

Industry and Commercial Review

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- 34 years in oil, gas, mineral exploration
- 24 years with Schlumberger as Operations Manager and 8 years with ARKeX as CEO
- Experience is in Operations and Business Development, as well as launching new technology into the exploration industry (Q Marine systems for SLB and ARKeX Gravity Gradiometry systems)

Industry and Commercial Review - Agenda

MCS Service Industry Discussion (Morning)

1) Who are we talking about in seismic service industry?

- a) Examples of operators with similar vessels to Langseth (e.g. Seabird, Gardline, BGP) and their fleets and equipment
- b) Examples of operators in the 3D fleet

2) The geophysical service industry market

- a) Past, Current and Future market

3) Costs in current MCS operator market

- a) Operator behavior and response to market changes
- b) Comparisons of market costs and Langseth

4) Other issues working with Industry

5) Impacts of Industry Only Charters for the US community

Can Industry Provide Services currently offered by Marcus Langseth and Support Group?

Seabird Fleet – Total of 8 Vessels- (4 stacked now)

SeaBird is a global provider of marine acquisition for 2D and 3D seismic data, and associated products and services to the oil and gas industry.

SeaBird specializes in high quality operations within the high end of the source vessel and 2D market, as well as in the shallow/deep water 2D and 3D market.

Main focus for the company is proprietary seismic surveys (contract seismic). Main success criteria for the company are an unrelenting focus on Health, Safety, Security, Environment and Quality (HSSEQ), combined with efficient collection of high quality seismic data.

- Industry recognized shallow water 3D towed streamer experts.
- High Resolution acquisition.
- 2D Long and Ultra long acquisition.
- Broadband acquisition technology.

Seabird Fleet Examples



Aquila Explorer --2D Long Offset / Source Vessel

The 2D Long Offset / Source Vessel M/V Aquila Explorer was converted to 2D Source vessel in Singapore in 2007. The vessel is designed for worldwide operation.



2D/3D Shallow Water Vessel

M/V Voyager Explorer joined the fleet August 2011. The vessel is designed for shallow water operation world wide.

Aquila Explorer Specifications

Vessel Specifications	
Type	2D / Source
Year Built	1981
Rebuilt	2007
Length Overall	71.0m
Beam	17.5m
Mean Draft	5.45m
Transit Speed	11.5 knots
Accommodation, Hospital	43.2
VSAT	384 Kbit

Acquisition System	
Streamer	Seal Solid
Phone Type	Sercel Flexible Hydrophone
Recording System	Sercel Seal 408XL, 2000ch
Real-Time QC	Sercel Esqc-Pro
Streamer Lengths	1 x 12000m

Navigation & Positioning	
INS	SeaProNav
Vessel Positioning	Dual Veripos Ultra/Apex2
Source Positioning	SeaMap BuoyLink
Streamer Positioning	SeaMap BuoyLink, ION 5011 Digibird

Energy Source	
Source Controller	Seamap Gunlink 2000
Source Elements	Bolt 1900 LLXT
Sub Arrays	6 (Single / Dual Source)
Volume	Up to 8000 cu.in.
Operating Pressure	2000 psi

QC Quality Control	
Navigation QC	FGPS Seispos / P1 Tools
QC Seismic Processing	Open CPS
Project Reporting	MultiSeis Project Manager

Seabird Geo Pacific



M/V Geo Pacific joined our fleet January 2013. She is designed for worldwide operation and is capable to tow 6 x 8000m solid sentinel streamers.

Vessel Specifications	
Type	3D/4D
Year Built	1987
Rebuilt	2003
Length Overall	81.85m
Beam	14.8 / 20m
Mean Draft	5.7
Transit Speed	10 Knots
Accommodation, Hospital	60.1
VSAT	512 Kbit

Acquisition System	
Streamer	Seal Solid
Phone Type	Sercel Flexible Hydrophone
Recording System	Sercel Seal 408XL, 6000 ch
Real-Time QC	ProFocus Argus
Streamer Lengths	8 x 6000m / 6 x 8000m

Navigation & Positioning	
INS	SeaPro Navigation Suite
Vessel Positioning	Dual Veripos Ultra / Apex2
Source Positioning	SatPos Citius, Sonardyne SIPS2
Streamer Positioning	SatPos Citius, ION 5011, Digibird. Sonardyne SIPS2

