

RRS Discovery

Overview, commissioning, 1st year science, future issues

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National Marine Facilities
Sea Systems



New RRS Discovery – Outline

- 50 days endurance
- L 99.7m, B 18m, D 6.5m
- Scientific Transit Speed – 12 kts max
- 23 Officers & Crew
- 28 Scientists & Technicians
- DP Capable (DP2) SS6/7
- Multidisciplinary
- Multibeam(s) & Sub Bottom profiler
- Minimal Ice Class – for hull life (Lloyds 1D)
- Overside/overstern lifting - 20tonnes
- Low URN but not as low as RRS James Cook



Azimuth Thruster Propulsion

Drop Keels

Multibeam Blister

Azimuth Thruster

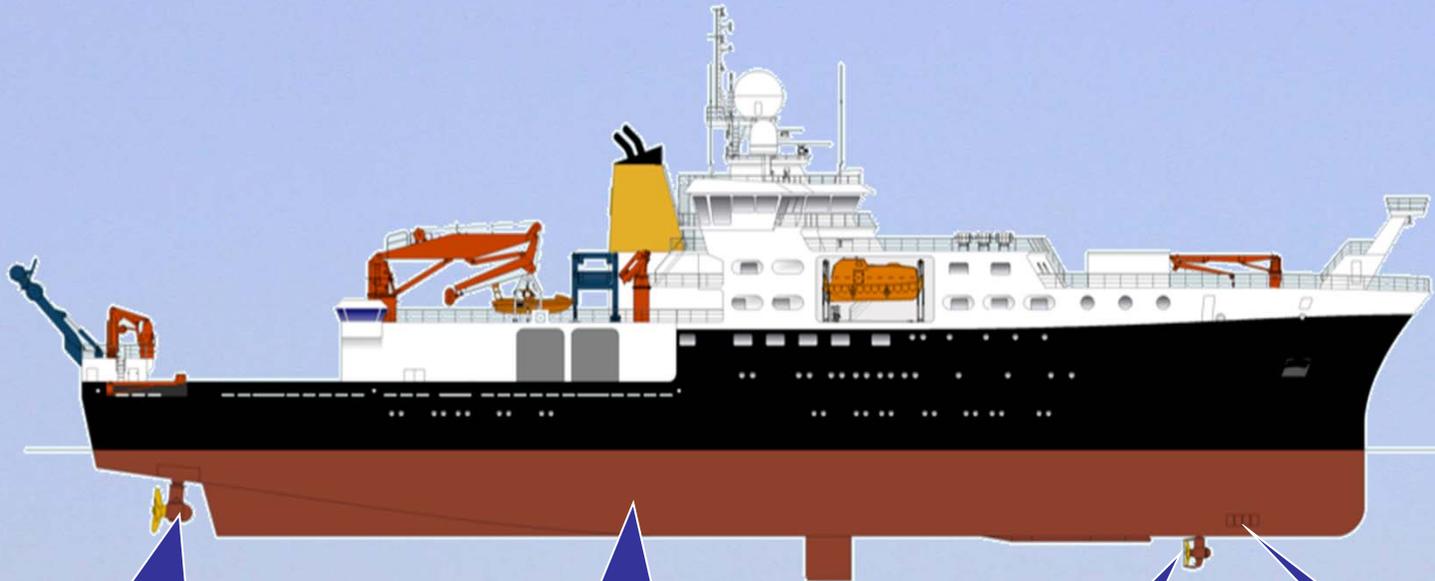
'Jet' Thruster



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New RRS Discovery – Propulsion



2 x Azimuth Thruster
5-bladed fixed-pitch
3.6m diameter props
(2 x 2,200kW DC Motors)

4 x Wartsila 8L20
(1,770kW ea. –
5,760kW tot.)

