training in conference hall about the SAIC buoy during the return sailing of the vessel.

Thanks & regards,
Chief Scientist
13-05-2011
With regards
Ajay
INCOIS

From : Ajay Kumar B
To : master@sagarkanya.amosconnect.com; venkat@niot.res.in NCAOR SUBBU mmsubbu@ncaor.org; srinivas@incois.gov.in
CC : ssamc@niot.res.in; sundar@niot.res.in; arul@niot.res.in ; tsunami@incois.gov.in; rajesh@incois.gov.in

Dear Chief Scientist, SK -284,

Congratulations to all cruise members for successful STB mission and all the best for TB-03 retrieval operation.

We have received normal mode dataset to INCOIS and received at 6:28 UTC. Enclosed the received message below:

|$0 05/12/2011 13:57:48 0700.1903 N 08758.3209 E 286° 13
D|$0 05/13/2011 01:13:28 0615.2678 N 08849.0937 E 057° 16
D|$0 05/13/2011 01:13:28 0615.2678 N 08849.0937 E 057° 74
D|$MI BATT 05/13/2011 01:19:00 24:00:00
11.03 11.00 47.09
D|$0 05/13/2011 01:13:28 0615.2678 N 08849.0937 E 057° 3C
D|$0 05/13/2011 01:13:28 0615.2678 N 08849.0937 E 057° 4B
D|$0 05/13/2011 01:13:28 0615.2678 N 08849.0937 E 057° 4D
D|$4I 03:54:34 tf= 0 rf= 1 x= 1 y= 0 3793233 3793233 3793233 3793231
D|$4I 03:56:34 tf= 0 rf= 1 x= 1 y= 0 3793232 3793231 3793231 3793231
D|$1I 05/13/2011 03:15:00 1454143 3793241 3793235 3793232 3793231 1° 39
D|$4I 03:58:34 tf= 0 rf= 1 x= 1 y= 0 3793232 3793231 3793232 3793232
D|$4I 04:00:34 tf= 0 rf= 1 x= 1 y= 0 3793231 3793232 3793232 3793232
D|$4I 04:02:34 tf= 0 rf= 1 x=80 y=81 3793232 3793231 3793231 3793231
D|$4I 04:04:34 tf= 0 rf= 1 x= 1 y= 0 3793232 3793231 3793231 3793231
D|$4I 04:06:34 tf= 0 rf= 1 x= 1 y= 0 3793233 3793232 3793233 3793232
D|$4I 04:08:34 tf= 0 rf= 1 x= 1 y= 0 3793232 3793232 3793232 3793232
D|$0 05/13/2011 01:13:28 0615.2678 N 08849.0937 E 057° 56
D|$4I 04:10:34 tf= 0 rf= 1 x= 1 y= 0 3793234 3793233 3793233 3793233
With regards
Ajay
INCOIS

From  : Srinivas Kumar T
To    : master@sagarkanya.amosconnect.com;
venkat@niot.res.in;mmsubbu@ncaor.org
CC    : ajay@incois.gov.in; ssamc@niot.res.in; sundar@niot.res.in;
arul@niot.res.in; tsunami@incois.gov.in; rajesh@incois.gov.in

I wish to congratulate the entire team for a very successful mission.

best regards

Srinivas

OUT MESSAGE:  Date: 14th may 2011

Email to: venkat@niot.res.in;srinivas@incois.gov.in;mmsubbu@ncaor.org;

CC: ssamc@niot.res.in;sundar@niot.res.in;arul@niot.res.in;ajay@incois.gov.in;tsunami@incois.gov.in; rajesh@incois.gov.in;

Good morning Sir,

We reached the TB03 location at 03.45pm for tsunami buoy searching operation. By using
the last transmission position and anchor drop position, we searched the buoy. The buoy
was not found in that location. we make 5nm radius search for that buoy and We searched
up to 06:30pm. We will prepare a report on SAIC retrieval and deployment. we will get
certified report from master for buoy search operation. Safety aspects also, we will
prepare a report.