Energy Source	
Source Controller	SeaMap Gunlink 2000
Source Elements	G-Gun
Sub Arrays	6 (Single / Dual Source)
Volume	Up to 4800 cu.in.
Operating Pressure	2000 psi

QC Quality Control	
Navigation QC	FGPS Seispos / P1 Tools
QC Seismic Processing	Open CPS
Prospect Planning	Survopt
Project Reporting	MultiSeis Project Manager

BGP Fleet Example



BGP Explorer is newly converted in 2010. The vessel is equipped with

- SERCEL SEAL5.2 recording system,
- SERCEL Sentinel solid streamer,
- Digi-Fins,
- Sercel GII-GUN,
- SUN workstation, and
- Landmark ProMAX processing system.

BGP Explorer is capable of doing 2D/3D seismic survey with 1X12000 m, 2X8000m, 3X6000m and 4X2500m towing technique. The vessel has done projects all around the world.

BGP has six vessels with BGP Explorer the only mid-range ship with comparable capabilities of Langseth

Gardline Fleet



Gardline Example



Kommandor

TYPE DP2 Multi-role vessel
BUILT 1986
LOA 69m
BEAM 12m
ENGINE Twin engine, twin propellers
THRUSTERS Bow/stern thrusters

ACCOMMODATION 44 berths
MOON POOL 4 x 4 covered Moon pool

A - FRAMES Rear A-Frame and retractable door side A-Frames

CAPABILITY Integrated geophysical, geotechnical and environmental surveys. Multi-channel seismic.

3D Services - Who are we talking about??



R/V Marcus Langseth MCS Specifications



MCS Acquisition

- Sercel 408
- SSI Seisnet active tape emulation

Hydrophone arrays

- Sentinel Solid Cable
- 12.5 meter groups
- 150m sections
- Up to 1x15km, 2x12, 4x6km, 6x6km
- separation 50 - 150 meters

Source Arrays

- 4 x 10 gun strings
- 9 active, one spare / string
- 17 meter string length
- 1650 cu. In. per string, 6600cu. in.

total volume

- Bolt 1500 and 1900LLXT

Source Controller

- DigiShot

MCS geometry sensors

- Digicourse 5011 Compassbirds
- Digicourse Digirange
- Tailbuoy GPS
- Source GPS (1 per string)

