Upgrade of Celtic Explorer Multibeam systems

28th IRSO Meeting

21ST October 2015

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www.marine.ie

International Research Ship Operators

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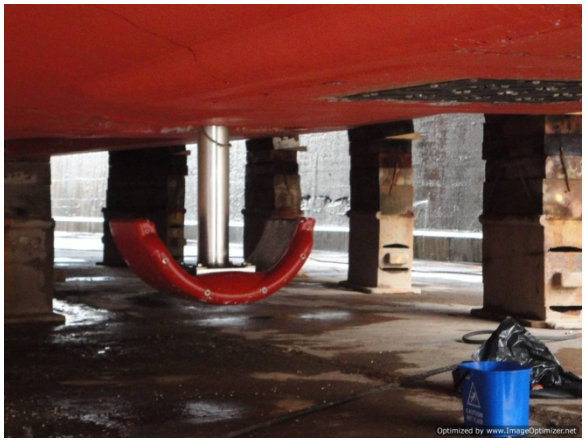
Celtic Explorer Geophysical /Hydrographic systems & status

- 4X4 3.5 kHz pinger unit on keel
- EA600 12/18/38/200 kHz single beam system
- Seapath 200 with Seatex MRU5 (Installed 2002)



Multibeam Echosounder:

- EM1002 (year 2002) on retraction unit
- Operational to 900m
- System nearing end of life and no longer fully supported

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Existing Geophysical /Hydrographic systems and status

Issues:

- Vessel under equipped in terms of equipment as vessels operational profile has changed significantly since delivery.
- Vessel is now engaged in a wide range of work beyond the shelf on a variety of surveys including ROV Work to 3000m and transatlantic transects.
- New fisheries interest in water column data .
- Existing pinger system limited to c. 800m water depth and limited penetration
- Profiled activity in future years will include the high resolution mapping of the Continental shelf in the Celtic Sea requiring high resolution shallow water system

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Funding received for upgrade

- Funding of c. €1.350k awarded in 2014 for upgrade of the Vessels' multibeam systems
- Went to EU tender in mid 2014
- **Tender awarded to Kongsberg for**:
  EM 2040
  EM302 (1 X 2 degree
  Seapath 330+ and MRU 5+
- **IXBLUE awarded a tender for:**
  IXBLUE ECHOES 3500 T7 sub bottom profiler


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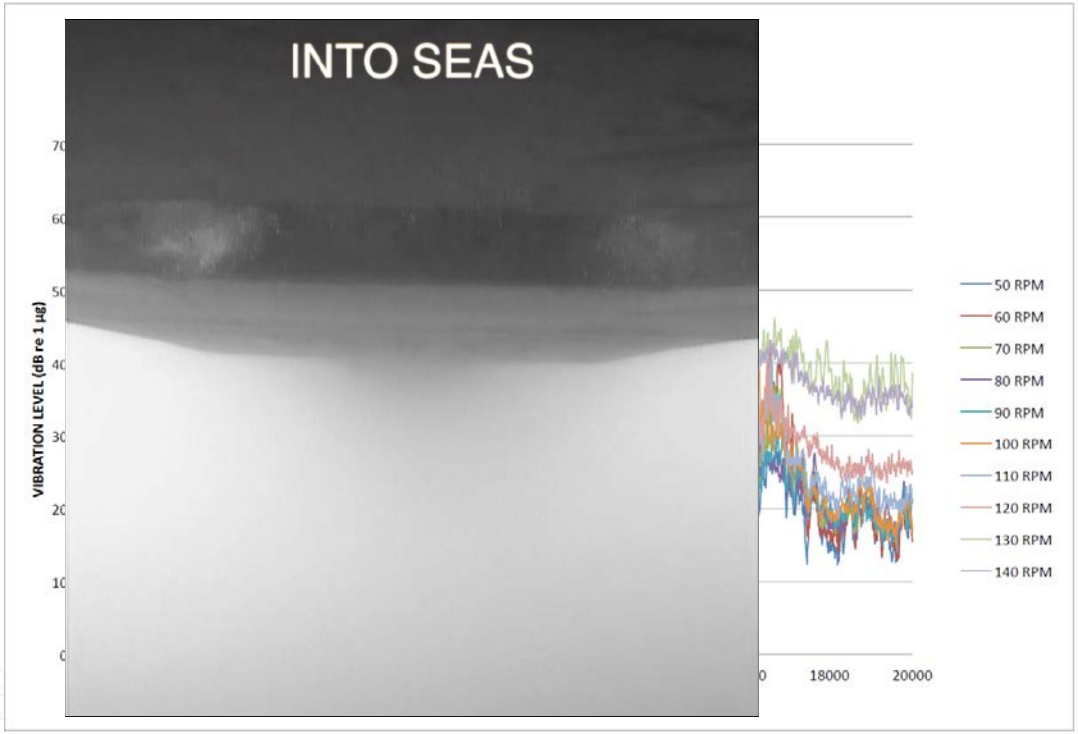
Installation Planning New systems