We have arranged training for the Goa University students.
14/05/2011, Saturday:
10.30-11am-Session-1 Norinco team explained about the lab equipments. Venue: All labs

11pm to 12:30pm-NIOT team explained Data, Tsunami and OMNI buoys, buoy
components and moorings. Venue: Ship Main deck

03:00pm-03:30pm-NIOT team presentation regarding location of buoys etc (Mr.Sundar will
give the presentation).Venue: Conference Hall
03:30pm-04:00pm-SAIC team will explain SAIC tsunami buoys and moorings (Mr. James will give the presentation). Venue: Conference Hall and ship main deck.

Training for NIOT team members at conference hall:
04:00pm to 05:00pm-SAIC team will explain SAIC tsunami buoys and moorings (Mr. James will give the presentation). Venue: Conference Hall.

Kind attn: Snehal madam
No material is to be unloaded from the ship.

Everything goes well as per the above plan.

Thanks & regards,
Chief Scientist
14-05-2011

IN MESSAGE: Date: 14th may 2011

From : Venkatesan
To : master@sagarkanya.amosconnect.com; atma@niot.res.in; shenoi@incois.gov.in

Dear Mr Murugesh,

Congratulations for successful retrieval and deployment of SAIC tsunami buoy
We convey our wishes to SAIC team The Master & Crew and NIOT & INCOIS team
Kindly prepare a report on this activity with all details and safety aspects followed.

regards
Venkat

From : Satish Shenoi
To : dr.r.venkatesan@gmail.com; master@sagarkanya.amosconnect.com; atma@niot.res.in
CC : venkat@niot.res.in; mmsubbu@ncaor.org; srinivas@incois.gov.in; ajay@incois.gov.in; ssamc@niot.res.in; sundar@niot.res.in; arul@niot.res.in; tsunami@incois.gov.in; rajesh@incois.gov.in

Congratulations to NIOT-INCOIS team and SAIC as well as Master & crew of Sagar Kanya for the job well done. This helps in keeping the Indian Tsunami Early Warning Centre in sensing the tsunami waves well before they arrival at our shores.

-sscs
Good morning Sir,

We are sailing towards chennai. ETA may be 17/05/2011 forenoon.

Training programmes goes well as per the plan. Tomorrow we are decided to do CTD operation for the students. We will do the CTD operation in shallow water region. I discussed with captain. Since all materials and equipments for the coring operation are in the main deck hatch and lot of buoy components on the deck, we could not open the hatch. So the coring operation cannot be done this leg of cruise. I asked the students to give a small report submitted to Master and me regarding what they have learnt for the last few days.

Yesterday Mr. Rajesh, INCOIS had given a presentation about Tsunami warning Centre to GOA University students.

We have attached a word file on mooring winch dimensions with details.

Kind attn: R.K. Muthumani

Please arrange accommodation for Rajesh, INCOIS from 17th-19th May 2011 in NIOT guest house.

The following materials is to be loaded in the second leg:

1. Lithium batteries
2. Pulley for mooring winch
3. Lock nut
4. Satellite phone (if required)

Please discuss with Mr. Rajaraman regarding the welding in sinker weights.

Thanks & regards,

Chief Scientist

15-05-2011
Good morning Sir,

We are sailing towards Chennai.

Training programmes went very well as per the plan. Today Norinco team was operated the CTD at the depth of 100m. Water samples were taken at 10m, 25m, 50m and 100m. We copied the results (graphs and data) for the training report. The students were collected the water samples.

During the CTD operation, SAIC team and deployment assistants did the dismantling of the SAIC buoy lower bridle section and keep the buoy in upright position using the 12 Ton crane. They shifted some materials also.

We have attached a pdf on "Safety procedures followed during deployment, retrieval and lifting operations" and "Training Programs on Buoy systems and Onboard Ship equipments".
Please send your suggestions to improve the reports.

Kind attn: R.K. Muthumani
Mr. Rajesh will speak you regarding the vehicles for the SAIC team. Please add tarpaulin sheet to the next leg.