MCS Navigation

- Concept Systems, Ltd Spectra, Sprint, Reflex, Orca

MCS QC and Planning Software

- SeisNet
- ProMaxx
- Focus
- SurvOpt
- Multiseis

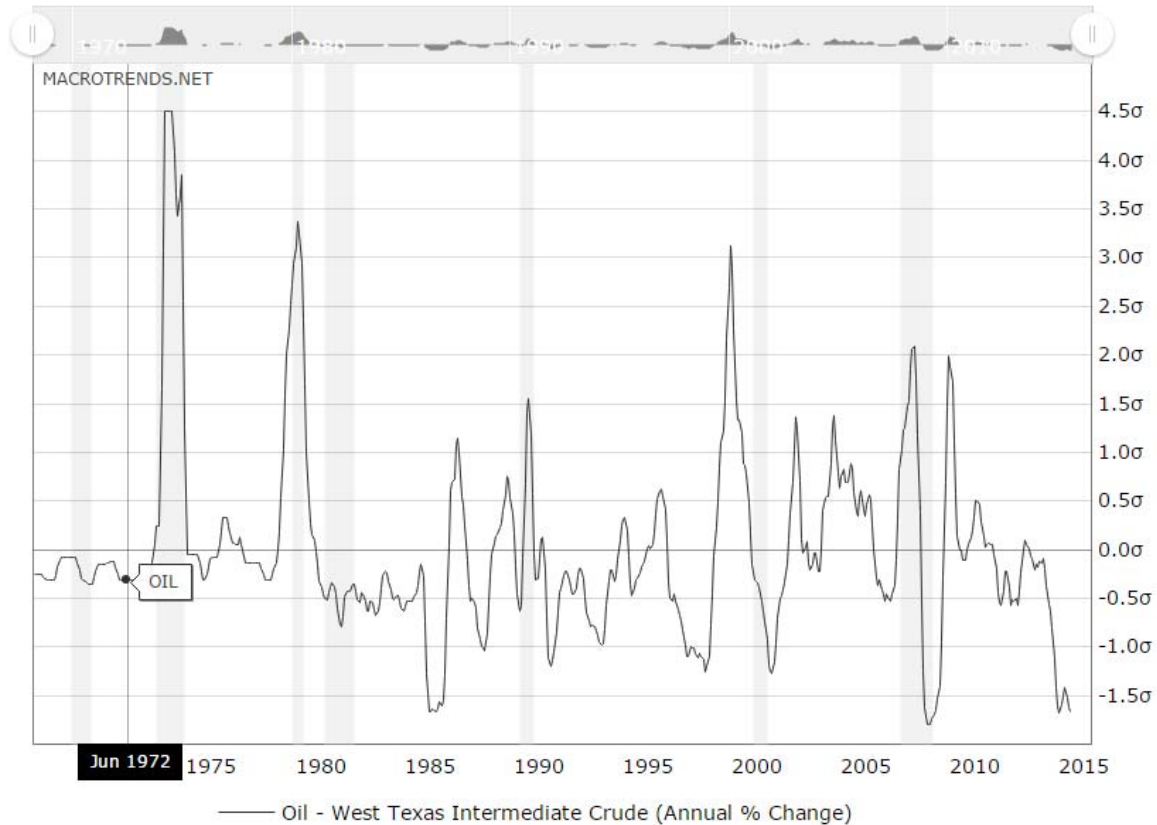
Communications

- HighSeasNet
- Inmarsat Sailor 500 Fleet

Broadband

- Iridium Sailor Satellite Phone

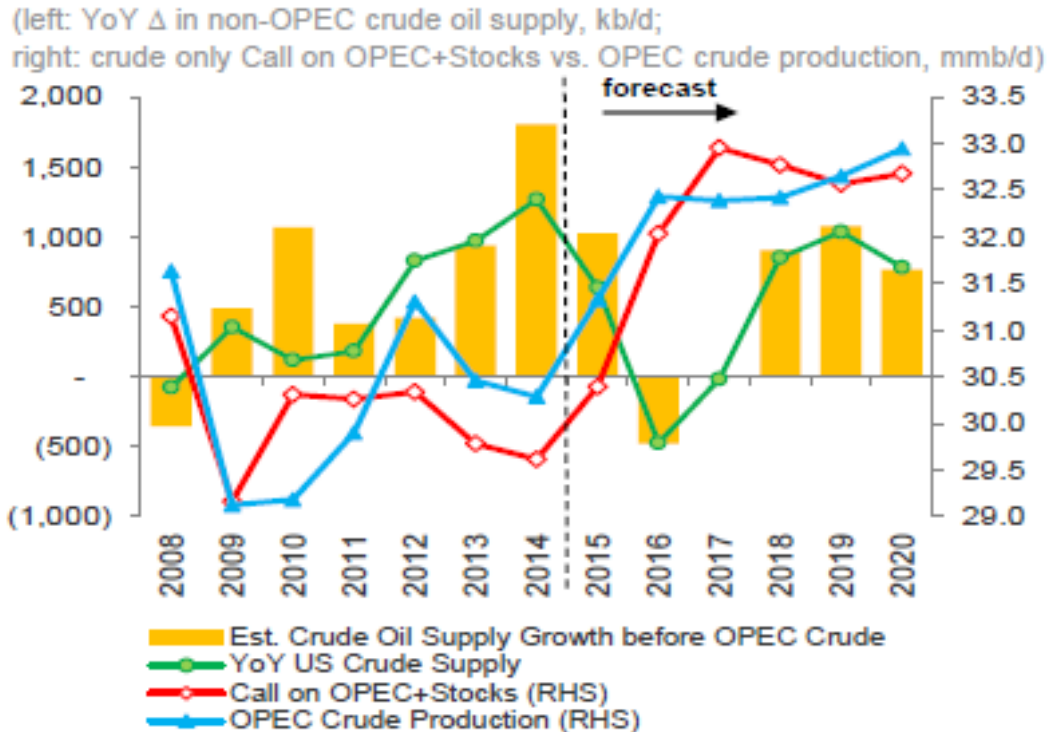
A historical (and future) look at Oil Price



- Rise and Fall of the oil price creates a cyclical nature to the oil service industry.
- The years when E&P companies were cutting budgets (and therefore vessel prices were falling) were 1985, late 90's early 00's, 2015.

A historical (and future) look at Oil Price

Still Cyclical: Oil Balance Points to a Tighter Market and Much Higher Prices in 2017/18.