- Vessel is designed to meet the requirements of ICES 209 Curve and is generally very quiet
- Some concern regarding the vessels bulbous bow and bubble generation
- Gates acoustic services engaged to complete acoustic and video trials in March 2014 to examine vessel performance
- Some bubble generation effect from bulbous bow down to 1.5 m below keel but only in head seas
- Drop keel excellent location for shallow water multibeam
- Vessel deemed very quiet and optimised for high quality data acquistion



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Installation Planning EM302

- Vessel built with provision for 2 x 2 EM 300
- Sea-chest to be extended for 1 degree Transmitter
- Existing cable conduits had too many 90 degree bends and too narrow for EM302 cabling, new conduits required for both TX and RX
- Processing unit to be fitted in existing Transducer room
- MI/P&O Team visited Horten for FAT and for detailed meeting with Kongsberg on installation requirements
- Kongsberg installation videos very useful




Installation Planning EM2040

- Vessel has 3 metre long drop keel which extends 3 metre below the vessel keel
- Concerns that keel position may not be replicated each time keel deployed
- Keel locked in position using large hydraulic locking ram
- Removable section modified to allow easily removable EM2040 in pre installed bracket


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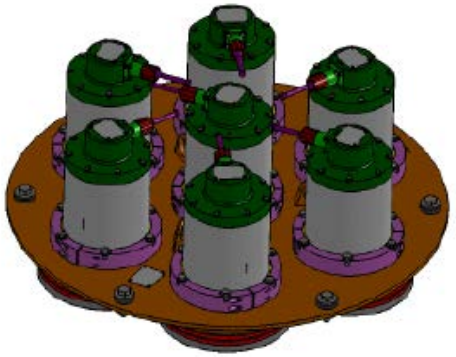
Installation Planning IXSEA Echoes 3500 T7

- Vessel had an existing SES probe 5000 hull mounted (4 x 4) pinger array
- New system used 7 transducers in a round configuration






Installation EM302

- Vessel entered dry Dock in A&P Falmouth on the 29th December 2014
- 23 Days allocated for full 3 year refit + installation of all three systems
- Vessel and system survey by Blue Pix including shimming and alignment of EM302 Frames.
- New Seachest section added onto TX Seachest
- Difficult routing for large new conduits without turns. Eventually terminated with high pressure Rox block units in void space with cable tray lead to transducer room
- Additional fairing added to smooth hull shape ahead of RX unit
- Alignment of frames challenging with modified Sea Chest
- EM300 dimensions slightly smaller then EM302 so tight fit for cabling and adjustments required
- Lots of new screens required modification to power supply in dry lab
- Wet Weather made work dicfficult!