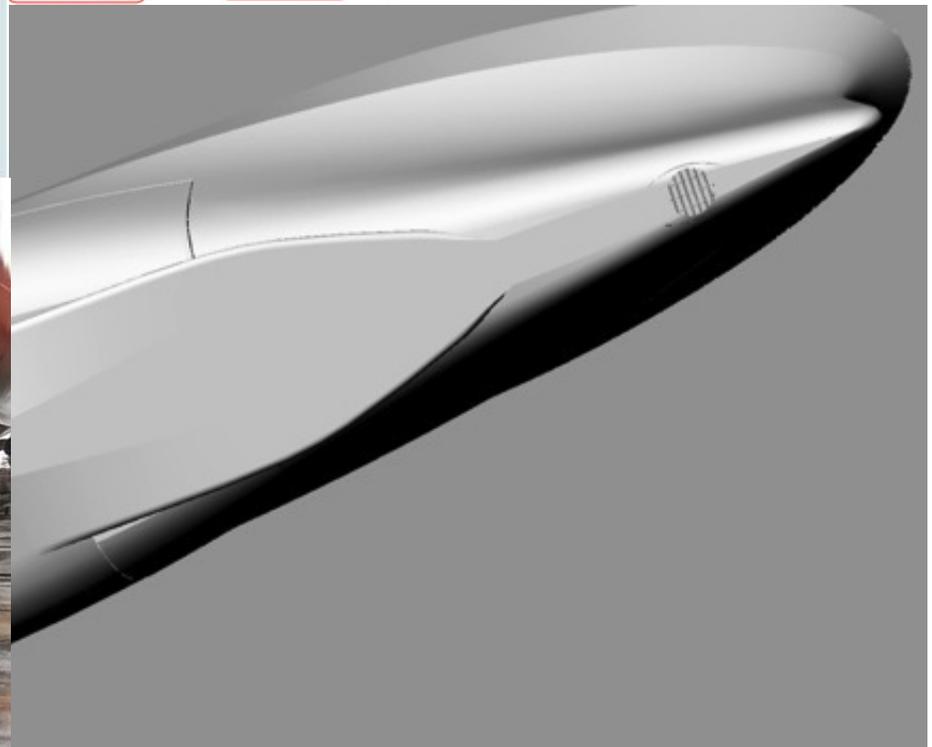
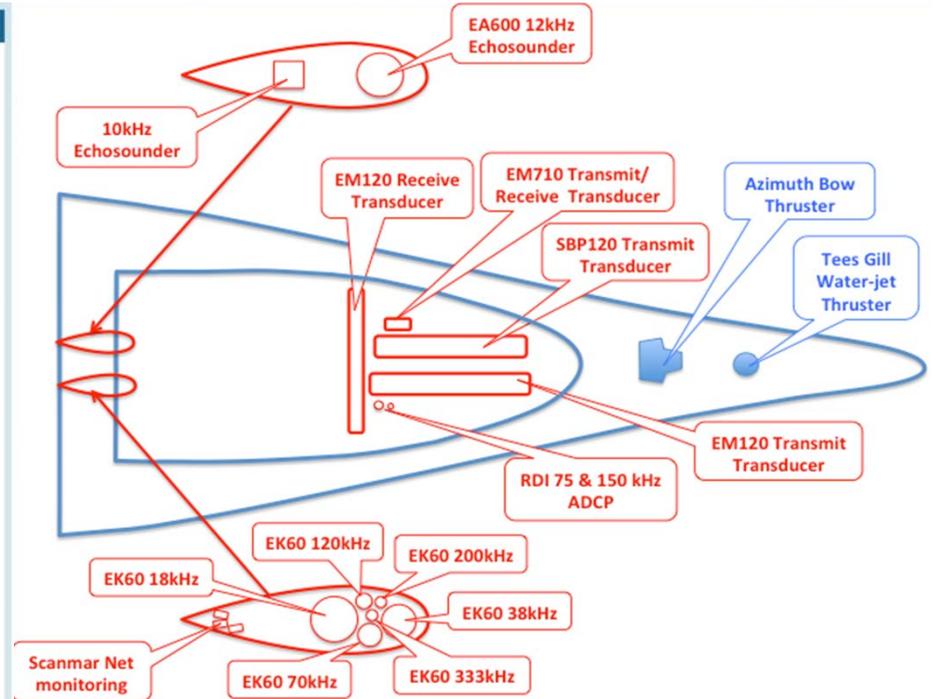
1,350kW
Azimuth Thruster