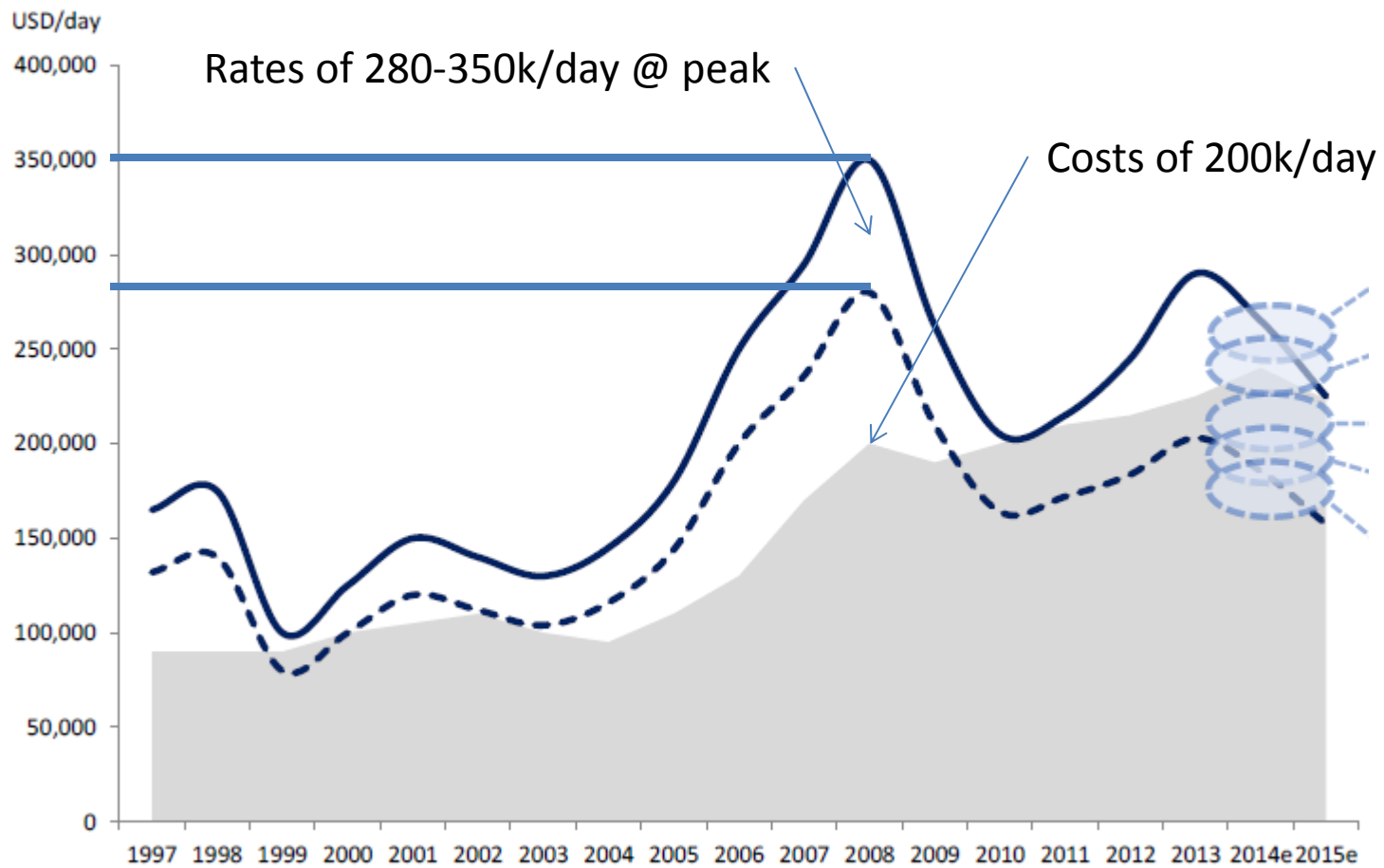
Sources: IEA, JODI, HPDI, EIA, WoodMac, Morgan Stanley Commodity Research estimates

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- There will be a recovery (see IEA and Morgan Stanley chart) and vessel pricing (ie. Day Rates) will rise from the current lows