Thanks & regards,
Chief Scientist
16-05-2011
ANNEXURE – A

Safety Procedures followed during Retrieval, Deployment and Lifting operations in Ship Onboard

Venue: ORV Sagar Kanya

Instructions at a glance:

1. The buoy and its materials should be tied with rope tightly. Otherwise the materials may drop into the sea when the weather becomes rough.
2. Piles of materials should be stocked safely. Storage of materials near the exit doors and near the stair case should be avoided.
3. Point of load of polypropylene rope coil should be inspected before lifting.
4. Handling rope is also inspected before usage.
5. When taking out the GI mooring hardware and handling the rope, deployment assistants should wear hand gloves.
6. All deployment assistants should wear safety shoes, boiler suit, safety glasses and safety helmets when assembling and at the time of buoy deployment.
7. No one should not cross below the lifting objects at the time of lifting. All the deployment assistants should wear safety helmet at the time of lifting.
8. Preparation of accident and incident report whenever the incident happened.
9. All lifting tackles boxes should display the safe work load.
10. Check for any leakage in Nitrogen cylinder and hose. Incorrect pressure reading may cause hazard.
11. Usage of portable electric equipment on wet ground will make a hazard.
12. Gemini craft leakage and any other inspection have to done before retrieval operation. Oil level should be checked.
13. No one should not run in deck during the rainy season.
14. No one should not stand near the edges of the ship during night time.
15. Experienced seamen should involve in paying out ropes. Two or three persons should stand near the spool stand.
16. Inspection of leakage on subsurface float has to be done before deployment.
SNAPSHOTS

Fig. 1 Deployment assistants wearing safety helmets and shoes

Fig. 2 Deployment assistants wearing hand gloves
Fig. 3 Enough clearance when lifting the buoy

Fig. 4 Deployment assistants wearing the life jacket, safety shoes and helmet
Fig. 6 Proper securing of buoy
ANNEXURE - B

Report on Lessons Learnt from the SK-284 cruise:

1. During the material loading in NIOT, the 5 Ton Overhead Crane makes problem now and then. So we can made arrangements to get a standby electrician or mechanic to rectify the problem from V.S.Enterprises. For every loading, a person from V.S.Enterprises should be in NIOT.

2. Problem faced:
   In ORV Sagar Kanya has berthed in Coal jetty (B2) as Starboard side as alongside. So the 12 Ton crane cannot approach the material in the trucks. This makes big problem. There is a railway between the ship and the truck. So the trucks are aligned in various angled manner and all the materials was unloaded.
   **Moral:** In Coal jetty for ORV Sagar Kanya, before loading the materials we should know the status of which side is along side?. Port side should be along side. If open trucks means it will be very easy.

3. When retrieving the buoy, the buoy should be towed up to the anchor drop point (Centre of watch circle), there the mooring rope tension is low. Then the buoy can be easily retrieved.

4. For OMNI, SAIC buoys and Mooring winch, we have to arrange 20’ open trailer (Ton truck).

5. For NIOT data buoy we can use closed truck.

6. For every truck or trailer, they should come up with lashing slings and tarpaulin or mat.

7. The “C” program to find Watch circle radius has to be kept in hand.

8. Word document to PDF file converter to be copied. Pdf will be sent to the shore station for big messages.

9. Previous cruise report should be in word document format. It will enable the Field Team to make their Cruise Report in a better manner.
10. During loading to the ship and unloading from the ship, the lorry drivers should be arranged food for themselves when the loading or unloading takes more days. We should intimate the condition before we book the truck.

11. For cruise, car request should be given for 2 or 3 days from loading to sailing and ship arrival to shore to unloading.

12. Crane request should be given earlier for two or three days from indicative loading date in NIOT.
ANNEXURE - C

Points Discussed in the SAIC Tsunami buoy training in Onboard Sagar Kanya

Date : 14/05/2011. Time: 04:30pm to 05:45pm
Venue: Conference Hall

Trainer:
Mr. James Robert Wrightsman, SAIC team

Participants:
P.Murugesh, Chief scientist
R.Sundar, Technical Assistant
P.Kaliya perumal, Project scientist
D.Gowtham, Project Technical Assistant

Points Discussed:

1. In SAIC buoy BPR, the aluminium battery container may have thickness of 2cm.
2. Acoustic transmission will not affected by the metallic frames which is covered the Surface transducers.
3. Green Tag-Inspection and testing of each components.
4. The minimum distance between the BPR and the buoy is maintained in the SAIC buoy will be 400m.
5. Induction cable is not used in the SAIC buoy mooring.
6. Totally 5sets of recovery flotation units is used in the BPR mooring.
7. Tilt sensor-is used to determine the aspect of the BPR platform as sitting on the seafloor surface.
8. Maximum tilt in the BPR measured in the SAIC buoy is 5°.Minimum is 0-1°.
9. No special fasteners are used in the buoy.
10. The buoy lid and the instrument container are made up of fiberglass. Two Iridium antennas are fixed inside the instrument container.
11. Each and every component (mechanical as well as electronics) are tested carefully before the usage of the components.
12. The mooring analysis of the moorings is done in CABLE software which is programmed by the Woods Hole Oceanographic Institution.
13. No Anti-foulant paints are applied to the 2.1m diameter hull.
14. In the upper mast, they are fixing radar reflector and the Navigation light.
15. Life span for the BPR in SAIC tsunami buoy has 4 years and the buoy has 2 years.
16. They are maintaining the mooring scope approximately 1 and which is should be less than 1.15.
17. The mooring scope is should not go less than 0.985.
18. In SAIC buoy, no tension recorders are used in the mooring line.
19. In Easy To Deploy (ETD) buoy, a load cell is fixed under the buoy to measure the tension in the mooring ropes.
20. To identify the BPR when it is surfacing, they attach flags between the top two floats.
21. Gap is maintained between the glass floats in the BPR mooring is used to avoid the hitting themselves.
22. In Australia, they are deployed two ETD buoys. Now some problem with the Australian deployment.
23. They have an in-built machine setup to make pre-stretched rope and to check the measurement of the rope.
24. In ETD buoy, BPR can be used only once. It is left in seabed itself after the working life span. The mooring also not used again. It was cut by the seamen.
25. In ETD buoy, only the buoy can be used again. After refurbished, the buoy can be used another deployment.
26. **Thumb rule:** The anchor will be landed on seabed at 10% of the total depth at the location from the place of dropped. The direction of landing of anchor will be based on the current direction in that location.
27. The BPR will be landed approximately at 100m away from the BPR dropped location.
28. SAIC team suggested and said that to maintain Health monitoring system for the buoy system is important.
ANNEXURE – D

STUDENTS REPORT ON NIOT AND NCAOR TRAINING

Introduction:
The NCAOR had conducted a cruise programme for the deployment of tsunami buoys on ORV Sagar kanya which has attended by 11 students of Goa University of Marine Science Department (Batch2010-2011). ORV Sagar Kanya is Indian research vessel coming under ministry of Earth science. The cruise has conducted on 9th of May 2011 and was carried out for 10 days. The aim of the cruise is retrieval and deployment of SAIC tsunami buoy.

We boarded the ship on 8th May at Chennai port. The ship sailed the very next day at 5 pm and the sailing commenced with the help of two tug boats, which helped the ship to turn and orient in the desired direction.

Navigation tools:
We were taken to the bridge of the ship where the chief officer guided us about the general safety precaution carried out on the ship. They informed us that the ship has two sides, starboard (right side) having life boats 1 and 3 and the port side (left side) having life boat 2 and 4. The life boats contain GPS, food and medical facilities. In case of emergency, general emergency alarms are blowed, which consist of 7 or more short blasts followed by prolonged blasts on the ship whistle or siren. On hearing the alarm, till all the members of the ship are supposed to wear their life jacket and helmet and are expected to move towards their respective life boats.

We were also shown different instruments on the bridge such as the GPS, Gyro compass with its output layout, low range telecommunication, Global Maritime Distress and Safety System (GMDSS), Echosounder, Radar, Bowster, Telegraph, Standard compass, Variable High Frequency System(VHF),Ultra High Frequency(UHF),Coarse Recorder, Repeaters to view the celestial objects and NAFTEC.