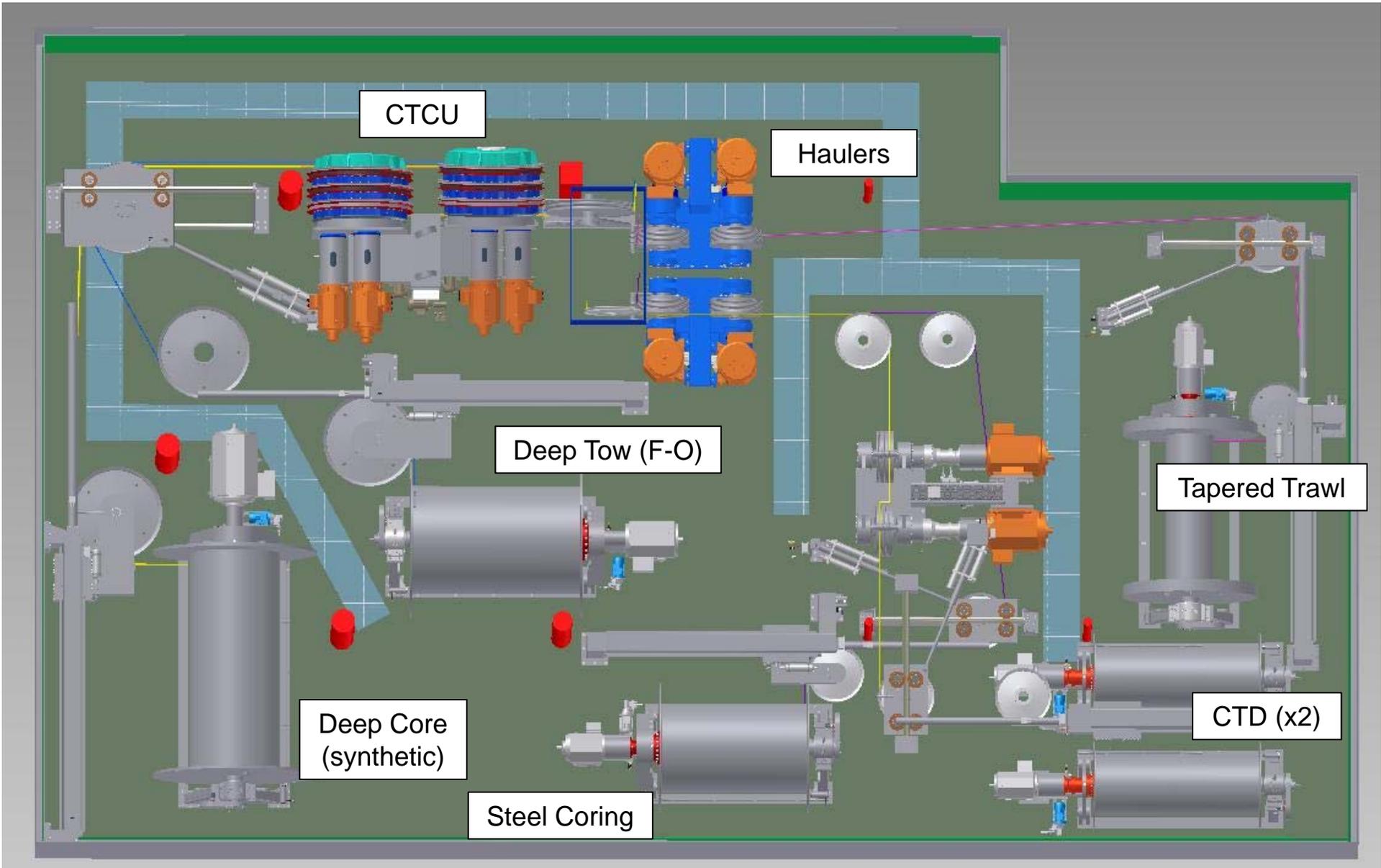
1,575kW
Tees Gill Thruster

Diesel capacity 596m³
Fresh water capacity 310m³



	System	Use
Forward Blister	EM122 1° x 1° 12kHz multibeam echosounder SBP120 3° x 3° sub-bottom profiler EM710 2° x 2° 70-100kHz multibeam echosounder 75kHz ADCP 150kHz ADCP Hydrophone	Seabed mapping up to full ocean depth Imaging the structure below the seabed Seabed mapping in depths up to Monitoring acoustic background and system performance Depth measurement
Port Drop Keel	EA600 12kHz singlebeam echosounder 10kHz singlebeam echosounder CCTV underwater camera	Depth measurement or equipment communication
Starboard Drop Keel	EK60 Bioacoustics echosounder with following frequencies: 18kHz, 38kHz 70kHz, 120kHz, 200kHz, 333kHz Scanmar S-1004/s-1007 hydrophone Hydrophone	Fishery research - biomass estimation Trawl net monitoring system Background/flow noise monitoring and system performance
Spar (pole)	Ultra Short Base line (USBL)	Underwater acoustic positioning