3D Vessel Day Rate Costs and Rates from 1997

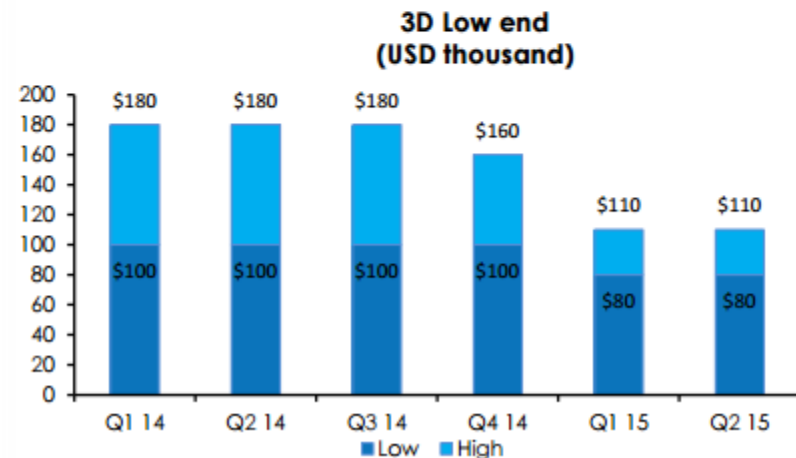
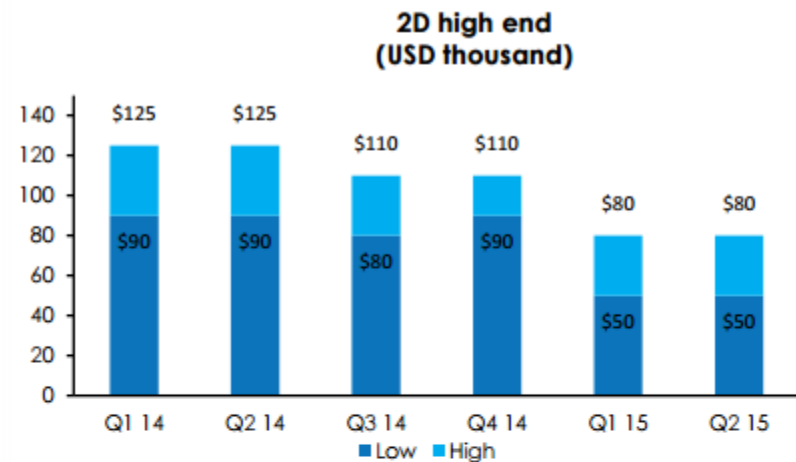
Cost curve and relative positioning (illustrative)



- Pareto Securities

2D Day Rate Range showing 2014 and 2015

- 2014 (considered by many to be better times) showed day rates for vessels of similar configuration to Langseth (including GeoPacific and other low end 3D vessels with large source as 100 –180k / day and and 80 - 110k (in poor times)
- The vessels which are currently going for US 50k/day are mainly source vessels with limited crew numbers.



Source: Petrodata

From Seabrid Geo Q2 Results

Comments from Contractors after H1 2015 performance

1. Still no balance in the Low Demand for Seismic vs High Availability of Vessels
2. Imbalance likely to carry on until 2017 as contractors continue to take vessels out of the market
3. All Contractors (CGG, PGS, Dolphin, Polarcus) talked about currently operating to only meet their cash demands. Eventually they need to think longer term about their debt repayments
4. SBEX and PLCS and DOLP have talked about further stacking of vessels to improve margins
5. All could not continue to operate in this manner and would be working on costs and removing capacity in order to get margins back to expected levels.
6. Industry should expect for day rates to increase as vessels are removed from the market

Some areas which are saving the market



HOUSTON (24 August 2015)- TGS is pleased to confirm that it has received authorization from Mexico's *Comisión Nacional de Hidrocarburos* (CNH) for the acquisition of multibeam, coring and geochemical analysis data over an area of approximately 600,000 square kilometers in Mexican waters.



OMAN (15 Sept 2015) Gardline CGG, a Singapore-based joint venture formed between Gardline and CGG, has been awarded a contract by the Ministry of Foreign Affairs of the Sultanate of Oman for the Oman continental shelf extension survey.

Historical *Langseth* Normalized Day Rate 2008-2015

Average Langseth Ship Operations Costs are inclusive of capex and shipyard expenditure.

The Sum of Ship Operations Day Rate + Technical Services (Basic + 2D) rates is a good estimate for comparing with Industry Day Rates

Historically, # of operating days has varied by almost factor of two between high and low but averaging over those years, ~ Ship Ops Day rate = \$44K with

Tech Basic + 2D have been \$20K with 3D averaging another \$15-20K

Overall -- ~65K/day for 2D is a reasonable average # to use for this comparison with average annual budget of \$13M

Current and Past market conditions and.....