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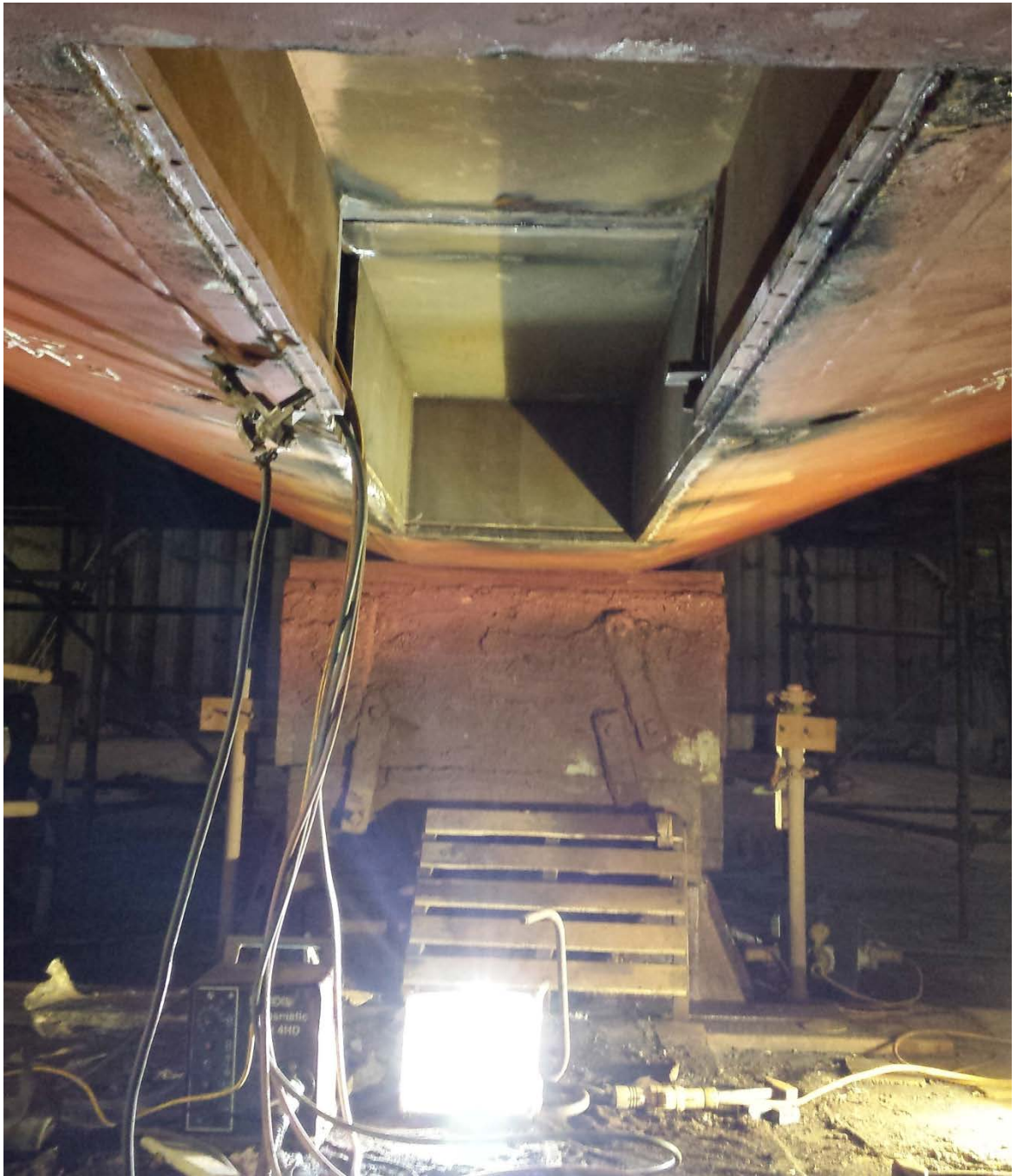


KONGSBERG


bluepix
HEWDEN



Installation IXBLUE ECHOES 3500

Relatively simple install

- Details sparse on installation
- Single cable meant no conduit issues
- Unit very tight in Sea chest
- Topside initially fitted in Dry Lab
- Moved it due to noise!
- System Noisy when in use