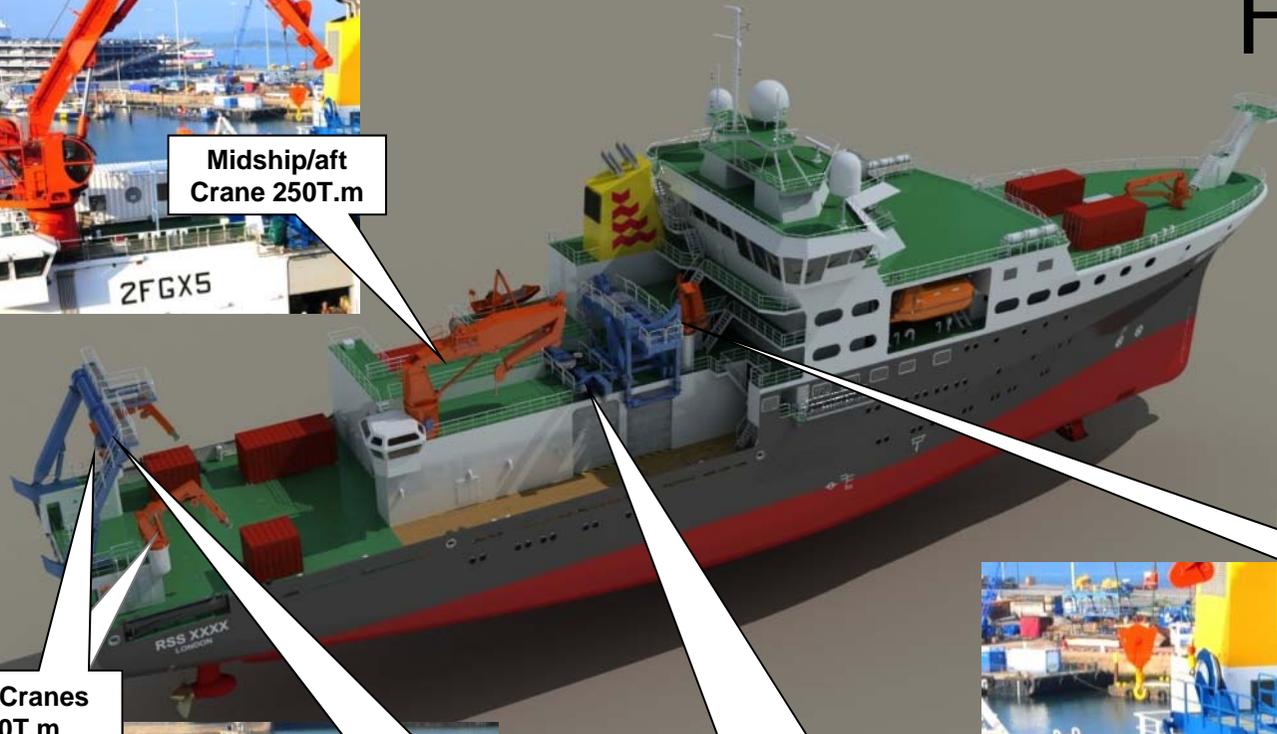




Handling



**Midship/aft
Crane 250T.m**

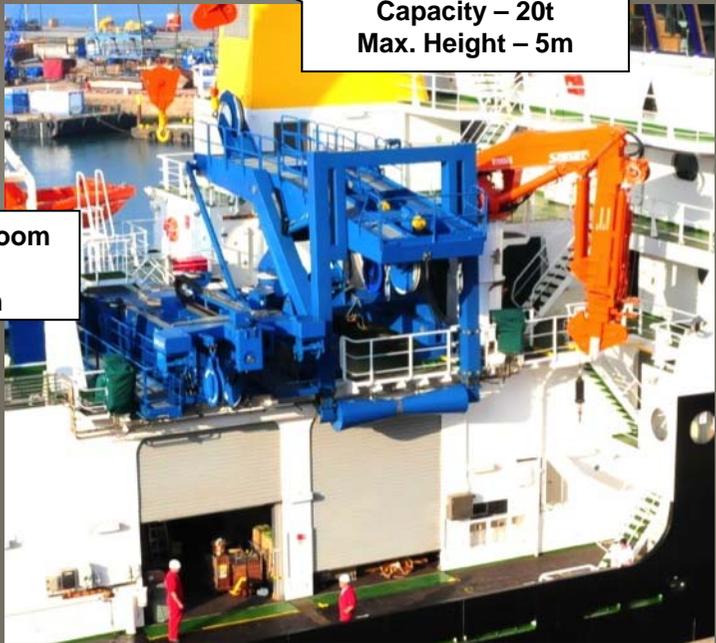


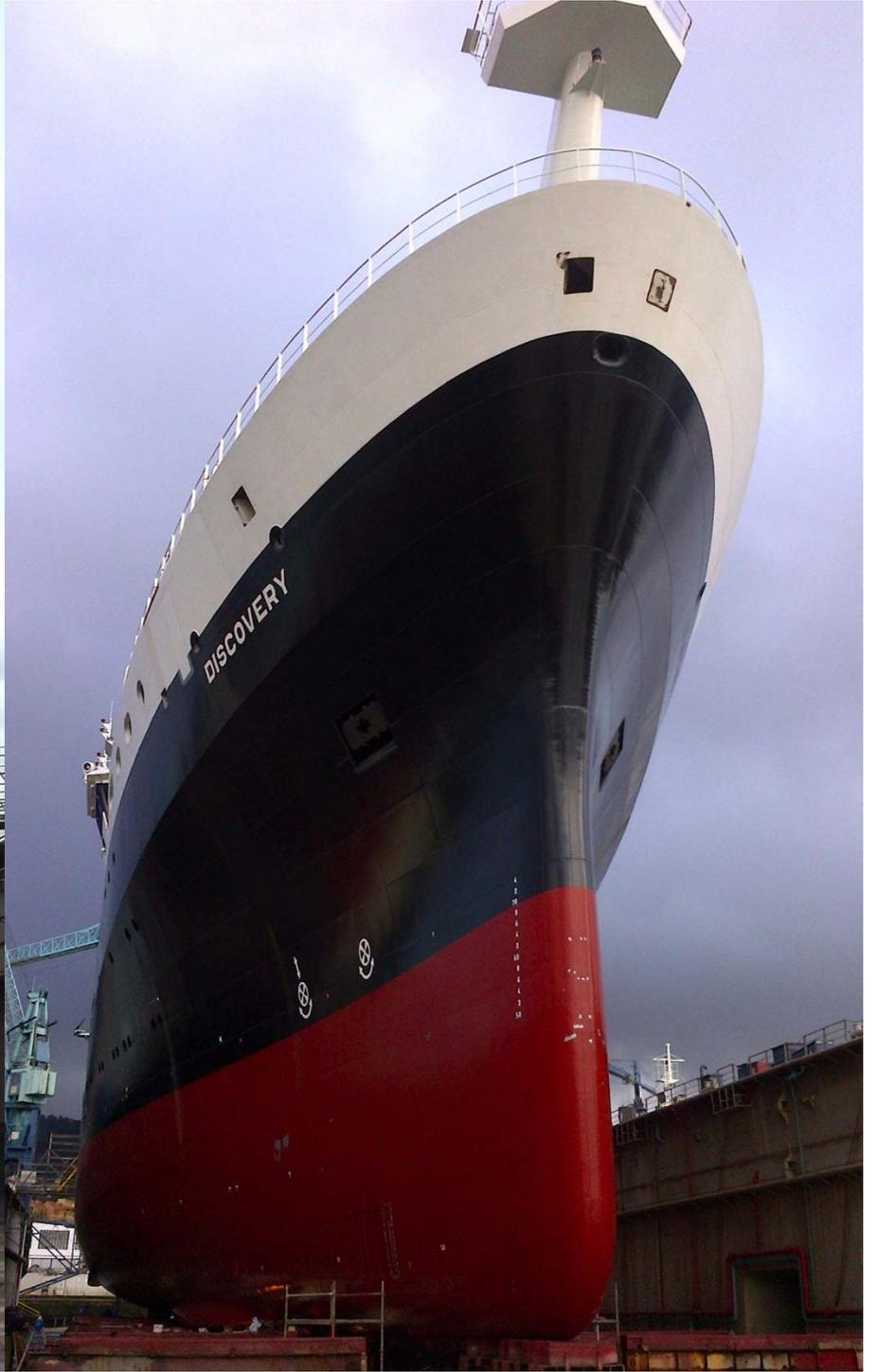
**Aft Cranes
40T.m**

**Stern 'A' Frame
Capacity – 30t
Max. Height – 8m**

**Starboard Bull-horn Boom
Capacity – 20T
Max. Height – 4.5m**

**Starboard 'A' Frame
Capacity – 20t
Max. Height – 5m**







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RRS Discovery

Commissioning for science operations

Commissioning programme following delivery:

- Marine familiarisation sea trials
- Hydrographic sea trials
- Deep sea winch commissioning sea trials
- Full science equipment sea trials



RRS Discovery

Commissioning for science operations

1st deep sea winch commissioning sea trials:

- Objective of the trials were to operate and prove ships winch and over side handling systems for delivery of science support in March 2014
- Key activities were to operate and test all winches, wires, cables and ropes over all the handling systems to evaluate overall capability using steel weights only at this point
- All systems were trialled but some tests could not be completed either due to supporting ships scientific equipment not being operational or failure of winch components during the trials cruise
- Such as MRU, USBL, winch metering system.



RRS Discovery

Commissioning for science operations

Engineering issues identified during the 1st trials:

- Failure of the GP winch traction winch drive coupling
- Overheating of the deep tow storage drum non drive end bearing
- Cooling problems with the storage drum drive end bearings on the CTD1, CTD2 and trawl winches
- Spooling problems with the synthetic deep core winch/rope
- Outstanding commissioning problems with the metal Free CTD winch
- A number of common system faults across the systems such as;
- Bearings overheating (misalignment)
- Cooling systems & drive unit alignments
- Lack of stern cable runs (CTD & Core)



RRS Discovery

Commissioning for science operations

2nd deep sea winch commissioning sea trials:

- 2nd trials followed a period of shore based repair and commissioning but the coring, GP, deep tow and trawl winches were not operational and needing further work
- Trials progressed with the 2 ship fitted CTD winches and the portable metal free CTD winch
- The trials of the 3 CTD winches had some success but there were still a number of systems to bring online to complete the full commissioning package; this included AHC and spooling issues



RRS Discovery

Commissioning for science operations

3rd deep sea winch commissioning sea trials:

- Following further shore engineering work a 3rd trials sailed to continue the trials process, but a number of the winches still required further repair work
- The 3rd trials would concentrate on the key winches required to support the imminent science cruise programme, with the outstanding winch trials postponed for a period later in the year
- The trials suffered a number of electrical and control problems during the testing, the result was that only the 3 CTD winches were operable, the core, GP, deep tow and trawl winches were not commissioned to a point where they could be used for science operations



RRS Discovery

Commissioning for science operations

Initial science operations:

- Following the trials cruise the ship sailed for the initial science operation but continued problems with the winches required the ship to come out of service following the cruise to address the winch issues
- The remainder of the 2014/15 cruise programme was dedicated to carrying out major winch repair along with a number of interspersed science activities
- In mid 2014 a further winch trials had to be curtailed due to a major weld failure on one of the traction winch drums requiring the ship to be taken out of service.



RRS Discovery

Commissioning for science operations

Initial science operations:

- The ship carried out a 3 month period of major winch testing, repair and sea trials
- Following this period the ship was ready to carry out the programmed science cruises in early 2015 which were postponed from the previous years programme
- Following the extended repair and trials period for these systems, a number of key capabilities of the ship still needed commissioning which are planned for 2016



RRS Discovery

1st year science delivery

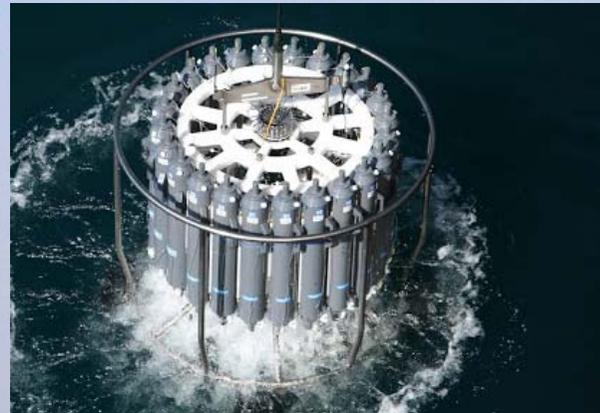
- In February 2015 the RRS Discovery sailed on the first of a series of cruises
- NMF Sea Systems felt they could be adequately supported by the limited level of commissioned mechanical handling systems on board.
- These cruises consisted of:
 - 5 Shelf Seas Biogeochemistry cruises (Celtic Sea, 2 pelagic, 3 benthic)
 - 2 long term time series mooring and physical oceanography cruises in the Line.