All the instruments are solely used for navigation purposes.
**Scientific Instruments**

We than visited different labs available on Sagar kanya. There were total 11 labs of which we observed

a) Dry lab port side-XBT launcher unit, Plotter- lockhead martin, printer, Flow meter, ADCP
b) Dry lab star board side-Deep sea Echosounder, CTD frame, shallow sea Echosounder, Gyro.
c) Wet lab port side-CTD
d) Wet lab star board side-Autosal, Rollers, Magnetometer, Acoustic release, Rock saw
e) Chemical lab-Autoclave, Ultra violet photo-oxidation unit, Milli-Q, Exil, Titration unit, Thermosalinograph
f) Geophysical lab- Magnorox, magnetometer, Gravimeter, Narrow beam, Echosounder, Gyro, Deep Sea Pinger Echosounder
g) Hydrosweep lab-Multibeam Echosounder, Sub bottom profiler
h) Multipurpose lab-PH meter, Sieve Shaker and Auto analyser, core freezer
i) Electronic lab

**CTD: Conductivity Temperature Depth**

This instrument is basically used to retrieve water samples from different depths in the water column. The instrument can accommodate 24 niskin samplers of varying capacities, 1.7 litres, 5 litres, 7 litres and has maximum capacity of 30 litres. The instrument is provided with a temperature sensor, conductivity sensor for salinity, pressure sensor, altimetre sensor. There are 2 types of CTD present on the vessel

1) SBE-CTD (Seabird Electronic)- The instrument has a rosette unit consisting of steeper motar, magnetic switch, magnetic solanoid, trigger arm. It also has underwater units which supplies power. It works on magnetic solanoid coil. On passing the fire command the magnetic switch is pushed in. Due to magnetic attraction releasing the trigger arms which closes the niskin sampler at desired
depths. The trigger is programmed in such a way that, each sampler closes at a desired depth. The sensors here are externally attached.

2) Idronant CTD-It is Italian made and has inburnt sensors. The mechanism is motar based.

**ADCP: Acoustic Doppler Current Profiler**

This is used for wind direction and current speed, frequency measured is 150Khtz. The data can be read from a depth of 220-260mts.

**TSG: Thermosalinograph**

It is externally powered, high accuracy, temperature and conductivity recorder. The instrument is designed for shipboard determination of sea surface (pumped-water) conductivity and temperature. The platinum electrode glass conductivity cell's unique internal field geometry eliminates proximity effects. This feature is initially important in thermosalinograph, where the cell must operate in a water jackets confined volume.

Corrosion resistance. Only plastic, titanium and the glass or platinum conductivity cells are exposed to seawater.

**Buoys**

The occurrence of tsunami is dependent on thrust or reverse faulting. The BPR units uses powers therefore has longer use. There are three different modes: Normal trigger and tsunami-It has no weather system and transmits data every 6 hours. It detects tsunami waves.

The BPR has glass buoys. It has 2 batteries; the BPR unit has anchors at the bottom. Due to acoustic signals, the mechanical linkages below the unit releases the BPR unit and the glass buoys float and lift the unit to the surface of the water.

The BPR unit has a pressure sensor, 2 alkaline batteries of 2 year life, low frequency transducer, acoustic modem containing the element titanium. It has a tsunami algorithm and a data history of 1 year. It can differentiate between the tsunami and the normal tidal fluctuations. When the tidal variation is above the threshold level, the
trigger alarm is put on by the unit. When the tsunami occurs, the data is sent frequently, but as the event eases out, the frequency of sending data gets reduced. The Indian buoys work on the similar principle except that Indian buoys have solar panels from which the energy is derived to change the batteries. The buoy also has a zinc anode to prevent corrosion. The main disadvantage of Indian buoy is that the solar panels are usually robbed by fisher folks which leads to operation failure. To avoid this imported USA buoys are used.

**Shipping tools**

We also saw sludge and waste incinerator room, flatch room anis being d power management i.e is the engine room that initiate all the generator. The temperature here should not exceed more than 27 degree celcius. Approximately 1.7 metric ton diesel is being utilized by the generator. The generator release a lot of heat. The generator are cooled by the flowing fresh water. The heat from the freshwater is extracted by the sea water bhy a loop system. Other machinery seen were hydrophore tank, water calorifier that is used to supply hot water throughout the ship. Back and grey water pump of the EVAC system which is the main and only drainage system in the vessel.

THANK YOU