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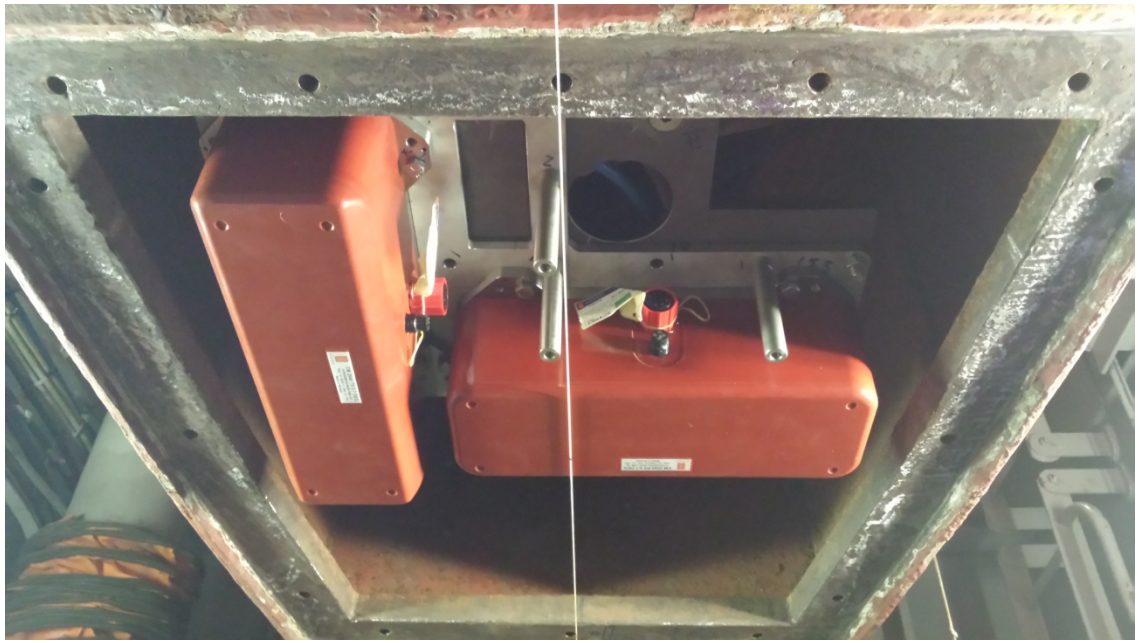
Echo 3500 T7 SBP
EM302 RX
EM302 TX



Installation EM2040

- Drop Keel removable section modified to accommodate permanent EM2040 Bracket and SVP probe

- 6000m rated Transducers also utilised on ROV so transducers and cable removed when not in use, bracket fixed so dimensional survey valid



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Trial of new systems

Due to pressure on vessel schedule, trials completed in 2 stages:

1st Trial 20-23rd January

EM2040 trial – Successfully completed off Falmouth, excellent data quality, patch test(s) revealed no heading/movement issues or repeatability issues with drop keel

2nd Trial 16th – 24th February

Deep water trial of EM302, IXBLUE echoes - John Hughes Clarke engaged to complete trials.

Trial completed in deep water in Bay of Biscay and west of Ireland in heavy weather conditions.