RRS Discovery

1st year science delivery

The Pelagic cruises had a diverse range of equipment – including;



And lots of CTDs.....

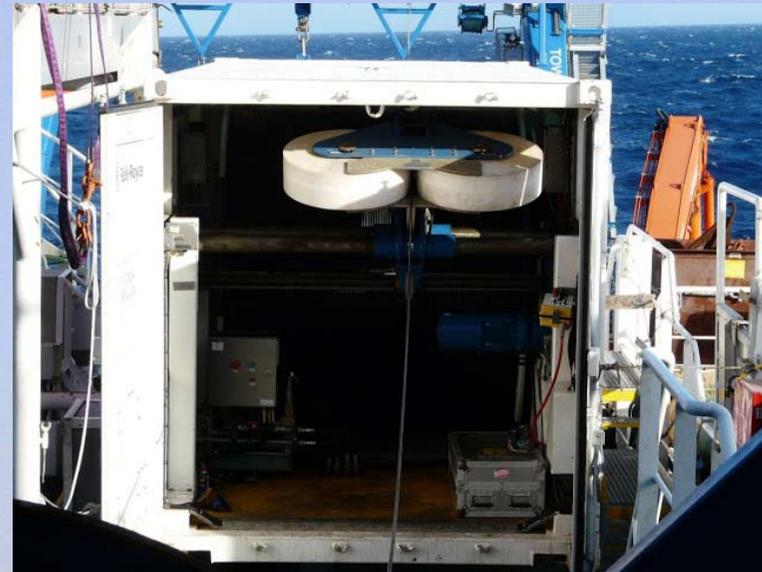


RRS Discovery

1st year science delivery

The Pelagic series of cruises was mainly:

- CTDs
- Gliders
- Moorings
- Shallow sea bed trawling
- A critical requirement of these cruises used the ODIM Trace Metal free CTD winch



RRS Discovery

1st year science delivery

At the conclusion we had operated all ships fitted winches (apart from the Deep Water Core) in support of science operations:

- Several hundred CTD dips with ships fitted and trace metal free winch ranging from 50m to 4000m depths
- Several hundred coring dips with the “General Purpose” winch
- Net tows with the trawl winch
- Camera deployments with the Deep Tow wire (Optical/Electrical).

All over the side handling equipment was also well used on these cruises:

- Bullhorn beam
- Starboard Parallelogram - “P-frame”
- Stern gantry
- Ships cranes.



RRS Discovery

1st year science delivery

- All cruises were very successful with very little downtime
- The ODIM TM CTD winch still has scrolling problems
- Commissioning of piston coring system yet to be progressed
- Commissioning of seismic operations on the Discovery to be completed
- ISIS ROV handling systems and ship operation yet to be commissioned
- A comprehensive trials programme is planned for all of these operations in 2016/17 cruise programme.



RRS Discovery

Ongoing issues

Outstanding capability commissioning:

- Piston coring operations
- Seismic operations
- ROV operations



RRS Discovery

Ongoing issues

Piston coring operations

- Modify starboard bulwark to support piston corer installation and deployment process
- Review ship fitted handling systems suitability through deep sea trial coring operations
- Fully commission synthetic coring winch and rope system during heavy deep sea coring operations
- Sea trail & commission to confirm systems are operational for programmed science in 2017/18



RRS Discovery

Ongoing issues

Seismic operations

- Modification of NMEP seismic compressors for deck operation
- Examination, testing, and modification of the High Pressure air distribution system
- Shore trials of maximum seismic source capability based on space limitations of ship systems
- Sea trail & commission to confirm systems are operational for programmed science in 2017/18

RRS Discovery

Ongoing issues

ROV operations

- Modify starboard deployment system to enable ISIS deployments from the side of the ship
- Modify the portable ROV docking head
- Review and confirm portable and ship fitted winch capability for starboard ISIS operations
- Sea trail & commission to confirm systems are operational for programmed science in 2017/18





Thank you
Any questions?