Average market conditions

- A. The current market is at the LOWEST possible point in the cycle (2015)
.....
- B. The market in 2008 could be seen as a High Point in the market.
- C. When comparing Industry Day Rate pricing we should use an average of Low Point and High Point. In the analysis on the next slides,
 - for 3D, this is conservatively estimated at 240k/day and
 - for 2D it's shown as 120k/day

	Cost/Day/Vsl	Rev/Day/Vsl	Expected Avg Rev/Day/Vsl	Comments
	2015	2012	Long Term	
	K \$	K \$	K \$	
PGS or CGG	200.0	300.0	240.0	PLC, DOLP, PGS, CGG, WG all operating below cost. In better times, would likely operate in the middle of the spectrum.
SBEX (2D)	80.0	180.0	120.0	Losses in 2015/16 as operating below cost. From the Q2 report, we see them trying to sustain operations at a low of 80k/day.
SBEX (SX)	50.0	125.0	80.0	Losses in 2015/16 as operating below cost. From the Q2 report, we see the most basic source vessels going for 50k/day

Current and Past market conditions and.....

Average market conditions

- Forecast an Average Year of Activity on NSF 2D and OBS / Source projects.
 - A. 3 x Long Offset 2D survey (new Regional Model)
 - A. ML = 3 x 30 day survey + 1 x 30 day mob/demob
 - B. Industry (SBEX) = 3 x 30 day survey 1 x 30 day mob/demob
 - B. 2 x Lrg Source OBS survey (new Regional Model)
 - A. ML = 2 x 30 day survey + 1 x 30 day mob/demob
 - B. Industry (SBEX) = 2 x 30 day survey + 1 x 30 day mob/demob

* Note: No 3D programs included as day rates > 240k/day didn't seem like it would fit the model.

Comparison between Industry and ML

1. For (Project A) we could assume similar acquisition and mob times. Industry likely to achieve slightly longer offset than even the new set up.
2. For (Project B) we should assume same acquisition and mob times. ML likely to have advantage in ability to work with PI's and more flexible in this type of operation.

	2D Long Offset	Large Source OBS	Total
ML Days	120	90	210
ML Rate/Day (K \$\$'s)	64.4	64.4	
ML Total (M \$\$'s)	7.7	5.8	13.524
Seabird Days	120	90	210
Seabird Rate/Day (K \$\$'s)	120		
Seabird Rate/Day (K \$\$'s)		85	
ALT Total (M \$\$'s)	14.4	7.7	22.1

Note: I have not included the additional costs there would be to add to the industry total for an internal NSF group to act as the link between Industry and Acadmia

Other Important Considerations

It's difficult to put a monetary value on these issues but they are each considerable and likely mean not achieving a full scope of work each year.

- 1) Contracting with industry is rigid in its contractual form and bids would be done on a basic Day Rate with ALL time (variation orders, waiting on permits, standby) for Client account.
- 2) Additional equipment required for science needs (following slide) will require additional vessels or further charges. There are NO vessels in the Seabird, BGP or Gardline fleets similar to Langseth
- 3) Health & safety policies limit back deck and involvement in data collection + training
- 4) Limited lab space and ability to change work program on the fly
- 5) Limited bunk space for PI's and students

Other Available Langseth Equipment

- Kongsberg MB (1x1° Array)
- Knudsen 3260 Echosounder
- Bell BGM-3 Gravimeter
- Towed Geometrics 882 Magnetometer
- RDI 75KHz ADCP
- Stbd Side A frame
- Markey Dsh-5 CTD winch
- Uncontaminated Seawater System
- Seabird SBE21 Thermosalinograph
- LDEO PCO2
- Labs to support other types of work

Summary

- A. High end 3D vessels are on the average 3X more expensive than operating ML.
- B. Low end 2D/3D vessels (eg. Seabird) are more expensive than Langseth even in difficult periods (eg. 2015/16)
- C. All other types of data recording (multi beam, ADCP, etc) would either
 - Not be collected or;
 - Be an additional cost to operations
- D. Contractual mechanisms are complex
- E. Examples of Industry providing assets to academia are few and far between in geophysics. There is a reason this doesn't happen very often.