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Outcome of Trials

A

EM302 bathymetry

B

EM302 backscatter

C

EM302 water column

0

km

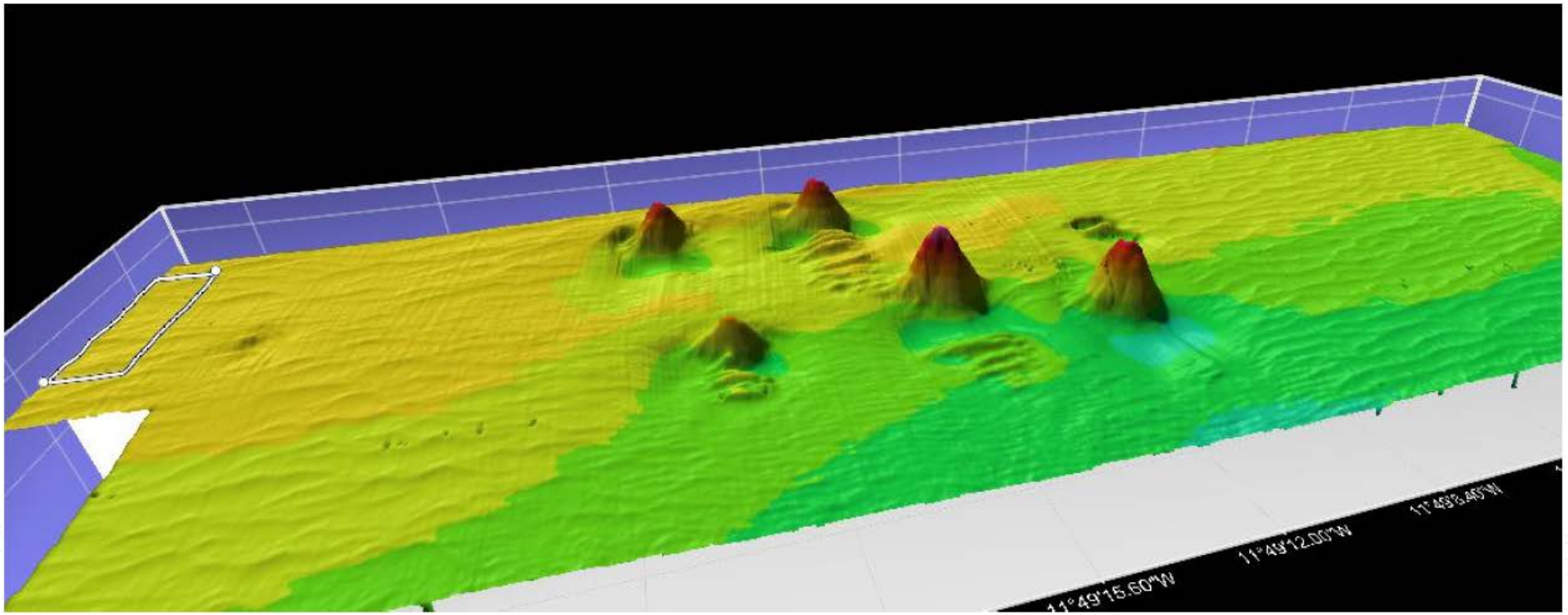
4.5

DSL

125 km




EM2040 on Holland 1 ROV



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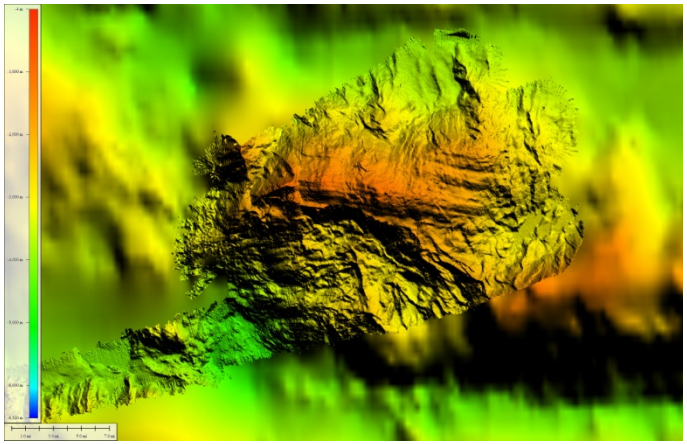
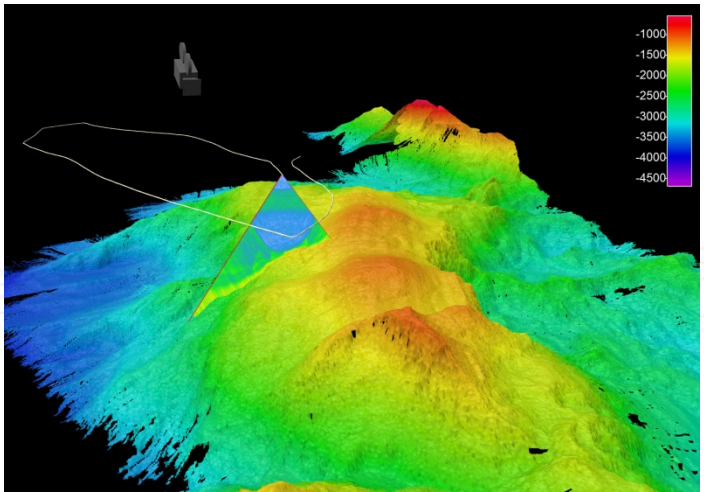
Summary /Conclusions

- Difficult and complex install completed on time and on budget
- Unexpected hurdles overcome
- Worth spending money on the best possible survey company
- Visit to Manufacturer and detailed installation planning vital
- Project has resulted in the Celtic Explorer now having full ocean depth capability
- Exceptional quality data being acquired in summer campaigns including transatlantic transect in June
- Removable EM2040 allows use on Holland 1





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